Predicting Risk for Pregnancy Complications

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Abstract

For years, it has been a challenge to identify women at risk of Preeclampsia (PE) and Preterm Birth (PTB), one of the leading causes of maternal and perinatal morbidity and mortality. Despite an increasing number of clinical and statistical prediction models being developed, which have been shown to outperform traditional approaches based on maternal history, due to complex underlying relationships and gene-environment interactions, identifying women at risk based on a single time-point, especially during early stages of pregnancy, remains a challenge.

Therefore, this study not only aims to identify potential predictors for pregnancy outcomes and develop prediction models based on combinations of clinical measurements and Single-nucleotide polymorphisms (SNP) predictors, but also to establish a tiered prediction system by integrating risk estimates at various stages of pregnancy.

This thesis contains both theoretical development and practical application of the models, with results of best models written as manuscripts for future publication. Critical issues in real-life statistical analysis, including subgroup differences, and model and variable selection (with FDR control) were discussed, as well as novel strategies on the tiered prediction model development.

The results from tiered models provide prediction for PE and spontaneous preterm birth (SPTB) that not only outperform traditional approaches, but also provide an earlier prediction applicable to all pregnant women, including healthy nulliparous women. This approach also allows for regular monitoring and revision of predicted risk throughout pregnancy. This may assist in providing tailored antenatal care or interventions that could benefit both the mother and child, and to avoid unnecessary interventions for low-risk individuals, while modifiable predictors could also be addressed to reduce the risk or severity of PE or PTB.
Declaration

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# Table of Contents

LIST OF FIGURES ................................................................................................................................. i
LIST OF TABLES ........................................................................................................................................ ii
PUBLICATIONS ARISING FROM THIS THESIS ....................................................................................... iii
CONFERENCE PRESENTATIONS AND ABSTRACT PUBLICATIONS ARISING FROM THIS THESIS... iv

CHAPTER 1: INTRODUCTION .................................................................................................................. 1
  1.1. PROBLEM STATEMENT ............................................................................................................... 1
  1.2. AIM ............................................................................................................................................. 2
  1.3. OUTLINE .................................................................................................................................... 3
REFERENCES........................................................................................................................................... 5

CHAPTER 2: LITERATURE REVIEW ...................................................................................................... 6
  2.1. PREECLAMPSIA ....................................................................................................................... 6
    2.1.1. Complications ...................................................................................................................... 7
    2.1.2. Screening and Prediction ..................................................................................................... 10
      2.1.2.1. Clinical Risk Factors .................................................................................................. 10
      2.1.2.2. Genetic Risk Factors .................................................................................................. 13
      2.1.2.3. Current Prediction Methods ....................................................................................... 16
  2.2. SPONTANEOUS PRETERM BIRTH .......................................................................................... 20
    2.2.1. Health Impacts .................................................................................................................. 21
    2.2.2. Screening and Prediction .................................................................................................. 23
      2.2.2.1. Clinical Risk Factors ................................................................................................. 23
      2.2.2.2. Genetic Risk Factors ................................................................................................. 26
      2.2.2.3. Current Prediction Methods ...................................................................................... 28
REFERENCES......................................................................................................................................... 30

CHAPTER 3: SCOPE DATABASE ......................................................................................................... 46
  3.1. OVERVIEW .............................................................................................................................. 46
    3.1.1. Outcomes .......................................................................................................................... 47
    3.1.2. Data Quality Control ......................................................................................................... 48
VI. SIGNIFICANT COCHRAN-MANTEL-HAENSZEL (CMH) TEST RESULTS FOR PTB ....................... 322
VII. PAPER I: TIERED PREDICTION SYSTEM FOR PREECLAMPSIA ........................................... 326
VIII. PAPER II: RISK FACTORS FOR PRETERM BIRTH ................................................................... 333
IX. PAPER III: MULTIVARIATE VISUAL CLUSTERING ............................................................................ 342
List of Figures

