Opportunistic reminders and other influences on the performance of preventive activities in consultations in general practice

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4 Abstract

Introduction

Eighty five per cent of Australians visit a GP each year, but do not receive all of the preventive care which is indicated for them. There have been no controlled trials of the effects of on-screen preventive care reminders in Australian general practice, and there is little published research examining characteristics of patients, doctors and consultations associated with the performance of preventive services in general practice. This study aimed to measure the effects of opportunistic reminders and to explore previously unexamined patient, GP and consultation factors associated with performance of preventive activities. The hypotheses were: a) that general practitioners who were using a computer medical record system would take at least fifteen per cent more of opportunities to perform preventive care activities if they were reminded; b) that this would occur without any significant increase in the number of consultations or in patient billings; and c) that every characteristic of patients, GPs, consultations and preventive opportunities would be significantly associated with the performance of the preventive activities.
Method

All patients who attended a ten GP fully computerised practice during one year were enrolled and randomised either to an intervention group, for whom the GPs received opportunistic on-screen reminders about eleven preventive activities, or to a ‘usual care’ control group. Performance by the GPs of the preventive activities was recorded automatically and correlated with routinely-collected demographic and clinical information about the patients and billing data.

Results

For the intervention group compared to the control group, the GPs took thirty two per cent more of the preventive opportunities without any increase in numbers of services or in patient billings. Every characteristic of patients, GPs, consultations and preventive opportunities was independently associated with the performance of at least two of the preventive activities.

Discussion

This trial has shown that a low cost minimally-intrusive intervention in the form of automated opportunistic reminder messages can significantly improve GPs’ performance of preventive care activities. The findings of this trial may help to improve the design and effectiveness of opportunistic reminders in clinical software, and provide direction about possible changes to the health system which may foster increased provision of preventive care.
5 Statement of original work

This work contains no material which has been accepted for the award of any other degree or diploma in any university or other tertiary institution and, to the best of my knowledge and belief, contains no material previously published or written by another person, except where due reference has been made in the text.

I give consent to this copy of my thesis, when deposited in the University Library, being available for loan and photocopying.

Oliver Frank
6 Acknowledgements

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7 Glossary

Abbreviations and acronyms for preventive activities discussed

ALLE  Recording of patient’s allergies
BP    Recording of patient’s blood pressure, as screening for hypertension
DIAB  Recording of patient’s serum glucose, as screening for diabetes mellitus
FLU   Administration of influenza vaccine
LIPI  Recording of patient’s cholesterol level, as screening for hyperlipidaemia
MMR   Administration of measles, mumps and rubella vaccine
PAP   Cervical smear (Papanicolaou) test
PNEU  Prescribing of pneumococcal vaccine
SMOK  Recording of patient’s smoking status
TET   Administration of tetanus vaccine
WT    Recording of patient’s weight

Experimental groups

The expression ‘experimental groups’ throughout refers to both of the groups
(intervention and ‘usual care’ control groups) to which patients were randomised for the
study described in this thesis.

Statistical presentation

All confidence intervals shown are 95% unless otherwise stated.
8 Introduction

This thesis examines the role of opportunistic reminders in improving the performance of preventive activities in general practice.

The chapter Preventive Care in General Practice outlines the burden of diseases in the community and considers the question of who should provide care aimed at preventing these diseases and illnesses. The relative roles of public health and of general practice or primary care as providers of preventive care are examined and discussed. The chapter then discusses the environment in which general practice is operating, barriers to the performance of preventive activities and previous efforts to improve performance of preventive activities in general practice.

The theoretical aspects of reminder systems and their place in medical informatics are outlined. The literature about patient, GP, and service factors which influence the performance of preventive activities is reviewed, and previous studies of the effects of reminder systems are examined. Gaps in knowledge of the effects of reminders are discussed. Finally, a trial of opportunistic reminders, aimed at filling in some of the gaps in our knowledge of the effects of reminders and about characteristics of patients, GPs, consultations and preventive opportunities, is outlined. Findings of previous relevant studies, where they existed, and practical experience where they did not, were used to generate a primary hypothesis about the anticipated increase in performance of preventive activities resulting from the intervention, a related secondary hypothesis about changes in numbers of services and fees billed, and a number of sub-hypotheses about the associations of characteristics of patients, GPs, consultations and preventive opportunities associated with performance of preventive activities.
The Methods chapter describes the process of the development of a computerised automated opportunistic reminder system, the design of a randomised controlled trial of those reminders and the selection of the practice in which the trial was conducted. It explains why only one general practice was involved, which was a mainstream community practice of ten GPs in outer suburban and near country areas of Adelaide, operating at four locations. The method of enrolment and of randomisation of patients in the trial and the reasons for this are explained. The types of data to be collected and the outcome measurements are detailed. Methods of statistical description and analyses are described.

The Results chapter describes the data that were collected, and compares the study practice’s patients and services to national figures. Over a million data elements were collected, about more than 39,000 consultations which more than 10,500 patients had with the ten GPs during the one year of the trial, presenting more than 136,000 opportunities to perform the eleven preventive activities whose performance by the GPs was being studied. The results which were used to test the various hypotheses are detailed and the qualitative data obtained in interviews with the GPs are analysed and presented.

The Discussion chapter reviews and discusses the methods used in the trial and the data collected. The results that were obtained and their relationship to the results of previous studies, where they exist, is examined and discussed. Limitations of the study are discussed. The effects, positive and negative of opportunistic reminders in the trial are discussed.
The Recommendations chapter proposes useful further research directions in the use of reminders systems and their place in the health system, especially in primary care and general practice.

References to the literature quoted in this thesis follows. Five appendices are attached. The first is the ethics approval from the University of Adelaide for the study. The second appendix is copies of the source codes of the computer programs which formed the basis for the programs used in the study. The third appendix contains the analyses of data as they were obtained from the statisticians. The fourth appendix consists of the transcripts of the interviews with the GPs in the study. The last appendix consists of copies of the two peer-reviewed papers that have been published based on the trial of reminders and on the study of associations of characteristics of patients, GPs, consultations and preventive opportunities with the performance of preventive activities.
9 Preventive care in general practice

9.1 Introduction

In this chapter the public health burden of disease will be outlined and the role of general practice in public health and in preventing disease will be discussed. The environment in which general practice is operating will be described and incentives for and barriers to general practitioners performing preventive activities will be discussed.

Previous research that has examined the influences of health system, patient and doctor factors on the performance of preventive activities will be reviewed. This will be followed by consideration of attempts to increase the performance of preventive activities and a review of the literature about the effects of reminders for preventive activities. Previous difficulties in the use of reminders will be explained.

The important development of general practitioners increasingly using electronic clinical information systems will be traced. This will be followed by a discussion of the theoretical aspects of clinical decision support systems and of reminders.

Finally, the reasoning behind the approach used in the randomised controlled trial of automated opportunistic reminders that forms the centre of this thesis will be presented.

9.2 Public health burden of disease

The World Health Organization definition of health states:

“Health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity”.
This definition states that the health depends on the absence of disease. Diseases may cause suffering and may decrease quality of life, can sometimes be treated effectively and less often can be cured. A great amount of effort and money is spent in the treatment of common diseases which could have been prevented. Example of these are influenza, which can be prevented by immunisation and chronic obstructive airways disease, most cases of which can be prevented by not smoking tobacco. Table 1 shows the ten leading causes of disability-adjusted years of life lost in Australia compared with other ‘market economies’.

<table>
<thead>
<tr>
<th>Australia 1996</th>
<th>Per cent of total DALYs</th>
<th>Established market economies 1990(a)</th>
<th>Per cent of total DALYs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rank</td>
<td>Disease</td>
<td></td>
<td>Rank</td>
</tr>
<tr>
<td>1</td>
<td>Ischaemic heart disease</td>
<td>12.4</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>Stroke</td>
<td>5.4</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>Chronic obstructive pulmonary disease</td>
<td>3.7</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>Depression</td>
<td>3.7</td>
<td>4</td>
</tr>
<tr>
<td>5</td>
<td>Lung cancer</td>
<td>3.6</td>
<td>5</td>
</tr>
<tr>
<td>6</td>
<td>Dementia</td>
<td>3.5</td>
<td>6</td>
</tr>
<tr>
<td>7</td>
<td>Diabetes mellitus</td>
<td>3.0</td>
<td>7</td>
</tr>
<tr>
<td>8</td>
<td>Colorectal cancer</td>
<td>2.7</td>
<td>8</td>
</tr>
<tr>
<td>9</td>
<td>Asthma</td>
<td>2.6</td>
<td>9</td>
</tr>
<tr>
<td>10</td>
<td>Osteoarthritis</td>
<td>2.2</td>
<td>10</td>
</tr>
</tbody>
</table>

(a) Age-adjusted DALYs for Established Market Economies from the Global Burden of Disease Study (Murray and Lopez, 1996). Non age-weighted DALYs for Australia.

Table 1 The ten leading causes of disease burden (DALYs), Australia 1996 and Established Market Economies 1990. (Mathers, Vos et al. 1999)

Of the five leading causes of years of healthy life lost, ischaemic heart disease and stroke are cardiovascular diseases for which important avoidable or modifiable risk factors are hypertension, tobacco smoking and hyperlipidaemia, while for chronic
obstructive pulmonary disease and lung cancer, the avoidable risk factor of tobacco smoking is believed to be the major causative factor.

The AIHW estimates that the total burden of disability-adjusted life years lost in Australia through all diseases can be attributed to the following risk factors in the following proportions: tobacco (responsible for 12.1% of the total burden in men, and for 6.8% of the total burden in women), hypertension (5.1% and 5.8%), overweight (4.4% and 4.3%) and high blood cholesterol (3.2% and 1.9%) (Mathers, Vos et al. 1999).

The Australian Institute of Health and Welfare (AIHW) estimates that in 1993-1994 $3.7 billion was spent on treating people with cardiovascular disease and that the same amount was spent in treating people with digestive system diseases, including diabetes (Mathers, Vos et al. 1999). Many of these treatments do not achieve a cure, but only ameliorate the effects of the disease and sometimes can slow progression of the disease: examples of this are the treatments of diabetes and of coronary heart disease.

9.3 Some diseases are not curable but are preventable.

Our current inability and likely continuing inability to cure many diseases in the foreseeable future and the high costs of treating patients with established chronic diseases makes prevention of disease important, wherever it is possible to achieve this at financial and human costs that are less than the financial and human costs of the diseases themselves.
9.4 Public health services or medical care for prevention?

Starfield in her book about Primary Care (Starfield 1998) (pp. 184-187) discusses issues of whether preventive care should be provided by primary care practices or by public authorities. It should be noted that in Starfield’s discussion the expression ‘primary care’ does not refer solely to general practice. In international use and especially within the United States, the expression ‘primary care’ includes any type of ‘first contact’ health service or health professional, including community health clinics, nurse-run clinics, and specialist medical practitioners including internal medicine specialists, paediatricians and obstetricians and gynaecologists. One consideration in Starfield’s discussion is whether the national, regional or local primary care system is adequately able to provide or arrange preventive care for the population. Even if there is a primary system that can provide preventive care, patients have to be able to access it: there may be barriers such as cost which will deter the poor to a greater extent that the affluent.

Starfield distinguishes preventive activities which are indicated for the entire population, such as some immunisations, from others which are worth performing only for people who are actually at risk or at higher risk than others of the subject disease or condition. It is easier to argue that universally-indicated activities should be performed by public authorities, since no selection or targeting of recipients is needed. Starfield proposes:

“Population-wide interventions, which generally are more appropriately carried by public health activities, are most appropriate when individual risk assessment is impossible or difficult, when there is a low risk of adverse effect, and when the problem to be prevented is either common or has serious implications for the population. (...) The choice between generalized (whole population) and selective
(selected populations) approaches to ascertaining risks, and therefore the relative merits of a public health or a clinical medicine approach, often is not easy to make.”

Starfield points out that preventive activities are capable of causing physical or psychological harm. The harms may be physical, such as adverse effects of some interventions such as immunisation, or physical, such as from radiation employed in mammography, or psychological, through increasing patients’ concerns and when screening tests yield falsely positive results. The possibility of causing harm needs to be balanced against the expected benefits of the intervention. This means that for some preventive activities the expected benefits outweigh the possible harms only for certain types of people. The assessment of for whom such interventions are indicated, on balance, is best achieved in clinical practice.

This situation is complicated by the knowledge that certain sub-groups of the population are less likely than others to take up the care which is being offered to all. There may be a number of possible reasons for this differential uptake, including literacy and language problems and particular beliefs and attitudes which may exist in various social, ethnic, racial and religious groups, such as a belief that certain preventive activities are harmful. Family doctors, who see most of the population each year, are able to be aware of some patients’ lower likelihood of taking up care and pay special attention to these patients, to increase the likelihood that they will receive the care being offered.

This point is made also by McWhinney in his textbook of family medicine (McWhinney 1999) at the beginning of his discussion of “Preventive methods in family practice”
when he says: “The strength of a family doctor’s effectiveness is his or her knowledge of the strengths and vulnerabilities of individual patients and their families.” (p. 196).

The role of general practitioners in providing public health services is acknowledged by Walker, Gardner and Robinson in a chapter about ‘Strategic Alliances in Public Health’, in which they report that in Australia “Public health services are provided with the states and territories by organisations including local councils, nongovernment organisations, general practitioners, community-based health services, and universities, among others.” (Gardner (ed.) and Barraclough (ed.) 2002) (p. 143).

However, not all authorities see general practitioners as playing a role in providing public health or preventive services. In the chapter ‘Public Health’ in his book “The Australian Health Care System” (Duckett 2000), Duckett discusses the reduction of tobacco smoking that has been achieved in Australia (p. 155), but in doing so does not include general practitioners as agents of this change. He cites the efforts of “state Anti-Cancer Councils, (…) regulatory approaches (to ban the advertising and promotion of smoking products, and to ban smoking in public places (…)), taxation strategies, mass media advertising aimed at behavioural and cultural change, as well as groups to support individuals’ attempts to stop smoking, (…) supplemented periodically with additional national funding for anti-smoking advertisement programs.” General practitioners are not mentioned as having had any significant role in the reduction of tobacco smoking in Australia. In contrast, in discussing immunisation (pp. 168-169), Duckett acknowledges that GPs provide most immunisations in Australia.
However, his list of encouraging factors does not include the General Practitioner Immunisation Incentive Payments scheme which has been an important factor in increasing GPs’ performance of immunisations for children (Commonwealth Department of Health and Family Services 1997; Bond, Davie et al. 2002). Duckett also recognises a role for GPs in discussing ‘Early Detection’ of disease (p. 171), stating: “The public health approach to screening focuses on mass screening and selective screening, but primary health care practitioners are also encouraged to undertake opportunistic screening where it has been shown to be effective or cost effective.” Duckett does not say who is encouraging GPs to perform opportunistic screening, nor does he seem to see any role for GPs to perform screening on any kind of planned or systematic basis. Overall, Duckett appears to believe that GPs or other primary care health professionals have a rather small current or potential role in the provision of public health and preventive services.

In contrast to Duckett’s apparent attitude towards the role of general practice and primary care, Fry and Furler in their chapter “General practice, primary health care and population health interface” in General Practice in Australia 2000 (Commonwealth of Australia 2000) see a greater role for GPs and other primary care professionals. Fry and Furler list what they see as “the central elements of the definitions of public health” (p. 386). Amongst these is “An emphasis on prevention”. They note that “a number of key population health activities, such as immunisation, pap (sic) smears and antenatal care require personal interaction between individuals and health professionals” (p. 388). In fact, many other prevention activities also require personal interaction between individuals and health professionals, although new technologies, such as home faecal
occult blood testing kits, automated sphygmomanometers and Amsler grids, enable a
certain amount of self-testing or at least initial screening.

The difficult relationship, in terms of defining appropriate roles and boundaries and
scope for collaboration between public health and general practice of primary care, is
touched on by Murtagh in his textbook of general practice (Murtagh 2003), in which
Murtagh mentions public health only in passing in his chapter on prevention (p. 68),
when he quotes Piterman’s review (Piterman and Sommer 1993) of the leading causes
of death under 70 years of age: “Accidents, poisoning and violence 29%, neoplasms
19%, circulatory disorders 17%, perinatal conditions 10% and congenital conditions
7%” and states: “This gives quite a different perspective to prevention and explains why
the efforts of public health authorities and practising doctors do not always coincide.”

One of Fry and Furler’s other central elements in definitions of public health is “a focus
on the whole population” (p. 386). What does this mean to an Australian GP? Who is
included in the “whole population” and how can the individual GP focus on all of these
people simultaneously? Is the whole population everybody who lives within a defined
radius of a general practice, even if they have never attended that practice? Is it every
patient who has ever attended that GP, even if they now have a different GP or have
moved away from the area? Is it every patient who has attended within the last year or
two years, even if those patients now have a different GP or have moved away from the
area? Does the “whole population” include current, former or potential patients who are
refusing or who have refused some or all preventive activities? Is the GP expected
actively to contact and to keep contacting whoever is included in that defined “whole
population” in order to offer all appropriate preventive care, and to do so even if they
have previously refused some or all preventive activities? What funding is available for GPs to address and care for the “whole population”?

The literature contains no authoritative definitions of practice population in Australia.

The Medicare Practice Incentives Program (Medicare Australia 2006) calculates practice size in the following way for the purpose of making incentive payments to accredited practices that have elected to participate in the Practice Incentives Program:

“Most components of the PIP payments are proportional to practice size. Practice size is calculated using a measure of patient load at the practice that is independent of the number of services provided to patients. This measure is called the SWPE.

The SWPE value for a practice is the sum of the fractions of care it provides to each of its patients, weighted for the age and sex of each patient. This value is calculated in three steps.

Firstly, the WPE value of each individual patient attending the practice is calculated. This is the fraction of the care provided by the practice for each patient.

This fraction is based on the schedule fee value of non-referred consultations received by the patient at the practice within the twelve-month reference period used to calculate the payment. The value of these consultations is then divided by the total schedule fee value of all non-referred consultations received by the patient within the reference period. Using the schedule fee value in the calculation, rather than just the number of consultations, allows greater weight to be given to longer consultations, out of surgery visits, and the like.

Secondly, this fraction is multiplied by a weighting factor that varies according to the patient's age and sex. This adjustment recognises that, on average, people require different amounts of general practice care at different stages in their life, and that this amount of care also differs between males and females.
Thirdly, these weighted fractions of patient care are then added together, giving the SWPE value for the practice.”

It needs to be noted that the SWPE does not reflect the number of individual patients who have attended the practice within the twelve-month reference period. For example, five patients receive 10%, 40%, 75%, 80% and 95% of their care respectively from a particular general practice, as defined by Medicare’s formula, with other general practices providing the balance of care. This results in a calculated SWPE for that practice of $0.10 + 0.40 + 0.75 + 0.80 + 0.95 = 3.00$ SWPE. Five patients have attended the practice during the one year reference period, but the practice is regarded as having only 3 SWPE. Medicare Australia does not provide information to practices about the numbers of patients recorded by Medicare as having attended each practice in the last year or two years.

Fry and Furler note that “population-based anticipatory care is more applicable to the UK, where the GPs have responsibility for definable populations (the practice list)” (pp. 396-7). The corollary of this statement is that the lack of registered practice populations in Australia means Australian GPs realistically cannot be expected to care for any “whole population”, since the “whole population” cannot be defined in any Australian general practice. Fry and Furler outline some recent developments in the United Kingdom, including Primary Care Groups and health action zones, aimed at improving population health, but note that “these initiatives are at an early stage of development”.

(Table of weightings omitted)
The disjunction between general practice and public health in Australia was mentioned obliquely when Rogers and colleagues (Rogers, Veale et al. 1999) assessed the relevance of projects funded between 1992 and 1998 under the General Practice Evaluation Program in Australia to population health and reported that they had found that those projects had shown that in general practice there was a “lack of systematic documentation of preventive activities, lack of effective interventions to improve documentation”, and “the need for evaluation of the efficacy of preventive activities, both short term and long term.”

9.5 **How prevention in general practice fits with wider public health measures**

The history of prevention in medical practice was reviewed by Aita and Crabtree (Aita and Crabtree 2000), who outlined the divergence of public health and medical care. They quoted from a 1932 United States government report:

“… the provision of medical service should have as its paramount aim the prevention (emphasis original in the report) of disease”.

Starfield and colleagues (Starfield, Shi et al. 2005) in an essay which examined the benefits of the ready availability of primary care, noted:

“In addition to its relationship to better health outcomes, the supply of primary care physicians was associated with lower total costs of health services. Areas with higher ratios of primary care physicians to population had much lower total health care costs than did other areas, possibly partly because of better preventive care (emphasis added)…”
The status of the current links between public health and general practice or primary care in Australia seems uncertain. The Web site of the Australian National Public Health Partnership (National Public Health Partnership 2006) states:

“The National Public Health Partnership (NPHP) provides a formal structure for the Australian Government, and States and Territory Governments, to come together to develop a joint Australian intergovernmental agenda for public health. It operates under a Memorandum of Understanding signed by all Australian Health Ministers in February 2003, for the period 2003-2007. The National Public Health Partnership Group (NPHPG) is a sub-committee of the Australian Health Ministers' Advisory Council (AHMAC).

(…)
The NPHP is responsible for identifying and developing strategic and integrated responses to public health priorities in Australia.

(…)
Current public health priorities of the NPHP include addressing issues of healthy weight, communicable disease control, environmental health, injury prevention, child public health, information development and workforce development and planning.

(…)
The Joint Advisory Group on General Practice and Population Health (JAG) was established in 1999 to advise the General Practice Partnership Advisory Council (GPPAC) and the NPHP on opportunities to enhance the population health role of general practitioners (GPs) and how the general practice and population health sectors can collaborate to achieve improved population health outcomes.”

However, the next paragraph reports:

“The disbanding of the General Practice Partnership Advisory Council in March 2004 led to the disbanding of its advisory groups, including JAG. The NPHP is considering future arrangements for engaging the General Practice sector.”
This information from the National Public Health Partnership reveals that in March 2006 there was at the highest level no formal connection in Australia between public health and general practice.

Before its disbandment, the Joint Advisory Group on General Practice and Population Health defined population health in the context of general practice as:

“The prevention (emphasis added) of illness, injury and disability, reduction in the burden of illness and rehabilitation of those with a chronic disease. This recognises the social, cultural and political determinants of health. This is achieved through the organised and systematic responses to improve, protect and restore the health of populations and individuals. This includes both opportunistic (emphasis added) and planned interventions in the general practice setting.” (Joint Advisory Group on General Practice and Population Health 2001)

Towler (Towler 1999) in a report prepared for the Australian government on ‘Enhancing the population health role of general practitioners” states:

“Clearly, GPs have a well established population health role which particularly focuses on one-to-one population health activities with individual patients (screening, lifestyle advice, immunisation) and activities in relation to the control of communicable disease surveillance and reporting. (…) Potentially GPs could have a large impact on ‘population health’ (and the health of the population) because of the large numbers of people they see in their local communities and because of their capacity to influence behaviour change in individuals, necessary for illness prevention or health improvement. (…) Because of these issues of access and influence, GPs are strategically placed within the Australian health system to improve health and prevent illness and already do this through clinical and some population health activity.” (p.28).
Jim Dickinson, an academic Australian general practitioner with international experience, co-authored a paper that suggested a “new definition of general practice”:

"The general practitioner is a specialist trained to work in the front line of a healthcare system and to take the initial steps to provide care for any health problem(s) that patients may have. The general practitioner takes care of individuals in a society, irrespective of the patient's type of disease or other personal and social characteristics, and organises the resources available in the healthcare system to the best advantage of the patients. The general practitioner engages with autonomous individuals across the fields of prevention, diagnosis, cure, care, and palliation, using and integrating the sciences of biomedicine, medical psychology, and medical sociology." (Olesen, Dickinson et al. 2000)

Notably in this proposed definition the general practitioner “takes care of individuals” rather than populations, and “engages with autonomous individuals”, rather than whole populations, in order to provide preventive care. Dickinson’s view concurs with the reality of Australian general practice: unable to know the population of their practices are at any point in time, Australian GPs’ best chance of providing preventive care efficiently may be to make the maximum possible use of opportunities that arise in consultations.

Having the patient sitting in front of him or her, the GP:

- knows that the patient is a current patient of the practice;
- knows or can ascertain on the spot the patient’s current health and preventive care status;
- can offer appropriate preventive care to the patient;
- can answer questions and discuss with the patient the care that the GP is offering;
• can record immediately the patient’s refusal of the preventive activity or activities, or the patient’s ineligibility because of his or her health status. Both of these actions will save the practice from offering care to that patient futilely in the future;
• can perform or arrange to perform indicated preventive care.

9.6 The place of prevention in general practice

The definition of general practice published by WONCA Europe, the European Society of General Practice/Family Medicine includes the following:

“The characteristics of the discipline of general practice/family medicine are that it (...) promotes health and well being both by appropriate and effective intervention.” (WONCA Europe (European Society of General Practice/Family Medicine) 2002)

The American Academy of Family Physicians in its definition of primary care states:

“Primary care includes health promotion, disease prevention, health maintenance (emphasis added), counseling, patient education, diagnosis and treatment of acute and chronic illnesses in a variety of health care settings (e.g., office, inpatient, critical care, long-term care, home care, day care, etc.).” (American Academy of Family Physicians 2006)

The Royal Australian College of General Practitioners defines general practice in the following way:

“General practice is part of the Australian health care system and operates predominantly through private medical practices, which provide universal unreferred access to whole person medical care for individuals, families and communities. General practice care means comprehensive, coordinated and continuing medical care drawing on biomedical, psychological, social and environmental understandings of health.”
Although there is no specific reference in this definition to preventive care, the reference to “comprehensive” care can be taken to include prevention. However, the RACGP mentions the role of GPs in providing preventive care more explicitly in some of its other documents. For example, the Training Program Curriculum of the RACGP states that “population health in the context of general practice can include epidemiology, public health, prevention (emphasis added), family influences on health and resources.” (Royal Australian College of General Practitioners 2005)

Further, Criterion 1.3.1 titled “Health promotion and preventive care” of the RACGP Standards for General Practices (Royal Australian College of General Practitioners 2005) requires practices actively to perform preventive activities (pp. 21-22), with practices expected to be able to state: “Our practice provides health promotion and illness prevention services”.

The Explanation section of this criterion states:

“Practices need a systematic approach to health promotion, preventive care and early detection and intervention. (…) This criterion also requires practices to have a systematic process for providing preventive care to patients. This may be through the use of (…) recall and reminder systems. It may also be through the use of patient presentations at the practice as an opportunity to provide health promotion and illness prevention activities additional to those relating to the specific reason for the patient’s visit.”

No level of performance of preventive activities is specified in the RACGP Standards. There is no requirement in the Standards that a certain proportion of patients seen in a defined period must have been offered particular preventive activities if they were due, or that opportunities to perform indicated preventive activities were taken in a defined proportion of consultations. The practice has to be able to show only that the doctors
and relevant staff have performed some preventive activities at some consultations, and that the practice has some kind of system to facilitate the provision of preventive care.

General practices can operate in Australia without performing any preventive activities at all. GPs and general practices in Australia are not required by medical registration authorities or by government to perform any preventive activities. While medical registration authorities in the States of Australia are required to see that standards of care are maintained, they do not specify or expect any particular level of performance of preventive activities. Practising to the standards specified in the RACGP Standards is voluntary.

9.6.1 Potential of general practice to provide preventive care

Eighty three per cent of the Australian population attended a general practitioner at least once in the year from 1st July 2001 to 30th June 2002, with females having an average 6.8 consultations and males 5.6 consultations (Commonwealth of Australia 2005). These consultations represented many opportunities at which general practitioners could offer and provide appropriate preventive care to a large majority of the Australian population.

General practitioners have a large potential to perform preventive activities for the large majority of the population that attends each year, if they advise their patients to have preventive care which is indicated for them. General practitioners are seen by many patients as authoritative, and are able link preventive activities to the illnesses with which patients attend, or fear, such as telling a patient with bronchitis: “If you want to have less of this problem, it is important that you stop smoking” or an obese patient:
“You can reduce your risk of becoming diabetic by becoming slimmer by eating less and exercising more” or an elderly or frail patient: “You can decrease your risk of dying from influenza or pneumonia if we immunise you now against these conditions”.

9.6.2 Actual provision of preventive care in general practice

There is little objective evidence available about the performance of preventive care in individual consultations in general practice in Australia. A little more is known about the proportions of patients attending GPs who have had relevant preventive care activities performed within the intervals recommended by authoritative bodies.

Dickinson and colleagues found that GPs in Newcastle (Australia) identified only 56% of the smokers in a study which “examined doctor and patient factors and interactions within, and outcomes of, general practice consultations” (Dickinson, Wiggers et al. 1989). The implication of this is that GPs are unlikely to help patients who smoke to stop doing so if they are not even aware that the patient does smoke.

A comparison between the alcohol intake reported by 2,081 patients of 56 Australian GPs and the GPs’ knowledge of their alcohol intake (Reid, Webb et al. 1986) found that the GPs “correctly identified only 45.2% of patients who were classified as "moderate to heavy" drinkers”.

A survey of tetanus immunity in Australians aged over 48 years found that only 52% had protective levels of tetanus anti-toxin (Heath, Smith et al. 1996), and a survey of juveniles in the criminal justice system similarly found that about half were non-immune to either tetanus or diphtheria (Thompson, Ogilvie et al. 1998).
The Australian Institute of Health and Welfare surveyed people over 65 years of age and found that “of about 2.6 million Australians in the target group, 2.1 million were vaccinated against influenza, giving an estimate of coverage of 79.1%”, and that “of about 2.6 million Australians in the target group, 1.3 million were vaccinated against pneumococcal disease, giving an estimate of coverage of 51.1% (Australian Institute of Health and Welfare 2005).

Older women have been found to be less likely to have been screened for cancer of the cervix than younger women (Australian Institute of Health and Welfare 2003). In a survey published in 1988 of patients of full time GPs in Newcastle and Lake Macquarie, the proportions of non-hysterectomised women who reported having had a cervical smear test within the previous 2 years ranged from 31% of those aged 55-64 years to 64% of those aged 25-34 years (Dickinson, Leeder et al. 1988). The authors noted that in excluding part time GPs, they probably excluded a significant proportion of female GPs, and they also noted that the patient self-reports may be unreliable.

The Supplementary Analysis of Nominated Data (SAND) component of the national ongoing Bettering the Evaluation and Care of Health (BEACH) study asked patients attending general practitioners how recently they had had various preventive care procedures performed (Sayer, Britt et al. 2000). They found that:

- 32% of patients over 45 years of age reported having had a cholesterol test within the previous year;
- 64% of patients said that they had had a tetanus immunisation within the previous ten years
- 70% of women aged 50 to 69 years reported having had a screening mammogram within the previous two years
• 74% of patients aged over 65 years reported having had an influenza immunisation within the previous year.

A questionnaire which included questions about preventive care was completed by 12,605 patients in Australian general practices, who reported relatively high levels of performance of a range of preventive services. An average of 86% (range 36-100) of patients reported that their blood pressure had been checked within the past 12 months, 62% (range 25-97%) reported that they had received a tetanus immunisation within the past 10 years, and 63% (range 10-91%) of women for whom cervical smear testing was indicated reported having had a cervical smear in the past 2 years.

A large study of 44 family practices in the US collected reports from 6,830 patients about when they had last received eight preventive services (Kottke, Solberg et al. 1997). The recommended intervals for the preventive activities were similar to those in the RACGP ‘Guidelines for Preventive Activities in General Practice (Royal Australian College of General Practitioners 1996), with the exception of screening for hypertension, with blood pressure being expected to be measured at ‘every visit’ in the practices in the study. The proportions of patients who reported themselves as being ‘up to date’ for various preventive services ranged from 81% (SD 5%) for screening for hypertension, to 33% (SD 10%) for pneumococcal immunisation. A subgroup of the authors noted wide variation not only between practices in their performance of the preventive activities but also poor correlation within each practice in its performance of the eight activities – the authors reported that “good performance on one service (relative to other 43 clinics) does not imply good performance on others” (Solberg, Kottke et al. 2001).
Some of the researchers involved in the Direct Observation of Primary Care study (DOPC Writing Group 2001) examined the relationships of characteristics of those practices with whether their patients were ‘up to date’ for a range of preventive activities (Flocke, Stange et al. 1998). The practices were examined from ‘the perspective of the patient’, using a “20 item questionnaire that measures four domains: interpersonal communication, physician’s accumulated knowledge about the patient, coordination of care, and patient preference to see their usual physician”. Being ‘up to date’ for ‘screening’ preventive activities was most strongly associated with better interpersonal communication and with greater coordination of care; being ‘up to date’ for immunisations was found to be most strongly associated with the patient’s preference for his or her usual physician, and then with greater accumulated knowledge about the patient; being ‘up to date’ for ‘health habit counselling’ was found to be associated most strongly with better interpersonal communication and then with greater coordination of care, though both of these associations were much weaker than those found for screening or immunisation. The authors noted that “the primary care scale scores account for a small amount of the variation of the delivery of preventive services, indicating that factors (e.g. the use of office systems, a high level of physician motivation, or other personnel are involved in delivering preventive services) other than variations in the delivery of primary care may affect those outcomes among patients visiting family physicians.”.

A review of studies published between 1987 and 1997 which examined quality of care across the United States (Schuster, McGlynn et al. 2005) reported: “A simple average of the findings of the preventive care studies shows that about 50 percent of people received recommended care.”
9.6.2.1 Self-report usually over-estimates performance of preventive activities

Self-report has been found often to overestimate levels of provision of preventive care.

An Australian study which compared self-reports of cervical smear testing with laboratory records found:

“Of women reporting a smear within the last three years, only 61.2% were verified within pathology laboratory records (...). Self-report of Pap smear histories consistently results in over-reporting of screening.” (Bowman, Sanson-Fisher et al. 1997)

In another study, self-reports of cervical smear testing were compared with practice and laboratory records as part of a trial of a computerised preventive care questionnaire completed by women in Australian general practice waiting rooms (Campbell, Peterkin et al. 1997). The authors found that there was no laboratory record of a smear test within 2.5 years for more than 30% of women who reported having had one within the previous 2 years.

Another Australian study (Ward and Sanson-Fisher 1996) which compared patient’s recollections of being asked whether they smoked with audiotaped consultations concluded that “Patient recall is systematically biased towards over-reporting of a question about smoking status…” and “although we recommend its continued application in health services evaluation, findings should be interpreted with caution…”.

Comparison of medical record, patient self-report and observation of consultations in the Direct Observation of Primary Care study (DOPC Writing Group 2001) found that all three methods gave similar results for “Pap smears, breast, pelvic and rectal
examinations and influenza immunization”, but that medical record review was more sensitive for recording other immunisations. They also noted that “the accuracy of patient recall declined with duration of time since having had the procedure”, a finding that had also been made in the Australian study of patient’s recall of being asked about their smoking status (Ward and Sanson-Fisher 1996).

McKenna et al found that a group of black women in the USA with cervical cancer over reported the numbers and timing of any cervical smear tests that they had had previously (McKenna, Speers et al. 1992).

9.6.2.2 Performance of preventive care activities in individual consultations

9.6.2.2.1 Opportunities during consultations to perform preventive activities

Stott and Davis in a seminal paper (Stott and Davis 1979) stated that “one of the most exciting (...) components of every consultation” is “the promotion of healthy life-styles and early or pre-symptomatic diagnosis”. Murtagh (Murtagh 2003) discusses the Stott and Davis model, re-categorising GPs’ activities within consultations into “reactive” or “proactive” professional behaviour (p.88), but also explaining that in some consultations there may be good reasons for the GP not to offer unsolicited preventive care: “This mix of reactive and proactive behaviour is not appropriate in every consultation. It requires counselling skills and training in the delivery of quality general practice.”

In the United States, the Agency for Healthcare Research and Quality (AHRQ), which describes itself as “the lead Federal agency charged with supporting research designed
to improve the quality of health care, reduce its cost, and broaden access to essential 
services, advises that: “Clinicians must take every opportunity to deliver recommended 
preventive services, especially to persons with limited access to health care (Agency for 

In Australia, criterion 1.31 of the RACGP’s standards for general practices similarly 
requires practices to take all opportunities to provide preventive services to patients 
(Royal Australian College of General Practitioners 2005) (p.21).

Consultations in general practice provide many opportunities for GPs to offer and 
provide appropriate preventive care for each patient. However, GPs have many 
competing tasks that they wish to perform and that they are expected by others to 
perform.

Jaen and colleagues (Jaen, Stange et al. 1994) discussed the complex factors and 
characteristics of patients, patients and the health care system that influence what is 
done or not done in primary care practices. Based on the results of the large Direct 
Observation of Primary Care study (DOPC Writing Group 2001), Crabtree and 
colleagues concluded that:

“… primary care practice is much more complex than research and transformation 
efforts generally acknowledge. The data identified a diverse set of features that 
describe how primary care practices are organized and function. These included 
cognitive and behavioral components of physician philosophy and style, and 
numerous features of the practice organization, such as office efficiency, clarity of 
staff roles, communication patterns among physicians and staff, and approaches to 
using office protocols.” (Crabtree, Miller et al. 1998)

The same authors reported:
“Clinicians acknowledged a 3-fold mission of providing acute care, managing chronic problems, and prevention, but only some made prevention a priority.” (Crabtree, Miller et al. 2005).

9.6.2.2.2 **Opportunistic performance of preventive activities**

For the purpose of this thesis, an opportunity to perform a preventive activity was held to exist if at that consultation the activity was indicated for the patient based on his or her age, gender and past history, and the patient had not been recorded as refusing that activity or as ineligible for that activity.

It is clear that GPs have many opportunities in their consulting to perform preventive activities, but how many and which of these opportunities do they take? The literature about this is relatively sparse. This may be because using paper medical records to try to establish what preventive opportunities existed for each patient at each visit, based on his or her gender, age at that visit, past history and the preventive activities that had actually been performed, and their result, required huge amounts of manual searching for information and then calculations that made it a very expensive exercise. However, the few studies in this area provide some idea, and these will be outlined below.

Hutchison et al. sent “unannounced standardized patients”, who were trained research assistants posing as new patients, to practices of Canadian GPs to examine whether the GPs offered or performed a range of preventive activities which were indicated according to local guidelines (Hutchison, Woodward et al. 1998). The GPs took relatively high proportions of opportunities to offer or perform preventive activities (Table 2). While this study tells us about GPs’ treatment of new patients, it provides no information about their care of known patients. In contrast to Hutchison’s approach of
examining the provision of preventive care to new patients, Stange et al. observed the provision of preventive care only to “established patients” in the large Direct Observation of Primary Care study (Stange, Flocke et al. 2000). The GPs took lower proportions of opportunities to offer or perform the preventive activities than the doctors in Hutchison’s study took for new patients (Table 2).

<table>
<thead>
<tr>
<th>Preventive service</th>
<th>New patients (Hutchison, Woodward et al. 1998)</th>
<th>Established patients (Stange, Flocke et al. 2000)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Smoking status</td>
<td>87%</td>
<td>7%</td>
</tr>
<tr>
<td>Cervical smear</td>
<td>90%</td>
<td>11%</td>
</tr>
<tr>
<td>Blood pressure</td>
<td>68%</td>
<td>52%</td>
</tr>
<tr>
<td>Serum cholesterol screening</td>
<td>50%</td>
<td>6%</td>
</tr>
<tr>
<td>Tetanus immunisation</td>
<td>42%</td>
<td>1%</td>
</tr>
<tr>
<td>Pneumococcal immunisation</td>
<td>16%</td>
<td>2%</td>
</tr>
<tr>
<td>Influenza immunisation</td>
<td>31%</td>
<td>14%</td>
</tr>
</tbody>
</table>

Table 2 Proportions of opportunities taken to perform preventive services for new patients compared to established patients

It should be noted that serum cholesterol testing and pneumococcal immunisation had been rated by the Canadian national preventive care guidelines (Canadian Task Force on the Periodic Health Examination 1994) as category C recommendations, for which the Task Force said there was “poor evidence regarding the inclusion or exclusion of the condition in a periodic health examination, but recommendations may be made on other grounds”. These recommendations may have reduced the enthusiasm of the Canadian GPs in Hutchison’s study to perform these activities.

In Australia, Heywood et al studied the opportunistic performance of five cancer preventive activities by ‘full time’ GPs, who were defined as those seeing 80 or more patients per week (Heywood, Sanson-Fisher et al. 1994). The trial relied on patients’ self-reports about preventive services that they had had in the past, and on GPs’ self-
reports about which services they provided. The patients’ medical records were not examined. Performance of preventive services was defined rather loosely as “taking at least one activity” of “action taken, referrals, or follow-up consultations made for each of the conditions”. National guidelines for routine cervical smear testing recommend that women who have not had abnormal smears can stop having smear tests at the age of 70 years, but this study apparently expected women up to age of 75 to be having smear tests. For non-hysterectomised female patients aged 18-75 who reported not having had a cervical smear test within the previous two years, the GPs reported performing a smear test in 61% of the 15.8% of the consultations in which they reported taking a relevant action. This equates to smears being taken in 9.6% of consultations at which the patient had reported that this was due. The authors did not discuss explain or discuss their decision to include only full time GPs, which would have excluded a significant proportion of GPs, amongst whom a disproportionate fraction were likely to have been female. The findings of this study should be interpreted cautiously, because it is based on self-report by both patients and GPs.

Cohen and her colleagues (Cohen, DiCicco-Bloom et al. 2004) observed directly how family physicians introduced prevention into ‘illness visits’. They found what they described as two methods of changing the topic from the patient’s current illness(es) to discussing or offering preventive care. The GPs in the study provided at least one of four preventive services being studied (smoking counselling, immunisation, screening mammography and cervical smear) in 230 (17.2%) of 1,620 consultations. The same group of authors in another paper examining other aspects of the same study (Crabtree, Miller et al. 2005) reported that different practices emphasised different preventive
activities and concluded that: “…different specific preventive services compete with each other, in addition to competing with illness visits, for time on the agenda”.

9.6.2.2.3 Acceptability to patients of opportunistic performance of preventive activities

Two Australian studies examined the effects of offering Pap smears opportunistically to women for whom this was due to be performed. Ward et al (Ward, Boyle et al. 1991) found that 61% of women aged 20-65 years who had not had a smear within the last year accepted the offer to have a Pap smear performed by their male GPs and that they found the opportunistic offering of this service by their GP acceptable. The authors concluded that “opportunistic screening is an effective and acceptable way to encourage women at risk to have a Pap smear”. Another study of offering Pap smear testing opportunistically to women aged 50-70 years found that two of every three patients accepted the offer (Brett 1992).

One of the findings of the Direct Observation of Primary Care study in the US (Stange, Flocke et al. 1998) was that “visit satisfaction reported by 2454 patients using the Medical Outcomes Survey 9-item Visit Rating Scale was not different during illness visits with or without the delivery of preventive services” and concluded that “the delivery of preventive services during illness visits is common in community practice and is well accepted by patients.” Other studies have found that patient satisfaction was not just “not different” but in fact greater when doctors offering and performed a range of preventive services (Weingarten, Stone et al. 1995; Hollis, Bills et al. 2000; Barzilai, Goodwin et al. 2001; Solberg, Boyle et al. 2001).
9.7 Political landscape of Australian general practice as it relates to prevention

9.7.1 Divisions of general practice

Divisions of general practice were established in Australia in the late 1990s on the profession’s initiative and funded by the Commonwealth. The Australian Divisions of General Practice (ADGP) states its vision to be:

“Divisions of General Practice are the key infrastructure for integrated, quality primary health care services delivered through general practice.” (Australian Divisions of General Practice 2006).

ADGP’s Position Statement on primary health care (Australian Divisions of General Practice 2005) begins with:

“The Australian Divisions of General Practice Network supports:

- a comprehensive approach to primary health care that includes health promotion, illness prevention (emphasis added), treatment and care of the sick, community development, advocacy, rehabilitation, population health approaches and inter-sectoral action.
- a wellness oriented (emphasis added), primary health care system with general practice in a pivotal role as a necessary pre-requisite to an effective health system.”

It is clear from the above that prevention and health promotion are ranked first in the aims of the Australian Divisions of General Practice. Evidence of the results of this priority setting can be seen in the Annual Survey of Divisions of General Practice for 2003-2004, which reports:
“Approximately 80% of Divisions provided accreditation, immunisation and IM/IT services to their local general practices.

(…)

Divisions’ overall involvement in all categories of risk factor programs was not as great as in disease programs. Physical activity remained the most common risk factor program, with 68% of Divisions involved in activities in this area. (…) GP education was again the most frequent approach reported (…). Almost as many Divisions reported using community awareness approaches for risk factor programs, particularly for health promotion.

(…)

The number of Divisions reporting involvement in cancer screening programs increased for all types of screening programs in 2003-04. There were considerable increases for cervical cancer and skin cancer.

Cervical cancer screening is the most common screening program run by Divisions, with 79% of Divisions involved in cervical screening programs. (…) GP education is the most common approach used by Divisions for cancer screening programs, however, community awareness and practice support were also common approaches.”

9.7.2 Competing providers of preventive care

A range of people and organisations other than general practitioners and general practices offer advice, goods or services promised or intended to help people who are well to maintain their health. These people and organisations range from gymnasium and sports clubs, purveyors of products claimed to either to be ‘natural’, better or safer than registered therapeutic goods and medications, to a wide range of amateurs and professionals (that is, people who charge fees or who are paid for their work, and who may be registered or unregistered) including dieticians, naturopaths, homeopaths, osteopaths, chiropractors, crystal healers, colonic irrigationists, aromatherapists and others.
Some of these people and organisations portray general practitioners and medical practitioners in general as part of what they call the ‘sickness system’, implying or suggesting that doctors have no interest or no role in prevention. Additionally, some of the other people or groups offering preventive health care claim that some conventional preventive medical practices, such as immunisation are harmful, or even that all conventional medical care is harmful.

9.7.3 Incentives to perform preventive activities

In July 1998 the Commonwealth government established the Practice Incentives Program “to recognise and provide financial incentives to general practices that provide comprehensive quality care and that are working towards meeting the Royal Australian College of General Practitioners Entry Standards for General Practices” (Medicare Australia 2006). Despite the intention “to recognise and financial incentives to general practices that provide comprehensive quality care”, there was no element in the Program to reward practices for performing preventive activities, until in November 2001 a Cervical Screening component was added to the Practice Incentives Program. This pays general practices for performing cervical smear testing for under-screened women and for achieving specified levels of cervical screening for their patient population. The Services Incentive Payment of the cervical screening component of the PIP is payable to “practitioners for screening women between 20 and 69 years who have not had a cervical smear within the last four years” and the Outcomes Payment is payable to “practices where a specified proportion of women ages between 20 and 69 years has been screened in the last 24 months”. From July 2001, if GPs wished their practices to be eligible to receive payments, they had to have their practices accredited.
The accreditation process involves an inspection of the practice to see whether its operations appear to meet the RACGP Standards for General Practices. The accreditation process has been controversial, with questions about whether and how much it improves the quality of care in practices, whether practices are seeking accreditation mainly in order to qualify for the payments available under the Practice Incentives Program, rather than from a desire to improve their standard of care, and whether practices actually adhere to the prescribed standards between the triennial inspections that occur on dates planned in advance and agreed to by practices.

In contrast to the arrangements for the Practice Incentives Program, general practices do not need to be accredited to participate in the General Practice Immunisation Incentives Scheme (Medicare Australia 2006), which was introduced in July 1998. This scheme pays a ‘Service Incentive Payment’ to GPs and general practices to provide childhood immunisations and also an ‘Outcomes Payment’ if their patients achieve 90% or greater immunisation coverage, irrespective of by whom or where (GP, council clinic, community health centre, hospital, etc.) the immunisations are given. There is evidence that this Scheme has been effective in increasing rates of childhood immunisation (Bond, Davie et al. 2002).

Australian government support for the provision of preventive care in Australian general practice was increased further in 2005 through the introduction of Medicare benefits for practice nurses to perform childhood immunisations and cervical smear tests, and by an announcement in February 2006 the government would be “supporting early detection of risk factors and chronic disease” through the introduction of:

“(…) a new Medicare Benefits Schedule (MBS) item to support general practitioners, assisted by practice nurses, to provide a focused health check for
patients aged around 45 years with identifiable risk factors such as weight, smoking or family history. This health check will identify patients at risk of developing chronic conditions and provide an opportunity to promote lifestyle changes, for example through Lifestyle Prescriptions (Lifescripts), or referrals to programs such as Quitline. This new item will also help general practitioners and their staff in the early detection of chronic disease so that any required treatment can be commenced early and the risk of the disease progression reduced.” (Abbott 2006)

The announcement of this new item followed the federal Budget submission to the Commonwealth government from the RACGP in late 2005 that it seemed illogical that the government was offering incentives for better care of patients with chronic diseases, but that it was not offering incentives for GPs to provide appropriate preventive care that would reduce the numbers of people developing those chronic diseases in the first place. The outcome has been that although the RACGP had requested incentives to GPs to provide appropriate preventive care for all patients, the new Medicare item is to be available once only for each patient, and only for those patients aged over 45 years “with identifiable risk factors such as weight, smoking or family history”. The logic behind this has not been explained by the federal government, but presumably results from some caution on the government’s part about the financial implications of introducing new items into the Medicare Benefits Schedule.

A report by Martin Roland reviewed the history of incentives for performance in the British National Health Service (Roland 2004). The author describes the positive effects of incentives to perform immunisations and cervical smear tests in the 1990 contract for GPs, which have led to an expanded range of incentives for better performance in many areas of general practice, including preventive care, in the 2004 contract (The NHS Confederation 2004). Under the 2004 contract, general practices earn points, which result in extra payments, for documented performance of preventive activities.
Kouides et al (Kouides, Bennett et al. 1998) found that a modest incentive payment of 80 cents per patient if 70% of patients over 65 were immunised, or $1.60 per patient if 85% were immunised, resulted in immunisation rates of 68.6% in the practices randomised to be eligible for the incentive and 62.7% in the control practices.

### 9.8 Barriers to the provision of preventive care in general practice

Limitations of general practitioners in performing preventive care include being able to care only for people who seek care or who agree to be cared for by the practice. In the case of people who do attend a general practitioner, barriers to performance of preventive activities include:

#### Health system factors:
- inadequate funding from government and other sources;
- poor continuity of care resulting from:
  - lack of a universal and unique health record for each person;
  - lack of patient registration with only one practice at a time;
- medical record systems that do not facilitate organised provision of preventive care;
- categoric, sporadic screening programs and campaigns.

#### Patient factors:
- ignorance of benefits of preventive care;
- fatalistic attitude;
- fear of being identified as ‘at risk’ which may lead to anxiety or depression;
- unwillingness to change unhealthy habits;
- out of pocket costs of care;
- discomfort (embarrassment and/or pain);
- adverse effects of preventive activities;
- perceiving oneself as “too sick” to have the preventive activity performed.

Doctor factors:
- uncertainty about conflicting recommendations or recommendations that are not clear;
- lack of doctors’ time;
- fear that the patient will perceive that the doctor is pursuing the doctor’s or the government’s agenda rather than the patient’s;
- doctors’ belief that patients will not change their unhealthy behaviours;
- a perceived lack of training in how to facilitate behavioural change in patients;
- lack of knowledge about preventive services;
- disagreement with preventive recommendations;
- feared adverse effects of performing preventive activities;
- concern about effectiveness of preventive activities;
- doctors’ fear of accusations of excessive provision of services;
- delayed and indirect gratification from providing preventive care;
- information overload;
- simply forgetting to provide preventive services.

The list above has been adapted from those published by Frame (Frame 1992) and Green and Eriksen (Green, Eriksen et al. 1988), with additions based on experience in practice. Each of the barriers is examined and discussed below.

9.8.1 Health system factors

9.8.1.1 Inadequate funding from government and other sources for prevention

In some countries, government or private organisational funders of health care do not pay for some preventive activities. The lack of support for those services obviously will tend to limit their use, particularly by poorer patients.
In Australia, Medicare benefits are payable for GPs to provide appropriate preventive care. The Medicare Benefits Schedule states: “Ministerial directions have been issued (…) that enable Medicare benefits to be payable for a medical examination or a test on a symptomless patient by that patient's own medical practitioner in the course of normal medical practice, to ensure the patient receives any medical advice or treatment necessary to maintain his/her state of health. In such cases benefits would be payable for the attendance and such tests which would be considered reasonably necessary according to the circumstances of the patient such as age, physical condition, past personal and family history”. (Commonwealth of Australia 2003) (p.22). The responsibility for deciding which prevention-related tests “would be considered reasonably necessary” for the purpose of Medicare benefits payments rests not with the medical profession or with the RACGP but with the Minister of Health. While many prevention-related tests, such as cervical cytology and serum lipid measurements, are eligible for Medicare benefits, others such as bone densitometry for all menopausal women are not. The lack of Medicare benefits for some preventive activities is likely to have the effect of reducing the use of these tests.

Medicare benefits were introduced in 1999 for the performance of a ‘Health Assessment’ for patients aged over 75 years. The Explanatory Notes in the Medicare Benefits Schedule for these item numbers state:

“A.21.6 A health assessment means the assessment of a patient’s health and physical, psychological and social function and whether preventative health care and education should be offered to the patient, to improve that patient’s health and physical, psychological and social function.

A.21.7 The assessment must include:

(a) measurement of the patient’s blood pressure, pulse rate and rhythm; and
(b) an assessment of the patient’s medication; and
(c) an assessment of the patient’s continence; and
(d) an assessment of the patient’s immunisation status for influenza, tetanus and pneumococcus; and
(e) an assessment of the patient’s physical function, including the patient’s activities of daily living, and whether or not the patient has had a fall in the last 3 months; and
(f) an assessment of the patient’s psychological function, including the patient’s cognition and mood; and
(g) an assessment of the patient’s social function, including the availability and adequacy of paid and unpaid help, and whether the patient is responsible for caring for another person.”

The relatively large amount of the Medicare benefit for the time that it is expected to take to perform the Health Assessments provides an incentive for GPs to perform them. One can consider that in addition to looking at the patient’s situation overall, with a view to helping the patient to improve or at least maintain his or her health, these Health Assessment items represent an incentive to perform at least one specific preventive activity (namely screening for hypertension, by measuring the patient’s blood pressure) and that they prompt, while not specifically paying for, the doctor to provide any immunisations that are due.

From 1st February 2004, Medicare provided a benefit for practice nurses to immunise children and from 1st January 2005 added a benefit for practice nurses in rural and remote areas to perform cervical smear testing. Although these new items address restricted areas of the overall need for preventive care in the community, they represent an increase in funding available for prevention.
9.8.1.2  Poor continuity of care resulting from lack of a universal and unique health record for each person

Currently in Australia each medical practice creates its own record for each patient, which medical indemnity insurers advise their members to keep and not to forward to any other practices from which their patients may seek care. Although it is considered good practice and is a criterion of the RACGP Standards for General Practice (Royal Australian College of General Practitioners 2005) (criterion 4.2.3, p.61) that practices transfer a health summary for patients moving to another practice, this does not always happen, for a variety of reasons, two of which are that the Medicare Benefits Schedule does not provide a Medicare benefit for the preparation or sending of a summary to a patient’s new GP, and GPs find it difficult to bill patients for services after they have left the practice. If and when summaries are sent, they may lack information about the patient’s preventive status.

In the United Kingdom, the paper records kept by GPs in the NHS are the property of the NHS, and follow the patient as he or she moves to different practices. GPs in the United Kingdom now make substantial proportions of their records in their computer systems, hold that information on behalf of the Secretary of State, and are required to transfer all of it (either printed out on paper, or electronically) to the next practice that the patient joins. While this may help to facilitate the provision of appropriate preventive care, paper records and paper printouts of data that were recorded electronically present their own difficulties in making information easily accessible, particularly in a lifetime record to which each doctor and practice contributes in their own style.
9.8.1.3  Poor continuity of care resulting from lack of patient registration with only one practice at a time

In Australia, patients are free to visit as many general practices as they wish. Knowing or suspecting that they are not the patient’s only source of care, some GPs may take or feel less responsibility for providing appropriate preventive care for the patient.

In the United Kingdom, this may be less of a problem, because patients may be registered in the NHS with only one general practice at a time. However, in response to long waiting times in general practices for appointments, the NHS has established ‘walk-in centres’ in cities, which will see anybody and which also provide preventive services including advice about diet and exercise, help to stop smoking, and screening for hypertension and for genital Chlamydia infections (National Health Service 2006). This breaks the relatively tight bond between patients and the general practices with which they are registered, and may lead to duplication of some preventive activities, because general practices in the United Kingdom now have incentives to perform appropriate preventive activities for specified proportions of their registered patient populations.

9.8.1.4  Medical record systems that do not facilitate organised provision of preventive care

Paper records need careful updating, summarising and re-writing from time to time as summary pages become untidy or contain too much information to fit legibly. The effort and time required for such housekeeping make it difficult for GPs and practices to do well.

Medical records can be organised in ways to make it easier for doctors and practice staff to see whether indicated preventive activities are due for the patient. Weyer and her
colleagues (Weyer, Konrad et al. 2005) found that the presence and use of flow sheets for preventive activities in 79 US practices was significantly associated with higher performance of preventive activities.

Another study of the “Influence of primary care practice and provider attributes on preventive service delivery use of reminder systems and patient registries were positively associated with preventive service delivery” (Hung, Rundall et al. 2006) found that “use of reminder systems and patient registries were positively associated with preventive service delivery”.

Computerised medical records can automatically summarise information and present it in different ways that can make it easier for the doctor to see what care is needed, but they need to be designed carefully for this to happen.

9.8.1.5  *Categoric, sporadic screening programs and campaigns*

Frame (Frame 1992) suggests that health screening offered at community events, shopping centres and similar public settings may do more harm than good, because the screening tests are not being performed as part of a considered systematic health maintenance program appropriate for the person being tested, and because they do not provide appropriate follow up. People who are tested and in whom the disease or condition being screened for is not found may wrongly take this as an indication that they have no health problems, and being screened in this way may divert or distract them from seeking or accepting appropriate preventive care from their GP for all of their health risks.
9.8.2 Patient factors

9.8.2.1 Ignorance of benefits of preventive care

Patients may not be aware of how their health may be able to be improved or maintained as a result of preventive activities. For example, some patients do not believe or accept that immunisation is effective at preventing various infections, or that stopping smoking is likely to improve or to help to maintain their health.

Fiebach and Viscioli (Fiebach and Viscoli 1991) found that 20% of 599 patients in a university hospital-based general medicine clinic in the United States for whom influenza immunisation was indicated either because they were over 65 years of age or because of a specified chronic medical condition did not receive the immunisation because they did “not believe that vaccine prevents “flu””.

9.8.2.2 Fatalistic attitude

Some patients feel that medical care can make little or no difference to their well-being or lifespan, and therefore are not interested in preventive care that may be offered to them. They may say: “You can’t prevent what’s going to happen anyway” or “When your time’s up, it’s up”. Sometimes such patients point to examples of people who behaved in unhealthy ways and remained apparently well and became very old, and other people who behaved in healthy ways and were ill or died young.

9.8.2.3 Fear of being identified as ‘at risk’

Being identified as ‘at risk’ can take away a patient’s “well time” – the time during which, if the risk or condition had not been identified, the patient may have continued to feel well and perceive himself or herself as healthy. For example, patients who have
high serum cholesterol levels are at higher risk of myocardial infarction. A person with a high cholesterol level may be unaware of his or her cholesterol level, be unaware therefore that he or she is at particular risk and believe himself or herself to be healthy. This is the patient’s “well time” – the time before his or her myocardial infarction or other cardiovascular event, during which the patient believes himself or herself to be healthy and expects that he or she will has the same chance of living for a normal lifespan as anybody else.

However, if the patient’s lipid levels are measured and the patient is told that the levels are very high and that he or she is therefore at high risk of a myocardial infarction, he or she may become depressed or anxious, or may decide to make no long term plans in the belief that he or she is doomed and probably won’t live for much longer.

9.8.2.4 Unwillingness to change unhealthy habits

Unwillingness to change unhealthy habits may result from a fatalistic attitude. Alternatively, the patient may believe that he or she is endangering his or her health or reducing his or her lifespan, but is willing to take that risk and is therefore unwilling to give up his or her unhealthy habits. Smokers sometimes tell their GPs “It’s my only pleasure, doc”. Some patients say that everybody has to have, or to be allowed to have, at least one vice.

9.8.2.5 Out of pocket costs to patients

Patients who are offered and accept preventive care by their GPs may have higher short term out of pocket costs than those who don’t. Patients receiving preventive services
may have to pay for additional consultations or longer consultations with their GPs, prevention-related services performed by other health care providers to whom they are referred, pathology testing or medical imaging fees and for medications, vaccines or other supplies. Some patients may not be convinced that receiving and accepting appropriate preventive care may prevent greater out of pocket costs or lost income in the future as a result of illness that could have been prevented.

It is human nature that having to pay for a good or service makes one less likely to seek that good or service. Satterthwaite (Satterthwaite 1997) found that when general practice patients in New Zealand aged over 65 years received a letter offering influenza vaccination free of charge, 45% were immunised, compared with 27% who received only a letter inviting them to attend but having to pay for the vaccine. Merkel and Caputo (Merkel and Caputo 1994) in a study of patients in an American hospital-based internal medicine clinic found that having to pay for influenza vaccine resulted in lower rates of immunisation than if the vaccine was paid for by the patient’s health insurance fund. Twenty two per cent of their patients refused the immunisation, with just over half (12%) of all patients refusing because of the cost of the vaccine.

**9.8.2.6 Physical or psychological discomfort**

Some preventive activities, especially but not only those involving intimate physical examinations such as breast, pelvic and rectal examinations are embarrassing for some patients. Some preventive activities are uncomfortable or painful for some patients (for example, some people dislike having their blood pressure measured, for this reason) and some activities are painful for all patients (such as immunisations administered by injection).
9.8.2.7  *Feared adverse effects of preventive activities*

The performance of preventive activities may cause physical or mental harm. The physical examinations required to perform some preventive activities may cause injury, pain or embarrassment to patient and doctor. Vaccines may cause a range of adverse effects, which may be apparent immediately (for example, fainting, pain, bleeding and bruising) or later (inflammation, fever and malaise).

The rates of refusal of preventive activities because of adverse effects in the past or fear of possible adverse effects have been reported by a number of authors. Merkel and Caputo (Merkel and Caputo 1994) found that 4% of the patients to whom influenza vaccination was offered refused because they feared adverse effects, with another 4% reported as “delaying” the immunisation. Some of the latter group of patients may have been unwilling to refuse outright and may have said something to the doctor like “I won’t have it now, but I may have it later”. Fiebach and Viscoli (Fiebach and Viscoli 1991) found that of 599 patients of any age for whom influenza immunisation was indicated either by age over 65 years or because of a specified chronic medical condition, but who did not receive the immunisation, 13 (2.2%) reported that a previous influenza immunisation had made them sick, while 116 (19%) said that their reason for refusal was that they had not received it the previous year, and 91 (15%) said that they had never been immunised against influenza. The true reason for the latter two groups’ refusal may have been that, like the first group, they feared adverse effects.

Fear of adverse effects may inhibit not only patients from accepting preventive activities but also doctors from offering them. Szilagyi et al. found in their study cited above
(Szilagyi, Shone et al. 2005) that family physicians and internists reported that ‘concerns about vaccine safety’ was the most important barrier to influenza immunisation and the second most important barrier to pneumococcal immunisation.

Asking patients about behaviours that endanger the health of the patient or of other people, such as use or excessive of drugs and medications, unprotected sex and various forms of anti-social behaviour such as perpetrating domestic violence may be seen by patients as intrusive and may adversely affect the GPs’ relationship with the patient. Being asked questions to screen for depression or other mental illness similarly may not be welcomed by the patient.

9.8.2.8 Perceiving self as “too sick” to have preventive activity performed

Merkel and Caputo (Merkel and Caputo 1994) found that 9% of the patients to whom influenza vaccination was offered said that they were “too sick” to have this done. In some cases, this may be a valid reason to defer some preventive activities.

There are a number of reasons why it can be inappropriate to offer or to perform preventive activities to patients who are ill or who are having a crisis. One reason is that it detracts time and attention from dealing with the patient’s current problem or problems, and can give the patient the impression that the doctor either does not appreciate the severity of those current problems or is not really interested in addressing them. Another reason is that the results of some screening tests, such as measuring blood pressure or glucose, may be abnormal because of the patient’s current illness. A third is that current illness such as back pain may add to the discomfort of some activities such as the undressing and lying on a couch required for a cervical smear test.
A fourth reason is that some immunisations may either increase an ill patient’s current morbidity or not be effective.

In a nationwide survey in the United States of their self-reported practices and attitudes to influenza and pneumococcal immunisation (Szilagyi, Shone et al. 2005), family physicians and internists reported that ‘urgent concerns dominating visits’ was the most important barrier to pneumococcal immunisation and the second most important barrier to influenza immunisation.

9.8.3 Doctor factors

9.8.3.1 Uncertainty about conflicting recommendations or recommendations that are not clear

Authoritative organisations may make differing recommendations about preventing or detecting the same disease or condition. Differences in their advice may confuse GPs or lead them to believe that the evidence for activities to prevent or detect the condition early is unclear, and may tend to reduce their performance of activities to prevent or detect the condition early.

Sometimes recommendations from a particular authority are not clear. They may refer to screening people ‘considered to be at high risk’ without specifying exactly who this group is. The RACGP Guidelines for Preventive Activities in General Practice (Royal Australian College of General Practitioners 1996) advised that patients should be weighed “at least every few years”. This vague recommendation is open to a range of interpretations and its vagueness probably tends to reduce the likelihood that GPs will
put it into action, or if they do, it is likely that the intervals with which they offer or perform it will be variable.

9.8.3.2 Perceived lack of time

Some GPs feel that they don’t have time available to identify the preventive activities that are due for their patients, offer them to the patient and perform those preventive activities. GPs who must provide care for a large number of patients, such as rural GPs in areas where no other GPs are available nearby, may feel that care of the ill has to take precedence over preventive care provided to the well.

This situation does not apply in urban areas where patients have a choice of general practices within relatively short distances of their homes. Urban GPs in Australia are not obliged by ethics or regulatory requirements to care for any minimum number of patients, and can decide to stop accepting new patients at any time. The number of patients in the practice population, and therefore the GPs’ workload is entirely under the control of the urban GP, who can decide how many patients to accept into the practice. The number of patients accepted depends on the style of the practice, factors such as standard appointment length offered, services offered, the availability of support staff who may perform some of the work, the efficiency of the practice’s office systems and routines, level of fees charged, hours per week that the GP is willing to work and the doctor’s own desired net income. GPs who aim to provide high quality care, a personal service, continuity of care, ready availability of appointments and who expect to earn lower levels of net income may be more likely to limit the practice population to a lower number in order to be able to deliver their preferred style and quality of care.
A powerful counter influence to GPs’ limiting their patient population in order to be able to spend sufficient time with each patient to provide quality care, is the structure of the Medicare Benefits Schedule, which provides significantly higher Medicare benefits per minute for consultations of less than twenty minutes than for those that are longer. This creates a strong financial incentive to provide short consultations in which preventive care is less likely to be provided, as has been shown by Zyzanski and colleagues in the United States in their study of the effects on quality of care of ‘high-volume’ practice (Zyzanski, Stange et al. 1998).

From patients’ point of view, some may feel that if they ask for or are offered preventive activities, they are reducing the time available for the doctor to attend to sick people who need the doctors’ attention.

In order to assess whether GPs can realistically be expected to perform all indicated preventive activities in the time that is claimed to be available for GPs to spend with their patients, Yarnall and colleagues examined the time that would be required if GPs in the United States were to implement the outpatient category A and B preventive activities in the 1996 Guide to Clinical Preventive Services published by the United States Preventive Services Task Force (Yarnall, Pollak et al. 2003). It was calculated that each GP would need 4.4 hours per working day for this purpose alone. However, it is worth noting that the category B activities included activities such as advising patients to wear seat belts in cars and helmets when driving or riding motorcycles, all terrain vehicles and bicycles, and to store and dispose of firearms safely. Australian GPs may not feel less need to perform these activities, because the wearing of seat belts and helmets is mandated by law, and because relatively few Australians own or keep
firearms. Yarnall and colleagues concluded that in the foreseeable future it is unlikely that doctors will have enough time to perform all of these preventive activities and that instead the expected increasing number of nurses, physician assistants and other health workers may be able to provide this care. As a compromise, using a priority ranking method devised by Coffield et al (Coffield, Maciosek et al. 2001), Yarnall calculated that the fourteen most important preventive activities could be provided in one hour daily, but noted that this still left patients not receiving many preventive activities that had been “shown to be efficacious”.

9.8.3.3 Fear that the patient will perceive that the doctor is addressing his or her own agenda or the government’s agenda, rather than the patient’s

Patients attend most consultations with an agenda of issues that they wish to address and tasks that they wish the doctor to perform. Some patients may feel that they do not want the doctor pursuing any agenda other than theirs and may resent the doctor introducing his or her own agenda into the consultation.

Szilagyi and colleagues reported in their study cited above (Szilagyi, Shone et al. 2005) that family physicians and internists reported that ‘urgent concerns dominating visits’ was the most important barrier to pneumococcal immunisation and the second most important barrier to influenza immunisation.

As has been outlined above, a number of studies have found that patient satisfaction with their care is as great or greater when GPs offer and perform preventive activities (Weingarten, Stone et al. 1995; Stange, Flocke et al. 1998; Hollis, Bills et al. 2000; Barzilai, Goodwin et al. 2001; Solberg, Boyle et al. 2001).
9.8.3.4  **Belief that patients will not change their unhealthy behaviours**

GPs may come to believe that they have little influence over their patients’ behaviour. This belief may arise or be reinforced when patients continue unhealthy behaviours despite the GPs’ advice and efforts to help them to change their habits. GPs may become sceptical or even cynical about their ability to influence their patients, and decide to take the path of least resistance by responding only to patients’ demands and give up trying to persuade their patients into healthier behaviours.

9.8.3.5  **Lack of training in facilitating behavioural change in patients**

Traditionally, doctors provided ‘medical treatment’, mainly in the form of prescribing or administering medications or performing surgery, in which the patient was seen as the relatively passive recipient of the treatment. The decline of the endemic and epidemic infectious diseases of the past and the rise of chronic conditions for which patients’ own behaviour is responsible to a greater or lesser degree has increased the importance of the doctor as an educator, adviser and change agent.

Undergraduate and postgraduate medical curricula are crowded with many topics in clinical medical practice. Behavioural change training has been introduced relatively recently and has to compete with the traditional biomedical subjects. Older GPs may feel that they have had little or no training in facilitating behaviour change in their patients (Green, Eriksen et al. 1988).

9.8.3.6  **Lack of knowledge about preventive services**

With changes in medical knowledge and in disease prevalence, the range of preventive services that are considered worthwhile is constantly changing. Preventive activities
that were recommended by authorities in the past may no longer be recommended, new activities are introduced and the guidelines and protocols for activities change. These changes may lead to some GPs not being fully aware of current recommendations.

A survey of Australian medical graduates’ self-reported recommendations for “each of 13 screening tests for asymptomatic adult patients with no associated risk factors”, and the answers were compared to the RACGP’s “Guidelines for Preventive Activities in General Practice” (Rolfe and Pearson 1996). There were significant differences between the respondents’ self-reported recommendations and the RACGP Guidelines, with the doctors reporting that they recommended a number of tests which the RACGP Guidelines advised were not indicated.

9.8.3.7 Disagreement with preventive recommendations

GPs vary in their knowledge of and interest in various diseases and conditions and how they may be prevented. This can lead to individual GPs deciding not to perform certain preventive activities or to perform them to different plans than those recommended by relevant authorities – more often or less often, for different groups of patients or in different ways.

As outlined above, some of the doctors in Rolfe’s study (Rolfe and Pearson 1996) reported giving recommendations for preventive care that differed from those in the RACGP Guidelines for Preventive Activities in General Practice. It is possible that a part of the reason for the differences was that rather than not knowing the RACGP recommendations, the doctors may actually have disagreed with them. The study did not answer this question.
9.8.3.8  **Doctors’ discomfort or embarrassment**

It is not only patients who may be embarrassed about having some preventive activities performed: some GPs may also be uncomfortable in performing or even offering to perform some preventive activities. This may be more likely where there is a large age difference between the patient and the doctor, which may engender feelings in the doctor such as: “He’s old enough to be my father” or “She’s just like my mother” which may inhibit a younger doctor from offering activities that involve intimate physical examination. Additionally, young doctors may be diffident about examining patients of a similar age because of possible sexual connotations that the doctor may perceive or fear in doing so. A doctor may be concerned about whether the patient may perceive an element of prurience or sexual gratification if the doctor seems keen to perform a preventive activity that requires intimate physical examination. Doctors may experience these feelings irrespective of whether the patient expresses any reservation about the preventive activity being offered.

9.8.3.9  **Feared adverse effects of preventive activities**

The old medical motto “first do no harm” is still seen as important in modern medical practice. The performance of preventive activities may cause physical or mental harm. Vaccines may cause a range of adverse effects, which may be apparent immediately (for example, fainting, pain, bleeding and bruising) or later (inflammation, fever and malaise). Szilagyi et al. found in their study cited above (Szilagyi, Shone et al. 2005) that family physicians and internists reported that ‘concerns about vaccine safety’ was the most important barrier to influenza immunisation and the second most important barrier to pneumococcal immunisation.
Asking patients about behaviours that endanger the health of the patient or of other people, such as use or excessive of drugs and medications, unprotected sex and various forms of anti-social behaviour such as perpetrating domestic violence may be seen by patients as intrusive and may adversely affect the GPs’ relationship with the patient. The doctors’ asking questions to screen for depression or other mental illness similarly may not be welcomed by the patient.

Results of laboratory or other tests can be wrong, for a number of reasons (for example, wrong patient’s specimen analysed, specimen not collected or handled correctly, laboratory malfunction) or misleading (results may be affected by the patient’s genetic or metabolic peculiarities, medications being taken or transient illness or metabolic states). False or misleading abnormal results may cause anxiety and worry for both patient and doctor and may lead to further testing, with its associated costs, to clarify the situation. This is an adverse effect of performing the preventive activity.

The finding of a health risk or an abnormality as a result of a preventive activity can take away the patient’s perception of him- or herself as a well person, and may cause a grief reaction which results in a pre-occupation with the finding and its possible implications for future health.

9.8.3.10 Concern about effectiveness of preventive activities

GP are likely to be aware that available methods of preventing disease or detecting in its early stages are variably effective. The sobering effect of learning about absolute reductions in risk afforded by preventive activities, compared to the more optimistic-sounding reduction in relative risks, may tend to discourage some GPs. The example
used by Getz et al in their article titled “Is opportunistic disease prevention in the consultation ethically justifiable?” (Getz, Sigurdsson et al. 2003) illustrates this:

“A 55 year old man may, for instance, be quite interested in an 18% reduction in the relative risk of dying from colorectal cancer but more reluctant if told that screening implies a relative risk reduction of only 0.014% in one year. He might alternatively consider that the likelihood of not dying from colorectal cancer is 99.34% if you are screened and 99.20% if you are not screened.”

All vaccines have a failure rate, with some patients not becoming immune as intended. Knowledge of the failure rate or that there is a failure rate may cause some GPs to feel that it doesn’t matter so much whether they immunise their patients or not.

9.8.3.11 Doctors’ fear of accusations of excessive provision of services

Medicare Australia (until 2005 known as the Health Insurance Commission) administers the Medicare program, monitors GPs’ service patterns and has notional limits of maximum numbers of services per day considered consistent with safe practice of adequate quality (Australian Government Medicare Australia 2005) (p.12). GPs are aware that their patients’ Medicare claims are monitored by Medicare Australia and that there are significant penalties for what is known as “inappropriate servicing”. This awareness may cause some GPs to decide to respond only to patient demand in the hope that this will protect them against any suggestion that they are generating extra business for financial motives.

Additionally, doctors may fear that patients to whom they offer appropriate preventive activities may feel that they are being ‘upsold’. This term from the commercial world refers to salespeople offering customers additional goods or services with a view to increasing the profit to be made from the transaction.
9.8.3.12  *Delayed and indirect gratification from performing preventive activities*

The benefits of many preventive activities may not be apparent for many years and are not easy for GPs to perceive because the populations of patients in their own practices are too small for the differences in outcomes between patients for whom various preventive activities are performed compared with those for whom they are not performed to be apparent. For example, tetanus is now so rare that most Australian GPs in their working lives will never see a patient suffering from tetanus, whether they immunise all of their patients or none of their patients. This can lead to a perception that tetanus immunisation is not important or worthwhile. Similarly, in the case of preventing cardiovascular disease by helping patients to lower their serum cholesterol, the long lead time between first advising, educating and, where indicated, prescribing for patients, and the eventual health outcomes, makes it difficult for a GP to detect whether his or her efforts have been useful. Again this may lead some GPs to feel that they can’t see any benefit to their patients from some preventive activities and conclude therefore that the preventive activities are not worthwhile.

The outcomes of preventive activities have been described as a ‘non-event’. GPs will never know for sure how many cases of any condition they have prevented by performing preventive activities. In contrast to the delayed and not readily appreciated benefits of many kinds of preventive services, the rewards for caring for people with an obvious illness or other problem are often immediate and apparent to the patient and his or her family, for which the doctor is likely to be thanked.
9.8.3.13  Information overload

Patients attend GPs with their own agendas of what they want from the consultation and often expect to have several problems or issues addressed. Each problem or issue requires time and mental energy and effort by the GP, often leaving little time or energy to consider the patient’s preventive needs, needs of which the patient is often unaware. McDonald’s seminal study of the responses of hospital doctors to reminders for a range of issues (McDonald 1976) was one of the early papers to draw attention to this factor. The family physicians and internists in the study by Szilagyi et al. cited above (Szilagyi, Shone et al. 2005) reported that ‘urgent concerns dominating visits’ was the most important barrier to pneumococcal immunisation and the second most important barrier to influenza immunisation: they may have been referring in part to the fact that the need to address the patient’s immediate problems and concerns left little time or energy for them to address the patients’ preventive care needs.

9.8.3.14  Forgetting to provide preventive services

Because they are often intensively occupied with addressing patient’s expressed needs and concerns, even GPs who intend to provide appropriate preventive care are likely to forget some or all of the preventive activities which are indicated and due to be performed for the patient. Forgetting to perform preventive activities may result from information overload, ‘urgent concerns dominating visits’ and patients who expect to have more than one problem or issue, need or concern addressed in their consultation.
9.8.4 Summary of causes of missed opportunities to perform preventive activities

It is clear from the discussion above that many factors influencing various parts and players in the health system militate to decrease the performance of preventive activities in general practice. Various aspects of health systems around the world, including lack of funding and lack of continuity of records discourage patients and doctors from seeking and offering appropriate preventive care. The lack of registration with only one general practice at a time in some countries means that since patients don’t ‘belong’ officially to any one general practice may result in no GP or practice feeling really responsible for each patient’s total care, including the provision of appropriate preventive care. Changing the health system to correct or ameliorate these factors is a major undertaking.

Patients have a range of knowledge and attitudes towards the concept of acting now to increase the likelihood of being well later. Their attitudes may range from passive indifference to actively avoiding the cost, effort, time and physical and mental discomfort of receiving preventive activities. GPs are well placed to educate patients about the benefits of preventive activities. Such education may be most effective when it is delivered to patients at times when they are most receptive, such as when they are seeing their GP for illnesses that could have been avoided or made less severe, or are related to available preventive measures.

GPs have many demands on their time and energy and can receive larger and more immediate rewards for responding to patient’s illnesses than for the low key undramatic work of systematically performing preventive activities for patients who are well.
Despite this, GPs report that they have a serious mission to prevent illness and are seeking strategies that can help them to improve their performance of preventive activities. The simple human failing of forgetting to perform desired actions when one’s attention is taken up with other demands may be reduced if the GP can be reminded at a critical moment of the actions that he or she wishes to perform.

9.8.5 Characteristics of patients, GPs and consultations associated with the performance of preventive care activities

Having considered possible barriers to the performance of preventive activities, we can examine the evidence about the circumstances in which preventive activities tend to be performed or not performed. We can consider what is known about the types of patients who tend to receive preventive care, what is known about the types of GPs who offer or provide that care, and what is known about the encounters between the two in which preventive activities tend to be performed.

9.8.5.1 Characteristics of patients associated with the performance of preventive care activities

A number of studies of performance of preventive activities, often measured by whether patients report having received various preventive services within defined intervals, have examined the associations of attributes of patients with the performance of a range of preventive activities.

In the Direct Observation of Primary Care study in the United States, Flocke et al. examined characteristics of patients and consultations which were independently associated with the performance of preventive care during “illness visits” (Flocke, Stange et al. 1998). Patients aged 40-64 years were more likely to receive preventive services than those of other ages, as were patients who had not attended during the
previous three years compared to those who had. Self-reported ‘health status’ was found not to be significantly associated with provision of preventive services. It was also found that male patients “were more up-to-date on counseling and immunizations” (Flocke and Gilchrist 2005).

In contrast to this latter finding, a study of 4,320 patients of 42 non-academic primary care practices in the US (Fontana, Baumann et al. 1997) found that the only association of patients’ self-perceived ‘health status’ with their self-report of having received cancer prevention or cancer screening services was that “women who perceive their health as better have an increased odds of having received a mammogram”. The same study found that patients who reported that they had been diagnosed as having hypertension, heart disease or diabetes were significantly less likely to report having received cancer prevention or cancer screening services. This study also examined the association between the number of visits made to the practice and patients’ self-reports of receiving cancer prevention or cancer screening services, and found that irrespective of whether the patient reported having been diagnosed with any chronic disease, the total number of visits during the previous three years was found to be a “significant predictor for both sexes of having received checkups or sigmoidoscopies, for women of having received clinical breast exams and mammograms, and for men of having received fecal occult blood tests. Total number of visits was not a significant predictor for either sex of having received smoking assessment or for women of having received a fecal occult blood tests, Pap test, or counseling about breast self-examination”. The authors noted that the design of the study was such that it examined the care only of patients aged “52 to 64 years of age, who reported a regular source of primary care, indicated high levels of education and family income, and elected to participate in this study” and they noted
that “the process of selecting study participants excluded a large fraction of patients in each practice”. In their discussion of their findings, the authors commented: “An important finding is that the presence of a chronic disease reduced the odds of having received colorectal, breast, and cervical cancer screening and counseling about smoking”.

A study of the reports by patients aged 52-77 years attending hospital-based primary care departments of whether they had received preventive services (Love, Davis et al. 1997) found that “patients with two or more chronic diseases were significantly more likely to receive primary preventive care services”, but “were no more likely (…) to receive screening tests and procedures than patients not reporting chronic disease”. The authors also found a “significant negative trend” with increasing age for the performance of cervical smear testing.

In Australia, Heywood et al. studied “factors associated with Pap smear taking in general practice” (Heywood, Firman et al. 1996). In multivariate analysis, the GPs were more likely to report taking some action about smear testing for women who had made fewer visits during the previous year, and for women who were aged 30 years compared to other ages. This agrees with the findings of Flocke and colleagues but contrasts with those of Fontana and colleagues.

Hall (Hall 1992) examined the association of patient age, gender and billing level with patients being ‘screened’ or ‘unscreened’ at the end of her study for a number of preventive activities. The mean ages of patients who had been screened for blood pressure and cholesterol of 45.8 years and 43.6 years respectively were significantly higher than the mean ages of 36.0 years and 38.2 years respectively for patients who
had not been screened for these conditions. In contrast, the mean age of 36.8 years for women who had had a smear test within the required interval was significantly lower than the mean age of 43.1 years of women who were not ‘up to date’ for this. For cholesterol screening, 50 of 302 men (17%) were ‘up to date’ compared with 133 of 940 (14%) of women, with a non-significant p value of 0.362. For cervical smear tests, 346 of 703 (49%) women who were billed at a fee level greater than the Medicare benefit were ‘up to date’, compared with only 76 of 210 (36%) of women who were billed at the Medicare benefit level, the difference being highly significant with a p value of 0.01.

Wiggers and Sanson-Fisher audiotaped 579 consultations conducted by 22 GPs in Australia (Wiggers and Sanson-Fisher 1997) and found that ‘practitioners were significantly less likely to discuss at least one preventive care topic with patients of high occupational status”. In possible contrast to this, a study of 4,245 patients of 22 private primary care clinics in the US (Solberg, Brekke et al. 1997) found that although patients of low socio-economic status (SES) were significantly less likely to be ‘up to date’ for a range of preventive services, apart from screening for hypertension, the doctors were equally as likely to offer or perform those services for those patients, if they were due to be performed, as they were offer them to patients of high SES, and in fact were significantly more likely to ask smokers of low SES whether they smoked than to ask the same question of smokers of high SES. The authors concluded that the poorer health status and preventive care status of people of low SES does not seem to result from doctors failing to offer them preventive services that they offer to other patients, but that it probably results from other complex factors.
A nationwide study in the US of the associations between sociodemographic factors, health status and use of health services (Asch, Kerr et al. 2006) found in multivariate analysis that for preventive care, women were significantly more likely to be ‘up to date’ (58.9% (95% CI 57.0-58.5%) than men (50.1%, 48.9-51.3%), that patients aged 18-30 years were significantly more likely to be ‘up to date’ (58.6%, 57.0%-60.2%) than patients aged 31-64 years (54.8%, 53.9%-55.7%), who in turn were also significantly more likely to be up to date than patients aged over 65 years (49.8%, 47.3%-57.2%), and that patients with household incomes of $50,000 or more were significantly more likely than those with household incomes of less than $15,000 to be ‘up to date’ for indicated preventive services (> $50,000: 56.4%, 55.3-57.5%); $15,000-$50,000: 55.1%, 54.2%-56.1%). However, the authors noted that these differences were all much smaller than he differences between “observed and desirable quality of health care”, and conclude that “quality-improvement programs that focus solely on reducing disparities among sociodemographic subgroups may miss larger opportunities to improve care”.

Steven et al. (Steven, Dickens et al. 1998) found in a large study of 12,605 patients in 133 Australian general practices that while patients who reported attending their current usual general practice for longer were more likely to report that they had received screening for hypertension and hyperlipidaemia, diet and exercise advice and instruction in breast self examination than patients who had attended their current practice for shorter periods, they were less likely to report receiving a tetanus immunisation in the preceding 10 years or a Pap smear test in the previous two years. The authors wondered which was the cause and which the effect – do patients who are more likely to seek preventive care also tend to stay with one practice longer, or does the provision of
preventive care make patients more likely to stay with that practice? The authors speculated that doctors may make a special effort to perform some preventive activities (in this study, tetanus immunisation and Pap smears) for patients who are new to their practice.

McIsaac et al. (McIsaac, Fuller-Thomson et al. 2001) found that increasing “regularity” of contact with a family doctor (presumably the intended meaning was ‘frequency’ rather than ‘regularity’ in the strict mathematical sense) was associated with increased likelihood that patients reported having had blood pressure screening, screening mammography and cervical smear tests within the recommended intervals, but they did not examine the question of whether patients considered that they had a usual GP within a practice.

### 9.8.5.2 Summary of characteristics of patients associated with the performance of preventive care activities

**Patient gender**

The findings of the few previous studies have varied from finding no significant difference in performance between male and female patients, to finding better performance either for female patients or male patients.

**Patient age**

Most studies have found that performance of most preventive activities is best for young adult or middle aged patients.


**Patient health status**

The findings of previous studies have varied from finding no significant effect of self-reported health status on receipt of preventive services to others that have found that patients with some chronic diseases are less likely to receive indicated preventive services.

**Frequency and length of attendance**

Most previous studies have found that performance of preventive activities is higher for new patients or patients who have made fewer visits during the preceding one, two or three years, while a minority of studies have found the opposite trend.

Length of attendance at the same practice has been found to be associated with patients being more likely to report having received some preventive services but less likely to report having received others.

**Patient income, occupational status and level of fees charged**

Previous studies have found that patient with higher income are more likely to have received preventive services, although one study found that GPs were just as likely to offer preventive care to patients of low socio-economic status as to patients of higher socio-economic status, while another reported that GPs were less likely to discuss prevention with patients of higher occupational status. The billing of higher levels of fees to patients has been found to be associated with higher performance of at least some preventive activities.
9.8.5.3 Characteristics of GPs associated with the performance of preventive care activities

The literature about types of GPs who are more likely to perform preventive activities is rather sparse.

In Australia, Heywood et al (Heywood, Firman et al. 1996) found that female GPs were more likely than male GPs to report taking some action about smear testing (OR 1.85, 1.11-3.09).

This finding agrees with that of other studies. Lurie and colleagues reported that in an independent practice association health plan in the USA, higher proportions of patients of female family practitioners and internists were up to date for cervical smear tests compared to patients of male physicians (70% vs 57%, OR 1.78, 1.69-1.87) (Lurie, Margolis et al. 1997). A random telephone survey of a sample representative of the national population of the United States conducted by Henderson and Weisman (Henderson and Weisman 2001) found that “Patients of female physicians report receiving more screening and counseling (Centers for Disease Control and Prevention)services than patients of male physicians.” This finding was supported by that of the Direct Observation of Primary Care study (Flocke and Gilchrist 2005), which examined “the interaction effect of physician and patient gender with preventive service delivery, controlling for patient age, insurance type, number of office visits in the past 2 years and physician age”, and concluded that “the interaction effect of physician and patient gender was not significantly associated with delivery of gender neutral screening, counseling, or immunizations. Patients of female physicians were more up-to-date on counseling services (P < 0.01) and immunizations (P < 0.05) than patients of
male physicians. Male patients, independent of physician gender, were more up-to-date on counseling and immunizations (P < 0.01)” and concluded that “physician-patient gender concordance is not associated with delivery of more preventive services. Rather, female physicians provide more counseling and immunization services to all of their patients.”

Pham et al. (Pham, Schrag et al. 2005) examined characteristics of primary care doctors in the United States (family physicians and general internal medicine physicians) and their practices associated with performance of preventive services for patients over 65 years old. Preventive services studied included screening for breast cancer and bowel cancer, and influenza and pneumococcal vaccination. The authors found that patients whose usual doctor was female were, in multivariate analysis, significantly more likely to have had screening mammography (OR 1.33, 95% CI 1.05-1.68) but that patients whose usual doctor was male were significantly more likely to have received influenza vaccination (1.22, 1.08-1.39). The other main significant finding was that patients of practices which received greater proportions of their incomes from Medicaid were significantly less likely to receive all of the preventive services studied. The authors speculated that the lower payments to practices under Medicaid may have caused them to compromise the care that they delivered. Patients in practices which had ‘information technology’ available for ‘facilitating access to clinical guidelines or generating physician reminders for preventive services’ were significantly more likely to have received pneumococcal vaccination (1.21, 1.06-1.38). There are two important things to note about this factor. The first is that the question asked of doctors in the study was “only whether information technology tools were available in their practice, not whether they actually used them”. The second important thing to note is that the question to the
doctors in the study did not differentiate between information systems that simply made guidelines available and those that actually generated reminders.

A recent ‘critical review of the medical literature regarding the relationships between interpersonal continuity of care and the outcomes of health care’ (Saultz and Lochner 2005). The authors defined interpersonal continuity of care as “continuity of care related to the ongoing relationship between an individual doctor and patient”. The review included 40 studies, with the authors reporting:

“Our results suggest that interpersonal continuity is associated with improvement in some outcomes of care. In particular, interpersonal continuity seems to be associated with improved delivery of preventive services and with lower rates of hospitalization. (...) In conclusion, the available medical literature suggests that is associated with significant improvement in at least some care outcomes. The strongest evidence of such an association is for these outcomes that have been most frequently studied: preventive services and hospitalization.”

9.8.5.4 Characteristics of consultations associated with the performance of preventive care activities

The literature about the associations of characteristics of consultations with the performance of preventive activities is sparse. This may reflect the difficulties and high costs of analysing events within consultations, especially in paper based clinical record systems.

In the United Kingdom, Wilson et al. conducted a trial of decreasing numbers of appointments from eight or more per hour to six per hour in English general practices, which resulted in consultation duration increasing from means of 7.04 and 7.16 minutes in two control periods before the change, to a mean of 8.25 minutes after the change
Wilson's finding of increased performance of preventive activities in longer consultations has been supported by the findings of the few other studies in this area. In Australia, Heywood et al. (Heywood, Firman et al. 1996) found that GPs were more likely to report taking some action about smear testing in consultations lasting 20 minutes compared to 10 minutes.

In the United States, Zyzanski and colleagues examined the data from the Direct Observation of Primary Care study to analyse the quality of care according to ‘volume’, which was defined as the rate per hour of patients seen by the GPs in the study (Zyzanski, Stange et al. 1998). As mean consultation length decreased from 12.5 minutes for the highest quartile of GPs to 8.8 minutes for the lowest quartile, performance of preventive activities decreased.
There is even less evidence about the effect of fees charged for consultations on the performance of preventive activities. In Australia, Hall (Hall 1992) examined the association of billing level with performance of cervical smear tests, and found that at the end of her study, 346 of 703 (49%) women who were billed at a fee level greater than the Medicare benefit were ‘up to date’, compared with only 76 of 210 (36%) of women who were billed at the Medicare benefit level, the difference being highly significant with a p value of 0.01.

