

Needleless and Sharp-Free Anaesthesia

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SUMMARY

Accidental occupational infection of anaesthetists from patient body fluids is a very real and potentially fatal risk that will be significantly reduced with the routine use of universal precautions and the adoption of specific safe work practices. Employers are required by law to provide a safe working environment and safe systems for work which anaesthetists should implement according to recommendations in this paper. A protocol should be available to be acted upon in the event of occupational parenteral, mucous membrane and non-intact skin exposure to infected patient body fluids. Recommendations are made in six major areas of clinical practice which anaesthetists should adopt to minimize risks to themselves and other healthcare workers: loading syringes, cannulating blood vessels, administering intramuscular (IM) or local anaesthetic injections, administering intravenous (IV) drugs, use of sutures and surgical instruments by anaesthetists and the safe disposal of needles, glass ampoules and other sharp materials. Despite the known risks and the development of these safe practices there is poor compliance by anaesthetists with measures to safeguard themselves and others.

Key Words: INFECTION: HIV/AIDS, hepatitis B, hepatitis C; ANAESTHETISTS, ANESTHESIOLOGISTS: safe practice, recommendations, universal precautions

The needlestick or contaminated sharps injury is not new. Andre Velpeau, a nineteenth century French surgeon, said: "a pin prick is a door open to death". Despite knowledge of the dangers, healthcare workers have long been complacent about this issue and as a group have only recently become pro-active in minimizing risks. Hepatitis B, now preventable by immunization, claimed many victims, but it was the worldwide HIV epidemic which caused a change in attitude and saw healthcare workers demand changes in both equipment and work practices. HIV, hepatitis C and the fear of as yet unknown infections should ensure that the current momentum to minimize risk is sustained. Anaesthetists are particularly at risk due to their high use of needles and cannulae, their involvement in emergency and crisis situations and their work in different theatres with different assistants. Given the lack of effective treatment and the present situation of not knowing the infective status of most patients, the figures from Jones in 1989 are still valid¹. Jones estimated in 1989 that an anaesthetist *who did not change his or her workpractice* stood a one in twenty-five chance of becoming in-

fectured during a forty-year working life. These grim figures should ensure every anaesthetist takes needleless anaesthesia as seriously as checking the machine or monitoring the patient.

The exact risk of anaesthetists acquiring occupationally transmitted hepatitis or HIV is not known. There are many factors that determine this risk which include the healthcare worker's exposure rate, the route of exposure, the severity of exposure, the fluid involved, the volume of the inoculum and its concentration of microbial agent, microbial pathogenicity and host susceptibility, the type of needle (hollow bore versus solid) and whether gloves are worn². The accepted risk index is reflected in a study using data from published figures in which it was calculated that anaesthetists would sustain 1.3 needlesticks per year with a seroconversion rate of 0.42% if exposed to HIV infected blood³.

There are many clinical and administrative guidelines and protocols to minimize the dangers of needlestick injuries to healthcare workers. In Australia the most relevant to anaesthesia practice are the Australian Society of Anaesthetists Policy Document "Anaesthesia and HIV, and Anaesthesia and Hepatitis B and C" (1994); the Australian and New Zealand College of Anaesthetists Policy P28 "Policy on Infection Control in Anaesthesia" (1995) and the College's "Statement on AIDS and Hepatitis" (1994) and the Policy Document of the Royal Australasian College of Surgeons "Infection

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Control in Surgery. Management of AIDS (HIV) and Hepatitis B" (1994). These documents provide a background of information, ethics, and work practice guidelines on which to base safe clinical practice. They also provide the means by which an individual anaesthetist, group practice or department can convince employing authorities of the need to maximize safety.

In the State of South Australia the Occupational Health, Safety and Welfare Act of 1986, Part III, Section 19.1 states, inter alia, that an employer shall provide and maintain, so far as is reasonably practicable, a safe working environment and safe systems of work. This clearly places a duty of care on the employing authority to provide preventive measures and to be prepared to meet the associated costs.

Prevention of needlestick injury is the obvious aim. The protocol must be ready to be followed should parenteral exposure to body fluids from a patient occur, especially potential inoculation from a needlestick or splash of body fluid on the conjunctiva or broken skin. The initial step is first aid, i.e. washing the affected area and then eliminating the cause of the injury. The next step is that of notification and investigation which involves formally informing the healthcare worker's supervisor. The supervisor then has the responsibility for investigating the incident, identifying the source patient and if necessary initiating proceedings to ascertain the infectivity of the source patient and referring of the situation to an infectious control clinician. The infectious control clinician should be a specialist in infectious diseases who will then instigate appropriate clinical management which may include baseline serological investigations and possibly active therapy, e.g. prophylactic treatment with zidovudine if the risk of HIV inoculation is considered significant. However, reliance cannot be placed on zidovudine to provide effective prophylaxis. Appropriate counselling and follow-up is arranged and an incident report prepared for risk management analysis and for the affected worker's protection in the event that an occupational health claim becomes relevant. More detail is available in the Australian National Council on AIDS Bulletin No. 16⁴.