Fig. 2.1.1: Differentiating hypertensive disorders in pregnant women (Wagner, 2004) ........................................ 6
Fig. 2.1.2: Susceptibility regions for preeclampsia (Mutze et al., 2008) ............................................................. 14
Fig. 2.1.3: Scheme of pathophysiological relevant factors in preeclampsia and corresponding candidate genes (Mutze et al., 2008) ........................................................................................................... 15
Fig. 2.2.1: Fetal development timeline (weeks 1 to 37). Images from 3D Pregnancy (Nickelodeon Parents and Preschool Network, 2010). .......................................................................................................... 20
Fig. 2.2.2: Scheme of pathophysiological relevant factors in preterm birth and corresponding candidate genes (Esplin et al., 2005) ...................................................................................................................... 26
Fig. 3.1.1: Pregnancy Outcomes in SCOPE ......................................................................................................... 48
Fig. 3.2.1: Clinical measurements database layout .............................................................................................. 49
Fig. 3.2.2: Single 3D array structure ..................................................................................................................... 50
Fig. 3.2.3: Multiple 3D array structure .................................................................................................................. 51
Fig. 3.3.1: Outcome differences between (a) Adelaide and (b) Auckland SCOPE women .................................. 53
Fig. 3.3.2: Common clinical measurement differences between Adelaide (shaded in blue) and Auckland (shaded in red) SCOPE pregnancies, with overall distribution (shown in white) ........................................ 54
Fig. 4.1.1: Methodology overview ...................................................................................................................... 67
Fig. 4.2.1: Partition plot (white=Uncomplicated pregnancy, yellow=PE) ............................................................. 80
Fig. 4.3.1: K-means Clustering .......................................................................................................................... 82
Fig. 4.3.2: K-means cluster map (blue=term birth, red=Preterm birth) .............................................................. 86
Fig. 4.3.3: Chernoff face ....................................................................................................................................... 88
Fig. 4.3.4: Chernoff faces displaying 11 clinical and 4 genetic predictors (yellow=PTB cases) ..................... 91
Fig. 4.4.1: Elastic-Net variable shrinkage pathway .............................................................................................. 94
Fig. 4.5.1: Distribution of test results and optimal cutoff point ............................................................................ 98
Fig. 4.5.2: Perfect, conventional and baseline ROC curves ................................................................................. 99
Fig. 5.1.1: Tiered prediction approach ................................................................................................................ 108
Fig. 5.2.1: Model integration overview ................................................................................................................ 110
Fig. 5.2.2: Tiered model risk classification ......................................................................................................... 112
Fig. 5.3.1: Process of elimination ....................................................................................................................... 115
Fig. 9.1.1: ROC curves for a) PE and b) SPTB models ......................................................................................... 215
Fig. 9.1.2: Venn diagram of patients predicted as high risk for PE or SPTB ....................................................... 218
Fig. 9.1.3: Top 40 models developed in this study for preeclampsia (sorted by r+s) compared with current approaches .................................................................................................................................. 220
Fig. 9.1.4: Top 40 models developed in this study for preterm birth (sorted by r+s) compared with current approaches .................................................................................................................................. 221
List of Tables

Table 2.1.1: Maternal & fetal complications associated with preeclampsia (Sibai et al., 2005) ................. 8
Table 2.1.2: Risk factors for preeclampsia that can be measured at the first antenatal appointment, reviewed by Sibai et al. (Sibai et al., 2005) ........................................................................................................ 12
Table 2.1.3: Summary of current prediction methods for preeclampsia (sorted by accuracy) ............... 17
Table 2.2.1: Fetal morbidities associated with Preterm birth ........................................................................ 22
Table 2.2.2: Risk factors for Preterm birth (Murphy, 2007) .................................................................... 24
Table 2.2.3: Summary of potential prediction methods for spontaneous preterm birth .................. 28
Table 3.4.1: Univariate analysis of common factors associated with PE .................................................. 59
Table 3.4.2: Univariate analysis of common factors associated with SPTB ........................................... 59
Table 3.4.3: SNPs associated with PE in univariate analysis at 5% significance level ...................... 60
Table 3.4.4: SNPs associated with SPTB in univariate analysis at 5% significance level .................... 61
Table 4.2.1: Logistic regression model for PE at 15 weeks of gestation .............................................. 73
Table 4.2.2: Example clinical and genotype record .................................................................................. 74
Table 4.2.3: Group means for PE and Uncomplicated pregnancy ....................................................... 79
Table 5.3.1: Pre-test and post-test accuracy measures ........................................................................... 114
Table 5.3.2: Final risk classification ....................................................................................................... 116
Table 9.1.1: Final model predictors for preeclampsia and spontaneous preterm birth ...................... 211
Table 9.1.2: Predicted risk vs. true cases of preeclampsia and preterm birth ....................................... 217
Publications arising from this thesis


‡ Last name changed to Leemaqz from Lee in 2013.
Conference presentations and abstract publications arising from this thesis


