PREVENTIVE CARE TOOL FOR HYPERTENSION AND DIABETES

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# PREVENTIVE CARE TOOL FOR HYPERTENSION AND DIABETES

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This report is submitted in partial fulfilment of the requirements for the Bachelor of Computer Science (Software Development)

FACULTY OF INFORMATION AND COMMUNICATION TECHNOLOGY

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2016

# DECLARATION

I hereby declare that this project report entitled

PREVENTIVE CARE TOOL FOR HYPERTENSION AND DIABETES

is written by me and is my own effort and that no part has been plagiarized without citations.

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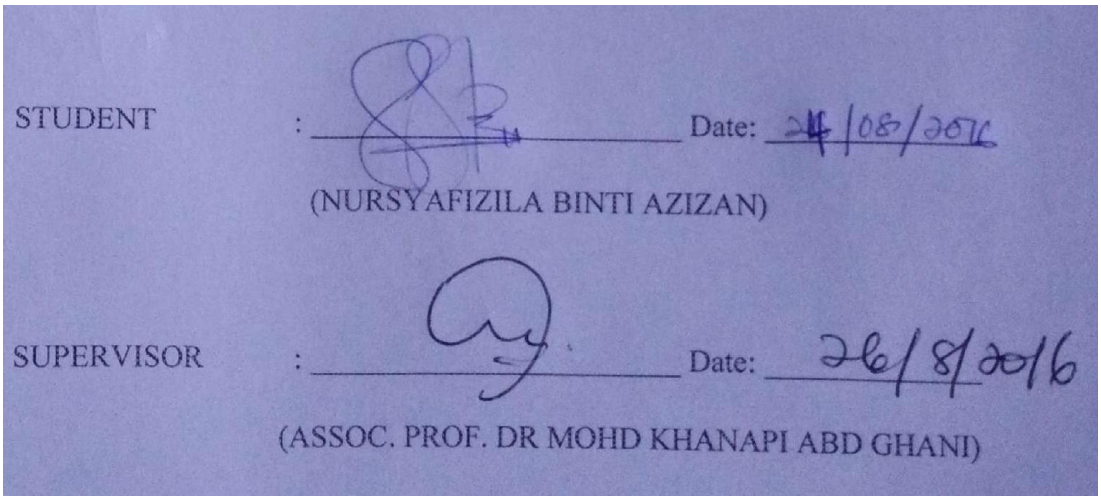

# DEDICATION

This thesis is dedicated to my family for their endless love, support and encouragement.

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I would like to console my deepest apologies to my lovely parents. I am sorry for not being able to making it back home for the past few months. I just want them to know, I am working at my very best to ensure their smile when they see me succeed. And when that day comes, I would like to dedicate the success to them. I will give my very best, to ensure that they will get a better living once I have reached my goals. There's nothing more that I wanted to achieve in my entire life. But to see my parents, looking back at me and say "That's my daughter over there, we are so proud of her".

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# ABSTRACT

Preventive care is a health services like screenings, check-up and counselling that are utilized to prevent diseases and other health problem. Preventive care is to detect illness at an early stage, by discovering medical problems early; peoples can save money to cure disease because medical cost is very high.

Preventive Care Tool for Hypertension and Diabetes is developed for Universiti Teknikal Malaysia Melaka (UTeM) students and staff. The system is to educate students and staffs practice wellness paradigm. The system scope is focusing on two type of disease that is major health concern in Malaysia, hypertension and diabetes mellitus.

The National Health and Morbidity Survey (NHMS) 2011 has shown that the predominance of hypertension in Malaysia has increased from 32.2% in 2006 to 32.7% in 2011. NHMS also reported that the pervasiveness of diabetes in Malaysia has increased by 31.08% in the space of only 5 years, from 11.6% in 2006 to 15.2% in 2011.

The system is done automatically using medical model that is to analyse patient's records on hypertension and diabetes then generate result from the analysis. The system uses the capabilities of a mobile phone as a communication tool to monitor the patient's health status. The system is developed to analyse, develop preventive model, integrate and test the tool with e-Clinical Support System (e-CSS).