In the Unites States, Stange and colleagues were interested in which preventive services indicated for a patient GPs said that they would offer to a patient (Stange, Fedirko et al. 1994). In their study, of a random sample of 480 family physicians, the 268 GPs who responded were asked about preventive services that they would offer to a 53-year-old woman. More than half of the number of family physicians said that if the patient had attended because of an illness, they would take that opportunity to provide “smoking cessation advice, blood pressure, height, and weight measurements, and the scheduling of a return visit”. If the patient had attended for a check up, the family physicians said that they would also offer “breast examination, Papanicolaou test, pelvic examination" and order a mammogram. The authors found that “physicians performing a high level of USPSTF-recommended preventive services and a low level of not recommended services were characterized by their young age, residency training, not being in solo practice, and greater experience with USPSTF recommendations.”
9.9 **Efforts to improve the provision of preventive care in general practice**

Efforts to increase the provision of preventive services have included:

- education of the public and of the medical profession about the benefits of preventive services;
- guidelines published by authorities such as the Royal Australian College of General Practitioners (Royal Australian College of General Practitioners 1996; Young and Ward 1999);
- provision of free or subsidised services and vaccines, such as the National Immunisation Program and Breastscreen Australia;
- national and State based recall registers, such as the Australian Childhood Immunisation Register and the Pap smear back-up record system operated by the Department of Human Services in South Australia;
- patient-held reminder cards, such as those issued by the Department of Human Services in South Australia;
- use of staff dedicated to performing preventive activities (Fullard, Fowler et al. 1987);
- practice age/sex/disease registers;
- various manual or computer-based reminder and recall systems.

Despite the strategies and programs listed above, it appears that the provision of preventive care in Australia remains less than optimal.

9.9.1 **The literature about the effects of reminders on the performance of preventive activities in general practice**

9.9.1.1 **Search strategy**

Medline was searched on 30th March 2003 via PubMed using the following search using MeSH headings:

Medical records systems, computerized AND reminder systems AND (preventive medicine OR preventive health services) AND (primary health care OR family practice)

This search found only 3 papers, none of which met the criteria for the present study.
A second search for:

Reminder systems AND (preventive medicine OR preventive health services) AND (primary health care OR family practice)

found 79 papers, none of which met the criteria.

A third search for:

"family practice" AND "reminder systems" AND "randomized controlled trials"

found no papers.

Less specific searches using only some of the terms listed above, and using related terms, returned hundreds of articles, including a number of reviews of the area. The reviews will be described below in chronological order of their publication.

Searches of the CINAHL and Australasian Medical Index databases on 3rd February 2004 yielded no further relevant papers. A search of the Cochrane database yielded the papers listed below.

The searches were repeated in March 2006 and relevant papers published since 2003 are included below.

9.9.2 Reviews of attempts to improve the performance of preventive care

‘Influencing diagnostic and preventive performance in ambulatory care by feedback and reminders: a review’. (Buntinx, Winkens et al. 1993)

This review included only one randomised controlled trial of preventive care reminders conducted in general practice (Weingarten, Bazel et al. 1989). This study was conducted in a solo general practice in Israel. The GP in the practice was the author of the software program which generated the reminders, which were for eleven preventive activities, of which five (weight, smoking, blood pressure, cholesterol and tetanus immunisation) were also examined in the present study. Significant increases at the p = 0.05 level were seen for intervention group patients compared to control group patients, with the following items recorded in their casenotes: smoking status (83% intervention
vs. 56% control, RR = 1.45, 1.19-1.77), tetanus (42% vs 16%, RR = 2.59, 1.55-4.33) and blood pressure (73% vs 57%, RR = 1.28, 1.03-1.58). The generalisability of this study is diminished by its having involved only one GP who was obviously an enthusiast in the field of preventive care.

‘Effect of physician reminders on preventive care: meta-analysis of randomized clinical trials’. (Austin, Balas et al. 1994)

This review included three randomised controlled trials in which GPs received reminders generated by computers. These will be described below.

McDowell et al (McDowell, Newell et al. 1989) compared three interventions to increase the rate of cervical smear testing. They found that reminding the doctors about patients for whom a cervical smear test was due resulted in this being done for 41 of 94 patients who attended during the trial (43.6%) compared to 35 of 101 (34.7%) of ‘usual care’ control group patients, giving a RR of 1.26 (0.88-1.79). Reminding doctors during consultations was found to be more cost-effective in terms of increasing the performance of cervical smear tests than was reminding patients by letter or by telephone call.

Rosser et al. in the same Canadian hospital family medicine centre examined the provision of five preventive activities which were also examined in the present study – tetanus and influenza vaccinations, screening for hypertension, recording of smoking status and cervical smear testing (Rosser, McDowell et al. 1991). For 1,471 patients for whom the doctors were reminded, 33.7% of indicated preventive activities were performed, while for the ‘usual care’ control group, only 13.5% of indicated preventive
activities were performed, giving a relative risk of 2.48 (2.12-2.89). The largest
difference in proportions of activities done by the end of the trial was for tetanus
immunisation (22.8% performed for intervention group patients vs. 3.2% for control
group patients) and the smallest was 1.2 for cervical smear testing (16.5% vs. 13.7%).

The trial by Weingarten already described above was the third GP trial in this review.

‘Effects of computer-based clinical decision support systems on clinician
performance and patient outcome. A critical appraisal of research.’ (Johnston,
Langton et al. 1994)

This review included four controlled trials of preventive care reminders issued to GPs.
They are described below.

McDowell et al. (McDowell, Newell et al. 1989) found that for 2,843 patients who
attended during a trial of reminders to GPs and family medicine trainees in a Canadian
hospital family medicine centre to measure blood pressure, this was done for 66% of
intervention group patients compared to 43% of control group patients (RR 1.39, 1.13-
1.71).

The same authors examined the effects of reminding GPs about influenza immunisation
for 448 patients aged over 65 years (McDowell, Newell et al. 1986). During a trial of
only 69 days (23rd October to 31st December 1984), 29% of patients allocated to the
‘doctor reminder’ group were immunised, compared to 16% of ‘usual care’ control
group patients (RR 1.85, 1.28-2.66). Comparison with two control practices which
elected not to be involved in the trial and which immunised only 4% of their patients...
during the trial suggests that there may have been significant contamination of the control patients in the trial practices through the doctors being made more aware of the need to give influenza vaccine.

Rosser et al.’s trial for one year of reminders for tetanus immunisation (Rosser, Hutchison et al. 1992) for 2,728 patients of a Canadian Hospital Family Medicine Centre reported that in the intervention group 24% of male and 22% of female patients received the immunisation compared to 3.5% of men and 2.9% of women in the control group. The authors discussed the rarity of tetanus in developed world despite quite low levels of immunisation compared to authoritative recommendations, and questioned whether any intervention to increase immunisation rates can be justified on cost grounds.

McDowell et al.’s study of reminders for cervical smear testing was the fourth study included in this review and has already been described above.


Davis and his colleagues included four trials of reminder systems in general practice in their review. Whether simply reminding a doctor about care that he or she wants to provide represents a form of medical education can be debated, since reminding a doctor about an activity which he or she wishes to perform for his or her patients is not teaching the doctor anything new.
A trial of reminding GPs about screening mammography by Chambers et al. (Chambers, Balaban et al. 1989) is the only trial included in Davis et al.'s review which has not been described in the reviews listed above. New patients who had made only one visit during the six month trial were excluded. Of patients who were or who became due for screening mammography during the trial, the doctors ordered mammography for 19.1% for those for whom they received reminders compared to 12.1% of control patients. (RR = 1.49, 1.12-1.98).

‘Has general practitioner computing made a difference to patient care? A systematic review of published reports.’ (Sullivan and Mitchell 1995)

This review included 21 studies of the effects of use of electronic medical systems on ‘clinician performance’.

Pringle and colleagues in a small study in their own practice showed that GPs using paper medical records who consulted a computerised checklist performed more cervical smear tests, tetanus immunisation and blood pressure screening (Pringle, Robins et al. 1985) than when they did not consult the computerised checklist. It is important to note that the GPs were using paper medical records and had to consult the computer screen in order to see the checklist, which means that the messages were not reminders in the sense that they did not appear automatically in the course of the GPs’ routine work. The very act of consulting the computer to see whether any preventive activities were due means that the GP had to be thinking already about the patient’s preventive care needs in order to see the messages.

McPhee et al. examined the effects in Californian community practices of using a complex intervention, consisting of paper reminder forms issued to the doctors,
educational materials and guidelines for the doctors, educational materials for patients and a reminder form for each patient which the doctor was asked to give to the patient (McPhee, Bird et al. 1991). The title of the paper, “Promoting cancer prevention activities by primary care physicians. Results of a randomized, controlled trial”, is a slight misnomer because the activities comprised both true cancer-preventive activities (such as advising and helping patients to stop smoking), and cancer-detection activities, such as cervical smear testing and screening mammography. The forms which the doctors were asked to give to the patients summarised the patient’s status for relevant preventive activities. Thirty family physicians, ten internists and 2,331 of their patients participated in the trial. One doctor from each of 20 practices was allocated to the intervention, and another 20 doctors from 20 other practices allocated as controls, with no “significant differences in (...) the proportion of family physicians between the intervention and control groups”. Doctors in the intervention group received reminders for all patients at each consultation. In multivariate analysis, the intervention significantly increased the performance of nine of the eleven preventive activities, including cervical smear testing and “smoking assessment”, but not the performance of sigmoidoscopy or screening mammography.

Ornstein et al. studied the effects of physician reminders for five preventive services for 3,564 patients for one year in a North American academic family practice centre (Ornstein, Garr et al. 1991). When reminded, the doctors took 34% of opportunities to perform lipid tests, 22% of opportunities to perform cervical smear tests and 20% of opportunities to give tetanus vaccine to patients for whom these activities were due. At the end of the one year trial, the proportions of the practice’s population ‘up to date’ for the various services was: Cholesterol test: control group patients 28.3%, reminder group
patients 35.2%, Pap smear: control 45.1%, reminder 39.3%, Tetanus: control 22.0%, reminder 34.2%. The only activity for which the improvement in the intervention group was significantly greater than that in the control group was tetanus immunisation ($p < 0.0001$). The authors noted that the proportions at the start of the trial for cervical smear test were: control 46.0%, reminder 43.8%, and that the proportions of both groups who were ‘up to date’ for cervical smear testing had declined during the trial. The authors could not explain this.

‘The clinical value of computerized information services. A review of 98 randomized clinical trials’. (Balas, Austin et al. 1996)

This review included 19 trials of reminders, all of which reported positive findings.

Chambers et al examined the effect of reminders for influenza immunisation for 686 patients during a two month trial in an academic family practice centre, with some doctors receiving reminders at all visits made by eligible patients, some not receiving any reminders, and some receiving reminders for half of their patient population (Chambers, Balaban et al. 1991). Although the study was designed to measure efficacy rather than the taking of opportunities, for patients who attended only once during the trial, these results will be the same. For these patients, the doctors who were reminded at each visit took 47% of opportunities, those who were reminded for half of their patients took 30% of opportunities when reminded and 16% when not reminded, and the doctors who received no reminders took 28% of opportunities. The authors commented that the difference in results for the doctors who were ‘sometimes reminded’ suggested that they became dependent on the reminders. The combined result for all patients of these doctors was that the doctors took 29% of opportunities
overall. This is about the same proportion overall as for the doctors who did not receive any reminders. Of patients who did not receive the vaccine despite their doctors being reminded at every visit, 25% were recorded as refusing the vaccine.

Fordham et al examined the effects on performance of cancer prevention activities in an academic internal medicine clinic of opportunistic reminders issued over nine months for seven preventive activities presented on paper encounter forms (Fordham, McPhee et al. 1990). Sixty-two resident doctors were randomised to the intervention or to a ‘usual care’ control group. The opportunistic reminders significantly increased the performance of all of the activities except cervical smear testing. Limitations of this paper are that neither the numbers of patients nor the actual proportions ‘in compliance’ with guidelines at the end of the study are given.

‘A meta-analysis of 16 randomized controlled trials to evaluate computer-based clinical reminder systems for preventive care in the ambulatory setting’. (Shea, DuMouchel et al. 1996)

Shea et al’s review (Shea, DuMouchel et al. 1996) of clinical trials of ‘the effect of physician reminders on preventive care’ included nine controlled trials, eight of which have already been described above.

The ninth study was a pilot study by Landis et al (Landis, Hulkower et al. 1992) in an academic practice of reminders for screening mammography. The authors reported that at the end of the 16 month trial 1 of 14 patients for whom the doctor was reminded had had screening mammography, while 2 of 43 patients for whom no reminders had been issued had had this done. These numbers are too small to demonstrate any significant effect of the reminders.
Shea et al concluded:

“Computer reminders improved preventive practices compared with the control condition for vaccinations (adjusted odds ratio 3.09; 95% confidence interval 2.39-4.00), breast cancer screening (OR 1.88; 95% CI 1.44-2.45), colorectal cancer screening (OR 2.25; 95% CI 1.74-2.91), and cardiovascular risk reduction (OR 2.01; 95% CI 1.55-2.61) but not cervical cancer screening (OR 1.15; 95% CI 0.89-1.49) or other preventive care (OR 1.02; 95% CI 0.79-1.32). For all six classes of preventive practices combined the adjusted OR was 1.77 (95% CI 1.38-2.27) (...) Evidence from randomized controlled studies supports the effectiveness of data-driven computer-based reminder systems to improve prevention services in the ambulatory care setting.”

‘Effects of computer-based clinical decision support systems on physician performance and patient outcomes: a systematic review.’ (Hunt, Haynes et al. 1998)

The eleven trials of reminders in this review have already been described above. Hunt found positive effects of reminders in ten of the trials of reminders for a range of preventive activities in various types of family practices. The trial which did not show any significant effect of reminders was that of McDowell for cervical smear tests (McDowell, Newell et al. 1989), which has been described above.

‘On-screen computer reminders: effects on professional practice and health care outcomes. (Protocol)’ (Gordon, JM et al. 1998)

This is the protocol for a systematic review by the Cochrane Collaboration. The objective of the review is “to examine the effectiveness of computerised reminders”. The reminders may be for any reason, not just for preventive activities, and in any setting. The authors review previous reviews and studies in the area and propose thirteen hypotheses addressing various aspects of computer-generated on-screen reminders. The hypotheses are detailed in a later section of this thesis.
‘Improving preventive care by prompting physicians’. (Balas, Weingarten et al. 2000)

This review by Balas included 33 trials of reminders, with most being conducted in hospitals or university-based clinics, and with only a small minority conducted in family practices. Balas reports that “the prompts were always delivered before a scheduled encounter”. The only study (Tape and Campbell 1993) in which reminders were displayed on a computer screen involved 45 internal medicine resident doctors and their four supervisors in a hospital clinic. Balas used sophisticated statistical techniques to ‘estimate the overall prompting effect’ from the diverse studies and found a ‘significant increase in the performance of all 16 preventive care procedures’. The duration of the studies ranged from “5 to 161 weeks” with “an average study length of 83 weeks”. The authors found that the “length of intervention period did not show a significant influence on the overall difference made by prompting” and that “there was no association between the length of study and the health maintenance rate”. In their discussion, the authors pointed out that the results of efficacy studies may be difficult to compare because the results may be influenced by the number of visits which patients make in a defined period.

‘Interventions that increase use of adult immunization and cancer screening services: a meta-analysis.’ (Stone, Morton et al. 2002)

This review of 108 articles reported controlled trials of a range of interventions, including 12 trials of reminding doctors about influenza immunisation, 10 about pneumonia immunisation, 21 about screening mammography, 17 about cervical smear testing and 15 about bowel cancer screening. All of the studies involving reminders to GPs for preventive activities have been described above.
The authors concluded that “The most potent intervention types involved organizational change (which) included the use of separate clinics devoted to prevention, use of a planned care visit for prevention, or designation of nonphysician staff to do specific prevention activities.” They suggested that “If such interventions are not feasible or are already in place and additional improvement is desired, then a system of patient reminders should be implemented.” The authors made this recommendation despite their finding that provider reminders had a stronger effect for immunisation than patient reminders, although the position was the reverse for reminders for cervical smear testing. The authors acknowledged that a limitation of their study was that the cost-effectiveness of the various interventions had not been established. This is an important consideration, because even if they were effective, the types of organisational changes outlined by the authors may cost more than health systems or patients would be willing to pay.

‘Interventions to implement prevention in primary care.’ (Hulscher, Wensing et al. 2003)

This review is in the Cochrane Library. The four trials of the effects of preventive care reminders issued to GPs included in it have all been described above.

The authors stated: “Relatively many comparisons concerned group education (5 comparisons), physician reminders (9 comparisons) or multifaceted interventions (25 comparisons) versus no intervention. Overall, these studies showed a small to moderate absolute increase of preventive services (5-20% range).”
‘From best evidence to best practice: effective implementation of change in primary care.’ (Grol and Grimshaw 2003)

This paper aimed to ‘provide an overview of present knowledge about initiatives to changing medical practice’. The authors had systematically reviewed “235 assessments of guideline dissemination and implementation strategies” and “derived a median effect across studies for each intervention.” In contrast to the findings of Stone’s review described above (Stone, Morton et al. 2002), they found that reminders to doctors had “the largest average effect (13%) of all interventions studied”, being “especially influential for prevention (vaccination, cancer screening).” They stated that “Results of different systematic reviews suggest that computerised decision support is more likely to be effective for management decisions than for diagnosis, and that simple prompting systems show more positive results than knowledge-based and advanced systems.”

Effects of computerized clinical decision support systems on practitioner performance and patient outcomes: a systematic review. (Garg, Adhikari et al. 2005)

This review included a series of reports by Burack and his colleagues (Burack, Gimotty et al. 1994; Burack, Gimotty et al. 1996; Burack and Gimotty 1997; Burack, Gimotty et al. 1998; Burack, Gimotty et al. 2003) of their implementation of reminders for screening mammography and Pap smears in a health maintenance organisation, a report of the effects pf reminders for immunisation (Flanagan, Doebbeling et al. 1999), and the results of reminders issued in hospital clinic settings (Tang, LaRosa et al. 1999). These studies are described below.

Burack et al. found that reminders for cervical smear tests issued to doctors in a health maintenance organization had no significant effect (Burack, Gimotty et al. 1998). A
number of features of this trial may explain the lack of effect. Of twenty doctors in the trial, only the nine gynaecologists were allowed by the HMO’s rules to actually perform smear tests. The other doctors (nine internal medicine specialists and two family physicians) had to refer patients to the gynaecologists for this to be done. New patients and women over 40 years of age were excluded from the trial. The screening interval was set at one year, apparently without seeking the doctors’ views on whether they agreed that this was appropriate.

Flanagan et al. studied the effects of on screen reminders for standard child and adult immunisations in an academic centre (Flanagan, Doebbeling et al. 1999). The group of doctors participating in the trial comprised GPs, paediatricians and internists, but the numbers of doctors in each discipline who participated are not stated. The reminders had no significant effects on “correct decisions” (decisions to order or not order a vaccine according to whether it was indicated) for any of the vaccines. An opportunity to give at least one vaccine existed in 877 out of 980 consultations, but in 420 (48%) of these, no vaccine was ordered. It needs to be noted that “physicians in the reminder arm saw vaccine reminders every time they chose to use the Immunization application to write any vaccine order”, and that they used the Immunization application in only 53% of consultations. Reminders were not presented if the doctors did not first make a decision to order at least one vaccine. When at least one vaccine was ordered, causing reminders to be generated for the doctors in the intervention group, those reminders significantly increased the ordering of tetanus vaccine but also significantly decreased the ordering of pneumococcal vaccine.

A trial conducted in an academic internal medicine clinic in the USA by Tang et al. (Tang, LaRosa et al. 1999) examined the taking of opportunities in consultations to
perform influenza immunisation. The study found that the increase in the proportions of opportunities taken to provide influenza immunisation by doctors using online computer medical records and who started receiving reminders was significantly greater than for doctors who used paper medical records and who received no reminders. Limitations of this study were a) that the on-screen reminders were not the only variable, because doctors in the intervention group used computer medical records and doctors in the control group used paper medical records; and b) the doctors had not been randomised to either of the two groups, but instead the doctors who were using computer records had volunteered to do so as part of a pilot project. The study examined the “compliance” of the doctors during consultations with the recommendation to administer influenza immunisation to patients over 65 years old. The doctors could comply with the guideline either by administering the vaccine or by noting either that the patient had already had the vaccine, was refusing it, or that they (the doctor) had counselled the patient about having the vaccine. The compliance of the control group doctors was 28, 29 and 37 per cent in the three seasons before the intervention, decreasing to 31 per cent during the first season in which the other (computer medical record) group of doctors received the intervention.

The compliance of the intervention group of doctors was 40, 38 and 61 per cent pre-intervention, rising further to 68 per cent in the first year of the intervention. The authors noted the significant increase in compliance in the season before the intervention was implemented, and noted that in that season there were public awareness campaigns in the media, educational displays in the health centre, the doctors had been informed that the health funds were auditing their compliance with the influenza recommendations, and that the computer medical record system (without
reminders) was introduced in that year. The absolute changes in the first year of the intervention were −6.4% for the control group and +7.3% for the intervention group. The authors noted that the effect of the secular changes in the third year (which was pre-intervention), which were associated with increased compliance in both groups, disappeared for the control group in the first year of the intervention, with their compliance falling to nearly the level that it had been in the first two pre-intervention years, while compliance continued to increased in the intervention group. They attributed this to the effect not only of the reminders but also to the use of the computer medical record itself, which they felt had led to the increase found in compliance in the third year, presumably by providing better information about patients than the paper medical records did.

The review included McDonald et al.’s classic early paper (McDonald, Hui et al. 1984) of the positive effects of reminders to internists in an academic hospital from the computer system for a range of preventive activities.

‘Improving clinical practice using clinical decision support systems: a systematic review of trials to identify features critical to success’ (Kawamoto, Houlihan et al. 2005)

This review ‘included 88 papers describing 70 studies’, of systems ‘in which characteristics of individual patients are used to generate patient-specific assessments or recommendations that are then presented to clinicians for consideration’. The studies included paper-based and computer-based medical record systems and ranged in topic from 28 papers about reminders for preventive activities in family practice to a system advising about thrombolytic treatment in myocardial infarction and another advising on antibiotic prophylaxis during prolonged cardiac surgery. The authors examined the role
of various functions and characteristics of ‘clinical decision support systems’ that were associated with their effect in improving clinical practice. Multiple logistic regression analysis of these factors:

“…identified four features as independent predictors of improved clinical practice: automatic provision of decision support as part clinical workflow (P < 0.00001), provision of recommendations rather than just assessments (P = 0.0187), provision of decision support at the time and location of decision making (p = 0.0263), and computer based decision support (P = 0.0294). Of 32 systems possessing all four features, 30 (94%) significantly improved clinical practice. (…) Most notably, 75% of interventions succeeded when the decision support was provided to clinicians automatically, whereas none succeeded when clinicians were required to seek out the advice of the decision support system (rate difference 75% (37% to 84%)).”

‘Impact of Health Information Technology on Quality, Efficiency, and Costs of Medical Care’ (Chaudhry, Wang et al. 2006)

This systematic review which included 257 studies of the effects of ‘health information technology’ concluded:

“Three major benefits on quality were demonstrated: increased adherence to guideline-based care, enhanced surveillance and monitoring, and decreased medication errors. The primary domain of improvement was preventive health.”

9.9.3 Other attempts to improve performance of preventive activities

Leif Solberg and his colleagues have published a number of papers exploring characteristics of family practices associated with performance of preventive activities. They established that family doctors’ and nurses’ intentions to provide preventive care had little to do with the level of performance of preventive activities in their practices (Solberg, Brekke et al. 1997). They reviewed previous attempts by others to improve
the performance of preventive activities and concluded that “organizing the office environment to support the consistent delivery of preventive services has been the most effective way to do this.” (Solberg, Kottke et al. 1997). They then examined in a controlled trial whether family practices would implement organised processes that were aimed at improving the performance of preventive care (Solberg, Kottke et al. 1998). However, they found that these organised processes resulted in little improvement in performance of those preventive activities. It is important to note firstly that performance of preventive activities was measured by patient self-report, which has been shown to over-estimate the performance of preventive activities, as has been outlined earlier in this thesis, and that the 22 intervention practices made little use of reminder systems, with “only 9 (having) component 3 (a reminder system) in place for Papanicolaou smears and only 1 to 5 (having) component 3 in place for each of the other seven services” (Solberg, Kottke et al. 2000).

9.9.3.1 Trials of on-screen reminders for preventive activities

One of the aims of searching the literature was to identify evidence published to date about how on-screen reminders issued to GPs during consultations affected the opportunistic performance of preventive care activities.

Because the trial proposed to be conducted for this thesis was to study opportunistic performance of preventive care activities, published trials were sought in which the outcome measure was the proportions of opportunities taken, rather than the effectiveness or efficacy of reminders.
The following criteria were developed for published evidence:

- The studies must have been conducted in general practice;
- The reminders must have been for preventive care activities;
- The studies must have been randomised;
- The studies must have been controlled by using a ‘no intervention’ or ‘usual care’ control group;
- The reminders must have been presented during the consultation on the doctor’s computer screen;
- The analysis must have been of the performance of preventive activities in each consultation.
9.9.3.2 *Australian evidence about the effects of on screen preventive care reminders*

There are no published controlled trials of on-screen reminders to GPs for preventive care activities in general practice in Australia.

In her Masters thesis, Hall reported the results of the introduction of automated opportunistic preventive care reminders presented on her and her assistant doctor’s computer screens during consultations (Hall 1992). This was not a randomised trial, with all patients aged 20 years or older who attended the author’s practice during a one year period being included in the study. At the end of the study period, the proportions of patients for whom the following preventive activities were due during the trial had had those activities performed: smoking status 84%, blood pressure 58%, cervical smear 46%, influenza vaccine 29%, body mass index 27%, cholesterol test 15%, tetanus immunisation 8%.

Ravet described the effects of implementing on screen reminders for tetanus immunisation in his practice (Ravet 1988). Before the reminder system was implemented, fewer than 30% of patients were ‘up to date’ for tetanus immunisation. After nine months, 60% of patients were ‘up to date’. However, Ravet reported that after another year, the ‘up to date’ figure had not increased significantly. He speculated about whether this represented a limit to what can be achieved by opportunistic approaches to preventive care.
9.9.3.3  **Relevance of studies reporting effectiveness or efficacy of reminders**

9.9.3.3.1  **Relevance of studies reporting effectiveness**

Some of the trials described above reported their results in terms of effectiveness, which is calculated as the proportion of the practice’s population which is defined as ‘active’ and which is eligible for a preventive activity and which is ‘up to date’ for that activity. However, as has been outlined above, there is no agreed definition in Australia of the population of a general practice.

Studies which report outcomes of reminders in terms of effectiveness include patients who have not attended the practice during the study period. This has limited relevance to the present study in which patients were not recalled for care and in which the taking of opportunities during consultations was the measure of performance.

9.9.3.3.2  **Frequency of attendance affects results of studies reporting efficacy**

Some of the trials described above reported results in terms of efficacy, which considers what proportion of eligible patients who have attended during the trial are ‘up to date’ by the end of the trial for the preventive activities being studied. The results that are achieved are likely to depend on the number of consultations that each patient has during the trial, because the doctor receives a reminder at each consultation until the preventive activity has been performed. Other than for patients who attend only once during a trial, efficacy measurements do not directly report on the likelihood within any one consultation that the doctor will take the opportunity to perform the preventive activity. For patients who attend only once during a trial, the efficacy and the
proportion of opportunities taken will be the same, because the doctors will have had only one opportunity to perform the preventive service. Different results may be found in different trials reporting efficacy simply because the durations of trials may differ and because patients in one trial may attend a greater number of times than patients in another.

9.9.4 Summary of the literature

Fifteen randomised controlled trials were found that involved GPs, reminded the doctors about preventive care activities, and compared the effects of reminders with ‘usual care’. On-screen reminders were used in only three of the fifteen trials (Weingarten, Bazel et al. 1989; Flanagan, Doebbeling et al. 1999; Tang, LaRosa et al. 1999).

Two of these trials (Flanagan, Doebbeling et al. 1999; Tang, LaRosa et al. 1999) were conducted in North American academic centres and also involved ‘primary care’ doctors other than GPs. One study (Flanagan, Doebbeling et al. 1999) found that the reminders had no significant effects on “correct decisions” for standard child and adult immunisation, but the other (Tang, LaRosa et al. 1999), which involved reminders only for influenza vaccine, found a positive effect of the reminders. The third on-screen trial (Weingarten, Bazel et al. 1989; Flanagan, Doebbeling et al. 1999; Tang, LaRosa et al. 1999) reported positive effects on the performance of a range of preventive activities, but was limited in involving only one GP, who was the author of the reminder software. Only two trials (Flanagan, Doebbeling et al. 1999; Tang, LaRosa et al. 1999) analysed their data in terms of the taking of opportunities within consultations to perform preventive activities.
9.9.4.1 Characteristics of patients, doctors and consultations associated with opportunistic performance of preventive care activities

There have been few studies of characteristics of patients, doctors and consultations associated with opportunistic performance of preventive care activities.

Most studies have reported higher rates for patients new to the practice and for middle aged patients. Female GPs have been found to perform better than male GPs. Longer consultations and higher levels of fees billed have been found to be associated with higher performance of some preventive services.

9.10 Theoretical approach to improving performance of preventive activities

9.10.1 Clinical use of computers by general practitioners

A number of studies have examined the uptake of clinical computing by general practitioners or family physicians.

Van der Lei reported that in 1992, 58% of Dutch GPs had a computer in their practice, and that 38% had ‘installed a patient-record module’ (van der Lei, Duisterhout et al. 1993). The apparent market leading software, Elias, was able to perform preventive care functions, but the article does not provide any information about the proportion of GPs using these functions.
Bomba compared the self-reported uptake of ‘computerised medical records’ between Australian and Swedish GPs (Bomba 1998). In November 1994 he posted a questionnaire in Swedish to 600 Swedish GPs and in November 1995 he posted the same questionnaire in English to 600 GPs in New South Wales. Seventy two per cent of the Swedish GPs reported that they used computerised medical records while only 14% of the Australian GPs reported that they did so. There was no analysis of the exact functions for which the computerised medical record systems in either country were being used, and in particular the author did not report whether GPs in either country who were using computerised medical records were receiving opportunistic reminders for preventive care.

The uptake of computers for clinical purposes in Australia has been studied in surveys conducted in central Sydney in 1994 and 1996 (Bolton, Usher et al. 1999).

Bolton and his colleagues found that the respondents to their surveys reported that use of computers for ‘clinical records’ increased from 12.0% of respondents to the 1994 survey to 21.8% of respondents to the 1996 survey. There was no analysis of the clinical functions for which GPs were using clinical record systems.

A national Australian survey commissioned in 1997 by the Commonwealth Department of Health and Family Services (A C Nielsen Research Pty Ltd 1998) found that 31% of responding practices had at least one computer, and that 15% of the GPs were ‘clinical users’. The study did not separate the functions of recall (contacting patients who are not present in order to offer some care) from reminders (informing a patient or doctor in a consultation about care which is indicated). The ranked target activities of recalls
were: “Pap Smear tests 89% of respondents, immunisation (child or adult) 51%, mammography 27%, blood pressure/cholesterol 18%, diabetes 13%, anything needed 10%, prostate checks/PSA’s 7%, bowel cancer/colonoscopy 7%, flu vaccines 6%, weight review 4%”.

The authors noted that the “the recall function is sometimes used as a reminder system; 39% use it in this way.” These results were obtained after the authors had prompted respondents with the following examples of uses of reminders: “How often do you use the recall function as a reminder system to yourself, for example, to check whether tests have come back, or a patient has been to a specialist?” It should be noted that these examples were not for specific clinical or preventive activities.

Another major national survey of ‘computerisation in Australian general practice’ conducted in 2001 found that use of computers in practices appeared to have doubled from that found in the 1997 survey, with ‘over 85% of practices computerised’ (Western, Dwan et al. 2003). Amongst other functions, the GPs were asked about their use of computers for the clinical functions of ‘running a recall or reminder system, e.g. smear tests, immunisation’. Fifty four per cent of the GPs replied that they ‘always/usually’ used computers for these functions, and 45% reported they ‘sometimes/never’ did so, with one per cent not knowing whether they did or not. Again it should be noted that the use of computers for recalling patients for care was not distinguished from using them for reminders during consultations.

The use of computers by New Zealand GPs was studied in 1995, when 84% of GPs reported clinical use and 80% reported using an electronic recall system. A more
recent study in which a questionnaire was sent to all general practices in New Zealand (Didham, Martin et al. 2004) achieved a response rate of 80% and found that 71.8% of responding practices reported that they stored ‘full clinical notes’ in their practice computer systems. The only finding relevant to the use of computerised reminder systems was that 94.6% of practices reported they “record screening information or keep disease registers on their PMS (Patient Management System), however it is not known how in-depth, or complete, these registers are”. The authors incorrectly quoted a Canadian study (Kazimirski, Renaud et al. 2000) as showing that “only 81% of (Canadian) practices were computerised in 2002”. It is important to note that the study by Kazimirski included medical and surgical specialists as well as family physicians, and that the figures reported include aggregated responses from all of these groups. Kazmisrki actually stated that “eighty one per cent of respondents use a computer at home or in the office an average of 9 hours per week”. This is a different statement from Didham’s quotation of this study: use of a computer at home does not necessarily mean that those doctors also had any computers in their practices. It is possible and likely that a significant proportion of the doctors responding to the survey used computers only at home. Table 6 of Kazmirski’s paper shows that the clinical function used by the highest proportion of respondents was “generate form and referral letters” at 19%, with only nine per cent of respondents reporting that they “generate recall lists/reminder notices” using their computer systems.

A survey of 29 primary care and family practices in the Atlanta, Georgia area of the US found that 33% of those practices reported that they used an electronic health record system (Condon and Smith 2002).
The Royal College of General Practitioners in the United Kingdom reported in 2005 that “Basic computerisation of practices is now virtually universal” (Royal College of General Practitioners 2005), and a survey of 520 GPs in all Primary Care Trusts in London in 2004 (Keddie and Jones 2005) found that 95% of GPs reported using computers in clinical consultations, with 76% reporting that they always made their consultation record electronically and 19% reporting that they never used paper medical records.

A survey of the use of ‘electronic medical records’ amongst private primary care practices in a research network in Kentucky in the United States conducted at some time between 2000 and 2004 (not specified in the article) found that 21% of responding practitioners reported that they were currently using electronic medical records, that 11% planned to use electronic medical records within the next year and that 59% ‘would like to use electronic medical records’ (Andrews, Pearce et al. 2004). It should be noted that the primary care practices apparently included practices run by family doctors, general internists or general paediatricians, and the practitioners responding to the survey included doctors, nurses and physician assistants. This makes the results difficult to compare directly to studies of general practice in Australia. The only reference to the use of electronic clinical systems for prevention is in Table 2, in which it is reported that for ‘disease prevention’, ‘IT impact on practice’ was rated as ‘major’ by 36% of respondents, ‘minor’ by 48% and ‘no impact’ by 16% of respondents. There is no reference in the text of the article to the information in this table. Possibly any such text was lost in the process of revision and editing.

A survey of 29 primary care practices in Georgia in the United States (Condon and Smith 2002), which included fifteen family practices, found that 33 per cent of the total
The number of primary care practices reported using an electronic medical record system.

The authors reported that 13 per cent of the practices reported using an “electronic reminder” system, but did not report in any more detail about the functions of the electronic reminder systems being used.

The papers outlined above are summarised in Table 3.

<table>
<thead>
<tr>
<th>Author</th>
<th>Year of data collection</th>
<th>Country</th>
<th>Any computers in practice</th>
<th>Clinical use of computers</th>
<th>Electronic recall or reminder system</th>
</tr>
</thead>
<tbody>
<tr>
<td>Van der Lei</td>
<td>1992</td>
<td>Netherlands</td>
<td>60%</td>
<td>35%</td>
<td></td>
</tr>
<tr>
<td>Bomba</td>
<td>1994</td>
<td>Sweden</td>
<td>72%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bomba</td>
<td>1995</td>
<td>Australia</td>
<td>14%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thakuradas</td>
<td>1995</td>
<td>New Zealand</td>
<td>84%</td>
<td>80%</td>
<td></td>
</tr>
<tr>
<td>Bolton</td>
<td>1994</td>
<td>Australia</td>
<td>43.2%</td>
<td>12.0%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1996</td>
<td>Australia</td>
<td>59.4%</td>
<td>21.8%</td>
<td></td>
</tr>
<tr>
<td>AC Nielsen</td>
<td>1997</td>
<td>Australia</td>
<td>31%</td>
<td>15%</td>
<td>7%</td>
</tr>
<tr>
<td>Andrews</td>
<td>2000</td>
<td>United States</td>
<td>21%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Western</td>
<td>2001</td>
<td>Australia</td>
<td>86%</td>
<td>71%</td>
<td>54%</td>
</tr>
<tr>
<td>Condon</td>
<td>2002</td>
<td>United States</td>
<td>33%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Didham</td>
<td>2003</td>
<td>New Zealand</td>
<td>100%</td>
<td>99%</td>
<td>95%</td>
</tr>
<tr>
<td>RCGP</td>
<td>2005</td>
<td>United Kingdom</td>
<td>“Basic computerisation of practices is now virtually universal”</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Keddie</td>
<td>2005</td>
<td>United Kingdom</td>
<td>95%</td>
<td>80% use at least weekly</td>
<td></td>
</tr>
</tbody>
</table>

Table 3: Use of computers by GPs in different countries.

In Australia, GPs have been encouraged to computerise their practices for clinical uses, through incentive payments offered by the federal government under the Practice
Incentives Program (Medicare Australia 2006), for “using prescribing software to generate prescriptions, and electronically sending and/or receiving clinical information”. The payments offered cover only a small fraction of the cost to practices in installing and using computer systems, but are believed to have had a significant effect in motivating GPs to do so. In the United Kingdom, government support goes much further, with the National Health Service fully funding GPs’ computer systems.

Patient acceptance of GPs’ use of clinical computer systems was studied by Garrison and colleagues in the United States, (Garrison, Bernard et al. 2002), who found that “a majority of the patients (74.6%) thought that the computer had an overall positive impact on the quality of care provided.”

9.10.2 Summary of use of computers by GPs

Published research on GPs’ use of computer systems indicates increasing use over time, with increasing use of clinical functions including recall or reminders systems. Differences in terminology, definition and organisation of primary care versus general practice or family medicine in different countries make direct comparisons difficult. Clinical use of computers by Australian GPs appears to be greater than that in the United States but less than that in the United Kingdom and New Zealand. Published studies do not provide any information about any use of opportunistic reminder functions for preventive activities as distinct from the function of recalling patients for care.
9.10.3 Electronic information systems can help doctors to perform better

A large and important part of GPs’ work involves the collection, storage, transmission, manipulation, synthesis and summarisation of clinical, billing and administrative information. Medical informatics is the science of studying these functions within the health system. The active use of clinical information by electronic information systems in order to provide warnings, advice, reminders, suggestions and education to patients and providers is a growing field.

Software which helps doctors to perform their various tasks better is often referred to as providing ‘clinical decision support’. This rather vague expression has overtones of origins possibly in the business world, where ‘decisions’ have to be made about projects and financial commitments.

Shortliffe defined a ‘medical decision-support system’ as ‘any computer program that deals with clinical data or medical knowledge and which performs one or more of the following tasks: serving as a tool for information management; helping health-care workers to focus attention; or giving advice in the form of a patient-specific consultation’ (Shortliffe 1987).

There are a number of ways in which electronic clinical information systems can help doctors to perform their work better. Coiera (Coiera 2006) categorises the types of help as:
• Alerts and reminders
• Diagnostic assistance
• Therapy critiquing and planning
• Prescribing decision support systems
• Information retrieval
• Image recognition and interpretation

The first of Coiera’s categories is the most relevant to computer systems helping doctors to improve their performance of preventive activities. As an example of how computers can alert and remind health professionals, Coiera uses the example of a clinical computer system providing reminders about immunisations.

Heathfield and Wyatt (Heathfield and Wyatt 1993) discussed aspects of the ‘design and development of clinical decision-support systems’, reviewed the then current approaches that they felt had contributed to what they saw as the failure of most decision-support systems to become used in practice, and proposed a new ‘philosophy for decision-support system developers’. The first point in that philosophy was to ‘establish and clarify the need through rapid prototyping’ and the authors stated that ‘user involvement is vital at all stages of the design and development process’.

A more recent paper outlined “Ten Commandments for Effective Clinical Decision Support” (Bates, Kuperman et al. 2003) based on the authors’ experiences of designing and implementing computer systems to help doctors to improve their quality of care:

“1. Speed Is Everything.
2. Anticipate Needs and Deliver in Real Time.
3. Fit into the User's Workflow.
4. Little Things Can Make a Big Difference.

5. Recognize that Physicians Will Strongly Resist Stopping.


7. Simple Interventions Work Best.

8. Ask for Additional Information Only When You Really Need It.


10. Manage and Maintain Your Knowledge-based Systems.”

The first three points and the last one are fairly self-explanatory. The fourth point is that apparently small differences in the design of screens or workflow can make critical differences to whether and how doctors respond to the advice or warning from the system. The fifth and sixth commandments are based on the author’s experience that advice not to perform an action is often not accepted by doctors, but that offering an alternative more appropriate action often is accepted. The eight commandment is based on the authors’ experience that “the likelihood of success in implementing a computerized guideline is inversely proportional to the number of extra data elements needed”. The ninth commandment refers to the desirability of crafting computerised advice so that it is followed most of the time, and for advice that is not usually followed, seeking feedback about the reasons, so that the advice can be better tailored to be more useful.

9.10.4 The use of reminders for preventive care

9.10.4.1 Previous difficulties in generating reminders about preventive care
When GPs keep their records on paper, a major obstacle to generating preventive care reminders to general practitioners is the very considerable labour cost. To generate opportunistic reminders for preventive activities which are actually due for each patient, the patient’s record has to be checked just before the consultation in order to find:

- whether the patient has become eligible or is still eligible for each preventive activity, based on the patient’s age, gender and medical history. It should be noted that just working out current age from a date of birth in itself takes significant mental effort and time;
- whether the patient has any contraindications to that activity;
- whether the patient is refusing that activity.

If the answers to these questions reveal that the activity is indicated for that patient, the person who is generating the reminder messages then has to:

- find the most recent performance, if any, of that activity in the record – this can take significant time;
- calculate the date on which the activity is next due – each activity may have a different interval at which it is to be performed, again adding to time taken to calculate this date.

If the ‘due date’ has arrived, the staff member has to generate the reminder message to the doctor. This may consist of a stamp or other note in the paper record, or of some physical marker attached to the record. It is important to note that the tedious and expensive undertaking of searching patients’ paper records in this way results in only reminder or set of reminders for each patient. Further, the reminders that are created may become out of date the next day if the patient’s circumstances change, for example, if the preventive activity is performed for the patient elsewhere or even in the same practice, or the a change in the patient’s health status renders him or her ineligible for
the preventive activity or activities for which the reminder or reminders have been created.

The advent and increasing use of electronic medical record systems running in powerful modern computers affordable by general practices has allowed the development of software which can search each patient’s record at the beginning of each consultation and generate preventive care reminders at effectively no marginal cost.

GPs’ performance of preventive activities may be improved if the limitations listed above can be addressed.

The factor of doctors’ forgetfulness may be addressed by the use of reminders. Reminders can be defined as messages presented during consultations or other contacts with patients about care that is due or may be due to be provided for that patient. In this definition, reminders differ from recalls, which can be defined as messages sent to patients who are not in contact with the doctor or other member of the practice team about care that is due or may be due to be provided to that patient.

9.10.4.2 Types of reminders

Reminders can be characterised on a number of dimensions, as has been done in the protocol for the planned Cochrane review (Gordon, JM et al. 1998) of ‘on–screen computer reminders’, which hypothesises:
“Type of reminder:

(…) Reminders that include some individual patient-specific information are more effective than generic reminders.

(…) Reminders that indicate that a response should be recorded or given are more effective than reminders that do not require a response.

Development of the reminder:

(…) Reminders developed with the involvement of target clinicians are more effective than reminders developed without their participation.

Delivery of the reminder:

(…) Reminders delivered within a consultation are more effective than reminders delivered outwith a consultation.

(…) Reminders delivered by or with the knowledge of the target clinician's colleagues or patients are more effective than reminders delivered by other means.

Content of the reminder:

(…) Reminders that offer explicit advice are more effective than reminders that offer implicit advice or no advice at all.

(…) Reminders that include an explanation of their content or advice are more effective than reminders that do not include this.

(…) Reminders that are explicitly from or justified by reference to an influential source are more effective than reminders from another source. An influential source is a person or body likely to be perceived as credible by the target clinician.

Behaviour targeted by the reminder:

(…) Reminders will vary in effectiveness systematically according to the targeted activity.”

This is a useful ontology of reminders and will be discussed later in this thesis.
9.11 Summary of background to this thesis

9.11.1 What was known about prevention in general practice and about improving the performance of preventive activities in general practice

In this chapter the public health burden of disease, the role of general practice in public health and in preventing disease have been discussed. This was followed by an examination of the environment in which general practice is operating, and of incentives for and barriers to general practitioners performing preventive activities.

Previous research that has examined the influences of health system, patient and doctor factors on the performance of preventive activities has been reviewed, followed by a discussion of previous attempts to increase the performance of preventive activities, focussing particularly on the use of reminders for preventive activities. Reminders have been found to have the most consistently positive effect of all strategies to change the behaviour of GPs. Previous difficulties in the creation and use of reminders in paper based medical records have been elucidated, and the facilitation of the generation and presentation of reminders through the increasing use of electronic medical record systems by GPs has been reviewed. Theoretical aspects of clinical decision support systems and of the use of reminders have been outlined.
9.11.2 What was not known about prevention in general practice and about improving the performance of preventive activities in general practice

The studies quoted have provided some evidence about the effects of reminders and about patient, GP and consultation characteristics which are associated with the opportunistic performance of preventive care. However, most of this evidence is from the United States, whose system of primary care differs substantially from that of Australia, and some of the evidence has been gathered in academic rather than community settings. There are no published controlled trials of on-screen preventive care reminders in Australian general practice, and the only Australian evidence about the association of patient, GP and consultation characteristics and performance of preventive care comes from studies which examined only a limited range of these characteristics. Whether or how the proportions of opportunities taken by Australian GPs to perform various preventive care activities vary according to characteristics of patients, GPs, consultations and preventive opportunities remains little known.
9.12 A study of opportunistic reminders and other influences on the performance of preventive activities, to fill some of the gaps in existing knowledge

9.12.1 Aims

This chapter has discussed previous research which has established that reminders have had the most consistently positive effect of all strategies for improving the performance of preventive activities in general practice.

It was intended for this study to examine the effects of a reminder intervention aimed at improving the performance of preventive activities in Australian general practices using electronic clinical records.

It was decided to explore ways of maximising the value of the many contacts that GPs have with patients in their daily consulting work.

The intention was to address barriers within consultations to the performance of preventive activities using an intervention that required a minimum of changes to the health system, patients and doctors. Automatically-generated opportunistic targeted reminders appeared best to fulfil these requirements. The use of reminders was aimed at addressing one of the postulated causes of GPs’ failure to take opportunities to perform preventive activities that they intend to perform, namely forgetting to do so. Possible reasons for GPs forgetting to perform preventive activities have been discussed earlier in this chapter.
The study was intended to address two of the gaps in existing knowledge about prevention in Australian general practice:

(a) the effect of reminders on the proportions of preventive opportunities taken within consultations to perform preventive activities;
(b) characteristics of patients, GPs, consultations and preventive opportunities associated with the performance of preventive activities.

The first gap in existing knowledge was to be addressed by conducting a trial of opportunistic reminders. A secondary question to be examined in this trial was whether any increased performance of preventive activities resulting from the opportunistic reminders came at a price of increased numbers of services provided or fees billed.

To address the second gap in existing knowledge, it was proposed to correlate the performance of preventive activities with demographic, clinical and billing data that were being collected routinely.

9.12.2 Hypotheses

A number of hypotheses were developed to be tested in the proposed study, based on evidence from previous studies which has been described above. Where evidence was lacking, such as about some of the characteristics of patients, GPs, consultations and preventive opportunities that may be associated with the performance of preventive activities, the hypotheses were based on the author’s own experience of many years in general practice.
9.12.2.1 Primary hypothesis

The primary hypothesis was that at least fifteen per cent more of the opportunities to perform indicated preventive care activities would be taken for patients in an intervention group, for whom reminders would be generated during the consultation, than for patients in a ‘usual care’ control group.

9.12.2.2 Secondary hypotheses

A number of secondary hypotheses were developed and are listed below.

9.12.2.2.1 Numbers of services provided and fees billed

The secondary hypothesis related to the primary hypothesis was that the increase in performance of preventive activities specified in the primary hypothesis would occur without significant increase in services or in fees.

9.12.2.2 Associations of characteristics of patients, GPs, consultations and preventive opportunities with the performance of preventive activities

Based on the findings of the previous studies described in the previous chapter, where available and on the author’s experience in general practice, the following hypotheses were proposed to examine the associations of certain characteristics of patients, GPs, consultations and preventive opportunities with the performance of preventive activities in general practice.
9.12.2.2.1  GPs will take higher proportions of preventive opportunities for female patients

The findings of previous studies about this aspect conflict with each other. Women may be more willing to report health problems and may be more interested in preventive care than men, who are often perceived as tending to believe that they are indestructible.

9.12.2.2.2  GPs will take higher proportions of preventive opportunities for middle aged patients

Previous studies suggest that the performance of preventive activities is best for middle aged patients. This may be because GPs may feel that it is too late to alter the quality of life or life expectancy significantly for older patients. However, it is possible that GPs may feel that older patients are at greater risk of health problems and therefore take higher proportions of preventive opportunities for their older patients. Alternatively, GPs may feel that performing preventive activities is likely to have most influence on quality of life and life expectancy for their younger patients. However, younger patients may have a feeling of immortality and may be less interested in considering their long term future.

9.12.2.2.3  GPs will take higher proportions of preventive opportunities for patients who have had fewer visits during the preceding two years

Previous studies are in conflict about this. It is likely that GPs would feel that they know patients who have attended a greater number of times better than patients who have attended a fewer number of times, and may therefore find it easier to ask patients
who have attended a greater number of times about preventive care which is indicated. They may also feel a greater responsibility towards patients whom they know better.

**9.12.2.2.4 GPs will take higher proportions of preventive opportunities for patients who have more long term health problems.**

The findings of previous studies conflict. GPs may perceive these patients as being at greater risk of developing further health problems. Conversely, performance of preventive activities may be lower for patients with more long term problems because GPs may be so occupied in dealing with these patients’ existing known health problems that they have less time and energy to address the patients’ preventive care needs.

**9.12.2.2.5 Female GPs will take higher proportions of preventive opportunities than male GPs**

Previous studies have found this. Female GPs may be more willing to accept advice than male GPs and may therefore respond better to reminders, may be more conscientious about fulfilling their responsibilities or may be willing to take the extra time needed to provide preventive care than male GPs.

**9.12.2.2.6 Performance of preventive activities will be higher when the GP is the patient’s usual GP within the practice.**

There is very little evidence about this. A GP who is aware that the patient usually attends him or her rather than any of the other GPs in the practice may feel more responsibility for the patient’s welfare than the other GPs in the practice. Further, because the patient’s ‘usual’ GP is likely to know the patient better and have good
rapport, he or she could be expected to find it easier to offer indicated preventive care to the patient.

9.12.2.2.7  GPs will take higher proportions of preventive opportunities in longer consultations

Previous studies have found this to occur. Longer consultations provide more time in which GPs can consider offering preventive services after addressing the patient’s known health problems.

9.12.2.2.8  GPs will take higher proportions of opportunities when they charge higher levels of fees

Previous studies are in conflict. GPs may feel more obligated to perform better in all aspects when they are charging higher fees. Conversely, GPs may be reluctant to ‘add in’ the performance of preventive activities to consultations if it is going to result in a higher fee charged to the patient.

9.12.2.2.9  GPs will take lower proportions of preventive opportunities when more problems are coded in the consultation

There is very little evidence about this. The coding of more problems implies that the consultation was more complex and addressed a greater number of problems. It is likely that doing so will occupy more of the GP’s time and energy and tend to decrease the performance of preventive activities.
9.12.2.2.10  GPs will take higher proportions of preventive opportunities when there are fewer preventive activities due for the patient

This has not been studied previously. If there are many preventive activities due for the patient, the likelihood of any one being performed may be lower, because the GP may not have time and energy to perform them all. Additionally, patients for whom many preventive activities are due include those who are reluctant to accept preventive activities.

9.12.2.2.11  GPs will take higher proportions of subsequent rather than first opportunities for preventive activities

This has not been studied previously. Feelings of responsibility and guilt may cause GPs to be more likely to perform preventive activities which have not been performed in previous consultations. Conversely, the reasons that caused the activities not to be performed in previous consultations (for example, patient reluctance or refusal) may make it more likely that subsequent opportunities will be taken either.

9.12.2.2.12  GPs will take higher proportions of opportunities that have been due for longer periods

This has not been studied previously. Similar considerations may apply as for subsequent opportunities discussed above.
Almost all previous studies of the effects of reminders have reported their results in terms of efficacy or effectiveness, and most have found that patients whose GPs received reminders were more likely to be ‘up to date’ for the preventive activities about which the GPs were reminded than for patients who received usual care. These positive findings imply that GPs took greater proportions of preventive opportunities when reminded, but they do not explicitly demonstrate or measure the differences in the proportions of preventive opportunities that were taken within consultations. The proposed study was designed to elucidate this question.

9.12.3 Distinctive features of the proposed study

The proposed study of reminders would differ from most previous studies in the following ways:

- The study would be conducted in a non-academic community setting;
- The study would be conducted in a fully computerised general practice with reminders presented on screen, rather than on paper;
- The study would examine the taking of opportunities to perform preventive activities;
The study would examine the relationship of reminders to the numbers of services and fees billed;

The study would examine the influence of a range of previously-unexamined characteristics of patients, GPs, consultation and preventive opportunities on the performance of preventive activities.

The design of a trial of opportunistic reminders and the methods used will be described in the next chapter.
10 A randomised controlled trial of automated opportunistic reminders for preventive activities, and a study of factors associated with the performance of preventive activities

10.1 Introduction

This chapter will describe a study which was designed to fill some of the gaps in existing knowledge, described in the previous chapter, about GPs’ responses to reminders for preventive activities and about factors which influence the performance of preventive activities. The study incorporated a trial of opportunistic automated on-screen reminders for preventive activities in a general practice, and a study of the associations of characteristics of patients, GPs, consultations and preventive opportunities with the performance of preventive activities.

The methods used in the study will be described below. This will be followed by a presentation of the results of the study, which will be followed by a discussion of the meaning and significance of the results and their relationship to the findings of previous studies in the area. Finally recommendations for further research and development of reminder systems, and their place in primary care will be presented.
10.2 Methods

This section will describe the methods used in the randomised controlled trial of opportunistic reminders and in the study of the associations of characteristics of patients, GPs, consultations and preventive opportunities with the performance of preventive activities. The processes of selecting practices, deciding the purposes of the reminders, development of the reminders and the data to be collected and methods for their analysis that were used will be described.

10.2.1 Setting

10.2.1.1 Selection of practices

Three criteria which determined the selection of practices for the study are explained below.

10.2.1.1.1 Compatibility of the practice’s computer software with the available reminder software

The reminder software to be used in the study had been written for the Medrecord software based on the PICK operating system. It was not practical to re-write the software for use in other software packages. This meant that only practices using the Medrecord software could participate in this trial.
10.2.1.1.2  **Practice familiarity with the clinical software**

In order to make the introduction of the automated reminders the only variable, it was considered necessary to use practices which had been using the Medrecord software for at least two years.

This was because personal experience in general practices using computer systems had taught that it takes this long to make the use of the computer system a seamless part of the doctor’s way of working. Previous studies which have asked GPs to collect medical record data in newly-installed clinical computer systems have run into difficulties (Miller, Britt et al. 1994; Beilby 1998), because the task of learning to use the new computer systems while continuing normal practice and also collecting data for research studies was too difficult in the time available.

10.2.1.1.3  **All clinical and billing records must be kept in the practice’s computer system**

The practices must be keeping all case notes, including pathology test results in the computer system, and must be using their computer systems to bill patients.

The reasons for using this criterion were:

- To obviate any need for the doctors or the researchers to collect data on paper. Asking the doctors to record research data on paper would have imposed what was considered an unacceptable burden on the doctors, and also would have introduced a potentially confounding variable in the trial;
- To reduce the cost of the trial by collecting and analysing data which was already in electronic form.
10.2.1.2 *Description of the practice used in this study*

Only one practice was known to meet these criteria, and the doctors in that practice agreed to participate in the study.

The practice operates in four surgeries in what were near country towns but which are now outer suburbs of Adelaide. The practice had ten doctors, but had been trying for several years to attract more doctors, because of continuing growth in local population and patient numbers. After hours care was provided daily by the doctors until the late evenings.

All four surgeries were open on Saturday mornings and one surgery provided Sunday morning consultations for the whole practice. Visiting medical specialist and allied health services including psychology and physiotherapy were available at the largest of the surgeries. The practice provided mainstream general practice care and some specialised care reflecting the range of special interests within the practice.

Patients were billed privately and for most services had to make a co-payment. The doctors had never bulk billed for their services.

The practice installed the Medrecord computer billing and medical record system in 1990. It had been using the recall facility provided by Medrecord to ‘manually’ note future dates on which care had been due. This facility allowed the GPs to look up during the consultation the dates on which any activities are due to be performed, or to print out lists of these dates.
10.2.2 The intervention

The proposed intervention was to consist of opportunistic on-screen reminders which were to be generated automatically by the clinical computer system. The practice’s computer system would use routinely-collected demographic and clinical information about the patient stored in the patient’s electronic medical record to target the reminders for patients for whom they were likely to be relevant.

10.2.3 Study design

10.2.3.1 Effect of automated opportunistic reminders for preventive activities

Randomised controlled trials (RCTs) and systematic reviews of RCTs are considered to provide the strongest evidence for the effects of interventions (Oxford Centre for Evidence-based Medicine 2001). Accordingly the study was designed as a randomised controlled trial.

10.2.3.2 Characteristics of patients, GPs, consultations and preventive opportunities associated with the performance of preventive activities

This observational study was designed also to examine whether certain characteristics of patients, GPs, consultations and preventive opportunities were associated with the performance of preventive activities.
10.2.4 Explanation of terms used in the study

In order to clarify the hypotheses, some of the terms in them need to be clarified. This will be done below.

10.2.4.1 Indicated preventive care activities
The Royal Australian College of General Practitioners is the academic body which sets standards for general practice in Australia. Its evidence-based Guidelines for Preventive Activities in General Practice (Royal Australian College of General Practitioners 1996; Royal Australian College of General Practitioners 2005) are accepted as the standard of care by the profession and by the Commonwealth government.

In the RACGP’s Guidelines, each preventive activity is indicated for patients of a particular age range and some of the preventive activities are gender-specific.

A preventive activity was considered to be indicated for a patient at a consultation if:

- the patient was within the age range and of the gender specified for the activity by the GPs in the study;
- the patient had not been recorded as ineligible for the activity because of his or her medical history;
- the patient had not been recorded as refusing the preventive activity.

10.2.4.2 Opportunities to provide preventive care

An opportunity for the doctor to perform a preventive activity was considered to exist for the purposes of this study when a patient for whom a preventive activity was
indicated according to the GPs’ intentions was due to be performed, the patient had not been recorded as refusing the preventive activity or as being ineligible for it, and attended at the surgery for a consultation for which a consultation item number was billed.

The reason for specifying that the consultation had to occur at the surgery was that the doctors would be reminded only if they were in the surgery, where they used the practice computer system during the consultation for their medical records. The reason for specifying that the patient must be billed for the consultation is that GPs often make notes about patients at times other than during consultations, such as if they receive a message about a patient.

### 10.2.5 The level of difference between opportunities taken for intervention and control groups

A level of fifteen per cent was nominated as being a large enough difference to be seen by GPs as clinically significant. While the large number of patients involved in the trial provided sufficient statistical power to detect smaller differences than fifteen per cent, a difference of only one per cent is not likely to interest GPs for whom the provision of more preventive care would cost them additional time and effort which may not have been rewarded financially under the Medicare Benefits Schedule current at the time of trial.

### 10.2.6 Preventive care intentions of the doctors in the study

It was considered important that the doctors in the study received reminders only about care which they actually wanted to provide. Before the start of the trial, the GPs in the
study practice were given a list of preventive activities and at a meeting with the author were asked to nominate for which of the preventive activities they wished to receive reminders. For those procedures for which they wished to receive reminders, they were asked to nominate the age range of patients for whom they wished to perform each procedure, and the frequency with which they wished to perform it.

A consensus was obtained of the doctors’ intentions. The study doctors stated that they wished to be reminded about the procedures listed in the following table. Eleven of the preventive activities which the doctors chose were listed in the then current edition of the RACGP’s Guidelines for Preventive Activities in General Practice.

The twelfth activity for which the doctors wished to be reminded was the recording of whether the patient had any allergies. The Medrecord computer medical record system, as it had been provided to the practice, did not actively point out to the doctors if the field for the recording of allergies was blank. This permitted a risk that a doctor may assume that a patient had no allergies when in fact the patient had never been asked. The doctors in the study practice felt that it was a good idea to be reminded that a patient’s allergy record was blank.

To assess how well the doctors’ intentions conformed to authoritative recommendations, they were compared to recommendations made in the RACGP Guidelines for Preventive Activities in General Practice. Table 1 below compares the age ranges and frequencies nominated by the doctors for each procedure with those recommended for those procedures by the then current RACGP Guidelines.
<table>
<thead>
<tr>
<th>Preventive activity</th>
<th>RACGP Guidelines</th>
<th>Study GPs’ intentions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Smoking status</td>
<td>From 18 years: no interval specified</td>
<td>At least once from 17 years</td>
</tr>
<tr>
<td>Recording of allergies</td>
<td>Not mentioned</td>
<td>At least once from birth</td>
</tr>
<tr>
<td>Blood pressure to screen for hypertension</td>
<td>Every 1-2 years from 16 years</td>
<td>Biennially from 20 years</td>
</tr>
<tr>
<td>Weight measurement</td>
<td>&quot;At least every few years&quot;</td>
<td>Every year from 20 years</td>
</tr>
<tr>
<td>Serum glucose to screen for diabetes</td>
<td>“Not routinely”: based on risk factors, including age</td>
<td>Every 5 years from 65 years</td>
</tr>
<tr>
<td>Screening for hyperlipidaemia</td>
<td>At least once for men aged 45 to 65 years</td>
<td>Every 5 years from 20 years, for both genders</td>
</tr>
<tr>
<td>Cervical (Pap) smear</td>
<td>Biennially from 18 to 70 years</td>
<td>(Same)</td>
</tr>
<tr>
<td>Screening mammography for breast cancer</td>
<td>Biennially from 50 to 70 years</td>
<td>(Same)</td>
</tr>
<tr>
<td>Tetanus vaccine</td>
<td>Primary course starting at 2 months, then 10 yearly from 15 years</td>
<td>(Same)</td>
</tr>
<tr>
<td>Measles, mumps and rubella vaccine</td>
<td>1st dose at 1 year and 2nd dose at 10-16 years</td>
<td>(Same)</td>
</tr>
<tr>
<td>Influenza vaccine</td>
<td>Every year from 65 years</td>
<td>(Same)</td>
</tr>
<tr>
<td>Pneumococcal vaccine</td>
<td>“Consider once over 65 years”</td>
<td>Every 5 years from 65 years</td>
</tr>
</tbody>
</table>

Table 1: Comparison of recommendations in the RACGP Guidelines for Preventive Activities in General Practice (4th Edition, 1996) and intentions of GPs in the study
10.2.7 Differences between the study doctors’ intentions and the RACGP guidelines

10.2.7.1 Screening for hypertension

The doctors in the study practice chose to start screening at a later age and possibly less often than recommended by the RACGP Guidelines.

10.2.7.2 Screening for diabetes

The RACGP Guidelines stated that “the risk factors of age over 40, family history of the disease, history of gestational diabetes or birth of an infant > 4Kg, and obesity (body mass index >30 Kg/m2) should be used as guides to decide when to measure blood glucose”.

At the time of the study, the position statement of the Australian Diabetes Society (Welborn 1996) advised screening of patients from “ethnic groups with a high prevalence of NIDDM”, those with a “positive family history of NIDDM”, those who were overweight, or aged greater than 50 years, or who had previously had “abnormal glucose tolerance”, “pregnant women aged 30 years or more”, patients with “hypertension, dyslipidaemia, or clinical macrovascular disease” and those taking “diabetogenic medications”. The Diabetes Society position statement contained some further details and definitions not quoted here. The position statement did not state any interval at which screening should be performed.
Because of the complexity of detecting risk factors other than age and because the risk factors of family history, gestational diabetes, birth of an infant >4Kg and obesity had not been recorded consistently in the practice, it was decided for these reasons to limit the study of this activity to patients 65 years and over.

10.2.7.3 Screening for hyperlipidaemia

The RACGP Guidelines stated that “it may be appropriate to screen for cholesterol levels in asymptomatic men 45 to 64 years”. At the time of the study, the “Guide to Plasma Lipids for Doctors” from the National Heart Foundation recommended that all adults aged 18 years and over be tested at least every five years (National Heart Foundation 1996). The study doctors’ intentions were similar to this latter guideline.

10.2.7.4 Screening mammography

The intentions of the study doctors conformed to the RACGP guideline.

10.2.7.5 Cervical smear (Pap) screening

The intentions of the study doctors conformed to the RACGP guideline.

10.2.7.6 Smoking status

The study practice’s computer medical record system stored the record of smoking status as an undated free text entry in a dedicated field of the database. This means that it was not possible to tell from the computer record when the entry in the smoking field had been made.
It would have been possible to reprogram the computer system to capture the date on which the record was made, and to use that information to generate reminders at some defined interval. However, this would have required the doctors to alter their usual method of recording the patient’s smoking status. The trial had been designed with the intention of minimising the need for the doctors to alter their usual methods of keeping their medical records, in order to try to make the intervention the only variable. Therefore, it was decided that patients with any entry in the smoking field of their record would be regarded as being ‘up to date’ for this preventive activity.

The date on which this entry was deemed to have been made was calculated using the following logic: At the beginning of the consultation, if there is an entry in the ‘smoking’ field and there is a consultation before this one, then assume that the entry in the ‘smoking’ field was made at that last consultation, and write the date of that previous consultation into the research data file as the date of the entry. If there is no previous consultation in the record, write today’s date as the date of the entry.

10.2.7.7 Weight

The study doctors chose to weigh patients annually, which is probably more often than the RACGP guideline of “at least every few years”.

10.2.7.8 Influenza immunisation

Because the criteria for giving influenza vaccine to patients less than 65 years of age are complex and subject to judgment about the severity of conditions which may indicate influenza vaccine, it was decided to include only opportunities to give the vaccine to
patients over 65 years of age. It was also decided that for maximum benefit, influenza vaccine should be given before winter, so for the purposes of this trial the end of June was chosen as the cut off date of the pre-influenza period. Neither opportunities that occurred after the end June to give influenza vaccine (that is, consultations with unimmunised patients over 65), nor the administration of the vaccine after the end of June were included in the trial.

10.2.7.9  Mumps, measles and rubella vaccine

Although the national immunisation schedule specified two doses to be given, for practical reasons it was decided to accept at least one dose of this vaccine recorded as having been given before the age of five years as fulfilling the requirement.

10.2.7.10  Pneumococcal vaccine

The RACGP Guidelines of 1996 recommended this vaccine only once for patients over 65 years who were not considered high risk, but in November 1996 the NH&MRC recommended that all patients over 65 years of age should receive this vaccine every 5 years (National Health and Medical Research Council 1996). The study doctors’ intentions were in agreement with this latter recommendation.

10.2.7.11  Tetanus immunisation

The doctors in the practice intended to provide tetanus immunisation in accordance with the NH&MRC Guidelines current at the time of the trial. However, for the purposes of this study it was decided to accept one tetanus-containing vaccine given within the
previous ten years as satisfying the criterion. This was because the doctors could not
document for all patients the dates and numbers of doses of tetanus vaccines that they
had had, and because adults often do not know the details of their own immunisation
history (Heath, Smith et al. 1996) and have difficulty in accessing records of their
immunisations, which may be kept in a number of different organisations, including
general practices, local councils and hospitals.

10.2.8 The consultation screen of the practice’s computer software

When a doctor in the study practice started a consultation with a patient, he or she
identified in the computer system the patient whose consultation was being started,
usually by entering part of the patient’s surname and if desired, part of the patient’s first
name. The doctor then used the ‘Start Consultation’ function of the clinical software
which presents a screen which displays demographic information about the patient, and
fields including ones titled ‘Subjective’, ‘Objective’, ‘Assessment’ and ‘Treatment’ into
which the doctor can write the record of the consultation (Figure 1).

10.2.8.1 The intervention

The intervention was to consist of messages displayed during consultations on the GPs’
consulting room computer screens, for preventive activities about which the GPs
wanted to be reminded.
10.2.8.1.1  Development of the reminder programs

10.2.8.1.1.1  Existing clinical software

The Medrecord software, as it was supplied by the vendor, did not have a function to tell the GP during a consultation whether any preventive activities were indicated and due for the patient. It was however supplied with a ‘recall’ function, which enabled the creation of a recall note in a special purpose file, for any patient for any particular reason. The reasons could include preventive activities, such as lipids screening or influenza immunisation, or they could be for follow up of known health problems, such as review of diabetes or asthma. The user would enter a date on which the patient was to be recalled, and the reason or purpose of the recall. The computer system could then be interrogated at any time and made to print lists of patients for whom recalls had become due or would become due within a specified date range. The user could restrict or sort the list to be printed by the reasons or purposes of the recalls. For example, the user could print a list of all patients for who would become due within the next week to have their lipids tested. The process of searching through the recall database and of assembling the list of patients to be recalled required hours of processing on the computers used in general practices in the 1980s and early 1990s, so this process was often run overnight. The intention of the original design of this function was that the practice would then contact those patients, usually by letter or telephone, and advise them to make an appointment for the care to be provided.

The ‘recall’ function made it possible for the GP or practice staff to create recall notes for every patient for every preventive activity that was indicated for that patient, and to send letters or telephone every patient when one or more preventive activities had
become or would soon become due. However, the work involved in creating the recall notes, one at a time for each preventive activity that was indicated for each patient, and updating them as the various preventive activities were performed, was very significant and because of this the study practice, like other practices using computerised medical record systems, created recalls only for cervical smear tests and for only a few other selected purposes for only some patients.

During a consultation, the GP could look up any existing recalls for the patient, and if there were any, see whether they were due to be performed. This required the GP leaving the consultation screen and going to the recall module, then returning to the consultation screen. Even if the GP went through this process, he or she would see information only for preventive activities for that patient for which he or she or somebody else in the practice had earlier made entries, and not for all preventive activities that were indicated for the patient.

10.2.8.1.1.2 First development of the reminder function

In 1980 Dr. Jan Ravet, whose work was cited in the previous chapter, joined the practice in Kalamunda in Western Australia in which the Medrecord clinical software had originally been developed by Dr. Graeme Simpson. After joining the practice Dr. Ravet wrote programs to add to and improve on those which had been provided by Medrecord. He made two main improvements. The first was that he wrote a suite of programs that contained information about the practice’s intentions to provide preventive care for its patients. This included for each preventive activity information about the patient age range and gender for which the activity was indicated, and any factors that would make that patient ineligible that preventive activity, based on
information in the patient’s electronic clinical record. For example, if the word “hysterectomy” appeared as previous treatment for a woman’s previous health problems, this implied that further cervical smear tests were not indicated, or if a patient had already been diagnosed as hypertensive, he or she would no longer be eligible for screening for hypertension. The second improvement that Dr. Ravet made was that he could call his reminder programs during a consultation by pressing a particular combination of keys (it happened to be Shift-F7), and they would search the patient’s record in real time, taking a few seconds to do so, and find the most recent performance, if any, of preventive activities that were indicated and due for the patient and then list them on the screen.

The provision of preventive care is a high priority in my practice. I asked Dr. Ravet whether he would let me use his programs in my practice, and he kindly supplied the source code of his programs and gave me advice in the early stages of their further development. With help from Dr. Ravet and useful textbooks about PICK BASIC, I had already started learning to program in PICK BASIC, the language in which the Medrecord software was written, and had started writing programs to provide various types of reports and analysis of my practice’s activities. I was therefore able to read, understand and modify the source code of Dr. Ravet’s programs.

10.2.8.1.1.3 Further development of the reminder function

In Dr. Ravet’s practice, the doctor had actively to call the reminder programs during the consultation, in order to see the reminder messages. In my practice, the programs were further developed so that the reminders appeared automatically at the beginning of the consultation without having to be called by the user. The reminder programs and the
display of the reminder messages were prototyped in my own practice from 1995 to the start of the trial in March 1998, with many alternatives being tested and many refinements being made. Many of the changes were made during the working day in my practice, often between consultations, until they were as informative and helpful as possible while being as unintrusive as possible. During this process, all aspects of the reminders, including their placement on the screen and the information contained in them, were tested, changed and improved many times.

Additional programs were written for a wide range of preventive activities and eventually there were reminders for thirty different preventive activities, including, for example:

- a reminder to offer a falls prevention program to patients over 60 years old;
- a reminder to offer to test the rubella immunity of young women before they planned to become pregnant;
- a reminder to consider whether patients over 65 years old qualified for the State’s subsidised taxi scheme for people who were not able physically to use public transport;
- a reminder to check the electrolytes of patients who had a current prescription for diuretics.

The reminder format established at the end of this process is that shown in Figure 1 below.
The study GPs were asked to notify the author during the trial of any problems or difficulties with the functions of the reminder programs, such as failing to detect preventive activities that had been performed previously. Very few such notifications were made, probably because of the extensive testing and refinement which the reminders had undergone for three years in my own practice.

10.2.8.2 Logical structure of reminder programs

The computer programs which generated the reminders in this study followed the general logic:

1. Check that a date of birth and a gender are in the patient’s master file record. If either is not found, abort the reminder routine and display as appropriate: “Date of birth not recorded” or “Sex not recorded”;

2. If date of birth and gender found, check for which preventive activities the patient is eligible;

3. For each preventive activity, search back through the medical record to find the most recent date on which the activity was performed;

4. Calculate the date on which the activity is next due;

5. If date due is on or before today, and if the patient is in the intervention group, display the reminder message, which shows:

   5.1 acronym for type of reminder e.g. BP for blood pressure;

   5.2 the date on which the activity was last performed, or, if the activity has never been performed for the patient, display the
message “None on record”; 

5.3 the result, finding or action taken at that time;

5.4 the date on which the activity was next due to be performed.

Great care was taken before the start of the trial to ensure that the reminder programs reliably detected all performances in the study practice of each preventive activity being studied. This required close examination of the study practice’s electronic medical records to find all of the different ways in which data elements were being recorded by the GPs. The test results file was searched very carefully to find the exact formats in which cholesterol, glucose and cervical smear results were being sent by the pathology laboratories used by the study practice. Many iterations of modifying the reminder routines and re-testing eventually resulted in reliable detection of all of the preventive activities to be studied during the trial. This process took several months.

10.2.8.3 Specific logic for smoking status

The study practice’s computer medical record system stored the record of the patient’s smoking status as an undated free text entry in a dedicated field of the database. This meant that it was not possible to tell from the computer record when the entry in the smoking field had been made.

It would have been possible to reprogram the computer system to capture the date on which the record was made, and to use that information to generate reminders at some defined interval. However, this would have required the doctors to alter their usual
method of recording the patient’s smoking status. The trial had been designed with the intention of minimising the need for the doctors to alter their usual methods of keeping their medical records, in order to try to make the intervention the only variable. Therefore, it was decided that patients with any entry in the smoking field of their record would be regarded as being ‘up to date’ for this preventive activity.

The date on which this entry was deemed to have been made was calculated using the following logic: At the beginning of the consultation, if there is an entry in the ‘smoking’ field and there is a consultation before this one, then assume that the entry in the ‘smoking’ field was made at that last consultation, and write the date of that previous consultation into the research data file as the date of the entry. If there is no previous consultation in the record, write today’s date as the date of the entry.

10.2.8.4 Specific logic for pneumococcal immunisation

Unlike influenza vaccine, pneumococcal vaccine was not provided to GPs by government to give to patients over 65 years of age, so the GPs had to prescribe it and patients had to buy it at a pharmacy. Discussion with the doctors in the study practice reported that after prescribing the pneumococcal vaccine, the patients usually brought it with them to the subsequent consultation, at which it was administered. For the analysis, it was assumed that the vaccine was prescribed at the consultation immediately before the one at which it was given. The consultation at which the vaccine was presumed to have been prescribed was taken as the date of the taking of the opportunity to provide pneumococcal immunisation.
10.2.9 Doctors’ possible responses to reminders

The GPs could either perform the preventive activity about which they were being reminded, record that the activity had been performed on a previous date, mark the patient as excluded from that activity or simply ignore the reminder. These possibilities are explained below.

10.2.9.1 Perform the activity

The doctors could perform the activity and record in their usual way that they had done so.

10.2.9.2 Record performance of the activity on a previous date

Patients may have had preventive activities performed previously at the study practice or elsewhere, but this may not yet have been recorded in the study practice’s computer system. For example, patients may receive immunisations at locations other than their usual general practice, including other general practices, local council clinics, schools, Child & Youth Health Clinics or hospitals.

The GPs could note at a consultation that the preventive activity had been performed on a previous date. At the patient’s next consultation, the reminder programs would detect this previous performance of the activity, and:
• if the activity had been performed so long ago that it was still due to be performed, the ‘date due’ on the reminder that was displayed would take this new information into account;
• if the previous performance of the activity had brought the patient ‘up to date’ for that activity at that next consultation, the computer system would not display a reminder for that activity.

10.2.9.3 Exclude this activity for this patient

The Medrecord computer software had been supplied with a default set of problem codes, which were based on the International Classification of Health Problems in Primary Care version 2 (ICHPPC2) (Classification Committee of WONCA (World Organization of National Colleges 1983) . It contained codes for conditions commonly seen in general practice, such as upper respiratory infection and hypertension.

In the design of the Medrecord software, attaching a problem code to a consultation record was intended to serve a number of purposes:
• To allow the doctor to be able to find all of a patient’s consultations at which a particular problem had been dealt with;
• To allow analysis of the problems of the patient population of the practice;
• To facilitate the on-demand display or printing of an automated health summary, which could be reviewed before or during consultations and which could also be provided to the patient and to other health care providers treating the patient.

In order to enable the doctors to suppress reminder messages for particular preventive activities for particular patients, a pair of problem codes was added for each of the twelve preventive activities being studied to the practice’s computer system. For example, one pair was:
• Influenza immunisation refused
• Influenza immunisation not indicated

These codes could be used to indicate the patient’s permanent or temporary refusal of a particular preventive activity, or the doctor’s judgement that the patient was permanently or temporarily ineligible for the activity. Permanent refusal or ineligibility was indicated by adding the relevant code to the list of the patient’s long term problems. Temporary refusal or ineligibility was indicated by attaching the relevant code to the progress note of the consultation.

The ways in which the doctors may have used these codes include:

• The patient refused the preventive activity;
  Refusal may be considered temporary, for example, if a patient says: “I won’t have the influenza vaccine this year, but I will have it next year”, or it may be considered permanent, if for example, the patient says quite definitely: “I will never have an influenza immunisation”;
• There was a reason why the activity was not indicated for the patient.
  One example is in the case of young women who are not sexually active, and for whom cervical smear testing is therefore not yet indicated. The relevant code could be attached to the progress note to indicate that this was (most likely) temporary ineligibility. In the case of older women who had never been sexually active and felt that they were unlikely to become sexually active in the future, and for those for whom it was physically impossible to perform a cervical smear for some reason (such as severe vaginal stenosis), the relevant code could be added to the patient’s long term problem to indicate permanent ineligibility.
Attaching the problem code to the progress note of the consultation to indicate temporary ineligibility caused the reminder programs to suppress that reminder message for one year. This meant that no more reminders would be presented for that activity for that patient during the trial. The reason for providing the facility for temporary suppression of any reminder was that the doctors in the study practice intended to continue using the reminder system after the trial was concluded, because they expected to find the reminder system useful as a part of their normal practice.

10.2.9.4 Ignore the reminder

The doctors could simply ignore the reminder message and conduct the consultation as usual. If the GP ignored the reminder, the same reminder would re-appear at every subsequent consultation until either the activity was performed or the GP noted that the patient was refusing or ineligible for the activity.

The source code of the computer programs on which the ones used in the trial were based is appended as Appendix B.

10.2.10 Preparation before the trial

The reminder software was loaded and integrated with the practice’s existing clinical software. The functions of the reminder software and of the codes for patient refusal or ineligibility were explained to the doctors at a meeting at the practice and on an instruction sheet.

The reminder software was activated on 9th March 1998.
10.2.11 Sample size calculation

Sample sizes required to provide 90% power to show a difference of 15% in the taking of opportunities with a confidence of 95% for various levels of incidence are shown in Table 2.

<table>
<thead>
<tr>
<th>Incidence in one experimental group</th>
<th>Number needed in each group</th>
</tr>
</thead>
<tbody>
<tr>
<td>10%</td>
<td>131</td>
</tr>
<tr>
<td>20%</td>
<td>183</td>
</tr>
<tr>
<td>30%</td>
<td>215</td>
</tr>
<tr>
<td>40%</td>
<td>229</td>
</tr>
<tr>
<td>50%</td>
<td>225</td>
</tr>
</tbody>
</table>

*Table 2  Calculation of sample sizes required (Fleiss 1981)*

Preliminary assessment of the practice’s active patient population revealed that the smallest sub-group to be analysed was likely to consist of 400 children under the age of five years, who were expected to make an average of four visits annually. Three preventive activities were indicated for children aged two months to five years old: ALLE, MMR and TET. This translates to a theoretical maximum of approximately 400 children x 4 consultations = 1,600 opportunities, or 800 opportunities per randomised group for each preventive activity during the one year period of the trial, well above the minimum sample size required.
10.2.12 Enrolment

Patients were enrolled in the trial if:

they were billed during the trial for a consultation in the surgery using Medicare
Benefits Schedule item numbers 3, 23, 36 or 44

and

an opportunity to perform any of the preventive activities being studied arose for them during the trial.

Each patient was enrolled automatically at the first consultation during the trial at which there was an opportunity to perform any of the preventive activities being studied.

10.2.13 Randomisation

All patients who were enrolled were randomised to an intervention group for whom reminders would be generated and displayed, or to a control group which was to receive usual care. The patients were randomised according to their identity number within the study practice, as described below.

The practice uses the ‘family number : patient suffix’ method of allocating a unique number to each registered patient, as recommended by the Royal Australian College of General Practitioners for use with its manual Health Record System. In this system, the ‘family number’ is a five digit number. The first family registered at the practice is allocated the number 00001, and each subsequent family registered receives the next
higher number. The family numbers are allocated automatically by the practice’s computer system.

Each patient in a family is identified by a two digit suffix. The first patient in each family is allocated the suffix 01, the next 02 and so on. The combination of the family number with the patient’s suffix creates a unique seven digit identifying number for each patient within that practice. The number for the first patient registered in family 00001 is 0000101, the second patient’s number in that family is 0000102 and so on.

The meaning of ‘family’ in this context is not fixed. The design of the Medrecord computer billing system makes one person in a family group the nominated debtor for that family. In this system, when patients who are not their own debtor become responsible for their own debts, such as in the case of children who start working, those patients are allocated to a new family number, and are removed from their previous family number.

Patients were randomised automatically by the practice’s computer system to either the intervention or the control group, according by the fifth digit of their family number. Patients whose family number’s fifth digit was 0, 1, 2, 3 or 4 were randomised to the intervention group, while those whose family number’s fifth digit was 5, 6, 7, 8 or 9 were randomised to the control group.

Each patient whose family number changed during the trial, as outlined above, had a 50% chance of being changed from one intervention group to the other. This is because patients whose original family number ended in 0, 1, 2, 3 or 4 and who therefore had been randomised to the intervention group had a 50% chance of their new family
number ending in 5, 6, 7, 8 or 9 and being re-assigned to the control group. The reverse applies to patients originally randomised to the control group. No attempt was made in the trial to track the movements of patients from one family number to another or to try to continue their original randomisation.

10.2.14 Concealment of allocation

The basis of the allocation of patients to the experimental groups was not concealed from the GPs in the study.

10.2.15 Protection against contamination

No specific measures were implemented to try to reduce the probability that the doctors would increase their provision of preventive care to control group patients as a result of being reminded to do so for intervention group patients.

10.2.16 The data to be collected

The existing literature described in the previous chapter has reported some characteristics of GPs and patients which had been found to be associated with the performance of preventive activities. The ‘minimal intrusion’ approach taken for this trial precluded the recording or collection of some of the characteristics of patients that had been examined in previous studies, such as educational level attained, occupational status and self-reported health status. However, the fully electronic medical and billing records made by the practice made it possible economically to extract other data which the practice was already collecting routinely, and which could provide information that
had not been collected in previous studies of performance of preventive activities. In order to explore these, the following data were collected.

10.2.16.1.1 Patient data

Date of birth;
Gender;
Codes for long term health problems and the date on which each problem was coded.

10.2.16.1.2 Doctor data

Doctor identity.

10.2.16.1.3 Consultation data

Clinical problems coded during consultation;

The GPs could attach problem codes to the record of a consultation to note care of acute problems (for example, upper respiratory tract infection), or of long term health problems (for example, hypertension). The GPs could code as many problems as they felt were relevant to the consultation.

Medicare item number billed;

Fee billed.

10.2.16.1.4 Special research data

These data elements were created from the data outlined above. They were:
10.2.16.1.4.1 **Doctor gender;**

This was looked up automatically by the computer system in a table that linked the doctors’ identities and genders.

10.2.16.1.4.2 **Patient’s age at consultation;**

This was calculated automatically for each consultation using the date of the consultation and the patient’s date of birth.

10.2.16.1.4.3 **Whether the patient was seeing his or her usual doctor in the practice;**

In the interests of minimising intrusion into the practice’s usual routine, patients were not asked to name their usual GP within the practice.

A number of different formulae for determining the usual GP for each patient were considered and tested. Methods of allocating the usual GP based on which GPs the patient had attended before the start of the trial, as well as those during the trial, were tested but discarded. This was because a number of GPs and GP registrars who had worked in the practice had left it before the start of the trial. This meant that patients past patterns of attendance may not have accurately reflected the patterns of attendance during the trial.

In the end the most practical and meaningful approach seemed to be that the ‘usual’ doctor for each patient was the doctor whom the patient had seen for more than half of his or her consultations during the trial. At the end of the trial, the computer system compared for each consultation the identity of the doctor
seen at that consultation with the identity of the doctor who had been determined to be the patient’s usual doctor within the practice. For the record of each preventive opportunity, the computer wrote a ‘1’ into the ‘usual GP seen’ field if the GP seen was the patient’s usual doctor within the practice, or a zero if the GP was not the patient’s usual doctor within the practice.

10.2.16.1.4.4 Number of services provided to this patient within the two years preceding this consultation:

Because the practice routinely culled its billing records, billing records were available only from 7th October 1997 onwards. In order to estimate the number of consultations in the two years preceding the opportunity during the trial that was being examined, the following procedure was used:

Calculate the date which was two years before the opportunity during the trial being examined;

Count the number of progress notes between this date and 6th October 1997 inclusive;

Add to this number the number of consultation items billed from 7th October 1997 until the date of the opportunity being examined.

For patients who had attended the practice before 7th October 1997, the calculated number of consultations in the two years preceding each opportunity was therefore a hybrid of billing data from 7th October 1997 and the number of progress notes made before that date.
10.2.16.1.4.5  **Number of preventive activity opportunities at this consultation;**

Each patient could be due for more than one preventive care activity at a consultation. For example, a patient could be due to have his or her blood pressure measured and also for an influenza immunisation. In this case, the number of opportunities at this consultation is two.

The patient sub-group for whom the maximum number of opportunities could be available were women aged between 65 and 69 years, for whom there could be an opportunity to perform each of the eleven preventive activities being studied (ALLE, BP, DIAB, FLU, LIPI, MAMM, PAP, PNEU, SMOK, TET and WT), if these had not been performed within the intervals specified by the GPs. For patients of other ages and genders, the maximum possible numbers of opportunities were smaller. For example, a child eight years of age could have a maximum of three preventive opportunities, for the activities ALLE, MMR and TET.

For each consultation, the computer system counted the number of preventive opportunities and wrote that value into a special field in the research data file.

10.2.16.1.4.6  **The ordinal number of this preventive care opportunity during this trial;**

This noted whether this consultation represented the first, second, third, etc. opportunity during the trial for this preventive activity to be performed for this patient. For example, if blood pressure measurement as screening for hypertension was due for a patient at his first consultation during the trial, this was the first opportunity during the trial for the GPs to record the patient’s blood
pressure. If the GP did not record a blood pressure at that first consultation, another opportunity may occur if the patient attended for a second consultation during the trial, and this would be labelled as the second opportunity. If the GP did not record a blood pressure at that second consultation, and the patient attended for a third time during the trial, another opportunity would occur at that third consultation and would be labelled as the third opportunity. If the GP did record a blood pressure at that third consultation, that opportunity was noted as having been taken. If the patient attended during the trial for any further consultations, no opportunity would exist at those subsequent consultations, because the patient’s blood pressure was not due to be recorded again (according to the GPs’ intentions) for another two years from the date of it having been recorded during the third consultation during the trial. The special purpose data file of opportunities would show: 1st opportunity: not taken; 2nd opportunity: not taken; 3rd opportunity: taken.

The purposes of creating this characteristic of opportunities were:

- to examine whether the GPs tended to take the first rather than subsequent opportunities for each of the preventive activities, or whether they did the reverse, and to examine whether for patients for whom they were receiving reminders they tended to take subsequent opportunities as a result of the cumulative effect of seeing the reminder more than once;

- to examine whether and how the preventive opportunities ‘competed’ with each other to be performed. When there were opportunities in a
consultation to perform more than one preventive activity, did the GPs tend to perform some of those activities in preference to the others?

It is likely that for most of the patients who had attended the practice before the start of the trial, the GPs will have had opportunities before the start of the trial to perform various preventive activities. For example, the first opportunity that occurred during the trial may in fact have been the GPs’ fourth opportunity to perform that activity for that patient, because the patient had attended three times before the start of the trial and the preventive activity had not been performed, even though it had been indicated and due. Because data were not available to allow accurate numbering of opportunities that occurred before the start of the study, opportunities that may have existed before the start of the trial were ignored.

10.2.16.1.4.7  **Number of years since this patient became due for this preventive activity;**

This data element noted the number of years that had elapsed since the preventive activity had become due for this patient. It was possible that the patient had become due for the activity before his or her first visit to the study practice. Because the study doctors had no opportunity to perform the activity before the patient first attended their practice, the number of days elapsed since each preventive activity was considered to have become due for each patient for was defined as:  (date of consultation) - (date of first visit to study practice).

The date of the first visit to the study practice was defined as the earlier of the date of the first progress note or the date of the first service for which the patient had been billed by the practice.
The purpose of defining and measuring this characteristic was to see whether the
GPs preferentially performed activities which had been due for longer. It is
possible that the listing of the reminders on the screen in order of date due would
have acted to encourage this pattern of taking opportunities.

10.2.16.1.4.8 Number of long term health problems recorded prior to this date for this
patient;

This number was found by examining the dates of the patient’s recorded long
term health problems, and counting only those which had been recorded prior to
the date of the consultation being examined.

10.2.16.1.4.9 The level at which the fee for this consultation was charged;

The fees charged by the practice fell into three distinct bands, with the lowest
band of fees being those billed at the level of the Medicare benefit for that item.
Fees were categorised into a “Medicare benefit only” band, a “middle” fee band
with patient co-payments of up to and including $5.00 for an item 23 level B
consultation (and proportionate co-payments for the other consultation items
numbers), and a “high” fee band with higher co-payments than these. It is
common for Australian general practices to charge a lower level of fees to
patients who have a pension card or government-issued Health Care Cards, and
a higher level of fees to other patients. Additionally, for particular types of
services, such as immunisations, and for particular consultations, such as follow
up consultations, it is common for GPs to charge lower levels of fees or
“Medicare benefit only”.

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10.2.16.1.4.10 Dates on which each preventive activity had been performed;

The reminder programs stored this information in a special purpose file.

10.2.16.2 Modification of the standard consultation screen

At the beginning of consultations during the trial, the reminder software wrote the reminder messages into the ‘assessment’ field, as shown in Figure 1 below.

By their being displayed at all, the reminders on this screen are telling the GP that the activities TET, LIPI, PAP, WT and SMOK (please refer to glossary at beginning of thesis) are indicated and due for this patient. For each preventive activity, the date on which it was last performed and the date on which it was next due are shown, or if the activity has not ever been recorded as performed for the patient, the text ‘None on
record’ is displayed. For activities that have been performed, relevant information about that activity is displayed in the column ‘Result, finding or action’.

The reminder messages were ordered by the dates on which the activities became due for the patient.

Shortly before the start of the trial, the GPs requested that the reminder messages be moved so that they appeared on the screen immediately below the line displaying the doctor’s name. No image is available of this. The effect of moving the display of the reminders to nearer the top of the consultation screen was that in some consultations, as the doctors made entries in the subsequent fields on the screen, they would go ‘over the page’ to a second screen on which the reminders were no longer visible. However, the GPs could move the cursor upwards to previous fields and go ‘back to the first page’, on which the reminders remained visible throughout the consultation, if they wanted to amend their entries in earlier fields or if indeed they wanted to review the reminders. In consultations in which the GPs may have written brief notes which did not take up more than one line in each field, the reminders would have remained visible throughout the consultation.

**10.2.17 Outcome measurements**

The following measurements were planned to examine the outcome of the trial:

**10.2.17.1 Effect of the reminders**
The main outcome measure of the effect of the reminders was the proportion of preventive care opportunities taken for patients in the intervention group compared to the proportion taken for patients in the control group.