Totally needleless or sharp-free anaesthesia is rarely possible, but by defining the risk areas it is possible by use of appropriate equipment and work practices to substantially minimize, and in some cases eliminate the danger of a sharp when used in conjunction with universal precautions as a routine. The concept of universal precautions was introduced in 1987 by the Centers for Disease Control in Atlanta, U.S.A., with the objective of protecting healthcare

workers from parenteral, mucous membrane and non-intact skin exposure to pathogens contained in body secretions from patients. Despite the promulgation of these guidelines compliance is poor, as a recent study has shown. Only 88% of anaesthetists followed the guidelines when dealing with known HIV-infected patients and 24.7% adhered to the guidelines when dealing with low risk patients⁵.

SITUATIONS POSING SPECIFIC RISKS TO ANAESTHETISTS

There are six major risk areas and each will be discussed, although recommended equipment and work practices may overlap between them. It is also important to note that equipment is constantly being improved and anaesthetists should use the equipment and work practices to suit their particular environment. There are many commercially available devices which support the principles described here and no reference will be made to specific products. It is important that anaesthetists constantly encourage continuing development of safer devices.

1. Loading syringes

In this area, needles can be totally eliminated and exposure to sharps can be minimized. Blunt drawing-up cannulae, either metal or plastic, are inexpensive and readily available. Plastic ampoules are safer than glass and are available for many drugs. Drug companies should be encouraged to package all drugs in plastic ampoules and to devise tamper-proof and tamper-evident packaging for drugs with substance abuse potential. Any container with a sharp edge should be discarded into a suitable disposable container as soon as is practicable since, although it may be clean, it can provide a break in the skin for later contamination from body fluids. A 6-week survey of anaesthetists showed that the incidence of hand laceration secondary to opening glass ampoules was 6% and the prevalence of visible old hand laceration 26%⁶. The author concluded that anaesthetists continue to risk inoculation by human secretions via such unprotected breaches in the dermis. Plastic drawing-up cannulae are now also available for the rubber-capped containers that are commonly used for antibiotics.

2. Cannulating blood vessels

This is a particularly high-risk procedure and is necessary for the majority of patients undergoing general or regional anaesthesia. Gloves should be worn during cannulation to prevent skin contamination. In addition, there is evidence that wearing

gloves decreases the total amount of inoculum, should a needlestick injury occur⁷.

Various protected stylet cannulae are now available which can be activated manually or by a spring device to lock the stylet safely in an integral sheath upon withdrawal of the stylet. Although there is a definite learning process in mastering the use of these cannulae, the greatly reduced risk of needlestick makes it difficult to justify the continued use of non-protected devices. This remains the area of highest risk to the anaesthetist and new technology should be embraced rather than ignored. In one large study of 2,524 hollow-bore needle injuries, 59% were from syringes/hypodermic needles, but the rate was 3.8 per 100,000 units used; 5.4% of the injuries were from IV catheter stylets, but at a rate of 15.7 per 100,000 units used⁸.

If a conventional unprotected cannula is used, an approved sharps disposal container must be placed adjacent to the patient and the stylet disposed of immediately by the operator. The stylet must not be put down or handed to a second person for disposal. A second person should not hold the sharps container. If an IV line is not being connected to the cannula, then a one-way valve, three-way tap, needleless port or other such device must be attached to the cannula to allow IV access without the use of a sharp needle.

When practicable, the use of local anaesthetic infiltration via a fine needle should be avoided. If local anaesthesia is to be used, then work practices should be modified to allow the application of a topical local anaesthetic cream an hour prior to induction in situations where this is known to be efficacious. If infiltration is used, the needle should not be recapped but the needle and syringe should be disposed of immediately as one unit into an adjacent, approved sharps container by the operator. Positive pressure on the plunger as the needle is being withdrawn from the skin may reduce the degree of contamination of the needle.

3. Injections

The aim is to avoid exposing the sharp tip of the needle. IM injections are a high-risk procedure and should be avoided where possible. Patented safety syringes are available for IM or SC injections. The needle in these syringes is only made safe by an active twisting manoeuvre which locks the needle into a sheath after the injection has been made. They are certainly more cumbersome and require familiarization, but can reduce the risk of needlestick injury. This area needs improved technology of the type that has gone into IV cannulae. Safety devices for blood

sampling are available and their use should be encouraged.

If a standard syringe and needle is used, the needle should not be resheathed, but the syringe and needle disposed of immediately as one unit by the user into an adjacent sharps container. Resheathing is said to account for 20-40% of needlestick injuries⁹ and needs to be actively discouraged unless an appropriate protocol with safe equipment (eg flanged sheath) is in place. Although there has been some controversy in this area, current opinion seems to indicate that resheathing should not be done. Despite this, there is evidence that healthcare workers are well informed about the dangers of resheathing, but continue to put themselves at risk¹⁰.