The methodology uses for this project is agile methodology. This methodology is more adaptable than traditional modelling methods, making it a better fit in a quick changing environment. The techniques break product development work into small items. This minimizes the overall risk and allows the project to adapt to changes quickly.

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# ABSTRAK

Rawatan pencegahan adalah prosedur kesihatan seperti pemeriksaan dan kaunseling yang digukanakn untuk mencegah penyakit dan masalah kesihatan lain. Rawatan pencegahan adalah untuk mengesan penyakit pada peringkat awal, dengan mengenal pasti masalah kesihatan pada peringkat awal, orang awam dapat menyimpan wang daripada menggunakan wang tersebut untuk merubati penyakit yang dihidapi.

Alat rawatan pencegahan hipertensi dan diabetis dibangunkan untuk pelajar dan kakitangan Universiti Teknikal Malaysia Melaka (UTeM). Sistem ini adalah untuk mendidik pelajar dan kakitangan UTeM mengamalkan paradigma kesihatan. Skop sistem ini memberi tumpuan kepada dua jenis penyakit yang membimbangkan di Malaysia, iaitu hipertensi dan diabetis.

Kesihatan dan Morbiditi Kebangsaan (NHMS) 2011 menunjukkan bahawa pesakit hipertensi di Malaysia telah meningkat daripada 32.2% pada tahun 2006 kepada 32.7% pada tahun 2011. NHMS juga melaporkan bahawa pesakit diabetis di Malaysia telah meningkat sebanyak 31.08% dalam jangka masa 5 tahun, daripada 11.6% pada tahun 2006 kepada 15.2% pada tahun 2011.

Sistem ini dilalukan secara automatik menggunakan model perubatan iaitu untuk menganalisa rekod pesakit pada hipertensi dan diabetis kemudian sistem akan menghasilkan laporan dari analisis. Sistem ini menggunakan keupayaan telefon bimbit sebagai alat komunikasi untuk memantau status kesihatan pesakit. Sistem ini dibangunkan untuk menganalisis dan membangunkan model pencegahan, mengintegrasikan dan menguji alat ini dengan Sistem Sokongan Elektronik Klinikal (e-CSS).

Kaedah yang digunakan untuk projek ini adalah metodologi tangkas. Teknik ini lebih cepat menyesuaikan diri pada persekitaran yang berubah-ubah berbanding teknik lain. Teknik ini memecahkan kerja pembagunan kepada lebih kecil. Ini mengurangkan risiko kegagalan projek.

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# TABLE OF CONTENTS

DECLARATION iv
DEDICATION v
ACKNOWLEDGEMENTS vi
ABSTRACT vii
ABSTRAK viii
TABLE OF CONTENTS ix
LIST OF TABLES xiii
LIST OF FIGURES xiv
LIST OF DIAGRAMS xv

CHAPTER I INTRODUCTION 16
1.1. Introduction 16
1.2. Problem Statement(s) 17
1.3. Objective 18
1.4. Scope 18
1.4.1. System's functionality 18
1.4.2. System's user 19
1.5. Project Significance 19
1.6. Expected Output 20
1.7. Conclusion 20

CHAPTER II LITERATURE REVIEW 21
2.1 Introduction 21
2.2 Facts and findings 22
2.2.1 Blood glucose and its problem 22
2.2.2 Blood pressure and its problem 23
2.2.3 Preventive health care technology 24
2.2.4 Mobile phone and health care services 24

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

2.2.5 Existing System and Technology 26
2.3 Project Requirements 29
2.3.1 Software Requirement 29
2.3.2 Hardware Requirement 30
2.4 Project Schedule and Milestones 30
2.5 Conclusion 31

CHAPTER III ANALYSIS 32
3.1. Introduction 32
3.2. Problem Analysis 32
3.3. Requirement Analysis 35
3.3.1. To-be System 35
3.3.2. Others Requirement 37
3.4. Conclusion 38