10.2.17.2 Predictors of performance of preventive activities

The outcome measures were the associations of the taking of preventive care opportunities at each consultation, with the following characteristics of patients, doctors, consultations and preventive opportunities:

Patient characteristics:
- Age at consultation;
- Gender;
- Number of visits during previous two years;
- Number of long term health problems coded to date.

Doctor characteristics:
- Gender;
- Whether the doctor is the patient’s usual doctor within the practice.

Consultation characteristics:
- Number of health problems coded at this consultation;
- Medicare item number billed;
- Fee level billed;
- The number of preventive care opportunities at this consultation.
Opportunity characteristics:

- The ordinal number of the opportunity during the trial;
- Number of years since this activity became due for this patient;
- Whether a reminder was displayed.

10.2.18 Comparison with other general practices

The study practice’s patient population and the numbers and patterns of services which it provides to its patients will be compared with those of other Australian practices, using data provided by the Health Insurance Commission (Commonwealth of Australia 2000).

10.2.19 Data extraction and storage

The data were extracted from the practice’s computer system at the end of the trial and loaded on to a computer used only for this study. The data were held on this computer under physical and password protection. The computer was a ‘stand alone’ machine and was not connected to any network.

10.2.20 Data files for analysis

The following files were created using the data extracted from the study practice’s computer system. The symbol “*” is used to indicate concatenation (chaining together) of elements in fields in the following files.
10.2.20.1 **Opportunity file**

Each item in this file represented an opportunity for the doctor to perform one of the preventive activities for one patient. The fields of items in this file were:

- Identifier (patient’s number*date of consultation* type of preventive activity)
- Whether the opportunity had been taken
- Days since patient due for this preventive activity.

All items in this file related to a consultation for which Medicare item 3, 23, 36 or 44 had been billed.

10.2.20.2 **Consultation file**

Each item in this file contained data about the consultation. The fields were:

- Identifier (patient’s number*date of consultation)
- Doctor’s identity code
- Medicare item number billed
- Fee charged
- Number of preventive care opportunities at this consultation
- Number of problems coded at this consultation
- Number of consultations during previous two years.

10.2.20.3 **Patient file**

The fields in this file were:
- Identifier (patient’s number within the practice)
- Patients’ date of birth
- Patient’s gender
- Dates of long term problem codes
- Code numbers of the patient’s long term problems
- Code of usual doctor

10.2.21 Statistical analyses

Descriptive statistics will be presented about the patients and GPs in trial, and about consultations and opportunities that occurred during the trial.

10.2.21.1 Randomised trial of reminders

10.2.21.1.1 Analysis by intention to treat

To examine the effect of the reminders, the data were analysed by ‘intention to treat’ (Pocock 1984). This means that data from all patients who were enrolled and randomised were included in the analyses for the experimental group to which they had been randomised irrespective of any events that occurred during the trial.

10.2.21.1.2 Data were binary

The data about whether opportunities were taken were binary, because opportunities were either taken or not taken. Log binomial regression (McCullagh and Nelder 1989) was used to provide relative risks of opportunities being taken.
10.21.1.3 Clustering of data

Clustering of data occurred at multiple levels. Many patients attended the same GP in the practice for most or all of their consultations during the trial, which resulted in patients being clustered within GPs. This represents one level of clustering. In many consultations there were opportunities to perform a number of indicated preventive activities for the patient, which resulted in those opportunities being clustered within consultations, which represents a second level of clustering. Further, for each patient there may have been multiple opportunities for the GPs to perform a particular preventive activity: this would have occurred if the GP failed to take the opportunity at the first consultation during the trial at which that preventive activity was due to be performed. If the patient attended twice and at each consultation a particular preventive activity was due, but neither opportunity was taken, there would have been two opportunities to perform that activity. If the patient attended three times, and at each consultation a particular preventive activity was due, but neither of the first two opportunities was taken, there would have been three opportunities to perform that activity. These opportunities were clustered within the patient. This is a third level of clustering.

Standard regression techniques assume that the events being examined are independent of each other. This is clearly not true of many or most of the opportunities to perform preventive activities in this trial. The clustering of data that occurred in this trial means that the use of standard regression analyses was likely to result in falsely small standard errors of the mean, which may lead to spurious findings of statistical significance in the
results of the trial or study, noting that occasionally failure to correct for clustering of data results in the opposite effect.

A number of statistical techniques have been developed to correct for the effects on standard errors of the mean of clustering or correlation of data. One of the more sophisticated techniques is the Generalized Estimating Equations (GEE) method (Liang and Zeger 1986), which is able to account for multiple levels of clustering. This method was appropriate and was used in the analyses of the data for this trial.

10.2.21.2 Association of performance of preventive activities with characteristics of patients, GPs, consultations and preventive opportunities

It was expected that many of the variables outlined above would be related to each other: for example, older patients were likely to have had more consultations during the preceding two years than younger patients. Logistic regression multivariate analysis using Generalised Estimating Equations was performed to examine which variables were independently associated with the performance of preventive care.

It was possible for the GPs to see patients without using the ‘Start Consultation’ program which generated reminders for patients in the intervention group, or to write the progress note after the end of the consultation, or to see patients without making any progress note at all, so for these analyses, the reminder variable used was whether a reminder was actually displayed or not, rather than the ‘intention to treat’ analyses used for the randomised trial of the reminders.
10.2.21.2.1 Multiple testing of data

The use of Bonferroni correction for multiple testing of the same datasets was considered. It was decided not to use this correction, and to prefer to accept the increased risk of falsely detecting an association which did not exist (type 1 error), to that of accepting an increased risk if a Bonferroni correction was used, of failing to detect a significant association which did exist (type 2 error).

10.2.22 Qualitative data and their analysis

Seven of the ten GPs who participated in the trial were still in the practice in September 2005 and agreed to be interviewed. They were interviewed in September 2005 about their experiences of the reminder system and about their provision of preventive activities.

The interviews followed a semi-structured format, were audio recorded with the GPs’ permission and transcribed. The transcripts are appended to this thesis as Appendix D.

10.2.23 Ethical approval

Ethical approval was obtained from the University of Adelaide. The notice of approval is attached as Appendix A. It was considered neither necessary nor desirable to inform patients of the trial or of their enrolment into it, because:
• the intervention was not introducing any new medical treatment;
  the doctors’ behaviour was the focus of the trial;
• no identifiable patient data were to be used;
• informing the patients of the nature of the trial may have had a confounding
  effect by prompting the patients to request preventive care.

### 10.3 Results

In this section, the data collected are described and the results of the analyses are
presented.

#### 10.3.1 Data collected

**10.3.1.1 Ages and genders of the GPs in the trial**

The ages and genders of the GPs in the practice in March 1998 are shown in
Table 3 below.

<table>
<thead>
<tr>
<th>GP number</th>
<th>Age at start of trial</th>
<th>Gender</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>29</td>
<td>Male</td>
</tr>
<tr>
<td>2</td>
<td>36</td>
<td>Male</td>
</tr>
<tr>
<td>3</td>
<td>37</td>
<td>Male</td>
</tr>
<tr>
<td>4</td>
<td>38</td>
<td>Male</td>
</tr>
<tr>
<td>5</td>
<td>38</td>
<td>Male</td>
</tr>
<tr>
<td>6</td>
<td>38</td>
<td>Female</td>
</tr>
<tr>
<td>7</td>
<td>39</td>
<td>Female</td>
</tr>
<tr>
<td>8</td>
<td>41</td>
<td>Female</td>
</tr>
<tr>
<td>9</td>
<td>44</td>
<td>Male</td>
</tr>
<tr>
<td>10</td>
<td>45</td>
<td>Female</td>
</tr>
</tbody>
</table>

Table 3: Ages and genders of GPs at the start of the study in March 1998

**10.3.1.2 Planned data that were not able to be collected or used**
The data described in Methods were collected during the trial as planned and were extracted after the trial from the practice’s computer system, with the exception of data about advice for screening mammography.

Data about the GPs’ taking of opportunities to advise patients about screening mammography were not able to be extracted. This was because:

a) the GPs were not asked to record the giving of such advice;

b) there were waiting times of several weeks for appointments at the local screening mammography unit;

c) patients were being recalled by the State mammography system;

d) patients could refer themselves for screening mammography and were being encouraged to do so by public health campaigns.

These factors prevented the linking of a particular consultation with a woman’s attendance for screening mammography. Therefore no data or results will be presented for the taking of opportunities for advising patients to have screening mammography.

10.3.1.1 Patients seen and services provided during the trial

Descriptive statistics about patients, services provided and preventive care opportunities are presented below in Table 1.
<table>
<thead>
<tr>
<th>No. Patients Per ‘Family’*</th>
<th>Intervention</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2,222 (66.0)</td>
<td>2,265 (65.4)</td>
</tr>
<tr>
<td>2</td>
<td>719 (21.4)</td>
<td>711 (20.5)</td>
</tr>
<tr>
<td>3</td>
<td>282 (8.4)</td>
<td>298 (8.6)</td>
</tr>
<tr>
<td>4</td>
<td>112 (3.3)</td>
<td>142 (4.1)</td>
</tr>
<tr>
<td>5</td>
<td>25 (0.7)</td>
<td>36 (1.0)</td>
</tr>
<tr>
<td>6</td>
<td>5 (0.1)</td>
<td>10 (0.3)</td>
</tr>
<tr>
<td>9</td>
<td>1 (0.0)</td>
<td>0 (0.0)</td>
</tr>
</tbody>
</table>

* ‘Family’ refers to patients who share the same five digit family number

Table 1: Comparison of sizes of families randomised to the two experimental groups.

Family sizes were similar for the experimental groups, with approximately two thirds of families in each experimental group having only one member attending during the trial.

10.3.1.1 Patient Level

To examine further whether the randomisation process had been effective, the patients allocated to the two experimental groups were compared (Table 2).
<table>
<thead>
<tr>
<th></th>
<th>Intervention</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>n</td>
<td>n=5,118</td>
<td>n=5,389</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>2,849 (55.7)</td>
<td>3,046 (56.5)</td>
</tr>
<tr>
<td>Age at 8/3/99 (years)</td>
<td>36.0 (21.7)</td>
<td>35.4 (21.9)</td>
</tr>
<tr>
<td>Age Group at 8/3/99</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; 15</td>
<td>1,151 (22.5)</td>
<td>1,281 (23.8)</td>
</tr>
<tr>
<td>16-25</td>
<td>555 (10.8)</td>
<td>600 (11.1)</td>
</tr>
<tr>
<td>26-35</td>
<td>778 (15.2)</td>
<td>851 (15.8)</td>
</tr>
<tr>
<td>36-45</td>
<td>908 (17.7)</td>
<td>943 (17.5)</td>
</tr>
<tr>
<td>46-55</td>
<td>700 (13.7)</td>
<td>656 (12.2)</td>
</tr>
<tr>
<td>56-65</td>
<td>460 (9.0)</td>
<td>441 (8.2)</td>
</tr>
<tr>
<td>&gt; 65</td>
<td>566 (11.1)</td>
<td>617 (11.4)</td>
</tr>
<tr>
<td>Number of services in 6 months before start of trial</td>
<td>1 (0-2)</td>
<td>1 (0-2)</td>
</tr>
<tr>
<td>Medicare items billed before start of trial:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>69 (0.9)</td>
<td>77 (1.0)</td>
</tr>
<tr>
<td>23</td>
<td>5,458 (73)</td>
<td>5,833 (73)</td>
</tr>
<tr>
<td>36</td>
<td>1,007 (14)</td>
<td>1,114 (14)</td>
</tr>
<tr>
<td>44</td>
<td>150 (2.0)</td>
<td>138 (1.7)</td>
</tr>
<tr>
<td>Other</td>
<td>819 (11)</td>
<td>923 (12)</td>
</tr>
<tr>
<td>Fees charged in 6 months before start of trial†</td>
<td>$21 ($0-$59)</td>
<td>$21 ($0-$56)</td>
</tr>
<tr>
<td>Number of long term health problems coded before start of trial</td>
<td>0 (0-1)</td>
<td>0 (0-1)</td>
</tr>
</tbody>
</table>

Values are:
- number (%) of patients and of Medicare items;
- mean (sd) of age; and
- median (Inter-Quartile range) of numbers of services, long term health problems and fees charged before trial

† Billing records were available only from 7/10/97.

**Table 2. Comparison of patients randomised to the experimental groups**

Patients in the two experimental groups were similar for each characteristic listed in the table.
### 10.3.1.1.2 Doctor level

<table>
<thead>
<tr>
<th>Doctor number</th>
<th>No. of consultations during the trial with patients in intervention group</th>
<th>No. of consultations during the trial with patients in control group</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2,399</td>
<td>2,892</td>
</tr>
<tr>
<td>2</td>
<td>1,677</td>
<td>1,828</td>
</tr>
<tr>
<td>3</td>
<td>1,613</td>
<td>1,552</td>
</tr>
<tr>
<td>4</td>
<td>2,288</td>
<td>2,267</td>
</tr>
<tr>
<td>5</td>
<td>1,876</td>
<td>2,212</td>
</tr>
<tr>
<td>6</td>
<td>1,082</td>
<td>919</td>
</tr>
<tr>
<td>7</td>
<td>1,368</td>
<td>1,685</td>
</tr>
<tr>
<td>8</td>
<td>2,413</td>
<td>2,814</td>
</tr>
<tr>
<td>9</td>
<td>1,926</td>
<td>2,235</td>
</tr>
<tr>
<td>10</td>
<td>1,963</td>
<td>2,306</td>
</tr>
<tr>
<td>Total</td>
<td>18,605</td>
<td>20,710</td>
</tr>
</tbody>
</table>

**Table 3: Numbers of consultations during trial**

The GPs had 39,315 consultations during the trial with 10,507 patients, giving a mean number of 3.7 consultations per patient during the trial.

### 10.3.1.1.3 Opportunities for preventive care activities during the trial

The numbers of opportunities which occurred during the trial were critical to the study. Sufficient numbers of opportunities were needed to provide the required statistical power calculated in the Methods chapter. Table 4 below shows the numbers of opportunities which occurred during the trial for each type of preventive activity.
<table>
<thead>
<tr>
<th>Activity</th>
<th>Number (%) of opportunities for patients in intervention group</th>
<th>Number (%) of opportunities for patients in control group</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALLE</td>
<td>10,991 (17.3)</td>
<td>13,713 (18.9)</td>
</tr>
<tr>
<td>BP</td>
<td>4,370 (6.9)</td>
<td>4,404 (6.1)</td>
</tr>
<tr>
<td>DIAB</td>
<td>1,858 (2.9)</td>
<td>1,900 (2.6)</td>
</tr>
<tr>
<td>FLU</td>
<td>935 (1.5)</td>
<td>912 (1.3)</td>
</tr>
<tr>
<td>LIPI</td>
<td>7,268 (11.4)</td>
<td>7,929 (10.9)</td>
</tr>
<tr>
<td>MMR</td>
<td>446 (0.7)</td>
<td>523 (0.7)</td>
</tr>
<tr>
<td>PAP</td>
<td>4,387 (6.9)</td>
<td>4,833 (6.7)</td>
</tr>
<tr>
<td>PNEU</td>
<td>2,079 (3.3)</td>
<td>2,370 (3.3)</td>
</tr>
<tr>
<td>SMOK</td>
<td>8,908 (14.0)</td>
<td>9,407 (12.9)</td>
</tr>
<tr>
<td>TET</td>
<td>11,947 (18.8)</td>
<td>15,089 (20.8)</td>
</tr>
<tr>
<td>WT</td>
<td>10,476 (16.5)</td>
<td>11,592 (16.0)</td>
</tr>
</tbody>
</table>

Table 4: Numbers of opportunities to perform preventive activities for patients in each experimental group

As predicted, the smallest numbers of opportunities were for MMR immunisation of children under 4 years of age, with 446 opportunities in the intervention group and 523 in the control group. These numbers are well above the 225 needed in each group in order to provide 90% power to detect a 15% difference at an incidence of 50% in one group.

It is not surprising that the proportions of opportunities in the two experimental groups differ. This is because if the reminders had any significant effect, the GPs would be expected to have taken a higher proportion of the opportunities for at least some of the preventive activities. The taking of an opportunity means that there will be no further opportunities during the trial to perform that preventive activity. This reduces the total number of opportunities for the activity in the trial. The smaller proportions of opportunities to record the allergies of intervention group patients (17.3% vs. 18.9% for the control group) and to provide tetanus immunisation for patients in the intervention
group (18.8% vs. 20.8% for the control group may be a result of the GPs’ responding to the reminders for these activities.

10.3.1.1.4 Reminders displayed for each GP

The following table shows the numbers and proportions of opportunities for patients in the intervention group for which reminders were actually displayed, by each GP. As explained in the Methods chapter, the display of reminders occurred when the GPs used the ‘Start Consultation’ program, but did not occur if they used the older ‘Add Progress Note’ program.

<table>
<thead>
<tr>
<th>Doctor number</th>
<th>No. of opportunities for patients in intervention group</th>
<th>No. (%) of opportunities for which a reminder was displayed</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>6,285</td>
<td>6,221 (99%)</td>
</tr>
<tr>
<td>5</td>
<td>6,442</td>
<td>6,309 (98%)</td>
</tr>
<tr>
<td>1</td>
<td>5,780</td>
<td>5,402 (93%)</td>
</tr>
<tr>
<td>10</td>
<td>5,283</td>
<td>4,513 (85%)</td>
</tr>
<tr>
<td>8</td>
<td>8,053</td>
<td>6,848 (85%)</td>
</tr>
<tr>
<td>2</td>
<td>5,768</td>
<td>3,879 (67%)</td>
</tr>
<tr>
<td>6</td>
<td>3,485</td>
<td>2,232 (64%)</td>
</tr>
<tr>
<td>9</td>
<td>6,677</td>
<td>3,936 (59%)</td>
</tr>
<tr>
<td>7</td>
<td>5,544</td>
<td>2,829 (51%)</td>
</tr>
<tr>
<td>4</td>
<td>10,336</td>
<td>10 ( 0%)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>63,653</strong></td>
<td><strong>42,179 (66%)</strong></td>
</tr>
</tbody>
</table>

Table 5  Display of reminders for intervention group patients, by GP

Five of the GPs received reminders for 85% or more of the opportunities for intervention group patients whom they were seeing, another four of the GPs received reminders for more than 50% of the opportunities for intervention group patients whom they were seeing, and one GP appears to have not used the ‘Start Consultation’ program.
for more than perhaps two or three consultations, having received reminders for only 10 opportunities during the trial.

10.3.1.2 Patients recorded as refusing preventive activities or assessed as ineligible for them

<table>
<thead>
<tr>
<th>Activity</th>
<th>Refused: Intervention group</th>
<th>Refused: Control group</th>
<th>Ineligible: Intervention group</th>
<th>Ineligible: Control Group</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>BP</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>FLU</td>
<td>13</td>
<td>12</td>
<td>2</td>
<td>0</td>
<td>27</td>
</tr>
<tr>
<td>LIPI</td>
<td>0</td>
<td>2</td>
<td>4</td>
<td>2</td>
<td>8</td>
</tr>
<tr>
<td>PAP</td>
<td>4</td>
<td>1</td>
<td>39</td>
<td>17</td>
<td>61</td>
</tr>
<tr>
<td>PNEU</td>
<td>3</td>
<td>1</td>
<td>2</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>SMOK</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>TET</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>1</td>
<td>13</td>
</tr>
<tr>
<td>Total</td>
<td>25</td>
<td>21</td>
<td>52</td>
<td>21</td>
<td>119</td>
</tr>
</tbody>
</table>

Table 6. Patients who refused preventive activities or whom the GPs recorded as being ineligible.

One hundred and fourteen patients were recorded by the GPs as refusing or as ineligible for at least one preventive activity, with five patients recorded as refusing or as being recorded ineligible for more than one activity.

10.3.2 Study practice compared to other Australian general practices

10.3.2.1 Patient and service demographics

The percentage of services provided in the study practice to patients of various gender and age groups during the trial were compared to those provided by all Australian general practitioners (Commonwealth of Australia 2000).


**10.3.2.1.1 Female GPs**

<table>
<thead>
<tr>
<th>Item</th>
<th>Study practice</th>
<th>All practices</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>16 (14-21)</td>
<td>8 (3-22)</td>
</tr>
<tr>
<td>23</td>
<td>1,232 (940-1,374)</td>
<td>563 (275-937)</td>
</tr>
<tr>
<td>36</td>
<td>265 (240-356)</td>
<td>95 (45-171)</td>
</tr>
<tr>
<td>44</td>
<td>43 (28-53)</td>
<td>7 (2-19)</td>
</tr>
</tbody>
</table>

Figures are median (inter-quartile range)

Table 7. Numbers of services provided in the June quarter of 1998 by female GPs in the study practice compared with services provided in the June quarter of 1999 by female GPs in all Australian general practices.

The numbers of item 3, 23, 36 and 44 consultations provided by the female GPs in the study practice were double or more than those for female GPs nationally.

**10.3.2.1.2 Male GPs**

<table>
<thead>
<tr>
<th>Item</th>
<th>Study practice</th>
<th>All practices</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>31 (22-45)</td>
<td>15 (4-44)</td>
</tr>
<tr>
<td>23</td>
<td>1,583 (1,348-1,755)</td>
<td>1,114 (678-1,640)</td>
</tr>
<tr>
<td>36</td>
<td>166 (106-202)</td>
<td>90 (39-171)</td>
</tr>
<tr>
<td>44</td>
<td>22 (13-35)</td>
<td>5 (2-15)</td>
</tr>
</tbody>
</table>

Figures are median (inter-quartile range)

Table 8. Numbers of services provided in the June quarter of 1998 by male GPs in the study practice, compared with services provided in the June quarter of 1999 by male GPs in all Australian general practices.

The male GPs in the study practice provided greater numbers of item 3, 23, 36 and 44 consultations than male GPs nationally.
10.3.2.1.3 Proportions of patients seen during the 1997-1998 financial year, by age and gender

Figure 1: Proportions of female patients seen during the 1997-1998 financial year, by age group.

The proportions of female patients in each age group seen by the GPs in the study practice differed from the national pattern mainly in having higher proportions of patients aged < 1 year and aged 25-64 years, and lower proportions of patients older than 74 years.
The proportions of male patients in each age group seen by the GPs in the study practice were reasonably similar to the national figures, but with higher proportions of patients aged up to 14 years, and lower proportions of patients older than 14 years.
Figure 3: Proportions of services provided in June quarter 1999 to female patients, by age group.

The proportions of all services provided to the study practice’s female patients by age group mirrored the proportions of female patients seen by age group shown in Figure 1.
Figure 4: Proportions of services provided in June quarter 1999 to male patients, by age group.

The proportions of all services provided to the study practice’s male patients by age group differed from the national pattern mainly in higher proportions of services provided to males aged < 1 year and 25-44 years, and lower proportions provided to males aged 15-24 years and those older than 44 years.

10.3.3 Analyses for randomised trial of reminders

The tables containing the principal analyses that were used to examine the effects of the reminders in the randomised controlled trial are in Appendix C. The structure of the analyses will be analysed below using the first table in Appendix C, which is reproduced below as an example as Table 9.
<table>
<thead>
<tr>
<th>Activity = ALLE</th>
<th>No. Opportunities</th>
<th>No. (%)</th>
<th>Univariate RR (95% CI)</th>
<th>Multivariate RR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>No.</td>
<td>Taken</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Treatment Group</td>
<td>n= 24704</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control</td>
<td>13713</td>
<td>682 (5.0)</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Intervention</td>
<td>10991</td>
<td>991 (9.0)</td>
<td>1.81 (1.63,2.02) p=&lt;.0001</td>
<td>1.69 (1.55,1.86) p=&lt;.0001</td>
</tr>
<tr>
<td>Doctor Gender</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>7653</td>
<td>772 (10.1)</td>
<td>1.91 (1.72,2.11) p=&lt;.0001</td>
<td>1.16 (1.04,1.28) p=0.01</td>
</tr>
<tr>
<td>Male</td>
<td>17051</td>
<td>901 (5.3)</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Patient Gender</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>14050</td>
<td>902 (6.4)</td>
<td>0.89 (0.80,0.99) p=0.03</td>
<td>0.92 (0.84,1.01) p=0.07</td>
</tr>
<tr>
<td>Male</td>
<td>10654</td>
<td>771 (7.2)</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Patient Age at Visit</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-26</td>
<td>8318</td>
<td>626 (7.5)</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>27-48</td>
<td>8072</td>
<td>640 (7.9)</td>
<td>1.05 (0.94,1.19) p=0.39</td>
<td>1.52 (1.31,1.76) p=&lt;.0001</td>
</tr>
<tr>
<td>49-95</td>
<td>8314</td>
<td>407 (4.9)</td>
<td>0.65 (0.57,0.74) p=&lt;.0001</td>
<td>1.23 (1.04,1.44) p=0.01</td>
</tr>
<tr>
<td>Usual Doctor Consulted</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not usual GP</td>
<td>7590</td>
<td>518 (6.8)</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Usual GP</td>
<td>17114</td>
<td>1155 (6.7)</td>
<td>0.99 (0.89,1.10) p=0.83</td>
<td>0.93 (0.85,1.03) p=0.16</td>
</tr>
<tr>
<td>Consult Length</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Long</td>
<td>3887</td>
<td>362 (9.3)</td>
<td>1.48 (1.31,1.67) p=&lt;.0001</td>
<td>1.28 (1.14,1.43) p=&lt;.0001</td>
</tr>
<tr>
<td>Standard/Short</td>
<td>20817</td>
<td>1311 (6.3)</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>No. Visits Last 2 Years</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>00-4</td>
<td>9009</td>
<td>1022 (11.3)</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>05-11</td>
<td>7097</td>
<td>397 (5.6)</td>
<td>0.49 (0.44,0.55) p=&lt;.0001</td>
<td>0.74 (0.66,0.82) p=&lt;.0001</td>
</tr>
<tr>
<td>12+</td>
<td>8598</td>
<td>254 (3.0)</td>
<td>0.26 (0.23,0.30) p=&lt;.0001</td>
<td>0.53 (0.45,0.61) p=&lt;.0001</td>
</tr>
<tr>
<td>No. Opportunities at Visit</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1-2</td>
<td>7193</td>
<td>575 (8.0)</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>3-4</td>
<td>6980</td>
<td>450 (6.4)</td>
<td>0.81 (0.71,0.92) p=0.001</td>
<td>0.84 (0.73,0.97) p=0.01</td>
</tr>
<tr>
<td>5+</td>
<td>10531</td>
<td>648 (6.2)</td>
<td>0.77 (0.68,0.87) p=&lt;.0001</td>
<td>0.63 (0.54,0.73) p=&lt;.0001</td>
</tr>
</tbody>
</table>
Table 9: Analysis of whether opportunity was taken to record patient’s allergies

<table>
<thead>
<tr>
<th>Activity = ALLE</th>
<th>No. Opportunities</th>
<th>No. (%) Taken</th>
<th>Univariate RR (95% CI)</th>
<th>Multivariate RR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Opportunity Number</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>8101</td>
<td>1086 (13.4)</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>2</td>
<td>4680</td>
<td>280 (6.0)</td>
<td>0.45 (0.39,0.51)</td>
<td>0.53 (0.47,0.60)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>p=&lt;.0001</td>
<td>p=&lt;.0001</td>
</tr>
<tr>
<td>3</td>
<td>3154</td>
<td>124 (3.9)</td>
<td>0.29 (0.24,0.35)</td>
<td>0.38 (0.32,0.46)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>p=&lt;.0001</td>
<td>p=&lt;.0001</td>
</tr>
<tr>
<td>4+</td>
<td>8769</td>
<td>183 (2.1)</td>
<td>0.16 (0.13,0.18)</td>
<td>0.27 (0.23,0.32)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>p=&lt;.0001</td>
<td>p=&lt;.0001</td>
</tr>
</tbody>
</table>

No. Problems Coded at Visit

|                   | No. Problems Coded at Visit |                     |                        |                          |
|                   | 0 | 13685 | 405 (3.0) | 1.00 | 1.00 |
|                   | 1 | 8000  | 828 (10.4)| 3.50 (3.11,3.94) | 2.81 (2.49,3.18) |
|                   |   |       |   | p=<.0001 | p=<.0001 |
|                   | 2+| 3019  | 440 (14.6)| 4.92 (4.31,5.63) | 3.48 (3.02,4.02) |
|                   |   |       |   | p=<.0001 | p=<.0001 |

No. Long Term Problems

|                   | No. Long Term Problems |                     |                        |                          |
|                   | 0 | 15422 | 1172 (7.6) | 1.00 | 1.00 |
|                   | 1 | 4770  | 309 (6.5)  | 0.85 (0.75,0.97) | 1.02 (0.91,1.15) |
|                   |   |       |   | p=0.02 | p=0.69 |
|                   | 2+| 4512  | 192 (4.3)  | 0.56 (0.48,0.66) | 0.94 (0.80,1.10) |
|                   |   |       |   | p=<.0001 | p=0.43 |

Days (Years) Since Due at Practice

|                   | Days (Years) Since Due at Practice |                     |                        |                          |
|                   | 0-629 (0-1.7) | 8235 | 730 (8.9)  | 1.00 | 1.00 |
|                   | 630-2,164 (1.7-5.9) | 8235 | 461 (5.6)  | 0.63 (0.55,0.72) | 0.90 (0.80,1.01) |
|                   |   |       |   | p=<.0001 | p=0.07 |
|                   | 2,165-11,378 (5.9-31.2) | 8234 | 482 (5.9)  | 0.66 (0.58,0.75) | 0.90 (0.80,1.02) |
|                   |   |       |   | p=<.0001 | p=0.09 |

Billing Rate

|                   | Billing Rate |                     |                        |                          |
|                   | Highest fee band | 8188 | 638 (7.8)  | 1.45 (1.26,1.68) | 1.05 (0.92,1.20) |
|                   |   |       |   | p=<.0001 | p=0.44 |
|                   | Middle fee band | 11374 | 759 (6.7)  | 1.24 (1.08,1.43) | 1.13 (1.00,1.29) |
|                   |   |       |   | p=0.003 | p=0.05 |
|                   | Rebate Medicare | 5142  | 276 (5.4)  | 1.00 | 1.00 |

The first line in Table 9 shows that an opportunity to record the patient’s allergies occurred in 24,704 consultations. For this particular preventive activity the opportunity existed because the allergy field in the patient’s computer record was blank. For preventive activities which were intended to be performed more than once, such as
blood pressure screening, the opportunities existed because the interval since the most recent performance, if any, of the activity was longer than that intended by the GPs.

10.3.3.1.1 Treatment group

In 13,713 of these consultations included in Table 9 for the activity ALLE, the patient was in the control group, for whom the GPs did not receive any reminder to record the patient’s allergies. For these patients, the GPs took 682 of the opportunities to record the patient’s allergies. This represented 5.0% of those opportunities. This was taken as the reference value. For patients in the intervention group, the GPs took 991 or 9.0% of those opportunities. The univariate relative risk that the GPs would take the opportunity for patient in the intervention group, compared to those in the control group, was 1.81 and had a 95% confidence interval of 1.63-2.02 and a p value of < 0.0001.

10.3.3.1.2 Doctor gender

In 7,653 of the 24,704 consultations in which there was an opportunity to record the patient’s allergies, the GP was female. These female GPs took 772 or 10.1% of the opportunities to record the patient’s allergies, compared to the reference of 5.3% of opportunities taken by the male GPs.

10.3.3.1.3 Patient gender

The categories for patient gender are self-explanatory.
10.3.3.1.4 Patient age at visit

The categories are tertiles of the ages of the patients for all of the opportunities to perform the preventive activity that occurred during the trial. Each patient’s age was calculated for each of his or her consultations during the trial. This means that if a patient had a birthday between consultations during the trial, the preventive opportunities that arose during his or her consultations may appear in different age tertiles in the table.

10.3.3.1.5 Usual doctor consulted

As explained in the Methods section, the identity of the usual GP was calculated retrospectively as being the GP who had been seen for more than half of the number of consultations in the trial. If the patient attended only once during the trial, the GP seen for that single consultation was labelled as that patient’s usual doctor. If none of the GPs was seen by the patient for more than half of the number of the patient’s consultations during the trial, the patient was regarded as having no usual doctor: therefore the ‘not usual GP’ line includes the consultations all of patients who had no usual GP and the consultations of patients who did have a usual GP but who did not see that usual GP at that particular consultation.

10.3.3.1.6 Consult length

‘Long’ consultations are those billed as Medicare item 36 or 44, while ‘standard/short’ consultations are those billed as Medicare item 3 or 23.
10.3.3.1.7  No. Visits Last 2 Years

This number represents the number of consultations that the patient had had at the practice during the two years preceding that particular consultation, including consultations that occurred before the start of the trial and consultations that occurred during the trial before the consultation being examined.

This number could have been different for each consultation that a patient had during the trial. For example, it was possible that at a patient’s first consultation during the trial, there had been eight consultations during the two years preceding that consultation, but that at the second consultation during the trial there may have been only three consultations during the two years preceding that second consultation, and that at the third consultation during the trial there may have been five consultations during the preceding two years.

10.3.3.1.8  No. Opportunities at Visit

The number of opportunities at the visit represents the number of different preventive opportunities at the consultation. For example, if there were two opportunities at the consultation, one of them will have been for the activity ALLE (in this case) and the other could have been for any of the other ten preventive activities being studied.

10.3.3.1.9  Opportunity number

This number tells us whether this consultation represented the first, second, third or fourth and subsequent opportunity that the patient had during the trial to perform that
preventive activity. It does not include any opportunities that may have existed before the start of the trial.

10.3.3.1.10 No. Problems Coded at Visit

This number is the number of problem codes that the GP attached to the consultation to indicate health problems that had been presented or addressed during the consultation. The problems may have been acute ones such as ‘upper respiratory tract infection’ or long term ones such as ‘diabetes’.

10.3.3.1.11 No. Long Term Problems

This number reports the number of codes for long term health problems (such as hypertension) that were in the patient’s list of long term problems before the date of the consultation. If the GPs added or removed any problems from the patient’s record during the trial, this number may have differed at different consultations by the patient. The number was calculated separately for each consultation.

10.3.3.1.12 Years Since Due at Practice

This number reports the number of years since the preventive activity became due for the patient. The maximum possible number of years since due is the number of years since the patient’s first visit to the practice.
**Billing rate**

As explained in the Methods section, ‘highest fee band’ represents consultations billed with a patient co-payment of ‘gap’ or more than $5.00, ‘middle fee band’ represents consultations billed with a patient co-payment of ‘gap’ of between 1 cent and $5.00, and ‘Rebate Medicare’ represents consultations billed at the Medicare benefit level of fee.

**Multivariate analysis**

The multivariate analysis used all of the variables that were used in the univariate analyses.

**Aim 1: Primary hypothesis**

To examine whether the primary hypothesis was fulfilled, the proportions taken of opportunities for all preventive activities studied were examined.

<table>
<thead>
<tr>
<th>Treatment Group</th>
<th>No. Opportunities</th>
<th>No. (%) Taken</th>
<th>Univariate relative risk (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>72,672</td>
<td>3,248 (4.5)</td>
<td>1.00</td>
</tr>
<tr>
<td>Intervention</td>
<td>63,665</td>
<td>3,749 (5.9)</td>
<td>1.32 (1.23-1.41)</td>
</tr>
</tbody>
</table>

**Table 10  Effect of reminders on performance of preventive activities combined**

Table 10 shows that the GPs took 32% more of the preventive opportunities for patients in the intervention group than for patients in the control group. This fulfils the primary hypothesis that at least 15% more of the preventive opportunities would be taken for patients in the intervention group than for patients in the control group.
Table 11 shows the proportions of opportunities taken for each of the eleven preventive activities.
Preventive activity and patient group | No. of opportunities | No. (%) of opportunities taken | Univariate relative risk (95% CI)
--- | --- | --- | ---
Recording of allergies |  |  |
| Control | 13,713 | 682 (5.0) | 1.00
| Intervention | 10,991 | 991 (9.0) | 1.81 (1.63-2.02)**
Recording of smoking status |  |  |
| Control | 9,407 | 171 (1.8) | 1.00
| Intervention | 8,908 | 181 (2.0) | 1.12 (0.90-1.39)
Screening for hypertension |  |  |
| Control | 4,404 | 666 (15.1) | 1.00
| Intervention | 4,370 | 677 (15.5) | 1.02 (0.90-1.16)
Cervical smear test |  |  |
| Control | 4,833 | 348 (7.2) | 1.00
| Intervention | 4,387 | 343 (7.8) | 1.09 (0.91-1.29)
Recording of weight |  |  |
| Control | 11,592 | 567 (4.9) | 1.00
| Intervention | 10,476 | 654 (6.2) | 1.28 (1.13-1.44)**
Screening for diabetes |  |  |
| Control | 1,900 | 47 (2.5) | 1.00
| Intervention | 1,858 | 45 (2.4) | 0.98 (0.65-1.48)
Screening for hyperlipidaemia |  |  |
| Control | 7,929 | 215 (2.7) | 1.00
| Intervention | 7,268 | 176 (2.4) | 0.89 (0.73-1.09)
Influenza immunisation |  |  |
| Control | 912 | 248 (27.2) | 1.00
| Intervention | 935 | 245 (26.2) | 0.96 (0.78-1.18)
MMR immunisation |  |  |
| Control | 523 | 43 (8.2) | 1.00
| Intervention | 446 | 46 (10.3) | 1.25 (0.82-1.93)
Pneumococcal immunisation |  |  |
| Control | 2,370 | 39 (1.6) | 1.00
| Intervention | 2,079 | 58 (2.8) | 1.70 (1.10-2.62)*
Tetanus immunisation |  |  |
| Control | 15,089 | 222 (1.5) | 1.00
| Intervention | 11,947 | 333 (2.8) | 1.89 (1.59-2.25)**

* p < 0.05  ** p < 0.005

Table 11 Effect of reminders on performance of individual preventive activities

For patients in the intervention group compared to patients in the control group, the GPs took significantly higher proportions of opportunities for the activities ALLE, WT, PNEU and TET, insignificantly higher proportions of opportunities for the activities
SMOK, BP, PAP and MMR and insignificantly smaller proportions of opportunities for the activities DIAB, FLU and LIPI.

10.3.3.3 **Aim 2: Secondary hypotheses**

The secondary hypothesis stated that at least 15% more of the preventive opportunities would be taken without significant increase in numbers of services provided or in fees billed. Table 12 compares the numbers of services provided and the fees billed during the trial for patients in each of the experimental groups.

<table>
<thead>
<tr>
<th>Services and fees per patient during trial</th>
<th>Mean (inter-quartile range)</th>
<th>Median (inter-quartile range)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Services:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intervention</td>
<td>4.22</td>
<td>3 (1-5)</td>
</tr>
<tr>
<td>Control</td>
<td>4.29</td>
<td>3 (1-5)</td>
</tr>
<tr>
<td>Fees:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intervention</td>
<td>$128</td>
<td>$78.90 ($37.00 - $159.31)</td>
</tr>
<tr>
<td>Control</td>
<td>$129</td>
<td>$78.60 ($37.95 - $160.00)</td>
</tr>
</tbody>
</table>

**Table 12** Services and fees billed during the trial

The results in Table 12 confirm that the secondary hypothesis was fulfilled.

The mean number of services during the trial and mean fees billed during the trial was smaller for intervention group patients than for control group patients, while the medians and inter-quartile ranges of numbers of services during the trial were the same for both groups.

The mean fees billed during the trial similarly were lower for intervention group patients than for control group patients. The median fee for intervention group patients was higher for intervention group patients than for control group patients, but the inter-
quartile range of fees was lower than that for the control group. This was consistent with the lower mean fees billed.
### 10.3.4 Associations of characteristics of patients, GPs, consultations and preventive opportunities with performance of preventive activities

**10.3.4.1 Sub-hypothesis: There will be no significant difference in performance of preventive activities for male or female patients**

<table>
<thead>
<tr>
<th>Preventive activity and patient gender</th>
<th>No. of opportunities</th>
<th>No. (%) of opportunities taken</th>
<th>Multivariate relative risk (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recording of allergies</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>14,050</td>
<td>902 (6.4)</td>
<td>1.00</td>
</tr>
<tr>
<td>Male</td>
<td>10,654</td>
<td>771 (7.2)</td>
<td>1.09 (0.99-1.19)</td>
</tr>
<tr>
<td>Recording of smoking status</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>11,705</td>
<td>145 (1.2)</td>
<td>1.00</td>
</tr>
<tr>
<td>Male</td>
<td>6,610</td>
<td>207 (3.1)</td>
<td>1.85 (1.49-2.32)**</td>
</tr>
<tr>
<td>Screening for hypertension</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>5,212</td>
<td>733 (14.1)</td>
<td>1.00</td>
</tr>
<tr>
<td>Male</td>
<td>3,562</td>
<td>610 (17.1)</td>
<td>1.15 (1.04-1.27)*</td>
</tr>
<tr>
<td>Recording of weight</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>13,536</td>
<td>728 (5.4)</td>
<td>1.00</td>
</tr>
<tr>
<td>Male</td>
<td>8,532</td>
<td>493 (5.8)</td>
<td>1.27 (1.12-1.41)**</td>
</tr>
<tr>
<td>Screening for diabetes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>2,349</td>
<td>49 (2.1)</td>
<td>1.00</td>
</tr>
<tr>
<td>Male</td>
<td>1,409</td>
<td>43 (3.1)</td>
<td>1.54 (0.95-2.50)</td>
</tr>
<tr>
<td>Screening for hyperlipidaemia</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>9,560</td>
<td>210 (2.2)</td>
<td>1.00</td>
</tr>
<tr>
<td>Male</td>
<td>5,637</td>
<td>181 (3.2)</td>
<td>1.56 (1.27-1.92)**</td>
</tr>
<tr>
<td>Influenza immunisation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>1,137</td>
<td>257 (22.6)</td>
<td>1.00</td>
</tr>
<tr>
<td>Male</td>
<td>710</td>
<td>236 (33.2)</td>
<td>1.16 (1.01-1.33)*</td>
</tr>
<tr>
<td>MMR immunisation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>471</td>
<td>41 (8.7)</td>
<td>1.00</td>
</tr>
<tr>
<td>Male</td>
<td>498</td>
<td>48 (9.6)</td>
<td>1.20 (0.85-1.69)</td>
</tr>
<tr>
<td>Pneumococcal immunisation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>2,688</td>
<td>59 (2.2)</td>
<td>1.00</td>
</tr>
<tr>
<td>Male</td>
<td>1,761</td>
<td>38 (2.2)</td>
<td>0.83 (0.55-1.27)</td>
</tr>
<tr>
<td>Tetanus immunisation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>16,162</td>
<td>308 (1.9)</td>
<td>1.00</td>
</tr>
<tr>
<td>Male</td>
<td>10,874</td>
<td>247 (2.3)</td>
<td>1.27 (1.08-1.49)*</td>
</tr>
</tbody>
</table>

* p < 0.05    ** p < 0.005

Table 13: The association of performance of preventive activities with patient gender

For each preventive activity, performance for female patients was the reference.
In multivariate analysis, for male patients performance of the activities SMOK, BP, WT, LIPI, FLU and TET was significantly higher. Performance of the activities ALLE, DIAB and MMR was insignificantly higher while that of the activity PNEU was significantly lower.

The hypothesis that there would be no significant difference in performance of the preventive activities for male compared with performance for female patients was partly fulfilled.
Sub-hypothesis: The performance of preventive activities will be significantly greater for middle aged patients

<table>
<thead>
<tr>
<th>Preventive activity and patient age (years) at consultation</th>
<th>No. of opportunities</th>
<th>No. (%) of opportunities taken</th>
<th>Multivariate relative risk (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recording of allergies</td>
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<td></td>
</tr>
<tr>
<td>0-26</td>
<td>8,318</td>
<td>626 ( 7.5)</td>
<td>1.00</td>
</tr>
<tr>
<td>27-48</td>
<td>8,072</td>
<td>640 ( 7.9)</td>
<td>1.48 (1.28-1.70)**</td>
</tr>
<tr>
<td>49-95</td>
<td>8,314</td>
<td>407 ( 4.9)</td>
<td>1.23 (1.05-1.45)*</td>
</tr>
<tr>
<td>Recording of smoking status</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17-39</td>
<td>6,103</td>
<td>179 ( 2.9)</td>
<td>1.00</td>
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<tr>
<td>40-60</td>
<td>6,175</td>
<td>118 ( 1.9)</td>
<td>0.87 (0.69-1.09)</td>
</tr>
<tr>
<td>61-95</td>
<td>6,037</td>
<td>55 ( 0.9)</td>
<td>0.77 (0.56-1.07)</td>
</tr>
<tr>
<td>Screening for hypertension</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>20-37</td>
<td>2,908</td>
<td>495 (17.0)</td>
<td>1.00</td>
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<tr>
<td>38-53</td>
<td>2,959</td>
<td>546 (18.5)</td>
<td>1.21 (1.09-1.35)**</td>
</tr>
<tr>
<td>54-95</td>
<td>2,907</td>
<td>302 (10.4)</td>
<td>1.17 (1.02-1.33)*</td>
</tr>
<tr>
<td>Cervical smear test</td>
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<td></td>
</tr>
<tr>
<td>18-36</td>
<td>3,130</td>
<td>290 ( 9.3)</td>
<td>1.00</td>
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<tr>
<td>37-52</td>
<td>3,082</td>
<td>279 ( 9.1)</td>
<td>1.10 (0.94-1.28)</td>
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<tr>
<td>53-69</td>
<td>3,008</td>
<td>122 ( 4.1)</td>
<td>0.67 (0.54-0.82)**</td>
</tr>
<tr>
<td>Recording of weight</td>
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</tr>
<tr>
<td>20-39</td>
<td>7,231</td>
<td>510 ( 7.1)</td>
<td>1.00</td>
</tr>
<tr>
<td>40-58</td>
<td>7,519</td>
<td>453 ( 6.0)</td>
<td>0.89 (0.79-1.01)</td>
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<tr>
<td>59-95</td>
<td>7,318</td>
<td>258 ( 3.5)</td>
<td>0.75 (0.64-0.88)**</td>
</tr>
<tr>
<td>Screening for diabetes</td>
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</tr>
<tr>
<td>65-68</td>
<td>1,127</td>
<td>28 ( 2.5)</td>
<td>1.00</td>
</tr>
<tr>
<td>69-74</td>
<td>1,352</td>
<td>33 ( 2.4)</td>
<td>0.52 (0.21-1.26)</td>
</tr>
<tr>
<td>75-95</td>
<td>1,279</td>
<td>31 ( 2.4)</td>
<td>0.56 (0.21-1.47)</td>
</tr>
<tr>
<td>Screening for hyperlipidaemia</td>
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<td></td>
<td></td>
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<tr>
<td>20-33</td>
<td>4,940</td>
<td>74 ( 1.5)</td>
<td>1.00</td>
</tr>
<tr>
<td>34-46</td>
<td>5,255</td>
<td>145 ( 2.8)</td>
<td>1.86 (1.40-2.47)**</td>
</tr>
<tr>
<td>47-69</td>
<td>5,002</td>
<td>172 ( 3.4)</td>
<td>2.65 (2.00-3.50)**</td>
</tr>
<tr>
<td>Influenza immunisation</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>65-69</td>
<td>665</td>
<td>178 (26.8)</td>
<td>1.00</td>
</tr>
<tr>
<td>70-74</td>
<td>557</td>
<td>161 (28.9)</td>
<td>1.06 (0.89-1.25)</td>
</tr>
<tr>
<td>75-95</td>
<td>625</td>
<td>154 (24.6)</td>
<td>0.91 (0.77-1.08)</td>
</tr>
<tr>
<td>MMR immunisation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>387</td>
<td>86 (22.2)</td>
<td>1.00</td>
</tr>
<tr>
<td>2-3</td>
<td>582</td>
<td>3 (0.5)</td>
<td>0.01 (0.00-0.04)**</td>
</tr>
<tr>
<td>Pneumococcal immunisation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>65-69</td>
<td>1,618</td>
<td>40 ( 2.5)</td>
<td>1.00</td>
</tr>
<tr>
<td>70-74</td>
<td>1,315</td>
<td>34 ( 2.6)</td>
<td>1.09 (0.68-1.73)</td>
</tr>
<tr>
<td>75-95</td>
<td>1,516</td>
<td>23 ( 1.5)</td>
<td>0.69 (0.43-1.13)</td>
</tr>
<tr>
<td>Tetanus immunisation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-31</td>
<td>9,029</td>
<td>198 ( 2.2)</td>
<td>1.00</td>
</tr>
<tr>
<td>32-51</td>
<td>9,103</td>
<td>212 ( 2.3)</td>
<td>1.50 (1.21-1.87)**</td>
</tr>
<tr>
<td>52-95</td>
<td>8,904</td>
<td>145 ( 1.6)</td>
<td>1.33 (1.02-1.72)*</td>
</tr>
</tbody>
</table>

* p < 0.05   ** p < 0.005

Table 14 The association of performance of preventive activities with patient age
For each activity, performance for patients in the youngest tertile of age was the reference. The numbers of opportunities taken to perform the activity MMR for patients aged over 1 year is too small to yield statistically meaningful results.

In multivariate analysis, for patients in the middle tertiles of age for the activity, performance of the activities ALLE, BP, LIPI and TET was significantly higher, while performance of the activities PAP, FLU and PNEU was insignificantly higher and that of the activities SMOK, WT and DIAB was insignificantly lower.

For patients in the oldest tertiles of age for the activity, performance of the activities ALLE, BP, LIPI and TET was significantly higher, while performance of the activity PAP was significantly lower and that of the activities SMOK, DIAB, FLU and PNEU was insignificantly lower.

The hypothesis that performance of preventive activities would be significantly greater for middle aged patients was partly fulfilled.
### Sub-hypothesis: The performance of preventive activities will be significantly greater for patients who have had fewer consultations during the preceding two years

<table>
<thead>
<tr>
<th>Preventive activity and number of consultations during preceding two years</th>
<th>No. of opportunities</th>
<th>No. (%) of opportunities taken</th>
<th>Multivariate relative risk (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Recording of allergies</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0- 4</td>
<td>9 009</td>
<td>1 022 (11.3)</td>
<td>1.00</td>
</tr>
<tr>
<td>5-11</td>
<td>7 097</td>
<td>397 (5.6)</td>
<td>0.74 (0.66-0.83)**</td>
</tr>
<tr>
<td>12+</td>
<td>8 598</td>
<td>254 (3.0)</td>
<td>0.55 (0.47-0.63)**</td>
</tr>
<tr>
<td><strong>Recording of smoking status</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0- 4</td>
<td>2 230</td>
<td>16 (0.7)</td>
<td>1.00</td>
</tr>
<tr>
<td>5-11</td>
<td>5 911</td>
<td>108 (1.8)</td>
<td>0.85 (0.66-1.09)</td>
</tr>
<tr>
<td>12+</td>
<td>10 174</td>
<td>228 (2.2)</td>
<td>0.37 (0.25-0.55)**</td>
</tr>
<tr>
<td><strong>Screening for hypertension</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0- 4</td>
<td>4 162</td>
<td>963 (23.1)</td>
<td>1.00</td>
</tr>
<tr>
<td>5-11</td>
<td>2 170</td>
<td>255 (11.8)</td>
<td>0.72 (0.63-0.83)**</td>
</tr>
<tr>
<td>12+</td>
<td>2 442</td>
<td>125 (5.1)</td>
<td>0.45 (0.37-0.54)**</td>
</tr>
<tr>
<td><strong>Cervical smear test</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0- 4</td>
<td>2 854</td>
<td>361 (12.6)</td>
<td>1.00</td>
</tr>
<tr>
<td>5-11</td>
<td>2 304</td>
<td>204 (8.9)</td>
<td>1.14 (0.96-1.35)</td>
</tr>
<tr>
<td>12+</td>
<td>4 062</td>
<td>126 (3.1)</td>
<td>0.67 (0.53-0.86)**</td>
</tr>
<tr>
<td><strong>Recording of weight</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0- 4</td>
<td>6 615</td>
<td>569 (8.6)</td>
<td>1.00</td>
</tr>
<tr>
<td>5-11</td>
<td>6 285</td>
<td>354 (5.6)</td>
<td>0.81 (0.71-0.93)**</td>
</tr>
<tr>
<td>12+</td>
<td>9 168</td>
<td>298 (3.3)</td>
<td>0.53 (0.45-0.63)**</td>
</tr>
<tr>
<td><strong>Screening for diabetes</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0- 4</td>
<td>773</td>
<td>29 (3.8)</td>
<td>1.00</td>
</tr>
<tr>
<td>5-11</td>
<td>983</td>
<td>23 (2.3)</td>
<td>0.62 (0.35-1.09)</td>
</tr>
<tr>
<td>12+</td>
<td>2 002</td>
<td>40 (2.0)</td>
<td>0.56 (0.29-1.09)</td>
</tr>
<tr>
<td><strong>Screening for hyperlipidaemia</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0- 4</td>
<td>5 924</td>
<td>185 (3.1)</td>
<td>1.00</td>
</tr>
<tr>
<td>5-11</td>
<td>4 509</td>
<td>116 (2.6)</td>
<td>0.85 (0.67-1.08)</td>
</tr>
<tr>
<td>12+</td>
<td>4 764</td>
<td>90 (1.9)</td>
<td>0.68 (0.50-0.92)*</td>
</tr>
<tr>
<td><strong>Influenza immunisation</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0- 4</td>
<td>356</td>
<td>88 (24.7)</td>
<td>1.00</td>
</tr>
<tr>
<td>5-11</td>
<td>493</td>
<td>143 (29.0)</td>
<td>1.04 (0.83-1.30)</td>
</tr>
<tr>
<td>12+</td>
<td>998</td>
<td>262 (26.3)</td>
<td>1.03 (0.83-1.29)</td>
</tr>
<tr>
<td><strong>MMR immunisation</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0- 4</td>
<td>353</td>
<td>21 (5.9)</td>
<td>1.00</td>
</tr>
<tr>
<td>5-11</td>
<td>328</td>
<td>39 (11.9)</td>
<td>1.13 (0.73-1.74)</td>
</tr>
<tr>
<td>12+</td>
<td>288</td>
<td>29 (10.1)</td>
<td>1.25 (0.74-2.13)</td>
</tr>
<tr>
<td><strong>Pneumococcal immunisation</strong></td>
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<td></td>
<td></td>
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<tr>
<td>0- 4</td>
<td>825</td>
<td>22 (2.7)</td>
<td>1.00</td>
</tr>
<tr>
<td>5-11</td>
<td>1 132</td>
<td>29 (2.6)</td>
<td>1.18 (0.69-2.03)</td>
</tr>
<tr>
<td>12+</td>
<td>2 492</td>
<td>46 (1.8)</td>
<td>1.29 (0.77-2.16)</td>
</tr>
<tr>
<td><strong>Tetanus immunisation</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0- 4</td>
<td>8 939</td>
<td>273 (3.1)</td>
<td>1.00</td>
</tr>
<tr>
<td>5-11</td>
<td>7 492</td>
<td>168 (2.2)</td>
<td>0.98 (0.80-1.20)</td>
</tr>
<tr>
<td>12+</td>
<td>10 605</td>
<td>114 (1.1)</td>
<td>0.63 (0.49-0.82)**</td>
</tr>
</tbody>
</table>

* p < 0.05  ** p < 0.005

Table 15: The association of performance of preventive activities with the patient’s number of consultations during the preceding two years

205
For each activity, performance for patients who had had 0-4 consultations during the preceding two years was the reference.

In multivariate analysis, for patients who had had 5-11 consultations during the preceding two years, performance was significantly lower for the activities ALLE, BP and WT, insignificantly higher for the activities PAP, FLU, MMR and PNEU and insignificantly lower for the activities SMOK, DIAB, LIPI and TET.

For patients who had had more than 11 consultations during the preceding two years, performance was significantly lower for the activities ALLE, SMOK, BP, PAP, WT, LIPI and TET, insignificantly higher for the activities FLU, MMR and PNEU and insignificantly lower for the activity DIAB.

The hypothesis that performance would be significantly higher for patients who had had fewer consultations during the preceding two years was fulfilled for some of the activities, but the reverse trend was seen for the activities FLU, MMR and PNEU.
10.3.4.4 **Sub-hypothesis:** The performance of preventive activities will be significantly greater for patients for whom more long term health problems have been recorded.

<table>
<thead>
<tr>
<th>Preventive activity and patient’s number of long term health problems</th>
<th>No. of opportunities</th>
<th>No. (%) of opportunities taken</th>
<th>Multivariate relative risk (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recording of allergies</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>15,422</td>
<td>1,172 (7.6)</td>
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<tr>
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<td>4,770</td>
<td>309 (6.5)</td>
<td>0.97 (0.86-1.09)</td>
</tr>
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<td>4,512</td>
<td>192 (4.3)</td>
<td>0.87 (0.75-1.02)</td>
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<tr>
<td>Recording of smoking status</td>
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<td>0</td>
<td>10,281</td>
<td>238 (2.3)</td>
<td>1.00</td>
</tr>
<tr>
<td>1</td>
<td>3,344</td>
<td>62 (1.9)</td>
<td>1.26 (0.95-1.66)</td>
</tr>
<tr>
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<td>4,690</td>
<td>52 (1.1)</td>
<td>1.33 (0.97-1.81)</td>
</tr>
<tr>
<td>Screening for hypertension</td>
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<td></td>
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</tr>
<tr>
<td>0</td>
<td>6,293</td>
<td>911 (14.5)</td>
<td>1.00</td>
</tr>
<tr>
<td>1</td>
<td>1,396</td>
<td>261 (18.7)</td>
<td>1.34 (1.18-1.52)**</td>
</tr>
<tr>
<td>2+</td>
<td>1,085</td>
<td>171 (15.8)</td>
<td>1.40 (1.20-1.62)**</td>
</tr>
<tr>
<td>Cervical smear test</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>4,193</td>
<td>377 (9.0)</td>
<td>1.00</td>
</tr>
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<td>1,975</td>
<td>186 (9.4)</td>
<td>1.27 (1.07-1.51)*</td>
</tr>
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<td>3,052</td>
<td>128 (4.2)</td>
<td>0.96 (0.78-1.18)</td>
</tr>
<tr>
<td>Recording of weight</td>
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<td>1.00</td>
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<tr>
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<td>4,785</td>
<td>334 (7.0)</td>
<td>1.32 (1.15-1.52)**</td>
</tr>
<tr>
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<td>5,726</td>
<td>313 (5.5)</td>
<td>1.35 (1.17-1.57)**</td>
</tr>
<tr>
<td>Screening for diabetes</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>2,105</td>
<td>50 (2.4)</td>
<td>1.00</td>
</tr>
<tr>
<td>1</td>
<td>493</td>
<td>15 (3.0)</td>
<td>1.03 (0.57-1.88)</td>
</tr>
<tr>
<td>2+</td>
<td>1,160</td>
<td>27 (2.3)</td>
<td>0.83 (0.43-1.58)</td>
</tr>
<tr>
<td>Screening for hyperlipidaemia</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>8,344</td>
<td>227 (2.7)</td>
<td>1.00</td>
</tr>
<tr>
<td>1</td>
<td>3,620</td>
<td>93 (2.6)</td>
<td>0.94 (0.73-1.22)</td>
</tr>
<tr>
<td>2+</td>
<td>3,233</td>
<td>71 (2.2)</td>
<td>0.84 (0.61-1.14)</td>
</tr>
<tr>
<td>Influenza immunisation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>973</td>
<td>182 (18.7)</td>
<td>1.00</td>
</tr>
<tr>
<td>1</td>
<td>293</td>
<td>102 (34.8)</td>
<td>1.29 (1.06-1.57)*</td>
</tr>
<tr>
<td>2+</td>
<td>581</td>
<td>209 (36.0)</td>
<td>1.36 (1.15-1.62)**</td>
</tr>
<tr>
<td>MMR immunisation</td>
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<td></td>
</tr>
<tr>
<td>0</td>
<td>805</td>
<td>72 (8.9)</td>
<td>1.00</td>
</tr>
<tr>
<td>1</td>
<td>129</td>
<td>16 (12.4)</td>
<td>1.27 (0.82-1.98)</td>
</tr>
<tr>
<td>2+</td>
<td>35</td>
<td>1 (2.9)</td>
<td>0.54 (0.07-4.06)</td>
</tr>
<tr>
<td>Pneumococcal immunisation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>2,320</td>
<td>35 (1.5)</td>
<td>1.00</td>
</tr>
<tr>
<td>1</td>
<td>659</td>
<td>21 (3.2)</td>
<td>1.64 (0.95-2.85)</td>
</tr>
<tr>
<td>2+</td>
<td>1,470</td>
<td>41 (2.8)</td>
<td>1.49 (0.92-2.43)</td>
</tr>
<tr>
<td>Tetanus immunization</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>14,499</td>
<td>335 (2.3)</td>
<td>1.00</td>
</tr>
<tr>
<td>1</td>
<td>5,646</td>
<td>119 (2.1)</td>
<td>1.00 (0.80-1.24)</td>
</tr>
<tr>
<td>2+</td>
<td>6,891</td>
<td>101 (1.5)</td>
<td>0.87 (0.68-1.12)</td>
</tr>
</tbody>
</table>

* p < 0.05   ** p < 0.005

Table 16: The association of performance of preventive activities with the patient’s number of long term problems
Patients with no long term problems recorded before the date of the consultation were
the reference.

In multivariate analysis, for patients with one long term problem recorded before the
date of the consultation, performance was significantly higher for the activities BP,
PAP, WT and FLU, insignificantly higher for the activities SMOK, DIAB, MMR and
PNEU, the same as the reference for the activity TET and insignificantly lower for the
activities ALLE and LIPI.

For patients with more than 1 long term problem recorded before the date of the
consultation, performance was significantly higher for the activities BP, WT and FLU,
insignificantly higher for the activities SMOK and PNEU and insignificantly lower for
the activities ALLE, PAP, DIAB, LIPI, MMR and TET.

The hypothesis that performance would be higher for patients who had more long term
problems recorded was partly fulfilled, and there were also some insignificant trends in
the opposite direction.
### Table 17: The association of performance of preventive activities with the GP's gender

<table>
<thead>
<tr>
<th>Preventive activity and GP’s gender</th>
<th>No. of opportunities</th>
<th>No. (%) of opportunities taken</th>
<th>Multivariate relative risk (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recording of allergies</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female GP</td>
<td>7,653</td>
<td>772 (10.1)</td>
<td>1.13 (1.01-1.25)*</td>
</tr>
<tr>
<td>Male GP</td>
<td>17,051</td>
<td>901 (5.3)</td>
<td>1.00</td>
</tr>
<tr>
<td>Recording of smoking status</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female GP</td>
<td>6,563</td>
<td>96 (1.5)</td>
<td>0.64 (0.50-0.81)**</td>
</tr>
<tr>
<td>Male GP</td>
<td>11,752</td>
<td>256 (2.2)</td>
<td>1.00</td>
</tr>
<tr>
<td>Screening for hypertension</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female GP</td>
<td>2,981</td>
<td>557 (18.7)</td>
<td>1.19 (1.07-1.33)**</td>
</tr>
<tr>
<td>Male GP</td>
<td>5,793</td>
<td>786 (13.6)</td>
<td>1.00</td>
</tr>
<tr>
<td>Cervical smear test</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female GP</td>
<td>3,878</td>
<td>494 (12.7)</td>
<td>3.17 (2.68-3.74)**</td>
</tr>
<tr>
<td>Male GP</td>
<td>5,342</td>
<td>197 (3.7)</td>
<td>1.00</td>
</tr>
<tr>
<td>Recording of weight</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female GP</td>
<td>7,239</td>
<td>657 (9.1)</td>
<td>1.59 (1.39-1.82)**</td>
</tr>
<tr>
<td>Male GP</td>
<td>14,829</td>
<td>564 (3.8)</td>
<td>1.00</td>
</tr>
<tr>
<td>Screening for diabetes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female GP</td>
<td>1,369</td>
<td>39 (2.8)</td>
<td>1.61 (0.99-2.61)</td>
</tr>
<tr>
<td>Male GP</td>
<td>2,389</td>
<td>53 (2.2)</td>
<td>1.00</td>
</tr>
<tr>
<td>Screening for hyperlipidaemia</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female GP</td>
<td>5,060</td>
<td>144 (2.8)</td>
<td>1.13 (0.89-1.43)</td>
</tr>
<tr>
<td>Male GP</td>
<td>10,137</td>
<td>247 (2.4)</td>
<td>1.00</td>
</tr>
<tr>
<td>Influenza immunisation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female GP</td>
<td>733</td>
<td>198 (27.0)</td>
<td>1.02 (0.86-1.22)</td>
</tr>
<tr>
<td>Male GP</td>
<td>1,114</td>
<td>295 (26.5)</td>
<td>1.00</td>
</tr>
<tr>
<td>MMR immunisation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female GP</td>
<td>290</td>
<td>47 (16.2)</td>
<td>1.39 (0.96-2.01)</td>
</tr>
<tr>
<td>Male GP</td>
<td>679</td>
<td>42 (6.2)</td>
<td>1.00</td>
</tr>
<tr>
<td>Pneumococcal immunisation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female GP</td>
<td>1,438</td>
<td>42 (2.9)</td>
<td>1.36 (0.82-2.26)</td>
</tr>
<tr>
<td>Male GP</td>
<td>3,011</td>
<td>55 (1.8)</td>
<td>1.00</td>
</tr>
<tr>
<td>Tetanus immunisation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female GP</td>
<td>8,256</td>
<td>273 (3.3)</td>
<td>1.78 (1.46-2.17)**</td>
</tr>
<tr>
<td>Male GP</td>
<td>18,780</td>
<td>282 (1.5)</td>
<td>1.00</td>
</tr>
</tbody>
</table>

* p < 0.05  ** p < 0.005

For each activity, the performance of the male GPs was the reference.
In multivariate analysis, the performance of the female GPs was significantly higher for the activities ALLE, BP, PAP, WT and TET, insignificantly higher for the activities DIAB, LIPI, FLU, MMR and PNEU, and significantly lower for the activity SMOK.

The hypothesis that the performance of female GPs would be significantly higher was partly fulfilled.
### Sub-hypothesis: Performance of preventive activities will be significantly greater when the patient is seeing his or her usual GP within the practice

<table>
<thead>
<tr>
<th>Preventive activity and whether usual GP</th>
<th>No. of opportunities</th>
<th>No. (%) of opportunities taken</th>
<th>Multivariate relative risk (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recording of allergies</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not usual GP</td>
<td>7,590</td>
<td>518 (6.8)</td>
<td>1.00</td>
</tr>
<tr>
<td>Usual GP</td>
<td>17,114</td>
<td>1,155 (6.7)</td>
<td>0.93 (0.85-1.03)</td>
</tr>
<tr>
<td>Recording of smoking status</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not usual GP</td>
<td>4,433</td>
<td>100 (2.3)</td>
<td>1.00</td>
</tr>
<tr>
<td>Usual GP</td>
<td>13,882</td>
<td>252 (1.8)</td>
<td>0.78 (0.63-0.98)*</td>
</tr>
<tr>
<td>Screening for hypertension</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not usual GP</td>
<td>2,248</td>
<td>314 (14.0)</td>
<td>1.00</td>
</tr>
<tr>
<td>Usual GP</td>
<td>6,526</td>
<td>1,029 (15.8)</td>
<td>1.03 (0.92-1.15)</td>
</tr>
<tr>
<td>Cervical smear test</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not usual GP</td>
<td>2,666</td>
<td>159 (6.0)</td>
<td>1.00</td>
</tr>
<tr>
<td>Usual GP</td>
<td>6,554</td>
<td>532 (8.1)</td>
<td>1.10 (0.93-1.30)</td>
</tr>
<tr>
<td>Recording of weight</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not usual GP</td>
<td>5,887</td>
<td>310 (5.3)</td>
<td>1.00</td>
</tr>
<tr>
<td>Usual GP</td>
<td>16,181</td>
<td>911 (5.6)</td>
<td>0.98 (0.86-1.11)</td>
</tr>
<tr>
<td>Screening for diabetes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not usual GP</td>
<td>628</td>
<td>23 (3.7)</td>
<td>1.00</td>
</tr>
<tr>
<td>Usual GP</td>
<td>3,130</td>
<td>69 (2.2)</td>
<td>0.63 (0.39-1.00)</td>
</tr>
<tr>
<td>Screening for hyperlipidaemia</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not usual GP</td>
<td>4,604</td>
<td>81 (1.8)</td>
<td>1.00</td>
</tr>
<tr>
<td>Usual GP</td>
<td>10,593</td>
<td>310 (2.9)</td>
<td>1.44 (1.13-1.84)**</td>
</tr>
<tr>
<td>Influenza immunisation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not usual GP</td>
<td>316</td>
<td>93 (29.4)</td>
<td>1.00</td>
</tr>
<tr>
<td>Usual GP</td>
<td>1,531</td>
<td>400 (26.1)</td>
<td>0.95 (0.79-1.13)</td>
</tr>
<tr>
<td>MMR immunization</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not usual GP</td>
<td>448</td>
<td>33 (7.4)</td>
<td>1.00</td>
</tr>
<tr>
<td>Usual GP</td>
<td>521</td>
<td>56 (10.7)</td>
<td>1.27 (0.86-1.87)</td>
</tr>
<tr>
<td>Pneumococcal immunisation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not usual GP</td>
<td>718</td>
<td>15 (2.1)</td>
<td>1.00</td>
</tr>
<tr>
<td>Usual GP</td>
<td>3,731</td>
<td>82 (2.2)</td>
<td>1.15 (0.66-1.99)</td>
</tr>
<tr>
<td>Tetanus immunisation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not usual GP</td>
<td>8,069</td>
<td>155 (1.9)</td>
<td>1.00</td>
</tr>
<tr>
<td>Usual GP</td>
<td>18,967</td>
<td>400 (2.1)</td>
<td>1.03 (0.85-1.24)</td>
</tr>
</tbody>
</table>

* p < 0.05  ** p < 0.005

Table 18 The association of performance of preventive activities with whether the GP is the patient's usual GP within the practice

For each activity, performance when the patient was seeing a GP who was not his or her usual GP in the practice was the reference.
In multivariate analysis, when patients were seeing their usual GP within the practice, performance was significantly higher for the activity LIPI, insignificantly higher for the activities BP, PAP, MMR, PNEU and TET, significantly lower for the activity SMOK, and insignificantly lower for the activities ALLE, WT, DIAB and FLU.

The hypothesis that performance would be higher when patients were seeing their usual GP within the practice was partly fulfilled, and there was also an insignificant trend for the reverse.
### 10.3.4.7 Sub-hypothesis: Performance of preventive activities will be significantly higher in longer consultations

<table>
<thead>
<tr>
<th>Preventive activity and consultation length†</th>
<th>No. of opportunities</th>
<th>No. (%) of opportunities taken</th>
<th>Multivariate relative risk (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Recording of allergies</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shorter</td>
<td>20,817</td>
<td>1,311 (6.3)</td>
<td>1.00</td>
</tr>
<tr>
<td>Longer</td>
<td>3,887</td>
<td>362 (9.3)</td>
<td>1.23 (1.10-1.38)**</td>
</tr>
<tr>
<td><strong>Recording of smoking status</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shorter</td>
<td>14,913</td>
<td>276 (1.9)</td>
<td>1.00</td>
</tr>
<tr>
<td>Longer</td>
<td>3,402</td>
<td>76 (2.2)</td>
<td>1.46 (1.14-1.87)**</td>
</tr>
<tr>
<td><strong>Screening for hypertension</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shorter</td>
<td>7,244</td>
<td>926 (12.8)</td>
<td>1.00</td>
</tr>
<tr>
<td>Longer</td>
<td>1,530</td>
<td>417 (27.3)</td>
<td>1.71 (1.54-1.90)**</td>
</tr>
<tr>
<td><strong>Cervical smear test</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shorter</td>
<td>6,997</td>
<td>371 (5.3)</td>
<td>1.00</td>
</tr>
<tr>
<td>Longer</td>
<td>2,223</td>
<td>320 (14.4)</td>
<td>1.77 (1.52-2.05)**</td>
</tr>
<tr>
<td><strong>Recording of weight</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shorter</td>
<td>18,145</td>
<td>749 (4.1)</td>
<td>1.00</td>
</tr>
<tr>
<td>Longer</td>
<td>3,923</td>
<td>472 (12.0)</td>
<td>2.35 (2.09-2.63)**</td>
</tr>
<tr>
<td><strong>Screening for diabetes</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shorter</td>
<td>3,296</td>
<td>67 (2.0)</td>
<td>1.00</td>
</tr>
<tr>
<td>Longer</td>
<td>462</td>
<td>25 (5.4)</td>
<td>2.63 (1.61-4.29)**</td>
</tr>
<tr>
<td><strong>Screening for hyperlipidaemia</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shorter</td>
<td>12,476</td>
<td>252 (2.0)</td>
<td>1.00</td>
</tr>
<tr>
<td>Longer</td>
<td>2,721</td>
<td>139 (5.1)</td>
<td>2.82 (2.27-3.50)**</td>
</tr>
<tr>
<td><strong>Influenza immunisation</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shorter</td>
<td>1,576</td>
<td>436 (27.7)</td>
<td>1.00</td>
</tr>
<tr>
<td>Longer</td>
<td>271</td>
<td>57 (21.0)</td>
<td>0.68 (0.53-0.87)**</td>
</tr>
<tr>
<td><strong>MMR immunisation</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shorter</td>
<td>942</td>
<td>88 (9.3)</td>
<td>1.00</td>
</tr>
<tr>
<td>Longer</td>
<td>27</td>
<td>1 (3.7)</td>
<td>0.40 (0.05-3.00)</td>
</tr>
<tr>
<td><strong>Pneumococcal immunisation</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shorter</td>
<td>3,850</td>
<td>82 (2.1)</td>
<td>1.00</td>
</tr>
<tr>
<td>Longer</td>
<td>599</td>
<td>15 (2.5)</td>
<td>0.74 (0.44-1.26)</td>
</tr>
<tr>
<td><strong>Tetanus immunisation</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shorter</td>
<td>22,528</td>
<td>442 (2.0)</td>
<td>1.00</td>
</tr>
<tr>
<td>Longer</td>
<td>4,508</td>
<td>113 (2.5)</td>
<td>0.91 (0.74-1.12)</td>
</tr>
</tbody>
</table>

* p < 0.05  ** p < 0.005
†Shorter = Medicare item 3 or 23 (less than 20 minutes); Longer = Medicare item 36 or 44 (20 minutes or longer)

Table 19 The association of performance of preventive activities with length of consultation

For each activity, performance at shorter consultations (billed as Medicare item 3 or 23) was the reference.
In multivariate analysis, in longer consultations (billed as Medicare item 36 or 44), performance was significantly higher for all non-immunisation activities, significantly lower for the activity FLU and insignificantly lower for the other immunisations.

The hypothesis that performance would be significantly higher in longer consultations was fulfilled for all non-immunisation activities, with the reverse being true for the activity FLU and a insignificant reverse trend for the other immunisations.
### 10.3.4.8 Sub-hypothesis: Performance of preventive care will be significantly greater when higher levels of fees are billed

<table>
<thead>
<tr>
<th>Preventive activity and patient co-payment billed</th>
<th>No. of opportunities</th>
<th>No. (%) of opportunities taken</th>
<th>Multivariate relative risk (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recording of allergies</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nil</td>
<td>5,142</td>
<td>276 (5.4)</td>
<td>1.00</td>
</tr>
<tr>
<td>Nil - $5.00</td>
<td>11,374</td>
<td>759 (6.7)</td>
<td>1.12 (0.99-1.27)</td>
</tr>
<tr>
<td>&gt; $5.00</td>
<td>8,188</td>
<td>638 (7.8)</td>
<td>1.00 (0.88-1.14)</td>
</tr>
<tr>
<td>Recording of smoking status</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nil</td>
<td>3,981</td>
<td>35 (0.9)</td>
<td>1.00</td>
</tr>
<tr>
<td>Nil - $5.00</td>
<td>8,843</td>
<td>134 (1.5)</td>
<td>1.42 (0.98-2.05)</td>
</tr>
<tr>
<td>&gt; $5.00</td>
<td>5,491</td>
<td>183 (3.3)</td>
<td>1.91 (1.32-2.77)**</td>
</tr>
<tr>
<td>Screening for hypertension</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nil</td>
<td>1,386</td>
<td>124 (8.9)</td>
<td>1.00</td>
</tr>
<tr>
<td>Nil - $5.00</td>
<td>4,046</td>
<td>542 (13.4)</td>
<td>1.41 (1.18-1.67)**</td>
</tr>
<tr>
<td>&gt; $5.00</td>
<td>3,342</td>
<td>677 (20.3)</td>
<td>1.68 (1.41-2.00)**</td>
</tr>
<tr>
<td>Cervical smear test</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nil</td>
<td>1,562</td>
<td>70 (4.5)</td>
<td>1.00</td>
</tr>
<tr>
<td>Nil - $5.00</td>
<td>4,404</td>
<td>305 (6.9)</td>
<td>1.43 (1.13-1.82)**</td>
</tr>
<tr>
<td>&gt; $5.00</td>
<td>3,254</td>
<td>316 (9.7)</td>
<td>1.59 (1.25-2.03)**</td>
</tr>
<tr>
<td>Recording of weight</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nil</td>
<td>4,074</td>
<td>151 (3.1)</td>
<td>1.00</td>
</tr>
<tr>
<td>Nil - $5.00</td>
<td>10,497</td>
<td>565 (5.4)</td>
<td>1.41 (1.18-1.67)**</td>
</tr>
<tr>
<td>&gt; $5.00</td>
<td>7,497</td>
<td>505 (6.7)</td>
<td>1.42 (1.19-1.71)**</td>
</tr>
<tr>
<td>Screening for diabetes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nil</td>
<td>875</td>
<td>19 (2.2)</td>
<td>1.00</td>
</tr>
<tr>
<td>Nil - $5.00</td>
<td>2,654</td>
<td>68 (2.6)</td>
<td>1.11 (0.66-1.85)</td>
</tr>
<tr>
<td>&gt; $5.00</td>
<td>229</td>
<td>5 (2.2)</td>
<td>0.70 (0.24-2.07)</td>
</tr>
<tr>
<td>Screening for hyperlipidaemia</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nil</td>
<td>2,257</td>
<td>84 (3.7)</td>
<td>1.00</td>
</tr>
<tr>
<td>Nil - $5.00</td>
<td>6,584</td>
<td>139 (2.1)</td>
<td>0.57 (0.44-0.75)**</td>
</tr>
<tr>
<td>&gt; $5.00</td>
<td>6,356</td>
<td>168 (2.6)</td>
<td>0.75 (0.58-0.98)*</td>
</tr>
<tr>
<td>Influenza immunisation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nil</td>
<td>656</td>
<td>223 (34.0)</td>
<td>1.00</td>
</tr>
<tr>
<td>Nil - $5.00</td>
<td>1,102</td>
<td>249 (22.6)</td>
<td>0.60 (0.52-0.70)**</td>
</tr>
<tr>
<td>&gt; $5.00</td>
<td>89</td>
<td>21 (23.6)</td>
<td>0.53 (0.37-0.76)**</td>
</tr>
<tr>
<td>MMR immunisation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nil</td>
<td>234</td>
<td>31 (13.2)</td>
<td>1.00</td>
</tr>
<tr>
<td>Nil - $5.00</td>
<td>453</td>
<td>31 (6.8)</td>
<td>0.63 (0.44-0.92)*</td>
</tr>
<tr>
<td>&gt; $5.00</td>
<td>282</td>
<td>27 (9.6)</td>
<td>0.66 (0.43-1.00)</td>
</tr>
<tr>
<td>Pneumococcal immunisation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nil</td>
<td>1,017</td>
<td>21 (2.1)</td>
<td>1.00</td>
</tr>
<tr>
<td>Nil - $5.00</td>
<td>3,196</td>
<td>73 (2.3)</td>
<td>1.15 (0.72-1.83)</td>
</tr>
<tr>
<td>&gt; $5.00</td>
<td>236</td>
<td>3 (1.3)</td>
<td>0.48 (0.14-1.63)</td>
</tr>
<tr>
<td>Tetanus immunisation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nil</td>
<td>5,122</td>
<td>100 (2.0)</td>
<td>1.00</td>
</tr>
<tr>
<td>Nil - $5.00</td>
<td>12,935</td>
<td>244 (1.9)</td>
<td>0.96 (0.77-1.21)</td>
</tr>
<tr>
<td>&gt; $5.00</td>
<td>8,979</td>
<td>211 (2.3)</td>
<td>0.95 (0.74-1.21)</td>
</tr>
</tbody>
</table>

* p < 0.05  ** p < 0.005

Table 20 The association of performance of preventive activities with patient co-payment
For each activity, performance at consultations for which the Medicare benefit was billed was the reference.

In multivariate analysis, when the patient co-payment was more than nil and less than $5.00, performance was significantly higher for the activities BP, PAP and WT, insignificantly higher for the activities ALLE, SMOK, DIAB and PNEU, significantly lower for the activities LIPI and MMR and insignificantly lower for the activity TET.

When the patient co-payment was $5.00 or more, performance was significantly higher for the activities SMOK, BP, PAP, WT and FLU, the same as the reference for the activity ALLE, significantly lower for the activity LIPI and insignificantly lower for the activities DIAB, MMR, PNEU and TET.

The hypothesis that performance would be significantly higher when patient-co-payments were higher was partly fulfilled, with significant reverse results for the activities LIPI and MMR and an insignificant reverse trend for some activities.
### 10.3.4.9 Sub-hypothesis: Performance of preventive activities will be significantly lower when more problems are coded at the consultation

<table>
<thead>
<tr>
<th>Preventive activity and number of problems coded at consultation</th>
<th>No. of opportunities</th>
<th>No. (%) of opportunities taken</th>
<th>Multivariate relative risk (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Recording of allergies</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>13 685</td>
<td>405 (3.0)</td>
<td>1.00</td>
</tr>
<tr>
<td>1</td>
<td>8 000</td>
<td>828 (10.4)</td>
<td>2.76 (2.43-3.12)**</td>
</tr>
<tr>
<td>2+</td>
<td>3 019</td>
<td>440 (14.6)</td>
<td>3.43 (2.97-3.97)**</td>
</tr>
<tr>
<td><strong>Recording of smoking status</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>10 722</td>
<td>128 (1.2)</td>
<td>1.00</td>
</tr>
<tr>
<td>1</td>
<td>4 884</td>
<td>163 (3.3)</td>
<td>2.46 (1.96-3.09)**</td>
</tr>
<tr>
<td>2+</td>
<td>2 709</td>
<td>61 (2.3)</td>
<td>2.31 (1.72-3.11)**</td>
</tr>
<tr>
<td><strong>Screening for hypertension</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>4 507</td>
<td>592 (13.1)</td>
<td>1.00</td>
</tr>
<tr>
<td>1</td>
<td>3 129</td>
<td>451 (14.4)</td>
<td>0.93 (0.83-1.04)</td>
</tr>
<tr>
<td>2+</td>
<td>1 138</td>
<td>300 (26.4)</td>
<td>1.33 (1.17-1.51)**</td>
</tr>
<tr>
<td><strong>Cervical smear test</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>4 583</td>
<td>329 (7.2)</td>
<td>1.00</td>
</tr>
<tr>
<td>1</td>
<td>3 119</td>
<td>127 (4.1)</td>
<td>0.39 (0.32-0.47)**</td>
</tr>
<tr>
<td>2+</td>
<td>1 138</td>
<td>335 (15.5)</td>
<td>0.85 (0.72-1.00)</td>
</tr>
<tr>
<td><strong>Recording of weight</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>12 502</td>
<td>439 (3.5)</td>
<td>1.00</td>
</tr>
<tr>
<td>1</td>
<td>6 634</td>
<td>423 (6.4)</td>
<td>1.43 (1.24-1.65)**</td>
</tr>
<tr>
<td>2+</td>
<td>2 932</td>
<td>359 (12.2)</td>
<td>1.78 (1.52-2.10)**</td>
</tr>
<tr>
<td><strong>Screening for diabetes</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>2 163</td>
<td>53 (2.5)</td>
<td>1.00</td>
</tr>
<tr>
<td>1</td>
<td>1 085</td>
<td>25 (2.3)</td>
<td>0.97 (0.59-1.58)</td>
</tr>
<tr>
<td>2+</td>
<td>510</td>
<td>14 (2.7)</td>
<td>0.97 (0.51-1.83)</td>
</tr>
<tr>
<td><strong>Screening for hyperlipidaemia</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>7 938</td>
<td>219 (2.8)</td>
<td>1.00</td>
</tr>
<tr>
<td>1</td>
<td>5 264</td>
<td>106 (2.0)</td>
<td>0.74 (0.58-0.94)*</td>
</tr>
<tr>
<td>2+</td>
<td>1 995</td>
<td>66 (3.3)</td>
<td>0.89 (0.66-1.19)</td>
</tr>
<tr>
<td><strong>Influenza immunisation</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>924</td>
<td>231 (25.0)</td>
<td>1.00</td>
</tr>
<tr>
<td>1</td>
<td>569</td>
<td>140 (24.6)</td>
<td>0.98 (0.82-1.16)</td>
</tr>
<tr>
<td>2+</td>
<td>354</td>
<td>122 (34.5)</td>
<td>1.12 (0.91-1.38)</td>
</tr>
<tr>
<td><strong>MMR immunisation</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>462</td>
<td>40 (8.7)</td>
<td>1.00</td>
</tr>
<tr>
<td>1</td>
<td>416</td>
<td>33 (7.9)</td>
<td>0.76 (0.52-1.11)</td>
</tr>
<tr>
<td>2+</td>
<td>91</td>
<td>16 (17.6)</td>
<td>1.09 (0.65-1.82)</td>
</tr>
<tr>
<td><strong>Pneumococcal immunisation</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>2 643</td>
<td>46 (1.7)</td>
<td>1.00</td>
</tr>
<tr>
<td>1</td>
<td>1 219</td>
<td>29 (2.4)</td>
<td>1.05 (0.64-1.73)</td>
</tr>
<tr>
<td>2+</td>
<td>587</td>
<td>22 (3.7)</td>
<td>1.10 (0.58-2.06)</td>
</tr>
<tr>
<td><strong>Tetanus immunisation</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>14 833</td>
<td>235 (1.6)</td>
<td>1.00</td>
</tr>
<tr>
<td>1</td>
<td>8 926</td>
<td>143 (1.6)</td>
<td>0.75 (0.60-0.94)*</td>
</tr>
<tr>
<td>2+</td>
<td>3 277</td>
<td>177 (5.4)</td>
<td>2.22 (1.76-2.78)**</td>
</tr>
</tbody>
</table>

* p < 0.05 ** p < 0.005

Table 21 The association of performance of preventive activities with the number of problems coded at the consultation
Consultations in which no problems were coded were the reference.

In multivariate analysis, in consultations in which one problem was coded, performance was significantly higher for the activities ALLE, SMOK and WT, insignificantly higher for the activity PNEU, significantly lower for the activities PAP, LIPI and TET and insignificantly lower for the activities BP, DIAB, FLU and MMR.

In consultations in which more than one problem was coded, performance was significantly higher for the activities ALLE, SMOK, BP, WT and TET, insignificantly higher for the activities FLU, MMR and PNEU and insignificantly lower for the activities PAP, DIAB and LIPI.

The hypothesis that performance would be significantly lower when more problems were coded at the consultation was partly fulfilled, and there were also significant reverse results, with insignificant trends in both directions for some of the activities.
10.3.4.10 **Sub-hypothesis:** Performance of preventive activities will be significantly lower when more other preventive activities are also due to be performed

<table>
<thead>
<tr>
<th>Preventive activity and number of other preventive opportunities at the consultation</th>
<th>No. of opportunities</th>
<th>No. (%) of opportunities taken</th>
<th>Multivariate relative risk (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recording of allergies</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-1</td>
<td>7,193</td>
<td>575 (8.0)</td>
<td>1.00</td>
</tr>
<tr>
<td>2-3</td>
<td>6,980</td>
<td>450 (6.4)</td>
<td>0.85 (0.74-0.98)*</td>
</tr>
<tr>
<td>4+</td>
<td>10,531</td>
<td>648 (6.2)</td>
<td>0.70 (0.61-0.81)**</td>
</tr>
<tr>
<td>Recording of smoking status</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>0-1</td>
<td>2,230</td>
<td>16 (0.7)</td>
<td>1.00</td>
</tr>
<tr>
<td>2-3</td>
<td>5,911</td>
<td>108 (1.8)</td>
<td>1.54 (0.90-2.64)</td>
</tr>
<tr>
<td>4+</td>
<td>10,174</td>
<td>228 (2.2)</td>
<td>1.28 (0.75-2.17)</td>
</tr>
<tr>
<td>Screening for hypertension</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-1</td>
<td>176</td>
<td>34 (19.3)</td>
<td>1.00</td>
</tr>
<tr>
<td>2-3</td>
<td>1,488</td>
<td>303 (20.4)</td>
<td>0.83 (0.62-1.10)</td>
</tr>
<tr>
<td>4+</td>
<td>7,110</td>
<td>1,006 (14.1)</td>
<td>0.61 (0.46-0.82)**</td>
</tr>
<tr>
<td>Cervical smear test</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>0-1</td>
<td>1,412</td>
<td>53 (3.8)</td>
<td>1.00</td>
</tr>
<tr>
<td>2-3</td>
<td>3,222</td>
<td>229 (7.1)</td>
<td>1.26 (0.95-1.67)</td>
</tr>
<tr>
<td>4+</td>
<td>4,586</td>
<td>409 (8.9)</td>
<td>1.27 (0.95-1.70)</td>
</tr>
<tr>
<td>Recording of weight</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-1</td>
<td>2,540</td>
<td>194 (7.6)</td>
<td>1.00</td>
</tr>
<tr>
<td>2-3</td>
<td>8,200</td>
<td>507 (6.2)</td>
<td>0.79 (0.67-0.93)**</td>
</tr>
<tr>
<td>4+</td>
<td>11,328</td>
<td>520 (4.6)</td>
<td>0.55 (0.46-0.67)**</td>
</tr>
<tr>
<td>Screening for diabetes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-1</td>
<td>337</td>
<td>7 (2.1)</td>
<td>1.00</td>
</tr>
<tr>
<td>2-3</td>
<td>764</td>
<td>23 (3.0)</td>
<td>1.54 (0.63-3.76)</td>
</tr>
<tr>
<td>4+</td>
<td>2,657</td>
<td>62 (2.3)</td>
<td>1.47 (0.59-3.66)</td>
</tr>
<tr>
<td>Screening for hyperlipidaemia</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-1</td>
<td>1,661</td>
<td>55 (3.3)</td>
<td>1.00</td>
</tr>
<tr>
<td>2-3</td>
<td>5,183</td>
<td>145 (2.8)</td>
<td>0.74 (0.53-1.02)</td>
</tr>
<tr>
<td>4+</td>
<td>8,353</td>
<td>191 (2.3)</td>
<td>0.51 (0.36-0.72)**</td>
</tr>
<tr>
<td>Influenza immunisation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-1</td>
<td>124</td>
<td>52 (41.9)</td>
<td>1.00</td>
</tr>
<tr>
<td>2-3</td>
<td>390</td>
<td>165 (42.3)</td>
<td>1.13 (0.88-1.44)</td>
</tr>
<tr>
<td>4+</td>
<td>1,333</td>
<td>276 (20.7)</td>
<td>0.77 (0.59-1.00)</td>
</tr>
<tr>
<td>MMR immunisation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-1</td>
<td>512</td>
<td>74 (14.5)</td>
<td>1.00</td>
</tr>
<tr>
<td>2-3</td>
<td>457</td>
<td>15 (3.3)</td>
<td>0.42 (0.25-0.72)**</td>
</tr>
<tr>
<td>Pneumococcal immunisation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-1</td>
<td>327</td>
<td>7 (2.1)</td>
<td>1.00</td>
</tr>
<tr>
<td>2-3</td>
<td>1,041</td>
<td>38 (3.7)</td>
<td>1.00 (0.42-2.34)</td>
</tr>
<tr>
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<td>3,081</td>
<td>52 (1.7)</td>
<td>0.50 (0.22-1.14)</td>
</tr>
<tr>
<td>Tetanus immunisation</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>0-1</td>
<td>7,030</td>
<td>175 (2.5)</td>
<td>1.00</td>
</tr>
<tr>
<td>2-3</td>
<td>9,190</td>
<td>179 (1.9)</td>
<td>0.76 (0.61-0.94)*</td>
</tr>
<tr>
<td>4+</td>
<td>10,816</td>
<td>201 (1.9)</td>
<td>0.61 (0.48-0.78)**</td>
</tr>
</tbody>
</table>

* p < 0.05   ** p < 0.005

Table 22 The association of performance of preventive activities with the number of other preventive opportunities at the same consultation
For each activity, performance at consultations at which the activity was the only one
due for the patient, or at which only one other preventive activity was due to be
performed was the reference.

In multivariate analysis, for consultations at which two or three other activities were due
to be performed, performance was insignificantly higher for the activities SMOK, PAP,
DIAB and FLU, independently the same as that for the reference for the activity PNEU,
significantly lower for the activities ALLE, WT, MMR and TET and insignificantly
lower for the activities BP and LIPI.

For consultations at which more than three other activities were due to be performed,
performance was insignificantly higher for the activities SMOK, PAP and DIAB,
significantly lower for the activities ALLE, BP, WT, LIPI and TET and insignificantly
lower for the activities FLU and PNEU.