Regional anaesthesia is a field in which injections cannot be avoided and anaesthetists need to develop meticulous work practices to avoid injury. Not much development has occurred in devising safer products for this aspect of the anaesthetist's work. It may be appropriate to adopt some of the principles recommended by the Royal Australasian College of Surgeons as outlined in Section 5 below, e.g. the use of a yellow sharps dish for spinal and epidural needles and stylets when they are not in the hands of the anaesthetist. Epidural needles having a blunter tip are less likely to cause injury but spinal and other major regional anaesthetic techniques pose a very high risk. At this time improved work practice is the only way to reduce risk in this field.

4. Intravenous giving sets

The aim is to use giving sets which do not require sharp needles for the administration of drugs. This can easily be achieved and there is no excuse for needles being used in this area. All giving sets should incorporate some form of needleless injection port. This can be achieved by using a number of devices, e.g. one-way needleless ports, three-way taps or rubber bung with a self-sealing centre slit that permits the use of a blunt needle. Many infusion pumps have their own specific giving sets and if they do not contain needleless ports, it is a simple matter to add a short extension with the appropriate port. A one-way valve or anti-reflux device is a useful addition to a drip line since it prevents blood from refluxing and thus contaminating an injection port¹¹. Skirted needles are available if an injection via a needle through a rubber bung is necessary. These are short needles protected by a skirt or flange projecting beyond the needle tip, designed to fit over the rubber bung. They are cheap, effective and easy to dispose of safely.

5. Use of sutures and surgical instruments by anaesthetists

Anaesthetists perform procedures such as central venous cannulation, insertion of chest drains and cut-downs which involve the use of scalpels, suture needles and other surgical instruments. The Royal Australasian College of Surgeons policy document "Infection Control in Surgery" contains important points which anaesthetists should consider adopting to protect themselves and their co-workers, e.g.

- Surgeons must be responsible for safe placement of sharp instruments.
- Sharp instruments must not be passed by hand; a yellow sharps dish must be used.
- Hand held suture needles must not be used.
- Suture needles must never be picked up with the fingers.
- Suture needles should be cut off before knots are tied.

The latter three points are not practised by anaesthetists or intensivists as most central venous cannulation kits contain handheld sutures. Manufacturers should be requested to change the contents of these kits and provide alternatives to handheld suture needles such as improved adhesive tapes and dressings to secure IV catheters.

6. Disposal of needles, glass ampoules and other sharp materials

It should be unnecessary to comment on this area, but again, healthcare workers continue to put themselves and others at risk by the careless disposal of sharps. The person using the sharp must immediately dispose of it into an adjacent approved container. This principle extends to the anaesthetist disposing of the contents of central venous cannulation kits which contain a variety of sharp needles and scalpels. Sharps must not be placed on beds, anaesthetic machines, etc and they must never be handed to a second person for disposal. Sharps containers must conform to Australian and New Zealand Standards AS 4031 or AS/NZS 4261 which cover aspects such as the handle, mouth, closure device, impact resistance, resistance to penetration, colour and marking^{12,13}. They must be replaced when filled to the designated safe level and not allowed to be overfilled.

The uncooperative patient can cause special problems and greatly increase the risk of needlestick injury to healthcare workers and active steps or protocols should be in place to reduce the risk rather than let a potentially dangerous situation develop. Adequate assistance, premedication, or inhalational

induction are some of the measures that may be taken.

In patients in whom IV access may be difficult or hazardous the "single breath" inhalational induction technique has been shown to be effective and rapid in both children and adults but relies on complete patient cooperation¹⁴.

The final message is that we must look after ourselves and our fellow workers and should not expect hospital administrators or government bodies to take the lead. Administrators expect a certain level of needlestick injury in their institutions¹⁵. As individual anaesthetists, we should expect none. The various devices to minimize risk may add extra expense, but each needlestick injury not resulting in infection costs about US\$363.00 in routine follow-up¹⁶. This figure is quite similar in Australia, the U.K. and North America. An infection resulting from needlestick can result in devastating consequences and cost hundreds of thousands of dollars. It is totally unacceptable that cost should be given as an excuse for not having safe equipment.

In conclusion, it can be said that the risks to anaesthetists of occupational exposure to infected body fluids from patients are very real. The adoption of universal precautions in conjunction with well-established safe practices as described in this paper as an absolute routine should minimize these risks. The introduction of blunt plastic cannulae and needleless injection ports has been shown to reduce IV-related needlestick injuries by 72%¹⁷. Once safe practice becomes a habit, handling a sharp needle seems wrong and extra care is automatic. The feeling is similar to not putting on a seat belt when driving. After a tragic infection of oneself or a colleague is not the time to change. Do it now!

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