The hypothesis that performance would be significantly lower when there were more
other preventive activities also due to be performed was partly fulfilled, with an
insignificant reverse findings for four of the activities.
### 10.3.4.11 Sub-hypothesis: Performance of preventive activities will be significantly higher when they have been due for longer

<table>
<thead>
<tr>
<th>Preventive activity and years since activity became due for the patient</th>
<th>No. of opportunities</th>
<th>No. (%) of opportunities taken</th>
<th>Multivariate relative risk (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recording of allergies</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-&lt;2</td>
<td>8,783</td>
<td>748 (8.5)</td>
<td>1.00</td>
</tr>
<tr>
<td>2-&lt;6</td>
<td>7,810</td>
<td>451 (5.8)</td>
<td>0.97 (0.87-1.09)</td>
</tr>
<tr>
<td>6+</td>
<td>8,111</td>
<td>474 (5.8)</td>
<td>1.01 (0.90-1.13)</td>
</tr>
<tr>
<td>Recording of smoking status</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-&lt;2</td>
<td>5,481</td>
<td>185 (3.4)</td>
<td>1.00</td>
</tr>
<tr>
<td>2-&lt;6</td>
<td>6,414</td>
<td>92 (1.4)</td>
<td>0.73 (0.57-0.93)*</td>
</tr>
<tr>
<td>6+</td>
<td>6,420</td>
<td>75 (1.2)</td>
<td>0.63 (0.48-0.83)**</td>
</tr>
<tr>
<td>Screening for hypertension</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-&lt;1</td>
<td>3,861</td>
<td>679 (17.6)</td>
<td>1.00</td>
</tr>
<tr>
<td>1-&lt;3</td>
<td>1,679</td>
<td>307 (18.3)</td>
<td>1.35 (1.20-1.52)**</td>
</tr>
<tr>
<td>3+</td>
<td>3,234</td>
<td>357 (11.0)</td>
<td>0.97 (0.86-1.10)</td>
</tr>
<tr>
<td>Cervical smear test</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-&lt;1</td>
<td>3,534</td>
<td>368 (10.4)</td>
<td>1.00</td>
</tr>
<tr>
<td>1-&lt;4</td>
<td>2,652</td>
<td>211 (8.0)</td>
<td>1.11 (0.94-1.31)</td>
</tr>
<tr>
<td>4+</td>
<td>3,034</td>
<td>112 (3.7)</td>
<td>0.71 (0.56-0.89)**</td>
</tr>
<tr>
<td>Recording of weight</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-&lt;1</td>
<td>6,480</td>
<td>468 (7.2)</td>
<td>1.00</td>
</tr>
<tr>
<td>1-&lt;5</td>
<td>8,073</td>
<td>433 (5.4)</td>
<td>1.03 (0.91-1.18)</td>
</tr>
<tr>
<td>5+</td>
<td>7,515</td>
<td>320 (4.3)</td>
<td>0.94 (0.81-1.09)</td>
</tr>
<tr>
<td>Screening for diabetes</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>0-&lt;1</td>
<td>1,667</td>
<td>18 (1.1)</td>
<td>1.00</td>
</tr>
<tr>
<td>1-&lt;4</td>
<td>898</td>
<td>25 (2.8)</td>
<td>2.50 (1.29-4.84)*</td>
</tr>
<tr>
<td>4+</td>
<td>1,193</td>
<td>49 (4.1)</td>
<td>5.86 (2.62-13.10)**</td>
</tr>
<tr>
<td>Screening for hyperlipidaemia</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-&lt;1</td>
<td>5,070</td>
<td>102 (2.0)</td>
<td>1.00</td>
</tr>
<tr>
<td>1-&lt;5</td>
<td>5,151</td>
<td>153 (3.0)</td>
<td>1.91 (1.47-2.48)**</td>
</tr>
<tr>
<td>5+</td>
<td>4,976</td>
<td>136 (2.7)</td>
<td>1.68 (1.27-2.21)**</td>
</tr>
<tr>
<td>MMR immunisation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-&lt;1</td>
<td>574</td>
<td>65 (11.3)</td>
<td>1.00</td>
</tr>
<tr>
<td>1+</td>
<td>395</td>
<td>24 (6.1)</td>
<td>3.41 (2.47-4.72)**</td>
</tr>
<tr>
<td>Pneumococcal immunisation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-&lt;1</td>
<td>929</td>
<td>14 (1.5)</td>
<td>1.00</td>
</tr>
<tr>
<td>1-&lt;2</td>
<td>2,602</td>
<td>75 (2.9)</td>
<td>1.60 (0.91-2.79)</td>
</tr>
<tr>
<td>2+</td>
<td>918</td>
<td>8 (0.9)</td>
<td>1.13 (0.45-2.87)</td>
</tr>
<tr>
<td>Tetanus immunisation</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>0-&lt;2</td>
<td>8,819</td>
<td>215 (2.4)</td>
<td>1.00</td>
</tr>
<tr>
<td>2-&lt;6</td>
<td>9,192</td>
<td>176 (1.9)</td>
<td>0.99 (0.80-1.22)</td>
</tr>
<tr>
<td>6+</td>
<td>9,025</td>
<td>164 (1.8)</td>
<td>0.96 (0.78-1.19)</td>
</tr>
</tbody>
</table>

* p < 0.05    ** p < 0.005

Table 23 The association of performance of preventive activities with elapsed time since the preventive activity became due for the patient
For each activity, performance when the activity had been due for the lowest category of years was the reference.

In multivariate analysis, for opportunities at which the activity had been due for the middle category of years, performance was significantly higher for the activities BP, DIAB, LIPI and MMR, insignificantly higher for the activities PAP, WT and PNEU, significantly lower for the activity SMOK and insignificantly higher for the activities ALLE and TET.

For opportunities at which the activity had been due for the highest category of years, performance was significantly higher for the activities DIAB, LIPI and MMR, insignificantly higher for the activities ALLE and PNEU, significantly lower for the activities SMOK and PAP and insignificantly lower for the activities BP, WT and TET.

The hypothesis that performance would significantly higher when the activity had been due for longer was partly fulfilled, with significant reverse findings and insignificant trends in both directions for some activities.
### Sub-hypothesis: Performance of preventive activities will be significantly higher with each subsequent opportunity during the trial

<table>
<thead>
<tr>
<th>Preventive activity and ordinal number of opportunity</th>
<th>No. of opportunities</th>
<th>No. (%) of opportunities taken</th>
<th>Multivariate relative risk (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Recording of allergies</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1&lt;sup&gt;st&lt;/sup&gt;</td>
<td>8,101</td>
<td>1,086 (13.4)</td>
<td>1.00</td>
</tr>
<tr>
<td>2&lt;sup&gt;nd&lt;/sup&gt;</td>
<td>4,680</td>
<td>280 ( 6.0)</td>
<td>0.54 (0.48-0.61)**</td>
</tr>
<tr>
<td>3&lt;sup&gt;rd&lt;/sup&gt;</td>
<td>3,154</td>
<td>124 ( 3.9)</td>
<td>0.40 (0.34-0.48)**</td>
</tr>
<tr>
<td>4&lt;sup&gt;th&lt;/sup&gt;</td>
<td>8,769</td>
<td>183 ( 2.1)</td>
<td>0.30 (0.25-0.35)**</td>
</tr>
<tr>
<td><strong>Recording of smoking status</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1&lt;sup&gt;st&lt;/sup&gt;</td>
<td>5,023</td>
<td>247 ( 4.9)</td>
<td>1.00</td>
</tr>
<tr>
<td>2&lt;sup&gt;nd&lt;/sup&gt;</td>
<td>3,182</td>
<td>47 ( 1.5)</td>
<td>0.37 (0.28-0.50)**</td>
</tr>
<tr>
<td>3&lt;sup&gt;rd&lt;/sup&gt;</td>
<td>2,302</td>
<td>22 ( 1.0)</td>
<td>0.27 (0.18-0.42)**</td>
</tr>
<tr>
<td>4&lt;sup&gt;th&lt;/sup&gt;</td>
<td>7,808</td>
<td>36 ( 0.5)</td>
<td>0.21 (0.14-0.31)**</td>
</tr>
<tr>
<td><strong>Screening for hypertension</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1&lt;sup&gt;st&lt;/sup&gt;</td>
<td>3,477</td>
<td>899 (25.9)</td>
<td>1.00</td>
</tr>
<tr>
<td>2&lt;sup&gt;nd&lt;/sup&gt;</td>
<td>1,607</td>
<td>218 (13.6)</td>
<td>0.61 (0.53-0.70)**</td>
</tr>
<tr>
<td>3&lt;sup&gt;rd&lt;/sup&gt;</td>
<td>991</td>
<td>106 (10.7)</td>
<td>0.51 (0.42-0.62)**</td>
</tr>
<tr>
<td>4&lt;sup&gt;th&lt;/sup&gt;</td>
<td>2,699</td>
<td>120 ( 4.4)</td>
<td>0.30 (0.24-0.37)**</td>
</tr>
<tr>
<td><strong>Cervical smear test</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1&lt;sup&gt;st&lt;/sup&gt;</td>
<td>2,643</td>
<td>401 (15.2)</td>
<td>1.00</td>
</tr>
<tr>
<td>2&lt;sup&gt;nd&lt;/sup&gt;</td>
<td>1,559</td>
<td>154 ( 9.9)</td>
<td>0.75 (0.63-0.89)**</td>
</tr>
<tr>
<td>3&lt;sup&gt;rd&lt;/sup&gt;</td>
<td>1,059</td>
<td>63 ( 5.9)</td>
<td>0.48 (0.38-0.62)**</td>
</tr>
<tr>
<td>4&lt;sup&gt;th&lt;/sup&gt;</td>
<td>3,959</td>
<td>73 ( 1.8)</td>
<td>0.20 (0.15-0.26)**</td>
</tr>
<tr>
<td><strong>Recording of weight</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1&lt;sup&gt;st&lt;/sup&gt;</td>
<td>6,625</td>
<td>693 (10.5)</td>
<td>1.00</td>
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<tr>
<td>2&lt;sup&gt;nd&lt;/sup&gt;</td>
<td>4,058</td>
<td>200 ( 4.9)</td>
<td>0.55 (0.47-0.64)**</td>
</tr>
<tr>
<td>3&lt;sup&gt;rd&lt;/sup&gt;</td>
<td>2,839</td>
<td>101 ( 3.6)</td>
<td>0.42 (0.34-0.51)**</td>
</tr>
<tr>
<td>4&lt;sup&gt;th&lt;/sup&gt;</td>
<td>8,546</td>
<td>227 ( 2.7)</td>
<td>0.39 (0.33-0.46)**</td>
</tr>
<tr>
<td><strong>Screening for diabetes</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1&lt;sup&gt;st&lt;/sup&gt;</td>
<td>784</td>
<td>23 ( 2.9)</td>
<td>1.00</td>
</tr>
<tr>
<td>2&lt;sup&gt;nd&lt;/sup&gt;</td>
<td>591</td>
<td>14 ( 2.4)</td>
<td>0.88 (0.47-1.66)</td>
</tr>
<tr>
<td>3&lt;sup&gt;rd&lt;/sup&gt;</td>
<td>475</td>
<td>16 ( 3.4)</td>
<td>1.26 (0.69-2.28)</td>
</tr>
<tr>
<td>4&lt;sup&gt;th&lt;/sup&gt;</td>
<td>1,908</td>
<td>39 ( 2.0)</td>
<td>0.92 (0.50-1.66)</td>
</tr>
<tr>
<td><strong>Screening for hyperlipidaemia</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1&lt;sup&gt;st&lt;/sup&gt;</td>
<td>4,955</td>
<td>130 ( 2.6)</td>
<td>1.00</td>
</tr>
<tr>
<td>2&lt;sup&gt;nd&lt;/sup&gt;</td>
<td>3,047</td>
<td>125 ( 4.1)</td>
<td>1.56 (1.23-1.99)**</td>
</tr>
<tr>
<td>3&lt;sup&gt;rd&lt;/sup&gt;</td>
<td>2,004</td>
<td>52 ( 2.6)</td>
<td>1.01 (0.73-1.38)</td>
</tr>
<tr>
<td>4&lt;sup&gt;th&lt;/sup&gt;</td>
<td>5,191</td>
<td>84 ( 1.6)</td>
<td>0.67 (0.49-0.91)*</td>
</tr>
<tr>
<td><strong>Influenza immunisation</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1&lt;sup&gt;st&lt;/sup&gt;</td>
<td>953</td>
<td>382 (40.1)</td>
<td>1.00</td>
</tr>
<tr>
<td>2&lt;sup&gt;nd&lt;/sup&gt;</td>
<td>383</td>
<td>93 (24.3)</td>
<td>0.62 (0.52-0.74)**</td>
</tr>
<tr>
<td>3&lt;sup&gt;rd&lt;/sup&gt;</td>
<td>511</td>
<td>18 ( 3.5)</td>
<td>0.09 (0.06-0.15)**</td>
</tr>
<tr>
<td><strong>MMR immunisation</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1&lt;sup&gt;st&lt;/sup&gt;</td>
<td>432</td>
<td>66 (15.3)</td>
<td>1.00</td>
</tr>
<tr>
<td>2&lt;sup&gt;nd&lt;/sup&gt;</td>
<td>210</td>
<td>11 ( 5.2)</td>
<td>0.57 (0.32-1.02)</td>
</tr>
<tr>
<td>3&lt;sup&gt;rd&lt;/sup&gt;</td>
<td>327</td>
<td>12 ( 3.7)</td>
<td>0.43 (0.26-0.70)**</td>
</tr>
<tr>
<td><strong>Pneumococcal immunisation</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1&lt;sup&gt;st&lt;/sup&gt;</td>
<td>850</td>
<td>61 ( 7.2)</td>
<td>1.00</td>
</tr>
<tr>
<td>2&lt;sup&gt;nd&lt;/sup&gt;</td>
<td>638</td>
<td>12 ( 1.9)</td>
<td>0.24 (0.13-0.44)**</td>
</tr>
<tr>
<td>3&lt;sup&gt;rd&lt;/sup&gt;</td>
<td>531</td>
<td>9 ( 1.7)</td>
<td>0.20 (0.10-0.40)**</td>
</tr>
<tr>
<td>4&lt;sup&gt;th&lt;/sup&gt;</td>
<td>2,430</td>
<td>15 ( 0.6)</td>
<td>0.07 (0.04-0.14)**</td>
</tr>
<tr>
<td><strong>Tetanus immunisation</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1&lt;sup&gt;st&lt;/sup&gt;</td>
<td>7,789</td>
<td>297 ( 3.8)</td>
<td>1.00</td>
</tr>
<tr>
<td>2&lt;sup&gt;nd&lt;/sup&gt;</td>
<td>4,933</td>
<td>102 ( 2.1)</td>
<td>0.57 (0.46-0.71)**</td>
</tr>
<tr>
<td>3&lt;sup&gt;rd&lt;/sup&gt;</td>
<td>3,454</td>
<td>61 ( 1.8)</td>
<td>0.51 (0.39-0.69)**</td>
</tr>
<tr>
<td>4&lt;sup&gt;th&lt;/sup&gt;</td>
<td>10,860</td>
<td>95 ( 0.9)</td>
<td>0.31 (0.24-0.40)**</td>
</tr>
</tbody>
</table>

* * p < 0.05  ** ** p < 0.005

Table 24 The association of performance of preventive activities with the ordinal number of the opportunity
For each activity, performance at the first opportunity during the study was the reference.

In multivariate analysis, at the second opportunity, performance was significantly higher for the activity LIPI, significantly lower for the activities ALLE, SMOK, BP, PAP, WT, FLU, PNEU and TET and insignificantly lower for the activities DIAB and MMR.

At the third (for the activities FLU and MMR third or subsequent) opportunity, performance was significantly higher for the activities DIAB and LIPI and significantly lower for the activities ALLE, SMOK, BP, PAP, WT, FLU, MMR, PNEU and TET.

At the fourth and subsequent opportunities, performance was significantly lower for the activities ALLE, SMOK, BP, PAP, WT, LIP, PNEU and TET and insignificantly lower for the activity DIAB.

The hypothesis that performance of preventive activities would be significantly higher with each subsequent opportunity during the trial was fulfilled mainly in the reverse, with performance decreasing significantly with each subsequent opportunity for most of the activities. The patterns of performance of the activities DIAB and LIPI with each subsequent opportunity were clearly different from those for all of the other activities, with the performance of the activity DIAB showing no significant trend and that of the activity LIPI being significantly higher at the second opportunity and significantly lower at the fourth opportunity.
### 10.3.4.13 Sub-hypothesis: Performance will be higher when a reminder is displayed

<table>
<thead>
<tr>
<th>Preventive activity and whether a reminder was displayed</th>
<th>No. of opportunities</th>
<th>No. (%) of opportunities taken</th>
<th>Multivariate relative risk (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Recording of allergies</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>7 402</td>
<td>973 (13.1)</td>
<td>2.58 (2.35-2.83)**</td>
</tr>
<tr>
<td>No</td>
<td>17 302</td>
<td>700 (4.0)</td>
<td>1.00</td>
</tr>
<tr>
<td><strong>Recording of smoking status</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>5 772</td>
<td>138 (2.4)</td>
<td>1.23 (1.00-1.52)</td>
</tr>
<tr>
<td>No</td>
<td>12 543</td>
<td>214 (1.7)</td>
<td>1.00</td>
</tr>
<tr>
<td><strong>Screening for hypertension</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>2 197</td>
<td>609 (27.7)</td>
<td>1.72 (1.56-1.90)**</td>
</tr>
<tr>
<td>No</td>
<td>6 577</td>
<td>734 (11.2)</td>
<td>1.00</td>
</tr>
<tr>
<td><strong>Cervical smear test</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>3 347</td>
<td>303 (9.1)</td>
<td>1.20 (1.05-1.38)*</td>
</tr>
<tr>
<td>No</td>
<td>5 873</td>
<td>388 (6.6)</td>
<td>1.00</td>
</tr>
<tr>
<td><strong>Recording of weight</strong></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>7 111</td>
<td>626 (8.8)</td>
<td>1.70 (1.52-1.89)**</td>
</tr>
<tr>
<td>No</td>
<td>14 957</td>
<td>595 (4.0)</td>
<td>1.00</td>
</tr>
<tr>
<td><strong>Screening for diabetes</strong></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>973</td>
<td>31 (3.2)</td>
<td>1.43 (0.86-2.39)</td>
</tr>
<tr>
<td>No</td>
<td>2 785</td>
<td>61 (2.2)</td>
<td>1.00</td>
</tr>
<tr>
<td><strong>Screening for hyperlipidaemia</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>5 181</td>
<td>157 (3.0)</td>
<td>1.18 (0.96-1.46)</td>
</tr>
<tr>
<td>No</td>
<td>10 016</td>
<td>234 (2.3)</td>
<td>1.00</td>
</tr>
<tr>
<td><strong>Influenza immunisation</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>494</td>
<td>194 (39.3)</td>
<td>1.30 (1.13-1.50)**</td>
</tr>
<tr>
<td>No</td>
<td>1 353</td>
<td>299 (22.1)</td>
<td>1.00</td>
</tr>
<tr>
<td><strong>MMR immunisation</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>368</td>
<td>43 (11.7)</td>
<td>1.24 (0.91-1.71)</td>
</tr>
<tr>
<td>No</td>
<td>601</td>
<td>46 (7.7)</td>
<td>1.00</td>
</tr>
<tr>
<td><strong>Pneumococcal immunisation</strong></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>1 048</td>
<td>48 (4.6)</td>
<td>2.20 (1.47-3.27)**</td>
</tr>
<tr>
<td>No</td>
<td>3 401</td>
<td>49 (1.4)</td>
<td>1.00</td>
</tr>
<tr>
<td><strong>Tetanus immunisation</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>8 295</td>
<td>302 (3.6)</td>
<td>2.41 (2.03-2.85)**</td>
</tr>
<tr>
<td>No</td>
<td>18 741</td>
<td>253 (1.3)</td>
<td>1.00</td>
</tr>
</tbody>
</table>

* p < 0.05  ** p < 0.005

**Table 25 The association of performance of preventive activities with whether a reminder was displayed**

Opportunities for which no reminder was displayed were the reference.
In multivariate analysis, when a reminder was displayed, performance of the activities ALLE, BP, PAP, WT, FLU, PNEU and TET was significantly higher and that of the activities SMOK, DIAB, LIPI and MMR was insignificantly higher.

The hypothesis that performance would be significantly higher when a reminder was displayed was partly fulfilled, with an insignificant trend in the same direction for the remaining activities.

10.3.4.14 Summary of characteristics of patients, GPs, consultations and preventive opportunities significantly associated with performance of preventive activities in consultations

Table 26 below summarises the results of the tables for each characteristic of patients, GPs, consultations and preventive opportunities which reached independent statistical significance.
<table>
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* = p < 0.05

Table 26  Summary of patient, GP, consultation and preventive opportunity characteristics significantly associated with the performance of preventive activities.
10.3.5 Interviews with GPs participating in the study

In this section the results of the analysis of the qualitative data are presented. The transcripts of the interviews with the GPs are attached as Appendix D.

The seven of the GPs who were still in the practice and who agreed to be interviewed were interviewed in September 2005 about their experiences of the reminder system and about their provision of preventive activities.

The doctors reported benefits of the reminder system and some difficulties and disadvantages. The themes which emerged from the interviews are below, with representative extracts from the interviews.

10.3.5.1 Benefits of the reminders

10.3.5.1.1 Usefulness of the reminders

All of the GPs reported that they had found the reminders useful. Comments included:

“I found them very useful.”

“I think they worked very well.”

“I certainly liked them and they certainly helped for certain functions.”

10.3.5.1.2 The reminders were appropriate
The accuracy of the reminders was checked by asking the GPs whether the reminders did actually remind them about preventive activities that they wished to perform for their patients. All of their responses were positive. Examples included:

“I think that the ones that were on there were ones that I always considered relevant.”

“So those things were all relevant to me, I think, and tetanus state, you know, update for tetanus.”

10.3.5.2 The GPs’ responses to the reminders

The GPs reported that they responded to significant proportions of the reminders, with several adding that they felt that their response had declined over time because they had become used to seeing the reminders. Representative statements included:

“I think I responded to most of them fairly well. I tended to act on them, is what I’m saying, if I saw them, initially anyway.”

“You’d try and target to try and get rid of them so that you didn’t see them again the next time around, and actually it did prompt you to ask some questions and do some preventative health stuff, so they weren’t there on the screen.”

“I think I would have started getting through at least fifty per cent of... my patients would have been having updated records and I think by now probably about ninety per cent of my patients would have pretty updated problem lists of their preventative health type things.”

“To start off with mostly, just about all the time. I could always look at them and respond.”

“Now I think it’s probably more so, because, you know... I’ll fly down the problem list now and have a look at the eighty year old and think, no bone density mentioned,
we haven’t got a bone density. I wonder if they’ve ever had one. And half the time they have and half the time it’s never been mentioned. So because you’re getting used to looking for these seven or eight different things, you tend to be a bit more aware.”

“I’m doing less of them at the moment, I suppose because of the fact that I’m kind of used to it. Just: “That’s fine, I’ll get around to it”, whereas previously it was much more interesting to get on to it, get it done.”

“After a while it’s that you do actually turn off and ignore them being there after using it for several years.”

One of the GPs described a compulsion that had developed to perform preventive activities:

“I’m now probably a little obsessive-compulsive about those things and I’m going to have as part of my problem profile, I will always have preventative medicine which will have everything in it. (...) I’m a little obsessive-compulsive, I’m afraid, so I have a tendency to do it. If I’m seeing someone for the first time, even if they’re just coming in with a cold, I tend to check for everything, I just tend to check for everything if I have time. Sometimes even if I don’t have time, I tend to check that everything’s been done.”

Two of the GPs reported that as newly-qualified or new GPs in the practice, their initial need to concentrate on establishing themselves took precedence over responding to the reminders:

“I was probably still finding my feet in terms of working my way I was going to practise as such, even though I was supposed to be a fully-qualified GP and whatever else. My evolving practice has been such that the way I practise now is actually quite different to the way I was practising then, and in some ways it was a case of treading water back then.”
“I think probably in the early stages of things whilst I was still getting used to the running of the computer system, I probably didn’t take a huge amount of notice of them in the early stages, ‘cos I was still getting used to, alright, now how do I open the patient’s notes and follow things through?”

\[10.3.5.2.1\] The reminders increased the GPs’ awareness of prevention in general

The GPs reported that the presence of the reminders made them more aware of preventive care in general and led to a change in the style of their practice. Representative statements include:

“Sometimes it would then mean it would be, potentially remember then to consider other things as well, it wasn’t just the ones that were written there, but you might say: “Look”, if it was in a consult where I had the time, then I would check up the other things.”

“I think it, from memory, it changed what I was doing quite a lot in terms of preventative medicine. I was much better at preventative medicine with the reminders.”

“It started getting me always thinking about preventative issues.”

\[10.3.5.2.2\] The reminders prompted increased performance of preventive activities

The GPs reported that they responded to the reminders either by performing the preventive activity or activities opportunistically in the same consultation or that they planned with the patient to perform the activity or activities it a later consultation.

Reports of opportunistic performance included:
“Most of them were fairly quick simple things that you could slot in if it was appropriate at the time.”

“If someone comes in with a cold, that takes you two minutes and they’re here for fifteens so that gives you thirteen to get your head around the rest of it.”

“Certainly if you saw someone with a relatively quick problem to deal with and you had time left in a fifteen minute appointment, then it was really easy to start to look at those things and start to knock one or two of them off.”

“Still quite regularly people will come in with only one or two comparatively minor things, which we might get through in eight to ten minutes. I will then, rather than packing them off out the door after ten minutes, I’ll then use, knowing that officially I’m giving them a fifteen minute, roughly a fifteen minute service, I’ll often use that time just to have a quick look on some of those other issues and see when they last had various things done.”

“I think I’d be using the opportunistic time to update most of those sort of things.”

“I would be more likely to say quickly: “Look, you haven’t had your lipids done for a while. Look, I’ll just rattle a form out.”

“There’s that temptation that if you come in just to say: “I’ve got a sore ear, Doc” and you look and then find, and: “Yeah, you’ve got otitis externa. Here’s a script for Sofradex. Off you go.” Those are the times when you should be thinking even more so about, look, let’s have a quick blood pressure check, and a quick skin check, and make it more than a five minute consult.”

The GPs reported that they made additional appointments in order to perform preventive activities. Their statements about this included:

“If it was something where we were really lacking, that somebody had a complicated medical history and we were lacking in that information, then I’d say: “Look, I need
you to come back as a special appointment just to update your medical notes to make it relevant, so that if you did come in and you were really crook, we’ll have all that information and … but that would be the … or if it’s a new patient too, I’d sometimes say: “We haven’t had time to do all this, you need to do that, you need to make a special appointment to come back”.”

“I may not want to do it today. I will get you back and I actually specifically do it”, and then you’ve got a different mind set, you’re actually saying: “Let’s start thinking about prevention”. And even if you only do that say once a week, you’re going to start picking up some extra problems, dealing with a few issues, giving people an opportunity, so I think it’s got an advantage there.”

“I mean, if somebody, if a woman’s well overdue on a Pap smear or something like that, we’ll certainly give them a strong reminder about that: “Look, it’s four years since you last had a Pap smear, do you realise that? Let’s get another appointment to come back and have one of those done”, or whatever.”

10.3.5.2.3 Effect on workload

The GPs reported that the reminders increased their workload, either by increasing the time and complexity of the consultations in which they received the reminders, or by leading them to make additional appointments, as outlined above. Statements included:

“It increases the amount of what you’re trying to do at the time of the consult, so it increases the time spent with the patient.”

“If it was a follow up appointment, like I knew I was going to get them back in any case, I’d say: “Make that a long consult”.

“Yeah, I’m sure they built on it. I’m sure they probably built on it, but if that’s a good thing or a bad thing, I don’t know. As I said, in those days I was starting off early and had less of a workload than I would now, and I was a young GP. I was
probably starting off, trying to start off a practice, rather than actually trying to minimise work and it was rational work as it were, so I think in that sort of way it was probably actually a good tool to finding work.”

10.3.5.2.4 Reminders prompted the GPs to make their medical records more complete and up to date

The GPs felt that the reminders had prompted them to make their medical records more complete and up to date. Statements included:

“I think it would have improved the care overall, because it meant that you had a better consistency of information that you had there, areas that could be blanks that could be overlooked and that you were able to update.”

“I think it’s improved the quality of notes.”

“I think that probably actually, look documentation, I think for things was quite often that you may do and don’t get to document.”

“They’re really good actually for things, medico-legal things, the amount of times later on that you get requests from an insurance company for standard income protection sorts of form, or whatever else, where those kind of things you don’t get to do. They’ve probably saved a lot of times.”

“It’s really important. I still see patients, especially young males … I was just reading one of my notes this morning. The last time I saw this bloke, I wrote: “This guy’s been coming to this practice for eight years and nobody’s ever taken his blood pressure, nobody’s taken family history, nobody’s checked his immunisation status. So I did all that stuff.”
10.3.5.2.5 Patients’ responses to preventive activities prompted for by the reminders

The GPs reported that patients sometimes commented on the care that was being provided, with the comments mostly being positive. Statements included:

“You would get the occasional patient who would make a comment and would be saying: “Thank you for being so thorough, thank you for taking the time, often that would be a comment, you know, to do all that, and sometimes you also get the comment where I was going back and updating medical history and things and saying: “Look, this has taken a bit longer, this consult, because we’ve done that”, but you’d get a positive response from some patients saying, you know, that they appreciated the effort that was being put in. Occasionally you’d get someone saying, you know, I’ve had some patients who have made the comment: “I used to see Doctor So and So, Doctor So and So never used to do that, but I really appreciate that you take the time and look at other things.”

“Then you’d explain why and: “My other doctor never did that!”

“I hope that they think that we’re being a little bit more interested in what’s going on, and are able to support them better.”

“I certainly had no perception of “It’s a bloody waste of time sitting around here.””

“They’re always happy to talk about themselves.”

“For most people, they would just accept that as being part of the normal process of gathering information and improving their health status.”

However, the GPs reported that a small number of patients were suspicious or unhappy about the GPs asking for certain information. When this happened, it was usually when
the GPs were asking about elements of social history such as occupation or hobbies.

One GP’s statement about this was:

“The patient registration social thing, the social thing. You’d get some folk who would be suspicious of that, why are you asking me all these questions, and why do you want to know that, and who else is going to know that? So you do get that from some patients, that you then have to start defending why you need that information from them, and some folk would say, “Look, I don’t want that recorded.” There’d be certain things they’d say that they didn’t want actually recorded.”

10.3.5.3 Difficulties and disadvantages of reminders

10.3.5.3.1 Lack of time is the biggest barrier to responding to reminders

The GPs stated that time pressure was the main barrier to being able to respond to the reminders. Statements included:

“If a consult where I was running a long way behind, or it was very complicated or busy or whatever, then I wouldn’t necessarily always use them, but if it was one that was, that had the space to do it, then I’d make use of them.”

“You never do it when you’re busy.”

“And also, if you’re pushed for time, if you’re running late, all those sorts of things impact on whether you’re going to pay some attention to reminders.”

“Sometimes you’re flat out, somebody’s not terribly impressed that they’ve just walked in because you’re running over an hour late, and if you start saying: “And now I want to do this and now I want to do that”, they’re going to say: “But hang on, I wanted to be out of here an hour ago, and they’re not at all happy to stay around while you’re doing all the extra things.”
10.3.5.3.2 Offering prevention is inappropriate in some consultations

The GPs stated that one reason that they didn’t respond to reminders or provide indicated preventive activities on some occasions was that it would have been inappropriate to do so in light of other issues being presented or dealt with.

Representative statements include:

“There’d certainly be the consults where it just wasn’t appropriate, because the person was presenting with things that … if somebody’s very sick and they’ve got a raging temperature and they’re throwing up all over the place, then that’s not the time to start doing background stuff, unless it’s really relevant to what you’re doing at that stage.”

“Sometimes it’s the nature of the consult, where it’s not appropriate to sometimes talk about those sorts of things. Certain times where someone’s come in because they’re down and depressed, you don’t want to say have them hop on the scales and check their height and things. If they’ve got low self-esteem or whatever else, you try to say, well actually you’re overweight and everything as well, it’s not going to be an appropriate time to that when you’re trying to do CBT-like activities.”

“The time sometimes is really inappropriate to do that.”

10.3.5.3.3 Some patients refused preventive activities

The GPs reported that some patients refused various preventive activities when they were offered. Statements included:

“They didn’t mind me sort of doing their weight or whatever but well, some of them do, some of them say they don’t want to know what their weight is, and don’t want to have that.”
“I do recall I had a diabetic fellow come in, now I can’t even remember if this was in relation to your preventive reminders, and he was just so, he was an insulin-dependent diabetic, and he was just so far behind everything. He was just wanted an insulin script, and I said: “You need all of these things done” and I never saw him again. I gave him the forms to have all these tests done. He never came back. It was clear that he did not want to engage in that preventive behaviour, for whatever reason, I don’t know why. That’s the only time I can remember anybody being really put off by trying to do preventive stuff.”

10.3.5.3.4 Using the computer is different from using paper records

The GPs commented on differences between reading and making medical records on paper and using their practice computer system for this task. One GP commented on the ability of the computer to help her to perform her work:

“The computer helped the GP by searching the computer medical record. It did the looking for me.”

Another GP reported that in other ways the computer system that was used in the practice also could slow the GPs down:

“The computer tends to be rather, the way we’ve got it set up is a time-consuming process in any case because you have to go out of where you are, you have to go into somewhere else, you have to detail it, and then you have to come back out of that section and go back in. Again, in contrast to when you could just do it on one sheet of paper, just do a quick notation, you could do that very fast, it wouldn’t be nearly as time-consuming to do that.”

10.3.5.3.5 Too many reminders would be annoying

The GPs talked about the negative effects of receiving too many reminders or reminders in too high a proportion of consultations. One of them referred to the reminder function
in the Medical Director software package, which the practice had started using some
years after the trial of reminders which had been run using the Medrecord clinical
software system:

“I suppose the recall system on Medical Director is a potentially useful thing, but
I’ve got a sneaking suspicion that it could get a little bit overloaded, that if you put a
reminder for everything, Pap smears, lipids, the whole works as a reminder, every
time the patient comes in, there’ll be a flashing phone telling me: “You’ve got a
recall overdue”. If you’re genuinely getting your problem list up to date, I will put
down: “PSA 9/05 2.2” and then I know myself the next time patient comes in, if it’s
in twelve months’ time or two years or whatever, well look, we’re due for something
else to be done. I mean, the recall system of the flashing telephones would be useful,
but I think I’d find it frustrating if with every single patient that came in, when I
opened up their Medical Director file, I’ve got bloody recalls flashing at me every
time, I’d think find that, I think it would get to me after a while.”

Another of the GPs described increased anxiety or stress that he experienced if he
received a number of reminders in a consultation:

“In terms of, sometimes they add to the extra angst, I remember at that stage, if a
person comes in with a complicated problem, and you see they’ve got seventeen
reminders come through, it tends to make you feel sometimes how am I going to
tackle this, where am I going to tackle this, where am I going to start chipping away
at. It’s when you start to look into certain issues. If someone comes in with multiple
different problems first time and it’s the first time you’ve seen them as such.
Sometimes it’s a problem of how am I going to do this and then you get a prompt all
of a sudden that says you don’t have this done, you don’t have that done, it probably
adds to your own levels of angst and that potentially may come across in the way in
which we do practise.”
10.3.5.3.6 GP forgot how to use reminder system to record activities

One GP reported some difficulty using the reminder system because she had forgotten how to record some of what occurred:

“There’s some that are … there was a keyword that I know I was often looking for something to put on, and couldn’t find, but I can’t remember now.”

10.3.5.3.7 Some reminders were duplicated by previously-generated recalls from an existing recall system

One GP reported receiving more than one reminder about the same preventive activity in a consultation.

“One thing that was sometimes happening, and I don’t think that it was your system, I think that it was because there was already something on the system, was sometimes I’d get multiple Pap smear reminders up there when the person had already had their Pap smear, but I think that was coming through because somebody else had already programmed.”

10.3.5.3.8 Improving the effectiveness of reminders

In response to a question about possible improvements to make reminders more effective, the GPs stated:

“The only way you can make them more effective is to refuse to let people go on with their consultation unless they fill the bloody information in.”
“So something like as an example, if height’s not been recorded, something like:
“George, have you thought about a height?” And if it just looks different, it’s more likely.”

GPs wanted a method to record the offer of prevention

The GPs reported that they would have liked an easy method to record that they had offered preventive care, but that the patient either didn’t refuse outright or the patient did not know enough of his or her own medical history to enable a reasonably accurate assessment to be made of the need for a preventive activity. Representative statements included:

“There was nowhere to actually say that I’d asked them.”

“I must admit, most of the time, I wouldn’t have been thinking about people refusing and saying “OK, I’ll put that down as being a refusal”. That’s because they didn’t know, people don’t know when their last tetanus was. That was always hard how to record that when people don’t know, when you’ve actually asked it.”

“So I’ve actually asked, but there’s nowhere to say that I’ve asked that in the recall system, like “Tetanus asked for, but patient doesn’t know.””

“But for some people, they’d say: “I don’t know if I’ve ever had a tetanus”, and so I can’t put down a best guess if they may never had a tetanus.”
### 10.3.5.4 Summary of themes

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<td>Offering prevention is inappropriate in some consultations</td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Some patients refused preventive activities</td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>The computer helped by searching through records</td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>The computer slowed the GPs down</td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Receiving too many reminders is annoying</td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Reminders increase GPs’ anxiety and stress</td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Reminders could be made more effective</td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>GPs wanted a method to record offers of preventive care</td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>GP forgot how to use the reminder system</td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Existing Pap smear recall system duplicated smear reminders</td>
<td></td>
<td>✓</td>
</tr>
</tbody>
</table>

Table 27 Summary of themes from interviews with GPs

Table 27 shows that positive themes emerged about improvements in the quality of care resulting from the reminders, changes in the GPs’ style of practice to incorporate prevention, more complete and up to date records, help from the computer in searching the records and positive response from patients. Negative themes that emerged included increased workload, increased anxiety and stress in the GPs, with some of this resulting
from perceived lack of time to perform preventive activities, declining response to the
reminders with subsequent presentations of the same reminders as time passed, negative
reactions from a few patients and some operational issues including remembering how
to use the reminder system and duplication of pre-existing recall messages.
10.3.6 Key findings

The study provided many data on which many analyses were performed. The key findings of the study are summarised below.

10.3.6.1 Aim 1: Primary hypothesis

The intervention significantly increased the performance of the preventive activities overall by 32%.

10.3.6.2 Aim 2: Secondary hypothesis

The increase in the performance preventive activities through the reminders occurred without increase in services provided or in fees billed.

10.3.6.3 Aim 3: Association of characteristic of patients, GPs, consultations and preventive opportunities with the performance of preventive activities

Every characteristic of patients, GPs, consultations and preventive opportunities that was examined was found to be significantly associated with performance of at least two of the preventive activities. The associations were complex and heterogenous.
10.4 Discussion

The trial which forms the basis for this thesis set out to test the hypothesis that when they received automated reminders, GPs would take at least fifteen per cent more of the opportunities arising in consultations to perform indicated preventive activities which were due for their patients, and that they would do so without significant increase in services provided or in fees billed. The study also examined the associations of characteristics of patients, GPs and consultations with the performance of preventive activities.

This chapter will discuss the results of the trial, their implications for Australian general practice and provide some recommendations for the further development of automated reminders for preventive care in Australian general practice.

10.4.1 Methods

10.4.1.1 Setting

The setting of this study was dictated by the aim to examine the research questions in community rather than in academic or special research settings.

The study depended on the use of computer programs that would remind GPs about preventive activities that were due for their patients. Computer programs are very specific to the application (that is, the package of software that is designed for a particular purpose, such as a clinical record system) for which they are written. Different software packages may be written in different computer languages, and even
packages written in the same language may have quite different structures, program
logic, database organisation and user interfaces. For many years Australian GPs have
had a dream or vision of being able easily to interchange software applications without
having to convert their existing clinical and billing data into different formats.
Conversion of data into different formats often results in loss of data, a loss of the some
of the structural relationships of those data, or both.

Informatics-focussed general practice organisations including the National Computer
Committee of the RACGP and the General Practice Computing Group have worked for
many years to try to get the medical software industry to agree to a common format and
structure for clinical data. A common format and structuring would enable all medical
software packages to read from and write to the same database in a practice. This
would allow practices to change easily from using one clinical software package to
another, and in theory would allow GPs even to use one package for one consultation
and a different one for the next, or to use software modules for specific tasks, from
different vendors. However, the commercial software vendors who make up the bulk of
the clinical software market in Australia see it as against their commercial interests to
make it easy for users to change from one software package to another. More
specifically, the vendors with the larger market shares are more likely to resist allowing
users to change easily to another package, because they may be more likely to lose
market share than to gain it, while for vendors with smaller market shares the opposite
may be true.

In the 1980s, the Medrecord billing and clinical software package was the leading
product in Australia, and additional programs such as those developed by users of the
Medrecord software, including Dr. Jan Ravet, had the potential to become widely implemented. However, despite a modular design that was intended to allow users to add their own programs to perform various tasks, the new owners of the Medrecord software package discouraged users from doing so.

The lack of portability of software between clinical computer packages was the reason that it was necessary to find practices that were using the Medrecord software package. Awareness of the difficulties of collecting data on paper dictated the need to find practices that were making all of their medical records using the Medrecord software, as well as billing their patients through the Medrecord billing package, so that all clinical and billing data would be available electronically.

The need to liaise very closely with the practices to be used in the study dictated that they had to be located in Adelaide. It was also important that the practices in the study had to be familiar with the Medrecord software, so that when the reminder programs were introduced the GPs would not be struggling to learnt to use them as well as having to learn the Medrecord software itself.

The practice that participated in the study was the only one in Adelaide which met these criteria, apart from my own practice. I chose not to include my own practice in the study because the generalisability of results obtained in the practice in which the reminder software had been developed was likely to be low. This has been a criticism of the widely-quoted study of reminders conducted in Israel by Weingarten and Bazel (Weingarten, Bazel et al. 1989), in which Weingarten was the sole GP and one of the authors of the reminder software.
Positive features of the practice in the study were that it is a ‘normal’ community-based practice, had patients of similar demographic profiles (age and gender) as the national patient population, had a relatively large number of GPs including some of each gender, and operated at four locations, which may have allowed some degree semi-autonomy and differing styles of practice. These aspects were not explored, but to at least some extent the four different surgeries may have resembled separate practices. The number of GPs participating also helped to compensate for the fact that only practice was involved. In these ways, this study may have better generalisability than Weingarten and Bazel’s.

Negative features of the practice in the study, from a research point of view, were that the practice was busier than it wanted to be, because of a chronic and increasing shortage of GPs in the area, and that the GPs were of fairly similar ages. The overload of patients was likely to cause the GPs to do only what patients perceived as most urgent and most important, and to omit, knowingly or unknowingly, other desirable actions, just in order to get through the workload for the day. The figures for the numbers of patients seen by the GPs in the practice which were detailed in the Results chapter testify to this, with the female GPs providing more than twice as many services as female GPs nationally, and the male GPs providing greater numbers of services than male GPs nationally. The practice’s heavy patient load was likely to have reduced the GPs’ ability to respond to the reminders, and therefore to have reduced the effect size of the intervention and the number of statistically significant results obtained. The fact that the GPs were of fairly similar ages and years of experience made it unfeasible to analyse their responses to the reminders and their patterns of performance of preventive
activities according to age. If the practice had had two newly vocationally-qualified GPs, two very senior GPs nearing retirement, two who were ten years post-qualification and two were twenty years post-qualification, analysis by years of experience or by age may have yielded useful information, although the small numbers of doctors involved would have militated against the results reaching statistical significance.

10.4.1.2 Study design

Randomised controlled trials are considered to provide the strongest evidence for the effects of interventions, but other designs such as time series (alternating periods of reminders and no reminders) can also provide useful evidence.

The design of the study was dictated in part by the suitability of only one practice for the study, which precluded randomisation by practice. A time series design would have been possible for this study. Reminders could have been switched on for all patients for a period, say one week, one month or three months, then switched off for a similar period, then on again and off again, and the results studied. This design would not been very suitable for the reminders about influenza immunisation, which is indicated for a relatively short period of about four months in each year. Some contamination or carry over is likely to have occurred if the trial had been conducted as a time series design. It is reasonable to expect that such carryover would have been greatest at the beginning of a ‘no reminders’ control period and then to have decayed gradually. It was decided to aim to conduct the trial as a randomised controlled trial. The randomisation method is discussed below.
The decision to conduct the trial in a fully computerised practice was made for two main reasons. The first was that GPs increasingly are using electronic systems for clinical and administrative purposes, and as was outlined in the Background chapter, they are being encouraged to do so by government through incentive payments for using practice computer systems to prescribe and to communicate clinical information.

10.4.1.3 Preventive care intentions of GPs in the trial.

As was outlined in the Methods chapter, the GPs in the study practice were offered a choice of thirty activities for which they could receive reminders. The GPs chose twelve activities, of which eleven were included in the then current RACGP Guidelines for Preventive Activities in General Practice (Royal Australian College of General Practitioners 1996). The twelfth activity about which the GPs wanted to be reminded was the recording of patients’ allergies.

It is understandable that the GPs chose to be reminded mainly about activities which were well-known, relevant to relatively large proportions of their patient population, and most of which were long-established, rather than less well-established and less widely-discussed activities such as testing the rubella immunity of women before their first pregnancy or assessing the eligibility of older patients for the State’s subsidised taxi fares scheme. The GPs had not experienced opportunistic reminders from their clinical computer system and presumably wanted to ‘test the water’ with a relatively small subset of the activities for which reminder programs had been written.
10.4.1.4 Recording of smoking status

The study GPs’ intention to record the smoking status of patients from the age of 17 years is quite similar to the then current RACGP Guidelines of doing so “from 18 years”. The RACGP Guidelines did not specify how often GPs should ask patients whether they had started smoking or whether they still smoked. This was a deficiency in the RACGP Guidelines.

As it happens, this reflected what was possible to do in the Medrecord software. As was explained in the Methods chapter, the Medrecord software was designed to record smoking status as an undated free text field. Without re-programming that function to include a date field or trying to force the GPs to make entries in the free text field in a highly structured way, this meant that the only information that was reliably obtainable about patients’ smoking status was whether any entry had been made in the smoking field, and this was the approach that was taken. As was explained in previous chapters, a decision was made at the outset of the study that the GPs would not be asked to make any additional or different records from their usual way of working, and that the intervention would be very carefully designed to use whatever data the GPs were already routinely recording.

10.4.1.5 The intervention used in the study

As was outlined in the First chapter, reminders can be characterised on a number of dimensions, as has been done in the protocol for the planned Cochrane review (Gordon, JM et al. 1998) of ‘on–screen computer reminders’, which may be reminders for any
kind of care in any kind of health care setting, and not only reminders about preventive activities in general practice. The intervention used in this study can be compared with the hypotheses developed by Gordon and colleagues based on the results of previous reviews and studies of reminders.

The Cochrane protocol hypothesises that “reminders that include some individual patient-specific information are more effective than generic reminders”. The reminders used in this study fitted this definition.

The Cochrane protocol hypothesises that “reminders that indicate that a response should be recorded or given are more effective than reminders that do not require a response.” The reminders used in this study did not require any response, for the reasons outlined previously. When the Cochrane systematic review of reminders is published, it will be interesting to see whether it acknowledges the possibility that forcing doctors to respond in some way to reminders leads to doctors recording inaccurate or untruthful responses, so that they can get on with the rest of the consultation.

The Cochrane protocol hypothesises that “reminders developed with the involvement of target clinicians are more effective than reminders developed without their participation.” The reminders used in the present study were developed after consulting with the GPs in the study practice about their preventive care intentions.

The Cochrane protocol hypothesises that “reminders delivered within a consultation are more effective than reminders delivered outwith a consultation.” The reminders used in the present study fitted this definition.
The Cochrane protocol hypothesises that “reminders delivered by or with the knowledge of the target clinician's colleagues or patients are more effective than reminders delivered by other means.” The meaning of this is not clear. Presumably it does not refer to any real-time notification of other GPs that the GP seeing the patient is being reminded at this moment about some care that was indicated. It may refer to some entry remaining visible in the patient’s record after the consultation that the GP received a reminder or reminders about some care that was indicated. If this is the case, the reminders in the present study did not fit this definition. At the request of the study GPs, the reminder messages were not permanently written into the patient’s case notes. It is certainly possible that a permanent record of the reminders that would allow other GPs in the practice, or even quality assurance organisations such as practice accreditation authorities, to see that the GP was reminded but did respond to the reminder, would have a significant effect in encouraging responses to the reminders.

The Cochrane protocol hypothesises that “reminders that offer explicit advice are more effective than reminders that offer implicit advice or no advice at all.” It is not clear how a reminder can “offer no advice at all”. The very act of reminding a GP constitutes the giving of advice. The reminders uses in the present study gave explicit advice in the sense that each reminder was about a specific preventive activity and stated a date on which the activity had become due to be performed for the patient.

The Cochrane protocol hypothesises that “reminders that include an explanation of their content or advice are more effective than reminders that do not include this.” While this hypothesis may be relevant to reminders that present information of which GPs may
have been unaware, in the present study the GPs effectively had designed the reminders themselves to remind them about care which they knew that they wanted to give for reasons that they knew and understood. For the particular purposes of the reminders in this study, this criterion is less relevant than it would be for reminders that may be presenting new knowledge (that is, new to the GP reading the reminder) about various aspects of care.

The Cochrane protocol hypothesises that “reminders that are explicitly from or justified by reference to an influential source are more effective than reminders from another source. An influential source is a person or body likely to be perceived as credible by the target clinician.” The reminders in the present study were sourced from the GPs themselves, who it is reasonable to assume would regard themselves as ‘influential sources’ on their own behaviour. During the discussions with the GPs in the study, no specific reference was made to the RACGP Guidelines for Preventive Activities, but the GPs were asked to state what their own intentions about preventive care were.

The Cochrane protocol hypothesises that “reminders will vary in effectiveness systematically according to the targeted activity.” The results of the reminders used in this study support this hypothesis, with different sizes of effect seen for the various preventive activities.

The intervention that was developed and used in this study served its purpose reasonably well, at a time when few GP clinical computer systems were able to provide targeted opportunistic reminders that provided useful information to GPs.
The intervention benefited from arising from the needs of GPs for tools that can help them to improve the quality of care that they provide, and from being developed and refined literally in daily general practice. Being developed in general practice by GPs who could refine the prototypes several times daily, even between patients, allowed for much more rapid development and refinement than is usual in the software industry. It is usual that users of clinical software have to lodge development requests, which are accumulated by the vendor, periodically ranked for urgency, benefit and importance according to the vendor’s perception, then programmers are instructed on the basis of the requests, prototypes are supplied to beta testing practices which then have to feed back their comments, and the cycle is repeated possibly many times, until months or years later some new or enhanced software is made available.

Because the aim was to avoid asking the GPs in the study to alter their usual way of working, the intervention was custom programmed very carefully to accept and use the data that the GPs were already recording routinely. To enable the use of reminder programs for preventive activities to become widespread or universal, this will not be feasible, and practices will have to be asked to record some of their data in pre-defined ways so that the reminder programs can reliably detect and use the information that they need. However, programs can be written so that the user can define some of the inputs to conform with his or her, or his or her practice’s usual way of recording various data elements, and to do so through an interface that is easy for non-programmers and non technically-inclined people (which may include the bulk of GPs) to use. The cost of increasing the user-definability of how programs will work is in a larger amount of programming by the vendor to make this possible, which adds to the development costs, and also possible increases in maintenance and in making sure that future versions of
programs can accept and use the range of possible inputs that users may define for themselves.

The reminders were listed in their order of date due. This placed those due for longest first on the list and to that extent, the reminders were prioritised. It would have been possible to try to present the reminders in a number of different ways, in order to try to maximise response and to provide the greatest health benefit to patients.

Preventive activities may be judged to be of higher priority because:

- the result of the previous performance of the activity was abnormal (for example, a blood pressure reading of 190/100);
- the activity has not yet been performed for the patient at all despite having been indicated for some time;
- the activity has been performed previously for the patient, but a long time ago;
- because the health risk to the patient of not having the activity performed is judged to be higher than of not having other preventive activities performed;
- based on the patient’s recorded medical history, the activity is considered more important for this particular patient than for most other patients.

For example, women who have never had a cervical smear or who have not had one for many years are believed to be at greater risk of having undiagnosed cancer of the cervix. The Commonwealth now offers an incentive payment to GPs for performing a cervical smear for a woman who has not had one within the previous four years.

Reminders for smear tests for women for whom no test is on record or whose last test was more than say four years ago could be highlighted. The highlighting of the reminder could use any or several of a number of methods, such as larger font size, reverse video (pale characters on a dark background or dark characters on a pale background, depending on the background colour of the rest of the screen), a coloured
background, flashing, blinking or other animation, audible warnings or pre-recorded spoken messages.

This study found that for some of the preventive activities the GPs took smaller proportions of opportunities if there were more other preventive care opportunities at the same consultation. One implication of these findings is that GPs may respond better if fewer reminders are presented at a consultation. Alternatively, some of the GPs interviewed suggested that showing different reminders for each patient at each consultation may help to avoid habituation leading to reduced response to the reminders. Further research is needed to find the best balance between (for example) highlighting the most important of several reminders and suppressing display of reminders considered of lesser importance.

It would have been possible to require the GPs to respond to the reminders, which understandably has been shown to improve response (Litzelman, Dittus et al. 1993), but for a number of reasons outlined in the Methods chapter, it was decided against doing this.

Other more sophisticated and more computer processor-intensive modifications could have been made to the reminders. Some of the GPs in the study agreed that if the computer system had reported the number of times that a preventive activity had not been performed previously, even though it was due, this would motivate them to be more likely to perform the activity.

Another method of encouraging response would be to use GPs’ natural competitiveness and to inform the GP of his or current ranking in performance of this activity, or of all
preventive activities against that of his or her colleagues in the practice. The reminder
could notate something like 6/10, informing the GP that he or she was currently ranked
as the sixth best performer out of the ten GPs in the practice for performance of this
particular preventive activity. The programming of the logic for this is quite
straightforward and a simple extension of the programs that were used in the trial. The
computer simply would note for each activity that was due for the patient whether the
GP took that opportunity or not and record this in a file for that GP in which there could
be a data item for each preventive activity, containing in one element the number of
opportunities that the GP has had to perform that activity and the number of those
opportunities that the GP actually took. It is simple to express this as a ratio or
percentage, compare that GPs’ ratio of opportunities taken with those of all of the other
GPs in the practice for that activity, work out that GP’s position relative to the other
GPs in the practice and report the result as suggested above.

Further refinements could include monitoring each GP’s pattern of performance of each
preventive activity and response to reminders, in order to work out whether the GP
tends to perform preventive activities preferentially or selectively for certain types of
patients or in certain situations. The aim of this would be to highlight reminders in
situations in which the GP historically has performed worse, in attempt to make his or
her behaviour more consistent. This and the preceding idea of ranking GPs’
performance in real time may have been beyond the computer processing power
available at the time of the study to perform within the three seconds or so believed to
be the maximum reasonable time for users to wait for a response to their input.
The intervention had the virtue of not requiring the GPs to do anything differently from their usual practice in order to make it function. It built on their existing intentions to perform and actual practice of performing preventive activities for their patients. The intervention required no new education of doctors or patients. It required no change to be made to the local or national health system.

The intention that the study would be conducted in practices that used electronic medical and billing systems was fulfilled and made it possible to collect very large numbers of data automatically, cheaply and easily, and to manipulate and analyse those data in order to answer the research questions. This study would have been very expensive to conduct if the data were all on paper, and this is probably why no previous studies have examined many of the questions that were explored in this study.

10.4.1.6 **Relationship of the intervention to principles for clinical decision support systems**

My own experience as a GP participant in research trials led me to conclude that the acceptability of the reminders would be maximised by making them as unintrusive and non-disruptive as possible. My intention was to require as little alteration as possible to the study GPs’ usual ways of working, in order to maximise their compliance with the reminders and with the research trial. Many of the ‘commandments’ for clinical decision support systems discussed in a previous chapter (Bates, Kuperman et al. 2003), which were published after the trial of reminders had been conducted, also pointed to the desirability of interfering with doctors’ work as little as possible.

The relationship of those ten ‘commandments’ to the intervention is discussed below.
Speed Is Everything (Bates, Kuperman et al. 2003)

Running the reminder routines added less than a second to the time that it took the computer system to display the consultation screen after the doctor had identified the patient. In discussions before the start of the trial, the GPs in the study said that they found this acceptable.

Anticipate Needs and Deliver in Real Time (Bates, Kuperman et al. 2003)

The reminders were presented at the beginning of the consultations, more or less instantly, so that the GPs could take them into consideration when planning the conduct of the consultation. This was felt to be better than presenting them only later in the consultation or at the end of the consultation.

Fit into the User's Workflow (Bates, Kuperman et al. 2003)

The reminders alerted the GPs at the beginning of the consultation about preventive activities that were due for the patient, which allowed the GP to consider whether and how to perform or offer to perform those preventive activities during the consultation. The reminders remained visible for at least the earlier parts of the consultation, and if the GP had ‘gone over the page’ to a second screen, could be viewed again. This meant that if some time remained towards the end of the consultation after dealing with the patient’s agenda and with any other agenda that the GP may have had, the GP could review the reminders and again consider performing as many of the outstanding activities as time, energy and the particular situation permitted.

The reminders fitted in to the GPs’ workflow also by not requiring the GP to do anything different from his or her usual routine when using the practice computer system during consultations. For example, the reminder programs did not require that
the doctor leave the consulting screen to look at another screen on which reminders the
reminders were displayed, nor did they require that the doctor respond to a notice that
there were reminders, for example, by answering a question such as “Do you wish to
see the reminders now?” by clicking on a ‘yes’ or ‘no’ icon, nor did they appear only
when using another module, such as in Flanagan’s trial of immunisation reminders,
when the doctors saw the reminders only if they decided to prescribe a vaccine.

**Little Things Can Make a Big Difference** (Bates, Kuperman et al. 2003)

This commandment referred to the need to fine tune the intervention very carefully in
order to make it as effective as possible. The reminders were extensively tested and
refined first in my practice and then in the study practice, in order to make them as
useful as possible, by providing the maximum useful information in the relatively small
space available on the 80 column text screen display of the Medrecord clinical software.

In contrast, the reminders provided by the vendor of the widely-used Medical Director
clinical software version 2.87 (Health Communication Network 2006) provide less
information about some of the same preventive activities. For example, GPs get
reminders from this system in a rather alarmist and possibly punitive style. A reminder
to measure the patient’s blood pressure says: “A Blood Pressure reading has not been
recorded in MD2 for over a year!” . This message does not tell the GP how long ago the
patient’s blood pressure was last measured or what the reading was. GPs’ responses are
likely to be different to a reminder that shows that the patient’s last measured blood
pressure was 110/80 one year ago, or 190/110 five years ago, but the Medical Director
reminder does not provide this information.

**Simple Interventions Work Best** (Bates, Kuperman et al. 2003)
The reminders sought to give only relatively simple advice about routine preventive activities that were due. They did not aim to advise about diagnosis or treatment of health problems, nor did they try to offer a rationale or references for the reasons why the various preventive activities were indicated.

This approach was reasonable because the GPs had helped to design the reminders so that they were reminded only about activities for the types of patients for whom they wanted to perform them, at the intervals at which they wanted to perform them. This reduced the need for justification and explanation of the reasons for each reminder when it appeared.

**Ask for Additional Information Only When You Really Need** (Bates, Kuperman et al. 2003)

The reminders were very carefully crafted so that the GPs were not expected to record any data that they would not normally record about their patients.

**Recognize that Physicians Will Strongly Resist Stopping** (Bates, Kuperman et al. 2003)

This commandment points out that doctors in general do not respond well to being told that an action that they are proposing to take or are taking may not represent best quality care. This commandment did not apply to the intervention in this study, because the reminders offered only positive advice to consider performing preventive activities that were likely to be appropriate for the patient according to the GPs’ intentions.

**Changing Direction Is Easier than Stopping** (Bates, Kuperman et al. 2003)
This commandment was not relevant to the intervention in this study, which did not seek to change proposed or current courses of action that the GP was taking.

**Monitor Impact, Get Feedback, and Respond** *(Bates, Kuperman et al. 2003)*

While it would have been possible to monitor the effects of the reminders, feed this information back to the GPs and alter the reminder system in response, doing so would have significantly complicated the trial.

Feedback was sought during the trial about any problems with the function of the reminder programs.

**Manage and Maintain Your Knowledge-based Systems** *(Bates, Kuperman et al. 2003)*

There were no changes of any significance during the trial to authoritative recommendations about the preventive activities being studied, so it was not necessary to make any changes to the reminders.

### 10.4.1.7 Enrolment and randomisation

As explained in the Methods chapter, various forms of randomisation were considered. Randomisation could have been by GP. With some of the GPs working mainly in only one of the four locations, this may have been a reasonable approach. However, the doctors did all work as part of the same practice, did all consult in more than of the practice’s locations and did all participate in formal and informal meetings of the whole practice, so some degree of contamination is likely to have occurred, especially amongst the GPs who tended to be working more frequently together in the same locations.
It may have been desirable to randomise by opportunity, since this was the unit of analysis. However, randomisation by opportunity would have involved keeping a count of opportunities occurring for up to ten doctors simultaneously, allocating every second opportunity for each doctor (keeping in mind that there were up to ten opportunities in each consultation) to the intervention group and then generating the reminders. All this would have had to occur while the doctors waited after pushing the return button to initiate the ‘Start Consultation’ process. The computer processing power available was assessed as probably not adequate to ensure that this intensive computation would occur in the three seconds or less that Bates and colleagues’ Ten Commandments (Bates, Kuperman et al. 2003) suggest is the maximum acceptable time that GPs will wait for the computer to perform each task, so this method of randomisation was not implemented.

Randomisation by patient seemed a reasonable compromise between randomisation by GP or randomisation by opportunity. Randomisation by using the last digit of the sequentially-allocated family numbers of patients was expected to provide experimental groups that were balanced not only for characteristics such as age and gender, but it also meant that the experimental groups were expected to be balanced in terms of each covering the spectrum from the patients and families first registered by the practice many years previously, to those who first attended the practice on the last day of trial and were registered on that day. This method of allocating patients to experimental groups would therefore prevent or avoid having patients in one experimental group consisting of a greater proportion of patients registered longer ago than patient in the other group. This was important because the demography of the patient population is
likely to have changed during the years since the practice opened, and a randomisation method that allocated earlier-registered patients to one group and later-registered patients to another may have resulted in the groups being unbalanced.

10.4.1.8 Data collected

10.4.1.8.1 Quantitative data

A very large number of data were successfully collected, and provided what was needed to answer the research questions.

The mean number of consultations of 3.7 per patient during the trial was less than the national average of about 6 consultations per Australian. A possible reason for this is that the study practice’s population contained a lower proportion of patients aged over 75 years than the national average. Another possible factor may be that, as was explained in the Methods chapter, only patients for whom at least one preventive activity was or became due during the trial were enrolled, and it is possible that patients who attended more frequently were more likely to be ‘up to date’ for indicated preventive activities and therefore less likely to be enrolled in the trial. Other reasons may relate to the setting of the study practice, which is in a beachside holiday and tourist area, and may have higher numbers of transient and itinerant patients that other practices, and that such patients may attend only once or a small number of times while they are holidaying, living or working in the area.

The raw data as they came from the practice were able to be manipulated to enable patients, GPs and consultations to be characterised in ways that are unique to this study.
No previous published study has examined the relationships between performance of preventive activities and the numbers of long term problems recorded for each patient prior to each consultation, whether the patient was seeing his or her usual GP within the practice, the numbers of preventive opportunities at consultations, the numbers of problems coded at consultations, the fee level billed, elapsed time since each preventive activity became due and the ordinal number of the opportunity.

10.4.1.8.2 Qualitative data

The qualitative data collected are reasonable but not extensive, because of lack of time and lack of access to some of the GPs in the trial. This is discussed further in the Limitations section.
10.4.2 Results

10.4.2.1 Comparability of experimental groups

The randomisation process was effective and resulted in experimental groups that were acceptably similar on a number of characteristics.

10.4.2.2 Numbers of opportunities during the trial

Numbers of opportunities for all of the preventive activities as predicted were large, ranging from 969 for the activity MMR to 27,036 for the activity TET.

It had been predicted for the present study, as described in the Methods chapter, that for children aged under five years there would be a maximum of 800 opportunities per randomised group to perform each of the three preventive activities indicated for them, and that this number would exceed the number of 225 required to provide 90% power to detect a difference in performance of 15% between the groups at a p value of 0.05. In fact, there were 446 opportunities to perform MMR immunisation during the trial for patients in the intervention group, and 523 opportunities for patients in the control group. These numbers of opportunities were expected to provide the required statistical power.

10.4.2.3 Reminders actually displayed to GPs

As was outlined in the Methods chapter, in the interests of not requiring the GPs to change their usual way of working, they were permitted to continue to use the ‘Add
The GPs’ apparent enthusiasm to use the reminders led to an expectation that they would use the ‘Start Consultation’ routine in all or most of their consultations. The finding was that one GP apparently chose not to do so, after perhaps the first couple of consultations, and that the other nine GPs used the ‘Start Consultation’ routine for between 51% and 99% of their consultations with intervention group patients, resulting in a mean use for the ten GPs of the “Start Consultation” routine in only 66% of consultations with intervention group patients. The reasons for the less than universal use by the nine GPs who did use the ‘Start Consultation’ routine are not known. In retrospect, it would have useful to ask them this during the interviews. A possible reason, outlined earlier, is that it is believed that some of the GPs wrote the progress notes of some of their day’s consultations only in the evening at home, by accessing the practice’s computer system remotely, and it may be that they tended to use the ‘Add Progress Note’ function to do so, because reminders would not have been directly useful to see at those times. Of the nine GPs who did use the ‘Start Consultation’ function, if they also used the ‘Add Progress Note’ function for some consultations while patients were with them, there is a question of whether they chose to do so for particular types of patients or in particular consultations, rather than at random.
Specifically, it would be useful to know whether those nine GPs used the ‘Add Progress Note’ function if for some reason they did not want to see any reminders at a particular consultation. If there were such reasons for the use of the ‘Add Progress Note’ function
during consultations by those nine GPs, this may have affected the effect size of the reminders.

Because the GPs in the trial were not forced even to see the reminders, the trial was not only a trial of the effects of the reminders, but also a trial at least to some extent of whether GPs chose to see reminders.

10.4.2.4 Primary hypothesis: Effects of the reminders

The univariate relative risk of 1.32 (1.23-1.41) for all preventive activities combined confirmed the hypothesis that the GPs would take at least fifteen per cent more of the preventive care opportunities overall when they were reminded to do so. This overall result was achieved through increased performance, for intervention patients compared to control patients, of eight of the preventive activities (ALLE, BP, MMR, PAP, PNEU, SMOK, TET and WT), and despite decreases in the performance of three of the preventive activities (DIAB, FLU and LIPI).

This result was achieved despite a number of limitations which are likely to have reduced the effect of the reminders and which are discussed in the Limitations section below.

The results of this study cannot be compared directly with the results of any previous study for two main reasons. The first reason is that no other published study has examined performance simultaneously of the same set of preventive activities. Most previous studies of the effects of reminders for preventive activities in general practice have examined the effects of a smaller number of reminders. The reasons for
examining the effects of reminders for only a few preventive activities have not been explained by the authors of those previous studies. A part of the explanation may be that in many or most of those studies, the medical records were kept on paper, and auditing paper records to find out which preventive activities were performed is expensive and tedious. The second reason for the difficulty in comparing the results of the present study with those of previous studies of is that almost all other studies of the effects of reminders for preventive activities effects of reminders for preventive activities in general practice is that the present study examined the rates of taking of preventive opportunities in individual consultations while almost all previous studies have reported only the effectiveness or efficacy of the interventions used. Whether this is a limitation of the present study or a limitation of previous studies depends on one’s point of view and focus of interest. In retrospect, this study would have been strengthened by including an assessment of each patient’s ‘up to date’ status at the start and end of the trial for each preventive activity indicated for him or her. This would have facilitated comparison with previous studies of reminders, most of which used only this measure to assess the effects of reminders.

One unintended apparent consequence of the introduction of the reminder system was that one of the GPs in the practice apparently decided to avoid seeing reminders, by using the ‘Add Progress Note’ method of recording progress notes, rather than the ‘Start Consultation’ method. The ‘Start Consultation’ routine differed from the ‘Add Progress Note’ method only in starting a timer that recorded the number of minutes until the ‘End Consultation’ function was used, and in providing facilities for user-written software to be added into the system at specified points to perform specific tasks. The only visible and practical difference for the GPs in the study practice between using the ‘Start
Consultation’ program and the ‘Add Progress Note’ program was that when GPs used the ‘Add Progress Note’ method, they did not receive any preventive care reminders for patients in the intervention group for whom any of the preventive activities being studied was due to be performed.

10.4.2.4.1  Effects of reminders for individual preventive activities

10.4.2.4.1.1  Recording of patients’ allergies

In the randomised trial, the reminders for this activity had the second largest size of effect for any of the individual preventive activities, with a univariate relative risk of 1.81 (1.63-2.02). The effect size exceeds the fifteen per cent level of difference in performance between control and intervention groups that was specified in the hypothesis as being clinically significant. In consultations in which GPs were reminded compared to those in which they weren’t, the independent relative risk was larger still at 2.58 (2.35-2.83). These results may reflect the importance that GPs place on recording the patient’s allergies, which is acknowledged by the RACGP in its Standards of General Practice (Royal Australian College of General Practitioners 2005), in which the explanation of criterion 1.7.2 states:

“While it is important to record all allergies in health summaries, it is particularly important to record allergies to medications as this facilitates safer prescribing (especially when computer based) and reduces the likelihood of adverse patient outcomes. It is important also to record ‘no known allergies’, but not to have this as an assumption in the absence of recorded data.”

As was explained in the Methods chapter, the recording of patients’ allergies is an important measure that GPs can take to reduce the risk of adverse drug reactions.
occurring as a result of prescribing a medication to which the patient has a known allergy, intolerance or other type of sensitivity.

In 1998, when the trial was started, the Medrecord software did not warn the user if no note had yet been made about whether the patient had any allergies, and this is why the GPs in the study asked for a reminder to be generated if this was the case. In 2006 the vendors of most clinical software in use in Australian general practice are aware of the importance of having something recorded about any allergies that the patient may have, and their software automatically warns the user if the patient’s allergy record is blank. GPs can note the absence of known allergies usually by ticking a box or clicking on an on-screen button, and the software subsequently displays a message to the effect of “No known allergies” on its main medical record screen or at least on the prescribing screen. Further, most current clinical systems use information about any recorded allergies to check during the electronic prescribing process for possible adverse reactions to proposed prescriptions, and warn the user if any are found.

Performance of recording of allergies independently was significantly better for patients aged over 27 years compared with performance for those who were younger. This is understandable, because older patients are both more likely to receive prescriptions for medications, and to have had medications prescribed previously and therefore more likely to have experienced adverse reactions. In comparison, an infant of one month old is much less likely to have any known allergies, because he or she is likely to have had fewer medications prescribed so far than an adult who is 60 years old. The significantly higher performance of recording of patients’ allergies for patients who had made fewer visits in the preceding two years is consistent with the general trend found for most of the other preventive activities studied, as is the higher performance of this
activity by the female GPs and when consultations were longer. The independently higher performance of this activity when more problems were coded in the consultation may suggest that if patients were sicker and had more problems, the GP may have been more likely to be considering prescribing medications and therefore may have been more concerned about documenting known allergies before doing so. The higher performance of recording of allergies when more problems were coded at the consultation is in the same direction as that found for the activities SMOK, BP and WT, but in the opposite direction to that found for the activities PAP and LIPI, for which performance was independently lower when more problems were coded. The association of between better performance of ALLE, SMOK, BP and WT when more problems were coded in the consultation may suggest that this occurred in consultations in which the GP was making a more thorough overall assessment of a patient who may have been ill and for whom the GP may have been intending to prescribe medication and was therefore concerned about possible allergies.

**10.4.2.4.1.2 Recording of smoking status**

The study GPs’ intention to record the smoking status of patients from the age of 17 years is quite similar to the then current RACGP Guidelines of doing so “from 18 years”. The RACGP Guidelines did not specify how often GPs should ask patients whether they had started smoking or whether they still smoked. This was a deficiency in the RACGP Guidelines. As it happens, this reflected what was possible to do in the Medrecord software.

Since the time of the trial, the RACGP has made its guideline about assessing patients’ smoking status more specific. The 6th edition of the RACGP Guidelines for Preventive
Activities in General Practice (Royal Australian College of General Practitioners 2005), published in September 2005, advises that GPs should ask all patients over ten years old annually whether they smoke.

Recording of patients’ smoking status had the lowest level of performance in the intervention group of patients of all of the eleven preventive activities being studied, with only 2.0% of opportunities being taken for this group of patients. The univariate relative risk of patients’ smoking status being recorded in the randomised trial of reminders was 1.12 (0.90-1.39), which did not reach the clinically significant fifteen per cent difference specified in the hypothesis. In consultations in which GPs were reminded compared to those in which they weren’t, the independent relative risk was larger at 1.23 (1.00-1.52) and just short of statistical significance at the p = 0.05 level.

McPhee et al (McPhee, Bird et al. 1989) reported that at the end of their trial of reminders, 45% of intervention patients compared with 32% of control patients had been assessed for smoking according to guidelines which were in use. Rosser reported that 38% of intervention patients compared with 12% of control patients were ‘up to date’ for this assessment, and Weingarten reported that 83% of his intervention patients compared with 56% of his control patients were ‘up to date’. The differences in methodology from the present study prevent the making of direct comparisons of the sizes of the effects of the reminders in the trials by McPhee and colleagues, Weingarten and the present study. As was explained above, the design of the trial made it more likely that the ‘hard cases’, patients for whom the GPs found it more difficult to perform preventive activities, were probably over-represented amongst the opportunities to perform preventive activities in this study. It is possible that one reason for the low
proportions of opportunities taken and for the relatively small effect sizes in the present study for some preventive activities, such as recording smoking status, may have been that the GPs had in fact already recorded the smoking status as large a proportion of their patients as the GPs in McPhee’s and Weingarten’s studies, leaving the smoking habits of only a few ‘hard cases’ unrecorded who, for example, may have refused to tell the GP whether they smoked, or for whom the GP was so busy with multiple or serious problems that he or she simply didn’t get around to asking the patient about his or her smoking habits.

10.4.2.4.1.3 Screening for hypertension

The GPs in the study chose to start screening patients from the age of 20 years every two years for hypertension. The then current RACGP Guidelines recommended screening for hypertension “every 1-2 years from 16 years”. The study GPs’ intentions about screening for hypertension were fairly similar to the recommendation in the RACGP Guidelines. Since hypertension is relatively rare in people under 20 years of age, the GPs’ decision to start screening patients from 20 years rather than 16 years was unlikely to result in many cases being missed compared to the number that would have been found by following the then current RACGP Guidelines. The RACGP since the time of the study has implicitly acknowledged the low value of screening 16 and 17 year olds, with the 6th edition of the RACGP Guidelines advising GPs to start screening patients from 18 years every two years.

The proportions of opportunities taken in the randomised trial to record patients’ blood pressure as screening for hypertension were relatively high compared to those for some other preventive activities in this study, at 15.1% in the intervention group of patients
and 15.5% in the control group of patients giving a very small univariate relative risk of 1.02 (0.90-1.16). However, in consultations in which GPs were reminded compared to those in which they weren’t, the independent relative risk was larger and statistically significant at 1.72 (1.56-1.90). This finding is consistent with the findings of other trials of reminding GPs to screen patients for hypertension. Rosser et al (Rosser, McDowell et al. 1991) reported that 31% of intervention patients, compared with 21% of control patients, were screened for hypertension in their trial, while Weingarten (Weingarten, Bazel et al. 1989) reported proportions of 73% of intervention patients compared with 57% of control patients up to date for this.

Again the differences in outcome measures used preclude direct comparison of the size of the effect of the reminders between previous studies and the present study.

Possible reasons for the apparent lack of effect of the blood pressure reminders in the randomised trial in the present study include: 1) blood pressure screening is a long-established preventive activity; 2) blood pressure is often measured as one of the observations performed when assessing patients who are ill, rather than just as screening for hypertension in asymptomatic patients. However, these considerations would have applied also in the other trials listed above. The various limitations and design effects discussed elsewhere in this thesis that all were likely to reduce the apparent size of the effect probably played a role in the size of effect in the randomised trial of the reminders being small and insignificant.

Performance of the activity BP was independently significantly higher:

- for male patients than female patients;
- for patients aged over 37 years compared to those younger;
• for patients who had had fewer than five consultations during the preceding two years, compared to those who had had more;
• for patients who had at least one long term health problem recorded previously;
• when the GP was female;
• in longer consultations than short ones;
• when a co-payment was billed;
• when two or more problems were coded at the consultation;
• when there was no other or only one other preventive activity due to performed, compared with four or more other preventive activities due to performed;
• when the activity had been due for 1-3 years, compared with having been due for less than one year;
• when there had been fewer previous opportunities to perform the activity.

10.4.2.4.1.4 Cervical smear test

The GPs in the study chose to perform this activity in accordance with the then current RACGP Guidelines.

In the randomised study, the reminders showed minimal effect, with 7.8% of opportunities taken for intervention patients and 7.2% taken for control patients. In consultations in which GPs were reminded compared to those in which they weren’t, the independent relative risk was larger and statistically significant at 1.20 (1.05-1.38).

Burack et al. (Burack, Gimotty et al. 1998) found that reminders for cervical smear testing had no significant effect, and Ornstein et al. (Ornstein, Garr et al. 1991) found that a smaller proportion of intervention patients was ‘up to date’ for this than control patients at the end of their trial (39% of intervention patients compared with 45% of control patients). As was outlined in the literature review, possible explanations for the
lack of effect of the reminders in Burack et al.’s study was the relatively short screening interval of only one year, possible lack of agreement by the doctors that this interval was appropriate, and the fact that the family physicians and internists had to refer patients to the gynaecologists in the HMO to perform the smear. Ornstein et al. could not explain the lack of effect or reminders in their trial nor the decline in the proportions of patients who were ‘up to date’ between the beginning and the end of their trial. In contrast, most other studies of reminding doctors about cervical smears tests that were due reported significantly positive effects (McDowell, Newell et al. 1989; McPhee, Bird et al. 1989; Rosser, McDowell et al. 1991). The results of these other studies are difficult to compare directly with those of the present study because of the differences in settings, practice systems and outcome measures, as was explained above.

Possible reasons for the apparently small effect of the reminders for cervical smear testing in the present study may include: 1) that cervical smear testing is a long-established preventive activity which has been heavily promoted to patients in public campaigns; 2) a large proportion of women are on the State-run Back-up register and receive recall letters from that organisation, which may prompt them to attend their GP specifically for the purpose of having a smear test; and 3) the study practice had already generated recalls for at least some patients for smear tests using the pre-existing recall function in the Medrecord software, and these previously-generated recall and reminder messages were available to the GPs for patients in both the intervention and control groups of patients.

Performance of this activity was independently significantly higher:

- for women aged 18-36 years compared with those aged over 53 years;
• for women who had had fewer than 5 consultations during the preceding two years than those who had had more than 11 consultations during the preceding two years;
• for women who had had one long term health problem recorded previously than those who had no long term health problems recorded previously;
• when the GP was female;
• in longer consultations compared to shorter consultations;
• when a co-payment was billed;
• when no problems were coded in the consultation, compared with when at least one problem was coded in the consultation;
• when the activity had been due for more than three years, compared with when it had been due for less than one year;
• at the first opportunity during the trial, with a strongly declining trend with each subsequent opportunity during the trial.

10.4.2.4.1.5 Recording of weight

The study GPs chose to weigh patients over 20 years of age annually, while the RACGP Guidelines advised GPs to weigh all patients “at least every few years”.

The results of the randomised trial showed a significant difference between performance for the intervention group of 6.2% of opportunities taken, compared with 4.9% of opportunities taken for the control group. In consultations when reminders were actually displayed compared to those in they were not, the difference was even more significant, with 8.8% of opportunities being taken compared with 4.0% of opportunities being taken in consultations where no reminder was displayed.

The other controlled trial of reminders in general practice for recording of weight was that of Weingarten (Weingarten, Bazel et al. 1989), who reported that at the end of their
trial, 71% of intervention patients had been weighed within the previous two years, compared with 68% of control patients, the difference not reaching statistical significance at the 0.05 level. There is a similarity between Weingarten’s results and those of the present study in that in both studies, the recording of weight was several places from the top in terms of size of effect of reminders.

The advice in the 6th edition of the RACGP Guidelines is more specific than the advice in the 4th edition of 1996, and contains the advice that “body mass index (BMI) and adult waist circumference should be measured every 2 years for those patients who appear overweight”, but also the somewhat conflicting advice that weight and waist circumference should be measured for "all Australians (…) every 2 years and for "patients who are overweight or obese (…) every 6 months." Presumably the difference in the advice is due to a failure of proof reading and the first statement was probably intended to say something like: "Body mass index (BMI) and adult waist circumference should be measured every 2 years for all patients and more often for those who appear overweight."

It is noteworthy that the 6th edition of the RACGP Guidelines now advises the measurement of waist circumference as an additional method of assessing whether and to what degree the patient is too fat, rather than relying only on weight and calculation of BMI, which can be misleading, because muscular people may have BMIs above the notional healthy maximum of 25. Furthermore, many or most people lose muscle mass and some height as they age beyond 50 years, which means that even if their weight and BMI remain the same, they be fatter than previously. The 6th edition of the RACGP Guidelines explains that no single measure will give an accurate picture for all patients.
Measuring patients’ fatness accurately is not easy, but probably is also not really necessary. Simply looking at the patient may be as reliable as any other method of judging whether a patient is too fat, but this does not provide a number that can be entered into the medical record and compared over time. The real concern is not about weight, but about fatness, size and shape. Changes in the patient’s clothing size may be as good a guide to this as any other measure, keeping in mind that clothes of the same actual size may be labelled differently by different manufacturers or even by the same manufacturer over time.

10.4.2.4.1.6 Screening for diabetes

The study GPs chose to screen patients over the age of 65 years every five years for diabetes. The then current RACGP Guidelines advised that screening for diabetes should be performed “not routinely” and should be “based on risk factors, including age”. The Medrecord software did come provided with some structured facilities for recording risk factors such as obesity and family history in systematic ways, but the GPs in the study practice were not using these facilities enough to provide any reliable method of assessing automatically which patients may be at higher risk for diabetes. Therefore they chose to use just the age criterion. Perhaps in part because the RACGP Guidelines gave no advice about how often to screen patients considered at higher risk of diabetes, the GPs chose the relatively infrequent interval of five years. It is important to note that in Australia serum glucose levels are performed very frequently without being specifically requested, as a part of multiple biochemistry testing that may be requested for a very wide range of reasons, ranging from diagnostic investigation or follow up for specific metabolic or other conditions, to a general purpose screen for
significant organ system and metabolic dysfunction in patients who are unwell but in whom there are no specific symptoms or signs. The high frequency with which glucose levels are performed in this way without being specifically requested means that a large proportion of the adult population is effectively being screened for diabetes. In this study, possibly a large proportion of the glucose levels performed for patients over the age of 65 years are likely to have been performed for these kinds of reasons, rather than specifically for screen for diabetes.

This may explain the finding that there was no significant difference in screening between the experimental groups, with 2.5% of opportunities being taken for patients in the control group and 2.4% being taken for patients in the intervention group. These results include consultations by the GP who apparently chose not to see reminders for any patients, and it also includes consultations with patients in the intervention group for whom this activity was due to be performed but for whom no reminder was generated because the GP used the ‘Add Progress Note’ method of recording the progress note, as has been explained in the Methods and Results chapters. The outcome is different when we compare the results for performance of this activity in consultations with patients for whom this was indicated and due and in which the GPs actually received the reminder to screen for diabetes, with performance in consultations with eligible patients for whom they did not receive the reminder (this includes all patients in the control group and consultations with intervention group patients in which the GP used the ‘Add Progress Note’ function which did not generate reminders).

When a reminder was actually displayed, the GPs took 3.2% of opportunities to screen for diabetes, compared with 2.2% of opportunities when no reminder was displayed, giving a relative risk of 1.43, which although showing a significant size of effect did not
reach statistical significance because of the low absolute proportions of opportunities taken.

The 6th edition of the RACGP Guidelines advises screening for diabetes every three years in all patients from 55 years of age onwards, with groups considered at higher risk to be screened annually from 35 or 45 years of age depending on their race and other risk factors. The intensifying of screening since the 4th edition of the Guidelines was published probably reflects both the increased awareness in the profession of the high health risks faced by diabetics and the increasing proportion of the population that is diabetic or becoming diabetic.

10.4.2.4.1.7 Screening for hyperlipidaemia

The GPs in the study practice chose to measure serum cholesterol every five years for patients over the age of 20 years, while the then current RACGP Guidelines were much more conservative, advising this only “at least once for men aged 45 to 65 years”.

In the randomised trial, the GPs took 2.4% of opportunities for patients in the intervention group and 2.7% of opportunities for patients in the control group, while in consultations in which they received reminders, the difference was a little larger with 3.0% of opportunities taken when the GPs were reminded compared with 2.3% of opportunities taken when they were not reminded. Neither of these results reached statistical significance at the \( p = 0.05 \) level.
Weingarten (Weingarten, Bazel et al. 1989) and Ornstein and colleagues (Ornstein, Garr et al. 1991) similarly found no significant effect of doctors being reminded about cholesterol screening.

The low proportions of opportunities taken in the present study to screen for hyperlipidaemia are noteworthy. A possible explanation is that in Australia total serum cholesterol is often included by pathology laboratories in multiple biochemical analyses which are being performed for reasons other than screening for hyperlipidaemia, and that it is likely therefore that many patients in the practice’s population had had a serum cholesterol recorded for these reasons, leaving only a relatively few ‘hard cases’ remaining unscreened. This group may have included patients either who refused screening for hyperlipidaemia or for whom the GPs were reluctant to perform this activity for some other reason.

The then current RACGP Guideline recommended screening only middle aged men for hyperlipidaemia. It appears that the GPs in this study agreed with this to some extent and may have implemented their stated intentions selectively, because they took increasing proportions of opportunities with increasing patient age: they took only 1.5% of opportunities for patients aged 20-33 years, increasing to 2.8% of opportunities for patients aged 34-46 years, and increasing further to 3.4% of opportunities for patients aged 47-69 years, results which did reach statistical significance.

The 6th edition of the RACGP Guidelines recommends screening both men and women every five years starting from age 45 years, without any upper age limit, but notes that the evidence for the benefits of this in women is weaker than that for men. Earlier and
more intensive screening and assessment of absolute cardiovascular risk are advised for patients who may be at higher than average risk of cardiovascular disease. There are two comments to make about the age limits for screening. The first is that recently the value of testing cholesterol and lipids in those over 75 years of age, with the intention of considering lipid-lowering drug treatment, has been questioned, with suggestions that doing so may do more harm than good. Secondly, there has been increasing emphasis on identifying younger adults with high lipids, with the intention of helping them to reduce their levels of lipids with lifestyle measures and possibly medication as well, in order to reduce their risk of cardiovascular disease in their middle or later years.

Clearly the study GPs saw lipid screening as worthwhile for a wider age and gender range than the RACGP Guidelines advised. Possible reasons for this may be that in the years since the RACGP Guidelines had been prepared before their publication in 1996, there may have been growing awareness within the profession of risks of high serum lipids, with the limits of maximum levels considered acceptable being revised progressively downwards.

10.4.2.4.1.8 Influenza immunisation

The study GPs agreed with the then current RACGP Guidelines that all patients over 65 years of age should be immunised. As was explained in the Methods chapter, certain chronic health conditions put patients younger than 65 years at higher risk of complications and hospitalisation. Although it would have been desirable to try to generate reminders for these patients, it was felt that the practice’s records did not contain sufficiently reliable information to ensure that the reminders would have been
targeted accurately enough to be of more help than hindrance to the GPs. The age
criterion had the advantage of being simple and clear.

Although the randomised trial showed no significant effect, with proportions of
opportunities taken being 26.2% for patients in the intervention group and 27.2% for
patients in the control group, when GPs actually received reminders they took 39.3% of
opportunities compared with 22.1% when they were not reminded, a statistically
significant difference.

The findings of most other studies of reminders contrast with the findings of the present
randomised controlled trial of reminders, but agree with the findings of the study of the
effects of GPs actually receiving reminders. Rosser et al (Rosser, McDowell et al.
1991) reported that 23% of intervention patients compared with 10% control patients
were immunised. McDowell et al (McDowell, Newell et al. 1986) reported a finding of
29% intervention patients immunised compared with 16% of control patients
immunised, while Chambers et al (Chambers, Balaban et al. 1991) reported that 51% of
patients for whom the doctors were always reminded had been immunised compared
with 30% of control patients for whom they were not reminded. Tang et al (Tang,
LaRosa et al. 1999) reported annual increases in proportions of intervention patients
immunised from 39% in the first year to 61% in the second year and then to 68% in the
third year, compared with control patients’ rates remaining relatively static, increasing
from 29% to 37% to 31% respectively. Only Flanagan et al (Flanagan, Doebbeling et
al. 1999) found no effect of reminders for influenza immunisation. It should be noted
that Flanagan’s trial differed from the present study in that in Flanagan’s trial, the
doctors saw reminders only if they first decided to administer an immunisation, while in
the present study reminders were displayed automatically as soon as the GP started the consultation using the ‘Start consultation’ program.

The heavily-publicised nature and relatively short duration of the influenza immunisation season, and the vaccine being available ‘free’ makes it likely that many patients will attend their GPs specifically for the immunisation. This may leave relatively few opportunities for GPs to offer the vaccine to patients who have not asked for it, and this would have reduced the apparent effect of the reminders in the present trial.

10.4.2.4.1.9 Mumps, measles and rubella immunisation (MMR)

The study GPs’ intentions conformed with the then current RACGP Guidelines, which incorporated the recommendations in the Australian Standard Immunisation Schedule.

In the randomised trial, the GPs took 10.3% of opportunities for patients in the intervention group compared with 8.2% of opportunities for patients in the control group. Although the effect size, with a relative risk of 1.25 (0.82-1.93), was larger than the effect sizes of reminders for six of the other preventive activities being studied, this result did not reach statistical significance because of the small numbers of opportunities in the trial and the small proportions of them that were taken. In consultations in which they received reminders, the GPs took 11.7% of the opportunities compared with 7.7% when they did not receive reminders. This result failed to reach statistical significance (RR 1.24 (0.91-1.71)) again because of the small proportions of opportunities that were taken.
It had been predicted for the present study, as described in the Methods chapter, that for children aged under five years there would be a maximum of 800 opportunities per randomised group to perform each of the three preventive activities indicated for them, and that this number would provide 90% power to detect a difference in performance of 15% between the groups at a p value of 0.05. In fact, there were 969 opportunities to perform MMR immunisation during the trial, but because the difference in performance was only 2.1% absolute (10.3% of opportunities taken for the intervention group compared with 8.2% taken for the control group), the result did not reach statistical or clinical significance.

This finding was consistent with the findings of Flanagan et al.’s trial (Flanagan, Doebbeling et al. 1999), which also found no significant effect of the reminders for MMR immunisation. Differences in setting and in method between Flanagan et al.’s trial and the present study, which have already been described, make direct comparisons difficult.

The General Practice Immunisation Incentives Scheme or GPII (Medicare Australia 2006), which was introduced in July 1998, the fifth month of the trial, may have been expected to increase performance of childhood immunisations, including MMR, by motivating GPs through the relatively large incentive payments offered. Analysis of performance before and after 1st July 1998 shows that performance increased in the intervention group from 8.7% to 11% of opportunities taken and in the intervention group from 4.7% to 10%. One may conclude either that the GPs’ performance increased for reasons such as increasing familiarity with the reminder system, or that the
introduction of the GPII incentives was effective in increasing the performance of childhood MMR immunisation, or that both effects were operating. The fact that performance in the control group increased by a larger proportion than performance in the intervention group suggests that the introduction of the incentive payments did have a significant effect, and that it was not just carryover or a training effect of seeing the reminders for patients in the intervention group that was mainly responsible for the increase. This conclusion is supported by Bond et al.’s study which showed increases in immunisation nationally following the introduction of the immunisation incentives, and by the comments of some of the GPs in the interviews that they felt that their response to the reminders decreased with each subsequent time that they saw them, although one GP reported that he felt that his response to the reminders had increased with increasing familiarity with them.

10.4.2.4.1.10 Pneumococcal immunisation

The study GPs chose to give pneumococcal vaccine every five years to patients over the age of 65 years, while the then current RACGP Guidelines advised GPs: “Consider once over 65 years”. As was explained in an earlier chapter, the advice in the then current RACGP Guidelines had become out of date, because later in the year of the publication of the RACGP Guidelines, the NH&MRC had recommended that all patients over 65 years of age should receive this vaccine every 5 years. The study GPs’ intentions conformed with this latter recommendation.

In the randomised trial, the performance of the activity was significantly higher for patients in the intervention group, with 2.8% of opportunities taken compared with
1.6% for patients in the control group. This was the third largest effect size in the trial of those which reached statistical significance. In consultations in which the GPs actually received reminders, they took 4.6% of opportunities compared with 1.4% when they were not reminded, a larger and also a significant difference.

Pneumococcal immunisation for all patients over 65 years of age had become recommended relatively recently compared to other vaccines included in the trial, with the RACGP first recommending it four years before the start of the trial and the NHMRC first recommending it seventeen months before the start of the trial. It is possible that the GPs responded more to the reminders for pneumococcal immunisation than to reminders for some of the other preventive activities because pneumococcal immunisation was a relatively new activity, and because remembering to advise and give that vaccine may not yet have become a strongly ingrained habit for the GPs. In other words, they may have found the reminders for pneumococcal immunisation relatively more helpful than those for other preventive activities which they had been performing for many years.

Flanagan et al.’s trial (Flanagan, Doebbeling et al. 1999) found no significant effect of reminders on the provision of pneumococcal immunisation. However, as already noted, the intervention group doctors in Flanagan’s trial received reminders only in the 53% of consultations in which they used the Immunization application of their software. When these doctors used the Immunization application, received reminders and ordered at least one vaccine, they ordered significantly more tetanus immunisations but significantly fewer pneumococcal immunisations. The possible reasons for this are not apparent, but some possible reasons for poor performance of pneumococcal immunisation generally are discussed below.
The 6th edition of the RACGP Guidelines reproduces the Australian Standard Vaccination Schedule (2003), which recommended one dose of pneumococcal vaccine for people over 65 years of age, and noted: “There are limited data on the value of revaccination with 23vPPV. Among adults 50 to 75 years, re-vaccination was associated with higher rates of local but not systemic adverse reactions and lower, though still significant, antibody rises compared with the first dose.” The advice of the Australian Government Department of Health and Ageing on 1st July 2006 (Australian Government: Department of Health and Ageing 2006) is that people over 65 should receive a single booster five years after the first dose. The issue of booster doses was not relevant during the trial because pneumococcal vaccine had been recommended for patients over 65 years of age for less than five years.

It is interesting to consider possible reasons in the present study for the apparent differences in the effects of the reminders for influenza immunisation, compared to those of reminders for pneumococcal vaccine, which is indicated for the same age group. Possible reasons for the differences in effects include:

- At the time of the trial, influenza immunisation was a relatively long-established preventive activity, compared with pneumococcal immunisation, which had become recommended only a few years previously for patients over 65 years of age;
- Influenza immunisation is a seasonal activity which is heavily promoted to the public for a few weeks each year, while pneumococcal immunisation is to be administered at any time of the year;
- At the time of the trial, pneumococcal vaccine had to be prescribed and paid for by the patient, while influenza vaccine was free of charge for patients over 65 years of age.
10.4.2.4.1.11  Tetanus immunisation

The study doctors’ intentions conformed with the then current RACGP Guidelines, but, as was explained in the Methods chapter, the expectation in the trial was for only one tetanus-containing vaccine to be administered within the last ten years to all patients aged over two months.

The proportion of 1.5% of opportunities taken during the trial to perform tetanus immunisation for control patients was the smallest of all proportions of opportunities taken in the trial. Seemingly paradoxically, the reminders for tetanus immunisation had the largest effect of the all reminders, with 2.8% of opportunities taken for patients in the intervention group, giving a relative risk of 1.89 (1.59-2.25). One can make two comments about this situation: the first is that it is usually easier to improve performance from a low base level, so performance did not have to increase much in absolute terms to achieve this result; the second is that the low absolute performance suggests that the perception amongst GPs of the importance of tetanus immunisation should be examined. As was discussed in the First chapter, tetanus is a quite rare disease in Australia and in the rest of the developed world. Despite the known low level of immunity in the Australian population, in 1997 only seven cases and one death from tetanus were reported in Australia. The low incidence of tetanus means that most Australian GPs will never see a patient suffering from tetanus. Because of this, the cost-effectiveness of efforts to increase the use of booster immunisation in adults has been questioned (Rosser, Hutchison et al. 1992).

The explanation for the reminders for tetanus immunisation having the largest effect size in the study is not apparent, but there are at least two possible reasons for this. One
is that a knowledge of the seriousness of the consequences of developing tetanus caused the GPs to respond relatively well to reminders for tetanus immunisation. A second possible reason may lie in the low absolute proportion of opportunities taken for patients in the control group, which may make it possible to take opportunities, when reminded to do so, with relatively little time and effort, by offering tetanus immunisation to patients who want or need relatively little explanation or persuasion.

Flanagan et al. found a significant effect of the reminders for tetanus immunisation only when the doctors ordered at least one vaccine in the consultation, with a relative risk for “correct” decisions of 1.28, which is similar to that in the present study (Flanagan, Doebbeling et al. 1999). The findings of other trials of reminders for tetanus immunisation (Weingarten, Bazel et al. 1989; Ornstein, Garr et al. 1991; Rosser, McDowell et al. 1991; Rosser, Hutchison et al. 1992) cannot be compared directly because of setting and design differences, but were similar to those of the present study in that each of them used reminders for a number of preventive care activities, and in each the effect size of reminders for tetanus was amongst the larger effects found, compared to those for the other preventive activities studied in those trials. In Australia, Ravet reported significant increases in his practice’s patients’ ‘up to date’ status from 30% to 60% nine months after the implementation of on-screen reminders (Ravet 1988). One difference between Ravet’s reminder system and that used in the present study was explained in the Methods chapter: the GPs in Ravet’s practice had to call the reminder programs during consultations in order to see the reminders, so in this sense his practice’s reminder system was not as automated as that used in the present study. One can speculate that the improvements in performance of tetanus immunisation and preventive activities in Ravet’s practice might have been greater if its reminder system
had been made fully automatic, so that the reminders appeared without the GP having to call them.

10.4.3 Secondary hypotheses

10.4.3.1 Effect of reminders on numbers of consultations and fees billed

The increases in the performance of the preventive care activities overall were achieved without any significant increase in services provided or in fees billed to the patients.

It would have been reasonable to expect that the greater performance of most of the preventive activities for patients in the intervention group compared with those in the control group would be associated with a higher mean number of consultations per patient, mean higher fees per patient, or some combination of these differences.

A greater number of mean services per patient could have been expected because when they were reminded in consultations about preventive activities which were due for the patient, the GPs may not have had time or energy to perform those activities at that consultation, or it may have seemed inappropriate to offer them at that particular consultation, for example if the patient was having a crisis of some sort, as has previously been discussed. In these cases, the GPs could have been expected to arrange additional appointments in order to perform the outstanding preventive activities for the patient.

Another possible response by the GPs to the reminders could have been to perform the preventive activity or activities in the same consultation. In these cases, the GPs could
have billed either the same item number and fee as they would have if they were not responding to the reminders, the same item number but a higher fee than otherwise, or, if the consultation met the criteria for a higher item number for a longer consultation, the GPs could have billed that higher item number, which would have been billed at a higher total fee, but not necessarily with a larger patient co-payment than if a lower item number had been billed.

The actual finding was that not only was there no significant increase in services or in fees billed for patients in the intervention group compared with the control group, but that for patients in the intervention group the GPs actually provided slightly fewer mean total services and charged slightly lower mean total fees per patient than for control group patients. The part of the hypothesis that stated that more preventive care would be provided without any significant increase in services or in fees billed to intervention group patients compared to control group patients thus was fulfilled to a greater degree than had been anticipated.

The finding that the intervention group patients had essentially the same mean number of services during the trial as control group patients means that if the GPs did arrange additional appointments as a result of the reminders, this must have been offset by a corresponding reduction in the number of appointments initiated by those patients or in the number of appointments initiated by the GPs for other reasons.

Alternative explanations may be that the GPs either “fitted in” the performance of those preventive activities when there was time available in consultations, or that the time
needed to perform the additional preventive activities was added to consultations without higher fees being billed for doing so.

The reasons why the study GPs provided more preventive care to intervention patients while providing fewer mean services and charging lower mean fees billed are not apparent. While it is tempting to suggest that better health resulting from increased performance of preventive activities may have been responsible, changes in the GPs’ behaviour or in patients’ behaviour induced by the GPs’ responses to the reminders could also each or together have had an effect that may have equalled or exceeded any effect of improved health from increased performance of preventive activities for the intervention group. For example, patients who appreciated what they perceived as extra attention from their GPs, when those GPs were responding to the reminders, may have increased the patient’s satisfaction with their care and their feelings of security, leading them to consult slightly less often subsequently.

Another possible explanation of the findings that performance of preventive activities increased, but only to a small extent when the GPs were reminded, without increase in services or fees billed, may be that the GPs constrained their performance of preventive activities to fit within what could be achieved in the consultation without extending the time so that it became the next higher level of consultation. As was outlined in the list of possible barriers to the provision of preventive care in the First chapter, GPs’ wish to respond to the patient’s agenda for the consultation may make them reluctant to introduce their own agenda, particularly if this will add significantly to the duration of the consultation and even more so if the patient may be asked to pay more for services that the patient may complain that he or she did not request, expect or want.
This simple analysis of services provided and of fees billed to the two experimental groups of patients is not a full economic analysis of the effects of the reminder system. It ignores all other costs and benefits of the preventive reminder system, such as the costs of:

- developing the reminder software;
- the purchase, installation, training and maintenance of the study practice’s computer system;
- pathology tests;
- medical specialist and hospital treatment;
- pharmaceuticals;
- patients’ time lost from paid or unpaid work;
- transport.

Similarly, no attempt has been made to calculate the health or monetary benefits of using the preventive care reminder system, nor any extra payments that the GPs may have received via the General Practice Immunisation Incentives Scheme. However, it is worth noting that as far as costs of generating reminders is concerned, once the reminder system had been implemented, the reminders were generated at effectively zero marginal cost. This contrasts with the significant costs of other methods, such as telephoning patients or writing, of reminding patients or doctors of preventive activities which are due, which generate significant costs every time every patient is reminded about every preventive activity that is due.

None of the other studies identified as directly relevant to the present one has reported on any effects of the reminders on fees billed to patients. However, the findings of Frame et al. (Frame, Zimmer et al. 1994) that improved provision of preventive care by
GPs using computer-generated reminders was achieved without significant increase in services provided or in fees billed to patients are consistent with those of the present study.

10.4.4 Association of patient, GP and consultation characteristics with the performance of preventive activities

10.4.5 Patient characteristics

10.4.5.1 Sub-hypothesis: There will be no significant difference in performance of preventive care activities for male or female patients

A possible explanation for the GPs taking significantly higher proportions of opportunities for the activities SMOK, BP, WT and LIPI for their male patients may be that these activities are associated with cardiovascular risk, and that the study GPs may have perceived men as being at higher risk of cardiovascular disease than women. A possible reason for the GPs’ significantly greater performance for male patients of the activity TET may be that men may tend to receive more injuries in the course of their work or of their home duties, sport or hobbies, prompting the GP to give a tetanus injection if it is indicated.

The reasons for the GPs’ significantly greater performance for male patients of the activity FLU or for their independently insignificantly lower performance for male patients of the activity PNEU are not apparent.

The findings of the present study appear to agree with those of the authors of one paper arising from the Direct Observation of Primary Care study, which found that male patients “were more up-to-date on counseling and immunizations” (Flocke and Gilchrist
The activity SMOK can be regarded as a counselling activity, and the activities FLU and TET are immunisations. However, these findings contrast with those of Flocke et al (Flocke, Stange et al. 1998), who found no significant difference in the provision of preventive services to male or female patients, and with those of Asch et al. (Asch, Kerr et al. 2006) who found that in their nationwide survey of self-reported receipt of health care in the United States that “women were significantly more likely to be ‘up to date’ than men. However, differences in designs and methods make it difficult to compare these findings with those of the present study.

Hall’s (Hall 1992) finding that a higher proportion of men were screened for cholesterol, while failing to reach statistical significance, is in the same direction as that of the present study.

10.4.5.2 Sub-hypothesis: The performance of preventive activities will be significantly greater for middle aged patients

This study found that performance independently was best for patients in the middle tertile of age for six of the preventive activities (ALLE, BP, FLU, LIPI, PAP, PNEU and TET), but that for three other activities (DIAB, SMOK and WT) performance was best for patients in the youngest tertile of age, while performance was best for patients in the oldest tertile of age only for the activity LIPI.

This pattern is similar to that in the findings of Flocke et al (Flocke, Stange et al. 1998), who found that patients aged 40-64 years were the most likely to receive at least one preventive service opportunistically, followed by patients aged 18-39 and then by patients over 65 years old. Love and colleagues (Love, Davis et al. 1997) similarly
found that in women aged 52-77 years, older women were less likely to report having received cervical smear testing. The findings of Asch et al. (Asch, Kerr et al. 2006) in their survey of a random sample of Americans varied a little from those of Flocke et al.: Asch et al. found that while the oldest group of people (aged over 64 years) similarly reported the lowest levels of receiving indicated preventive care, they found that the highest levels of preventive care were reported not by people in the middle aged group (31-64 years old) but by those aged 18-30 years.

The findings of the study by Heywood et al (Heywood, Firman et al. 1996) and of the present study are difficult to compare directly, because the age categories of patients for which performance of cervical smears was reported were different. The finding of Heywood et al that patients aged 20 to 30 years were most likely to have cervical smears performed opportunistically, and that “the likelihood (…) decreased sharply after age 40” is probably broadly consistent with the finding of the present study, as is Hall’s finding that the mean age of women who were screened adequately was 36.8 years compared with a mean age of 43.1 years for women who were not.

The reasons why performance of a majority of the preventive activities in the present study and in that of Flocke et al. tended to be highest for patients in the middle tertile of age are not apparent. One possible reason may be that younger patients may not be interested in prevention, because they see themselves as ‘immortal’ and can’t imagine ever becoming old or ill. Rightly or wrongly, GPs may perceive this to be a common attitude in young people, and may feel that it is therefore too difficult to try to interest young people in prevention. A possible reason for the lower performance of preventive activities in older people, the most consistent finding of the studies quoted, is that GPs
may feel that performing preventive activities for older patients is not likely to make much difference to their lifespan or health – they may feel that “most of the damage has been done already” to such patients.

10.4.5.3 **Sub-hypothesis: The performance of preventive activities will be significantly greater for patients who have had fewer consultations during the preceding two years**

The general finding of the lower performance of most of the preventive activities, other than the activities FLU, MMR, PAP and PNEU, for patients who had had more consultations within the preceding two years may be somewhat surprising. It would have been reasonable to assume that GPs may be more likely to perform preventive care activities better for patients whom they know better, with whom they have formed a bond, and to whom they may feel more responsible, than for relatively “unknown” patients.

In the present study, the group of patients who had had fewer than five consultations during the two years preceding each consultation during the study would have included not only patients relatively new to the practice, who had only ever had fewer than five consultations in the practice, but also longer established patients of the practice who attended relatively infrequently. This distinction was not made in the design and analysis of the present study, so comparison with the findings of previous studies must be tempered by this knowledge.

Flocke et al. (Flocke, Stange et al. 1998) similarly reported that “new” patients (defined as those who either were new to the practice or who had not visited within the previous three years) were more likely to receive at least one preventive service than
“established” patients. Flocke et al.’s interpretation of their findings that ‘new’ patients received higher levels of preventive services was: “It appears that physicians are taking advantage of their more limited opportunities with patients who make fewer visits” (Flocke, Stange et al. 1998). This is an interesting and plausible explanation. Many patients have chronic conditions for which they are advised to attend their GPs on a planned basis. For such patients, GPs may expect that they will have further opportunities in the future to perform preventive activities, and therefore feel less pressure to address every indicated preventive activity at every consultation.

Heywood et al. (Heywood, Firman et al. 1996) found that women who had made more than six visits during the preceding year were significantly more likely to defer or refuse having a cervical smear test than women who had made no visits during the preceding year, with a non-significant trend in the same direction for women who had made 1-6 visits compared with those who had made no visits. In the present study, performance of cervical smear testing was highest for women who had had 5-11 consultations during the preceding two years. This was insignificantly higher at the p = 0.05 level than that for women who had had 0-4 consultations during the preceding two years. Performance for women who had had 12 or more consultations during the preceding two years was significantly lower than for the other two groups of women. These findings of the present study are probably broadly consistent with those of Heywood et al and with those of Flocke et al.

In possible contrast, Fontana et al. (Fontana, Baumann et al. 1997) found that while the total number of visits during the previous three years was a “significant predictor for both sexes of having received checkups or sigmoidoscopies, for women of having received clinical breast exams and mammograms, and for men of having received fecal
occult blood tests”, it was not a significant predictor “for either sex of having received smoking assessment or for women of having received a fecal occult blood tests, Pap test, or counseling about breast self-examination”. The authors noted that their study was limited in including only a small sub-group of the patients in each practice. The findings of McIsaac et al. (McIsaac, Fuller-Thomson et al. 2001) that increasing “regularity” of contact with a family doctor was ‘frequency’ rather than ‘regularity’ in the strict mathematical sense) was associated with increased likelihood of patients reporting having received some preventive services also contrast with those of the present study and those of Flocke et al. and Heywood et al.

It is potentially somewhat disturbing at first glance that for patients who had had 12 or more consultations during the preceding two years, performance was lowest for eight of the eleven preventive activities (ALLE, BP, DIAB, LIPI, PAP, SMOK, TET and WT). However, this finding may be less disturbing than it seems, because it results from this study’s focus on events in each consultation, rather than focussing on the preventive care status of the practice’s population at a point in time as most other studies in the area have done. The explanation for why this finding may not be particularly disturbing is that for patients who attend relatively frequently, GPs have a relatively large number of opportunities to perform indicated preventive activities. If the measure of preventive care performance is ‘up to date’ status for preventive activities of the practice’s population at any point in time, then for frequently-attending patients GPs are under less pressure to perform indicated preventive activities at any one visit than they are for patients who attend less frequently and for whom they have fewer opportunities to provide indicated preventive care. Nevertheless, the fact remains that if we are interested in making the best use of patient’s contact with GPs during consultations as far as providing preventive care goes, consultations with patients who attend relatively
frequently may need to be planned differently, such as planning for them to be longer than for patients who attend less frequently.

10.4.5.4 **Sub-hypothesis:** *The performance of preventive activities will be significantly greater for patients for whom more long term health problems have been recorded.*

For three of the activities whose performance varied significantly with the patient’s number of long term health problems (BP, WT, FLU), performance increased slightly with increasing numbers of long term health problems. The performance of the activity SMOK also increased, but to a non-significant extent. The findings for the activity PAP differed in that performance was significantly higher when the patient had already had one long term health problem recorded, but insignificantly lower when the patient had two or more long term problems already recorded.

The finding in the present study that the GPs took higher proportions of opportunities for the activities FLU and PNEU for patients with more long term health problem suggests that the GPs recognised that patients over 65 years of age who have chronic health problems are more at risk of serious illness from influenza and pneumonia and complications of these conditions.

The increasing performance of the activities BP and WT for patients with increasing numbers of health problems may result from the GPs making clinically indicated measurements and observations of patients who have chronic conditions, rather than performing these activities purely for the purpose of prevention.
The finding that for the activities PAP, DIAB, MMR and TET the GPs performance was higher than when the patient had one long term problem already recorded, but lower when the patient had two or more long term problems already recorded is interesting, as is the finding that performance of lipid screening decreased with increasing numbers of long term problems. These findings may suggest that when they are consulting with patients who have more long term health problems, GPs may be so occupied with dealing with those problems that they have less time and energy to address outstanding preventive care activities.

Other studies of performance of preventive care have not examined patients’ health status according to long term health problems documented in their medical records. Flocke et al (Flocke, Stange et al. 1998) used a self-report by patients to assess “health status” and found that this made no significant difference to whether at least one preventive service was provided. Fontana et al. (Fontana, Baumann et al. 1997) found that the only association of patients’ self-perceived ‘health status’ with their self-report of having received cancer prevention or cancer screening services was that “women who perceive their health as better have an increased odds of having received a mammogram”. The same study found that patients who reported that they had been diagnosed as having hypertension, heart disease or diabetes were significantly less likely to report having received cancer prevention or cancer screening services. This appears to contrast with the finding in the present study that cervical smear testing was most likely to be performed for women who had one long term health problem previously recorded, but differences in settings, design and methods between these studies and the present study make direct comparisons difficult.
The findings of the present study that performance of the activities FLU, PNEU and SMOK was higher for patients with more long term health problems are similar to those of Love and colleagues (Love, Davis et al. 1997) who found that “patients with two or more chronic diseases were significantly more likely to receive primary preventive care services”, and the finding of the present study that the performance of the activity PAP was significantly higher when the patient had already had one long term health problem recorded, but insignificantly lower when the patient had two or more long term problems already recorded, may be similar to Love et al.’s findings that patients with “two or more chronic diseases” “were no more likely (…) to receive screening tests and procedures than patients not reporting chronic disease”. Direct comparisons are difficult because Love et al.’s study included only patients aged 52-77 years, while the present study included patients of all ages, and the studies were conducted in quite different settings, in different countries with different insurance systems and the studies used quite different methods of measuring the performance of preventive activities.

10.4.6 GP characteristics

10.4.6.1 Sub-hypothesis: Performance of preventive activities by female GPs will be significantly greater than performance by male GPs

The reasons why the female GPs in the present study took higher proportions of opportunities for ten of the preventive activities but a smaller proportion of opportunities to record patients’ smoking status, independently of other factors such as length of consultation and fee level billed are not apparent. One possible explanation is that because they were taking higher proportions of opportunities for the other activities, they may have simply run out of time and energy to discuss the patient’s smoking
habits. It is possible that they placed lesser importance on the patient’s smoking habits than the male GPs did.

Other studies in this area have reported findings generally similar to that of the present study. Heywood et al found that female GPs were significantly more likely to perform smear tests opportunistically than male GPs. Lurie et al. (Lurie, Margolis et al. 1997) found that according to doctors’ self-report “Female physicians were more likely to ask new patients about components of prevention, to believe in the effectiveness of mammography, to feel more personal responsibility for ensuring that their patients received screening, and to report more comfort in performing Pap smears and breast examinations.” It is possible that these findings apply at least in part to the GPs in the present study. However, none of these other studies has specifically examined the question of female GPs’ opportunistic recording of their patients’ smoking status.

Pham et al. (Pham, Schrag et al. 2005) found that patients whose usual doctor was female were significantly more likely to have had screening mammography, but that patients whose usual doctor was male were significantly more likely to have received influenza vaccination. These findings appear to contrast with those of the present study, in which GP gender made virtually no difference to the likelihood of opportunities for influenza immunisation of patients over 65 years of age being performed, but differences in setting, design and methods make direct comparisons difficult.

Flocke et al (Flocke, Stange et al. 1998) did not include doctor gender in their study of factors associated with performance of preventive services.
The findings of the previous studies and of the present study that female GPs are more likely to perform most preventive activities than are male GPs raises the question of whether they are doing so at the expense of other useful activities within consultations, or whether they are performing most preventive activities better than male GPs in addition to performing equally as well in other aspects of their care of patients. The present study was not designed to answer this question, nor the question of whether any GP, irrespective of gender, who performs preventive activities at a higher rate than other GPs is thereby likely to provide less other care or to reduce or omit other aspects of care than GPs whose performance of preventive activities is lower.

10.4.6.2 Sub-hypothesis: Performance of preventive activities will be significantly greater when the patient is seeing his or her usual GP within the practice

The effects on performance of preventive activities of the patient seeing his or her usual GP within the practice were heterogenous. In multivariate analysis, when patients were seeing their usual GP within the practice, the sizes of effect, in decreasing order of relative risk, were, for activities in which the patient’s usual GP performed better: LIPI, MMR, PNEU, PAP, BP and TET, and for those activities in which the patient’s usual GP performed worse: DIAB, SMOK, ALLE, FLU and WT, with only the results for LIPI and SMOK reaching statistical significance.

The reasons why the GPs took higher proportions of some types of opportunities but not others if they were the patient’s usual GP in the practice are not apparent.

Very few published studies have been found that have examined the effects on performance of preventive activities of seeing one’s usual GP within a practice. Saultz
and Lochner conclude from their review of the medical literature ‘regarding the relationships between interpersonal continuity of care and the outcomes of health care’ that ‘interpersonal continuity seems to be associated with improved delivery of preventive services’ (Saultz and Lochner 2005). As has been noted above, McIsaac et al. (McIsaac, Fuller-Thomson et al. 2001) found that increasing “regularity” of contact with a family doctor was associated with increased likelihood of some preventive activities having been performed, but they did not examine the question of whether patients considered that they had a usual GP within a practice. The differences in setting, design and methods between McIsaac et al.’s study and the present study make direct comparisons difficult.

The method used in the present study of allocating the usual doctor for each patient may have influenced the results obtained. As was explained in the Methods chapter, in order to minimise intrusion into the practice, the patients were not asked to nominate their usual doctor within the practice. Instead various formulae for deciding each patient’s usual doctor based on information in each patient’s clinical and billing records were considered. The method that was eventually used, of declaring each patient’s usual doctor to be the doctor seen for more than half of all that patient’s visits to the practice during the trial, while potentially still prone to some mis-allocation, seemed the most practical. While the decision to name a GP who has seen a patient for his or her only consultation during the trial as that patient’s ‘usual’ GP could be criticised as simplistic, it was considered preferable to do so than to allocate that patient to the group who were said to have no usual GP within the practice. Different formulae of determining each patient’s usual GP may have yielded different results, but were not explored further in the interests of addressing other questions considered more important.
One explanation for the significantly lower performance of patients’ usual GPs of the activity SMOK may be that the usual GPs felt that they knew whether the patient smoked and were not going to bother to record this, while ‘non-usual’ GPs were aware that they didn’t know and therefore were more likely to ask the patient and to record the answer. The same explanation may apply to the lower performance of the activities ALLE and DIAB by patients’ usual GPs, but possible reasons for their lower performance of the activities WT and FLU are not apparent. Conversely, GPs seeing a patient who did not usually see them may have felt a need to ask the patient about his or her allergies and smoking status, and in doing so, may have recorded these details for their own future reference in case they happened to see that patient again.

10.4.7 Consultation characteristics

10.4.7.1 Sub-hypothesis: Performance of preventive activities will be significantly higher in longer consultations

Consultation length was one of the strongest predictors of performance of preventive activities in this study. For preventive activities other than immunisations, performance was significantly higher in longer consultations. In contrast, for all four immunisation activities, performance was lower in longer consultations, with the result for influenza immunisation reaching independent statistical significance.

The finding that longer consultations were associated with increased performance of preventive care activities other than immunisations is broadly consistent with the results of the other studies in this area, which were described in the review of the literature.
This finding of this study supports arguments that have been made for better rewarding the provision of consultations longer than the average of twelve minutes reported by the BEACH program (Sayer, Britt et al. 2000), which legally could have been billed only as item 23 services, colloquially still known as ‘standard’ consultations. This was the descriptor of consultations of similar length before the introduction of the Vocational Register for GPs 1989. Item 23 covers consultations of up to 20 minutes in length.

There has been much debate in Australia about the presumably inadvertent encouragement of ‘six minute medicine’ by the structure of the Medicare Benefits Schedule (MBS), in which a ‘standard’ consultation (item 53) must be of at least five minutes. Vocationally-registered GPs, who constitute a large majority of those working in primary care (Commonwealth of Australia 2000) can allow their patients to claim for ‘level A’ (item 3) or ‘level B’ (item 23) services, which have higher Medicare benefits) and which have no defined minimum durations. Concern about the quality of care provided in short consultations led to an amendment in 1999 of the Health Insurance Act to penalise GPs who provide more than 80 consultations daily (Australian Government Attorney-General's Department 1999).

In recognition of the demonstrated better quality of care that can be provided in consultations of twenty minutes or more, and to encourage GPs to provide longer consultations when appropriate, in November 2001 the Medicare benefits for item 36 consultations, which have to be of at least twenty minutes, were increased by ten per cent while those for shorter consultations were increased by only four per cent (Commonwealth Department of Health and Aged Care 2001/09/19). This has partly redressed the imbalance in earnings that can be achieved by GPs who choose to provide
only the shortest possible item 23 consultations, in order to maximise their earnings per hour, compared to those who choose to provide consultations of 20 minutes or more when these are needed and useful to the patient’s care.

However, the gains for the GPs practising in the latter style were eroded in 2004 when as a result of political concern about falling bulk billing rates, the government introduced a flat additional benefit of $5.15 for all bulk billed consultations with ‘concessional’ patients, which it regarded as those with a pension or government-issued ‘Health Care Card’ (that is supposedly issued to low income earners), and with children aged under 16 years. The introduction of the same fixed extra benefit for all consultations irrespective of their length reversed some of the small incentive to provide consultations of at least twenty minutes which had been provided by the previous selective increase of the item 36 benefit. As a result of the introduction of the additional $5.15 benefit for bulk billing children and ‘concessional’ patients, Medicare benefits for bulk billed item 3, 23, 36 and 44 consultations increased by 42%, 19%, 10% and 7% respectively. The increase of 42% for a level A consultation was six times that of the 7% for a level D consultation and the increase for a level B consultation of 19% was nearly double that of the 10% for a level C consultation. This new increase in the perverse incentives to provide shorter consultations has been pointed out to the federal government, but to date it has taken no action to address this issue.

10.4.7.2 Sub-hypothesis: Performance of preventive care will be significantly greater when higher levels of fees are billed

Relationships between performance of the preventive activities and the levels of fees billed fell into three groups: in multivariate analysis the activities SMOK, BP, PAP and
WT were significantly more likely to be performed when the middle and highest levels of fees were billed, performance of the activities ALLE, DIAB, PNEU and TET showed no significant association with the level of fee billed, and the activities FLU, LIPI and MMR were significantly more likely to be performed when the Medicare benefit level of fee was billed.

As outlined in the First chapter, no other published studies have been found which have examined the relationship between fees charged for consultations and the performance of preventive activities. In Australia, the nearest has been Hall’s unpublished study for her Masters thesis (Hall 1992) which examined the association of billing level with performance of cervical smear tests, and found that women who were billed in her practice at a fee level greater than the Medicare benefit were significantly more likely to be ‘up to date’ for this activity than those who were billed at the Medicare benefit level. However, it needs to be noted that Halls’ measure of the patient’s usual billing rate may differ from that used in the present study, which examined the level of fee actually billed at each consultation. It is common in Australian general practice that patients may be billed for certain consultations and services at rates higher or lower than any usual billing rate with which the practice has labelled that patient.

As outlined in the First chapter, other studies have examined the associations between performance of preventive activities and income levels, health insurance status and socio-economic status. Patients with higher incomes have been found to be more likely to have received preventive services, although one study found that GPs were just as likely to offer preventive care to patients of low socio-economic status as to patients of higher socio-economic status, while another reported that GPs were less likely (rather
than more likely, as might have been expected) likely to discuss prevention with patients of higher occupational status.

Each of the characteristics of patients’ income levels, health insurance status and socio-economic status may to some extent represent a proxy for fees billed, but the relevance of these proxies may be limited, because in the United States, many patients receive their health care as a benefit of their employment or belong to health maintenance organisation and do not pay fees per consultation, and in the United Kingdom, GPs are not paid per consultation by the National Health Service and patients may not offer the GP any payment even if they wish to do so in order to buy a better quality of care.

The association between higher levels of fees billed and higher performance of the activities PAP, SMOK and WT in the present study may be explained in part by knowing that addressing each of these may involve more effort and time by the GP. Cervical smear testing requires a relatively large amount of time, preparation and physical exertion by the patient and by the GP: the patient may need first to empty her bladder, and has to undress before the test and dress again afterwards: the GP has to assemble the required equipment, prepare the smear taking equipment and specimen container or containers (if a specimen is sent for thin film or liquid-based examination as well as the conventional glass slide examination), and then tidy and clean up afterwards. Asking patients about smoking and discussing their weight may be relatively sensitive topics that may initiate longer discussions about stopping smoking and about becoming slimmer.
In contrast, measuring blood pressure is a relatively quick task which is usually accepted well by patients, who expect it as part of routine care. The reasons why performance of blood pressure measurement is more likely when higher levels of fees are charged are not apparent.

Three of the four activities for which performance was independently highest at the Medicare benefit rate (LIPI, FLU, MMR and TET) were immunisations. As discussed above, many patients aged over 65 years attend their GPs each autumn specifically to receive the influenza vaccine, and for such relatively straightforward visits GPs may tend to bill at the Medicare benefit rate. From July 1998, GPs were paid relatively well by the Commonwealth’s General Practice Immunisation Incentive Scheme to immunise children under 6 years of age, and these significant incentive payments may have caused the GPs to be willing to accept the Medicare benefit for providing childhood immunisations including MMR and tetanus-containing vaccines.

The performance of prescription of pneumococcal vaccine was independently a little higher at consultations billed at the middle fee level than at consultations billed at the Medicare benefit level. The result for performance at consultations billed at the highest fee level was about half that for consultations billed at the Medicare benefit level but this result cannot be relied upon, since only three patients were immunised when the highest level of fee was billed. Nevertheless, the association of the activity PNEU with billing level resembles those for the other immunisations in as far as the relative risk was lower when the highest fee level was billed.
The result for the activity LIPI may be explained by knowing that commonly patients who are to have lipid tests are instructed at a consultation to attend at another consultation fasting early in the morning for this purpose. The likelihood that this occurred during the trial is supported by the finding that a greater proportion of second opportunities to test patients’ lipids was taken than were first or third opportunities. It is possible that the GPs tended to bill for such consultations at the Medicare benefit rate on the basis that they were perceived as being relatively simple.

The finding that some preventive activities (ALLE, SMOK, BP, PAP and WT) were more likely to be performed when higher levels of fees were billed

10.4.7.3  Sub-hypothesis: Performance of preventive activities will be significantly lower when more problems are coded at the consultation

There were three patterns of performance of preventive activities seen in association with the numbers of problems coded at the consultation. The first pattern was of independently higher performance in consultations in which at least one problem was coded: this was seen for the activities ALLE, SMOK, WT and PNEU; the second pattern was the reverse of this, with independently lower performance in consultations in which at least one problem was coded: this was seen for the activities PAP, DIAB and LIPI; the third pattern was that of independently lower performance in consultations in which at least one problem was coded, but independently higher performance in consultations in which two or more problems were coded, and was seen for the activities BP, FLU, MMR and TET.
No other published studies have been found in this area which have examined the association of number of problems coded in consultations with performance of preventive activities.

It is reasonable to assume that consultations at which more problems were coded are likely to have been more complex in terms of addressing more problems, either presented by the patient or which the GP believed needed to be addressed. It is interesting to note that despite the presumed greater demands on the GPs’ time and energy in such consultations, performance of four of the preventive activities was independently higher in consultations in which one problem was coded, and that performance of eight of the preventive activities was independently higher in consultations in which two or more problems were coded.

10.4.8 Opportunity characteristics

10.4.8.1 Sub-hypothesis: Performance of any preventive activity will be significantly lower with increasing numbers of other preventive activities also due to be performed

The results mostly supported the hypothesis, but it is interesting to note that when there were two or more other preventive opportunities at the same consultation, performance of three of the activities (DIAB, PAP and SMOK) was independently higher and that the performance of seven activities (ALLE, BP, LIPI, MMR, PNEU, TET and WT) was independently lower. This suggests that when there are several preventive activities ‘competing’ to be performed, some activities are performed preferentially while the performance of other activities is suppressed by the GPs’ attention to the competing other preventive opportunities.
Few studies have been found which have examined this question. Stange and colleagues surveyed family physicians about preventive services that they would offer to a 53 year old woman (Stange, Fedirko et al. 1994). More than half of the number of respondents in Stange et al.’s study said that if the patient was attending for an ‘illness visit’, they would offer “smoking cessation advice, blood pressure, height, and weight measurements, and the scheduling of a return visit”. If the patient had attended for a check up, the family physicians said that they would also offer “breast examination, Papanicolaou test, pelvic examination” and order a mammogram. It is important to keep in mind that doctors’ self-reports usually over-estimate what they actually do, so these results may over-report the actual practices of the family physicians. These findings are similar to those of the present study in that the patient’s smoking habits and need for a cervical smear test were more likely to be addressed, but it is difficult to compare the findings directly, because of differences in study designs and methods.

10.4.8.2 Sub-hypothesis: Performance of preventive activities will be significantly higher when they have been due for longer

Higher independent performance of the activities DIAB, LIPI, MMR and PNEU when these activities had been due for one year or longer supported the hypothesis, as did higher performance of the activity BP when it had been due for between one and three years.

In contrast, the significantly lower performance of the activity SMOK when it had been due for two years or longer, and of the activity PAP when it had been due for four years or longer ran against this trend. The finding for the activity PAP may be partly
explained if some patients were refusing the activity or were considered ineligible for it by the GPs (e.g. because of hysterectomy), but had not been recorded as such by the GPs in the study practice. Five patients were recorded by the study GPs as refusing the activity Pap and 56 as being ineligible for it. This seems a small number and probably represents a lack of recording some patients’ refusal or ineligibility.

For the remaining activities (ALLE, WT and TET) and elapsed time categories of the activities listed above, the independent effect sizes were small.

In conclusion, the associations of elapsed time since due and performance of preventive activities were heterogenous.

Opportunities could have been further characterised into those never performed for the patient, those performed at least once previously with an acceptable or normal result, and those performed previously but with an unacceptable or abnormal result on the most recent occasion. Performance may vary according to each of these situations and could be the subject of further studies.

No published studies have been found that have examined this characteristic of preventive opportunities.
10.4.8.3  Sub-hypothesis: Performance of preventive activities will be significantly higher with each subsequent opportunity during the trial

For most of the activities, there was a strong trend of decreasing performance with each subsequent opportunity during the trial, causing the hypothesis to be rejected.

For the activity DIAB, the apparently inconsistent association may be a chance result arising simply from the small numbers of opportunities and the small proportions of them which were taken. For the activity LIPI, it is possible that the higher proportion of second opportunities being taken resulted from the GPs advising patients at a consultation that they were due for a lipids test, and then arranging another appointment on a subsequent morning for a fasting specimen to be obtained. The data available do not allow this question to be examined.

Some of the patients for whom none of the opportunities was taken for a preventive activity may either have been refusing that activity or may have been judged ineligible for it by the GPs, but the GPs had not recorded their refusal or ineligibility. For example, a relatively common reason for women not needing Pap smear tests is previous hysterectomy for non-malignant conditions such as menorrhagia or prolapse. If a woman’s history of hysterectomy had not been coded by the GPs, and if more than two years had elapsed since the most recent smear test, the data analysis used for this trial would have counted such consultations as representing opportunities for the GP to perform a smear test. In such situations, the automatic reminder system would have also generated reminders for those patients at such visits if they were in the intervention group. As has been discussed above, it seems likely that the study GPs did record all
women who were ineligible for the activity PAP by virtue of hysterectomy or other medical history as such. In order to maximise the co-operation of the GPs with the study and to minimise disruption to the practice, the GPs were not asked to make any special effort to record patients’ refusals or ineligibility for any or all of the preventive activities which were indicated for them.

Other studies in this area have not examined whether first or subsequent opportunities tended to be taken for various preventive activities.

One of the implications of these findings for the design of reminder systems may be that reminder messages should highlight the number of previous opportunities which have been missed to perform the preventive activity. GPs’ resultant guilt may cause them either to perform the activity or to label the patient as refusing or ineligible, where this is appropriate.

10.4.8.4 Sub-hypothesis: Performance will be higher when a reminder is displayed

The display of a reminder was associated with higher independent performance of all of the preventive activities, with the results for seven of the activities reaching statistical significance.

The effects of the reminders have been compared with those of previous studies in section 10.4.2.4 “Primary hypothesis: effects of the reminders” above.
10.4.8.5  Comparability of experimental groups

The randomisation process was effective and resulted in experimental groups that were acceptably similar on a number of characteristics.

10.4.8.6  Numbers of opportunities during the trial

Numbers of opportunities for all of the preventive activities as predicted were large, ranging from 969 for the activity MMR to 27,036 for the activity TET.

It had been predicted for the present study, as described in the Methods chapter, that for children aged under five years there would be a maximum of 800 opportunities per randomised group to perform each of the three preventive activities indicated for them, and that this number would exceed the number of 225 required to provide 90% power to detect a difference in performance of 15% between the groups at a p value of 0.05. In fact, there were 446 opportunities to perform MMR immunisation during the trial for patients in the intervention group, and 523 opportunities for patients in the control group. These numbers of opportunities were expected to provide the required statistical power.

10.4.8.7  Reminders actually displayed to GPs

As was outlined in the Methods chapter, in the interests of not requiring the GPs to change their usual way of working, they were permitted to continue to use the ‘Add Progress Note’ function, which did not generate reminders for patients in the
intervention group, to record their notes, rather than the ‘Start Consultation’ method which did generate the reminders.

The GPs’ apparent enthusiasm to use the reminders led to an expectation that they would use the ‘Start Consultation’ routine in all or most of their consultations. The finding was that one GP apparently chose not to do so, after perhaps the first couple of consultations, and that the other nine GPs used the ‘Start Consultation’ routine for between 51% and 99% of their consultations with intervention group patients, resulting in a mean use for the ten GPs of the “Start Consultation” routine in only 66% of consultations with intervention group patients. The reasons for the less than universal use by the nine GPs who did use the ‘Start Consultation’ routine are not known. In retrospect, it would have useful to ask them this during the interviews. A possible reason, outlined earlier, is that it is believed that some of the GPs wrote the progress notes of some of their day’s consultations only in the evening at home, by accessing the practice’s computer system remotely, and it may be that they tended to use the ‘Add Progress Note’ function to do so, because reminders would not have been directly useful to see at those times. Of the nine GPs who did use the ‘Start Consultation’ function, if they also used the ‘Add Progress Note’ function for some consultations while patients were with them, there is a question of whether they chose to do so for particular types of patients or in particular consultations, rather than at random. Specifically, it would be useful to know whether those nine GPs used the ‘Add Progress Note’ function if for some reason they did not want to see any reminders at a particular consultation. If there were such reasons for the use of the ‘Add Progress Note’ function during consultations by those nine GPs, this may have affected the effect size of the reminders.
Because the GPs in the trial were not forced even to see the reminders, the trial was not only a trial of the effects of the reminders, but also a trial at least to some extent of whether GPs chose to see reminders.

10.4.9 Possible negative effects of reminders

It is possible that the use of reminders may not address and may even exacerbate some of the other factors currently limiting performance of preventive activities. Firstly, if the performance of preventive activities is increased, cost to patients may be increased through higher consultations fees for longer consultations needed to perform the preventive activities, as well as whatever other care would have been given. Secondly, if GPs respond to reminders for preventive activities, performing those activities will take time and the GPs, who already feel that they are under time pressure, will have even less time available for other tasks in the consultation. Thirdly, if GPs perform more preventive activities in response to being reminded, they will be exposed more often to the possibilities of adverse effects arising from the performance of those preventive activities. Fourthly, GPs who are already concerned about possible accusations of excessive provision of services may feel that offering additional services to patients can only increase this risk. Fifthly, receiving reminders may increase GPs’ existing overload of information.
10.4.10 Comparison of taking of opportunities with findings of other studies

10.4.10.1 Recording of allergies

No other published studies have been found which have examined the taking of opportunities to record patients’ allergies.

10.4.10.2 Recording of smoking status

Stange et al (Stange, Flocke et al. 2000) reported that the North American GPs in their study took 14% of opportunities to record the smoking status of “established patients”, while Hutchison et al. (Hutchison, Woodward et al. 1998) reported that the Canadian GPs in their trial took 87% of opportunities to ask research assistants posing as new patients about their smoking habits. This is a higher proportion than the 1.8% and 2.0% of opportunities taken in the present study for control and intervention group patients respectively. Differences in setting, design and methods make direct comparison difficult, but the Australian study by Dickinson and colleagues (Dickinson, Wiggers et al. 1989) which found that GPs in Newcastle identified only 56% of the smokers supports the notion that the performance of the Australian GPs in the present study may have been lower than that of the American and Canadian GPs in the studies quoted above. If this is correct, the reasons for the lower performance of the Australian GPs in the present study of this activity are not apparent.
10.4.10.3 Screening for hypertension

In the present study, the GPs took 23% of opportunities to perform blood pressure measurement for patients who had had 0-4 visits during the preceding two years. Hutchison et al (Hutchison, Woodward et al. 1998) reported that the Canadian GPs in their trial took 68% of opportunities to offer or to perform blood pressure measurement for research assistants posing as new patients. The lower figure obtained in the present study may in part be explained by the fact that only some of these patients would actually have been new to the practice.

In contrast, Stange et al. (Stange, Flocke et al. 2000) found that the North American GPs in their study took 52% of opportunities to offer or to perform blood pressure measurement for “established patients”. This figure is higher than the 15.1% and 15.5% of opportunities taken in the present study for control and intervention group patients respectively. The difference may be accounted for by a strongly ingrained custom in US practices of nurses recording patients’ vital signs before they see the doctor.

10.4.10.4 Cervical smear testing

Hutchison et al (Hutchison, Woodward et al. 1998) reported that the Canadian GPs in their trial took 90% of opportunities to raise the question of cervical smear tests with research assistants posing as new patients. In the present study, the GPs took 12.6% of opportunities to perform cervical smear test for patients who had had 0-4 visits during the preceding two years. This much lower figure may in part be explained by the fact that only some of these patients would have been new to the practice.
In contrast, Stange et al. (Stange, Flocke et al. 2000) found that the North American GPs in their study took 11% of opportunities to offer or to perform cervical smear tests for “established patients”. This figure is a little higher than the 7.2% and 7.8% of opportunities taken in the present study for control and intervention group patients respectively. Heywood et al. (Heywood, Firman et al. 1996) found that Australian GPs reported that they had taken 9.6% of opportunities to perform smear tests, which is similar to that of the present study.

10.4.10.5 Recording of weight

Stange et al. (Stange, Flocke et al. 2000) reported the North American GPs in their study took 62% of opportunities to offer to weigh or to actually weigh “established patients”. This is a higher proportion than the 4.9% and 6.2% of opportunities taken in the present study for control and intervention group patients respectively. Again the difference may be accounted of r at least in part by the custom in US practices of nurses recording patients’ vital signs before they see the doctor.

10.4.10.6 Screening for diabetes

The performance of this activity in the present study was quite low, with only 2.4% of opportunities being taken. The reasons for this are not apparent, but may result in part from the fact, as has been explained earlier that for many patients a glucose level will have already been be performed as part of biochemical testing for other purposes such as investigating illnesses or monitoring of any desired or adverse effects of medications such as anti-hypertensives. This may leave only a small ‘hard core’ of presumably
fairly well patients who may appear to be at low risk for diabetes, and to whom the GPs are not inclined to offer screening for diabetes.

No other published studies have examined opportunities taken for screening for diabetes.

10.4.10.7 Screening for hyperlipidaemia

Stange et al. (Stange, Flocke et al. 2000) found that the North American GPs in their study took 6% of opportunities to offer or to perform cholesterol measurement “established patients”, while Hutchison et al (Hutchison, Woodward et al. 1998) reported that the Canadian GPs in their trial took 50% of opportunities to raise the question of lipid screening with research assistants posing as new patients. This figure is higher than the 2.7% and 2.4% of opportunities taken in the present study for control and intervention group patients respectively. The reasons for these differences are not apparent, but allowing for differences in setting, designs and methods, it is possible that the GPs in the present study may have been less likely to perform or offer this activity than the GPs in the other studies.

10.4.10.8 Influenza immunisation

Stange et al. (Stange, Flocke et al. 2000) found that the North American GPs in their study took 14% of opportunities to offer or to perform influenza immunisation for “established patients”, while Hutchison et al (Hutchison, Woodward et al. 1998) reported that the Canadian GPs in their trial took 31% of opportunities to raise the
question of influenza immunisation with research assistants posing as new patients.

McDowell et al. (McDowell, Newell et al. 1986) reported that two control practices which elected not to be involved in their trial of reminders immunised only 4% of their patients with influenza vaccine. In contrast to this finding, Chambers et al. (Chambers, Balaban et al. 1991) found that doctors who received no reminders took 28% of opportunities to offer influenza immunisation. Altogether the performance of influenza immunisation in these North American and Canadian studies ranged from 4% to 31%.

Two of the results quoted above are lower than the 27.2% and 26.2% of opportunities taken in the present study for control and intervention group patients respectively. The reasons for the differences may include the fact that in Australia influenza vaccine is provided free of charge by the government for patients aged over 65 years, while in the US at least some patients over 65 years may have to pay for it, and there may be cultural differences in the perceptions of the vaccine’s benefit and harm in the two countries.
Again, differences in setting, designs, methods and in indications for influenza vaccine in the different studies make direct comparison difficult.

10.4.10.9 MMR immunisation

Stange et al. (Stange, Flocke et al. 2000) reported the North American GPs in their study took 14% of opportunities to offer or to perform MMR immunisation for “established patients”. This is a somewhat higher proportion than the 8.2% and 10.3% of opportunities taken in the present study for control and intervention group patients respectively. Reasons for the differences are not apparent, but may be accounted for by
differences in setting, designs, indications for mumps, measles and rubella vaccine in the different countries and studies and in the study methods.

10.4.10.10 Pneumococcal immunisation

Hutchison et al. (Hutchison, Woodward et al. 1998) reported that the Canadian GPs in their trial took 16% of opportunities to raise the question of pneumococcal immunisation with research assistants posing as new patients. In the present study, the GPs took 2.7% of opportunities to perform pneumococcal immunisation for patients who had had 0-4 visits during the preceding two years. This lower figure may in part be explained by the fact that only some of these patients would have been new to the practice.

In contrast, Stange et al. (Stange, Flocke et al. 2000) found that the North American GPs in their study took only 2% of opportunities to offer or perform pneumococcal immunisation to “established patients”. This figure is similar to the 1.6% and 2.8% of opportunities taken in the present study control and intervention group patients respectively.

As was outlined in the First chapter, fear of adverse effects may inhibit not only patients from accepting preventive activities but also doctors from offering them. This may apply especially to immunisations. Even more particularly, this fear may exist about new vaccines or vaccines such as pneumococcal vaccine, whose use previously had been restricted to a small group of patients (in the case of pneumococcal vaccine, asplenic patients and a few other small groups) perceived to be at high risk of disease
and in whom the risks of adverse effects of the vaccine are more clearly outweighed by the risks of the disease. Four patients were recorded in the trial as refusing the vaccine. This sounds quite low, but in the context of the numbers of patients who were recorded as refusing any of the preventive activities being very small, it probably under-represents the true rate of refusals, and is lower than the 10% refusal rate found for influenza immunisation by Merkel and Caputo (Merkel and Caputo 1994) and the 36% refusal rate found also for influenza immunisation by Fiebach and Viscoli (Fiebach and Viscoli 1991). These rates for refusal of influenza immunisation may have some relationship to those for the rates of refusal of pneumococcal immunisation because the two vaccines share most of their indications.

10.4.10.11 Tetanus immunisation

Hutchison et al. (Hutchison, Woodward et al. 1998) reported that the Canadian GPs in their trial took 42% of opportunities to raise the question of tetanus immunisation with research assistants posing as new patients. In the present study, the GPs took 3.1% of opportunities to perform tetanus immunisation for patients who had had 0-4 visits during the preceding two years. This much lower figure may in part be explained by the fact that only some of these patients would have been new to the practice.

In contrast to Hutchison’s findings, Stange et al. (Stange, Flocke et al. 2000) found that the North American GPs in their study took only 1% of opportunities to offer or perform tetanus immunisation to “established patients”. This figure is much closer to the 1.5% and 2.8% of opportunities taken in the present study for control and intervention group patients respectively.
Since July 1998, rates of primary immunisation against tetanus have improved in Australia (National Centre for Immunisation Research and Surveillance of Vaccine Preventable Diseases 2000; National Centre for Immunisation Research and Surveillance of Vaccine Preventable Diseases 2002), possibly partly as a result of the introduction of the General Practice Immunisation Incentives Scheme (GPII) for children less than six years old. The introduction of this Scheme may have encouraged the GPs in the study practice to improve primary immunisation rates of their patients during the trial. An analysis of the taking of opportunities to perform tetanus immunisation in the present study for children under six years of age before and after the start of the General Practice Immunisation Incentives Scheme, shows that for children in the intervention group, 6.7% of opportunities were taken before 1st July 1998 and 7.6% were taken after that date, while for children in the control group the rates were 3.8% before and 5.2% after. The same considerations apply to this as for MMR immunisation: the increases in performance after 1st July 1998 may have resulted from the introduction of the GPII incentives but may also have been due to the GPs’ increasing familiarity with the reminder system.

From 2000, the Australian Standard Vaccination Schedule changed the previous policy of a booster dose every 10 years after the age of 15 years, to only one booster dose at the age of 50 years, if none had been given since the age of 40 years. This considerably reduces the number of booster doses required for adults and may improve GPs’ performance in providing what is now regarded as adequate tetanus immunisation for adults.
10.4.10.12 Summary of rates of taking of opportunities compared with those found in other studies

The study by Hutchison et al. (Hutchison, Woodward et al. 1998) found that for new patients, the Canadian GPs in that study took higher proportions than the GPs in the present study for blood pressure screening, cervical smear tests, tetanus immunisation and about the same proportion for pneumococcal immunisation.

In their study of preventive opportunities taken for “established” patients, Stange et al. (Stange, Flocke et al. 2000) found that the North American GPs took higher proportions of opportunities for blood pressure screening, lipid screening, MMR immunisation, cervical smear tests, recording of smoking status and recording of weight than the GPs in the present study, about the same proportion for pneumococcal and tetanus immunisation, and a lower proportion for influenza immunisation than the GPs in the present study.

Reasons for the differences may include the differences in settings and health systems and differences in study designs and methods, including definitions of opportunities and of the taking of opportunities. The possible role of differences in settings and health systems is supported by the only published Australian evidence, that of Heywood et al. (Heywood, Firman et al. 1996), who found that the Australian GPs in their study reported that they had taken a similar proportion of opportunities to perform smear tests as the GPs in the present study had for their patients.
10.4.11 Limitations of this study

10.4.11.1 Effect size of reminders in this study may under-represent the potential effect of reminders

The result of the randomised controlled trial of reminders occurred despite likely reductions in the effect size resulting from limitations inherent in the design of the trial, which have been explained in earlier chapters, including:

- the intention that the trial should intrude minimally into the GPs’ usual ways of working;

- reminders being displayed in only 66% of cases in which they could have been displayed;

- likely carryover to the control group of the effect of GPs’ being prompted to perform preventive activities for the intervention group;

- a number of patients being likely to have changed from one experimental group to the other, after being given a new family number because of changes in family structure or becoming financially self-responsible;

- the GPs being free to ignore the reminders;

- the likelihood that patients who were refusing or ineligible for various preventive activities remained in the denominators;

- the likelihood that patients for whom the GPs found it more difficult to perform preventive activities were over-represented in the trial.
10.4.11.2 Population being studied

Patients were enrolled in the trial only if an opportunity arose during the trial to perform for them any of the preventive activities being studied. Patients who were ‘up to date’ throughout the trial for all preventive activities which were indicated for them were not enrolled, and no data were collected for or about them. It is possible that some types of patients in the practice may have been more likely not to be enrolled for this reason. They may have asked their GPs for a ‘check up’ when they attended, or asked their GP in some other way to perform whatever preventive activities were indicated for them, or for some reason or reasons the GPs in the practice offered and performed all indicated preventive activities for them on their own (the GP’s own) initiative without the patient asking. Patients who had received indicated preventive activities within a one year period before their first consultation during the trial would not have become due for any of those preventive activities during the trial and therefore would also not be enrolled.

Patients who request ‘check ups’ or for whom the GPs tend to perform all indicated preventive activities when they are due or even before they are due, may represent the ‘easier cases’ amongst the practice’s population, and may differ in their attitudes, relationships with their GPs, patterns of attendance or other characteristics from patients for whom GPs don’t offer or perform preventive activities. The multiplicity of preventive activities being studied increases the likelihood that for any patient at least one preventive activity will have become due during the trial, causing that patient to be enrolled and included in the data for at least one of the preventive activities.
Each patient effectively was enrolled separately for each preventive activity for which he or she became due during the trial. For example, if a woman had had a cervical smear test just before the trial started, no opportunity will be recorded during the trial to perform this activity for her and she will not have been included in the analyses of performance of cervical smear tests. However, if she was or became due during the trial for a tetanus immunisation, the opportunity to perform this will have been recorded, she will have been enrolled and data about her will have been included in the analyses of performance of tetanus immunisation.

The patients who were enrolled are likely to represent a continuum of ‘difficulty’ in terms of performance of preventive activities. Some will have been the ‘easy cases’ outlined above, for whom indicated preventive activities usually are done promptly, but for whom one or more preventive activities happened to become due during the trial. At the other end of the continuum, some patients will have been ‘hard cases’ for whom the GPs had failed to take a large number of opportunities to perform indicated preventive activities that had become due possibly years before the trial started. The design of the trial means that there will have been a tendency for the ‘hard cases’ to be over-represented in the population being studied. This will have been likely to reduced the apparent size of the effect of the reminders.

10.4.11.3 Availability of billing data before for consultations that occurred before the start of the trial

The lack of billing data before the 7th October 1997, due to the practice’s culling of billing records for services that had had been provided, reduced the accuracy with which the number of billed surgery consultations for each patient during the two years
preceding each consultation during the trial could be estimated. It is not known whether the number arrived at by the process described in the Methods chapter was more likely to overestimate the number of consultations, because the GPs may have made progress note entries when they were not seeing the patient, or more likely to underestimate the number of services before the start of the trial, because the GPs may have failed to write progress notes at some consultations.

10.4.11.4 Characteristics being studied

The trial was designed to be as minimally intrusive as possible, and this limited the number and types of characteristics of patients, GPs, consultations and opportunities whose associations with the performance of preventive care could be examined.

The patient characteristics able to be studied were limited to demographic aspects that could be extracted from the practice’s electronic patient master file (such as age and gender), those that could be extracted from the electronic clinical records (such as number of long term problems), and others that could be extracted from the electronic billing records (such as number of visits during preceding two years). Other possibly relevant characteristics such as educational level, occupation, income, concession card status, domestic situation, attitude to medical and preventive care, and number of medications being taken were not recorded in a structured way that would allow automatic extraction. A decision that this kind of information should be collected would have required either the patient or the GP to record the information especially for the purposes of the study.
The small number and relatively narrow age range of GPs involved in the study made it unlikely that any further characterisation of the GPs beyond their gender would yield useful results. The workload or ‘busyness’ of each GP may have been a useful characteristic to examine. Numbers of consultations during the trial for each GP varied from 2,001 to 5,291. However, this measure does not directly reflect each GP’s ‘busyness’, because the GPs worked different numbers of days and consulting sessions per week, so analysis by total number of consultations was not considered likely to be useful. It would have been possible to try to capture each GP’s daily workload by considering the number of consultations provided by each GP in one day, but since each GP may have spent a different number of hours on that day to provide those consultations, comparisons of ‘busyness’ on this basis would be unreliable.

The limitations of the method used to determine whether the patient was seeing his or her usual GP within the practice have been described in the Methods chapter. At the cost of intruding on the practice’s usual routines, and requiring more funding and organisation, it would have been possible to ask patients to nominate the GP whom they considered to be their usual doctor within the practice. Whether, how much and in which ways the answers obtained by this method would have differed from the determinations that were made using billing and progress note data is not known.

It is possible that characterising consultations further may have been useful. GPs have long term relationships with many of their patients, and each consultation is only one relatively small element in these long term relationships. In any one consultation, it may be inappropriate or impractical to offer or to perform some or all of the preventive activities that are indicated and due for the patient. For example, if the patient is having a marital or family crisis, or an acute significant illness, it would be highly
inappropriate, unhelpful and destructive of the doctor-patient relationship to suggest that a routine tetanus injection was now due, or to ask whether the patient smokes. Often the GP knows that the patient will be returning soon (for example, patients on long term anti-coagulation, or those being treated for hypertension) and plans to perform one or more preventive activities at the next consultation. It was decided, again in the interests of minimising intrusion on the practice’s usual routines, not to try to capture or get the GPs to record their awareness of preventive needs, deferment of performance of preventive activities, intentions to perform them later or plans made with patients to perform them later.

For most patients, each consultation is one part of a continuum of his or her care by the GP. Counting the number of visits during the preceding two years and calculating an ordinal number during the trial for each preventive opportunities put the consultations into some kind of context in this continuum. It would have been possible to further characterise consultations by:

- the elapsed time since the previous consultation had occurred;
- the time which elapsed until the next consultation occurred, if another did occur during the trial;
- some measure of the regularity of the patient’s consultations, as opposed to their frequency, which was partly addressed by counting the number of consultations during the two years preceding each consultation during the trial.

More effort could have been made to capture the exact duration of each consultation. The Medicare items 23, 36 and 44 each cover consultations of a wide range of durations: no minimum durations are specified in the Medicare Benefits Schedule for
items 3 and 23, while at least 20 minutes is specified for item 36 and at least 40 minutes
is specified to enable a claim for an item 44. Although the practice computer system
recorded the number of minutes from the time that the GPs used the ‘Start consultation’
function until they used the ‘End consultation’ function, the GPs often spent additional
time after the end of the consulting session writing some of the clinical record, and this
additional time was not recorded by the computer system. Further, the GPs may not
have invoked the ‘Start consultation’ function until some time into the consultation or
even after the consultation had finished, and they may have used the ‘End consultation’
function before or after the consultation had actually finished. Additionally, no
consultation times were recorded for the GP who avoided seeing any reminders by not
using the ‘Start consultation’ routine. It was felt that the consultation durations
recorded by the computer system were therefore not reliable for the purposes of this
study. Any attempt to record the duration of each consultation more precisely would
have involved asking the GPs to make a special effort to use the ‘Start consultation’
function only at the beginning of the consultation, and to use the ‘End consultation’
function only once the consultation had finished and all clinical notes about it had been
made. An alternative would have been to ask the GPs to make some kind of separate
notes of the durations of their consultations. It was believed that the GPs would not
have been willing to do either of these things, or that if they had agreed to do so, they
would not have done it reliably in the rush of daily consulting.

10.4.11.5 Accuracy of ordinal number of opportunity during the trial

The measure ‘opportunity number during trial’ used in the analyses does not include
opportunities that had occurred before the trial started. For opportunities for preventive
activities which had become due before the start of the trial, opportunities during the trial labelled as the \( n \)th opportunity were in fact the \((x+n)\)th opportunity, where \( x \) represents the number of consultations that that patient had had before the start of the trial at which the same preventive activity had been due.

There were four reasons why it was decided not to try to calculate the number of opportunities that had occurred for each preventive activity for each patient before the start of the trial. They were: 1) the GPs may have failed to enter progress notes for some consultations; 2) the GPs sometimes made progress notes when the patient had not actually been seen (for example after a telephone call); and 3) the billing records existed only from the 7th October 1997. These limitations meant that it could not be established with sufficient certainty when a patient had actually been seen before the start of the trial. The fourth reason was that, even if this degree of uncertainty had been accepted, an opportunity labelled as say the fourth may have actually been only the first which had occurred during the trial, with three opportunities having all occurred five years before the start of the trial, while another opportunity labelled as the fourth may have really been the fourth opportunity during the trial, without any opportunities having occurred before the start of the trial. It was felt that the effect of including pre-trial opportunities, whether the number was accurate or not, would have tended to confound the assessment of the effect of the ordinal number of the opportunity on the performance of the preventive activities.
10.4.11.6 Randomisation

A family number was allocated automatically by the practice computer system to the first patient in a family group at the time of that patient’s registration. The number was allocated without regard to any characteristics of the patient, family, surgery location or GP seeing the patient. The effect of using the family numbers as the basis of the randomisation was that in chronological order of their registration at the practice, alternate families were allocated either to the intervention or control groups. In this way, each experimental group was expected to contain balanced proportions of families registered across the period spanning from the beginning of the practice to the end of the trial, including patients registered during the trial itself. This is important because it is possible that the demography of the local population may have changed during the years that the practice had been operating.

Patients whose family number changed during the trial, as was outlined in the Methods chapter, had a 50% chance of moving from the intervention to the control group or vice versa. No attempt was made to monitor this or to control for the effects of such changes on the results of the trial. The likely effect of such changes and of not controlling for them is to reduce the size of the effect to the reminders by reducing the difference between the proportions of opportunities taken for the intervention and control groups.

Since analysis was to be chiefly by opportunity, randomisation by opportunity rather than by family could have been considered. This would have involved writing additional computer programs to monitor and count preventive care opportunities for each doctor as they occurred. The additional data processing required for this may have
slowed down the response time of the practice’s computer system enough to annoy the GPs, leading to decreased cooperation with or withdrawal from the study.

10.4.11.7 Accuracy of detection of the taking of some types of opportunities

As explained in the Methods chapter, the accuracy of detection of the taking of some types of opportunities was limited by the structure of the Medrecord computer medical record system, and because the design of the trial was not to ask or require the GPs to make any special records for the purposes of the trial.

These factors probably reduced the power to detect effects of the intervention by weakening the association of the taking of opportunities for some of the activities with specific consultations. For example, measurement of blood glucose and/or cholesterol as screening for diabetes and hyperlipidaemia respectively (the activities DIAB and LIPI) may have been done at the same consultation at which the GP advised it, or they may have been done on a subsequent date as planned tests. Often these are done as morning fasting tests. The dates of taking of opportunities to perform pneumococcal immunisation were able to be inferred with reasonable confidence, as described in the Methods chapter, but the links between the actual performances of screening mammography and any consultations preceding them were considered too weak to be useful.
10.4.11.8 Concealment of allocation

The basis of the allocation of patients to the experimental groups was not concealed from the GPs in the study, because the source code of the practice’s software and of the reminder programs was available on the practice’s computer system, where the doctors could read it if they went looking for it. However, no one in the practice had learnt the programming language of the practice’s computer system or studied the structure of the files in which the many programs were stored. It was considered unlikely that any of the doctors would bother to search through the many program files and thousands of lines of source code to try to find and read the randomisation statement.

It was believed necessary to keep the practice informed of what was being done to its live computer system for the research, and the basis of the randomisation was explained to the managing partner in the practice. During consultations, the patient’s practice record number is displayed on each screen, so it is possible that the doctors could have noted which group the patient was in and altered their care in some systematic way for the two experimental groups of patients.

10.4.11.9 Intention to treat analysis

Analysing by ‘intention to treat’ is likely to have reduced the apparent effect of the reminders, for two reasons. The first reason is that one GP used the ‘Start Consultation’ program for only two consultations during the trial. The reason for this is not known, because he refused to be interviewed, but it is reasonable to assume that he had decided to avoid the intervention. This means that his behaviour is likely to have been similar for patients in both the intervention and control groups, or to put it the other way
around, there is no reason to believe that he would have behaved differently when seeing patients in either group. His non-participation in using the intervention is likely to have reduced the apparent size of the effect in the randomised trial of the reminders.

The second reason why the intention to treat analysis is likely to have shown a smaller size of effect of the reminders is that the other nine GPs did not use the ‘Start Consultation’ program in all of their consultations with patients in the intervention group, but used it only for between 51% and 99% of those consultations. It is reasonable to assume that they behaved similarly with patients in the control group. The reasons for the GPs’ failure to use the ‘Start Consultation’ program at every consultation are not known. The GPs were not asked in their post-trial interviews about this. One possible reason why they didn’t use the ‘Start Consultation’ program at every consultation is that it was found in discussions before the start of the trial with some of the doctors that they sometimes they wrote the progress note only after the consultation was finished, at the end of their consulting session or even in the evening at home, which they did by accessing the practice computer system by modem. In these cases, they may have tended to use the ‘Add Progress Note’ program which did not generate reminders. They may also have used the ‘Add Progress Note’ program during some consultations, but again whether they did and if so, why they would have done so, is not known. In retrospect, it would have been possible to detect and control for this by extracting from the practice’s computer billing system the exact time at which the patient was billed for each consultation, with the time that the progress note for that consultation was started. Progress notes that were started after the patient had been billed were likely to have been written after the consultation had finished, which means that even if the GP had used the ‘Start Consultation’ program, any reminders generated
and displayed could not have affected what happened in that consultation. Had this been done, any such consultations could have been omitted from a sub-analysis of the effects of the reminders in order to give a more accurate picture of the effects of the reminders. The GPs’ failure to use the ‘Start Consultation’ program at every consultation with every patient in the intervention group is likely to have reduced the apparent size of the effect of the reminders for the whole practice in the randomised trial.

10.4.11.10 Contamination

No specific measures were implemented to try to avoid the possibility that the doctors would increase their provision of preventive care to control group patients as a result of being reminded to do so for intervention group patients. It was accepted that contamination was likely to occur, and that this would tend to reduce the apparent size of the effect of the intervention.

The data do not provide any means of estimating the magnitude of the contamination that was likely to occur. Whatever contamination did occur would have reduced the apparent effect of the reminders.

Rosser et al (Rosser, McDowell et al. 1991) examined the extent of possible contamination that may have occurred in their trial of reminders for five preventive activities. Two of the six practices in their academic centre chose not to participate in the trial. In practices in which the doctors received reminders for influenza vaccine for some patients, 10% of patients in the randomised control group received influenza vaccine, compared with 4% of patients in control practices in which none of the doctors
received any reminders. For blood pressure, the respective figures were 21% vs. 19%, for smoking status 12% vs. 10%, for cervical smear 14% vs. 11% and for tetanus immunisation 3% vs. 2%. This may give an indication of the extent to which reminders issued for some patients caused the doctors to increase their provision of care to patients for whom they did not receive reminders. However, the authors noted that the two practices which were used as controls were not randomly allocated to this role but that they ‘elected’ not to be involved in the trials in which reminders were being used. This leaves open the question of whether the doctors in those control practices had a different attitude towards reminders or towards the provision of preventive care from the doctors in the practices that volunteered to participate in the trial.

Chambers et al found in their the trial of reminders for influenza immunisation that when doctors received reminders for half of the number of their patients, 27 of 72 patients (38%) for whom they had been reminded were immunised, compared with 15 of 74 patients (20%) for whom they had not been reminded (Chambers, Balaban et al. 1991). For comparison, another sub-group of doctors who were never reminded immunised 65 of 218 (30%) of their patients. This was interpreted by the authors as showing that the doctors had become dependent on the reminders. Their results would suggest that rather than the ‘contamination’ leading to higher performance in the control group, the opposite occurred, leading to a larger rather than a smaller effect size of the reminders. It is possible that this also occurred in the present study, but the data do not provide any means of assessing this.
Different designs would be needed to try to prevent significant contamination from occurring. These could involve the use of a number of practices and randomisation by practice or by GP.

10.4.11.11 Recording of patients’ refusal or ineligibility for preventive activities

Although a means was provided by which the GPs in the study could note patients’ refusals or ineligibility for particular preventive activities, they were not asked to make any special effort to do this. It is likely that the small number of 119 such notations does not represent all refusals and ineligibilities. The GPs’ probable failure to record all refusals and ineligibilities would have increased the numbers of apparent opportunities for the various preventive activities, and therefore decreased the apparent proportions of opportunities that were taken, reducing the power of the study to find statistically significant effects of the reminders.

It is not surprising that the GPs recorded more refusals and ineligibilities for patients in the intervention group, because the reminders would have prompted the GPs either to perform the activity or to label the patient as refusing or ineligible, if either of these labels seemed appropriate. For control group patients, the GPs may not have even have been aware that the activity was apparently indicated for the patient and therefore would have been less likely to label the patient as refusing or ineligible.

It would have been possible to delete all opportunities recorded for patients eventually labelled as refusing or ineligible, to try to obtain a more correct denominator. This was not done because of insufficient certainty about what proportion of actual refusals or
ineligibilities had been recorded for each activity. It would have been possible to try to get the GPs to more clearly record patients’ refusal or ineligibility, by forcing the GPs to respond to the reminders before they could continue using the computer. This was not done because it was feared that doing so may have caused the GPs to withdraw from the trial because they may have found it an unacceptable intrusion, or else the GPs may have effectively sabotaged the trial by falsely labelling patients as refusing or ineligible simply in order to suppress further reminders for that activity for that patient.

10.4.11.12 Offering of preventive activities was not recorded

In the interests of interfering with the GPs’ usual way of working as little as possible, they were not asked to record offers that they made to perform preventive activities. This probably reduced the apparent effect of the reminders, for the following reason. Patients may have and probably did refuse some of the offers by the GPs to perform various preventive activities, or the GPs regarded certain patients as ineligible for particular preventive activities because of their medical history. If the GPs did not reliably record these situations by using the special ‘refused’ or ‘not indicated’ codes, as outlined in the Methods chapter, the analyses used in this study will have recorded these preventive opportunities as ‘not taken’, rather than deleting that preventive opportunity from the patient’s record. The small number of recorded refusals and notations of patients’ ineligibility for preventive activities suggests that in many and probably most of these cases, the GPs did not record patients’ refusal or ineligibility for particular preventive activities. This will have reduced the apparent size of the effect of the reminders.
10.4.11.13 It is not known whether preventive activities were performed on the doctor’s or patient’s initiative

In the interests of minimising intrusion into the study practice, the GPs were not asked to record on whose initiative each preventive activity was performed. It is likely that patients will have asked their GPs to perform at least some of the preventive activities that were performed in the trial. If it is assumed that patients in each of the control and intervention groups were equally likely to do this, this will have reduced the apparent effect of the reminders by increasing performance equally in both groups. However, it is possible that if the GPs offered more preventive activities to the patients in the intervention group as a result of the reminders, this may have prompted those patients or effectively given them permission to ask for other preventive activities to be performed. Patients sometimes are reluctant to ask their GPs about issues that they would like to discuss or address, because they are conscious of the GP being busy, and they don’t want to “waste the doctor’s time”. Having the GP raise the topic of prevention effectively put this on the agenda for the consultation, and the patients may have responded to this by thinking of other preventive activities that they thought may be indicated for them. These may have been activities that were being studied or they may have been other preventive activities.

10.4.11.14 The performance of only some preventive activities was studied

The study examined the performance of only the preventive activities for which the GPs wished to be reminded. It is possible that performance of other preventive activities was increased or possibly even decreased as a result of the reminders, but this was not measured.
10.4.11.15 ‘Early’ performance of preventive activities was not recorded

Opportunities were considered to exist in consultations to perform preventive activities only if the interval specified by the GPs in the study practice had elapsed since the previous performance of that activity, or if a patient had become old enough since any previous consultations for the activity start being indicated for him or her. If a GP performed a preventive activity before it was due to be performed, this will have delayed the earliest date on which the next opportunity could occur by the same number of days as the performance was ‘early’. For example, the interval specified for measurement of blood pressure was 24 months. If a patient’s blood pressure was measured 18 months after the previous reading, the consultation at which this was done would not have represented an opportunity according to the definition used for this study, and the next opportunity could occur only at the earliest 42 months (24 months + 18 months) after the previous blood pressure measurement, rather than 24 months later.

Because the study will have not recorded such ‘early’ performance of preventive activities, it tended to ignore the ‘easy cases’, patients for whom the GPs may have found it easier to perform some or all indicated preventive activities, leaving the ‘hard cases’ in the trial, for whom performance of preventive activities may have been less likely for a range of reasons.
**10.4.11.16 Performances of preventive activities may have been opportunistic or they may have been planned in advance**

While the reminders were presented opportunistically, the study was not designed to detect whether the performance of preventive activities was as a result of the prompting effect in that consultation of the reminder, or whether that performance of that activity had been planned before the consultation by the doctor or the patient.

To elucidate this, it would have been possible to try to develop a method of displaying the reminders only after the doctor had apparently finished the consultation. The reminders would have had to be displayed before the patient had left the consulting room. There would have been a number of practical difficulties in trying to develop such a method without asking the GPs to change their usual way of working. For example, it was known that the GPs in the practice often completed writing the progress notes of consultations at the end of consulting sessions or even in the evenings at home.

The inability of the study to distinguish opportunistic versus pre-planned performance of the preventive activities does not reduce the study’s ability to measure the effect of opportunistic reminders on the performance of the preventive activities. This note is really intended only to point out that it should not be assumed that performance of the preventive activities was always opportunistic.
10.4.11.17 Statistical power

The low proportions of opportunities taken for many of the preventive activities, even when the GPs were reminded, reduced the statistical power of the analyses, and was responsible for some of the differences found not reaching statistical significance at the $p = 0.05$ level even when the effect size was relatively large.

As explained above, the fact that patients were enrolled in the study of performance of each preventive activity only if that activity was due to be performed for them means that patients who were ‘up to date’ for an activity at all of their consultations during the trial were not enrolled. Amongst such patients who were ‘up to date’ is likely to be an over-representation of the ‘easy cases’, patients who either ask for or readily agree to the performance of preventive activities. This will have left an over-representation of the ‘hard cases’ amongst the patients who were enrolled for the study of performance of each preventive activity: patients who either are reluctant to receive preventive care, perceived as such by their GPs, or for whom for some other reason or reasons the GPs find it harder to perform preventive activities. This may in part account for the low absolute proportions of opportunities that were taken to perform the preventive activities that were studied in the present trial.

Larger studies involving more patients may overcome this limitation of the present study, and designs which help to elucidate the ease or difficulty that GPs have with performing indicated preventive activities for different types of patients could help to answer some of these questions.
10.4.11.18 Limitations in the qualitative data

The qualitative data are limited in being obtained from only seven of the ten GPs who participated in the trial, and in particular from not including the views of the GP who apparently chose to avoid seeing the reminders. They are also limited in the interviews not having explored, because of a lack of time, all of the questions that arose from examination of the quantitative data. This has resulted in a lack of knowledge of some of the GPs’ perceptions and feelings about various aspects of their performance of preventive activities and their reasons for responding or not responding to the reminders.

10.4.11.19 Comparability with other studies

The enrolling of a patient because one preventive activity was due for him or her at a consultation did not cause or result in the patient being enrolled for any other preventive activity. Effectively it was the opportunity for each preventive activity that became enrolled during the trial, rather than the patient as a person. For example, the occurrence during the trial of an opportunity to give a tetanus immunisation resulted in that opportunity being enrolled and recorded. The attributes of that opportunity included the patient’s age and gender, the GPs’ gender, whether the GP was the patient’s usual GP within the practice, the patient’s number of long term problems previously recorded, number of consultations by the patient in the previous two years, the item number billed, the fee level billed, the elapsed time since that preventive activity had become due for the patient, the number of other preventive opportunities at the same consultation, the ordinal number of the opportunity during the trial and
whether the GP received a reminder about the activity. Opportunities that occurred at the same consultation shared the patient’s age and gender, the GPs’ gender, whether the GP was the patient’s usual GP within the practice, the patient’s number of long term problems previously recorded, number of consultations by the patient in the previous two years, the item number billed, fee level billed, number of other preventive opportunities at the same consultation and whether the GP received a reminder about the activity, but not necessarily the elapsed time since that preventive activity had become due for the patient or the ordinal number of the opportunity during the trial. The use of Generalised Estimating Equations in the analyses of the quantitative data was able to take these multiple levels of clustering into account in order to arrive at the correct standard errors of the means.

The focus in this study was on events within each consultation, specifically on the characteristics of the taking of opportunities to perform preventive activities. Almost all of the published trials of opportunistic reminders have reported their results in terms of effectiveness or efficacy. This is probably partly because in most of the published trials the medical records were made on paper, and the cost of extracting individual consultation data from paper records and preparing them for analysis has been prohibitive. Another reason may be that in these trials the intention may have been to take a ‘population health’ approach, rather than undertaking a detailed examination of events within each consultation with the aim of gaining a better understanding of why a preventive care opportunity is taken in one consultation and not in another.

The decision to examine performance of the preventive activities within each consultation makes this study nearly unique, and makes comparison with most previous studies difficult.
10.4.11.20 Generalisability

The lack of a large number of trials which have examined the performance of preventive activities within consultations makes it difficult to assess the generalisability of the findings of the present study.

Although the age and gender distribution of the study practice’s patients and of its services to its patients were fairly similar to those of general practices nationally, the results of this study may not be generalisable, because:

- the study practice was making greater use of computer systems for its clinical records than most practices;
- the study practice had more GPs than the national average;
- the GPs in the study practice (particularly the female GPs) provided more services than the national average;
- the study practice operated from a larger number of surgeries than average;
- the study practice had never bulk billed its patients.

There may be other unidentified factors unique to the study practice, or which it has in common with only a minority of other general practices, which may limit the generalisability of the findings of this study.


10.4.12 Distinctive features of this study

The trial described in this thesis had a number of features which made it different from most preceding studies.

One of these features was the study’s focus on opportunities within consultations, rather than on the effectiveness or efficacy of reminders. The reason for this was to focus attention on what happens within each consultation, with the aim of better understanding factors that influence the provision of care within each consultation. The reason for this focus on events within each consultation is that patients’ contacts with their general practice are critical events whose value should be maximised.

The characterisation of preventive opportunities by the elapsed time since the preventive activity became due to be performed, the number of other preventive opportunities at the same consultation, and their ordinal number appear to be unique to this study.

The decision that the study would be conducted in a setting in which all data were electronic enabled the collection of large numbers of data cheaply and efficiently, their subsequent manipulation and the synthesis of new data such as the characteristics of preventive opportunities outlined above. The use of only electronic data also facilitated the calculation of characteristics of patients and opportunities for every opportunity, rather than just at the start or end of the trial. For example, the number of consultations that the patient had had during the preceding two years was calculated for every
consultation and its associated preventive opportunities, rather than just on the first day of the trial.

The decision to collect and use only electronic data obviated the need for the GPs to write any data or notes on paper forms and for a research assistant to transcribe those data into an electronic system. This greatly reduced the cost of the study.

10.4.13 The roles of GPs and of public health in providing preventive services

The literature reviewed in the first chapter traces the debate about the relative roles of public health and GPs in providing preventive health services.

The first chapter explained that countries with weak or poorly-developed primary health care services have to depend more on public health services to provide preventive services. It also explained that some preventive services are relevant to everybody in the community, such as education about the harmfulness of tobacco smoking and that these types of public health care be provided through mass media and various public campaigns. Other preventive services are relevant only to some people, depending on their demographics and health status, and are best provided by a GP or possibly other primary health care professional consulting with a patient, assessing the relevance of that preventive service to that particular patient and advising the patient whether the preventive service is indicated for him or her. Although mass media campaigns and education aimed at everybody in the community may have a useful effect, it has also been shown that even brief advice from GPs to their patients about these same preventive health measures is effective in encouraging healthy behaviours.
The vision and mission statements of general practice organisations around the world tell us that GPs and their professional and academic organisations see the provision of preventive care as one of the major roles for GPs. It follows therefore that GPs want and seek strategies and systems that help them to perform this role as best as possible. However, the health systems of many countries do not support this role for GPs as fully as is desirable. The reasons for this are probably complex. One reason may be that government policy, legislation, regulatory systems, and government funding tend to lag behind the rapid changes in the evolving health care system. Governments have a tendency to fund ‘more of the same’. Established institutions and organisations, such as large public hospitals, tend simply to have their funding renewed, usually with increases proudly announced by health ministers standing in front of the main entrance to a large hospital building. A second reason for the relative lack of support for the provision of preventive care in general practice and primary care is that the quiet painstaking systematic work of providing preventive care is much less visible and apparent than dramatic operating theatre scenes which show patients with advanced pathology being treated intensively by large teams of doctors, nurses, technicians and other health professionals. The latter situation is highly photogenic for the lay media and for politicians. The pleasure with which health ministers announce the expansion or modernisation of public hospitals may give an impression that members of the public are looking forwards to becoming sick enough to need treatment there. A third reason for the relative lack of government support for the provision of preventive care in general practice relates to this second reason: the nature of general practice and primary care services is that they operate in small practices and units scattered throughout the community, often not well connected with each other and often not well-represented by
a unified organisation. These widely scattered small practices and units are hard to see as a totality. In Australia, a number of organisations claim to represent general practice but often disagree and fight with each other. The natural consequence of this fragmented and conflicting representation is that government tends to listen less to any one of those organisations when seeking or receiving advice about policy. A fourth reason for the relative lack of support for the provision of preventive care in general practice and primary care is that political time frames are short and usually limited to the current or next electoral cycle of a few years. Faced with a choice between supporting the provision of preventive services that will reduce morbidity and premature death in twenty years’ time, or with funding more operating theatres equipped with what have become known colloquially as ‘machines that go “ping”’ (after a famous sketch in the television series Monty Python’s Flying Circus) and that will be photogenic on the television news that night, health ministers and governments find it difficult to resist funding the latter rather than the former.

As a counter balance to the factors outlined above, the rising costs of treating patients with advanced but preventable disease, many of whom will live for only a short time despite the public money spent on treating their advanced pathology, is now beginning to change governments’ attitudes to the balance between funding treatment of patients with advanced disease or funding services that may prevent those diseases or reduce their prevalence and severity. In Australia, the federal government is subsidising some of the costs of preventive services, through a variety of mechanisms, such as payments for reaching targets in immunisation and cervical smear testing and funding for practice nurses to provide immunisations and cervical smear tests in rural and under-doctored areas. Other elements of government schemes are subsidising a number of programs
intended to help to increase the quality of care generally. Support for the computerisation of general practice is an important help to towards facilitating systematic care. This is important for improving the performance of preventive activities, because prevention, being planned and routine is the most systematic part of all the elements of health care.

10.4.13.1 The potential of opportunistic reminders as part of a comprehensive preventive care system

A number of current developments in Australia may help to improve the provision of preventive care. These include:

- government subsidies for practice nurses;

- incentive payments offered for achieving specified levels of performance for practice populations as defined by the Medicare Australia Standardised Whole Patient Equivalent (SWPE) method;

- a Medicare Benefits Schedule item to be introduced in late 2006 to perform a “focused health check for patients aged around 45 years with identifiable risk factors such as weight, smoking or family history”.

Some of these initiatives are aimed at planned reviews and “health checks” aimed specifically at reviewing the patient’s preventive status. Not all patients like being organised to attend for care at times suggested or dictated by the GP or other health professional, but prefer to attend at times of their own choosing. Whatever such planned interventions are introduced, patients will continue to meet with or to have contact at other times with GPs and other primary care health professionals, such as for what are called “illness visits” in the United States. This will occur either face to face in the same room, as it does now in conventional consultations, and it is likely that that
increasing use will be made of remote consulting through voice (currently by telephone or Voice Over Internet Protocol) or Webcam link. These real time two-way consultations will continue to provide opportunities for the GP or other health professional to advise the patient about preventive care which is indicated and due for the patient. A system that automatically reminds GPs and other health care professionals at these times about care which is due will continue to be valuable in helping the patient and the GP or other professional to make the best use of the time that they spend together in this way.

It is likely that GPs and other health care professionals will be able to make more information available routinely to patients about their health status and health care needs, which may help to improve the quality of care by enabling the patient to prompt or ask the GP or other health worker about care that may be indicated. A possible method of introducing such a patient reminder system immediately is discussed below.

The effectiveness of opportunistic reminder systems could be increased by improving the display of reminders, as outlined below, and by providing appropriate incentives to GPs to provide preventive care which is indicated and due to be performed. Financial incentives could include encouraging GPs to provide longer consultations, which the present study and others have found to be associated with better performance of preventive activities other than immunisations, and also incentive payments for the performance of the various preventive activities. The latter approach has been used in Australia and in the United Kingdom with notable success.

Rosser’s group, which examined and compared the cost-effectiveness of opportunistic reminders and of recalling patients by telephone or letter, found that while opportunistic
reminders were the most cost-effective method for patients who attended the practice, the most cost-effective approach for a practice’s whole population would be to use opportunistic reminders at every consultation for all patients, with recall by telephone or letter for patients for whom preventive activities became significantly overdue (Rosser, McDowell et al. 1991).
11 Recommendations

11.1 Further studies of the effects of reminders in a variety of settings

The effects of opportunistic on-screen reminders for preventive activities have been examined so far in only one Australian general practice. Further studies of reminders conducted in a number of Australian general practices, of differing sizes, types, organisation and populations in order to assess whether and how the effects of opportunistic reminders vary in different conditions would help to elucidate the potential role of reminders.

11.2 Other characteristics of patients, GPs, practices and consultations should be examined

In order better to understand factors which influence the performance of preventive activities and the responses to reminders, further studies should examine the associations of other characteristics of patients, GPs, practices, consultations and preventive opportunities with the performance of preventive care. These may include, for example, patients’ socio-economic and educational status, occupation, attitudes to medical care and to prevention, the nature of their acute and long term health problems, the ages and professional backgrounds of GPs, their attitudes to prevention and to quality of care generally, and the elapsed time since the patient’s previous consultation.

In the present study, the reminders displayed the date of any previous performance of the activity, or if it had never been performed, the text “None on record”. The GPs’ responses to the reminders may have depended on whether the preventive activity being
reminded about has ever been performed or documented for the patient: if a preventive activity has been performed many times when it was due for a patient, always with normal results, GPs may feel less urgency about performing it again, in response to a reminder, than if it has never been performed. For example, GPs may respond differently if a reminder that a cervical smear test is due for a patient if it tells them for a longstanding patient of the practice: “Last cervical smear 2.1 years ago, result normal” than if it states “No cervical smear on record”.

11.3 Possible enhancements to make reminders more effective

The practice computer system displayed the reminders chronologically according to date due, but did not otherwise highlight or prioritise the preventive activities that were due for the patient.

11.3.1 Providing further incentives to GPs to provide appropriate preventive care

It is possible to influence human behaviour in any direction desired by altering the financial or other rewards for doing so. The success of the General Practice Immunisation Incentives scheme in helping to increase childhood immunisation levels testifies to the power of providing adequate incentives for GPs to provide appropriate care. This was achieved at the cost of establishing and maintaining a national Australian Childhood Immunisation Register, whose estimated budget for 2003-2004 is $6.7million (Commonwealth of Australia 2003), and the cost of the incentive payments made to GPs of $35.7million in the 2001-2002 year.
Currently the Commonwealth is providing incentive payments for GPs who provide specified care programs to patients with asthma or diabetes. While these schemes are aimed at the care of patients who have been diagnosed as suffering from the specified conditions, the Commonwealth’s scheme to reward GPs who perform smear testing for women who have not had a smear for over four years is, like the GPII, intended to increase the level of appropriate care either to prevent disease (in the case of the GPII) or to detect it disease in its early stages (in the case of the cervical smear test incentive scheme).

It would be possible to create similar incentive schemes for other preventive care activities, and if the rewards were sufficient, it is reasonably likely that GPs’ performance of the relevant preventive activities would increase. The United Kingdom has recently substantially increased the incentives offered to general practices for better performance of preventive care (Roland 2004) and found that the response and the number of practices achieving high levels of performance has been much greater than expected. The relationship between the amount of the incentive payment offered for the performance of any particular preventive activity for any particular patient and the size of response to reminders for that activity for that patient may not be linear: there may be a threshold effect, with an amount of incentive payment above which a significant response rate is seen but beyond which the size of the response may not increase very much, or conversely there may be an accelerating increase in size of response with increasing size of incentive payment.

Increased sophistication could be added by varying the amount of the incentive payment offered, according to one or more of: the elapsed time since the preventive activity had become due, the abnormality or otherwise of the finding on the previous performance of
the activity, or an automated assessment of how important the activity is for that particular patient. If higher incentive payments are offered for the performance of preventive activities that had been due for longer, the possibility of GPs being tempted to delay performing preventive activities in order to receive the higher incentive payments, would need to be offset by offering incentives for achieving prompt performance of the activity for a specified minimum proportion of the practice’s population. This is the approach that has been taken with the incentives in the Australian government’s Practice Incentive Program (Medicare Australia 2006) for the performance of cervical smears.

11.3.2 Telling GPs how much incentive payment is available for performing each preventive activity

The reminder message could display the amount of the incentive payment that the GP would receive for performing the preventive activity. This would be likely to have a significant motivating effect, whose size may bear some relationship to the amount of the payment available.

11.3.3 Requiring GPs to respond to the reminders

Requiring GPs to respond in some way to reminders may increase their performance of appropriate preventive care activities, as has been found by Litzelman et al. (Litzelman, Dittus et al. 1993). Requiring a response may also improve the recording of which patients are refusing preventive care activities and of those whom the GPs judge to be ineligible for them because of their medical condition. However, requiring responses to reminders before the GP can continue the consultation violates the third of Bates et al.’s
“Ten Commandments for Effective Clinical Decision Support (Bates, Kuperman et al. 2003), which states: “Fit into the User's Workflow”. Requiring responses before allowing the user to continue clearly obstructs the user’s workflow.

GPs may regard attempts to force responses from them as intrusive and obstructive, and may then seek to switch off or avoid seeing the reminders. There can be many reasons why a GP may decide that it is inappropriate at a particular consultation to offer or to perform one or more preventive care activities which are indicated for the patient. For example, GPs may regard it as inappropriate to offer a tetanus immunisation to a patient who has attended ill or seeking counselling for a problem, and GPs are likely to resent being forced to respond in some way to a reminder for this.

In this study, one of the ten GPs used a method of recording his clinical notes that prevented him from seeing any of the reminders. That GP did not agree to be interviewed about his attitude to and experiences with the reminder system, and the reasons for his actions are not known. It is possible that despite not being forced to make any response to the reminders, he decided to avoid seeing them. His action may be reflected in a proportion of the wider GP population if they are presented with reminders similar to those used in this study.

11.3.4 Monitoring each GP’s performance

The computer system could be programmed to keep a running score for each GP’s performance of each preventive activity. The computer system could effectively say to itself, as a result of its ongoing monitoring: “This GP has failed to take three opportunities so far for this activity for this patient” and include in the reminder
message a note of the number of times that the patient has attended while the activity has been due but has not been performed. Instead of or in addition to this, the computer system could display the number of opportunities that that particular GP has had but failed to take to perform the preventive activity for that patient.

It may be useful to take advantage GPs’ natural competitiveness and desire to perform well and to be seen to be performing well. It could help to motivate GPs by telling them at each preventive opportunity their ranking on performance of that activity or of all preventive activities. The reminder could include a message something like: “You performance of this activity is 6th highest of the 10 GPs in the practice”, or “Your performance of all preventive activities is 2nd highest in the practice”. In actual practice, these sentences are likely to be too wordy, and the rankings may appear just as fractions such as 6/10 next the reminders. The exact format that is best would need to be established by testing and refining a number of possible formats in conjunction with GPs.

11.3.5 Displaying reminders selectively based on the urgency or importance of the preventive activity for that patient

Algorithms could be written so that where one activity was greatly overdue but others were not, the computer might suppress all other reminders except the overdue one and display it more prominently, pointing out for how long it has been due and how many opportunities to perform it have not been taken.

Different preventive activities may be prioritised based on some criteria decided in advance and programmed into the system. For example, measuring the blood pressure
of a 50 year old woman for whom this has not been done previously may be judged as more important than performing a cervical smear that has been due for only one day (that is, the previous smear was performed two years and one day ago), if she has had smears performed every two years since the age of twenty years, all with normal results. For such a patient, the health benefit of measuring her blood pressure at this time and discovering significant previously-undiagnosed hypertension probably exceeds the health benefit of repeating the cervical smear whose result will most likely once again be normal. Writing algorithms to rank the likely importance of different preventive activities for different patients, depending on their age, gender, recorded medical history and history of preventive activities would be an interesting and challenging but not impossible exercise.

There could be a fixed size ‘reminder space’ on the screen, with fractions of that space allocated amongst the various preventive reminders according to their urgency and importance based on an algorithm that ranked these for the specific patient, based on the patient’s age, gender and health status.

### 11.4 Reminders could be provided to patients

The present study has examined the effects of reminders displayed to GPs. No published studies have been found which have examined the effects of targeted reminders provided to patients immediately before consultations. Patients have a vested interest in their own health, and while in the waiting room may prefer to read targeted information about their health and advice about how they can maintain it than to read magazines. Clinical computer systems currently in use in general practice are already
generating reminders to GPs, and it would be a small step to program the general practice clinical and appointment software currently in use to generate automatically a ‘preventive care summary’ sheet for patients when they are marked in the practice’s electronic appointment system as having arrived for their appointment. The ‘preventive care summary’ sheet could set out the preventive activities that are indicated and due to be performed for the patient, with an explanation of the purpose and benefits of each preventive activity. The sheet would advise the patient to discuss the information in it with the GP or nurse that the patient is about to see. A draft template of such a summary is shown in Figure 1.
Dear [patient’s name],

We want to help you to stay well. The following preventive activities are important in helping you to stay well and according to our records are due to be done for you now.

**Immunisations**

<table>
<thead>
<tr>
<th>Last done</th>
<th>Finding or action</th>
<th>Was next due on:</th>
</tr>
</thead>
</table>

**Examinations**


**Tests**

| Cholesterol | 25/7/2003 | 7.2mmol | 22/9/2005 |

**Explanation of the preventive activities listed above**

Influenza vaccine is designed to protect you against influenza ("the flu"), which is a serious illness which occurs in epidemics.

We measure your blood pressure and cholesterol to help us work out your risk for heart attack, stroke and other arterial diseases.

Please discuss the recommendations on this sheet with me when we meet in a few minutes.

[Name of doctor or nurse that the patient is about to see]

Preventive activities that are due to be done for you in the future:

<table>
<thead>
<tr>
<th>Cervical (Pap) smear test</th>
<th>Last done</th>
<th>Finding or action</th>
<th>Next due</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>14/6/2006</td>
<td>Normal</td>
<td>14/6/2008</td>
</tr>
</tbody>
</table>

The cervical (Pap) smear test can help to detect cancer of the cervix or neck of the womb. Screening mammography (breast Xray) can help to detect cancer of the breast early.

*Figure 1 Example of preventive care summary sheet to be printed on the patient's arrival for a consultation.*
11.5 Further development of reminder systems

Further research should be conducted aimed at developing more effective opportunistic reminder systems, exploring the ideas outlined above and others that may be useful.

The vital role played in medical informatics by medical software developers, commercial and non-commercial, has been relatively disregarded and neglected in the past. Development and improvement of software used in general practice cannot happen without software developers. The successful development and implementation of improved reminder systems will depend heavily on a close working relationship closely with those engaged in writing software for general practices.

One important issue which should be addressed is the current lack of any standard or standardised method of providing reminder functions, or indeed any other functions, in general practice computer systems. Each software developer is operating mostly in isolation and is writing software to provide necessary and desired functions only for its own software package. A current example is the introduction of Medicare Australia Online Claiming (formerly known as HIC Online) functions into billing software. Instead of developing a single module with an application programming interface (an API) through which all software developers would incorporate Medicare Australia Online Claiming functions into their packages, Medicare Australia has paid each software developer to write its own module specifically and only for its own software package. This approach as well as being wasteful of public money, means that any changes to Medicare Australia Online Claiming will require each developer to re-write
its individual proprietary module. It is important that the Commonwealth does not repeat this mistake if it funds the development of improved preventive care systems.

The results of the present study and of future studies in this area should be considered in designing changes to the Australian health system, in order to encourage the provision of appropriate preventive care.

11.5.1 Summary of recommendations

The already widespread and increasing use of electronic clinical record systems now allows the opportunistic reminders for preventive activities to be generated very economically. Once programmed, reminders cost effectively nothing to generate and are a sustainable intervention to improve care that requires no changes to the health system. The potential of opportunistic reminders to improve the delivery of appropriate preventive care should be further explored. Opportunistic reminders can probably be made more effective by using the increasing computer procession power now available to provide more information that is more useful and more motivating to GPs, and to present it in ways that are more effective in getting GPs, nurses and other health professionals working in general practice and primary care and other to respond. Incentives for the performance of preventive activities play an important role and should be further explored.
11.5.2 Conclusion

This study has gathered unique data about the effects of on-screen reminders about preventive activities and about some of the other influences on the performance of preventive activities in consultations in general practice in Australia.

The relationships between performance of various preventive activities and characteristics of patients, GPs, consultations and preventive opportunities have been shown to be complex.

The elucidation of these influences on the performance of preventive activities can help in the design of better reminder systems and other strategies to improve the performance of preventive activities.
References


National Health and Medical Research Council (1996). Pneumococcal immunisation.


Piterman, L. and S. Sommer (1993). Preventive Care: Final Year Handbook, Monash University, Department of Community Medicine, Melbourne.


WONCA Europe (European Society of General Practice/Family Medicine) (2002). The European Definition Of General Practice / Family Medicine, WONCA Europe (European Society of General Practice/Family Medicine).


13 Appendices

13.1 Appendix 1 Ethics approval

THE UNIVERSITY OF ADELAIDE
Registry Secretariat

F.255893
Enquiries:
Mrs. Helen Malby, Secretary,
Committee on the Ethics of Human Experimentation
Tel: 30-34014

20 September, 1996

Dr O. R. Frank,
Department of General Practice.

Dear Dr Frank,

H/22/96
IMPROVED PREVENTIVE CARE FROM AUTOMATED REMINDERS ADDED TO TO A GENERAL PRACTICE COMPUTER MEDICAL RECORD SYSTEM

I am pleased to inform you that the Committee on the Ethics of Human Experimentation has approved the above project. This is on the understanding that the examination of the records at the start of the project is to be done by the researchers, in order to secure the confidentiality of the records.

Approval will be current for one year. The expiry date for this project is

25 August, 1997

Where possible, subjects taking part in the study should be given a copy of the Information Sheet and the signed Consent Form to retain.

Please note that any change to the project which may affect its ethical aspects will invalidate the project's approval. In such cases an amended protocol must be submitted to the Committee for further approval.

Applications for renewal must be accompanied by a brief report on the project's progress and any ethical issues which may have arisen. Similarly, if the project has been completed, has lapsed, or has been withdrawn, a report should be submitted to the Committee.

Yours sincerely,

(F. J. O'Neill)
Registrar

Postal Address: The University of Adelaide, Australia 5005
Tel: (08) 851-3566 Fax: (08) 851-3347 Telex: UNIVAD AAS9141
THE UNIVERSITY OF ADELAIDE
COMMITTEE ON THE ETHICS OF HUMAN EXPERIMENTATION

Applications will be considered in terms of the University's guidelines on the ethics of human experimentation, based on the NHMRC Statement on Human Experimentation, refer application Information Kit. Submit the application plus 8 duplicate copies to the Secretary, Committee on the Ethics of Human Experimentation, Registry Secretariat.

COVER SHEET FOR APPLICATION FOR ETHICAL APPROVAL OF A PROJECT INVOLVING HUMAN EXPERIMENTATION

<table>
<thead>
<tr>
<th>APPLICANT:</th>
<th>Surname</th>
<th>Initials</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frank</td>
<td>O.R.</td>
<td></td>
<td>Doctor</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>DEPARTMENT:</th>
<th>General Practice</th>
<th>Tel:</th>
<th>33460</th>
</tr>
</thead>
</table>

| OTHERS INVOLVED: | | |
|------------------| Dr. John Litt, Senior Lecturer, Department of General Practice, Flinders University |

| PROJECT TITLE: | Improved preventive care from automated reminders added to a general practice computer medical record system. |

<table>
<thead>
<tr>
<th>SOURCE OF FUNDING:</th>
<th>Research and Development Grants Program, Department of Human Services and Health</th>
</tr>
</thead>
<tbody>
<tr>
<td>DATE PROJECT TO BEGIN:</td>
<td>As soon as funding received.</td>
</tr>
<tr>
<td>ESTIMATED DURATION OF PROJECT:</td>
<td>Two years.</td>
</tr>
<tr>
<td>LOCATION OF RESEARCH:</td>
<td>General medical practices of Rhyllyn Pty. Ltd., Adelaide</td>
</tr>
</tbody>
</table>

BRIEF DESCRIPTION OF THE PLAN/DESIGN OF PROJECT (In lay terms):

The study will be a randomised controlled trial of computer-generated opportunistic preventive care reminders to improve the delivery of preventive care in a general practice setting. For patients randomised to the intervention group, preventive care reminders will be generated automatically during each consultation by the computer medical record system currently used by the practice.

BRIEF DESCRIPTION OF THE AIMS OF PROJECT (In lay terms):

The aims of the research are:

a) to evaluate the efficacy of automatically-generated preventive care reminders in improving the delivery of preventive care by general practitioners who are already using a computer medical record system;

b) to explore characteristics of doctors, patients and consultations associated with improved preventive performance.

ETHICAL IMPLICATIONS OF PROJECT:

The participating general practitioners will of necessity be heavily involved in the setting up of the study and in the collection of data. They will be fully aware of what is being measured and compared.
DRUGS:
Will drugs be administered to subjects? YES/NO
If YES - give name of drug(s):

Will this project be conducted under the CTN Scheme? YES/NO
Is Commonwealth Department of Health permission required? YES/NO
Has Commonwealth Department of Health permission been obtained? YES/NO
Is the administration for therapeutic purposes? YES/NO
Dosage:
Method of administration:

SUBJECTS:
General medical practitioners.
Source:
The doctors practising in four general practices in the southern suburbs of Adelaide.
Age range:
Selection criteria:
All of the doctors in the practices will be invited to participate.
Exclusion criteria:
Doctors who do not wish to participate will be excluded.

SIGNATURE OF ALL INVESTIGATORS NAMED IN THE PROTOCOL:
Dr. J. Litt - until end of August
Date: 6/8/96

THE UNIVERSITY OF ADELAIDE COMMITTEE ON THE ETHICS OF HUMAN EXPERIMENTATION
PROJECT NO: 41/22/96
APPROVED BY THE COMMITTEE AT THE MEETING HELD ON: 26 AUG 1996
SUBJECT TO: The 8-year experiment that the test is the project is in order by the research in order to
maintain the confidentiality of the results
FOR THE PERIOD UNTIL:
Signed: C. E. Warkentin
Date: 28 AUG 1996
Convenor
13.2 Appendix 1 Computer programs on which reminder programs were based

These source codes on which the programs used in the trial were based have not been ‘cleaned up’. Dr. Oliver Frank substantially modified Dr. Jan Ravet’s original programs, but this has not been annotated in all places. Some of the programs were written entirely by Dr. Oliver Frank, having started as copies of Dr. Ravet’s programs.

```
RECAL.ONEPAT
001   SUBROUTINE RECAL.ONEPAT(FAMPAT)
002    RECAL.ONEPAT
003
004    POST AND CANCEL RECALLS FOR ONE PATIENT
005    PRINT @(10,10):"STARTING RPL RECAL.ONEPAT"
006    INPUT REPLY,1
007
008    JAN RAVET SEPTEMBER 1992
009    OLIVER FRANK JAN 95 - AUG 97
010
011    MOD.DATA = "250992"
012    PROG.NAME = "RECAL.ONEPAT"
013    TODAY = DATE()
014    MONTH = OCONV(TODAY,'DM')
015
016    PROMPT "
017
018    OPEN ",PATIENT.MASTER.FILE' TO PATIENT.MASTER.FILE ELSE
019    OPEN ",PATIENT.PROBLEMS.FILE' TO PATIENT.PROBLEMS.FILE
020    OPEN ",PAT.RECALL.FILE' TO PAT.RECALL.FILE ELSE STOP
021
022    READU PAT.DATA FROM PATIENT.MASTER.FILE,FAMPAT ELSE
023    PRINT @(0,23):"PMF ":FAMPAT:" NOT OPEN : IN RECAL.ONEPAT
024    LINE 20 ":@(-4):"
025    GOTO 999 ; * EXIT
026    END
027
028    VM = CHAR(253)
029    SURNAME = PAT.DATA<1>
030    GIVEN = PAT.DATA<2>
031    DOB = PAT.DATA<3>
032    AGE.DAYS = DATE() - DOB
033    AGE = AGE.DAYS/365.25
034    SEX = PAT.DATA<4>
035    POSTCODE = PAT.DATA<36>
036    FAMNUM = OCONV(FAMPAT,"T1,5")
```
ADDRESS = PAT.DATA<34>
RECALL.POINTERS = PAT.DATA<54>
PROBLEMS.POINTERS = PAT.DATA<23>
*************************************************************
FIND PATIENTS NOT FOR AUTOMATIC RECALLS AND REMINDERS
PRINT @16,2:""; * PRINT @16,2:""? EXCLUSIONS"
FIRST THOSE IN NURSING HOMES ETC.
IF FAMNUM > 69999 THEN
GOSUB 800; * DELETE ALL AUTOMATED RECALLS
GOTO 999; * EXIT
END
CANCEL RECALLS IF LIVES IN A NURSING HOME
IF INDEX(ADDRESS,"HOSTEL","'1") > 0 OR
INDEX(ADDRESS,"NURSING","'1") > 0 OR
INDEX(ADDRESS,"N.H.","'1") > 0 THEN
GOSUB 800; * DELETE ALL AUTOMATED RECALLS
GOTO 999; * EXIT
END
PROBLEMS
FIND THOSE WHO ARE LABELLED AS NOT FOR RECALLS
NO.PROBLEMS = DCOUNT(PROBLEMS.POINTERS,VM)
FOR I = 1 TO NO.PROBLEMS
PROBLEMS.ID = FAMPAT:"";PAT.DATA<23,I>
READ PROBLEMS.DATA FROM
PATIENT.PROBLEMS.FILE,PROBLEMS.ID ELSE
PROBLEMS.DATA = "
END
FOUND.ONE = INDEX(PROBLEMS.DATA<1>,"390","'1")
IF FOUND.ONE > 0 THEN
GOSUB 800; * DELETE ALL AUTOMATED RECALLS
GOTO 999; * EXIT
END
IF POSTCODE # " THEN
IF POSTCODE < 5000 OR POSTCODE > 5999 THEN
GOSUB 800; * DELETE ALL AUTOMATED RECALLS
GOTO 999; * EXIT
END
END
IF ALERT = "DC" OR ALERT = "RK" OR
INDEX(SURNAME,"ARCHIVED","'1") > 0 OR
INDEX(SURNAME,"DECEAS","'1") > 0 THEN

393
081 GOTO 800 ; * DELETE ALL AUTOMATED RECALLS
082 GOTO 999 ; * EXIT
083 END
084
085 NEXT I
086**********************************************************
087 BEFORE REGENERATING RECALLS, DELETE ALL EXISTING
AUTOMATED RECALLS
088 GOSUB 800
089**********************************************************
090 NOW START GENERATING THE RECALLS
091 DOB = PAT.DATA<3>
092 IF DOB = " THEN
093 CALL RECAL.AGE(FAMPAT,PAT.DATA,AGE)
094 END
095
096 SEX = PAT.DATA<4>
097 IF SEX = " THEN
098 CALL RECAL.SEX(FAMPAT,PAT.DATA,AGE)
099 END
100
101 IF SEX OR DOB MISSING, DON'T BOTHER TRYING TO
GENERATE OTHER REMINDERS UNTIL THESE ARE FIXED
102 IF DOB = "" OR SEX = "" THEN
103 GOTO 999 ; * EXIT
104 END
105
106 PRINT @ (16,2):"              "; PRINT @ (16,2):" RECAL.PATR"
107 CALL RECAL.PATRS(FAMPAT,PAT.DATA,AGE)
108
109 PRINT @ (16,2):"              "; PRINT @ (16,2):" RECAL.AGE"
110 CALL RECAL.AGE(FAMPAT,PAT.DATA,AGE)
111 CALL RECAL.SEX(FAMPAT,PAT.DATA,AGE)
112
113 PRINT @ (16,2):"              "; PRINT @ (16,2):" RECAL.PREV"
114 CALL RECAL.ALLERGY(FAMPAT,PAT.DATA)
115
116 CALL RECAL.BIRTHDAY(FAMPAT,PAT.DATA,AGE)
117
118 PRINT @ (16,2):"              "; PRINT @ (16,2):" RECAL.VISIT"
119 CALL RECAL.FIRST.VISIT(FAMPAT,PAT.DATA)
120
121 CALL RECAL.PREV(FAMPAT,PAT.DATA,USER.ID)
122
123 PRINT @ (16,2):"              "; PRINT @ (16,2):" RECAL.TET"
124 CALL RECAL.TET(FAMPAT,PAT.DATA,AGE,DOB)
125 PRINT @ (16,2):"              "; PRINT @ (16,2):" RECAL.FLU"
126 CALL RECAL.FLU(FAMPAT,PAT.DATA,AGE)
127 PRINT @ (16,2):"              "; PRINT @ (16,2):" RECAL.HELICO"
128 CALL RECAL.HELICO(FAMPAT,PAT.DATA)
PRINT @(16,2):"              "; PRINT @(16,2):"RECAL.DIUR"
CALL RECAL.TREAT.DIURETIC(FAMPAT,PAT.DATA)

IF AGE > 9 AND AGE < 19 THEN
PRINT @(16,2):"              "; PRINT @(16,2):"RECAL.HEPB"
CALL RECAL.HEPB(FAMPAT,PAT.DATA,AGE,DOB)
END

IF DOB > 3458 THEN ; * BORN AFTER 19/6/77
99% OF THOSE BORN EARLIER ARE IMMUNE, BECAUSE THEY HAD THE DISEASE
PRINT @(16,2):"              "; PRINT @(16,2):"RECAL.MMR"
CALL RECAL.MMR(FAMPAT,PAT.DATA,AGE,DOB)
END

TEMPORARY RECALL FOR RACGP BP RESEARCH TRIAL, STARTED JULY 1996

IF AGE < 80 THEN
PRINT @(16,2):"              "; PRINT @(16,2):"RECAL.BPRT"
CALL RECAL.BP.TRIAL(FAMPAT,PAT.DATA)
END

IF AGE > 17 THEN
PRINT @(16,2):"              "; PRINT @(16,2):"RECAL.SMOK"
CALL RECAL.SMOK(FAMPAT,PAT.DATA)
END

IF AGE > 17 THEN
PRINT @(16,2):"              "; PRINT @(16,2):"RECAL.ALCO"
CALL RECAL.ALCO(FAMPAT,PAT.DATA,AGE)
END

***********************
IF AGE > 19 THEN
*****
WEIGH & MEASURE FOR OBESITY AS DIABETES RISK (OVER 65 GET SCREENED ANYWAY)
PRINT @(16,2):"              "; PRINT @(16,2):"RECAL.HT"
CALL RECAL.HT(FAMPAT,PAT.DATA)

PRINT @(16,2):"              "; PRINT @(16,2):"RECAL.WT"
CALL RECAL.WT(FAMPAT,PAT.DATA)
END
*****
IF AGE > 20 THEN
PRINT @(16,2):"              "; PRINT @(16,2):"RECAL.BP"
CALL RECAL.BP(FAMPAT,PAT.DATA,AGE)

PRINT @(16,2):"              "; PRINT @(16,2):"RECAL.PATR"
CALL RECAL.PATRS(FAMPAT,PAT.DATA,AGE)
IF AGE > 39 THEN
    PRINT @(16,2):"              "; PRINT @(16,2):"RECAL.DIAB"
    CALL RECAL.DIAB(FAMPAT,PAT.DATA,AGE)
END

IF AGE > 17 AND AGE < 30 THEN
    PRINT @(16,2):"              "; PRINT @(16,2):"RECAL.THAL"
    CALL RECAL.THAL(FAMPAT,PAT.DATA)
END

IF AGE < 70 AND AGE > 19 THEN
    PRINT @(16,2):"              "; PRINT @(16,2):"RECAL.LIPI"
    CALL RECAL.LIPI(FAMPAT,PAT.DATA)
END

**********
IF AGE > 17 THEN
    PRINT @(16,2):"              "; PRINT @(16,2):"RECAL.SKIN"
    CALL RECAL.SKIN(FAMPAT,PAT.DATA,AGE,USER.ID)
END

**********
IF AGE > 65 THEN
    PRINT @(16,2):"              "; PRINT @(16,2):"RECAL.PNEUM"
    CALL RECAL.PNEUM(FAMPAT,PAT.DATA)
    PRINT @(16,2):"              "; PRINT @(16,2):"RECAL.HOMESAFE"
    CALL RECAL.HOMESAFE(FAMPAT,PAT.DATA)
END

**********
IF AGE > 70 THEN
    CALL RECAL.ACCESS(FAMPAT,PAT.DATA)
    PRINT @(16,2):"              "; PRINT @(16,2):"RECAL.ACCESS"
END

**********
IF SEX = "F" THEN
    IF AGE > 17 THEN
        IF AGE > 25  THEN
            PRINT @(16,2):"              "; PRINT @(16,2):"RECAL.BRST"
            CALL RECAL.BRST(FAMPAT,PAT.DATA)
        END
    END
    IF AGE < 70 THEN
        CALL RECAL.PAP(FAMPAT,PAT.DATA)
        PRINT @(16,2):"              "; PRINT @(16,2):"RECAL.PAP"
    END
    IF AGE > 49 THEN
        PRINT @(16,2):"              "; PRINT @(16,2):"RECAL.MAMM"
CALL RECAL.MAMM(FAMPAT,PAT.DATA)
END

IF AGE < 40 THEN
PRINT @(16,2):"              "; * PRINT @(16,2):"RECAL.RUBELLA"
CALL RECAL.RUBELLA(FAMPAT,PAT.DATA)
PRINT @(16,2):"              "; * PRINT @(16,2):"RECAL.FOLATE"
CALL RECAL.FOLATE(FAMPAT,PAT.DATA)
END

IF AGE > 47 THEN
PRINT @(16,2):"              "; * PRINT @(16,2):"RECAL.HRT"
CALL RECAL.HRT(FAMPAT,PAT.DATA)
END

END

GOTO 999 ; * EXIT

800 * DELETE PREVIOUS AUTOMATICALLY-GENERATED REMINDERS
NO.RECALLS = DCOUNT(RECALL.POINTERS,VM)
FOR I = 1 TO NO.RECALLS
RECALL.DATA = ''
RECALL.ID = FAMPAT:"*":PAT.DATA<54,I>
READ RECALL.DATA FROM PAT.RECALL.FILE, RECALL.ID
ELSE  RECALL.DATA = ''
SOURCE = RECALL.DATA<6>; BATCH.SOURCE = RECALL.DATA<5>
PRINT @(10,11):RECALL.DATA
PRINT @(10,12):"RECALL.DATE: ":OCONV(RECALL.ID,"G1*2")
INPUT REPLY,1
IF SOURCE = "A" OR SOURCE = "S" OR BATCH.SOURCE = "S" OR
BATCH.SOURCE = "A"
THEN ; * DELETE IT

PRINT @(10,13):PAT.DATA<54>
PRINT @(10,15):"DELETING ":OCONV(RECALL.ID,"G1*2").:" RECALL.DATA
DELETE PAT.RECALL.FILE, RECALL.ID
PAT.DATA = DELETE(PAT.DATA,54,I)
PRINT @(10,16):PAT.DATA<54>
INPUT REPLY,1
FOR Q = 10 TO 19
PRINT @(0,Q):SPACE(80)
NEXT Q
WRITE PAT.DATA ON PATIENT.MASTER.FILE, FAMPAT
READ THE ALTERED RECALL POINTERS
READV RECALL.POINTERS FROM PATIENT.MASTER.FILE,
FAMPAT, 54 ELSE GOTO 850 ; * FINISHED
GOTO 800 ; * GO AROUND AGAIN LOOKING FOR AUTO
RECALLS TO DELETE
END

NEXT I ; * NEXT RECALL ITEM
850 RETURN

*********************************************************
999 * EXIT
RELEASE ; * UNLOCK THE PATIENT'S PMF RECORD
RETURN

write.research

SUBROUTINE WRITE.RESEARCH(FAMPAT,PREV.PAR,LAST.DATE,RECALL.
DATE
TO WRITE DATA TO THE RESEARCH FILE
OLIVER FRANK JUNE 1997

if last.date = " and recall.date = " then
no data to write, so exit
go to 999 ; * exit
end

VM = CHAR(253)
RESEARCH.DATA = 
TODAY = DATE()
LAST.DATEGENERATED = 
LAST.RECALL.DATE = 
LAST.DATE.DONE = 

OPEN 'RESEARCH.REMINDER.FILE' TO RESEARCH.REMINDER.FILE
ELSE STOP "RESEARCH
REMARK. FILE NOT OPENED BY WRITE.RESEARCH"

PRINT @(30,9):"PREV.PAR = ":PREV.PAR
INPUT REPLY,1

RESEARCH.KEY = FAMPAT:"*:PREV.PAR

PRINT @(30,10):"RESEARCH.KEY = ":RESEARCH.KEY
PRINT @(30,11):"PREV.PAR = ":PREV.PAR
INPUT REPLY,1

READ RESEARCH.DATA FROM
RESEARCH.REMINDER.FILE,RESEARCH.KEY ELSE
RESEARCH.DATA = 
END

PRINT @(30,10):"OLD DATA: ":RESEARCH.DATA
DATES.GEN = RESEARCH.DATA<1>
DATES.DUE = RESEARCH.DATA<2>
DATES.DONE = RESEARCH.DATA<3>

NO.DATES.GEN = DCOUNT(DATES.GEN,VM)
LAST.DATE.GENERATED = RESEARCH.DATA<1,NO.DATES.GEN>

NO.DATES.DUE = DCOUNT(DATES.DUE,VM)
LAST.RECALL.DATE = RESEARCH.DATA<2,NO.DATES.DUE>

NO.DATES.DONE = DCOUNT(DATES.DONE,VM)
LAST.DATE.DONE = RESEARCH.DATA<3,NO.DATES.DONE>

if last.date.done # " and recall.date = " then
it does not need to be done again, so exit
goto 999 ; * exit
end

IF LAST.DATE.GENERATED # TODAY THEN
RESEARCH.DATA = INSERT(RESEARCH.DATA,1,-1;TODAY)
END

IF RECALL.DATE # LAST.RECALL.DATE THEN
RESEARCH.DATA = INSERT(RESEARCH.DATA,2,-1;RECALL.DATE)
END

IF LAST.DATE # LAST.DATE.DONE THEN
RESEARCH.DATA = INSERT(RESEARCH.DATA,3,-1;LAST.DATE)
END

WRITE RESEARCH.DATA ON
RESEARCH.REMINDER.FILE,RESEARCH.KEY
PRINT @(30,12):"NEW DATA: ":RESEARCH.DATA
INPUT REPLY,1

999 RETURN

MOD.DATA = "280193"
PROG.NAME = "RECAL.RECAL.TREAT.DIURETIC"

OLIVER FRANK FEBRUARY 1997

SUBROUTINE RECAL.TREAT.DIURETIC(FAMPAT,PAT.DATA)
RECAL.CHOL
TODAY = DATE()
LAST.DATE = "
ELEC.DATE = "
MEDIC.CEASE.DATE = " ; RESULT = "
ELEC.RESULT = "
REFUSAL.CODE = 354.2101
NOT.INDICATED.CODE = 354.2102
PREV.PAR = "ELEC"
UTD = "
RECALL.DATE = "
REFUSAL.TEXT = "ELECTROLYTE TEST"

OPEN ", 'PATIENT.MASTER.FILE' TO PATIENT.MASTER.FILE ELSE STOP "PATIENT. MASTER.FILE NOT OPEN"
OPEN ", 'PATIENT.RECALL.FILE' TO PATIENT.RECALL.FILE ELSE STOP "PATIENT. RECALL.FILE NOT OPEN"
OPEN ", 'PATIENT.LAB.TEST.FILE' TO PATIENT.LAB.TEST.FILE ELSE STOP "PATIENT. LAB.TEST.FILE NOT OPEN"
OPEN "PATIENT.PROBLEMS.FILE" TO PATIENT.PROBLEMS.FILE ELSE STOP "PATIENT.MEDIC. FILE NOT OPENED BY RECAL.TREAT.DIURETIC"
OPEN "MED.DRUG.GROUP.FILE" TO MDGF ELSE STOP "MDGF NOT OPENED BY RECAL.TREAT.DIURETIC"

RECALL.POINTERS = PAT.DATA<54>
PROBLEMS.POINTERS = PAT.DATA<23>
LAB.POINTERS = PAT.DATA<18>
MEDIC.POINTERS = PAT.DATA<16>

NO.PROBLEMS = DCOUNT(PROBLEMS.POINTERS,VM)
FOR I = 1 TO NO.PROBLEMS
PROBLEMS.ID = FAMPAT:"*":PAT.DATA<23,I>
READ PROBLEMS.DATA FROM PATIENT.PROBLEMS.FILE,PROBLEMS.ID ELSE
PROBLEMS.DATA = "
END

PROB.CODE = PROBLEMS.DATA<1>
FOUND.ONE = INDEX(PROB.CODE,REFUSAL.CODE,'1') OR INDEX(PROB.CODE,NOT.INDICATED.CODE,'1')
IF FOUND.ONE >0 THEN
GOTO 999 ; * EXIT

END
NEXT I
LOOK FOR CURRENT USE OF DIURETIC
NO.MEDIC = DCOUNT(MEDIC.POINTERS,VM)
FOR I = NO.MEDIC TO 1 STEP -1
MEDIC.ID = FAMPAT:"*":PAT.DATA<16,I>
READ MEDIC.DATA FROM PATIENT.MEDIC.FILE,MEDIC.ID
ELSE
MEDIC.DATA = "
END
MEDIC.CEASE.DATE = MEDIC.DATA<3>
MEDIC.REMAIN = MEDIC.DATA<9>
MEDIC.BRAND = MEDIC.DATA<1>
MEDIC.GENERIC = OCONV(MEDIC.BRAND,"TMDF;X;2;2")
MEDIC.CLASS = OCONV(MEDIC.GENERIC,"TMDGF;X;3;3")
MEDIC.START.DATE = OCONV(MEDIC.ID,"G1*1")
IF MEDIC.CEASE.DATE = " AND MEDIC.REMAIN > DATE() THEN
DRUG IS CURRENT
IF INDEX(MEDIC.CLASS,"DIURETIC","1") > 0 OR
INDEX(MEDIC.CLASS,"THIAZIDE","1") > 0 THEN
IT IS A DIURETIC, SO LOOK FOR ELECTROLYTES IN LAB FILE
PRINT @(20,10):"FOUND CURRENT DIURETIC"
END
GOTO 10 ; * LOOK FOR ELEC RESULT
END
NEXT I ; * NEXT MEDICATION
NO CURRENT DIURETIC FOUND, SO EXIT
GOTO 999 ; * EXIT
*****************************************************
10 NULL
LAB
NO.LAB = DCOUNT(LAB.POINTERS,VM)
ELEC.DATE = "
RESULT = "
FOR L = NO.LAB TO 1 STEP -1
LAB.ID = FAMPAT:"*":PAT.DATA<18,L>
READ LAB.DATA FROM PATIENT.LAB.TEST.FILE,LAB.ID ELSE
LAB.DATA = "
END
PRINT @(30,10):"LAB.DATA: ":LAB.DATA
INPUT REPLY,1
LAB.RESULT = LAB.DATA<3>
FOUND.ONE = INDEX(LAB.RESULT,"Na","1") OR
INDEX(LAB.RESULT,"SODIUM","1")
IF FOUND.ONE > 0 THEN
PRINT @(30,10):"FOUND ELECS: ":LAB.RESULT
INPUT REPLY,1
LAB.DATE = OCONV(LAB.ID,"G1*1")
LAST.DATE = LAB.DATE
RESULT = LAB.RESULT
GOSUB 500 ; * WORK OUT RECALL DATE
GOSUB 700 ; * POST IT
GOTO 999 ; * EXIT
END
NEXT L ; * CHECK NEXT LAB RESULT
20 ON CURRENT DIURETIC, BUT NO ELECS TEST FOUND
RECALL.DATE = MEDIC.START.DATE + 90
GOSUB 700 ; * POST IT *
GOTO 999 ; * EXIT
PRINT @(20,11):"VALUE OF I: ":I
PRINT @(20,12):"MEDIC: ":MEDIC.DATA<1>
PRINT @(20,13):"CEASED = ":OCONV(MEDIC.CEASE.DATE,"D2/")
PRINT @(20,14):"REMAIN = ":OCONV(MEDIC.REMAIN,"D2/")
PRINT @(20,15):"GENERIC: ":MEDIC.GENERIC
PRINT @(20,16):"CLASS = ":MEDIC.CLASS
INPUT REPLY,1
 *********************************************************
500 * CHECK RECALL INTERVAL
RECAL.NOTED = INDEX(RESULT,"Mths to repeat','1'
IF RECAL.NOTED > 0 THEN
MONTHS = RESULT[RECAL.NOTED +16,2]
RECALL.INTERVAL = MONTHS * 30
END ELSE
RECALL.INTERVAL = 365
END
RECALL.DATE = LAST.DATE + RECALL.INTERVAL
549 RETURN
 *********************************************************
700 ** POST A RECALL ENTRY
RECALL.DATA = 
RECALL.DATA<1> = PREV.PAR
RECALL.DATA<7> = LAST.DATE
RECALL.DATA<6> = "A"
IF RESULT # " THEN
RECALL.DATA<8> = LAB.RESULT
END ELSE
RECALL.DATA<8> = "On ":MEDIC.BRAND:" - no electrolytes recorded"
END
C_SEQ = ""
PTR_MV = 1
794 PTR = PAT_DATA<54,PTR_MV>
IF PTR = "" THEN GOTO 795
PTR_DATE = FIELD(PTR,"*",1)
PTR_SEQ = FIELD(PTR,"*",2)
IF PTR_DATE = RECALL_DATE THEN C_SEQ = PTR_SEQ + 1
IF PTR_DATE > RECALL_DATE THEN GOTO 795
PTR_MV = PTR_MV + 1
GOTO 794
795 RECAL_PTR = RECALL_DATE
IF C_SEQ # "" THEN RECAL_PTR = RECALL_DATE:"*:C_SEQ:"*"
RECAL_KEY = FAMPAT:"*:RECAL_PTR
PAT_DATA = INSERT(PAT_DATA,54,PTR_MV,0,RECAL_PTR)
WRITE RECALL_DATA ON PATIENT.RECALL.FILE,RECAL.KEY
WRITE PAT_DATA ON PATIENT.MASTER.FILE,FAMPAT
797 RETURN
999 * EXIT
PRINT @(40,23):"RECAL.ELEC ENDED":@(-4):
PRINT @(65,23):
INPUT REPLY,2:
CALL WRITE.RESEARCH(FAMPAT,PREV.PAR,LAST_DATE,RECALL.DATE)
RETURN UPDATE.PREV.SCORE(FAMPAT,PREV.PAR,UTD)
SUBROUTINE RECAL.TET(FAMPAT,PAT_DATA,AGE,DOB)
RECAL.TET
JUST SORT OUT THE TETANUS. CALLED FROM RECAL.ONEPAT
JAN RAVET SEPTEMBER 1992
MOD_DATA = "041192"
PROG_NAME = "RECAL.TET"
PRINT(@(0,9):PROG_NAME
PROMPT "
VM = CHAR(253)
TODAY = DATE()
DIM VACC.DATES(4)
TODAY = DATE()
MAT VACC.DATES = "
VACC.DOSE = "
FOUND.ONE = "
DOSES.FOUND = 0
RECALL.DATE = "
VACC.DATE = "
VACC.NAME = "
UTD = "
PREV.PAR = "TET"
LAST.DATE = "
RESULT = "
PROG.REFUSAL = "
REFUSAL.DATE = "
REFUSAL.CODE = 354.1031
NOT.INDICATED.CODE = 354.1032
REFUSAL.TEXT = "TETANUS IMMUNISATION"
PREV.VACC.DATE = "

OPEN '','PATIENT.MASTER.FILE' TO PATIENT.MASTER.FILE ELSE STOP "PATIENT.MASTER.FILE NOT OPEN"
OPEN '','PATIENT.RECALL.FILE' TO PATIENT.RECALL.FILE ELSE STOP "PATIENT.RECALL.FILE NOT OPEN"
OPEN '','PATIENT.VACC.FILE' TO PATIENT.VACC.FILE ELSE STOP "PATIENT.VACC.FILE NOT OPEN"
OPEN '','PATIENT.PROBLEMS.FILE' TO PATIENT.PROBLEMS.FILE ELSE STOP "PATIENT.PROBLEMS.FILE NOT OPEN"
OPEN '','PATIENT.ALLERGY.FILE' TO PATIENT.ALLERGY.FILE ELSE STOP "PATIENT.ALLERGY.FILE NOT OPEN"
OPEN 'PATIENT.PROG.NOTE.FILE' TO PATIENT.PROG.NOTE.FILE ELSE STOP "PPNF NOT OPENED BY RECAL.TET"

RECALL.POINTERS = PAT.DATA<54>
ALLERGY.POINTERS = PAT.DATA<22>
PROBLEMS.POINTERS = PAT.DATA<23>
VACC.POINTERS = PAT.DATA<17>
PROG.POINTERS = PAT.DATA<24>
VACCS.FOUND =0

NO.ALLERGY = DCOUNT(ALLERGY.POINTERS,VM)
FOR I = 1 TO NO.ALLERGY
ALLERGY.ID = FAMPAT:"*":PAT.DATA<22,I>
READ ALLERGY.DATA FROM PATIENT.ALLERGY.FILE,ALLERGY.ID ELSE
ALLERGY.DATA = "
END
PRINT @(10,10):ALLERGY.DATA
INPUT REPLY,1
FOUND.ONE = INDEX(ALLERGY.DATA<1>,"TETANUS","1")
IF FOUND.ONE >0 THEN
CALL RRF.NOT.ELIG(FAMPAT,PREV.PAR)
GOTO 1000 ; * EXIT
END
NEXT I

PROBLEMS
NO.PROBLEMS = DCOUNT(PROBLEMS.POINTERS,VM)
FOR I = 1 TO NO.PROBLEMS
PROBLEMS.ID = FAMPAT:"*":PAT.DATA<23,I>
READ PROBLEMS.DATA FROM PATIENT.PROBLEMS.FILE,PROBLEMS.ID ELSE
PROBLEMS.DATA = ""
END
PRINT @(10,12):PROBLEMS.DATA
INPUT REPLY,1

PROB.CODE = PROBLEMS.DATA<1>
IF PROB.CODE = REFUSAL.CODE OR PROB.CODE = NOT.INDICATED.CODE THEN
CALL RRF.NOT.ELIG(FAMPAT,PREV.PAR)
GOTO 1000 ; * EXIT
END
NEXT I

AGE IS VITAL
IF DOB = "" THEN
RECALL.DATE = TODAY
RESULT = "DATE OF BIRTH NOT RECORDED"
GOSUB 700 ; * POST IT *
GOTO 999 ; * EXIT
END
AGE.IN.MONTHS = (TODAY - DOB) /30

CHECK THE VACCINES GIVEN
NO.VACC = DCOUNT(VACC.POINTERS,VM)
FOR I = NO.VACC TO 1 STEP -1
VACC.ID = FAMPAT:"*":PAT.DATA<17,I>
READ VACC.DATA FROM PATIENT.VACC.FILE,VACC.ID ELSE
VACC.DATA = ""
PRINT @(10,14):VACC.DATA

FOUND.ONE = INDEX(VACC.DATA<1>,"INFANRIX","1") OR INDEX(VACC.DATA<1>,"DTP","1") OR INDEX(VACC.DATA<1>,"ADT","1") OR INDEX(VACC.DATA<1>,"TET","1")
OR INDEX(VACC.DATA<1>;"TA","I") OR INDEX(VACC.DATA<1>;"TRIPLE","I") OR INDEX(VACC.DATA<1>;"CDT","I")

PRINT @(10,16):"FOUND ONE = ":FOUND.ONE
INPUT REPLY,1

IF FOUND.ONE > 0 THEN
VACC.DATE = OCONV(VACC.ID,"G1*1")
VACC.DOSE = VACC.DATA<2>
VACC.NAME = VACC.DATA<1>

PRINT @(0,10):VACC.NAME
PRINT @(0,11):VACC.DOSE
PRINT @(0,12):"DOSES.FOUND: ":DOSES.FOUND
INPUT REPLY,1
IF AGE > 14 THEN GOTO 50 ; * CHECK PROGRESS NOTES FOR REFUSAL
IF AGE > 4 AND VACC.DOSE > 4 THEN GOTO 50 ; * CHECK PROGRESS NOTES
PRINT @(0,15):"GOING TO 50 NOW"
INPUT REPLY,1
IF AGE.IN.MONTHS > 18 AND VACC.DOSE > 3 THEN GOTO 50
IF AGE.IN.MONTHS > 6 AND VACC.DOSE > 2 THEN GOTO 50
IF AGE.IN.MONTHS > 4 AND VACC.DOSE > 1 THEN GOTO 50
IF AGE.IN.MONTHS > 2 AND VACC.DOSE > 0 THEN GOTO 50
REQUAED DOSE NUMBER NOT FOUND, SO COUNT 'EM INSTEAD
IF VACC.DATE # PREV.VACC.DATE THEN
DOSES.FOUND = DOSES.FOUND + 1
PRINT @(0,13):"DOSES.FOUND: ":DOSES.FOUND
INPUT REPLY,1
END
PREV.VACC.DATE = VACC.DATE
END

NEXT I
50 CHECK.PROGRESS.NOTES
PRINT @(30,16):"ABOUT TO CHECK PROGRESS NOTES"
INPUT REPLY,1
NO.PROGS = DCOUNT(PROG.POINTERS,VM)
FOR I = NO.PROGS TO 1 STEP -1
PROG.ID = FAMPAT:"*":PAT.DATA<24,I>
READ PROG.DATA FROM PATIENT.PROG.NOTE.FILE,PROG.ID ELSE
PROG.DATA = "
END
PROG.DATE = OCONV(PROG.ID,"G1*1")
IF TODAY - PROG.DATE > 365 THEN
  IF VACC.DATE # " THEN
    LAST.DATE = VACC.DATE
    RESULT = VACC.NAME:" DOSE ":VACC.DOSE:" GIVEN"
    GOSUB 500 ; * GET THE RECALL.DATE
    GOSUB 700 ; * POST IT
    GOTO 999 ; * EXIT
  END
  END

  PROG.PROBS = PROG.DATA<11>
  NO.PROG.PROB.CODES = DCOUNT(PROG.PROBS,VM)

  FOR Q = 1 TO NO.PROG.PROB.CODES
    PROG.PROB.CODE = PROG.DATA<11,Q>

    IF PROG.PROB.CODE = REFUSAL.CODE OR PROG.PROB.CODE = NOT.INDICATED.
    CODE THEN
      IF PROG.PROB.CODE = REFUSAL.CODE THEN
        PROG.REFUSAL = REFUSAL.TEXT:" REFUSED"
      END ELSE
        PROG.REFUSAL = REFUSAL.TEXT:" NOT INDICATED"
      END

      REFUSAL.DATE = PROG.DATE
      GOTO 60 ; * COMPARE DATES
    END ; * OF CHECKING FOR REFUSAL OR NOT.INDICATED CODES
  NEXT Q ; * NEXT PROBLEM ATTACHED TO THIS PROGRESS NOTE
  NEXT I ; * NEXT PROGRESS NOTE

  60  COMPARE DATES
  PRINT @30,12):"ABOUT TO COMPARE DATES"
  INPUT REPLY,1
  IF VACC.DATE # " OR REFUSAL.DATE # " THEN
  IF VACC.DATE # " AND REFUSAL.DATE = " THEN
    LAST.DATE = VACC.DATE
    PRINT @30,11):"AT SUB 60: ABOUT TO GOSUB 500"
    INPUT REPLY,1
    GOSUB 500 ; * GET THE RECALL.DATE
    RESULT = VACC.NAME:" DOSE ":VACC.DOSE:" GIVEN"
    END

  IF VACC.DATE = " AND REFUSAL.DATE # " THEN
    LAST.DATE = REFUSAL.DATE
    RESULT = PROG.REFUSAL
    RECALL.DATE = REFUSAL.DATE + 365
  END

  IF VACC.DATE # " AND REFUSAL.DATE # " THEN
IF VACC.DATE GE REFUSAL.DATE THEN
LAST.DATE = VACC.DATE
GOSUB 500 ; * GET THE RECALL.DATE
RESULT = VACC.NAME:" DOSE ":VACC.DOSE:" GIVEN"
END ELSE
LAST.DATE = REFUSAL.DATE
RESULT = PROG.REFUSAL
END
GOSUB 700 ; * POST IT
GOTO 999 ; * EXIT
END
IF NO TETANUS FOUND:
PRINT @(30,10):"GOT THROUGH COMPARE DATES"
INPUT REPLY,1
IF AGE.IN.MONTHS > 2 THEN
VACC.DATE = 
RECALL.DATE = DOB + 60
GOSUB 700 ; * POST IT
GOTO 999 ; * EXIT
END ELSE
RECALL.DATE = DOB + 60
GOSUB 700 ; * POST IT
GOTO 999 ; * EXIT
END
*********************************************************
500  * WORK OUT WHEN IT'S DUE *
BEGIN CASE
CASE AGE > 14
RECALL.DATE = VACC.DATE + INT(10*365.25)
CASE AGE > 3
IF VACC.DOSE > 4 THEN
RECALL.DATE = DOB + INT(15*365.25)
END ELSE
IF DOSE 5 NOT FOUND,
IF DOSES.FOUND > 4 THEN
RECALL.DATE = DOB + INT(15*365.25)
END ELSE
RECALL.DATE = DOB + INT(4*365.25)
END
CASE AGE.IN.MONTHS > 18
IF VACC.DOSE > 3 THEN
RECALL.DATE = DOB + INT(4*365.25)
END ELSE
IF DOSES.FOUND > 3 THEN
RECALL.DATE = DOB + INT(4*365.25)
247     END ELSE
248     RECALL.DATE = DOB + INT(18*30)
249     END
250     END
251
252     CASE AGE.IN.MONTHS > 6
253     IF VACC.DOSE > 2 THEN
254     RECALL.DATE = DOB + INT(18*30)
255     END ELSE
256     IF DOSES.FOUND > 2 THEN
257     RECALL.DATE = DOB + INT(18*30)
258     END ELSE
259     RECALL.DATE = DOB + 182
260     END
261     END
262
263     CASE AGE.IN.MONTHS > 4
264     IF VACC.DOSE > 1 THEN
265     RECALL.DATE = DOB + 182
266     END ELSE
267     IF DOSES.FOUND > 1 THEN
268     RECALL.DATE = DOB + 182
269     END ELSE
270     RECALL.DATE = DOB + 120
271     END
272     END
273
274     CASE AGE.IN.MONTHS > 2
275     IF VACC.DOSE = 1 THEN
276     RECALL.DATE = DOB + 120
277     END ELSE
278     IF DOSES.FOUND = 1 THEN
279     RECALL.DATE = DOB + 120
280     END ELSE
281     RECALL.DATE = DOB + 60
282     END
283     END
284
285     PRINT @(30,10):"ABOUT TO DO CASE MONTHS < 2"
286     INPUT REPLY,1
287     CASE AGE.IN.MONTHS LE 2
288     RECALL.DATE = DOB + 60
289     END CASE
290     END CASE
291
292     600 RETURN
293
294     700 ** POST A RECALL ENTRY
295     IF RECALL.DATE > DATE() THEN UTD = 1
296     RECALL.DATA = "
RECALL.DATA<1> = PREV.PAR
RECALL.DATA<7> = LAST.DATE
RECALL.DATA<8> = RESULT
RECALL.DATA<6> = "A"
C.SEQ = ""
PTR.MV = 1
794 PTR = PAT.DATA<54,PTR.MV>
IF PTR = "" THEN GOTO 795
PTR.DATE = FIELD(PTR,"*",1)
PTR.SEQ = FIELD(PTR,"*",2)
IF PTR.DATE = RECALL.DATE THEN C.SEQ = PTR.SEQ + 1
IF PTR.DATE > RECALL.DATE THEN GOTO 795
PTR.MV = PTR.MV + 1
GOTO 794
795 RECAL.PTR = RECALL.DATE
IF C.SEQ # "" THEN RECAL.PTR = RECALL.DATE:"*":C.SEQ:""
RECAL.KEY = FAMPAT:"*":RECAL.PTR
PAT.DATA = INSERT(PAT.DATA,54,PTR.MV,0,RECAL.PTR)
WRITE RECALL.DATA ON PATIENT.RECALL.FILE,RECAL.KEY
WRITE PAT.DATA ON PATIENT.MASTER.FILE,FAMPAT
797 RETURN
 ********************************
999 * EXIT
PRINT @(40,23):"RECAL.TET ENDED":@(-4):
PRINT @(65,23):
INPUT REPLY,2:
CALL WRITE.RESEARCH(FAMPAT,PREV.PAR,LAST.DATE,RECALL.DATE
CALL UPDATE.PREV.SCORE(FAMPAT,PREV.PAR,UTD)
1000 RETURN
SUBROUTINE RECAL.RUBELLA(FAMPAT,PAT.DATA)
RECAL.RUBELLA
JUST SORT OUT THE RUBELLA. CALLED FROM RECAL.ONEPAT
JAN RAVET SEPTEMBER 1992
MOD.DATA = "280193"
PROG.NAME = "RECAL.RUBELLA"
PROMPT "
VM = CHAR(253)
TODAY = DATE()
RECALL.DATE = "
PREV.PAR = "RUBE"
LAB.RESULT = "
RUB.DATE = "
UTD = "
LAST.DATE = "
RUB.DATE = "
PROG.REFUSAL = "
RESULT = "
RECALL.INTERVAL = "
REFUSAL.DATE = "
REFUSAL.CODE = 354.2051
NOT.INDICATED.CODE = 354.2052
REFUSAL.TEXT = "PRENATAL RUBELLA TEST"

OPEN ", 'PATIENT.MASTER.FILE' TO PATIENT.MASTER.FILE ELSE
STOP "PATIENT.MASTER.FILE NOT OPEN"
OPEN ", 'PATIENT.RECALL.FILE' TO PATIENT.RECALL.FILE ELSE
STOP "PATIENT.RECALL.FILE NOT OPEN"
OPEN ", 'PATIENT.LAB.TEST.FILE' TO PATIENT.LAB.TEST.FILE
ELSE STOP "PATIENT.LAB.TEST.FILE NOT OPEN"
OPEN ", 'PATIENT.PROBLEMS.FILE' TO PATIENT.PROBLEMS.FILE
ELSE STOP "PATIENT.PROBLEMS.FILE NOT OPEN"
OPEN 'PATIENT.PROG.NOTE.FILE' TO PATIENT.PROG.NOTE.FILE
ELSE STOP "PPNF NOT OPENED BY RECAL.RUBELLA"
RECALL.POINTERS = PAT.DATA<54>
PROBLEMS.POINTERS = PAT.DATA<23>
LAB.POINTERS = PAT.DATA<18>
PROG.POINTERS = PAT.DATA<24>
DOB = PAT.DATA<3>

NO.PROBLEMS = DCOUNT(PROBLEMS.POINTERS,VM)
FOR I = 1 TO NO.PROBLEMS
PROBLEMS.ID = FAMPAT:"*":PAT.DATA<23,I>
READ PROBLEMS.DATA FROM
PATIENT.PROBLEMS.FILE,PROBLEMS.ID ELSE
PROBLEMS.DATA = ""
END

PROBLEMS
NO.PROBLEMS = DCOUNT(PROBLEMS.POINTERS,VM)
FOR I = 1 TO NO.PROBLEMS
PROBLEMS.ID = FAMPAT:"*":PAT.DATA<23,I>
READ PROBLEMS.DATA FROM
PATIENT.PROBLEMS.FILE,PROBLEMS.ID ELSE
PROBLEMS.DATA = ""
END

MANAGEMENT = PROBLEMS.DATA<4>
PROB.CODE = PROBLEMS.DATA<1>
FOUND.ONE = INDEX(MANAGEMENT,"Hysterectomy",'1') OR
INDEX(MANAGEMENT,
"Vasectomy",'1') OR INDEX(MANAGEMENT,"Steril","1")
IF FOUND.ONE >0 THEN
UTD = 1
GOTO 999 ; * EXIT
END
IF PROB.CODE = REFUSAL.CODE OR PROB.CODE =
NOT.INDICATED.CODE THEN
UTD = 1
GO TO 999 ; * EXIT
END
NEXT I

LAB
NO.LAB = DCOUNT(LAB.POINTERS,VM)
RUBELLA.DATE = ""
FOR I = NO.LAB TO 1 STEP -1
LAB.ID = FAMPAT:"**":PAT.DATA<18,I>
READ LAB.DATA FROM PATIENT.LAB.TEST.FILE,LAB.ID ELSE
LAB.DATA = ""
END
PRINT @(30,10):"LAB.DATA":LAB.DATA
INPUT REPLY,1
STATUS = ""
IMMUNE.DATA = ""
RUB.DATE = ""
FOUND.ONE = INDEX(LAB.DATA<1>,"RUBELLA","1")
PRINT @(30,12):"FOUND.ONE = ":FOUND.ONE
INPUT REPLY,1
IF FOUND.ONE > 0 THEN
LAB.RESULT = LAB.DATA<3>
IMMUNE.DATA = INDEX(LAB.RESULT,"? IMMUNE","1")
STATUS = LAB.RESULT[IMMUNE.DATA +9,1]
RUB.DATE = OCONV(LAB.ID,"G1*1")
END
PRINT @(30,13):"IMMUNE.DATA: ":IMMUNE.DATA
PRINT @(30,14):"STATUS : ":STATUS
INPUT REPLY,1
IF FOUND.ONE > 0 AND STATUS = "Y" THEN
UTD = 1
PRINT @(30,15):"IS IMMUNE - ABOUT TO EXIT"
INPUT REPLY,1
GOTO 999 ; * EXIT
END
NEXT I
50 PROGRESS NOTES
NO.PROG = DCOUNT(PROG.POINTERS,VM)
FOR I = NO.PROG TO 1 STEP -1
PROG.ID = FAMPAT:"**":PAT.DATA<24,I>
READ PROG.DATA FROM PATIENT.PROG.NOTE.FILE,PROG.ID ELSE
PROG.DATA = ""
END
PROG.PROBS = PROG.DATA<11>
106     NO.PROG.PROB.CODES = DCOUNT(PROG.PROBS,VM)
107
108     FOR Q = 1 TO NO.PROG.PROB.CODES
109     PROG.PROB.CODE = PROG.DATA<11,Q>
110
111     IF PROG.PROB.CODE = REFUSAL.CODE OR PROG.PROB.CODE =
112         NOT.INDICATED.
113         CODE THEN
114         IF PROG.PROB.CODE = REFUSAL.CODE THEN
115         PROG.REFUSAL = REFUSAL.TEXT:" REFUSED"
116         END ELSE
117         PROG.REFUSAL = REFUSAL.TEXT:" NOT INDICATED"
118         END
119
120     REFUSAL.DATE = PROG.DATE
121     GOTO 60 ; * COMPARE DATES
122     END ; * OF CHECKING FOR REFUSAL OR NOT.INDICATED CODES
123     NEXT Q ; * NEXT PROBLEM ATTACHED TO THIS PROGRESS NOTE
124     NEXT I
125
126     60 **********************************************************
127     IF RUB.DATE = " AND REFUSAL.DATE = " THEN
128     RECALL.DATE = DOB + INT(365.25*20)
129     GOSUB 700 ; * POST IT
130     GOTO 999 ; * EXIT
131     END
132
133     IF RUB.DATE # " AND REFUSAL.DATE = " THEN
134     LAST.DATE = RUB.DATE
135     RESULT = "RUBELLA IMMUNITY NEGATIVE"
136     RECALL.DATE = TODAY
137     END
138
139     IF RUB.DATE = " AND REFUSAL.DATE # " THEN
140     LAST.DATE = REFUSAL.DATE
141     RECALL.DATE = REFUSAL.DATE + 365
142     RESULT = PROG.REFUSAL
143     END
144
145     IF RUB.DATE # " AND REFUSAL.DATE # " THEN
146     IF RUB.DATE GE REFUSAL.DATE THEN
147     LAST.DATE = RUB.DATE
148     RECALL.DATE = TODAY
149     RESULT = "RUBELLA IMMUNITY NEGATIVE"
150     END ELSE
151     LAST.DATE = REFUSAL.DATE
152     RECALL.DATE = REFUSAL.DATE + 365
153     RESULT = PROG.REFUSAL
154     END
155     GOSUB 700 ; * POST IT
700 ** POST A RECALL ENTRY
157 IF RECALL.DATE > DATE() THEN UTD = 1
158 RECALL.DATA = ""
159 RECALL.DATA<1>  = PREV.PAR
160 RECALL.DATA<7> = LAST.DATE
161 RECALL.DATA<8> = RESULT
162 RECALL.DATA<6> = "A"
163
164 C.SEQ = ""
165 PTR.MV = 1
166 794 PTR = PAT.DATA<54,PTR.MV>
167 IF PTR = "" THEN GOTO 795
168 PTR.DATE = FIELD(PTR,"*",1)
169 PTR.SEQ = FIELD(PTR,"*",2)
170 IF PTR.DATE = RECALL.DATE THEN C.SEQ = PTR.SEQ + 1
171 IF PTR.DATE > RECALL.DATE THEN GOTO 795
172 PTR.MV = PTR.MV + 1
173 GOTO 794
174 795 RECAL.PTR = RECALL.DATE
175 IF C.SEQ # "" THEN RECAL.PTR = RECALL.DATE:"*":C.SEQ:"*
176 RECAL.KEY = FAMPAT:"*":RECAL.PTR
177 PAT.DATA = INSERT(PAT.DATA,54,PTR.MV,0,RECAL.PTR)
178 WRITE RECALL.DATA ON PATIENT.RECALL.FILE,RECAL.KEY
179 WRITE PAT.DATA ON PATIENT.MASTER.FILE,FAMPAT
180
181 797 RETURN
182 ***********************************************************
183 999 * EXIT
184 CALL
185 WRITE.RESEARCH(FAMPAT,PREV.PAR,LAST.DATE,RECALL.DATE
186 CALL UPDATE.PREV.SCORE(FAMPAT,PREV.PAR,UTD)
187 RETURN
188 RECAL.ALCO
001 SUBROUTINE RECAL.ALCO(FAMPAT,PAT.DATA,AGE)
002 RECAL.ALCO
003
004 JUST SORT OUT THE ALCO. CALLED FROM RECAL.ONEPAT
005
006 JAN RAVET SEPTEMBER 1992
007 OLIVER FRANK MAY 1997
008
009 MOD.DATA = "190193"
010 PROG.NAME = "RECAL.ALCO"
011
012 PROMPT "
013 VM = CHAR(253)
014 TODAY = DATE()
015 NO.DRINKS = "
OPEN ",'PATIENT.MASTER.FILE' TO PATIENT.MASTER.FILE ELSE STOP "PATIENT.MASTER.FILE NOT OPEN"
OPEN ",'PATIENT.RECALL.FILE' TO PATIENT.RECALL.FILE ELSE STOP "PATIENT.RECALL.FILE NOT OPEN"
OPEN 'PATIENT.PROG.NOTE.FILE' TO PPNF ELSE STOP "PPNF NOT OPENED BY RECALCALCO"

PROG.POINTERS = PAT.DATA<24>
NO.PROGS = DCOUNT(PROG.POINTERS,VM)
LAST.PROG.DATE = OCONV(PAT.DATA<24,NO.PROGS>,"G0*1")
NO.DRINKS = PAT.DATA<11>
DOB = PAT.DATA<3>

IF NO.DRINKS # " THEN
HAS ENTRY IN ALCOHOL RECORD, SO NO MORE REMINDERS
CALL RRF.NOT.ELIG(FAMPAT,PREV.PAR)
LAST.DATE = LAST.PROG.DATE
GOTO 999 ; * WRITE TO RESEARCH FILE AND IT
END

IF NO.DRINKS # " THEN
HAS ENTRY IN ALCOHOL FIELD, SO LOOK FOR REFUSAL
FOR I = NO.PROGS TO 1 STEP -1
PROG.ID = FAMPAT:"*:PAT.DATA<24,I>
READ PROG.DATA FROM PPNF,FAMPAT ELSE PROG.DATA = "
PROG.DATE = OCONV(PROG.ID,"G1*1")
PROG.PROBS = PROG.DATA<11>
NO.PROG.PROBS = DCOUNT(PROG.PROBS,VM)
FOR Q = 1 TO NO.PROG.PROBS
PROG.PROB.CODE = PROG.DATA<11,Q>
IF PROG.PROB.CODE = REFUSAL.CODE OR PROG.PROB.CODE = NOT.INDICATED.CODE THEN
PROG.REFUSAL = REFUSAL.TEXT:" REFUSED"
END ELSE
PROG.REFUSAL = REFUSAL.TEXT:" NOT INDICATED"
END

LAST.DATE = PROG.DATE
RECALL.DATE = LAST.DATE + 365
RESULT = PROG.REFUSAL
GOSUB 700 ; * POST IT
GOTO 999 ; * EXIT
END
NEXT Q ; * NEXT PROG PROB CODE
NEXT I ; * NEXT PROG NOTE
NO ALCO ENTRY AND NO REFUSAL, SO GET DATE OF LAST VISIT
IF NO.PROGS > 0 THEN
RECALL.DATE = LAST.PROG.DATE
END ELSE
RECALL.DATE = DOB + INT(17*365.25)
END
GOSUB 700 ; * POST IT
GOTO 999 ; * WRITE RESEARCH AND EXIT

**** POST A RECALL ENTRY ****
RECALL.DATA = "
RECALL.DATA<1> = PREV.PAR
RECALL.DATA<7> = LAST.DATE
RECALL.DATA<8> = RESULT
RECALL.DATA<6> = "A"

C.SEQ = ""
PTR.MV = 1
794 PTR = PAT.DATA<54,PTR.MV>
IF PTR = "" THEN GOTO 795
PTR.DATE = FIELD(PTR,"*",1)
PTR.SEQ = FIELD(PTR,"*",2)
IF PTR.DATE = RECALL.DATE THEN C.SEQ = PTR.SEQ + 1
IF PTR.DATE > RECALL.DATE THEN GOTO 795
PTR.MV = PTR.MV + 1
GOTO 794
795 RECALL.PTR = RECALL.DATE
IF C.SEQ # "" THEN RECALL.PTR = RECALL.DATE:"":"C.SEQ:""
RECALL.KEY = FAMPAT:"":"RECALL.PTR
PAT.DATA = INSERT(PAT.DATA,54,PTR.MV,0,RECALL.PTR)
WRITE RECALL.DATA ON PATIENT.RECALL.FILE,RECALL.KEY
WRITE PAT.DATA ON PATIENT.MASTER.FILE,FAMPAT
797 RETURN

**********
999 CALL
WRITE.RESEARCH(FAMPAT,PREV.PAR,LAST.DATE,RECALL.DATE
1000 * EXIT WITHOUT WRITING TO RESEARCH FILE
RETURN
RECAL.DIAB
SUBROUTINE RECAL.DIAB(FAMPAT,PAT.DATA,AGE)
RECAL.DIAB
TO SCREEN FOR DIABETES IN THOSE AT RISK
OLIVER FRANK AUGUST 1995
MOD.DATA = "280895"
PROG.NAME = "RECAL.DIAB"

PREV.PAR = "DIAB"
PROMPT "
VM = CHAR(253)
TODAY = DATE()
RECALL.DATE = "
REFUSAL.CODE = 354.2021
NOT.INDICATED.CODE = 354.2022
REFUSAL.TEXT = "DIABETES SCREENING"
HYP.DIAGNOSED = 0
LIPID.DISORDER = 0
OBESE = 0
PROB.CODE = "
PROB.DESC = "
BSL.FOUND = 0
LAB.GLUC.FOUND = 0
REFUSAL.FOUND = 0
BSL.DATE = "; BSL.RESULT = "; LAB.DATE = ";LAB.GLUC.RESULT = 
LAST.DATE = "
GLUC.DATE = "
RESULT = "
TEST.DATE = "
AGE.RISK = "
UTD = "
FOUND.BSL = " ; FOUND.LAB = "
DIABETES.CODE = 050
RECALL.INTERVAL = 1826

OPEN ", 'PATIENT.MASTER.FILE' TO PATIENT.MASTER.FILE ELSE STOP "PATIENT.
MASTER.FILE NOT OPEN"
OPEN ", 'PATIENT.RECALL.FILE' TO PATIENT.RECALL.FILE ELSE STOP "PATIENT.
RECALL.FILE NOT OPEN"
OPEN ", 'PATIENT.PROG.NOTE.FILE' TO PATIENT.PROG.NOTE.FILE ELSE STOP "PATIENT.PROG.NOTE.FILE NOT OPEN"
OPEN 'PATIENT.LAB.TEST.FILE' TO PLTF ELSE STOP "PLTF NOT OPENED BY RECAL.
HYP.DIAB"
OPEN ",'PATIENT.PROBLEMS.FILE' TO PATIENT.PROBLEMS.FILE ELSE STOP "PATIENT.PROBLEMS.FILE NOT OPEN"

PROG.POINTERS = PAT.DATA<24>
PROBLEMS.POINTERS = PAT.DATA<23>
LAB.POINTERS = PAT.DATA<18>
DOB = PAT.DATA<3>
NO.PROBLEMS = DCOUNT(PROBLEMS.POINTERS,VM)

FOR I = 1 TO NO.PROBLEMS

PROBLEMS.ID = FAMPAT:"*":PAT.DATA<23,I>

READ PROBLEMS.DATA FROM
PATIENT.PROBLEMS.FILE,PROBLEMS.ID ELSE

PROBLEMS.DATA = ""

END

PROB.CODE = PROBLEMS.DATA<1>

FIRST CHECK FOR REFUSAL TO BE TESTED

IF PROB.CODE = REFUSAL.CODE OR PROB.CODE =
NOT.INDICATED.CODE THEN

CALL RRF.NOT.ELIG(FAMPAT,PREV.PAR)

GOTO 1000 ; * EXIT

END

EXIT IF KNOWN DIABETIC

PROB.DESC = OCONV(PROB.CODE,"TPCF;X;1;1")

IF INDEX(PROB.DESC,"DIABET","1") > 0 OR PROB.CODE =
DIABETES.CODE THEN

WHEN OTHER DIABETES PROGRAMS INSTALLED

CALL RECAL.DIAB.CARE(FAMPAT,PAT.DATA)

PRINT @(30,10):"KNOWN DIABETIC - EXITING"

INPUT REPLY,1

CALL RRF.NOT.ELIG(FAMPAT,PREV.PAR)

PRINT @(20,20):"DELETING BSL RECALLS - KNOWN DIABETIC"

INPUT REPLY,1

GOTO 1000 ; * EXIT

END

LOOK FOR COMBINATIONS OF CONDITIONS WHICH INDICATE
SCREENING

CHECK ALL PROBLEMS TO DETECT ALL CRITERIA CONDITIONS

CHECK WHETHER HYPERTENSIVE

IF INDEX(PROB.CODE,"119","1") OR INDEX(PROB.CODE,"120","1") OR
INDEX(
PROB.CODE,"121","1") OR INDEX(PROB.DESC,"HYPERTENSION","1")
> THEN

HYP.DIAGNOSED = 1

END

CHECK WHETHER LIPID DISORDER DIAGNOSED

IF INDEX(PROB.CODE,"056.0","1") > 0 THEN

LIPID.DISORDER = 1

END
CHECK WHETHER OBESE WITH BMI > 30
IF INDEX(PROB.CODE,"057.4","1") > 0 THEN
    OBESE = 1
END
NEXT I
PRINT @(10,14):"HYP.DIAGNOSED: ":HYP.DIAGNOSED
PRINT @(10,15):"OBESE: ":OBESE
PRINT @(10,16):"LIPID.DISORDER: ":LIPID.DISORDER
INPUT REPLY,1
***********************************************************************
DECIDE WHETHER ELIGIBLE FOR SCREENING

IF AGE > 65 THEN
    GOTO 10 ; * SCREEN
END
IF AGE > 40 THEN AGE.RISK = 1
PRINT @(20,18):"HYP.RISK + LIPID + OBES + AGE = ?"
PRINT @(20,19):HYP.DIAGNOSED:" + ":LIPID.DISORDER:" + " ":OBESE:" + " ":AGE.RISK
INPUT REPLY,1
IF HYP.DIAGNOSED + LIPID.DISORDER + OBESE + AGE.RISK > 1 THEN
    GOTO 10 ; * SCREEN
END ELSE
DOES NOT MEET CRITERIA FOR SCREENING, SO DELETE AND EXIT
PRINT @(30,12):"NOT FOR DIAB SCREEN"
INPUT REPLY,1
CALL RRF.NOT.ELIG(FAMPAT,PREV.PAR)
GOTO 1000 ; * EXIT
END
***********************************************************************
10 NO.PROGS = DCOUNT(PROG.POINTERS,VM)
PRINT @(20,17):"GOT TO PROGS FOR SCREENING"
INPUT REPLY,1
FOR I = NO.PROGS TO 1 STEP -1
    PROG.ID = FAMPAT:"*":PAT.DATA<24,I>
    READ PROG.DATA FROM PATIENT.PROG.NOTE.FILE,PROG.ID
ELSE
    PROG.DATA = "
END
***********************************************************************
INDEX(SUBJECTIVE,"BSL AT" ',1') OR INDEX(OBJECTIVE,"BSL =",1') OR INDEX(OBJECTIVE,"BSL AT",1') OR INDEX(OBJECTIVE,"BSL @",1')

136 IF BSL.FOUND = 0 THEN
137 IF FOUND.BSL > 0 THEN
138 BSL.DATE = OCONV(PROG.ID,"G1*1")
139 BSL.RESULT = "BSL MEASURED"
140 PRINT @((10,11):"BSL.DATE: ":BSL.DATE
141 PRINT @(10,12):"BSL.RESULT: ":BSL.RESULT
142 INPUT REPLY,1
143 END
144 END
145 LOOK FOR REFUSAL ETC.
146 IF REFUSAL.FOUND = 0 THEN
147 PROG.PROBS = PROG.DATA<11>
148 NO.PROG.PROB.CODES = DCOUNT(PROG.PROBS,VM)
149 FOR Q = 1 TO NO.PROG.PROB.CODES
150 PROG.PROB.CODE = PROG.DATA<11,Q>
151 IF PROG.PROB.CODE = REFUSAL.CODE OR PROG.PROB.CODE = NOT.INDICATED.
152 IF PROG.PROB.CODE = REFUSAL.CODE THEN
153 PROG.REFUSAL = REFUSAL.TEXT:" REFUSED"
154 END ELSE
155 PROG.REFUSAL = REFUSAL.TEXT:" NOT INDICATED"
156 END
157 REFUSAL.DATE = PROG.DATE
158 END ; * OF CHECKING FOR REFUSALS
159 NEXT Q ; * NEXT PROBLEM ATTACHED TO THIS PROGRESS NOTE
160 END
161 IF TODAY - PROG.DATE > 365 THEN ; * THEN WE ARE BEYOND THE REFUSAL SPAN
162 IF BSL.DATE # " THEN
163 GOTO 20 ; * MOVE ON
164 END
165 NEXT I
166 **********************************************************
167 20 ** LOOK FOR A GLUCOSE LAB RESULT
168 NO.LAB.TESTS = DCOUNT(LAB.POINTERS,VM)
169 FOR I = NO.LAB.TESTS TO 1 STEP -1
170 LAB.ID = FAMPAT:"*:PAT.DATA<18,I>
171 READ LAB.DATA FROM PLTF,LAB.ID ELSE LAB.DATA = "
172 LAB.DATE = OCONV(LAB.ID,"G1*1")
LAB.TEST = LAB.DATA<1>

IF BSL.DATE # " AND BSL.DATE > LAB.DATE THEN
THE BSL DATE IS MORE RECENT THAN ANY OF THE LAB TESTS
GOTO 30 ; * MOVE ON
END

FOUND.LAB = INDEX(LAB.TEST,"glucose","1") OR INDEX(LAB.TEST,"GENERAL CHEM ","1") OR INDEX(LAB.TEST,"MBA","1") OR INDEX(LAB.TEST,"Glucose","1") OR INDEX(LAB.TEST,"GLUCOSE","1") OR INDEX(LAB.TEST,"BSL","1")

IF FOUND.LAB > 0 THEN
GLUC.DATE = OCONV(LAB.ID,"G1*1")

IF LAB.DATA<3> = " THEN
LAB.GLUC.RESULT = LAB.DATA<1> "L#38"
GOTO 30 ; * MOVE ON
END

WHOLE.RESULT = LAB.DATA<3>

GLUC.INDEX = INDEX(WHOLE.RESULT,"GLUCOSE","1") OR INDEX(WHOLE.RESULT,"glucose","1")
IF GLUC.INDEX > 0 THEN ; * GLUCOSE IS MENTIONED IN THE RESULT
GLUC.PART = LAB.DATA<3>[GLUC.INDEX +9,24]
LAB.GLUC.RESULT = "LAB GLUCOSE ":GLUC.PART "L#38"
END ELSE ; * GLUCOSE IS NOT MENTIONED IN THE RESULT
LAB.GLUC.RESULT = LAB.DATA<3> "L#38"
END
GOTO 30 ; * SKIP REST OF LAB RESULTS AND START COMPARING DATES
END

PRINT @(10,13):"LAB.DATE: ":LAB.DATE
PRINT @(10,14):"LAB.GLUC.RESULT: ":LAB.GLUC.RESULT
INPUT REPLY,1
NEXT I

************************************************************
30 * GET THE MOST RECENT TEST DETAILS FOUND IN THE 
PROGRESS NOTES & LAB FILE
BEGIN CASE
CASE REFUSAL.FOUND = 0
IF BSL.DATE = " AND GLUC.DATE = " THEN
RECALL.DATE = DOB + INT(65*365.25)
GOSUB 700 ; * POST IT
GOTO 999 ; * EXIT
END

IF BSL.DATE #" AND GLUC.DATE #" THEN
IF BSL.DATE > GLUC.DATE THEN
LAST.DATE = BSL.DATE
RESULT = BSL.RESULT
END ELSE
LAST.DATE = GLUC.DATE
RESULT = LAB.GLUC.RESULT
END
END ; * IF THERE IS AT LEAST ONE OF EACH TYPE OF TEST

IF BSL.DATE #" AND GLUC.DATE =" THEN
LAST.DATE = BSL.DATE
RESULT = BSL.RESULT
END

IF BSL.DATE =" AND GLUC.DATE #" THEN
LAST.DATE = GLUC.DATE
RESULT = LAB.GLUC.RESULT
END

PRINT @(20,10):"BSL.DATE: ":BSL.DATE
PRINT @(20,11):"BSL.RESULT: ":BSL.RESULT
PRINT @(20,12):"GLUC.DATE: ":GLUC.DATE
PRINT @(20,13):"LAB.GLUC.RESULT: ":LAB.GLUC.RESULT
INPUT REPLY,1
RECALL.DATE = LAST.DATE + RECALL.INTERVAL
GOSUB 700 ; * POST THE RECALL
GOTO 999 ; * EXIT

CASE REFUSAL.FOUND = 1
IF REFUSAL.DATE > BSL.DATE AND REFUSAL.DATE > GLUC.DATE THEN
RESULT = PROG.REFUSAL
LAST.DATE = REFUSAL.DATE
RECALL.DATE = LAST.DATE + 365
GOSUB 700 ; * POST IT
GOTO 999 ; * EXIT
END ELSE
IF BSL.DATE #" AND GLUC.DATE #" THEN
IF BSL.DATE > GLUC.DATE THEN
LAST.DATE = BSL.DATE
RESULT = BSLRESULT
END ELSE
LAST.DATE = GLUC.DATE
RESULT = LAB.GLUC.RESULT
END

422
RECALL.DATE = LAST.DATE + RECALL.INTERVAL
END ; * IF THERE IS AT LEAST ONE OF EACH TYPE OF TEST

IF BSL.DATE # " AND GLUC.DATE = " THEN
LAST.DATE = BSL.DATE
RESULT = BSL.RESULT
RECALL.DATE = LAST.DATE + RECALL.INTERVAL
END

IF BSL.DATE = " AND GLUC.DATE # " THEN
LAST.DATE = GLUC.DATE
RESULT = LAB.GLUC.RESULT
RECALL.DATE = LAST.DATE + RECALL.INTERVAL
END

PRINT @(20,10):"BSL.DATE: ":BSL.DATE
PRINT @(20,11):"BSL.RESULT: ":BSL.RESULT
PRINT @(20,12):"GLUC.DATE: ":GLUC.DATE
PRINT @(20,13):"LAB.GLUC.RESULT: ":LAB.GLUC.RESULT
INPUT REPLY,1
RECALL.DATE = LAST.DATE + RECALL.INTERVAL
GOSUB 700 ; * POST THE RECALL
GOTO 999 ; * EXIT
END

END CASE

IF NO BSL FOUND ANYWHERE:
RECALL.DATE = TODAY
GOSUB 700 ; * POST IT **
GOTO 999 ; * EXIT

700 ** POST A RECALL ENTRY
PRINT @(20,22):"GOT TO SUB 700"
INPUT REPLY,1
IF RECALL.DATE > DATE() THEN UTD = 1
RECALL.DATA = 
RECALL.DATA<1> = PREV.PAR
RECALL.DATA<7> = LAST.DATE
RECALL.DATA<8> = RESULT
RECALL.DATA<6> = "A"
PRINT @(5,20):"RECALL.DATA: ":RECALL.DATA
INPUT REPLY,1
C.SEQ = ""
PTR.MV = 1
794 PTR = PAT.DATA<54,PTR.MV>
IF PTR = "" THEN GOTO 795
PTR.DATE = FIELD(PTR,"",1)
PTR.SEQ = FIELD(PTR,"*",2)
IF PTR.DATE = RECALL.DATE THEN C.SEQ = PTR.SEQ + 1
IF PTR.DATE > RECALL.DATE THEN GOTO 795
PTR.MV = PTR.MV + 1
GOTO 794
795 RECAL.PTR = RECALL.DATE
IF C.SEQ # "" THEN RECAL.PTR = RECALL.DATE;"*";C.SEQ;"*
RECAL.KEY = FAMPAT;"*";RECAL.PTR
PAT.DATA = INSERT(PAT.DATA,54,PTR.MV,0,RECAL.PTR)
WRITE RECALL.DATA ON PATIENT.RECALL.FILE,RECAL.KEY
PRINT @(5,22):"RECALL.ID: ":RECAL.KEY
PRINT @(5,21):"PREV.POINTERS WRITTEN:
";DCOUNT(PAT.DATA<54>,VM)
PRINT @(5,20):"<54>";PAT.DATA<54>
INPUT REPLY,1
WRITE PAT.DATA ON PATIENT.MASTER.FILE,FAMPAT
797 RETURN
999 * EXIT
PRINT @(30,15):"DIAB EXIT: UTD = ":UTD
INPUT REPLY,1
CALL
WRITE.RESEARCH(FAMPAT,PREV.PAR,LAST.DATE,RECALL.DATE
CALL UPDATE.PREV.SCORE(FAMPAT,PREV.PAR,UTD)
1000 RETURN
RECAL.MODEL
SUBROUTINE RECAL.MODEL(FAMPAT,PAT.DATA,AGE)
OLIVER FRANK JAN 97
MODEL RECAL ROUTINE - LOOKS UP PARAMETERS IN FILE
MOD.DATA = "260197"
PROG.NAME = "RECAL.MODEL"
VM = CHAR(253)
TODAY = DATE()
UTD = "
RESULT = "
LAST.DATE = "
PREV.PAR = A
REFUSAL.CODE = B
NOT.INDICATED.CODE = C
REFUSAL.TEXT = D
RECALL.INTERVAL = E
OPEN ", 'PATIENT.MASTER.FILE' TO PATIENT.MASTER.FILE ELSE
STOP "PATIENT.
MASTER.FILE NOT OPEN"
OPEN ", 'PATIENT.RECALL.FILE' TO PATIENT.RECALL.FILE ELSE
STOP "PATIENT.
RECALL.FILE NOT OPEN"
022 OPEN ", 'PATIENT.PROG.NOTE.FILE' TO PATIENT.PROG.NOTE.FILE ELSE STOP "PATIENT.PROG.NOTE.FILE NOT OPEN"
023 OPEN 'PATIENT.LAB.TEST.FILE' TO PLTF ELSE STOP "PLTF NOT OPENED BY RECAL. MODEL"
024 OPEN ", 'PATIENT.PROBLEMS.FILE' TO PATIENT.PROBLEMS.FILE ELSE STOP "PATIENT.PROBLEMS.FILE NOT OPEN"
025 OPEN 'PATIENT.XRAY.FILE' TO PATIENT.XRAY.FILE ELSE STOP "PATIENT.XRAY.FILE NOT OPENED"
026 OPEN ", 'PATIENT.VACC.FILE' TO PATIENT.VACC.FILE ELSE STOP "PATIENT.VACC. FILE NOT OPEN"
027 PROG.POINTERS = PAT.DATA<24>
028 PROBLEMS.POINTERS = PAT.DATA<23>
029 LAB.POINTERS = PAT.DATA<18>
030 VACC.POINTERS = PAT.DATA<17>
031 XRAY.POINTERS = PAT.DATA<19>
032 PROBLEMS = DCOUNT(PROBLEMS.POINTERS,VM)
033 FOR I = 1 TO NO.PROBLEMS
034 PROBLEMS.ID = FAMPAT;"*:PAT.DATA<23,I>
035 READ PROBLEMS.DATA FROM PATIENT.PROBLEMS.FILE,PROBLEMS.ID ELSE
036 PROBLEMS.DATA = "
037 END
038 PROB.CODE = PROBLEMS.DATA<1>
039 PROB.DESC = OCONV(PROBLEMS.DATA<1>,"TPCF;X;1;1")
040 FIRST CHECK FOR REFUSAL TO BE TESTED
041 IF PROB.CODE = REFUSAL.CODE OR PROB.CODE = NOT.INDICATED.CODE THEN
042 GOSUB 800 ; * DELETE ALL GLUC RECALLS
043 UTD = 1 ; * COUNT AS UP TO DATE
044 GOTO 999 ; * EXIT
045 END
046 CHECK PROGRESS NOTES TO SEE WHETHER REFUSING OR NOT INDICATED
047 NO.PROG = DCOUNT(PROG.POINTERS,VM)
048 I = NO.PROG + 1
049 LOOP
050 I = I - 1 ; * WORK BACKWARDS FROM MOST RECENT PROGRESS NOTE
051 PROG.DATE = OCONV(PAT.DATA<24,I>,"GO*1")

425
UNTIL DATE() - PROG.DATE > 365 DO ; * PROGRESS NOTE MORE THAN A YEAR AGO

PROG.ID = FAMPAT:"*:PAT.DATA<24,I>

READ PROG.DATA FROM PATIENT.PROG.NOTE.FILE,PROG.ID

PROG.DATA = " END

PROG.PROBS = PROG.DATA<11>

NO.PROG.PROBS = DCOUNT(PROG.PROBS,VM)

FOR Q = 1 TO NO.PROG.PROBS

PROG.PROB.CODE = PROG.DATA<11,Q>

IF PROG.PROB.CODE = REFUSAL.CODE OR PROG.PROB.CODE = NOT.INDICATED.

CODE THEN

IF PROG.PROB.CODE = REFUSAL.CODE THEN

PROG.REFUSAL = REFUSAL.TEXT:" REFUSED"

ELSE

PROG.REFUSAL = REFUSAL.TEXT:" NOT INDICATED"

END

GOSUB 700 ; * POST IT

GOTO 999; * EXIT

RECALL.TYPE = PREV.PAR

RECALL.DATE = RECALL.DUE

IF RECALL.DATE > DATE() THEN UTD = 1

RECALL.DATA = ''

RECALL.DATA<1> = RECALL.TYPE

RECALL.DATA<4> = LAST.DATE

RECALL.DATA<5> = RESULT

RECALL.DATA<7> = "S"

C.SEQ = ""

PTR.MV = 1

794 PTR = PAT.DATA<54,PTR.MV>

IF PTR = "" THEN GOTO 795

PTR.DATE = FIELD(PTR,"*",1)
106  PTR.SEQ = FIELD(PTR,"*",2)
107  IF PTR.DATE = RECALL.DATE THEN C.SEQ = PTR.SEQ + 1
108  IF PTR.DATE > RECALL.DATE THEN GOTO 795
109  PTR.MV = PTR.MV + 1
110  GOTO 794
111  795 RECAL.PTR = RECALL.DATE
112  IF C.SEQ # "" THEN RECAL.PTR = RECALL.DATE:"*":C.SEQ:"*"
113  RECAL.KEY = FAMPAT:"*":RECAL.PTR
114  PAT.DATA = INSERT(PAT.DATA,54,PTR.MV,0,RECAL.PTR)
115  WRITE RECALL.DATA ON PATIENT.RECALL.FILE,RECAL.KEY
116  WRITE PAT.DATA ON PATIENT.MASTER.FILE,FAMPAT
117  797 RETURN
118
119  999 * EXIT
120  CALL UPDATE.PREV.SCORE(FAMPAT,PREV.PAR,UTD)
121  RETURN
001  PREV.DAYS.ELAPSED
002  OLIVER FRANK JULY 1997
003  TO WRITE THE ELAPSED DAYS FROM WHEN EACH PREVENTIVE
004  PROCEDURE BECAME DUE
005  UNTIL IT WAS DONE, INTO ATTRIBUTE 4 OF
006  RESEARCH.REMINDER.FILE
007
008  OPEN 'RESEARCH.REMINDER.FILE' TO RRF ELSE STOP "RRF NOT
009  OPENED BY PREV.DAYS.ELAPSED"
010  VM = CHAR(253)
011  PAT.DATA = "
012  TODAY = "
013  EXECUTE 'SELECT RRF'
014  10 READNEXT RRF.ID ELSE GOTO 999 ; * FINISHED
015  016  RRF.DATA = "
017  018  READ RRF.DATA FROM RRF, RRF.ID ELSE RRF.DATA = "
019  020  DATES.GEN = RRF.DATA<1>
021  022  DATES.DUE = RRF.DATA<2>
023  024  DATES.DONE = RRF.DATA<3>
025  026  NO.DATES.GEN = DCOUNT(DATES.GEN,VM)
027  028  NO.DATES.DUE = DCOUNT(DATES.DUE,VM)
029  030  NO.DATES.DONE = DCOUNT(DATES.DONE,VM)
031  032  LAST.DATE.GEN = RRF.DATA<1,NO.DATES.GEN>
033  034  LAST.DATE.DUE = RRF.DATA<2,NO.DATES.DUE>
BEGIN CASE

CASE LAST.DATE.DONE # "
THE PROCEDURE HAS BEEN DONE AT LEAST ONCE

NEXT DETERMINE WHETHER IT WAS OR IS TO BE DONE AGAIN

IF DATES.DUE # " THEN ; * IT IS TO BE DONE AGAIN ONE DAY
DAYS.ELAPSED = PENULTIMATE.DATE.DUE - LAST.DATE.DONE
END ELSE

NOT TO BE DONE AGAIN - IT WAS A ONCE ONLY PROCEDURE
GET DATES OF RELEVANT PROGRESS NOTES
WE NEED THE DATE OF THE LAST PROGRESS NOTE AT WHICH IT
WAS DUE
THIS IS NOT THE LAST PROGRESS NOTE, BECAUSE ON THAT
DATE WE FIND

THAT THE PROCEDURE IS NO LONGER DUE - THEREFORE WE
NEED THE
PENULTIMATE PROGRESS NOTE DATE

PATNUM = OCONV(RRF.ID,"G0*1")
READ PAT.DATA FROM ELSE PAT.DATA = " PMF, PATNUM
PROG.POINTER = PAT.DATA<24>
NO.PROGS = DCOUNT(PROG.POINTER,VM)
LAST.PROG.DATE = OCONV(PAT.DATA<24,NO.PROGS>,"G0*1")
PENULTIMATE.PROG.DATE = OCONV(PAT.DATA<24,NO.PROGS -
1>,"G0*1")
DAYS.ELAPSED = LAST.PROG.DATE - PENULTIMATE.PROG.DATE
END ELSE ; * IT HAS NOT BEEN DONE EVER
DAYS.ELAPSED = TODAY - LAST.DATE.DUE
END

RECAL.BIRTHDAY

SUBROUTINE RECAL.BIRTHDAY(FAMPAT,PAT.DATA,AGE)
RECAL.BIRTHDAY

JUST SORT OUT THE AGE. CALLED FROM RECAL.ONEPAT
JAN RAVET SEPTEMBER 1992
MOD.DATA = "050495"
PROG.NAME = "RECAL.BIRTHDAY"
PROMPT "
VM = CHAR(253)
TODAY = DATE()
RECALL.POINTER = PAT.DATA<54>
OPEN ", 'PATIENT.MASTER.FILE' TO PATIENT.MASTER.FILE ELSE STOP "PATIENT.
MASTER.FILE NOT OPEN"
OPEN ", 'PATIENT.RECALL.FILE' TO PATIENT.RECALL.FILE ELSE STOP "PATIENT
RECALL FILE NOT OPENED BY RECAL.BIRTHDAY"

DOB = PAT.DATA<3>
DOB.DATE = OCONV(DOB,"D0")
AGE = FIELD(AGE,",",1)
AGE.NEXT = AGE + 1
DATE.LAST.BD = INT(DOB + AGE*365.25)
DATE.NEXT.BD = DATE.LAST.BD + 365
LAST.BD.GAP = TODAY - DATE.LAST.BD
NEXT.BD.GAP = DATE.NEXT.BD - TODAY

FIRST DELETE ANY EXISTING BIRTHDAY MESSAGES
GOSUB 800 ; * DELETE EXISTING MESSAGES
IF NEXT.BD.GAP < 8 THEN
GOSUB 500 ; * CREATE THE MESSAGE
GOSUB 700 ; * POST THE RECALL
GOTO 999 ; * EXIT
END
IF LAST.BD.GAP < 8 THEN
GOSUB 600 ; * CREATE THE MESSAGE
GOSUB 700 ; * POST THE RECALL
GOTO 999 ; * EXIT
END
IF BIRTHDAY NOT WITHIN + OR - 7 DAYS, DELETE ANY
BIRTHDAY REMINDERS
IF LAST.BD.GAP > 7 AND NEXT.BD.GAP > 7 THEN
GOSUB 800 ; * DELETE ALL BIRTHDAY RECALLS
GOTO 999 ; * EXIT
END
500 * CREATE THE MESSAGE
IF NEXT.BD.GAP < 15 THEN
MESSAGE = "HAVE A HAPPY ":AGE.NEXT:"TH BIRTHDAY ON ":DOB.DATE
MESSAGE = "NEXT AGE: ":AGE.NEXT:" AGE: ":AGE:"
";"DATE.LAST.BD = ":DATE.LAST.BD:" ;"DATE.NEXT.BD = ":DATE.NEXT.BD
RESULT = "WILL TURN ":AGE.NEXT:" YEARS OLD ON ":DOB.DATE
END
RETURN

600 NULL
IF LAST.BD.GAP < 15 THEN
MESSAGE = "CONGRATULATIONS ON TURNING ":AGE:" YEARS OLD ON ":DOB.DATE
MESSAGE = "AGE RAW: ":AGE:"NEXT AGE: ":AGE.NEXT:" AGE: ":AGE:" DATE.LAST.BD = ":DATE.LAST.BD:" DATE.NEXT.BD = ":DATE.NEXT.BD
RESULT = "TURNED ":AGE:" YEARS OLD ON ":DOB.DATE
END
RETURN

** POST A RECALL ENTRY
RECALL.TYPE = "BDAY"
RECALL.DATE = TODAY
RECALL.DATA = 
RECALL.DATA<1> = RECALL.TYPE
RECALL.DATA<8> = RESULT
RECALL.DATA<9> = MESSAGE
RECALL.DATA<6> = "A"
C.SEQ = ""
PTR.MV = 1
794 PTR = PAT.DATA<54,PTR.MV>
IF PTR = "" THEN GOTO 795
PTR.DATE = FIELD(PTR,"*",1)
PTR.SEQ = FIELD(PTR,"*",2)
IF PTR.DATE = TODAY THEN C.SEQ = PTR.SEQ + 1
IF PTR.DATE > TODAY THEN GOTO 795
PTR.MV = PTR.MV + 1
GOTO 794
795 RECAL.PTR = TODAY
IF C.SEQ # "" THEN RECAL.PTR = TODAY:"*:C.SEQ:"**
RECAL.KEY = FAMPAT:"*:RECAL.PTR
PAT.DATA = INSERT(PAT.DATA,54,PTR.MV,0,RECAL.PTR)
WRITE RECALL.DATA ON PATIENT.RECALL.FILE,RECAL.KEY
WRITE PAT.DATA ON PATIENT.MASTER.FILE,FAMPAT
797 RETURN

800 * DELETE ALL BIRTHDAY RECALLS
NO.RECALLS = DCOUNT(RECALL.POINTERS,VM)
FOR I = 1 TO NO.RECALLS
RECALL.ID = FAMPAT:"*:PAT.DATA<54,I>
READ PAT.RECALL.DATA FROM PATIENT.RECALL.FILE,RECALL.ID ELSE
PAT.RECALL.DATA = "
END
RECALL.TYPE = PAT.RECALL.DATA<1>
IF RECALL.TYPE = "BD" THEN
  PAT.DATA = DELETE(PAT.DATA,54,I,0)
  WRITE PAT.DATA ON PATIENT.MASTER.FILE,FAMPAT
  DELETE PATIENT.RECALL.FILE, RECALL.ID
END
NEXT I
RETURN

999 * EXIT
PRINT @(40,23):"RECAL.AGE ENDED":@(-4):
PRINT @(65,23):
INPUT REPLY,2:
RETURN

SUBROUTINE RECAL.ACCESS(FAMPAT,PAT.DATA)
OLIVER FRANK JULY 1995
MOD.DATA = "240295"
PROG.NAME = "RECAL.ACCESS"

VM = CHAR(253)
TODAY = DATE()
RECALL.DATE = 
LAST.DATE = 
RESULT = 
PREV.PAR = "ACCE"
UTD = 
REFUSAL.CODE = 354.3041
NOT.INDICATED.CODE = 354.3042
REFUSAL.TEXT = "ACCESS CABS"
DONE.TEXT.SUBJ = "HAS ACCESS CABS"
DONE.TEXT.TREAT = "ACCESS CABS FORM DONE"
DONE.TEXT.ASSESS = "ACCESS CABS NOT NEEDED"
REFUSAL.DATE = 
RECALL.INTERVAL = 1460
ACCESS.CABS.DONE.CODE = 371.1

OPEN ", 'PATIENT.MASTER.FILE' TO PATIENT.MASTER.FILE ELSE STOP "PATIENT. MASTER.FILE NOT OPEN"
OPEN ", 'PATIENT.RECALL.FILE' TO PATIENT.RECALL.FILE ELSE STOP "PATIENT. RECALL.FILE NOT OPEN"
OPEN ", 'PATIENT.PROBLEMS.FILE' TO PATIENT.PROBLEMS.FILE ELSE STOP "PATIENT.PROBLEMS.FILE NOT OPEN"
OPEN ", 'PATIENT.PROG.NOTE.FILE' TO PATIENT.PROG.NOTE.FILE ELSE STOP "PATIENT.PROG.NOTE.FILE NOT OPEN"

RECALL.POINTERS = PAT.DATA<54>
032 PROBLEMS.POINTERS = PAT.DATA<23>
033 PROG.POINTERS = PAT.DATA<24>
034 DOB = PAT.DATA<3>
035
036 100 ** PROBLEMS **
037 NO.PROBLEMS = DCOUNT(PROBLEMS.POINTERS,VM)
038 PROBLEMS.DATA = ""
039 FOR I = 1 TO NO.PROBLEMS
040 PROBLEMS.ID = FAMPAT:"*":PAT.DATA<23,I>
041 READ PROBLEMS.DATA FROM
    PATIENT.PROBLEMS.FILE,PROBLEMS.ID ELSE
042 PROBLEMS.DATA = ""
043 END
044
045 PROB.CODE = PROBLEMS.DATA<1>
046 IF PROB.CODE = ACCESS.CABS.DONE.CODE OR PROB.CODE =
    REFUSAL.CODE OR PROB.
    CODE = NOT.INDICATED.CODE THEN
047 UTD = 1
048 GOTO 999 ; * EXIT
049 END
050
051 NEXT I
052
053 200 * PROGRESS NOTES *
054 NO.PROG = DCOUNT(PROG.POINTERS,VM)
055 FOR I = NO.PROG TO 1 STEP -1
056 PROG.DATE = OCONV(PAT.DATA<24,I>,"G0*1")
057 PPNF.ID = FAMPAT:"*":PAT.DATA<24,I>
058 READ PROG.DATA FROM PATIENT.PROG.NOTE.FILE,PPNF.ID ELSE
    PROG.DATA = ""
059 SUBJ = PROG.DATA<2>
060 TREAT = PROG.DATA<7>
061 ASSESS = PROG.DATA<12>
062
063 FOUND.ONE = INDEX(SUBJ,DONE.TEXT.SUBJ,'1')
064 IF FOUND.ONE >0 THEN
065 GOSUB 600 ; * WRITE THIS AS A RESOLVED PROBLEM
066 UTD = 1
067 GOTO 999 ; * EXIT
068 END
069
070 FOUND.ONE = INDEX(TREAT,DONE.TEXT.TREAT,'1')
071 IF FOUND.ONE >0 THEN
072 GOSUB 600 ; * WRITE THIS AS A RESOLVED PROBLEM
073 UTD = 1
074 GOTO 999 ; * EXIT
075 END
076
077 FOUND.ONE = INDEX(ASSESS,DONE.TEXT.ASSESS,'1')
IF FOUND.ONE > 0 THEN
RECALL.DATE = PROG.DATE + RECALL.INTERVAL
LAST.DATE = PROG.DATE
RESULT = DONE.TEXT.ASSESS
GOSUB 700 ; * POST IT
GOTO 999 ; * EXIT
END

PROG.PROBS = PROG.DATA<11>
NO.PROG.PROBS = DCOUNT(PROG.PROBS,VM)
FOR Q = 1 TO NO.PROG.PROBS
PROG.PROB.CODE = PROG.DATA<11,Q>
IF PROG.PROB.CODE = NOT.INDICATED.CODE OR
PROG.PROB.CODE = REFUSAL.CODE
THEN
IF PROG.PROB.CODE = REFUSAL.CODE THEN
RESULT = REFUSAL.TEXT:" REFUSED"
RECALL.DATE = PROG.DATE + 365
END
IF PROG.PROB.CODE = NOT.INDICATED.CODE THEN
RESULT = REFUSAL.TEXT:" NOT INDICATED"
RECALL.DATE = PROG.DATE + RECALL.INTERVAL
END
LAST.DATE = PROG.DATE
GOSUB 700 ; * POST IT
GOTO 999; * EXIT
END
NEXT Q
NEXT I

IF NO REFERENCE FOUND TO ACCESS CABS
GOSUB 700
GOTO 999 ; * EXIT

600 * WRITE THE RESOLVED PROBLEM INTO THE PROBLEM LIST
FIRST WRITE THE PROBLEM POINTER INTO THE PROBLEM ATTRIBUTE
C.SEQ = ""
PTR.MV = 1
694 PTR = PAT.DATA<23,PTR.MV>
IF PTR = "" THEN GOTO 695 ; * THERE ARE NO EXISTING PROBLEM POINTERS
PTR.DATE = FIELD(PTR,"*",1)
PTR.SEQ = FIELD(PTR,"*",2)
IF PTR.DATE = PROG.DATE THEN C.SEQ = PTR.SEQ + 1 ; * GIVE IT
THE NEXT SUFFIX
125 IF PTR.DATE > PROG.DATE THEN GOTO 695 ; * THIS PROBLEM
126     NEEDS TO BE INSERTED AT BEGINNING OF PROB POINTERS
127     PTR.MV = PTR.MV + 1
128     GOTO 694
129     695 PROB.PTR = PROG.DATE
130     IF C.SEQ # "" THEN PROB.PTR = PROG.DATE:"*:C.SEQ:"*
131     PROB.KEY = FAMPAT:"*:PROB.PTR
132     PAT.DATA = INSERT(PAT.DATA,23,PTR.MV,0,PROB.PTR)
133     WRITE PAT.DATA ON PATIENT.MASTER.FILE,FAMPAT
134     NEXT ADD THE PROBLEM CODE TO THE LIST IN ATT. 51
135     READ PAT.DATA FROM PATIENT.MASTER.FILE,FAMPAT ELSE
136     STOP "PAT.DATA NOT READ
137     BY RECAL.ACCESS SUB 600"
138     PAT.DATA = INSERT(PAT.DATA,51,-1;ACCESS.CABS.DONE.CODE)
139     WRITE PAT.DATA ON PATIENT.MASTER.FILE,FAMPAT
140     LASTLY WRITE THE ACTUAL PROBLEM ITEM IN PPF
141     OPEN 'PATIENT.PROBLEMS.FILE' TO PPF ELSE STOP "PPF NOT
142     OPENED BY RECAL.ACCESS"
143     PPF.DATA = "
144     PPF.KEY = FAMPAT:"*:PROG.DATE:"*
145     PPF.DATA<1> = ACCESS.CABS.DONE.CODE
146     PPF.DATA<4> = "HAS ACCESS CABS"
147     PPF.DATA<5> = PROG.DATE
148     WRITE PPF.DATA ON PPF,FAMPAT:"*:PROB.PTR
149     RETURN
150     700 ** POST A RECALL ENTRY
151     IF RECALL.DATE > DATE() THEN UTD = 1
152     RECALL.DATA = "
153     RECALL.DATA<1> = PREV.PAR
154     RECALL.DATA<7> = LAST.DATE
155     RECALL.DATA<8> = RESULT
156     RECALL.DATA<6> = "A"
157     C.SEQ = ""
158     PTR.MV = 1
159     794 PTR = PAT.DATA<54,PTR.MV>
160     IF PTR = "" THEN GOTO 795
161     PTR.DATE = FIELD(PTR,"*:1)
162     PTR.SEQ = FIELD(PTR,"*:2)
163     IF PTR.DATE = RECALL.DATE THEN C.SEQ = PTR.SEQ + 1
164     IF PTR.DATE > RECALL.DATE THEN GOTO 795
165     PTR.MV = PTR.MV + 1
166     GOTO 794
167     795 RECAL.PTR = RECALL.DATE
168     IF C.SEQ # "" THEN RECAL.PTR = RECALL.DATE:"*:C.SEQ:"*
169     RECAL.KEY = FAMPAT:"*:RECAL.PTR

434
PAT.DATA = INSERT(PAT.DATA,54,PTR.MV,0,RECAL.PTR)
WRITE RECALL.DATA ON PATIENT.RECALL.FILE,RECAL.KEY
WRITE PAT.DATA ON PATIENT.MASTER.FILE,FAMPAT
797 RETURN
999 * EXIT
CALL
WRITE.RESEARCH(FAMPAT,PREV.PAR,LAST.DATE,RECALL.DATE
CALL UPDATE.PREV.SCORE(FAMPAT,PREV.PAR,UTD)
RETURN
RECAL.HOMESAFE
SUBROUTINE RECAL.HOMESAFE(FAMPAT,PAT.DATA)
RECAL.HOMESAFE
JUST SORT OUT THE HOMESAFE. CALLED FROM RECAL.ONEPAT
ACCEPTS "HOME SAFETY CHECK OK" IN SUBJECTIVE OF
CONSULT/PROGRESS NOTE
ACCEPTS "HOME SAFETY ADVICE GIVEN" IN TREATMENT FIELD
OF CONSULT/PROGRESS
NOTE
OLIVER FRANK JULY 1995
MOD.DATA = "240295"
PROG.NAME = "RECAL.HOMESAFE"
PROMPT "
VM = CHAR(253)
TODAY = DATE()
RECALL.DATE = "
LAST.DATE = "
UTD = "
RESULT = "
PREV.PAR = "HOME"
REFUSAL.CODE = 354.3021
NOT.INDICATED.CODE = 354.3022
REFUSAL.TEXT = "HOME SAFETY ADVICE"
DONE.TEXT.SUBJ = "HOME SAFETY"
DONE.TEXT.TREAT = "HOME SAFETY"
RECALL.INTERVAL = INT(4 * 365.25)
OPEN ",'PATIENT.MASTER.FILE' TO PATIENT.MASTER.FILE ELSE
STOP "PATIENT.
MASTER.FILE NOT OPEN"
OPEN ",'PATIENT.RECALL.FILE' TO PATIENT.RECALL.FILE ELSE
STOP "PATIENT.
RECALL.FILE NOT OPEN"
OPEN ",'PATIENT.PROBLEMS.FILE' TO PATIENT.PROBLEMS.FILE
ELSE STOP "PATIENT.PROBLEMS.FILE NOT OPEN"
OPEN ", 'PATIENT.PROG.NOTE.FILE' TO PATIENT.PROG.NOTE.FILE ELSE STOP "PATIENT.PROG.NOTE.FILE NOT OPEN"
OPEN 'MED.FAMILY.FILE' TO MFF ELSE STOP "MFF NOT OPENED BY RECAL.HOMESAFe"

RECALL.POINTERS = PAT.DATA<54>
PROBLEMS.POINTERS = PAT.DATA<23>
PROG.POINTERS = PAT.DATA<24>
DOB = PAT.DATA<3>

CANCEL RECALLS IF LIVES IN A NURSING HOME

ADDRESS = PAT.DATA<34>
IF INDEX(ADDRESS,"HOSTEL",'1') > 0 OR INDEX(ADDRESS,"NURSING",'1') > 0 OR INDEX(ADDRESS,"N.H.",'1') > 0 THEN
UTD = 1
GOTO 999 ; * EXIT
END

100 ** PROBLEMS **
NO.PROBLEMS = DCOUNT(PROBLEMS.POINTERS,VM)
PROBLEMS.DATA = "
FOR I = 1 TO NO.PROBLEMS
PROBLEMS.ID = FAMPAT:"*":PAT.DATA<23,I>
READ PROBLEMS.DATA FROM PATIENT.PROBLEMS.FILE,PROBLEMS.ID ELSE
PROBLEMS.DATA = "
END

PROB.CODE = PROBLEMS.DATA<1>
IF PROB.CODE = REFUSAL.CODE OR PROB.CODE = NOT.INDICATED.CODE THEN
UTD = 1
GOTO 999 ; * EXIT
END
NEXT I

200 * PROGRESS NOTES *
NO.PROG = DCOUNT(PROG.POINTERS,VM)
HOMESAFe.DATE = "
RESULT = "
FOR I = NO.PROG TO 1 STEP -1
PROG.ID = FAMPAT:"*":PAT.DATA<24,I>
READ PROG.DATA FROM PATIENT.PROG.NOTE.FILE,PROG.ID ELSE
PROG.DATA = "
END
PROG.DATE = OCONV(PROG.ID,"G1*1")
SUBJ = PROG.DATA<2>
TREAT = PROG.DATA<7>

FOUND.ONE = INDEX(SUBJ,DONE.TEXT.SUBJ,'1')
IF FOUND.ONE >0 THEN

LAST.DATE = PROG.DATE
RECALL.DATE = LAST.DATE + RECALL.INTERVAL
RESULT = "HOME SAFETY CHECK OK"
GOSUB 700 ; * POST IT
GOTO 999 ; * EXIT
END

FOUND.ONE = INDEX(TREAT,DONE.TEXT.TREAT,'1')
IF FOUND.ONE > 0 THEN
RESULT = "HOME SAFETY ADVICE GIVEN"
LAST.DATE = PROG.DATE
RECALL.DATE = LAST.DATE + RECALL.INTERVAL
GOSUB 700 ; * POST IT
GOTO 999 ; * EXIT
END

LOOK FOR REFUSAL

PROG.PROBS = PROG.DATA<11>
NO.PROG.PROB.CODES = DCOUNT(PROG.PROBS,VM)

FOR Q = 1 TO NO.PROG.PROB.CODES
PROG.PROB.CODE = PROG.DATA<11,Q>

IF PROG.PROB.CODE = REFUSAL.CODE OR PROG.PROB.CODE = NOT.INDICATED. CODE THEN
RESULT = REFUSAL.TEXT:" REFUSED"
END ELSE
RESULT = REFUSAL.TEXT:" NOT INDICATED"
END

LAST.DATE = PROG.DATE
RECALL.DATE = LAST.DATE + 365
GOSUB 700 ; * POST IT
GOTO 999; * EXIT
END

IF RELATIVE HAS HAD THE ADVICE, NOTE THIS
FAMNUM = OCONV(FAMPAT,"T1,5")
READ MFF.DATA FROM MFF,FAMNUM ELSE MFF.DATA = "'
MEMBERS = MFF.DATA<30>
NO.OF.MEMBERS = DCOUNT(MEMBERS,VM)
FOR I = 1 TO NO.OF.MEMBERS
MEMBER.NUM = MFF.DATA<30,I>
MEMBER.FAMPAT = FAMNUM:MEMBER.NUM
IF MEMBER.FAMPAT # FAMPAT THEN
READ MEM.DATA FROM
PATIENT.MASTER.FILE,MEMBER.FAMPAT ELSE MEM.DATA = "'
MEM.SURNAME = MEM.DATA<1>
MEM.FIRST.NAME = OCONV(MEM.DATA<2>,"G0 1")
MEM.NAME = MEM.FIRST.NAME:"":MEM.SURNAME
MEM.PROGS = MEM.DATA<24>
NO.PROG = DCOUNT(MEM.PROGS,VM)
FOR J = NO.PROG TO 1 STEP -1
MEM.PROG.ID = MEMBER.FAMPAT:"*:MEM.DATA<24,J>
READ MEM.PROG.DATA FROM
PATIENT.PROG.NOTE.FILE,MEM.PROG.ID ELSE
MEM.PROG.DATA = "'
END
FOUND.ONE = INDEX(MEM.PROG.DATA<2>,DONE.TEXT.SUBJ,'1')
OR INDEX(MEM.PROG
DATA<7>,DONE.TEXT.TREAT,'1')
IF FOUND.ONE >0 THEN
LAST.DATE = OCONV(MEM.PROG.ID,"G1*1")
RECALL.DATE = LAST.DATE + RECALL.INTERVAL
TREATMENT = "HOME SAFETY ADVICE GIVEN TO ":MEM.NAME
DOC = MEM.PROG.DATA<1>
WRITE THIS INTO A NEW PROGRESS NOTE FOR THE CURRENT
PATIENT
C.SEQ = ""
PTR.MV = 1
300  PTR = PAT.DATA<24,PTR.MV>
IF PTR = "" THEN GOTO 301
PTR.DATE = FIELD(PTR,"*",1)
PTR.SEQ = FIELD(PTR,"*",2)
IF PTR.DATE = LAST.DATE THEN C.SEQ = PTR.SEQ + 1
IF PTR.DATE > LAST.DATE THEN GOTO 301
PTR.MV = PTR.MV + 1
GOTO 300
301 HOME.PTR = LAST.DATE
IF C.SEQ # "" THEN HOME.PTR = LAST.DATE:"*:C.SEQ:"*
HOME.KEY = FAMPAT:"*:HOME.PTR
PAT.DATA = INSERT(PAT.DATA,24,PTR.MV,0,HOME.PTR)
MEM.PROG.DATA<7> = TREATMENT
MEM.PROG.DATA<1> = DOC
WRITEV TREATMENT ON PATIENT.PROG.NOTE.FILE,HOME.KEY,7
WRITEV DOC ON PATIENT.PROG NOTE.FILE, HOME.KEY, 1
WRITE PAT.DATA ON PATIENT.MASTER.FILE, FAMPAT
GOSUB 700 ; * POST IT
GOTO 999 ; * EXIT
END
NEXT J
END
NEXT I

IF NO REFERENCE FOUND IN PATIENT'S OR FAMILY'S NOTES TO HOME SAFETY*
RECALL.DATE = DOB + INT(365.25*65)
GOSUB 700 ; * POST IT
GOTO 999 ; * EXIT
700
IF RECALL.DATE > TODAY THEN UTD = 1
RECALL.DATA = 
RECALL.DATA<1> = PREV.PAR
RECALL.DATA<7> = LAST.DATE
RECALL.DATA<8> = RESULT
RECALL.DATA<6> = "A"
C.SEQ = ""
PTR.MV = 1
794 PTR = PAT.DATA<54,PTR.MV>
IF PTR = "" THEN GOTO 795
PTR.DATE = FIELD(PTR,"*",1)
PTR.SEQ = FIELD(PTR,"*",2)
IF PTR.DATE = RECALL.DATE THEN C.SEQ = PTR.SEQ + 1
IF PTR.DATE > RECALL.DATE THEN GOTO 795
PTR.MV = PTR.MV + 1
GOTO 794
795 RECAL.PTR = RECALL.DATE
IF C.SEQ # "" THEN RECAL.PTR = RECALL.DATE:"*:C.SEQ:"*"
RECAL.KEY = FAMPAT:"*:RECAL.PTR
PAT.DATA = INSERT(PAT.DATA,54,PTR.MV,0,RECAL.PTR)
WRITE RECALL.DATA ON PATIENT.RECALL.FILE, RECAL.KEY
WRITE PAT.DATA ON PATIENT.MASTER.FILE, FAMPAT
797 RETURN

PRINT @(30,10):"ABOUT TO EXIT HOMESAFL"
PRINT @(30,11):"LAST.DATE: ":OCONV(LAST.DATE,"D2/"
PRINT @(30,12):"RESULT ":RESULT
PRINT @(30,13):"RECALL.DATE: ":OCONV(RECALL.DATE,"D2/")
INPUT REPLY,1
CALL
WRITE.RESEARCH(FAMPAT, PREV.PAR, LAST.DATE, RECALL.DATE
CALL UPDATE.PREV.SCORE(FAMPAT,PREV.PAR,UTD)
RETURN
RECAL.DIAB.GLYC
SUBROUTINE RECAL.GLYC(FAMPAT,PAT.DATA)
RECAL.GLYC
JUST SORT OUT THE GLYC. CALLED FROM RECAL.ONEPAT
JAN RAVET SEPTEMBER 1992
MODS OLIVER FRANK NOV 1994
MOD.DATA = "221194"
PROG.NAME = "RECAL.GLYC"
LOOKS FOR LAB TEST NAME CONTAINING "GLYC"
PROMPT "
VM = CHAR(253)
PREV.PAR = "GLYC"
RECALL.NOTED = "
LAST.DATE = "
RECALL.DATE = "
MONTHS = "
UTD = "
LAST.DATE = "
OPEN ", 'PATIENT.MASTER.FILE' TO PATIENT.MASTER.FILE ELSE STOP "PATIENT.MASTER.FILE NOT OPEN"
OPEN ", 'PATIENT.RECALL.FILE' TO PATIENT.RECALL.FILE ELSE STOP "PATIENT.RECALL.FILE NOT OPEN"
OPEN ", 'PATIENT.LAB.TEST.FILE' TO PATIENT.LAB.TEST.FILE ELSE STOP "PATIENT.LAB.TEST.FILE NOT OPEN"
OPEN ", 'PATIENT.PROBLEMS.FILE' TO PATIENT.PROBLEMS.FILE ELSE STOP "PATIENT.PROBLEMS.FILE NOT OPEN"
RECALL.POINTERS = PAT.DATA<54>
PROBLEMS.POINTERS = PAT.DATA<23>
LAB.POINTERS = PAT.DATA<18>
PROBLEMS **
NO.PROBLEMS = DCOUNT(PROBLEMS.POINTERS,VM)
FOR I = 1 TO NO.PROBLEMS
PROBLEMS.ID = FAMPAT:"*":PAT.DATA<23,I>
READ PROBLEMS.DATA FROM
PATIENT.PROBLEMS.FILE,PROBLEMS.ID ELSE
PROBLEMS.DATA = "
END
FOUND.ONE = INDEX(PROBLEMS.DATA<4>,"REFUSES GLYC",1) OR
INDEX(PROBLEMS.DATA<4>,"354.9",1)
IF FOUND.ONE > 0 THEN
GOTO 999 ; * EXIT
END
NEXT I

LAB
NO.LAB = DCOUNT(LAB.POINTERS, VM)
FOR I = NO.LAB TO 1 STEP -1
LAB.ID = FAMPAT:"*":PAT.DATA<18,I>
LAB.DATA ="
READ LAB.DATA FROM PATIENT.LAB.TEST.FILE,LAB.ID ELSE
LAB.DATA ="
END

IGNORE LIPIDS TEST WITH STRING "TRIGLYCERIDES" IN THEM
IF INDEX(LAB.DATA<3>,"TRIGLYCERID","1") > 0 THEN
GOTO 400 ; * NEXT LAB RESULT
END

FOUND.ONE = INDEX(LAB.DATA<3>,"GLYC","1")
IF FOUND.ONE > 0 THEN
GLYC.DATE = OCONV(LAB.ID,"G1*1")
RESULT = LAB.DATA<3>
GOSUB 500 ; * WORK OUT RECALL DATE
GOSUB 700 ; * POST IT
GOTO 999 ; * EXIT
END

FOUND.ONE = INDEX(LAB.DATA<1>,"GLYC","1")
IF FOUND.ONE > 0 THEN
GLYC.DATE = OCONV(LAB.ID,"G1*1")
RESULT = LAB.DATA<3>
GOSUB 500 ; * WORK OUT RECALL DATE
GOSUB 700 ; * POST IT
GOTO 999 ; * EXIT
END

IF NO GLYC TEST IN LAB.FILE, THEN
GLYC.DATE ="
GLYC.DUE = DATE()
RESULT ="
GOSUB 700 ; * POST IT *
GOTO 999 ; * EXIT

500 * CHECK RECALL INTERVAL
LAB.RESULT = LAB.DATA<3>
RECAL.NOTED = INDEX(LAB.RESULT,"/12","1")
RECAL.NOTED = INDEX(LAB.RESULT,"MTHS TO REPEAT","1")
IF RECAL.NOTED > 0 THEN
    MONTHS = TRIM(LAB.RESULT[RECAL.NOTED -2,2])
    MONTHS = LAB.RESULT[RECAL.NOTED +16,2]
END

IF MONTHS # "" THEN
    RECALL.INTERVAL = MONTHS *30
END ELSE
    RECALL.INTERVAL = 365
END

PRINT @(30,11):"NO. OF TESTS : ":NO.LAB
PRINT @(30,8):"LAB TEST NO. : ":I
PRINT @(30,20):"RECAL.NOTED: ":RECAL.NOTED
PRINT @(30,21):"MONTHS     : ":MONTHS
PRINT @(30,22):"RECALL.INTERVAL: ":RECALL.INTERVAL
PRINT @(30,23):"RESULT       : ":RESULT
INPUT REPLY,1

GLYC.DUE = GLYC.DATE + RECALL.INTERVAL

549 RETURN

** POST A RECALL ENTRY
RECALL.DATE = GLYC.DUE
IF RECALL.DATE > DATE() THEN UTD = 1
RECALL.DATA = 
RECALL.DATA<1> = PREV.PAR
RECALL.DATA<7> = GLYC.DATE
RECALL.DATA<8> = RESULT
RECALL.DATA<6> = "A"

C.SEQ = ""
PTR.MV = 1
794 PTR = PAT.DATA<54,PTR.MV>
IF PTR = "" THEN GOTO 795
PTR.DATE = FIELD(PTR,"*",1)
PTR.SEQ = FIELD(PTR,"*",2)
IF PTR.DATE = RECALL.DATE THEN C.SEQ = PTR.SEQ + 1
IF PTR.DATE > RECALL.DATE THEN GOTO 795
PTR.MV = PTR.MV + 1
GOTO 794
795 RECAL.PTR = RECALL.DATE
IF C.SEQ # "" THEN RECAL.PTR = RECALL.DATE:"*:C.SEQ:"*
RECAL.KEY = FAMPAT:"*:RECAL.PTR
PAT.DATA = INSERT(PAT.DATA,54,PTR.MV,0,RECAL.PTR)
WRITE RECALL.DATA ON PATIENT.RECALL.FILE,RECAL.KEY
WRITE PAT.DATA ON PATIENT.MASTER.FILE,FAMPAT
797 RETURN
999 * EXIT
PRINT @((40,23);"RECAL.GLYC ENDED":@(-4):
PRINT @((65,23):
INPUT REPLY,2:
CALL
  WRITE.RESEARCH(FAMPAT,PREV.PAR,LAST.DATE,RECALL.DATE
  CALL UPDATE.PREV.SCORE(FAMPAT,PREV.PAR,UTD)
RETURN
RECAL.MMR
SUBROUTINE RECAL.MMR(FAMPAT,PAT.DATA,AGE,DOB)
001
002
003
004
005
006
007
008
009
010
011
012 MOD.DATA = "170796"
013 PROG.NAME = "RECAL.MMR"
014
015 PROMPT "
016 VM = CHAR(253)
017 TODAY = DATE()
018 RECALL.DATE = "
019 UTD = "
020 VACC.DATE = "
021 VACC.NAME = "
022 VACC.DOSE = "
023 REFUSAL.DATE = "
024 PREV.PAR = "MMR"
025 LAST.DATE = "
026 REFUSAL.CODE = 354.1041
027 NOT.INDICATED.CODE = 354.1042
028 REFUSAL.TEXT = "MMR"
029 IMM.NAME = "
030 RESULT = "
031 MEASLES.DISEASE.CODE = 012.0
032
OPEN ", 'PATIENT.MASTER.FILE' TO PATIENT.MASTER.FILE ELSE
STOP "PATIENT.
MASTER.FILE NOT OPEN"
OPEN ", 'PATIENT.RECALL.FILE' TO PATIENT.RECALL.FILE ELSE
STOP "PATIENT.
RECALL.FILE NOT OPEN"
OPEN ", 'PATIENT.VACC.FILE' TO PATIENT.VACC.FILE ELSE STOP
"PATIENT.VACC
FILE NOT OPEN"
OPEN "PATIENT.PROBLEMS.FILE' TO PATIENT.PROBLEMS.FILE ELSE STOP "PATIENT.PROBLEMS.FILE NOT OPEN"

OPEN "PATIENT.ALLERGY.FILE' TO PATIENT.ALLERGY.FILE ELSE STOP "PATIENT.ALLERGY.FILE NOT OPEN"

OPEN 'PATIENT.PROG.NOTE.FILE' TO PPNF ELSE STOP "PPNF NOT OPENED BY RECAL. MMR"

RECALL.POINTERS = PAT.DATA<54>
ALLERGY.POINTERS = PAT.DATA<22>
PROBLEMS.POINTERS = PAT.DATA<23>
VACC.POINTERS = PAT.DATA<17>
PROG.POINTERS = PAT.DATA<24>
VACC.DATE = "
VACC.NAME = "
VACC.DOSE = "

ALLERGY **
NO.ALLERGY = DCOUNT(ALLERGY.POINTERS,VM)
FOR I = 1 TO NO.ALLERGY
    ALLERGY.ID = FAMPAT:"*":PAT.DATA<22,I>
    READ ALLERGY.DATA FROM PATIENT.ALLERGY.FILE,ALLERGY.ID ELSE
    ALLERGY.DATA = "
END

FOUND.ONE = INDEX(ALLERGY.DATA<1>,'MMR','1') OR INDEX(ALLERGY.DATA<1>,"MUMPS","1") OR INDEX(ALLERGY.DATA<1>,"RUBELLA","1") OR INDEX(ALLERGY.DATA<1>,"MEASLES","1")
IF FOUND.ONE >0 THEN
    CALL RRF.NOT.ELIG(FAMPAT,PREV.PAR)
    GOTO 1000 ; * EXIT
END

PROBLEMS
NO.PROBLEMS = DCOUNT(PROBLEMS.POINTERS,VM)
FOR I = 1 TO NO.PROBLEMS
    PROBLEMS.ID = FAMPAT:"*":PAT.DATA<23,I>
    READ PROBLEMS.DATA FROM PATIENT.PROBLEMS.FILE,PROBLEMS.ID ELSE
    PROBLEMS.DATA = "
END

PROB.CODE = PROBLEMS.DATA<1>
IF PROB.CODE = REFUSAL.CODE OR PROB.CODE = NOT.INDICATED.CODE OR PROB.CODE = MEASLES.DISEASE.CODE THEN
CALL RRF.NOT.ELIG(FAMPAT,PREV.PAR)
GOTO 1000 ; * EXIT
END
NEXT I

AGE IS VITAL
IF DOB = " THEN
RESULT = "* DATE OF BIRTH NOT RECORDED *"
RECALL.DATE = DOB + 365
GOSUB 700 ; * POST IT
GOTO 999 ; * EXIT
END
VACCINES
NO.VACC = DCOUNT(VACC.POINTERS,VM)
FOR I = NO.VACC TO 1 STEP -1
VACC.ID = FAMPAT:"*":PAT.DATA<17,I>
READ VACC.DATA FROM PATIENT.VACC.FILE,VACC.ID ELSE
VACC.DATA = "
END
IMM.NAME = VACC.DATA<1>
PRINT @(30,14):"VACC.DATA: ":VACC.DATA
INPUT REPLY,1

FOUND.ONE = INDEX(IMM.NAME,"M-M-R","1") OR
INDEX(IMM.NAME,"MMR","1") OR
INDEX(IMM.NAME,"MEASLES","1") OR
INDEX(IMM.NAME,"MUMPS","1")
IF FOUND.ONE > 0 THEN
VACC.NAME = IMM.NAME
VACC.DOSE = VACC.DATA<2>
VACC.DATE = OCONV(VACC.ID,"G1*1")
PRINT @(30,10):"VACC.NAME: ":VACC.NAME
PRINT @(30,11):"VACC.DOSE: ":VACC.DOSE
INPUT REPLY,1

IF VACC.DOSE = 1 OR VACC.DOSE = 2 THEN
IF VACC.DOSE = 2 THEN ; * HAS HAD 2 DOSES, SO CANCEL RECALLS
LAST.DATE = VACC.DATE
UTD = 1
GOTO 999 ; * EXIT
END ELSE ; * HAS HAD ONLY 1 DOSE

IF VACC.DATE > (DOB + 10*365.25) THEN
LAST.DATE = VACC.DATE
UTD = 1
GOTO 999 ; * EXIT
END
PRINT @(30,15):"ABOUT TO GOTO 400 COMPARE DATES"
INPUT REPLY,1
GOTO 400 ; * CHECK FOR CURRENT REFUSAL
END ; * OF DECIDING BETWEEN 1 OR 2 DOSES
END ; * IF HAD 1 OR 2 DOSES

IF VACC.DOSE # 1 AND VACC.DOSE # 2 THEN
RESULT = "* DOSE NO. MISSING - PLEASE ADD *
RECALL.DATE = DOB + 365
GOSUB 700 ; * POST IT
GOTO 999 ; * EXIT
END
END
NEXT I

400 ******* LOOK IN PROGRESS NOTES FOR TEMPORARY REFUSAL *******
NO.PROGS = DCOUNT(PROG.POINTERS,VM)
FOR I = NO.PROGS TO 1 STEP -1
PROG.ID = FAMPAT:"*":PAT.DATA<24,I>
READ PROG.DATA FROM PPNF,PROG.ID ELSE
PROG.DATA ="
END

PROG.DATE = OCONV(PROG.ID,"G1*1")
IF TODAY - PROG.DATE > 365 THEN
GOTO 450 ; * GET THE DATES SORTED OUT
END

PROG.PROBS = PROG.DATA<11>
NO.PROG.PROB.Codes = DCOUNT(PROG.PROBS,VM)
FOR Q = 1 TO NO.PROG.PROB.Codes
PROG.PROB.CODE = PROG.DATA<11,Q>
IF PROG.PROB.CODE = REFUSAL.CODE OR PROG.PROB.CODE = NOT.INDICATED.
CODE THEN
IF PROG.PROB.CODE = REFUSAL.CODE THEN
PROG.REFUSAL = REFUSAL.TEXT:" REFUSED"
ELSE
PROG.REFUSAL = REFUSAL.TEXT:" NOT INDICATED"
END

REFUSAL.DATE = PROG.DATE
GOTO 450 ; * COMPARE AGAINST LAST VACCINE DATE
END ; * OF CHECKING FOR REFUSAL OR NOT.INDICATED CODES
NEXT Q ; * NEXT PROBLEM ATTACHED TO THIS PROGRESS NOTE
NEXT I ; * NEXT PROGRESS NOTE
450 COMPARE VACCINE & REFUSAL DATES
PRINT @(30,16):"AT SUB 450: COMPARE DATES"
PRINT @ (30, 17): "VACC.DATE: ": OCONV(VACC.DATE, "D2/")
INPUT REPLY, 1
IF VACC.DATE # " AND REFUSAL.DATE = " THEN
LAST.DATE = VACC.DATE
RESULT = VACC.NAME: " DOSE ": VACC.DOSE: " GIVEN"
GOSUB 500 ; * GET THE RECALL DATE
END

IF VACC.DATE = " AND REFUSAL.DATE # " THEN
LAST.DATE = REFUSAL.DATE
RESULT = PROG.REFUSAL
RECALL.DATE = REFUSAL.DATE + 365
END

IF VACC.DATE # " AND REFUSAL.DATE # " THEN
IF VACC.DATE > REFUSAL.DATE THEN
LAST.DATE = VACC.DATE
RESULT = VACC.NAME: " DOSE ": VACC.DOSE: " GIVEN"
GOSUB 500 ; * GET THE RECALL.DATE
END ELSE
LAST.DATE = REFUSAL.DATE
RESULT = PROG.REFUSAL
RECALL.DATE = LAST.DATE + 365
END

IF NO REFERENCE FOUND TO MMR
IF VACC.DATE = " AND REFUSAL.DATE = " THEN
RECALL.DATE = DOB + 365
END
GOSUB 700 ; * POST IT
GOTO 999 ; * EXIT

500 ** WORK IT OUT
HAS HAD 1 DOSE, SO WORK OUT DATE FOR SECOND DOSE
IF AGE > 9 THEN
RECALL.DATE = TODAY
END ELSE
RECALL.DATE = DOB + 1461 ; * WHEN PATIENT TURNS 4 YEARS
END
RETURN

700 ** POST A RECALL ENTRY
IF RECALL.DATE > TODAY THEN UTD = 1
RECALL.DATA = "
RECALL.DATA<1> = PREV.PAR
RECALL.DATA<7> = LAST.DATE
RECALL.DATA<8> = RESULT
RECALL.DATA<6> = "A"
C.SEQ = ""
PTR.MV = 1
794 PTR = PAT.DATA<54,PTR.MV>
IF PTR = "" THEN GOTO 795
PTR.DATE = FIELD(PTR,"*",1)
PTR.SEQ = FIELD(PTR,"*",2)
IF PTR.DATE = RECALL.DATE THEN C.SEQ = PTR.SEQ + 1
IF PTR.DATE > RECALL.DATE THEN GOTO 795
PTR.MV = PTR.MV + 1
GOTO 794
3795 RECAL.PTR = RECALL.DATE
IF C.SEQ # "" THEN RECAL.PTR = RECALL.DATE:"*:C.SEQ:"*
RECAL.KEY = FAMPAT:"*:RECAL.PTR
PAT.DATA = INSERT(PAT.DATA,54,PTR.MV,0,RECAL.PTR)
WRITE RECALL.DATA ON PATIENT.RECALL.FILE,RECAL.KEY
WRITE PAT.DATA ON PATIENT.MASTER.FILE,FAMPAT
797 RETURN
999 * EXIT
CALL WRITE.RESEARCH(FAMPAT,PREV.PAR,LAST.DATE,RECALL.DATE)
CALL UPDATE.PREV.SCORE(FAMPAT,PREV.PAR,UTD)
1000 RETURN
RECAL.HRT
SUBROUTINE RECAL.HRT(FAMPAT,PAT.DATA)
JUST SORT OUT THE HRT. CALLED FROM RECAL.ONEPAT
OLIVER FRANK MAR 1996
MOD.DATA = "080293"
PROG.NAME = "RECAL.HRT"
PROMPT "
VM = CHAR(253)
TODAY = DATE()
RECALL.DATE = ""
LAST.DATE = ""
RESULT = ""
UTD = ""
PREV.PAR = "HRT"
REFUSAL.CODE = 354.3011
NOT.INDICATED.CODE = 354.3012
REFUSAL.TEXT = "HRT"
HRT.CODE = 187.1
OPEN ',PATIENT.MASTER.FILE' TO PATIENT.MASTER.FILE ELSE STOP "PATIENT.MASTER.FILE NOT OPEN"
OPEN ',PATIENT.RECALL.FILE' TO PATIENT.RECALL.FILE ELSE STOP "PATIENT.RECALL.FILE NOT OPEN"
OPEN ',PATIENT.PROBLEMS.FILE' TO PATIENT.PROBLEMS/File ELSE STOP "PATIENT.PROBLEMS.FILE NOT OPEN"
OPEN 'PATIENT.PROG.NOTE.FILE' TO PATIENT.PROG.NOTE.FILE ELSE STOP "PATIENT.PROG.NOTE.FILE NOT OPENED BY RECAL.HRT"

RECALL.POINTERS = PAT.DATA<54>
PROBLEMS.POINTERS = PAT.DATA<23>
PROG.POINTERS = PAT.DATA<24>
DOB = PAT.DATA<3>

CHECK FOR CURRENT USE OF HRT: IF SO, CANCEL RECALLS, THEN
LOOK FOR PERMANENT REFUSAL OR UNIFT TO HAVE HRT
NO.PROBLEMS = DCOUNT(PROBLEMS.POINTERS,VM)
FOR I = 1 TO NO.PROBLEMS
PROBLEMS.ID = FAMPAT:"":PAT.DATA<23>I>
READ PROBLEMS.DATA FROM PATIENT.PROBLEMS.FILE,PROBLEMS.ID ELSE
PROBLEMS.DATA = "
END
PROB.CODE = PROBLEMS.DATA<1>
PROB.DATE = OCONV(PROBLEMS.ID,"G1*1")
IF PROB.CODE = REFUSAL.CODE OR PROB.CODE = NOT.INDICATED.CODE THEN
UTD = 1
GOTO 999 ; * EXIT
END
IF PROB.CODE = HRT.CODE THEN
UTD = 1
LAST.DATE = PROB.DATE
GOTO 999 ; * EXIT
END
NEXT I
PROGRESS NOTES
LOOK FOR TEMPORARY UNIFTNESS OR REFUSAL FOR HRT, AS CODED PROBLEM
NO.PROGS = DCOUNT(PROG.POINTERS,VM)
FOR I = 1 TO NO.PROGS
PROG.ID = FAMPAT:"":PAT.DATA<24>I>
READ PROG.DATA FROM PATIENT.PROG.NOTE.FILE, PROG.ID ELSE
   PROG.DATA = ""
END

PROG.DATE = OCONV(PROG.ID,"G1*1")
PROG.PROBS = PROG.DATA<11>
NO.PROG.PROB.CODES = DCOUNT(PROG.PROBS, VM)
FOR Q = 1 TO NO.PROG.PROB.CODES
   PROG.PROB.CODE = PROG.DATA<11,Q>
   IF PROG.PROB.CODE = REFUSAL.CODE OR PROG.PROB.CODE = NOT.INDICATED.
   CODE THEN
   IF PROG.PROB.CODE = REFUSAL.CODE THEN
      RESULT = REFUSAL.TEXT: " REFUSED"
   ELSE
      RESULT = REFUSAL.TEXT: " NOT INDICATED"
   END
   LAST.DATE = PROG.DATE
   RECALL.DATE = LAST.DATE + 365
   GOSUB 700 ; * POST IT
   GOTO  999; * EXIT
END ; * OF CHECKING FOR REFUSAL OR NOT.INDICATED CODES
NEXT Q ; * NEXT PROBLEM ATTACHED TO THIS PROGRESS NOTE
NEXT I

IF NO HRT ENTRY FOUND
   RECALL.DATE = DOB + INT(47*365.25)
   GOSUB 700 ; * POST IT
   GOTO 999 ; * EXIT

END ; * OF CHECKING FOR REFUSAL OR NOT.INDICATED CODES

700 ** POST A RECALL ENTRY
RECALL.DATA = ""
RECALL.DATA<1> = PREV.PAR
RECALL.DATA<7> = LAST.DATE
RECALL.DATA<8> = RESULT
RECALL.DATA<6> = "A"
PRINT @(10,10):"HRT RECALL.DATA: " .RECALL.DATA
PRINT @(10,9):"HRT RECALL DATE: " .OCONV(RECALL.DATE,"D2/")
INPUT REPLY,1
C.SEQ = ""
PTR.MV = 1
794 PTR = PAT.DATA<54,PTR.MV>
IF PTR = "" THEN GOTO 795
PTR.DATE = FIELD(PTR,"*",1)
451

112  PTR.SEQ = FIELD(PTR,"*",2)
113  IF PTR.DATE = RECALL.DATE THEN C.SEQ = PTR.SEQ + 1
114  IF PTR.DATE > RECALL.DATE THEN GOTO 795
115  PTR.MV = PTR.MV + 1
116  GOTO 794
117  795 RECAL.PTR = RECALL.DATE
118  IF C.SEQ # "" THEN RECAL.PTR = RECALL.DATE:"*:C.SEQ:"*
119  RECAL.KEY = FAMPAT:"*:RECAL.PTR
120  PAT.DATA = INSERT(PAT.DATA,54,PTR.MV,0,RECAL.PTR)
121  WRITE RECALL.DATA ON PATIENT.RECALL.FILE,RECAL.KEY
122  WRITE PAT.DATA ON PATIENT.MASTER.FILE,FAMPAT
123  797 RETURN
124  999 * EXIT
125  CALL
   WRITE.RESEARCH(FAMPAT,PREV.PAR,LAST.DATE,RECALL.DATE
126  CALL UPDATE.PREV.SCORE(FAMPAT,PREV.PAR,UTD)
127  RETURN
128  RECAL.BRST
001  SUBROUTINE RECAL.BRST(FAMPAT,PAT.DATA)
002  RECAL.BRST
003  JUST SORT OUT THE BRST. CALLED FROM RECAL.ONEPAT
004  ACCEPTS "BSE OK" IN SUBJECTIVE OF CONSULT/PROGRESS
005  NOTE
006  ACCEPTS "BREAST EXAM OK" IN OBJECTIVE OF
007  CONSULT/PROGRESS NOTE
008  OLIVER FRANK MARCH 1997
009  MOD.DATA = "250992"
010  PROG.NAME = "RECAL.BRST"
011  PRINT @(0,9):PROG.NAME
012  RESULT = "
013  UTD = "
014  TODAY = DATE()
015  RECALL.DATE = "
016  PREV.PAR = "BRST"
017  RECALL.INTERVAL = 365
018  REFUSAL.CODE = 354.2201
019  NOT.INDICATED.CODE = 354.2202
020  BREAST.CANCER.CODE = 035.0
021  BREAST.EXAM.DONE.CODE = 182.2
022  DONE.TEXT.SUBJ = "BSE OK"
023  DONE.TEXT.OBJ = "BREAST EXAM DONE"
024  REFUSAL.TEXT = "BREAST EXAMINATION"
025  LAST.DATE = "
026  PROMPT "
027  PROG.REFUSAL = "

REFUSAL.DATE = "
VM = CHAR(253)

OPEN ", 'PATIENT.MASTER.FILE' TO PATIENT.MASTER.FILE ELSE
STOP "PATIENT.
MASTER.FILE NOT OPEN"

OPEN ", 'PATIENT.RECALL.FILE' TO PATIENT.RECALL.FILE ELSE
STOP "PATIENT.
RECALL.FILE NOT OPEN"

OPEN ", 'PATIENT.XRAY.FILE' TO PATIENT.XRAY.FILE ELSE STOP
"PATIENT.XRAY
FILE NOT OPEN"

OPEN ", 'PATIENT.PROBLEMS.FILE' TO PATIENT.PROBLEMS.FILE
ELSE STOP "PATIENT.PROBLEMS.FILE NOT OPEN"

RECALL.POINTERS    = PAT.DATA<54>
PROBLEMS.POINTERS  = PAT.DATA<23>
PROG.POINTERS = PAT.DATA<24>
DOB           = PAT.DATA<3>

100 ** PROBLEMS **
NO.PROBLEMS = DCOUNT(PROBLEMS.POINTERS,VM)

FOR I = 1 TO NO.PROBLEMS
PROBLEMS.ID = FAMPAT:"*":PAT.DATA<23,I>
READ PROBLEMS.DATA FROM
PATIENT.PROBLEMS.FILE,PROBLEMS.ID ELSE

PROBLEMS.DATA = "
END

IF PROB.CODE = REFUSAL.CODE OR PROB.CODE =
NOT.INDICATED.CODE OR PROB.CODE =
BREAST.CANCER.CODE THEN
CALL RRF.NOT.ELIG(FAMPAT,PREV.PAR)
GOTO 999 ; * EXIT
END

PROGRESS NOTES *
NO.PROG = DCOUNT(PROG.POINTERS,VM)

BRST.DATE = "
BRST.RESULT = "

PROG.DATA = "
FOR I = NO.PROG TO 1 STEP -1
PROG.ID = FAMPAT:"*":PAT.DATA<24,I>
READ PROG.DATA FROM PATIENT.PROG.NOTE.FILE,PROG.ID
ELSE

PROG.DATA = "

SUBJECTIVE = PROG.DATA<2>; OBJECTIVE = PROG.DATA<6>

PROG.DATE = OCONV(PROG.ID,"G1*1")

FOUND.ONE = INDEX(SUBJECTIVE,DONE.TEXT.SUBJ,'1')

IF FOUND.ONE >0 THEN

LAST.DATE = PROG.DATE
RESULT = DONE.TEXT.SUBJ
RECALL.DATE = LAST.DATE + RECALL.INTERVAL
GOSUB 700 ; * POST IT
GOTO  999 ; * EXIT
END

FOUND.ONE = INDEX(OBJECTIVE,DONE.TEXT.OBJ,'1') OR
INDEX(OBJECTIVE,"BREAST EXAM DONE","1")

IF FOUND.ONE >0 THEN
LAST.DATE = PROG.DATE
RESULT = DONE.TEXT.OBJ
RECALL.DATE = LAST.DATE + RECALL.INTERVAL
GOSUB 700 ; * POST IT
GOTO  999 ; * EXIT
END

PROG.PROBS = PROG.DATA<11>
NO.PROG.PROB.CODES = DCOUNT(PROG.PROBS,VM)

FOR Q = 1 TO NO.PROG.PROB.CODES
PROG.PROB.CODE = PROG.DATA<11,Q>

IF PROG.PROB.CODE = REFUSAL.CODE OR PROG.PROB.CODE =
NOT.INDICATED.
CODE OR PROG.PROB.CODE = BREAST.EXAM.DONE.CODE THEN

IF PROG.PROB.CODE = REFUSAL.CODE THEN
RESULT = REFUSAL.TEXT:" REFUSED"
END

IF PROG.PROB.CODE = NOT.INDICATED.CODE THEN
RESULT = REFUSAL.TEXT:" NOT INDICATED"
END

IF PROG.PROB.CODE = BREAST.EXAM.DONE.CODE THEN
RESULT = "BREAST EXAM DONE"
END

LAST.DATE = PROG.DATE
RECALL.DATE = LAST.DATE + 365
GOSUB 700 ; * POST IT
GOTO  999; * EXIT
**RECALL.DATE = DOB + INT(25*365.25)**

**GOSUB 700 ; * POST IT**

**GOTO  999 ; * EXIT**

**700 **** POST THE RECALL ENTRY *************************

**IF RECALL.DATE > DATE() THEN UTD = 1**

**RECALL.DATA = "**

**RECALL.DATA<1> = PREV.PAR**

**RECALL.DATA<7> = LAST.DATE**

**RECALL.DATA<8> = RESULT**

**RECALL.DATA<6> = "A"**

**C.SEQ = ""**

**PTR.MV = 1**

**794 PTR = PAT.DATA<54,PTR.MV>**

**IF PTR = "" THEN GOTO 795**

**PTR.DATE = FIELD(PTR,"*",1)**

**PTR.SEQ = FIELD(PTR,"*",2)**

**IF PTR.DATE = RECALL.DATE THEN C.SEQ = PTR.SEQ + 1**

**IF PTR.DATE > RECALL.DATE THEN GOTO 795**

**PTR.MV = PTR.MV + 1**

**GOTO 794**

**795 RECAL.PTR = RECALL.DATE**

**IF C.SEQ # "" THEN RECAL.PTR = RECALL.DATE:"*",C.SEQ:"*"**

**RECAL.KEY = FAMPAT:"*",RECAL.PTR**

**PAT.DATA = INSERT(PAT.DATA,54,PTR.MV,0,RECAL.PTR)**

**WRITE RECALL.DATA ON PATIENT.RECALL.FILE,RECAL.KEY**

**WRITE PAT.DATA ON PATIENT.MASTER.FILE,FAMPAT**

**797 RETURN**

**FINISHED, EXIT**

**999 CALL**

**WRITE.RESEARCH(FAMPAT,PREV.PAR,LAST.DATE,RECALL.DATE**

**CALL UPDATE.PREV.SCORE(FAMPAT,PREV.PAR,UTD)**

**RETURN**

**RECAL.PNEUM**

**SUBROUTINE RECAL.PNEUM(FAMPAT,PAT.DATA)**

**RECAL.PNEUM**

**JUST SORT OUT THE PENUMOVAX. CALLED FROM RECAL.ONEPAT**

**JAN RAVET SEPTEMBER 1992**

**MODIFIED OLIVER FRANK 19 AUG 1994**

**MOD.DATA = "190894"**

**PROG.NAME = "RECAL.PNEUM"**
PROMPT "
VM = CHAR(253)
DIM VACC.DATES(4)
TODAY = DATE()
RECALL.DATE = ''
MAT VACC.DATES = ''
VACC.DATE = ''
VACC.NAME = ''
UTD = ''
PREV.PAR = "PNEU"
REFUSAL.CODE = 354.1021
NOT.INDICATED.CODE = 354.1022
REFUSAL.TEXT = "PNEUMOVAX"
REFUSAL.DATE = ''
PROG.REFUSAL = ''
LAST.DATE = ''
RESULT = ''
RECALL.INTERVAL = INT(5*365.25)
OPEN '', 'PATIENT.MASTER.FILE' TO PATIENT.MASTER.FILE ELSE
STOP "PATIENT.MASTER.FILE NOT OPEN"
OPEN '', 'PATIENT.RECALL.FILE' TO PATIENT.RECALL.FILE ELSE
STOP "PATIENT.RECALL.FILE NOT OPEN"
OPEN '', 'PATIENT.VACC.FILE' TO PATIENT.VACC.FILE ELSE STOP "PATIENT.VACC.FILE NOT OPEN"
OPEN '', 'PATIENT.PROBLEMS.FILE' TO PATIENT.PROBLEMS.FILE ELSE STOP "PATIENT.PROBLEMS.FILE NOT OPEN"
OPEN 'PATIENT.PROG.NOTE.FILE' TO PATIENT.PROG.NOTE.FILE ELSE STOP "PPNF NOT OPENED BY RECAL.PNEUM"
RECALL.POINTERS = PAT.DATA<54>
ALLERGY.POINTERS = PAT.DATA<22>
PROBLEMS.POINTERS = PAT.DATA<23>
PROG.POINTERS = PAT.DATA<24>
VACC.POINTERS = PAT.DATA<17>
DOB = PAT.DATA<3>
VACCS.FOUND =0
ALLERGY **
NO.ALLERGY = DCOUNT(ALLERGY.POINTERS,VM)
FOR I = 1 TO NO.ALLERGY
ALLERGY.ID = FAMPAT:"**":PAT.DATA<22,I>
READ ALLERGY.DATA FROM
PATIENT.ALLERGY.FILE,ALLERGY.ID ELSE
051  ALLERGY.DATA = "
052  END
053  FOUND.ONE = INDEX(ALLERGY.DATA<1>,"PNEUMOVAX","1")
054  IF FOUND.ONE >0 THEN
055  CALL RRF.NOT.ELIG(FAMPAT,PREV.PAR)
056  GOTO 1000 ; * EXIT
057  END
058  NEXT I
059
060  PROBLEMS
061  NO.PROBLEMS = DCOUNT(PROBLEMS.POINTERS,VM)
062  FOR I = 1 TO NO.PROBLEMS
063  PROBLEMS.ID = FAMPAT:"*":PAT.DATA<23,I>
064  READ PROBLEMS.DATA FROM
     PATIENT.PROBLEMS.FILE,PROBLEMS.ID ELSE
065  PROBLEMS.DATA = "
066  END
067
068  PROB.CODE = PROBLEMS.DATA<1>
069  IF PROB.CODE = REFUSAL.CODE OR PROB.CODE =
     NOT.INDICATED.CODE THEN
070  CALL RRF.NOT.ELIG(FAMPAT,PREV.PAR)
071  GOTO 1000 ; * EXIT
072  END
073  NEXT I
074  VACC
075  NO.VACC = DCOUNT(VACC.POINTERS,VM)
076  FOR I = NO.VACC TO 1 STEP -1
077  VACC.ID = FAMPAT:"*":PAT.DATA<17,I>
078  READ VACC.DATA FROM PATIENT.VACC.FILE,VACC.ID ELSE
079  VACC.DATA = "
080  END
081  VACC.NAME = VACC.DATA<1>
082  FOUND.ONE = INDEX(VACC.NAME,"PNEUM","1") OR
     INDEX(VACC.NAME,"pneum","1")
083  PRINT @(10,10):"FOUND ONE: ":FOUND.ONE
084  INPUT REPLY,1
085  IF FOUND.ONE >0 THEN
086  VACC.DATE = OCONV(VACC.ID,"G1*1")
087  VACC.NAME = VACC.DATA<1>
088  GOTO 50 ; * MOVE TO PROGRESS.NOTES
089  PRINT @(11,10):"GOING TO GOSUB 500 NOW"
090  INPUT REPLY,1
091  END
092  NEXT I
093  50 PROGRESS NOTES
094  NO.PROGS = DCOUNT(PROG.POINTERS,VM)
095  FOR I = 1 TO NO.PROGS
096  PROG.ID = FAMPAT:"*":PAT.DATA<24,I>
097  READ PROG.DATA FROM PATIENT.PROG.NOTE.FILE, PROG.ID

456
ELSE
098     PROG.DATA = ""
099     END
100     PROG.DATE = OCONV(PROG.ID,"G1*1")
101
102     PROG.PROBS = PROG.DATA<11>
103     NO.PROG.PROB.CODES = DCOUNT(PROG.PROBS,VM)
104
105     FOR Q = 1 TO NO.PROG.PROB.CODES
106     PROG.PROB.CODE = PROG.DATA<11,Q>
107
108     IF PROG.PROB.CODE = REFUSAL.CODE OR PROG.PROB.CODE = NOT.INDICATED.
109     CODE THEN
110     IF PROG.PROB.CODE = REFUSAL.CODE THEN
111     PROG.REFUSAL = REFUSAL.TEXT: "REFUSED"
112     END ELSE
113     PROG.REFUSAL = REFUSAL.TEXT: "NOT INDICATED"
114     END
115
116     REFUSAL.DATE = PROG.DATE
117     GOTO 60 ; *COMPARE DATES
118     END ; *OF CHECKING FOR REFUSAL OR NOT.INDICATED CODES
119     NEXT Q ; *NEXT PROBLEM ATTACHED TO THIS PROGRESS NOTE
120     NEXT I ; *NEXT PROGRESS NOTE
121
122     IF VACC.DATE # "" OR REFUSAL.DATE # "" THEN
123     IF VACC.DATE # "" AND REFUSAL.DATE = "" THEN
124     LAST.DATE = VACC.DATE
125     RESULT    = VACC.NAME:"GIVEN"
126     RECALL.DATE = VACC.DATE + RECALLINTERVAL
127     END
128
129     IF VACC.DATE = "" AND REFUSAL.DATE # "" THEN
130     LAST.DATE = REFUSAL.DATE
131     RESULT    = PROG.REFUSAL
132     RECALL.DATE = REFUSAL.DATE + 365
133     END
134
135     IF VACC.DATE # "" AND REFUSAL.DATE # "" THEN
136     IF VACC.DATE GE REFUSAL.DATE THEN
137     LAST.DATE = VACC.DATE
138     RESULT    = VACC.NAME:"GIVEN"
139     END ELSE
140     LAST.DATE = REFUSAL.DATE
141     RESULT    = PROG.REFUSAL
142     END
143     RECALL.DATE = VACC.DATE + RECALLINTERVAL
144     END
GOSUB 700 ; * POST IT
GOTO 999 ; * EXIT
END

******************************************************************************
IF NO PNEUMOVAX FOUND, POST RECALL WITH TODAY'S DATE
AS DUE DATE
RECALL.DATE = DOB + INT(365.25*66)
GOSUB 700 ; * POST A RECALL
GOTO 999 ; * EXIT
******************************************************************************
700 ** POST A RECALL ENTRY
IF RECALL.DATE > DATE() THEN UTD = 1
RECALL.DATA = ''
RECALL.DATA<1> = PREV.PAR
RECALL.DATA<7> = LAST.DATE
RECALL.DATA<8> = RESULT
RECALL.DATA<6> = "A"
C.SEQ = ""
PTR.MV = 1
794 PTR = PAT.DATA<54,PTR.MV>
IF PTR = "" THEN GOTO 795
PTR.DATE = FIELD(PTR,"*",1)
PTR.SEQ = FIELD(PTR,"*",2)
IF PTR.DATE = RECALL.DATE THEN C.SEQ = PTR.SEQ + 1
IF PTR.DATE > RECALL.DATE THEN GOTO 795
PTR.MV = PTR.MV + 1
GOTO 794
795 RECAL.PTR = RECALL.DATE
IF C.SEQ # "" THEN RECAL.PTR = RECALL.DATE:"":C.SEQ:""
RECAL.KEY = FAMPAT:"":RECAL.PTR
PAT.DATA = INSERT(PAT.DATA,54,PTR.MV,0,RECAL.PTR)
WRITE RECALL.DATA ON PATIENT.RECALL.FILE,RECAL.KEY
WRITE PAT.DATA ON PATIENT.MASTER.FILE,FAMPAT
797 RETURN
******************************************************************************
999 * EXIT
PRINT @(40,23):"RECAL.PNEUMOVAX ENDED":@(-4):
PRINT @(65,23):
INPUT REPLY,2:
CALL UPDATE.PREV.SCORE(FAMPAT,PREV.PAR,UTD)
CALL WRITE.RESEARCH(FAMPAT,PREV.PAR,LAST.DATE,RECALL.DATE)
1000 RETURN
RECAL.BP
SUBROUTINE RECAL.BP(FAMPAT,PAT.DATA,AGE)
RECAL.BP
JUST SORT OUT THE BP. CALLED FROM RECAL.ONEPAT
MOD.DATA = "041192"
PROG.NAME = "RECAL.BP"
PRINT @(0,9):PROG.NAME

PROMPT "
VM = CHAR(253)
TODAY = DATE()
PROG.BP = "
HYP.DIAGNOSED = 0
RECALL.DATE = "
RESULT = "
BP.DATE = "
UTD = "
PREV.PAR = "BP"
REFUSAL.CODE = 354.2041
NOT.INDICATED.CODE = 354.2042
LAST.DATE = "
PROG.REFUSAL = "
REFUSAL.TEXT = "BP"

OPEN ", 'PATIENT.MASTER.FILE' TO PATIENT.MASTER.FILE ELSE STOP "PATIENT.
MASTER.FILE NOT OPEN"
OPEN ", 'PATIENT.RECALL.FILE' TO PATIENT.RECALL.FILE ELSE STOP "PATIENT.
RECALL.FILE NOT OPEN"
OPEN ", 'PATIENT.PROG.NOTE.FILE' TO PATIENT.PROG.NOTE.FILE ELSE STOP "PATIENT.
PROG.NOTE.FILE NOT OPEN"
OPEN ", 'CONSULT.WORK.FILE' TO CONSULT.WORK.FILE ELSE STOP "CONSULT.WORK
FILE NOT OPEN"
OPEN ", 'PATIENT.PROBLEMS.FILE' TO PATIENT.PROBLEMS.FILE ELSE STOP "PATIENT.PROBLEMS.FILE NOT OPEN"
OPEN 'MED.CODE.FILE' TO MCF ELSE STOP "MCF NOT OPENED BY
RECAL.BP"
READ MCF.DATA FROM MCF,PREV.PAR ELSE MCF.DATA = 
MULTIPLIER = MCF.DATA<5>
INTERVAL = MCF.DATA<6>
DOB = PAT.DATA<3>
AGE.1ST.DUE = DOB + MULTIPLIER*INTERVAL
RECALL.POINTERs = PAT.DATA<54>
PROG.POINTERs = PAT.DATA<24>
PROBLEMS.POINTERs = PAT.DATA<23>

PROBLEMS
NO.PROBLEMS = DCOUNT(PROBLEMS.POINTERS,VM)
FOR I = 1 TO NO.PROBLEMS
PROBLEMS.ID = FAMPAT:"*":PAT.DATA<23,I>
READ PROBLEMS.DATA FROM
PATIENT.PROBLEMS.FILE,PROBLEMS.ID ELSE
PROBLEMS.DATA = "
END

PROB.CODE = PROBLEMS.DATA<1>
PROB.DESC = OCONV(PROB.CODE,"TPCF;X;1;1")

IF PROB.CODE = REFUSAL.CODE OR PROB.CODE =
NOT.INDICATED.CODE THEN
CALL RRF.NOT.ELIG(FAMPAT,PREV.PAR)
GOTO 999 ; * EXIT
END

IF HYP.DIAGNOSED = 0 THEN
HYP.DIAGNOSED = INDEX(PROB.DESC,"HYPERTENSI","1") OR
INDEX(PROB.CODE,"121","1") OR INDEX(PROB.CODE,"119","1") OR
INDEX(PROB.CODE,"120","1")
END
NEXT I

PROGRESS NOTES
10 NO.PROGS = DCOUNT(PROG.POINTERS,VM)
FOR I = NO.PROGS TO 1 STEP -1
PROG.ID = FAMPAT:"*":PAT.DATA<24,I>
READ PROG.DATA FROM PATIENT.PROG.NOTE.FILE,PROG.ID ELSE
PROG.DATA = "
END

PROG.BP = PROG.DATA<4>
PROG.DATE = OCONV(PROG.ID,"G1*1")
SYSTOLIC = FIELD(PROG.BP,"/",1)
DIASTOLIC = FIELD(PROG.BP,"/",2)

PROG.PROBS = PROG.DATA<11>
NO.PROG.PROBS = DCOUNT(PROG.PROBS,VM)
FOR Q = 1 TO NO.PROG.PROBS
PROG.PROB.CODE = PROG.DATA<11,Q>
IF PROG.PROB.CODE = REFUSAL.CODE OR PROG.PROB.CODE =
NOT.INDICATED.CODE THEN
IF PROG.PROB.CODE = REFUSAL.CODE THEN
PROG.REFUSAL = REFUSAL.TEXT:" REFUSED"
END ELSE
PROG.REFUSAL = REFUSAL.TEXT:" NOT INDICATED"
END
END
NEXT Q; * NEXT PROGRESS PROBLEM CODE

IF PROG.BP # " THEN
RESULT = PROG.BP
LAST.DATE = PROG.DATE
PRINT @(30,12):"PROG.BP ":PROG.BP
INPUT REPLY,1
GOTO 500 ; * WORK OUT DATES
END

IF PROG.REFUSAL # " THEN
LAST.DATE = PROG.DATE
RESULT = PROG.REFUSAL
GOTO 500 ; * WORK OUT DATES
END

NEXT I
IF NO REFERENCE TO BP FOUND IN PROGRESS NOTES
RECALL.DATE = DOB + INT(365.25*20)
GOTO 700 ; * POST IT **
GOTO 999 ; * EXIT
***********************************************************
500  * WORK OUT WHEN IT'S DUE *

IF PROG.BP # " THEN
IF HYP.DIAGNOSED = 0 THEN ; * FOR ROUTINE RECALL INTERVALS
RESULT = PROG.BP
ENDIF
RESULT = PROG.BP:" (KNOWN HYPERTENSIVE)"
END

IF BP UNACCEPTABLY HIGH
IF AGE < 40 THEN
IF SYSTOLIC > 140 OR DIASTOLIC > 90 THEN
RECALL.DATE = PROG.DATE + 30
GOTO 700 ; * POST IT
ENDIF
ENDIF
RECALL.DATE = PROG.DATE + 90 ; * CHECK BP EVERY 3 MONTHS
END ELSE ; * OR IF PATIENT IS NOT KNOWN HYPERTENSIVE RECALL.DATE = PROG.DATE + 730 ; * CHECK BP EVERY 2 YEARS END

RECALL.DATE = PROG.DATE + 730 GOTO 700 ; * POST IT

END ELSE ; * OF ROUTINES IF A BP WAS FOUND FIRST

IF REFUSAL.DATE # "" THEN
RECALL.DATE = REFUSAL.DATE + 365 RESULT = PROG.REFUSAL
GOTO 700 ; * POST IT
END

700 * POST THE RECALL IF RECALL.DATE > TODAY THEN UTD = 1
RECALL.DATA = " RECALL.DATA<1> = PREV.PAR RECALL.DATA<7> = LAST.DATE RECALL.DATA<8> = RESULT RECALL.DATA<6> = "A"
PRINT @(30,10):"RECALL.DATA":RECALL.DATA INPUT REPLY,1

C.SEQ = ""
PTR.MV = 1 794 PTR = PAT.DATA<54,PTR.MV>
IF PTR = "" THEN GOTO 795
PTR.DATE = FIELD(PTR,"*",1)
PTR.SEQ = FIELD(PTR,"*",2)
IF PTR.DATE = RECALL.DATE THEN C.SEQ = PTR.SEQ + 1
IF PTR.DATE > RECALL.DATE THEN GOTO 795
PTR.MV = PTR.MV + 1 GOTO 794
795 RECAL.PTR = RECALL.DATE IF C.SEQ # "" THEN RECAL.PTR = RECALL.DATE:"":C.SEQ:""
RECAL.KEY = FAMPAT:"*":RECAL.PTR PAT.DATA = INSERT(PAT.DATA,54,PTR.MV,0,RECAL.PTR)
WRITE RECALL.DATA ON PATIENT.RECALL.FILE,RECAL.KEY WRITE PAT.DATA ON PATIENT.MASTER.FILE,FAMPAT ******************************** 999 * EXIT
PRINT @(40,23):"RECAL.BP ENDED":@(-4):
PRINT @(65,23):
INPUT REPLY,2:
CALL WRITE.RESEARCH(FAMPAT,PREV.PAR,LAST.DATE,RECALL.DATE CALL UPDATE.PREV.SCORE(FAMPAT,PREV.PAR,UTD)
RETURN
RECAL.WT.OBESE
001 SUBROUTINE RECAL.WT(FAMPAT,PAT.DATA)
002 RECAL.WT
003
004 JUST SORT OUT THE WT. CALLED FROM RECAL.ONEPAT
005
006 JAN RAVET SEPTEMBER 1992
007
008 MOD.DATA = "250992"
009 PROG.NAME = "RECAL.WT"
010
011 PREV.PAR = "WT"
012 PROMPT "
013 VM = CHAR(253)
014 TODAY = DATE()
015 RECAL.DATE = "
016 PROG.WT = "
017 WT.DATE = "
018 WT.DUE = "
019 UTD = "
020 RECALL.INTERVAL = 365
021 LAST.DATE = "
022 RESULT = "
023 PROG.REFUSAL = "
024 PROG.PROBS = "
025 PROG.PROBS = "
026 REFUSAL.DATE = "
027 REFUSAL.CODE = 354.2081
028 NOT.INDICATED.CODE = 354.2082
029 REFUSAL.TEXT = "WEIGHT RECORDING"
030 HEIGHT = "
031 OBESE = "
032 OBESITY.CODE = "057.4"
033
034 OPEN ",PATIENT.MASTER.FILE" TO PATIENT.MASTER.FILE ELSE
STOP "PATIENT.MASTER.FILE NOT OPEN"
035 OPEN ",PATIENT.RECALL.FILE" TO PATIENT.RECALL.FILE ELSE
STOP "PATIENT.RECALL.FILE NOT OPEN"
036 OPEN ",PATIENT.PROG NOTE.FILE" TO PATIENT.PROG NOTE.FILE
ELSE STOP "PATIENT.PROG NOTE.FILE NOT OPEN"
037 OPEN ",CONSULT WORK.FILE" TO CONSULT WORK.FILE ELSE
STOP "CONSULT WORK.
FILE NOT OPEN"
038 OPEN "PATIENT.PROBLEMS.FILE" TO PATIENT.PROBLEMS.FILE
ELSE STOP "PATIENT.
PROBLEMS.FILE NOT OPENED BY RECAL.WT"
039 OPEN "PATIENT.PAED.FILE" TO PATIENT.PAED.FILE ELSE STOP
"PATIENT.PAED.FILE NOT OPENED BY RECAL.WT"
RECALL.POINTERS = PAT.DATA<54>
PROG.POINTERS = PAT.DATA<24>
PROBLEM.POINTERS = PAT.DATA<23>
PAED.POINTERS = PAT.DATA<20>
DOB = PAT.DATA<3>
CHECK PROBLEMS FOR REFUSAL
NO.OF.PROBS = DCOUNT(PROBLEM.POINTERS,VM)
FOR I = 1 TO NO.OF.PROBS
PROBLEM.ID = FAMPAT:"*":PAT.DATA<23,I>
READ PROBLEM.DATA FROM
PATIENT.PROBLEMS.FILE,PROBLEM.ID ELSE PROBLEM.DATA = 
PROB.CODE = PROBLEM.DATA<1>
DATE.RESOLVED = PROBLEM.DATA<5>
IF PROB.CODE = REFUSAL.CODE OR PROB.CODE =
NOT.INDICATED.CODE THEN
UTD = 1
GOTO 999 ; * EXIT
END
IF PROB.CODE = OBESITY.CODE AND DATE.RESOLVED = " THEN
OBESE = 1
NEXT I
CHECK PROGRESS NOTES FOR A WT. RECORDED
NO.PROGS = DCOUNT(PROG.POINTERS,VM)
FOR I = NO.PROGS TO 1 STEP -1
PROG.ID = FAMPAT:"*":PAT.DATA<24,I>
READ PROG.DATA FROM PATIENT.PROG.NOTE.FILE,PROG.ID
ELSE
PROG.DATA = "
END
PROG.DATE = OCONV(PROG.ID,"G1*1")
PROG.WT = PROG.DATA<3>
PRINT @(30,10):"VALUE OF I :":I
PRINT @(30,11):"WT FOUND :":PROG.WT
INPUT REPLY,1
IF NOT(NUM(PROG.WT)) THEN ; * IF IT'S NOT JUST A NUMBER
PRINT @(30,14):"WT IS NOT A NUMBER"
INPUT REPLY,1
TEST.VAR = PROG.WT
PRINT @(30,12):"GOING TO SUB 600"
INPUT REPLY,1
GOSUB 600 ; * TRY TO FIND THE ACTUAL NUMBER
PROG.WT = NUM.FLD
PRINT @(30,13):"PROG.WT = ":PROG.WT
INPUT REPLY,1
PRINT @(10,11):"NUM.FLD :":NUM.FLD
INPUT REPLY,1
END
087 IF VALID WT. FOUND, POST IT
088 IF PROG.WT > 1 THEN ; * CHECK CURRENT BMI AND WHETHER
089 OBESITY IS CODED
090 FIND THE HEIGHT
091 NO.PAEDS = DCOUNT(PAED.POINTERS,VM)
092 FOR J = NO.PAEDS TO 1 STEP -1 UNTIL HEIGHT # "
093 READ PAED.DATA FROM PATIENT.PAED.FILE,PAED.ID ELSE
094 PAED.DATA = "
095 NEXT J ; * NEXT PAED RECORD
096 IF HEIGHT # " THEN
097 HT = HEIGHT/100
098 BMI = PROG.WT/(HT*HT)
100 PRINT @(30,10):"PROG.WT      :":PROG.WT
101 PRINT @(30,11):"HEIGHT       :":HEIGHT
102 PRINT @(30,12):"BMI          :":BMI
103 PRINT @(30,13):"OBESE FOUND  :":OBESE
104 INPUT REPLY,1
105 IF BMI > 30 AND OBESITY IS NOT ON PROBLEM LIST, ADD IT
106 IF BMI > 30 AND OBESE = " THEN
107 PRINT @(30,14):"ABOUT TO GO TO ADD OBESITY"
108 INPUT REPLY,1
109 GOSUB 50 ; * ADD OBESITY
110 END
111
112 IF NOW NOT OBESE BUT HAS IT ON PROBLEM LIST, "RESOLVE" IT
113 IF BMI < 30 AND OBESE = 1 THEN
114 PRINT @(30,15):"ABOUT TO GO TO RESOLVE OBESITY CODE"
115 INPUT REPLY,1
116 GOSUB 60 ; * RESOLVE PROBLEM OBESITY
117 END
118
119 END ; * OF FIXING OBESE CODES IF A HEIGHT HAS ALSO BEEN
120 FOUND
121
122 RESULT = "Weight ":PROG.WT:" Kgs"
123 LAST.DATE = PROG.DATE
124 RECALL.DATE = LAST.DATE + RECALL.INTERVAL
125 GOSUB 700 ; * POST IT
126 GOTO  999 ; * EXIT
127 END ; * OF ACTIVITIES IF A WEIGHT IS FOUND
128
129 NO.PROG.PROBS = DCOUNT(PROG.PROBS,VM)
130 FOR Q = 1 TO NO.PROG.PROBS
PROG.PROB.CODE = PROG.DATA<11,Q>

IF PROG.PROB.CODE = REFUSAL.CODE OR PROG.PROB.CODE = NOT.INDICATED. CODE THEN

IF PROG.PROB.CODE = REFUSAL.CODE THEN
PROG.REFUSAL = REFUSAL.TEXT:" REFUSED"
END ELSE
PROG.REFUSAL = REFUSAL.TEXT:" NOT INDICATED"
END

LAST.DATE = PROG.DATE
RECALL.DATE = LAST.DATE + 365
RESULT = PROG.REFUSAL
GOSUB 700 ; * POST IT
GOTO 999; * EXIT
END ; * OF CHECKING FOR REFUSAL OR NOT.INDICATED CODES
NEXT Q ; * NEXT PROBLEM ATTACHED TO THIS PROGRESS NOTE

IF NO REFERENCE TO WEIGHT FOUND
RECALL.DATE = DOB + INT(365.25*20)
GOSUB 700 ; * POST IT **
GOTO 999 ; * EXIT

FIRST WRITE THE PROBLEM POINTER INTO THE PROBLEM ATTRIBUTE

C.SEQ = ""
PTR.MV = 1
871 PTR = PAT.DATA<23,PTR.MV>
IF PTR = "" THEN GOTO 872
PTR.DATE = FIELD(PTR,"*",1)
PTR.SEQ = FIELD(PTR,"*",2)
IF PTR.DATE = TODAY THEN C.SEQ = PTR.SEQ + 1
IF PTR.DATE > TODAY THEN GOTO 872
PTR.MV = PTR.MV + 1
GOTO 871
872 PROB.PTR = TODAY
IF C.SEQ # "" THEN PROB.PTR = TODAY:"":C.SEQ
PROB.KEY = FAMPAT:"":PROB.PTR
PAT.DATA = INSERT(PAT.DATA,23,PTR.MV,0,PROB.PTR)
WRITE PAT.DATA ON PATIENT.MASTER.FILE,FAMPAT
NEXT ADD THE PROBLEM CODE TO THE LIST IN ATT. 51
READ PAT.DATA FROM PATIENT.MASTER.FILE,FAMPAT ELSE
STOP "PAT.DATA NOT READ
BY RECAL.WRITE ROUTINE IN RECAL.PREV"
PAT.DATA = INSERT(PAT.DATA,51,-1;OBESITY.CODE)
WRITE PAT.DATA ON PATIENT.MASTER.FILE,FAMPAT

LASTLY WRITE THE ACTUAL PROBLEM ITEM IN
PATIENT.PROBLEMS.FILE
PATIENT.PROBLEMS.FILE.DATA = "
PATIENT.PROBLEMS.FILE.KEY = FAMPAT:"*:TODAY:"*
PATIENT.PROBLEMS.FILE.DATA<1> = OBESITY.CODE
WRITE PATIENT.PROBLEMS.FILE.DATA ON
PATIENT.PROBLEMS.FILE,FAMPAT:"*:PROB.PTR
RETURN

RESOLVE PROBLEM OF OBESITY
FOR K = NO.OF.PROBS TO 1 STEP -1
PROBLEMS.ID = FAMPAT:"*:PAT.DATA<23,K>
READ PROBLEMS.DATA FROM
PATIENT.PROBLEMS.FILE,PROBLEMS.ID ELSE
PROBLEMS.DATA = "
END
PROB.CODE = PROBLEMS.DATA<1>
DATE.RESOLVED = PROBLEMS.DATA<5>
IF PROB.CODE = OBESITY.CODE AND DATE.RESOLVED = " THEN
DATE.RESOLVED = PROG.DATE
WRITE PROBLEMS.DATA ON
PATIENT.PROBLEMS.FILE,PROBLEMS.ID
END
NEXT K
RETURN

* SPLIT THE WEIGHT FIELD INTO NUMERIC AND TEXT
The routine uses
TEST.VAR : the field to be split
and returns
NUM.FLD : the numeric part of TEST.VAR
TEXT.FLD : the text part of TEST.VAR
NUM.FLD ="
TEXT.FLD = ""
TEST.VAR = TRIM(TEST.VAR)
TEST.LEN = LEN(TEST.VAR)
FOR I = 1 TO TEST.LEN WHILE NUM(TEST.VAR[I,I])
NEXT I
I=I-1
Separate off numeric*
NUM.FLD = TEST.VAR[1,I]
Omit space between number & text, if present*

IF TEST.VAR[I+1,1] = " " THEN I = I + 1
Get text part*
TEXT.FLD = TEST.VAR[I+1,TEST.LEN-I]
FORM.ALPH = TEXT.FLD
RETURN

700 ** POST A RECALL ENTRY
IF RECALL.DATE > DATE() THEN UTD = 1
RECALL.DATA = ""
RECALL.DATA<1> = PREV.PAR
RECALL.DATA<7> = LAST.DATE
RECALL.DATA<8> = RESULT
RECALL.DATA<6> = "A"
C.SEQ = ""
PTR.MV = 1
794 PTR = PAT.DATA<54,PTR.MV>
IF PTR = "" THEN GOTO 795
PTR.DATE = FIELD(PTR,"*",1)
PTR.SEQ = FIELD(PTR,"*",2)
IF PTR.DATE = RECALL.DATE THEN C.SEQ = PTR.SEQ + 1
IF PTR.DATE > RECALL.DATE THEN GOTO 795
PTR.MV = PTR.MV + 1
GOTO 794
795 RECAL.PTR = RECALL.DATE
IF C.SEQ # "" THEN RECAL.PTR = RECALL.DATE:"":C.SEQ:""
RECAL.KEY = FAMPAT:"":RECAL.PTR
PAT.DATA = INSERT(PAT.DATA,54,PTR.MV,0,RECAL.PTR)
WRITE RECALL.DATA ON PATIENT.RECALL.FILE,RECAL.KEY
WRITE PAT.DATA ON PATIENT.MASTER.FILE,FAMPAT
797 RETURN
********************************************************************
999 * EXIT
CALL
WRITE.RESEARCH(FAMPAT,PREV.PAR,LAST.DATE,RECALL.DATE
CALL UPDATE.PREV.SCORE(FAMPAT,PREV.PAR,UTD)
RETURN
RECAL.WT.ORIG
001 SUBROUTINE RECAL.WT(FAMPAT,PAT.DATA)
002 RECAL.WT
003
004 JUST SORT OUT THE WT. CALLED FROM RECAL.ONEPAT
005
006 JAN RAVET SEPTEMBER 1992
MOD.DATA = "250992"
PROG.NAME = "RECAL.WT"

PREV.PAR = "WT"
PROMPT 
VM = CHAR(253)
TODAY = DATE()
RECAL.DATE = "
PROG.WT = "
WT.DATE = "
WT.DUE = "
UTD = "
RECALL.INTERVAL = 365
LAST.DATE = "
RESULT = "
PROG.REFUSAL = "
PROG.PROBS = "
PROG.PROBS = "
REFUSAL.DATE = "
REFUSAL.CODE = 354.2081
NOT.INDICATED.CODE = 354.2082
REFUSAL.TEXT = "WEIGHT RECORDING"

OPEN '"PATIENT.MASTER.FILE' TO PATIENT.MASTER.FILE ELSE STOP "PATIENT.MASTER.FILE NOT OPEN"
OPEN '"PATIENT.RECALL.FILE' TO PATIENT.RECALL.FILE ELSE STOP "PATIENT.RECALL.FILE NOT OPEN"
OPEN '"PATIENT.PROG.NOTE.FILE' TO PATIENT.PROG.NOTE.FILE ELSE STOP "PATIENT.PROG.NOTE.FILE NOT OPEN"
OPEN '"CONSULT.WORK.FILE' TO CONSULT.WORK.FILE ELSE STOP "CONSULT.WORK.FILE NOT OPEN"
OPEN 'PATIENT.PROBLEMS.FILE' TO PPF ELSE STOP "PPF NOT OPENED BY RECAL.WT"

RECALL.POINTERS = PAT.DATA<54>
PROG.POINTERS = PAT.DATA<24>
PROBLEM.POINTERS = PAT.DATA<23>
DOB = PAT.DATA<3>
CHECK PROBLEMS FOR REFUSAL
NO.OF.PROBS = DCOUNT(PROBLEM.POINTERS,VM)
FOR I = 1 TO NO.OF.PROBS
    PROBLEM.ID = FAMPAT;"*":PAT.DATA<23,I>
    READ PROBLEM.DATA FROM PPF,PROBLEM.ID ELSE PROBLEM.DATA = "
    PROB.CODE = PROBLEM.DATA<1>
    IF PROB.CODE = REFUSAL.CODE OR PROB.CODE = NOT.INDICATED.CODE THEN
        UTD = 1
GOTO 999 ; * EXIT
END
NEXT I
CHECK PROGRESS NOTES FOR A WT. RECORDERED
NO.PROGS = DCOUNT(PROG.POINTERS,VM)
FOR I = NO.PROGS TO 1 STEP -1
PROG.ID = FAMPAT:"*:PAT.DATA<24,I>
READ PROG.DATA FROM PATIENT.PROG.NOTE.FILE,PROG.ID ELSE
PROG.DATA = "
END
PROG.DATE = OCONV(PROG.ID,"G1*1")
PROG.WT = PROG.DATA<3>
PRINT @(30,10):"VALUE OF I :":I
INPUT REPLY,1
IF NOT(NUM(PROG.WT)) THEN ; * IF IT'S NOT JUST A NUMBER
PRINT @(30,14):"WT IS NOT A NUMBER"
INPUT REPLY,1
TEST.VAR = PROG.WT
PRINT @(30,12):"GOING TO SUB 600"
INPUT REPLY,1
GOSUB 600 ; * TRY TO FIND THE ACTUAL NUMBER
PROG.WT = NUM.FLD
PRINT @(30,13):"PROG.WT = ":PROG.WT
INPUT REPLY,1
PRINT @(10,11):"NUM.FLD :":NUM.FLD
INPUT REPLY,1
END
IF VALID WT. FOUND, POST IT **************
IF PROG.WT > 1 THEN
RESULT = "Weight ":PROG.WT: "Kgs"
LAST.DATE = PROG.DATE
RECALL.DATE = LAST.DATE + RECALL.INTERVAL
GOSUB 700 ; * POST IT
GOTO 999 ; * EXIT
END
10 ***** LOOK FOR TEMPORARY REFUSAL ***************
PROG.PROBS = PROG.DATA<11>
NO.PROG.PROBS = DCOUNT(PROG.PROBS,VM)
FOR Q = 1 TO NO.PROG.PROBS
PROG.PROB.CODE = PROG.DATA<11,Q>
IF PROG.PROB.CODE = REFUSAL.CODE OR PROG.PROB.CODE = NOT.INDICATED.
CODE THEN
END ELSE
PROG.REFUSAL = REFUSAL.TEXT:" NOT INDICATED"
END

LAST.DATE = PROG.DATE
RECALL.DATE = LAST.DATE + 365
RESULT = PROG.REFUSAL
GOSUB 700 ; * POST IT
GOTO 999; * EXIT
END ; * OF CHECKING FOR REFUSAL OR NOT.INDICATED CODES
NEXT Q ; * NEXT PROBLEM ATTACHED TO THIS PROGRESS NOTE

20 NEXT I; * NEXT PROGRESS NOTE

IF NO WEIGHT FOUND
RECALL.DATE = DOB + INT(365.25*20)
GOSUB 700 ; * POST IT **
GOTO 999 ; * EXIT
*********************************************************
600 * SPLIT THE WEIGHT FIELD INTO NUMERIC AND TEXT
The routine uses
TEST.VAR : the field to be split
and returns
NUM.FLD : the numeric part of TEST.VAR
TEXT.FLD : the text part of TEST.VAR

NUM.FLD ="
TEXT.FLD = "

TEST.VAR = TRIM(TEST.VAR)
TEST.LEN = LEN(TEST.VAR)
FOR I = 1 TO TEST.LEN WHILE NUM(TEST.VAR[1,I])
NEXT I
I=I-1
Separate off numeric*
NUM.FLD = TEST.VAR[1,I]
Omit space between number & text, if present*
IF TEST.VAR[I+1,1] = " " THEN I = I + 1
Get text part*
TEXT.FLD = TEST.VAR[I+1,TEST.LEN-I]
FORM.ALPH = TEXT.FLD
RETURN
*********************************************************
700 ** POST A RECALL ENTRY
IF RECALL.DATE > DATE() THEN UTD = 1
RECALL.DATA = "
RECALL.DATA<1> = PREV.PAR
RECALL.DATA<7> = LAST.DATE
RECALL.DATA<8> = RESULT
RECALL.DATA<6> = "A"
C.SEQ = ""
PTR.MV = 1
794 PTR = PAT.DATA<54,PTR.MV>
IF PTR = "" THEN GOTO 795
PTR.DATE = FIELD(PTR,"*",1)
PTR.SEQ = FIELD(PTR,"*",2)
IF PTR.DATE = RECALL.DATE THEN C.SEQ = PTR.SEQ + 1
IF PTR.DATE > RECALL.DATE THEN GOTO 795
PTR.MV = PTR.MV + 1
GOTO 794
795 RECAL.PTR = RECALL.DATE
IF C.SEQ # "" THEN RECAL.PTR = RECALL.DATE:"*".C.SEQ:"*
RECAL.KEY = FAMPAT:"*":RECAL.PTR
PAT.DATA = INSERT(PAT.DATA,54,PTR.MV,0,RECAL.PTR)
WRITE RECALL.DATA ON PATIENT.RECALL.FILE,RECAL.KEY
WRITE PAT.DATA ON PATIENT.MASTER.FILE,FAMPAT
797 RETURN
**************************************************************
999 * EXIT
CALL
WRITE.RESEARCH(FAMPAT,PREV.PAR,LAST.DATE,RECALL.DATE
CALL UPDATE.PREV.SCORE(FAMPAT,PREV.PAR,UTD)
RETURN
SUBROUTINE RECAL.MAMM(FAMPAT,PAT.DATA)
RECAL.MAMM
JUST SORT OUT THE MAMM. CALLED FROM RECAL.ONEPAT
ACCEPTS "MAMMOGRAM" IN MANAGEMENT OF PROBLEM FILE
AS (NOT WANTED)
ACCEPTS "MAMMOGRAM" IN XRAY TYPE
JAN RAVET SEPTEMBER 1992
OLIVER FRANK FEBRUARY 1997
MOD.DATA = "250992"
PROG.NAME = "RECAL.MAMM"
TODAY = DATE()
RECALL.DATE = "
PRINT @(0,9):PROG.NAME
RESULT = "
PROG.REFUSAL = "
LAST.DATE = " ; REFUSAL.DATE = "
UTD = "
PREV.PAR = "MAMM"
LAST.DATE = "
RESULT = "
REFUSAL.CODE = 354.2091
NOT.INDICATED.CODE = 354.2092
025 BREAST.CANCER.CODE = 035.0
026 RECALL.INTERVAL = 730
027 REFUSAL.TEXT = "SCREENING MAMMOGRAM"
028 MAMM.DATE = "
029 REFUSAL.DATE = "
030 PROG.REFUSAL = "
031 MAX.RECALL.AGE = 69
032
033 PROMPT "
034 VM = CHAR(253)
035
036 OPEN ", 'PATIENT.MASTER.FILE' TO PATIENT.MASTER.FILE ELSE STOP "PATIENT.
MASTER.FILE NOT OPEN"
037 OPEN ", 'PATIENT.RECALL.FILE' TO PATIENT.RECALL.FILE ELSE STOP "PATIENT.
RECALL.FILE NOT OPEN"
038 OPEN ", 'PATIENT.XRAY.FILE' TO PATIENT.XRAY.FILE ELSE STOP "PATIENT.XRAY
FILE NOT OPEN"
039 OPEN ", 'PATIENT.PROBLEMS.FILE' TO PATIENT.PROBLEMS.FILE ELSE STOP "PATIENT.PROBLEMS.FILE NOT OPEN"
040 OPEN ", 'PATIENT.PROG.NOTE.FILE' TO PATIENT.PROG.NOTE.FILE ELSE STOP "PATIENT.PROG.NOTE.FILE NOT OPEN"
041 OPEN ", 'CONSULT.WORK.FILE' TO CONSULT.WORK.FILE ELSE STOP "CONSULT.WORK
FILE NOT OPEN"
042
043 RECALL.POINTERS = PAT.DATA<54>
044 PROBLEMS.POINTERS = PAT.DATA<23>
045 XRAY.POINTERS = PAT.DATA<19>
046 PROG.POINTERS = PAT.DATA<24>
047 DOB = PAT.DATA<3>
048
049 100 ** PROBLEMS **
050 NO.PROBLEMS = DCOUNT(PROBLEMS.POINTERS,VM)
051 PROBLEMS.DATA = "
052 FOR I = 1 TO NO.PROBLEMS
053 PROBLEMS.ID = FAMPAT:"*":PAT.DATA<23,I>
054 READ PROBLEMS.DATA FROM
  PATIENT.PROBLEMS.FILE,PROBLEMS.ID ELSE
055 PROBLEMS.DATA = "
056 END
057
058 PROB.CODE = PROBLEMS.DATA<1>
059 IF PROB.CODE = REFUSAL.CODE OR PROB.CODE =
    NOT.INDICATED.CODE OR PROB.CODE =
    BREAST.CANCER.CODE THEN
060 CALL RRF.NOT.ELIG(FAMPAT,PREV.PAR)
061 GOTO 1000 ; * EXIT
NO.XRAY = DCOUNT(XRAY.POINTERS,VM)
LAST.DATE = "
XRAY.DATA = "
FOR I = NO.XRAY TO 1 STEP -1
XRAY.ID = FAMPAT:"*:PAT.DATA<19,I>
READ XRAY.DATA FROM PATIENT.XRAY.FILE,XRAY.ID ELSE
XRAY.DATA = "
END
XRAY.TYPE = XRAY.DATA<1>
FOUND.ONE = INDEX(XRAY.TYPE,"MAMMO","1") OR
INDEX(XRAY.TYPE,"BREAST SCREEN","1") OR
INDEX(XRAY.TYPE,"breast","1") OR
INDEX(XRAY.TYPE,"mamm","1")
IF FOUND.ONE >0 THEN
IF XRAY.DATA<4> # " THEN
MAMM.RESULT = "MAMMOGRAM ":XRAY.DATA<4>
END ELSE
MAMM.RESULT = XRAY.TYPE
END
MAMM.DATE = OCONV(XRAY.ID,"G1*1")
LAST.DATE = MAMM.DATE
RESULT = MAMM.RESULT
IF TODAY - MAMM.DATE < RECALL.INTERVAL THEN
IS STILL UP TO DATE, SO POST IT
RECALL.DATE = MAMM.DATE + RECALL.INTERVAL
GOSUB 700 ; * POST IT
GOTO 999 ; * EXIT
END ELSE ; * IS OUT OF DATE, SO LOOK FOR SUBSEQUENT REFUSAL
GOTO 300 ; * SKIP OTHER XRAYS *
END
END
NEXT I
300 **************** PROGRESS NOTES
NO.PROG = DCOUNT(PROG.POINTERS,VM)
FOR I = NO.PROG TO 1 STEP -1
PROG.ID = FAMPAT:"*:PAT.DATA<24,I>
READ PROG.DATA FROM PATIENT.PROG.NOTE.FILE,PROG.ID ELSE
PROG.DATA = "
END

PROG.DATE = OCONV(PROG.ID,"G1*1")

PROG.PROBS = PROG.DATA<11>

NO.PROG.PROBS = DCOUNT(PROG.PROBS,VM)

FOR Q = 1 TO NO.PROG.PROBS

PROG.PROB.CODE = PROG.DATA<11,Q>

IF PROG.PROB.CODE = REFUSAL.CODE OR PROG.PROB.CODE = NOT.INDICATED.CODE

THEN

REFUSAL.DATE = PROG.DATE

IF PROG.PROB.CODE = REFUSAL.CODE THEN

PROG.REFUSAL = REFUSAL.TEXT:" REFUSED"

ELSE

PROG.REFUSAL = REFUSAL.TEXT: "NOT INDICATED"

END

END

REFUSAL.DATE = PROG.DATE

GOTO 500 ; * SORT OUT DATES

END

NEXT Q

NEXT I

500 ************ SORT OUT DATES ***********************

IF MAMM.DATE = " THEN

IF REFUSAL.DATE # " THEN

LAST.DATE = REFUSAL.DATE

RESULT = PROG.REFUSAL

RECALL.DATE = LAST.DATE + 365

GOSUB 700

GOTO 999

END

END

IF MAMM.DATE # " THEN

IF REFUSAL.DATE = " THEN

LAST.DATE = MAMM.DATE

RESULT = MAMM.RESULT

RECALL.DATE = LAST.DATE + RECALL.INTERVAL

GOSUB 700

GOTO 999

END

END

IF MAMM.DATE # " AND REFUSAL.DATE # " THEN

IF MAMM.DATE GE REFUSAL.DATE THEN

LAST.DATE = MAMM.DATE

RESULT = MAMM.RESULT

RECALL.DATE = LAST.DATE + RECALL.INTERVAL

GOSUB 700

GOTO 999

GOTO 999
END ELSE
LAST.DATE = REFUSAL.DATE
RESULT = PROG.REFUSAL
RECALL.DATE = LAST.DATE + 365
GOSUB 700
GOTO 999
END

162 IF NO REFERENCE FOUND TO MAMMOGRAM
RECALL.DATE = DOB + INT(50*365.25)
GOSUB 700 ; * POST IT
GOTO 999 ; * EXIT

177 RECALL.DATA = "
RECALL.DATA<1> = PREV.PAR
RECALL.DATA<7> = LAST.DATE
RECALL.DATA<8> = RESULT
RECALL.DATA<6> = "A"

C.SEQ = ""
PTR.MV = 1
794 PTR = PAT.DATA<54,PTR.MV>
IF PTR = "" THEN GOTO 795
PTR.DATE = FIELD(PTR,"*",1)
PTR.SEQ = FIELD(PTR,"*",2)
IF PTR.DATE = RECALL.DATE THEN C.SEQ = PTR.SEQ + 1
IF PTR.DATE > RECALL.DATE THEN GOTO 795
PTR.MV = PTR.MV + 1
GOTO 794
795 RECAL_PTR = RECALL.DATE
IF C.SEQ = "" THEN RECAL_PTR = RECALL.DATE:"*/C.SEQ:"*
RECAL.KEY = FAMPAT:"*/RECAL_PTR
PAT.DATA = INSERT(PAT.DATA,54,PTR.MV,0,RECAL_PTR)
WRITE RECALL.DATA ON PATIENT.RECALL.FILE,RECAL.KEY
WRITE PAT.DATA ON PATIENT.MASTER.FILE,FAMPAT
797 RETURN

999 * EXIT
CALL
WRITE.RESEARCH(FAMPAT,PREV.PAR,LAST.DATE,RECALL.DATE
CALL UPDATE.PREV.SCORE(FAMPAT,PREV.PAR,UTD)
1000 RETURN
RECAL.FLU
001 SUBROUTINE RECAL.FLU(FAMPAT,PAT.DATA,AGE)
002 RECAL.FLU
003
004 JUST SORT OUT THE FLU. CALLED FROM RECAL.ONEPAT
005
006 JAN RAVET SEPTEMBER 1992
007 OLIVER FRANK MAY 1997
008
009 MOD.DATA = "041192"
010 PROG.NAME = "RECAL.FLU"
011 PROMPT "
012 VM = CHAR(253)
013 TODAY = DATE()
014 LAST.DATE = "
015 RECALL.DATE = "
016 VACC.DATE = "
017 VACC.DATE = "
018 VACC.DATE = "
019 YEAR.VAX.GIVEN = "
020 THIS.YEAR = OCONV(TODAY,"DY")
021 NEXT.YEAR = THIS.YEAR + 1
022 MONTH = OCONV(TODAY,'DM')
023 UTD = "
024 RESULT = "
025 PREV.PAR = "FLU"
026 REFUSAL.CODE = 354.1011
027 NOT.INDICATED.CODE = 354.1012
028 REFUSAL.TEXT = "FLUVAX"
029 PRESCRIBED.THIS.YEAR = "
030
031 OPEN '', 'PATIENT.MASTER.FILE' TO PATIENT.MASTER.FILE ELSE STOP "PATIENT.
MASTER.FILE NOT OPEN"
032 OPEN '', 'PATIENT.RECALL.FILE' TO PATIENT.RECALL.FILE ELSE STOP "PATIENT.
RECALL.FILE NOT OPEN"
033 OPEN '', 'PATIENT.VACC.FILE' TO PATIENT.VACC.FILE ELSE STOP "PATIENT.VACC
FILE NOT OPEN"
034 OPEN '', 'PATIENT.PROBLEMS.FILE' TO PATIENT.PROBLEMS.FILE ELSE STOP "PATIENT.PROBLEMS.FILE NOT OPEN"
035 OPEN '', 'PATIENT.ALLERGY.FILE' TO PATIENT.ALLERGY.FILE ELSE STOP "PATIENT.ALLERGY.FILE NOT OPEN"
036 OPEN '', 'PATIENT.MEDIC.FILE' TO PATIENT.MEDIC.FILE ELSE STOP "PATIENT.MEDIC.FILE NOT OPEN"
037
038 RECALL.POINTER = PAT.DATA<54>
FIRST LOOK FOR REASONS NOT TO GIVE AND TO CANCEL FLU RECALLS
10 ; * ALLERGIC TO FLUVAX
20 ; * REFUSES TO HAVE IT
30 ; * ALREADY HAD IT THIS YEAR

NEXT LOOK FOR REASONS TO GIVE FLUAVX
40 ; * AGE > 65 YEARS
50 ; * HAD IT PREVIOUSLY
60 ; * HAS A SPECIFIED HEART/LUNG/OTHER HEALTH PROBLEM

10 ** ALLERGY **
NO.ALLERGY = DCOUNT(ALLERGY.POINTERS,VM)
FOR I = 1 TO NO.ALLERGY
ALLERGY.ID = FAMPAT:"*":PAT.DATA<22,I>
READ ALLERGY.DATA FROM
PATIENT.ALLERGY.FILE,ALLERGY.ID ELSE
ALLERGY.DATA = ""
END

FOUND.ONE = INDEX(ALLERGY.DATA<1>,"FLUVAX","1") OR
INDEX(ALLERGY.DATA<
1>,"INFLUENZA","1") OR
INDEX(ALLERGY.DATA<1>,"INFLUENZA","1")
IF FOUND.ONE >0 THEN
CALL RRF.NOT.ELIG(FAMPAT,PREV.PAR)
GOTO 1000 ; * EXIT
END

NEXT I

PRINT @(10,12):"GOT THROUGH ALLERGY"
INPUT REPLY ; * DEBUGGING
20 ** REFUSES FLUVAX **
NO.PROBLEMS = DCOUNT(PROBLEMS.POINTERS,VM)
FOR I = 1 TO NO.PROBLEMS
PROBLEMS.ID = FAMPAT:"*":PAT.DATA<23,I>
READ PROBLEMS.DATA FROM
PATIENT.PROBLEMS.FILE,PROBLEMS.ID ELSE
PROBLEMS.DATA = ""
END

PROB.CODE = PROBLEMS.DATA<1>
IF INDEX(PROB.CODE,REFUSAL.CODE,'1') > 0 OR
INDEX(PROB.CODE,NOT.INDICATED.
CODE,'1') > 0 THEN
081     CALL RRF.NOT.ELIG(FAMPAT,PREV.PAR)
082     GOTO 1000 ; * EXIT
083     END
084     NEXT I
085     CHECK PROGRESS NOTES FOR REFUSAL
086     GET DATE OF MOST RECENT FLUVAX PRESCRIBED
087     30 ** IF TODAY IS BEFORE MARCH, LOOK FOR CURRENT PRESCRIPTION, ELSE
088     IF AFTER 1ST MARCH, LOOK FOR VACCINE GIVEN THIS YEAR
089     33 * CANCEL RECALL IF ALREADY PRESCRIBED FOR CURRENT YEAR
090     AND IF TODAY IS BEFORE 1ST MARCH
091
092     NO.RX = DCOUNT(RX.POINTERS,VM)
093     FOR I = NO.RX TO 1 STEP -1
094     RX.ID = FAMPAT:**:PAT.DATA<16,I>
095     READ RX.DATA FROM PATIENT.MEDIC.FILE,RX.ID ELSE
096     RX.DATA = "
097     END
098
099     RX.DATE = OCONV(RX.ID,"G1*1")
100     RX.YEAR = OCONV(RX.DATE,'DY')
101     DRUG.NAME = RX.DATA<1>
102
103     PRINT @(30,14):"DRUG.NAME: ":DRUG.NAME
104     PRINT @(30,15):"RX.DATE  : ":OCONV(RX.DATE,"D2/"
105     INPUT REPLY,1
106
107     IF INDEX(DRUG.NAME,"FLUVAX",'1') OR
INDEX(DRUG.NAME,"VAXIGRIP",'1') OR
INDEX(DRUG.NAME,"INFLUENZA",'1') > 0 THEN
108     IF RX.YEAR = THIS.YEAR THEN
109     PRESCRIBED.THIS.YEAR = OCONV(RX.DATE,"D2/"
110
111     IF MONTH < 3 THEN ; * POST IT
112     LAST.DATE = RX.DATE
113     RECALL.DATE = ICONV("01/03/":THIS.YEAR, "D/")
114     RESULT = "Fluvax was prescribed on ":PRESCRIBED.THIS.YEAR
115     GOSUB 700 ; * POST IT
116     GOTO  999 ; * EXIT
117     END
118
119     IF MONTH > 2 THEN ; * LOOK FOR WHETHER GIVEN
120     PRINT @(30,12):"AT LINE 102"
121     INPUT REPLY,1
122
123     PRINT @(30,11):"ABOUT TO GOSUB 600"
124     INPUT REPLY,1
GOSUB 600 ; * GET DATE OF MOST RECENT FLUVAX GIVEN

THIS.YEAR = OCONV(TODAY,'DY')
YEAR.VAX.GIVEN = OCONV(VACC.DATE,'DY')

IF YEAR.VAX.GIVEN = THIS.YEAR THEN
LAST.DATE = VACC.DATE
RECALL.DATE = ICONV("01/03/":NEXT.YEAR,"D/")
RESULT = VACC.NAME:" vaccine last given"
GOSUB 700 ; * POST IT
UTD = 1
13.3 Appendix I Principal results tables

13.3.1 Analyses used for the randomised controlled trial of reminders

The following tables present the results of the analyses performed on the data from the randomised controlled intention-to-treat trial of the opportunistic reminders.
<table>
<thead>
<tr>
<th>Activity = ALLE</th>
<th>No. opportunities</th>
<th>No. (%) Taken</th>
<th>Univariate RR (95% CI)</th>
<th>Multivariate RR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Treatment Group</td>
<td>n=24704</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control</td>
<td>13713</td>
<td>682 (5.0)</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Intervention</td>
<td>10991</td>
<td>991 (9.0)</td>
<td>1.81 (1.63, 2.02)</td>
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**Table 1** Analysis of whether opportunities were taken to record the patients' allergies
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Table 2  Analysis of whether opportunity was taken to record blood pressure as screening for hypertension.
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<td>No. Long Term Problems</td>
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<td>2163 53 (2.5)</td>
<td>1252 7 (0.6)</td>
<td>229 5 (2.2)</td>
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<tr>
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<td>591</td>
<td>1085 25 (2.3)</td>
<td>1253 35 (2.8)</td>
<td>2654 68 (2.6)</td>
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<tr>
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<td>475</td>
<td>510 14 (2.7)</td>
<td>1253 50 (4.0)</td>
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|                | 2163 53 (2.5)               | 1252 7 (0.6)           | 1253 7 (0.6)                      | 229 5 (2.2)   |
|                | 1085 25 (2.3)               | 1253 35 (2.8)          | 1253 35 (2.8)                     | 2654 68 (2.6) |
|                | 510 14 (2.7)                | 1253 50 (4.0)          | 1253 50 (4.0)                     | 875 19 (2.2)  |

|                | 2163 53 (2.5)               | 1252 7 (0.6)           | 1253 7 (0.6)                      | 229 5 (2.2)   |
|                | 1085 25 (2.3)               | 1253 35 (2.8)          | 1253 35 (2.8)                     | 2654 68 (2.6) |
|                | 510 14 (2.7)                | 1253 50 (4.0)          | 1253 50 (4.0)                     | 875 19 (2.2)  |

|                | 2163 53 (2.5)               | 1252 7 (0.6)           | 1253 7 (0.6)                      | 229 5 (2.2)   |
|                | 1085 25 (2.3)               | 1253 35 (2.8)          | 1253 35 (2.8)                     | 2654 68 (2.6) |
|                | 510 14 (2.7)                | 1253 50 (4.0)          | 1253 50 (4.0)                     | 875 19 (2.2)  |

Table 3 Analysis of whether opportunity was taken to measure serum glucose as screening for diabetes.
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<th>Activity = FLU</th>
<th>No. Opportunities</th>
<th>No. (%) Taken</th>
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<th>Multivariate RR (95% CI)</th>
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<td>248 (27.2)</td>
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<td>0.98 (0.86, 1.13)</td>
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<td>198 (27.0)</td>
<td>1.02 (0.84, 1.24)</td>
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<td>0.86 (0.74, 0.99)</td>
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<td>161 (28.9)</td>
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<td>0.94 (0.79, 1.13)</td>
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<td>262 (26.3)</td>
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<td>1.03 (0.82, 1.29)</td>
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<td>0.69 (0.53,0.89)</td>
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<td>18</td>
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<td>0.09 (0.05,0.14)</td>
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Table 4  Analysis of whether opportunity was taken to administer influenza vaccine.
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Table 5 Analysis of whether opportunity was taken to measure serum cholesterol as screening for hyperlipidaemia.
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<th>Multivariate RR (95% CI)</th>
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Table 6  Analysis of whether opportunity was taken to administer MMR vaccine.
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*Table 7* Analysis of whether opportunity was taken to perform cervical smear as screening for cancer of the cervix.
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**Table 8** Analysis of whether opportunity was taken to administer pneumococcal vaccine.
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Table 9 Analysis of whether opportunity was taken to record smoking status.
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Table 10  Analysis of whether opportunity was taken to administer tetanus vaccine.
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<td>No. Problems Coded at Visit</td>
<td>No. Long Term Problems</td>
<td>Days (Years) Since Due at Practice</td>
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</tr>
<tr>
<td>1-2 2540 194 (7.6) 1.00 1.00</td>
<td>3-4 8200 507 (6.2) 0.81 (0.68,0.96) 0.75 (0.64,0.89) p=0.02 p=0.001</td>
<td>1 12502 439 (3.5) 1.00 1.00</td>
<td>0 11557 574 (5.0) 1.00 1.00</td>
<td>0-487 (0-1.33) 7359 530 (7.2) 1.00 1.00</td>
</tr>
<tr>
<td>3-4 8200 507 (6.2) 0.81 (0.68,0.96) 0.75 (0.64,0.89) p=0.02 p=0.001</td>
<td>1 12502 439 (3.5) 1.00 1.00</td>
<td>1 4785 334 (7.0) 1.41 (1.22,1.62) 1.35 (1.17,1.55) p=0.001 p=0.001</td>
<td>1 4785 334 (7.0) 1.41 (1.22,1.62) 1.35 (1.17,1.55) p=0.001 p=0.001</td>
<td>488-1,855 (1.34-5.08) 7353 378 (5.1) 0.71 (0.62,0.82) 0.95 (0.84,1.09) p=&lt;.0001 p=0.48</td>
</tr>
<tr>
<td>5+ 11328 520 (4.6) 0.60 (0.51,0.72) 0.50 (0.42,0.61) p=&lt;.0001 p=0.001</td>
<td>2+ 2932 359 (12.2) 3.49 (3.04,4.00) 1.81 (1.55,2.13) p=&lt;.0001 p=0.001</td>
<td>2+ 5726 313 (5.5) 1.10 (0.95,1.27) 1.38 (1.19,1.60) p=0.19 p=&lt;.0001</td>
<td>1,856-11,378 (5.08-31.2) 7356 313 (4.3) 0.59 (0.51,0.69) 0.87 (0.75,1.01) p=&lt;.0001 p=0.06</td>
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</table>

Table 11 Analysis of whether opportunity was taken to record patient’s weight.
13.3.2 Analyses for characteristics associated with performance of preventive activities

These analyses were similar to those used for the randomised controlled trial of reminders, but differed in that the effect of the reminders was analysed by whether a reminder was actually displayed, rather than by the intervention group to which the patient had been allocated.
<table>
<thead>
<tr>
<th>Activity = ALLE</th>
<th>No. Opportunities Taken</th>
<th>No. (%)</th>
<th>Univariate RR (95% CI)</th>
<th>Multivariate RR (95% CI)</th>
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Reminder Displayed

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<th>7402</th>
<th>973 (13.1)</th>
<th>3.25 (2.93,3.60)</th>
<th>2.58 (2.35,2.83)</th>
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<tbody>
<tr>
<td>p</td>
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<td></td>
<td>p&lt;.0001</td>
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Doctor Gender

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<tr>
<th></th>
<th>Female</th>
<th>7653</th>
<th>772 (10.1)</th>
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<th>1.13 (1.01,1.25)</th>
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<tbody>
<tr>
<td>p</td>
<td>&lt;.0001</td>
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<td>p&lt;.0001</td>
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|       | Male   | 17051 | 901 (5.3) | 1.00            | 1.00            |

Patient Gender

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<tr>
<th></th>
<th>Female</th>
<th>14050</th>
<th>902 (6.4)</th>
<th>0.89 (0.80,0.99)</th>
<th>0.92 (0.84,1.01)</th>
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<tbody>
<tr>
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<td>p=0.08</td>
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|       | Male   | 10654 | 771 (7.2) | 1.00            | 1.00            |

Patient Age at Visit

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<table>
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<th>1.48 (1.28,1.70)</th>
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<table>
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Usual Doctor Consulted

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<table>
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Consult Length

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<td>p&lt;.0001</td>
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|       | Standard/Short | 20817 | 1311 (6.3) | 1.00            | 1.00            |

No. Visits Last 2 Years

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<table>
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<th>7097</th>
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</thead>
<tbody>
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<table>
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<tr>
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</thead>
<tbody>
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<td>Opportunities</td>
<td>Problems</td>
<td>Long Term Problems</td>
<td>Years Since Due</td>
<td>Billing Rate</td>
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<td>1-2</td>
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<td>0.70 (0.61,0.81)</td>
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<td>0.54 (0.48,0.61)</td>
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<td>3154</td>
<td>124 (3.9)</td>
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Table 12. Analysis of characteristics associated with taking of opportunities to record patients’ allergies.
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<th>No. (%)</th>
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<th>Multivariate RR (95% CI)</th>
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<tbody>
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<td>n=</td>
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<td>1.72 (1.56,1.90)</td>
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508
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<th>Multivariate RR (95% CI)</th>
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| Years Since Due at Practice | 1. 0-<1 | 3861 | 679 (17.6) | 1.00 | 1.00 |
|                            | 2. 1-<3 | 1679 | 307 (18.3) | 1.04 (0.89,1.21) | 1.35 (1.20,1.52) |
|                            |   |      |            | p=0.61 | p=<.0001 |
|                            | 3. 3+  | 3234 | 357 (11.0) | 0.63 (0.54,0.73) | 0.97 (0.86,1.10) |
|                            |   |      |            | p=<.0001 | p=0.64 |

| Billing Rate | Highest fee band | 3342 | 677 (20.3) | 2.26 (1.85,2.78) | 1.68 (1.41,2.00) |
|              |                  |      |            | p=<.0001 | p=<.0001 |
|              | Middle fee band  | 4046 | 542 (13.4) | 1.50 (1.22,1.84) | 1.41 (1.18,1.67) |
|              |                  |      |            | p=0.0001 | p=0.0001 |
|              | Rebate Medicare  | 1386 | 124 (8.9)  | 1.00    | 1.00    |

Table 13 Analysis of characteristics associated with taking of opportunities to screen for hypertension
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**Note:** Significance levels are indicated by p-values.
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<th>No. (%</th>
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<th>Multivariate RR (95% CI)</th>
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<td>Middle fee band</td>
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**Table 14** Analysis of characteristics associated with taking of opportunities to screen for diabetes
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Table 15 Analysis of characteristics associated with taking of opportunities to perform influenza immunisation

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| Billing Rate | Highest fee band |      |      |      |      |      |      |      |
|--------------|------------------|------|------|------|------|------|------|
|              | 89               | 21 (23.6) | 0.69 (0.46,1.05) | 0.08 |      |      |      |      |
|              | 1102             | 249 (22.6) | 0.66 (0.55,0.81) | <=.0001 |      |      |      |      |
|              | 656              | 223 (34.0) | 1.00 |      |      |      |      |      |

Table 15 Analysis of characteristics associated with taking of opportunities to perform influenza immunisation
<table>
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</table>

| No. Problems Coded at Visit | |
|-----------------------------|--|------|
| 0                           | 4583 329 (7.2) | 1.00 | 1.00 |
| 1                           | 3119 127 (4.1) | 0.57 (0.46,0.70) | 0.39 (0.32,0.47) |
|                            |                     | p=<.0001 | p=<.0001 |
| 2+                          | 1518 235 (15.5)   | 2.16 (1.82,2.56) | 0.85 (0.72,1.00) |
|                            |                     | p=<.0001 | p=0.06 |

| No. Long Term Problems | |
|------------------------|--|------|
| 0                      | 4193 377 (9.0) | 1.00 | 1.00 |
| 1                      | 1975 186 (9.4) | 1.05 (0.86,1.27) | 1.27 (1.07,1.51) |
|                        |                     | p=0.64 | p=0.01 |
| 2+                     | 3052 128 (4.2)   | 0.47 (0.37,0.59) | 0.96 (0.78,1.18) |
|                        |                     | p=<.0001 | p=0.70 |

| Years Since Due at Practice | |
|-----------------------------|--|------|
| 1. 0-<1                     | 3534 368 (10.4) | 1.00 | 1.00 |
| 2. 1-<4                     | 2652 211 (8.0)  | 0.76 (0.63,0.92) | 1.11 (0.94,1.31) |
|                            |                     | p=0.01 | p=0.20 |
| 3. 4+                       | 3034 112 (3.7)    | 0.35 (0.28,0.45) | 0.71 (0.56,0.89) |
|                            |                     | p=<.0001 | p=0.004 |

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<td>Rebate Medicare</td>
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*Table 18 Analysis of characteristics associated with taking of opportunities to perform cervical smear test*
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<th>Multivariate RR (95% CI)</th>
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<td>No. Long Term Problems</td>
<td>Years Since Due at Practice</td>
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<td>------------------------</td>
<td>-----------------------------</td>
<td>--------------</td>
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<tr>
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<td>2643 46 (1.7) 1.00</td>
<td>2320 35 (1.5) 1.00</td>
<td>236 3 (1.3) 0.62 (0.19,2.04)</td>
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<td>638 12 (1.9) 0.26 (0.14,0.48) p=&lt;.0001</td>
<td>1219 29 (2.4) 1.37 (0.86,2.18) p=0.19</td>
<td>2602 75 (2.9) 1.91 (1.06,3.44) p=0.03</td>
<td>236 3 (1.3) 0.62 (0.19,2.04) p=0.43</td>
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<td>587 22 (3.7) 2.15 (1.29,3.58) p=0.003</td>
<td>918 8 (0.9) 0.58 (0.24,1.40) p=0.22</td>
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<td>531 9 (1.7) 0.24 (0.12,0.47) p=&lt;.0001</td>
<td>2430 15 (0.6) 0.09 (0.05,0.15) p=&lt;.0001</td>
<td>1017 21 (2.1) 1.00</td>
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Table 19 Analysis of characteristics associated with taking of opportunities to perform pneumococcal immunisation
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Table 20 Analysis of characteristics associated with taking of opportunities to record patient's smoking status

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Table 21 Analysis of characteristics associated with taking of opportunities to perform tetanus immunisation

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<tr>
<td></td>
<td>(2.3)</td>
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</tr>
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<td>244</td>
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<td>0.96 (0.77,1.21)</td>
</tr>
<tr>
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<td>(1.9)</td>
<td>p=0.77</td>
<td>p=0.74</td>
<td>p=0.74</td>
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<td>1.00</td>
</tr>
<tr>
<td></td>
<td>(2.0)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Activity = WT</td>
<td>No. Opportunities</td>
<td>No. (%) Taken</td>
<td>Univariate RR (95% CI)</td>
<td>Multivariate RR (95% CI)</td>
</tr>
<tr>
<td>--------------</td>
<td>------------------</td>
<td>--------------</td>
<td>------------------------</td>
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</tr>
<tr>
<td>n=</td>
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<td>Reminder Displayed</td>
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<td></td>
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<td>Yes</td>
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<td>626 (8.8%)</td>
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<td>1.70 (1.52,1.89)</td>
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<td>p=&lt;.0001</td>
<td>p=&lt;.0001</td>
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<td>14957</td>
<td>595 (4.0%)</td>
<td>1.00</td>
<td>1.00</td>
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<tr>
<td>Doctor Gender</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>7239</td>
<td>657 (9.1%)</td>
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<td>14829</td>
<td>564 (3.8%)</td>
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<td>Patient Gender</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>13536</td>
<td>728 (5.4%)</td>
<td>0.93 (0.82,1.05)</td>
<td>0.79 (0.71,0.89)</td>
</tr>
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<td></td>
<td></td>
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</tr>
<tr>
<td>Male</td>
<td>8532</td>
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</tr>
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<td>Patient Age at Visit</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>7231</td>
<td>510 (7.1%)</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>2</td>
<td>7519</td>
<td>453 (6.0%)</td>
<td>0.85 (0.75,0.98)</td>
<td>0.89 (0.79,1.01)</td>
</tr>
<tr>
<td></td>
<td></td>
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<td>p=0.02</td>
<td>p=0.07</td>
</tr>
<tr>
<td>3</td>
<td>7318</td>
<td>258 (3.5%)</td>
<td>0.50 (0.43,0.59)</td>
<td>0.75 (0.64,0.88)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>p=&lt;.0001</td>
<td>p=0.0003</td>
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<tr>
<td>Usual Doctor Consulted</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not usual GP</td>
<td>5887</td>
<td>310 (5.3%)</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Usual GP</td>
<td>16181</td>
<td>911 (5.6%)</td>
<td>1.07 (0.94,1.22)</td>
<td>0.98 (0.86,1.11)</td>
</tr>
<tr>
<td></td>
<td></td>
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<td>p=0.31</td>
<td>p=0.71</td>
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<td>Consult Length</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Long</td>
<td>3923</td>
<td>472 (12.0%)</td>
<td>2.91 (2.59,3.28)</td>
<td>2.35 (2.09,2.63)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>p=&lt;.0001</td>
<td>p=&lt;.0001</td>
</tr>
<tr>
<td>Standard/Short</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>18145</td>
<td>749 (4.1%)</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>No. Visits Last 2 Years</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>00-4</td>
<td>6615</td>
<td>569 (8.6%)</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>05-11</td>
<td>6285</td>
<td>354 (5.6%)</td>
<td>0.65 (0.57,0.75)</td>
<td>0.81 (0.71,0.93)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>p=&lt;.0001</td>
<td>p=0.002</td>
</tr>
<tr>
<td>12+</td>
<td>9168</td>
<td>298 (3.3%)</td>
<td>0.38 (0.33,0.44)</td>
<td>0.53 (0.45,0.63)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>p=&lt;.0001</td>
<td>p=&lt;.0001</td>
</tr>
<tr>
<td>No. Opportunities at Visit</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1-2</td>
<td>2540</td>
<td>194 (7.6%)</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>3-4</td>
<td>8200</td>
<td>507 (6.2%)</td>
<td>0.81 (0.68,0.96)</td>
<td>0.79 (0.67,0.93)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>p=0.02</td>
<td>p=0.005</td>
</tr>
<tr>
<td>5+</td>
<td>11328</td>
<td>520 (4.6%)</td>
<td>0.60 (0.51,0.72)</td>
<td>0.55 (0.46,0.67)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>p=&lt;.0001</td>
<td>p=&lt;.0001</td>
</tr>
</tbody>
</table>

Opportunity Number
**Table 22 Analysis of characteristics associated with taking of opportunities to record patient's weight**

<table>
<thead>
<tr>
<th>Activity = WT</th>
<th>No. Opportunities</th>
<th>No. (%) Taken</th>
<th>Univariate RR (95% CI)</th>
<th>Multivariate RR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>6625</td>
<td>693 (10.5)</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>2</td>
<td>4058</td>
<td>200 (4.9)</td>
<td>0.47 (0.40,0.55)</td>
<td>0.55 (0.47,0.64)</td>
</tr>
<tr>
<td>3</td>
<td>2839</td>
<td>101 (3.6)</td>
<td>0.34 (0.28,0.42)</td>
<td>0.42 (0.34,0.51)</td>
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<tr>
<td>4+</td>
<td>8546</td>
<td>227 (2.7)</td>
<td>0.25 (0.22,0.30)</td>
<td>0.39 (0.33,0.46)</td>
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</table>

<table>
<thead>
<tr>
<th>No. Problems Coded at Visit</th>
<th>0</th>
<th>12502</th>
<th>439 (3.5)</th>
<th>1.00</th>
<th>1.00</th>
</tr>
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<tbody>
<tr>
<td>1</td>
<td>6634</td>
<td>423 (6.4)</td>
<td>1.82 (1.59,2.07)</td>
<td>1.43 (1.24,1.65)</td>
<td>p=&lt;.0001</td>
</tr>
<tr>
<td>2+</td>
<td>2932</td>
<td>359 (12.2)</td>
<td>3.49 (3.04,4.00)</td>
<td>1.78 (1.52,2.10)</td>
<td>p=&lt;.0001</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>No. Long Term Problems</th>
<th>0</th>
<th>11557</th>
<th>574 (5.0)</th>
<th>1.00</th>
<th>1.00</th>
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<tbody>
<tr>
<td>1</td>
<td>4785</td>
<td>334 (7.0)</td>
<td>1.41 (1.22,1.62)</td>
<td>1.32 (1.15,1.52)</td>
<td>p=0.0001</td>
</tr>
<tr>
<td>2+</td>
<td>5726</td>
<td>313 (5.5)</td>
<td>1.10 (0.95,1.27)</td>
<td>1.35 (1.17,1.57)</td>
<td>p=0.0001</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Years Since Due at Practice</th>
<th>1. 0&lt;-1</th>
<th>2. 1&lt;-5</th>
<th>3. 5+</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>6480</td>
<td>468 (7.2)</td>
<td>1.00</td>
</tr>
<tr>
<td>2</td>
<td>8073</td>
<td>433 (5.4)</td>
<td>0.74 (0.64,0.86)</td>
</tr>
<tr>
<td>3</td>
<td>7515</td>
<td>320 (4.3)</td>
<td>0.59 (0.50,0.69)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Billing Rate</th>
<th>Highest fee band</th>
<th>7497</th>
<th>505 (6.7)</th>
<th>1.82 (1.51,2.19)</th>
<th>1.42 (1.19,1.71)</th>
<th>p=0.0001</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Middle fee band</td>
<td>10497</td>
<td>565 (5.4)</td>
<td>1.45 (1.21,1.75)</td>
<td>1.41 (1.18,1.67)</td>
<td>p=0.0001</td>
</tr>
<tr>
<td></td>
<td>Rebate Medicare</td>
<td>4074</td>
<td>151 (3.7)</td>
<td>1.00</td>
<td>1.00</td>
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</tbody>
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13.4 Appendix 4: Interviews with GPs

13.4.1 Plan of questions for interviews with GPs

The plan for the interviews with the GPs followed the structure outlined below:

1. Thinking back, how well did the reminders work for you in your daily practice?
   Prompts:
   - How well did they remind you about the care that you intended to provide?
   - How much were you able to respond to the reminders?
   - Were there particular situations in which you were more or less likely to respond to the reminders? Particular patient, consultation or preventive opportunity factors?

2. In what ways do you think the reminders changed the care you provided to your patients?
   Prompts:
   - Did the reminders interfere with the care you wished to provide? In which ways?
   - Do you think the patients noticed any change in care? Why?

4. What effect did the reminders have on your workload? Why do you think that this happened?

5. Were there any particular aspects of the reminders that you found not so useful in your practice?
   Prompts:
   - Too many reminders in one consultation
   - Too much else to do in the consultation
   - Preventive activity or activities not indicated or appropriate for this particular patient
6. Could reminders about preventive care been made more useful? How?

Prompts:

Show number of previous opportunities to perform the activity

7. Looking back at the trial, and your use of the reminders since the trial finished, can you talk about the overall positive and negative aspects for you?

13.4.2 Transcripts of interviews with GPs

13.4.2.1 Doctor 2

OF: Thinking back, in that one year when we first did the reminders, how well did they work for you in your daily practice?

DOCTOR 2: I found them very useful, in terms of the ones that I’d use on a regular basis. It would be things like blood pressure, weight, height, smear test, to sort of, although we have our own smear test reminder system, so that was probably less useful for us because we already had that set up. But the other ones, I thought they were really useful, because it’s not the sort of thing that, in a computer system you can’t see the whole of the patient notes. When I had paper notes I could see on one page the summary of everything and had a wider view of what had been happening in the recent times by being able to see within just strictly one page, you could see like, you know, over the last six months or whatever, or a year, the recent things that had been happening. It was easier, I think, with that system to say: “Oh, look, I haven’t done your weight, I haven’t done this, I haven’t checked that, and be able to follow it up, but
on the computer system, I find that much harder, and having something at the top to remind me, those things need to be done.

OF: So the system kind of did the looking for you?

DOCTOR 2: It did the looking for me, and then I could go and check and see what things did need to be done, and sometimes it would then mean it would be, potentially remember then to consider other things as well, it wasn’t just the ones that were written there, but you might say: “Look”, if it was in a consult where I had the time, then I would check up the other things. If it a consult where I was running a long way behind, or it was very complicated or busy or whatever, then I wouldn’t necessarily always use them, but if it was one that was, that had the space to do it, then I’d make use of them.

OF: I think that’s an important point actually. Non GP researchers have criticised GPs for not doing everything every time. Part of my mission is to point out there are good reasons why you can’t or wouldn’t – like somebody’s had a nervous breakdown - you wouldn’t say: “We’re going to give you a tetanus injection. There are good reasons why you would not do things.

DOCTOR 2: Absolutely. Sometimes it’s just not practical. Sometimes you’re flat out, somebody’s not terribly impressed that they’ve just walked in because you’re running over an hour late, and if you start saying: “And now I want to do this and now I want to do that”, they’re going to say: “But hang on, I wanted to be out of here an hour ago, and they’re not at all happy to stay around while you’re doing all the extra things.
OF: How well did they remind you about the care you actually wanted to give? You might remember we had a meeting and I collected things from you about how often did you want to do what, and there were things all of you said: “We don’t want to do that, like pre-pregnancy rubella testing, or, there’s a whole range of them, so for the reminders we did have, did they remind you about things you did actually want to do for people, mostly, or were there ones that you thought were irrelevant or inappropriate?

DOCTOR 2: I think that the ones that were on there were ones that I always considered relevant. I do think it’s relevant to have a height recorded somewhere and to have the weight done regularly. Even if it’s only when people send you insurance forms to do, and they say: “And what was the weight and what was the height, you think: “Oh, I don’t know if I’ve got that anywhere (laughs). So those things were all relevant to me, I think, and tetanus state, you know, update for tetanus. There’s other ones that I find difficult, which is just updating background history and things, to remember to do that every so often. There’s no real prompt for that, it’s just if it comes up in the midst of something else you’re doing, or you’re having to do a referral and you go back and find out that you haven’t updated the background history of what’s been happening recently in the medical timeline for people.

OF: And can you talk about how the reminders changed the care that you were giving? Did they interfere with care that you did want to give, or what effect did they have on the quality of care?

DOCTOR 2: I don’t think that they interfered with the care that I wanted to give, ‘cos most of them were fairly quick simple things that you could slot in if it was appropriate
at the time, and I think it would have improved the care overall, because it meant that you had a better consistency of information that you had there, areas that could be blanks that could be overlooked and that you were able to update.

OF: And what effect do you think the reminders had on your workload? Did they make any difference?

DOCTOR 2: Yeah, I mean it increases the amount of what you’re trying to do at the time of the consult, so it increases the time spent with the patient and for most folk, they don’t mind that, most folk don’t mind you doing a bit extra and paying attention to them. Occasionally you’d find, because if I was also using that as a reminder to go back and check, because one of those prompts that appeared was our background data information, like the PAT...

OF: Yes, the Patient Registration Social.

DOCTOR 2: Yes, the patient registration social thing, the social thing. You’d get some folk who would be suspicious of that, why are you asking me all these questions, and why do you want to know that, and who else is going to know that? So you do get that from some patients, that you then have to start defending why you need that information from them, and some folk would say, “Look, I don’t want that recorded.” There’d be certain things they’d say that they didn’t want actually recorded. But for most people, they would just accept that as being part of the normal process of gathering information and improving their health status.
OF: Alright, that’s good. Can you think of any ways we could have made the reminders more effective? What would have helped to improve the response, if anything?

DOCTOR 2: No, I don’t think…one thing that was sometimes happening, and I don’t think that it was your system, I think that it was because there was already something on the system, was sometimes I’d get multiple Pap smear reminders up there when the person had already had their Pap smear, but I think that was coming through because somebody else had already programmed…

OF: You had your existing recalls already programmed, so I left them alone, so they also may have…

DOCTOR 2: And some of those were like the system before the current system too, so that was like, so you end up with a whole list of things that you had already marked off, but couldn’t get rid of, and so that was the only problem that I had with them.

OF: One thing I thought of, which we vaguely thought of, I don’t know if we thought of it at that time was, it would help me probably if it said: “The patient has been six times and this thing should have been done and it hasn’t been done yet. A kind of guilt-driven thing, I suppose, to say, this is still, nobody’s done anything about this.

DOCTOR 2: This is one that’s been ignored for some reason (laughs).

OF: Not just by you, because they’re seeing different doctors, but nobody’s done it, and to me that would be a motivating thing. I thought that could help.
DOCTOR 2: I think it’s (pause) I don’t know how much that would motivate – ‘cos just having it there tends to motivate me, so knowing that it’s been ignored X number of times would probably not make a difference. Just the fact that it’s come up and needs to be done is as much motivation to me as the fact that it’s been there for a long period of time probably.

OF: Do you think the patients noticed…

DOCTOR 2: That’s because I’m partly obsessional, I’m totally obsessional…

OF: You’re not the first one who’s said that.

DOCTOR 2: And I like to tick all the boxes (laughs).

OF: Maybe it’s just part of our job. Do you think the patients noticed anything different, once we had the reminders? Did anybody say anything, or did they seem to detect there was anything different going on?

DOCTOR 2: No, I don’t think so, except those ones that would question it, those ones who would jack up…

OF: Oh yes, that was only about the social…
DOCTOR 2: That would be more sort of once we got into the social registration. They didn’t mind me sort of doing their weight or whatever – but well, some of them do, some of them say they don’t want to know what their weight is, and don’t want to have that, but it was more the folk when I was getting into the details of other things that they would be worried about that information gathering, but I don’t think they actually noticed, there was no comments made otherwise.

OF: Do you remember I put in a set of codes, where you could write down that they were refusing or ineligible, either temporarily or forever, and there were very few of those kind of notations made, but there must have been more people who refused things.

DOCTOR 2: Sometimes I found that…

OF: Because that would switch them off, you see, so you wouldn’t be bothered again, for one year for the temporaries, or forever. Sometimes it’s not clear if they’re really refusing.

DOCTOR 2: I’m just trying to think. There’s some that are … there was a keyword that I know I was often looking for something to put on, and couldn’t find, but I can’t remember now.

OF: I think that I gave you a note that said if you put REFU or REFUSE that would find all the refusal and ineligible ones together. I tried to make it easy, but you may have forgotten it in the rush.
DOCTOR 2: That’s possibly - I must admit, most of the time, I wouldn’t have been thinking about people refusing and saying “OK, I’ll put that down as being a refusal”. That’s because they didn’t know – people don’t know when their last tetanus was. That was always hard – how to record that when people don’t know, when you’ve actually asked it.

OF: You can put your best guess.

DOCTOR 2: That certainly did happen – there’d be times I said “When was your last tetanus?” and the person would say that they had no idea. So I’ve actually asked, but there’s nowhere to say that I’ve asked that in the recall system, like “Tetanus asked for, but patient doesn’t know.”

OF: We could have had that as another category, I suppose.

DOCTOR 2: And so I’d say: “Go away and see if you can find out and let me know the next time you come back”, and some of them I’d say: “Did you have one when you were fifteen?”, and try to put that in back to when they were fifteen or five even. But for some people, they’d say: “I don’t know if I’ve ever had a tetanus”, and so I can’t put down a best guess if they may never had a tetanus, and there was nowhere to actually say that I’d asked them.

OF: I did the whole thing so that it wouldn’t interfere with all of your normal things, you could just ignore, I didn’t want to make you do anything different. That was the whole aim. We could have could have had a thing saying “Patient doesn’t know”, or
could have tried to write down “Care offered” and left it that, because sometimes they aren’t outrightly refusing, they say “Maybe next time” and so it’s not clear what they think. We’ve covered most things. This is only a small exercise. What do you think were barriers to providing the care, if the reminders were reminding you about things that you wanted to do, but you couldn’t always do them? What were the barriers?

DOCTOR 2: Time was the biggest one. If you’re busy or the patient came in and had a long list of questions or problems they were coming in with, and you’ve gone over time already with them, then taking extra time to go in and do … and the computer tends to be rather, the way we’ve got it set up is a time-consuming process in any case because you have to go out of where you are, you have to go into somewhere else, you have to detail it, and then you have to come back out of that section and go back in. Again, in contrast to when you could just do it on one sheet of paper, just do a quick notation, you could do that very fast, it wouldn’t be nearly as time-consuming to do that. So, time and … there’d certainly be the consults where it just wasn’t appropriate, because the person was presenting with things that … if somebody’s very sick and they’ve got a raging temperature and they’re throwing up all over the place, then that’s not the time to start doing background stuff, unless it’s really relevant to what you’re doing at that stage.

OF: It’s a big factor.

DOCTOR 2: Yeah, but it helped to make you think of it at least. What I did do with some folk is that I’d say: “Look, there’s a number of things here that would be useful for me to do like, I need to update some things on your records and I don’t have time to
do that right now, but could you, during the follow up appointment next time, if there was going to be a follow up, I’d say: “Can you make that a longer consult? I want to update some of those things and have the time to do it. It was useful to find the time to do that kind of reminder and get the people back

OF: So, would you arrange a special one, or just say: “Next time you’re coming”?

DOCTOR 2: If it was a follow up appointment, like I knew I was going to get them back in any case, I’d say: “Make that a long consult”. If it was something where we were really lacking, that somebody had a complicated medical history and we were lacking in that information, then I’d say: “Look, I need you to come back as a special appointment just to update your medical notes to make it relevant, so that if you did come in and you were really crook, we’ll have all that information and … but that would be the … or if it’s a new patient too, I’d sometimes say: “We haven’t had time to do all this, you need to do that, you need to make a special appointment to come back”, and then there’d be some to whom we’d say: “Look, next time you come in, because we’re not needing to see you in the near future, but just remind me that we need to update some of those things.”

(Interview ended, but DOCTOR 2 had more to say):

OF: A bit more about what the patients noticed and what their reaction was.

DOCTOR 2: I was saying that the majority of patients wouldn’t have made any comment, you know, you’d say can we, we haven’t done your weight recently, I’ll just
check that, or I need to check your height or whatever, or when was your last tetanus, from most of them there wasn’t any response. But you would get the occasional patient who would make a comment and would be saying: “Thank you for being so thorough, thank you for taking the time, often that would be a comment, you know, to do all that, and sometimes you also get the comment where I was going back and updating medical history and things and saying: “Look, this has taken a bit longer, this consult, because we’ve done that”, but you’d get a positive response from some patients saying, you know, that they appreciated the effort that was being put in. Occasionally you’d get someone saying, you know, I’ve had some patients who have made the comment: “I used to see Doctor So and So, Doctor So and So never used to do that, but I really appreciate that you take the time and look at other things.”

13.4.2.2 Doctor 3

OF: Thinking back, how well did the reminders work for you in your daily practice?

DOCTOR 3: It probably blended into the background, I think, so I’m happy to say that in terms of prompts and things they weren’t overly obstructive. I think in my career as a GP, though, they were probably started off fairly early, and so I was probably still finding my feet in terms of working my way I was going to practise as such, even though I was supposed to be a fully-qualified GP and whatever else. My evolving practice has been such that the way I practise now is actually quite different to the way I was practising then, and in some ways it was a case of treading water back then. So I don’t know as in how much of an impact it did have actually. I would have been curious to see as in how many of those prompts were doing that, or whether it was a
case of I was getting conscious or self-conscious of actually doing things properly. I remember there was a time that I didn’t try to say: “Oh, that’s person got about seventeen prompts that need to be addressed and it probably was a feeling that I should address them, but I’m not sure if I, if statistically I made any difference to that or not.

OF: Do you remember that we tried to tune the reminders up to do things that you said as a group that you wanted to do, and so I asked you about how often did you want to do all these different things for different people. Some things the group said: “No, we don’t want to do that”, so we didn’t have a reminder for those. How well did they remind you about the care that you were trying to provide? Did they pretty much match up to what you wanted to do for your patients?

DOCTOR 3: I think so. I think that it was after that set back. I think that as a group of people I’ve seen them more involved now go through it now and I think if I were to go through it now I’m guessing I would potentially do things differently, but I think that’s more the style of my practice that will have changed, rather than sort of what I’d hope to get out of them.

OF: Were there any particular situations do you think where you were more or less likely to respond to the reminders?

DOCTOR 3: Yep. The situation, it’s always time, because that what you do find is that when there is adequate time or when you are not being time poor, then that’s the sort of times when you look at all those preventive issues, “Gee, I haven’t got this person’s
height measured, I haven’t got, we haven’t done the smear test, I’d better remind her about it later”, all those sorts of things.

OF: Alright. In which ways do you think the reminders, which you’ve touched on I think, how did they change the care that you did provide? Did they change it, and if so, how?

DOCTOR 3: I think that they probably actually helped documentation, I think for things was quite often that you may do and don’t get to document. There’s some examples – things like: “You’d better come back for that smear test” is quite often... One example was that the purpose was to get rid of the prompt (laughs) as a worm. You’d actually say: “There’s a reminder re smear test.”

OF: Did the reminders interfere in the care you were trying to provide? Did they cause any problems?

DOCTOR 3: They caused some problems, they caused some problems with the care, I suppose this whole package can get to do that. In terms of, sometimes they add to the extra angst, I remember at that stage, if a person comes in with a complicated problem, and you see they’ve got seventeen reminders come through, it tends to make you feel sometimes how am I going to tackle this, where am I going to tackle this, where am I going to start chipping away at? It’s when you start to look into certain issues. If someone comes in with multiple different problems and it’s the first time you’ve seen them as such. Sometimes it’s a problem of how am I going to do this and then you get a prompt all of a sudden that says you don’t have this done, you don’t have that done, it
probably adds to your own levels of angst and whether that potentially may come across in the way in which we do practise. As I said it’s some time ago. I recall some of those sorts of thoughts.

OF: Related to that, do you think they had any effect on your workload as such?

DOCTOR 3: Yeah, I’m sure they built on it. I’m sure they probably built on it, but if that’s a good thing or a bad thing, I don’t know. As I said, in those days I was starting off early and probably had less of a workload than I would now, and I was a young GP. I was probably starting off, trying to start off a practice, rather than actually trying to minimise work and it was rational work as it were, so I think in that sort of way it was probably actually a good tool to finding work.

OF: Do you think the patients noticed any difference once we switched the reminders on? Did anybody say anything, or did you get a feeling that there was anything they were noticing?

DOCTOR 3: I didn’t sense that.

OF: Now we’ve kind of covered it, but I’d better ask you again – can you talk about any reasons why you could not or didn’t respond to reminders? What were the things that would stop you, if they were reminding you about things you wanted to do? You mentioned time.
DOCTOR 3: Time was the biggest thing. Sometimes it’s the nature of the consult, where it’s not appropriate to sometimes talk about those sorts of things. Certain times where someone’s come in because they’re down and depressed, you don’t want to say, have them hop on the scales and check their height and things. If they’ve got low self-esteem or whatever else, you try to say, well actually you’re overweight and everything as well, it’s not going to be an appropriate time to act on that when you’re trying to do CBT-like activities.

OF: Have you got any ideas on how we could make reminders like this more effective, so that they would help you more?

DOCTOR 3: Variation on the prompts (laughs). I imagine if you’re seeing the same ones each time - I imagine sometimes if it gets to be actually randomised in some ways. That’s something that’s gone through my mind. After a while it’s that you do actually turn off and ignore them being there, especially after using it for several years. So something like as an example, if height’s not been recorded, something like: “George, have you thought about a height?” And if it just looks different, it’s more likely. May not get to be like a standard block as we tend to see it, towards the end. It was actually about this morning, when I saw it come up, I thought I don’t really notice it any more. I’m guessing, it’s like to use a bad analogy every time they put the speed limit up or down, they change it, for a bit of time people adjust to it then they go back to old habits.

OF: One thing I thought of, which I’m not sure when I thought of it, I thought it would help me or motivate me, if the reminder said “You’ve ignored this the last eight times the patient’s been here”, if there was a little counter or something, or other ways of
highlighting them, but even counting them might do, because I think I would feel more guilty if it did this.

DOCTOR 3: Does it add to your angst, though? Eight different ways of saying you haven’t recorded this person’s height. They’re really good actually for things, medico-legal things, the amount of times later on that you get requests from an insurance company for standard income protection sorts of form, or whatever else, where those kind of things you don’t get to do. They’ve probably saved a lot of times.

OF: That’s good. That’s covered most of what I intended. Do you want to say anything more about in general what was good and what was not so good about having it?

DOCTOR 3: I’m pretty happy. I’m probably keen to re-visit and see what the results were like.

13.4.2.3 Doctor 6

OF: Thinking back, overall how well did the reminders work for you in your daily practice?

Doctor 6: I thought they were really good. I thought they worked well and they were my first experience with having the reminders. Now that we’re using Medical Director, of course, there’s a good reminder system, well you know, it can set up…

OF: I don’t think it’s as good personally, because you can’t change it yourself.
Doctor 6: But it was the first reminder system that we had. I thought it worked particularly well to start off with, and then unfortunately your brain got used to it, and you had a tendency just to ignore it as time went on, but I think it, from memory, it changed what I was doing quite a lot in terms of preventative medicine. I was much better at preventative medicine with the reminders.

OF: That’s good to hear. Were there situations where the reminders seemed more important? I found in my practice, where patients who are coming very often – a young person and we’d never done her cholesterol, and there was a family history of heart disease. She had a lot of problems, and we were so busy dealing with all that, and she was coming so often, you kind of assumed I must have done that, but we never had. Did you have any where you were surprised or shocked to think, we haven’t done…

Doctor 6: I actually think that probably about that period of time it actually changed the way I practised. The fact that I was reminded about all these things. I’m now probably a little obsessive-compulsive about those things and I’m going to have as part of my problem profile, I will always have preventative medicine which will have everything in it. So whatever they’re due for in terms of screening – smears, mammogram, demineralisation, bone density if I think they’re appropriate, faecal occult blood test are all listed in preventative medicine. I think that the start of that was when we started doing those reminders. It just sort of changed my thinking a bit about…Prior to that, I thought I was doing OK, but clearly the reminders demonstrated I wasn’t doing OK, and so I think that it probably did change the way I practised.
OF: That’s very important. OK, so you’re getting the reminders - how much of the time when you got them were you able to respond?

Doctor 6: To start off with mostly, just about all the time. I could always look at them and respond, as I say. As time went on, I think they lost some of their power, ‘cos I just got used to them, and when I was busy I just had a tendency to ignore them, whereas at the beginning, for some reason I think because it was fresh and new, I used to go Oh OK, we need to do all these things. And I think that’s what happens with lots of things, you know with, if you look at using Medical Director for scripts, you know when you first start using it, all those warnings that come up, you read them all, and then, you know, when you’re at this stage you just so I think for reminder systems to work maybe they have to change every twelve months to actually…

OF: That was going to be one of my questions: have you got any ideas how we could make reminders more effective for prevention in particular?

Doctor 6: I don’t know how you do that, but it sort of has to be fresh.

OF: One of the things that occurred to me was that, the way I set it up I didn’t think of it at the time too much, is would it help if the reminders said: “You’ve ignored this, this has not been done at the last six visits” and it’s been due every time the patient’s come for the last six times. It might have been other doctors seeing them. Would it help to know if the patient keeps coming and you keep not doing it?

Doctor 6: I think that would be very useful.
OF: To me, that would probably be a motivating thing, a kind of a guilt thing, I suppose.

Doctor 6: It’s really important. I still see patients, especially young males … I was just reading one of my notes this morning. The last time I saw this bloke, I wrote: “This guy’s been coming to this practice for eight years and nobody’s ever taken his blood pressure, nobody’s taken family history, nobody’s checked his immunisation status. So I did all that stuff and then of course, he hasn’t come in again for a couple of years. That’s fine. I’m not being critical of other people, because I do it too.

OF: It’s like that for all of us.

Doctor 6: So I think that would be very useful.

OF: Are you still getting those reminders now?

Doctor 6: Yes.

OF: So when he was coming, they would have been there. One of the questions that I’ve looked at in my research is does it matter if it’s the usual doctor, and I think if nobody feels they really own the patient because they only come infrequently and see a different person every time, I suspect that’s part of it - that everybody thinks somebody else will do it at some time.
Doctor 6: (Laughs) I’m a little obsessive-compulsive, I’m afraid, so I have a tendency to do it. If I’m seeing someone for the first time, even if they’re just coming in with a cold, I tend to check for everything, I just tend to check for everything if I have time. Sometimes even if I don’t have time, I tend to check that everything’s been done, and I’ll often go: “Look, you need da-da-da and you need come back and talk to us about again”, which they often don’t, but at least, you know, I’ve spoken to them about it and recorded that I’ve spoken to them about it, rather than as I say... or when you get a life insurance policy, someone comes... and you look back and you’ve got this person who hasn’t had a smear test for ten years, for crying out loud, and you wonder how did that happen, that sort of stuff.

OF: Did the reminders in those kind of situations make a difference, do you think?

Doctor 6: It doesn’t seem to happen so much now. Certainly on our recall system, they sometimes fall through the cracks. I’ve never seen anybody that’s fallen through the cracks on the reminder system, so obviously I’ve just been ignoring the reminders.

OF: Yes, that’s one of my interests, because doctors can’t respond every time. So I was going to ask you whether certain situations where you were more or less likely to respond - certain types of patients, or whether you charged them MBO or a higher level of fee, or if they were frequent attenders, or if you knew they usually saw you or they usually saw somebody else?

Doctor 6: I think it’s true. I think if they tend to be someone else’s patient, you tend to take less responsibility. Conversely, down the other end of the spectrum, I think if you
see someone with lots of problems frequently, often you get tunnel vision and you’re so focussed on their particular problem that you don’t look outside the square and you forget. All of a sudden you haven’t done anything for a long time, so I think at both ends of the spectrum there’s a problem. And also, if you’re pushed for time, if you’re running late, all those sorts of things impact on whether you’re going to pay some attention to reminders.

OF: Do you think the reminders made any difference to overall workload, and if they did, how?

Doctor 6: Yeah, they did… but I mean, as much as possible, you try and do what I said, you know … like, “I’m checking your blood pressure now. Here’s a form, go and have your cholesterol done. Come back and talk to me about it.” Or: “We really need to sit down and take a full history with you and do whatever, faecal occult bloods or whatever. This is the list. Here are a few things for you to do. Come back and see me again.” I think if you’re prepared to just get people to come back, and they’re prepared to come back, then you can sort of get around having to spend too much time. ‘Cos, quite honestly, if someone comes in with a cold, that takes you two minutes and they’re here for fifteens so that gives you thirteen to get your head around the rest of it.

OF: So, those situations, would you be more likely to act on reminders because you had some time available?

Doctor 6: Yes.
OF: I can tell you about the findings in a minute of what we found in that, which was very interesting. Were there any bad or negative things about the reminders? Did they cause you any problems, or interfere in the normal care you were trying to give?

Doctor 6: I don’t think so. I didn’t find them annoying or anything.

OF: Because you could ignore them. We deliberately did that, so you didn’t have to pay any attention. There have been other trials where they made their doctors respond, but I didn’t want to interfere with what you were doing in any way. You’ve probably answered most of the questions that I had written.

Doctor 6: As I say, I liked them, but I know some of the other guys, probably the people who aren’t going to talk to you, are the ones didn’t like them.

OF: I think that’s right. I think there’s at least one who … which is interesting in itself, of course.

Doctor 6: Just my own experience is the guys are much less focussed on preventative medicine, and whether that’s because they carry a, they tend to carry heavier workloads and see more patients, and they’re pressured, or whether it’s the obsessive-compulsive thing, I don’t know, but they don’t tend to be as good.

13.4.2.4 Doctor 7
OF: Thinking back to when he had that trial at the beginning of the first year, how well did the reminders work for you in your daily practice?

Doctor 7: I think I responded to most of them fairly well. I tended to act on them, is what I’m saying, if I saw them, initially anyway.

OF: You remember that we had a meeting when I met with the doctors and then I asked you to fill in some things about how often you wanted to do each thing for each patient, and I took a consensus of that. How well did they remind you about things you actually wanted to do for your patients? Where they mostly things that you agree with?

Doctor 7: Pretty well.

OF: How … do you think there were situations, certain patients or certain consultations where you were more or less likely to respond to the reminders?

Doctor 7: Certain situations, where I was more likely to respond. If I was running an hour late, I was less likely to respond, for example. If the nature of what they came to see me about was fairly occupying, and you had to do a lot, then I’d be less likely to respond. If it was an acute thing or something, I’d be less likely to do the preventive stuff, with the exception of men.

OF: What was different about…?
Doctor 7: With men, you only ever see them when it’s acute. Even to this day, I still, I get a man come in with a sore throat, and you’ll get his blood pressure and his family history updated, and his smoking and his alcohol, and all of that will be done, because you may not see him again for several years. So, yeah, men are an exception to that rule, unless it’s a severe emergency, like a heart attack, or something, in which case you’re not going to do all that stuff obviously. So even then, for women and my usual patients, it’d depend on the circumstances.

OF: Are you saying for people who come less often, you will therefore make the effort when they are there?

Doctor 7: Correct. If I can see that they’re not a common attender, and as I say, males in general fit this characteristic, they only come when they have to, if I saw that, if I spotted something that it was a long time since we’d done something, that might trigger me to…

OF: So seeing that something has not been done for a long time, so did that make a difference too, because that information was on there?

Doctor 7: Correct.

OF: Do you think it … that’s probably enough on that. How do you think the reminders changed the care that you were providing?
Doctor 7: Probably became more aware of the preventive issues. They were more at the front of my mind, I suppose, so I started to do that more, and that’s carried on. I think we’re – I don’t know, but most of the doctors in this practice are pretty good on preventive care these days.

OF: Do you think the patients noticed any difference once you started getting the reminders? Did anybody say anything, or…?

Doctor 7: I don’t recall anybody saying anything. Occasionally you would get somebody saying “Why are you asking me of all these things?” Then you’d explain why and: “My other doctor never did that!” (laughs). That sort of stuff. Occasionally you’d get that. I don’t remember noticing a lot of people commenting.

OF: Do you think their reaction was mostly favourable?


OF: Overall, what effect do you think the reminders had on your workload, if any?

Doctor 7: They would have increased it. They would have made some of my consultations longer. Yeah, not enormously, but some.

OF: What do you think were the main … if the reminders were reminding you about things that you wanted to do for your patients, what do you think were the main barriers
that caused you not to be able to respond? You’ve answered some of them - there was time…

Doctor 7: Yeah, the time was the …

OF: Are there other things that would make you not respond, or less likely to respond?

Doctor 7: I can’t think of anything else that would make me less likely to respond, actually.

OF: Have you got any ideas… oh, yes, I also wanted to ask you: did the reminders interfere in the care that you were trying to provide? Did they have negative effects or cause you any problems?

Doctor 7: Not in general. I don’t recall that ever happening. I do recall I had a diabetic fellow come in, now I can’t even remember if this was in relation to your preventive reminders, and he was just so, he was an insulin-dependent diabetic, and he was just so far behind everything. He was just wanted an insulin script, and I said: “You need all of these things done” and I never saw him again. I gave him the forms to have all these tests done. He never came back. It was clear that he did not want to engage in that preventive behaviour, for whatever reason, I don’t know why. That’s the only time I can remember anybody being really put off by trying to do preventive stuff.

OF: Right. So you’re saying that in general the reaction was favourable.
Doctor 7: Yeah, in general the reaction was favourable. People will tell you if they don’t want to do something.

OF: Have you got any ideas on how we could make reminders like this more useful, so they’re more effective in helping you? I thought that over the years you might have thought if they did something differently, or were presented differently?

Doctor 7: I think they worked fairly well. Presumably with the newer systems you could find something that was a bit more elegant.

OF: Yeah, you could make it prettier on the screen.

Doctor 7: Yeah, but yeah. I haven’t even looked at what’s on this one, Medical Director, in actual fact. The interesting thing for me is that the whole thing became so ingrained in my head that I do it automatically now (laughs).

OF: That’s good, I suppose, in terms of prevention. I did think that one thing that would motivate me to respond, which I never got round to programming at the time we used it, was to show the number of times we had not acted on the reminders, so if we knew it was twenty times the patient had been and we hadn’t done anything yet…

Doctor 7: I find that really interesting. I audit our notes. I’m the person who has that lovely job, and there is something that drives me insane, and that is, when a smear recall is generated, at least I, and most other doctors, actually record in the consultation data “smear recall letter sent”, and then you… When I’m doing auditing, I’ll see that that
patient has been seen five times subsequent to that letter, and nobody’s even commented on the fact they’re due for a smear test, so they’ve just, you know, they may not look. You see, I’ve made a habit of looking at the last five consultations as we start talking, but they just don’t do it. So it drives me nuts. So what do you do about that? How do you …?

OF: Well, that’s … I suppose that’s what I had in mind - that we need the reminder to point out how many times…

Doctor 7: (Interrupting) That’s what I’m saying. You need something to point out, some alarm come up saying this person still hasn’t had their smear test (laughs), or whatever.

OF: You can make the reminders bigger on the screen…

Doctor 7: Bigger…maybe…maybe…

OF: …various ways you could highlight them…

Doctor 7: “STOP!” (laughs)

OF: Or if something like that happened, in fact you could suppress all the other reminders, so that was the only one showing.

Doctor 7: Yeah, maybe there is, if you think that’s important enough…
OF: I thought about ranking them, so you could show fewer at a time. Somehow you’d have to work out which are the most important…

Doctor 7: You’ve got a point there ‘cos when you get a lot coming up on the screen, you tend to be selective about the things you do any … you’re not going to do them all, hardly ever, anyway.

OF: Unless the patient walked in and said: “I want a complete check up”, I suppose.

Doctor 7: Correct, and then you might do it. Yes, something like that might work, making it big, so that when you log on to their notes, it flashes in your face.

OF: I did think of that. You could progressively make the things bigger and noisier.

Doctor 7: Bigger and noisier, so to speak.

OF: You could have a hooter going: (hoot imitation)

Doctor 7: (big laugh)

OF: You could do all that. That pretty much I think is all I wanted to ask, unless you’ve got any other overall comments about the whole concept, or how to…
Doctor 7: I think it was useful, that’s about all I can say, that really it was useful. We had some glitches in it, some technical glitches.

OF: Yes, I remember that well.

Doctor 7: I can’t remember very well...

OF: We had some programming bugs, from having an amateur doing the programming.

Doctor 7: (Laughs) That gave a few frustrations, but overall I think it’s a good idea. What were the results like? Did it improve our behaviour?

13.4.2.5 Doctor 8

OF: Thinking back, how well did the reminders in that first year, that was from 98 to 99, when we had for some patients you were getting reminders and for some you weren’t, how well did they work for you in your practice?

Doctor 8: Well, I certainly liked them and they certainly helped for certain functions, and certainly the easier ones like weight and smoking were easy things to be prompted for and make notes of, that I can recall, at any rate.

OF: How well did they remind you about things that you wanted to do for patients, because you remember we had a meeting and I got you to write down what you wanted to do for people.
Doctor 8: We picked the top ten, didn’t we?

OF: Well, yes, you picked the…I offered you a whole big list and...

Doctor 8: We ended up with ten of our favourite reminders, I think. I think for my population that I see, certainly cardiovascular risk factors for blood pressure and lipids were good things to do, and they certainly helped me. Certainly the mammograms and the breast screening one was, and smears and things also kept popping up and kept you alert that they needed to be done.

OF: To what extent were you able to respond? So you got the reminders, and then how much of the time could you actually respond if you wanted to?

Doctor 8: About half the time.

OF: Were there situations, where you were more or less likely to be able to respond or to respond? Particular kinds of patients, or if they were new patients or old patients or they’d been a lot, or bulk billing or not, MBO billing or not?

Doctor 8: Because it’s up on the screen, then you knew that if you got, had done it, then it would be deleted off the screen, that sort of made you…

OF: A shooting gallery.
Doctor 8: Yeah, it was. Like, you’d try and target to try and get rid of them so that you didn’t see them again the next time around, and actually it did prompt you to ask some questions and do some preventative health stuff, so they weren’t there on the screen.

OF: Can you say in which ways the reminders might have changed the care that you did provide?

Doctor 8: I think it started changing the way that you practised, in terms of not just dealing with what was there on the day, and started to look at those other preventative health issues. That really does you make you think about that sort of thing, ‘cause it’s staring you in the face when you look at the screen all the time. So, yes, I think it does. It certainly changed the way that I practise, that’s for sure, and certainly I think the consults have got longer and the patients have become more difficult.

OF: I can tell you about some of the findings about that. Do you think the patients noticed any change in care? Did anybody comment that anything seemed different?

Doctor 8: I don’t think anyone ever commented on that. Certainly some of the times I think some of the way that we practised and our style of practice changed, and I think certainly that got round to the community and I think you did get some referrals back. I always think it’s a bit like the guy selling the steak knives: “And there’s more”, and you’re actually offering a different service, and so the people seek you out because of that.

OF: So you think that word got out that you were doing something more than...
Doctor 8: Yeah.

OF: That’s very interesting. What effect do you think the reminders had on your workload overall, and if they did, why do you think that they did?

Doctor 8: We certainly had to see the patients a bit more often, ‘cause you had to do a few things like either a blood test or a smear test, so your actual workload was increased, that’s for sure.

OF: Do you think the reminders... were there… what do you think would be the barriers to responding to the reminders? What would be some of the reasons?

Doctor 8: The biggest one is time. That’s the biggest one. Certainly if you saw someone with a relatively quick problem to deal with and you had time left in a fifteen minute appointment, then it was really easy to start to look at those things and start to knock one or two of them off. But if you’ve got someone come in crying with depression you didn’t have time to deal with those things.

OF: Were there any negative aspects? Did the reminders interfere in the care that you were trying to provide, or cause you any other difficulties or problems?

Doctor 8: I don’t think there was anything negative other than they were there on the screen, and I’m sure for the obsessive person they annoyed the heck out of them.
(Laughs). I’m not that obsessive, so it really didn’t worry me if they stayed there for a while.

OF: That’s right. I deliberately set it up so you could ignore them. You didn’t have to respond.

Doctor 8: That’s right.

OF: I thought that’s the only way to make it work. Have you got any ideas about how reminders for preventive care could be made more useful, now that you’ve had the experience of those? Is there anything we could do to improve them, so they help you more?

Doctor 8: I suppose there’s always going to be new things, and new reminders, and there’s always lots of things. I think the important thing is you can turn them on and turn them off and select target things that you want to try and target in your practice. I think that’s probably the best way to handle it. As long as they don’t interfere with your note taking on the computer, then I think that’s fine. I think that if you have to flick past them or click, click, click, click before you actually get to the notes is quite a bugbear in some of the programs, but the way that we’ve set it up, it was just there in the background, as it were. You could just go straight past them without having to worry. Certainly that wasn’t a major problem at all.

OF: I did think about at some point, and I don’t know if it was at the beginning, that it would probably motivate me more if I knew how many times I’d not done it and how
many times I’d ignored the reminders, so you can number as one of the columns as the
eighth time the patient’s been seen and...

Doctor 8: …nothing’s been done.

OF: That might motivate me.

Doctor 8: That might… yes, that might be true.

OF: Because as it was, you didn’t get a score like that, so you didn’t necessarily know.

Doctor 8: And if you wanted to, you could just continue ignoring them forever, without
doing anything. I suppose with Medical Director and things like that, people would
just turn them off and never turn them back on.

OF: I think that it’s quite common that they do.

Doctor 8: And so you can get caught in not having those reminders. Certainly things
like the blood pressure and the date there, as you were saying, is a good thing, because
you know when it was taken last, and you might sort of just say: “That’s all right, we’ll
let that one run”, because it’s always been low or something…

OF: That’s right. If you know it’s been normal every time…
Doctor 8: It doesn’t matter whether it’s one or two years since the blood pressure’s been taken. You might not feel so bad about that.

13.4.2.6 Doctor 9

OF: Thinking back, now we started the trial on 9th March 1998, so you started getting these reminders for some of your patients, for half on average, half the number of patients. Thinking back, how well did those reminders work for you in your daily practice?

Doctor 9: I think probably in the early stages of things whilst I was still getting used to the running of the computer system, I probably didn’t take a huge amount of notice of them in the early stages, ‘cos I was still getting used to, alright, now how do I open the patient’s notes and follow things through? I think once I got a bit more, once I got a bit more confident with using the system, and I had a little bit more time in each consultation, you then had time to sort of, just have a quick look at some of those reminders. Now, I think I would have to…I don’t know how my figures are going to show up down the line, but I think probably the main thing of relevance for me was that it…it started getting me always thinking about sort of preventative issues. In our problem lists on each patient, we have a particular sub-heading for preventative health which comes up as the first thing on every single patient we’ve got, and I think over the years, I’ve think I’ve become, I wouldn’t necessarily say obsessive, but I mean, a bit, as thorough as people like L in slipping in under the preventative health issues, slipping in when people had their lipids done, when people had their fasting sugars done if they were overweight, when they had a PSA test, or a Pap smear, or a mammogram or
vaccination type things, so that now about seven years down the line any patient who’s sort of got, it’s a really obviously glaring area if somebody’s record comes up and they’ve got nothing under that preventative health subset. I think it probably, whilst I’m not sure whether looking at individual prompts from your system is gonna make any difference to how my figures look, it certainly helped to get the ball rolling with me in sort of trying to cover as many preventative health issues in each patient as I could, if I had the time in particular consults.

OF: So are you saying that it raised your awareness of prevention in general, even if you didn’t specifically read the details of what they were saying?

Doctor 9: Yeah, yeah, yeah.

OF: Now you mentioned having time in the consultations. I’m interested in that aspect. Can you talk a bit about how that works?

Doctor 9: Yeah. Um…in… I think it varies a bit with person to person as to what they come in with. I mean, as the years have gone by, and the changes in medical fees and everything, in payment and everything, people tend to save up their lists of questions that they want dealing with at particular consultations, but… which makes it hard if someone’s come in with a great sheet of problems. But still quite regularly people will come in with only one or two comparatively minor things, which we might get through in eight to ten minutes. I will then, rather than packing them off out the door after ten minutes, I’ll then use, knowing that officially I’m giving them a fifteen minute, roughly a fifteen minute service, I’ll often use that time just to have a quick look on some of
those other issues and see when they last had various things done. And getting them
documented, as much as anything… a lot of patients have had some of these
preventative health things done, but it’s not been documented in the front page of their
medical record, which is for me, the most important place for it to be.

OF: Yes. So, I’d like to ask you, how well were you able to respond do you think
overall? In other words, when there were reminders, and they seemed to be for things
that you wanted to do for your patients, how often and how much of the time could you
respond, or did you respond?

Doctor 9: Um…

OF: Was it a lot, or a little? Did you find…?

Doctor 9: In the early stages, it wouldn’t have been too many, because I was still
learning the ropes of the computer system, but certainly progressively over the next
couple of years I think, I got a lot more, I think I would have started getting through at
least fifty per cent of… my patients would have been having updated records and I think
by now probably about ninety per cent of my patients would have pretty updated
problem lists of their preventative health type things.

OF: So it sounds as if you’re saying that your response may have increased over time.

Doctor 9: Over time, absolutely, yes.
OF: That was one of my research questions, about whether people get so used to it, they stop responding…

Doctor 9: No. Now I think it’s probably more so, because, you know... I’ll fly down the problem list now and have a look at the eighty year old and think, no bone density mentioned, we haven’t got a bone density. I wonder if they’ve ever had one. And half the time they have and half the time it’s never been mentioned. So because you’re getting used to looking for these seven or eight different things, you tend to be a bit more aware.

OF: Do you think were… one of the things I’m interested in is whether there were particular situations where you were more or less likely to respond, like for certain age of patients, or gender of patient, or whether you’ve charged them more or less, whether you’ve charged them MBO rates or a higher rate?

Doctor 9: I don’t think it made any difference to the billing rate. If I had somebody who was, if we’d already spent seventeen or eighteen minutes on a consultation, I probably wouldn’t then head down the line of doing a few extra things in order to charge them a level C. We’re usually struggling to keep on time as it is, so I don’t think it would have certainly changed my billing rates. I think I’d be using the opportunistic time to update most of those sort of things. I think we’re… I mean, our patients are getting, we’ve educated our patients a bit more over the years to come in even if they’re a fit and healthy person, to try and encourage them to come in once a year for a bit of a general check up. While there’s lots that don’t, there’s a significant percentage that do,
that do now, come in just for a skin check and a blood pressure and a prostate and a cholesterol and a whatever.

OF: Do you think having those reminders has played any role in the way, in the fact that you’ve wanted to encourage people, because you know there’s things on that list, or would you have been doing that anyway even if there were no reminders, or would you have done…

Doctor 9: To be honest, it’s a hard one to say. To be honest, I’d like to think in my role as a GP nowadays, I would have been doing it any rate, but er…yeah.

OF: If you get a long list of reminders…

Doctor 9: If you get a long list of reminders, you bloody think: “Oh, shit”.

OF: Are you more likely to say to a patient: “Well, there’s a few things we should do, so…”

Doctor 9: Probably more likely, to just double check.

OF: Was there much of that happening, where if you saw the reminders and you realised you didn’t have time, so you actually said to them: “There’s a few things we should do, please make another appointment just so we can do them”?

Doctor 9: Um…
OF: Because you’re under pressure here, with not enough doctors, we know.

Doctor 9: Yeah, probably, with me I’d say I probably haven’t too often got people back specifically, if I’ve, you know if we’ve run short of time with other things if they’ve still got other things to deal with, that they wanted dealing with, we’d get them back for a second one and I’d use that chance opportunistically. I mean, if somebody, if a woman’s well overdue on a Pap smear or something like that, we’ll certainly give them a strong reminder about that: “Look, it’s four years since you last had a Pap smear, do you realise that? Let’s get another appointment to come back and have one of those done”, or whatever. But…er…

OF: So there is some of that, where you’re making another appointment.

Doctor 9: Yeah, not that often. Usually I’ll use the consultation that they’ve made to dot the I’s and cross the T’s.

OF: So really it’s opportunistic in that sense. While they’re there, you’re doing things for them.

Doctor 9: Yeah.

OF: Do you think the patients noticed any difference? I thought about doing it, and it just seemed to hard, to ask them after the... it was a one year trial, this thing, but I left the reminders running, but the actual study was one year. Did you think they noticed
any difference once we had the reminders? Did anybody say anything about, you know, you’ve become much more thorough, or you’ve never asked me that before, or…

Doctor 9: Nup.

OF: I did wonder about surveying some patients, because it would have been interesting. If you’d left it open ended and said did you notice any difference, they probably would have said: “They’re charging me…, the fees have gone up, or there’s not enough doctors.”

Doctor 9: That’s probably one of the biggest things that I’m aware of. There’s cost issues involved. If one was doing a rebate only for a recall for a check like that, that might have prompted one to do a bit more. It’s knocking back your service to a certain degree, if you do, if somebody’s come in and paid fifty bucks for a consult, and you then say: “Let’s come in back in two weeks’ time for another fifty dollars to go through a few preventative health type things. I would be more likely to say quickly: “Look, you haven’t had your lipids done for a while. Look, I’ll just rattle a form out. Have it done a week before you come in, in three months for your next lot of blood pressure pills review and we’ll review your results when you come in.”

OF: So cost makes a difference in that way.

Doctor 9: I think it does.
OF: Now, were there … what was I going to ask you…oh, yes workload. Do you think
the reminders made any significant difference to your workload?

Doctor 9: Nah…

OF: Did they make your life seem harder?

Doctor 9: No, I don’t think so. If I had the time, I dealt with them and if I didn’t have
the time, I left them until the next time.

OF: Were there any things about the reminders that were not so useful?

Doctor 9: Oh, not specially. I mean, with any of the computer screen things, if you’ve
got five hundred and fifty things before you get down into the nitty-gritty of the
patient’s notes and you’ve got to keep scrolling down ‘cos there’s so many things on it,
it slows you down and puts you off a bit, but that…at that stage the medical notes were
in a … not very user-friendly format, in that the problem list, all of the problem lists for
patients’ problems kept sort of scrolling over in a form that when you looked at it, you
had words breaking off and appearing in second lines and it was very hard to follow.
That was more frustrating for me, so I actually discovered a way of working out how we
could get the problem lists in an easy read format.

OF: Do you have any ideas on … were there any…were the reminders reasonably
accurate in reminding you about the things you wanted to do at the intervals you wanted
to do them, or were there things coming where you said, no, this isn’t really what I want
to do for the patient? Or were there certain patients for whom they didn’t seem to apply? We tried to fine tune them to get them right for you.

Doctor 9: I can’t honestly say whether you…I would like to think that you didn’t have reminders for five year old children, when did you last have your cholesterol?

OF: No, of course not, well, we didn’t. I think we got all that ironed out. Nevertheless, sometimes…we’re just trying to find out is that a reason why doctors don’t respond, if they disagree with what the reminders are telling them? We went to a lot of trouble to integrate it.

Doctor 9: At that stage, I was probably not taking too much notice of the time spans involved. I mean, I would now, ‘cos now that I’m much more au fait with using the system.

OF: Alright. Have you got any ideas on how we could make reminders about prevention more useful? Is there something that could be different about them that would make them more useful to you?

Doctor 9: I suppose the recall system on Medical Director is a potentially useful thing, but I’ve got a sneaking suspicion that it could get a little bit overloaded, that if you put a reminder for everything, Pap smears, lipids, the whole works as a reminder, every time the patient comes in, there’ll be a flashing phone telling me: “You’ve got a recall overdue”. If you’re genuinely getting your problem list up to date, I will put down: “PSA 9/05 2.2” and then I know myself the next time patient comes in, if it’s in twelve
months’ time or two years or whatever, well look, we’re due for something else to be done. I mean, the recall system of the flashing telephones would be useful, but I think I’d find it frustrating if with every single patient that came in, when I opened up their Medical Director file, I’ve got bloody recalls flashing at me every time, I’d think find that, I think it would get to me after a while.

OF: One thing I’ve thought of, was would it help if the reminders said: “The patient’s been here six times already and this hasn’t been done previously.” In other words, it’s kind of a guilt thing, I suppose. “This was supposed to have been done but hasn’t been done in the last six visits or the last ten visits”. Would that make you more likely to respond?

Doctor 9: I think it might be. One of the things I’ve noticed most significantly over the years is that you get patients who don’t come in very often, and all of a sudden you get a request from an insurance company, wanting details of their weight and their blood pressure from the consultations that you’ve had. I’ve had to do one about six months ago for somebody who’d been here about ten times over the course of ten years with little incidental minor bits and pieces, but they’ve never had a blood pressure done and they’ve never had a weight done. That’s embarrassing. I mean, they’ve seen different people each time, because they’re irregular patients. There’s that temptation that if you come in just to say: “I’ve got a sore ear, Doc” and you look and then find, and: “Yeah, you’ve got otitis externa. Here’s a script for Sofradex. Off you go.” Those are the times when you should be thinking even more so about, look, let’s have a quick blood pressure check, and a quick skin check, and make it more than a five minute consult.
OF: Well, alright. Overall could I ask you, are you… what’s your attitude now having been through the experience of the reminders? Do you overall feel they’re something useful that does improve care or would life be better for the patient if you were without them?

Doctor 9: Um…I think now, I’m sufficiently focussed on the preventative health issues to be looking at those things in my problem list whenever a patient comes in at any rate. I think when it was coming through initially, I think it helped me focus more on those sort of issues. So…would having reminders flashing, coming up now…?

OF: Or if you never got any…?

Doctor 9: Or if I never got any? I like to think that my quality of medicine would be such that I’d keep looking for those sort of things anyway.

13.4.2.7 Doctor 10

Doctor 10: One of the things that, just from the recent area that I’m using it, is I think you need to rotate the reminders, because when they come up as an issue that you say: “OK, I’ve got this reminder”, you tend to get tired, you get fatigued by it, whereas if you manage to have your reminders come up and they rotate the flag around, I think that actually get a little bit more interest from people over a sustained period, because I’m doing less of the completion, OK there are fewer patients to (?) up, but I’m doing less of them at the moment, I suppose because of the fact that I’m kind of used to it. Just:
“That’s fine, I’ll get around to it”, whereas previously it was much more interesting to get on to it, get it done and...get it organised to get in there. Questions?

OF: These are the things that I’ve drafted, and you’ve addressed some of it. Thinking back, how well did they work for you in your practice, in the beginning say in that first year when we were running the actual trial?

Doctor 10: I think they worked very well. I know that you’ve spoken to L. When she was doing a lot of the review work for accreditation, and we’d go through and we’d look at the total number of squares that had to be filled in. When we first went through accreditation, you had to complete one record in twenty five, it was four per cent or something, that you had to do, and the way that as an examiner going through that, we used to it, if you could get out of twenty five patients four of the boxes ticked in any one area, not in the same patient, that would be four complete records as far as counted that had been completed. Then they made it twenty five per cent, one in four. But we were running at probably an absolute completion rate of eighty per cent, and as far as getting out of twenty patients that were seen with ten criteria concerned, you might have maybe six boxes that were not filled in, but it might be over a variety of functions. So we actually had a very high completion rate, and I think it was the fact that we had got the advantage of the recalls that were reminding people particularly to fill in the PATRS, the social history, the smoking, the drinking, etc. and that when you got into that, the ones that you needed to do were ready flagged. Now, it would have been interesting to kind of see, the ones that were not flagged as to whether people bothered to fill them in, such as the education and whether they were wearing spectacles, because the likelihood that if you’re going past you’re going to do that as well, no, it wouldn’t have been done.
I reckon that for say a hundred records that you completed that were flagged, as in bold, that they had to be done, you might have done, oh yeah, it is important that this person’s done this, that or the other, I’ll put in, but it might be less than one per cent. So, you’ve actually got, I reckon that if we looked at the data completions in those other fields, even though we’ve got good data collection in the areas that we wanted to collect it, the work demand to go and fill in the other stuff, it’s never been filled in, even at this stage.

OF: I’d like to ask, how well, you remember that we met with all the doctors and then I think I asked you to fill in a thing saying what did you want to do for your patients how often, and we got a consensus out of that. How well did the reminders remind you about things that you did want to do for your patients?

Doctor 10: I think it worked very well in getting us to chase things through. The one area that it would have been nice to have added, we could do it at this stage, is that when you get down to the end of the field, say in the PATRS, we should actually have it time stamped when it was last accessed and changed, so that at the end of say twelve months or eighteen months it came up and flagged that again and said: “Have you asked whether still smoking?” etc.

OF: That would not be hard to program.

Doctor 10: By pulling that in, then you’d pull it up. The other thing is that we also use a lot of their progress notes, such as an active problem list, past problem list, active medications and it would be kind of useful again to have a time stamp down there that says: “I’ve gone in there and changed it as of this date” and if you haven’t touched the
active medications for six months, again it comes through and says: “Active medication”, so you’re getting a little reminder to go back and reassess it. Because even using our Medical Director for our prescriptions, there’s so much rubbish that gets left in there, and you kind of actually have to stop and think and say: “I’d better clear all of that stuff out” so it looks neat and tidy again. So just having a little prompt that comes in and says: “This patient’s been seen for say every third consultation, or six months. It’s time just to check that these things are the same”. If it is the same, just go straight down the bottom, time stamp it again and you’ve set it for another six months.

OF: I can understand that. Do you have any ideas about situations or consultations or certain kinds of patients where you were more or less likely to act on the reminders and provide preventive care?

Doctor 10: You never do it when you’re busy. I had one particular patient who came in and I wasn’t busy and I thought: “Oh, look, we’ll just go around and do these sorts of things and ask a few other questions”, and opportunistically it gave them enough time to say: “Look, I’ve had some rectal bleeding” and they were in their sixties, so we discovered their bowel cancer, which unfortunately, despite doing that, we got to a little bit late, but it would never have come up otherwise, so having something to do that makes you think about prevention is useful, but if you’re really busy, you’re gonna take time to skip it, unfortunately.

OF: Now again, I think you’ve touched on it, but I’d like to ask you in what ways do you think the reminders did change the care you were providing?
Doctor 10: Although I’m no longer specifically in general practice, there are a few of the chronic care item numbers that have come out, 721, and every now and then I’m just grabbing people who come through on a script and saying: “Look, I want to have a look at you and see what we’re dealing with”, because I can get paid for it. It just gives me an opportunity to think out what their problems are and put it down, have a brief chat with them and get maybe paid for doing it. Now I don’t tend to do that when I’ve got long consultations, because a) it’s not worth enough to do it, and it’s an extra imposition. The reminders basically, they’re the same situation, that it’s kind of thinking: “Oh, gee, I really should get those things done”. So you may actually say: “Look, there a few questions I think I need to handle. I may not want to do it today. I will get you back and I actually specifically do it”, and then you’ve got a different mindset, you’re actually saying: “Let’s start thinking about prevention”. And even if you only do that say once a week, you’re going to start picking up some extra problems, dealing with a few issues, giving people an opportunity, so I think it’s got an advantage there.

OF: Did the reminders interfere in a negative way with the things you were trying to do for people, for the care that you wanted to give?

Doctor 10: No, no.

OF: Do you think the patients noticed anything different once we switched the reminders on? Did anybody comment that you were treating them differently?
Doctor 10: No, but they would’ve noticed it because I’d say: “There’s a few flags for things I need to get recorded, so I can get them out of the way, ‘cos I haven’t done them for…”, and certainly you’d have patients that may have been within the practice. The information was transcribed somewhere in their notes, and a reminder had come up, and you’d say: “Look, I know that you’ve been seeing us for about ten years, but the computer’s telling me I haven’t got this information in the right spot. I just want to go back and do it again. I’ll start completely afresh. I won’t look at the notes and transcribe them. I’ll just ask you, because you know.” And that was fine, but when you go back and look at the notes, it’s not there. So they’re just…I hope that they think that we’re being a little bit more interested in what’s going on, and are able to support them better.

OF: So did you get a feeling when you said that to those patients about the fact that you were getting messages about things that needed doing, did they mostly like that, do you think?

Doctor 10: I certainly had no perception of “It’s a bloody waste of time sitting around here”. No, they’re always happy to talk about themselves.

OF: We talked about barriers, I suppose. Are there any other barriers I suppose, apart from time, reasons why you could not or didn’t act on the reminders, if they were telling you about things you wanted to do? What else would prevent you?

Doctor 10: I never the situation of having anybody object, but J G, who was with this at one stage when these went on, had a patient come into the room, and he’d logged in and
the reminders came up, which included alcohol. The patient sat down and said: “How did the computer know I was drinking too much?”.

OF: (Laughs) It depends on what Jason said, I suppose.

Doctor 10: No, he hadn’t said anything.

OF: So you mean they just saw it on the screen.

Doctor 10: They saw it on the screen.

OF: “ALCO”. I suppose “ALCO” is a common term for... I see. Have you got any ideas on how we could have made reminders more useful? I’m thinking about preventive care reminders in particular, but is there anything we could have done to make them more effective or more useful?

Doctor 10: The only way you can make them more effective is to refuse to let people go on with their consultation unless they fill the bloody information in.

OF: Yes, that’s one thing that’s been done. I didn’t want to do it, because I wouldn’t want people doing that to me…force them to respond, because they could fill in rubbish, or they could find ways to...

Doctor 10: The time sometimes is really inappropriate to do that. No, I think that setting it up the way that we did, it would be useful to get the feedback, which is what L
gave to each individual doctor through her accreditation reviews of what’s going on, and in a sense getting a ranking scale of where people were, so they kind of knew how well they were doing, and all of us were comfortable that we were doing better than expectations of standards. However, I think it’s something like drug rep detailing or getting an idea across. You need to explain what you’re going to do, you need to get it being done, you need tell people how they’re going and you need to do it again. So I would say that on probably no further apart than about a twelve monthly cycle, having somebody come along either as a group or individually, saying: “Look, this is how we’re going, this is what the data’s showing, these are the important areas, this is where it fits in”, bringing it up to conscious awareness, so over a time it can decay, probably doing it over five or six cycles would get people into a pattern where they knew it was important, because it had been important for long enough.

OF: I had an idea at some point, and I never prototyped it, that what would motivate me would be if the reminder showed how many times I’d ignored it before, how many times the patient had been and it was due and it wasn’t done yet, because although we had a thing saying when it was last done, it didn’t say how many visits there had been since then, and to me that would probably tend to make me feel guilty, and think: “I’d better do that”.

Doctor 10: Well, L certainly objects when somebody might be due for a smear recall and it’s up there.

OF: She mentioned that she’d found people who had been …
Doctor 10: Multiple times and they just haven’t been done. Watching those counters go up would, I think, put a far from subtle pressure on people to comply at some stage, although somebody might think: “look, it’s at ninety nine. Does it go to three digits, or will it go over to zero?”.

OF: (Laughs). Well, there’s also the question: does it matter if I’ve seen the person that many times, or if they’ve seen the others in the practice, so does it have to show how many times I’ve seen them, or just the total number?

Doctor 10: I think it should be the total number.

OF: Yeah, it should be, if you’re looking after them as a group. I’m interested to look into that. I haven’t got any other particular questions overall comments about its value, or problems that it caused.

Doctor 10: I think it’s improved the quality of notes. Still not available in an adequate form in Medical Director. The little reminders that come up there. It’s something that really needs to almost to have a hot key, that you can sort of hit a particular function key and then hit one that says: “As of six months’ time from now, I need a smear recall”, function key two: “Cholesterol check needs to be flagged in two months’ time”, so that you’ve actually got something that immediately you just go bang and put it in, and can generate your own that way, as well as the background counting, that would be good.
13.5 Appendix 5: Published papers


NOTE: This publication is included on pages 584 – 587 in the print copy of the thesis held in the University of Adelaide Library.
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NOTE: This publication is included on pages 588 – 592 in the print copy of the thesis held in the University of Adelaide Library.