CHAPTER IV DESIGN 39
4.1. Introduction 39
4.2. High Level Design 40
4.2.1. System Architecture 40
4.2.2. User Interface Design 41
4.2.3. Database Design 49
4.2.3.1. Conceptual and Logical Database Design 49
4.3. Detailed Design 64
4.4. Software Design 67
4.5. Physical Database Design 74
4.5.1. Data Definition Language (DDL) 74
4.5.1.1. Blood Glucose 74
4.5.1.2. Blood Pressure 75
4.4.2. Data Manipulation Language (DML) 76
4.1.1.1. Blood Glucose 76
4.1.1.2. Blood Pressure 76
4.6. Conclusion 77

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

CHAPTER V IMPLEMENTATION 78
5.1. Introduction 78
5.2. Software Development Environment Setup 79
5.3. Software Configuration Management 81
5.3.1. Configuration Management Setup 81
5.3.2. Version Control Procedure 82
5.4. Implementation Status 82
5.5. Conclusion 83

CHAPTER VI TESTING 84
6.1. Introduction 84
6.2. Test Plan 85
6.2.1. Test Organization 85
6.2.2. Test Environment 86
6.2.3. Test Schedule 88
6.3. Test Strategy 88
6.3.1. Classes of tests 89
6.4. Test Design 89
6.4.1. Test Description 89
6.4.2. Test Data 89
6.5. Test Result and Analysis 96
6.5.1. Sign Up Module 96
6.5.2. Login Module 97
6.5.3. Check Abnormal Sign Module 98
6.5.4. Measure Abnormal Sign Module 99
6.5.5. Generate Graph Module 100
6.5.6. Alert Message Module 101
6.6. Conclusion 101

CHAPTER VII CONCLUSION 102
7.1. Introduction 102
7.2. Observation on Weakness and Strengths 102
7.3. Propositions for Improvement 104

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

7.4. Project Contribution 105
7.5. Constrain and Limitation 105
7.6. Reflection and Concluding Observation 106
7.7. Learning process 106
7.8. Conclusion 107
REFERENCES 108
APPENDICES A 109
APPENDICES B 113

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# LIST OF TABLES


Table 1 Blood Glucose Reading Chart 22
Table 2 Blood Pressure Reading Chart 23
Table 3 Percentage distribution of hand phone users by nationality 25
Table 4 Project Milestone 30
Table 5 Data Dictionary Blood Pressure Chart 50
Table 6 Data Dictionary Blood Glucose Chart 52
Table 7 Data Dictionary Blood Pressure 54
Table 8 Data Dictionary Blood Glucose 57
Table 9 Data Dictionary Blood Pressure Abnormal History 59
Table 10 Data Dictionary Blood Glucose Abnormal History 62
Table 11 Development Server Specification 80
Table 12 Configuration Management Setup 81
Table 13 Implementation Status 82
Table 14 Test Organization 86
Table 15 Test Schedule 88
Table 16 Test Data Set A 90
Table 17 Test Data Set B 91
Table 18 Test Data Set C 92
Table 19 Test Data Set D 93
Table 20 Test Data Set E 94
Table 21 Test Data Set F 95


UNIVERSITI TEKNIKAL MALAYSIA MELAKA

# LIST OF FIGURES


Figure 1 Project Gantt chart 31
Figure 2 System Architecture 40
Figure 3 Navigation Design 41
Figure 4 Input Sign Up 42
Figure 5 Input Login 43
Figure 6 Input Body Mass Index 43
Figure 7 Input Blood Pressure 44
Figure 8 Input Blood Glucose 44
Figure 9 Output Health History Record 45
Figure 10 Output Body Mass Index 46
Figure 11 Output Blood Pressure 47
Figure 12 Output Blood Glucose 48
Figure 13 Create Table Blood Glucose Level Chart 74
Figure 14 Create Table Blood Glucose Abnormal History 74
Figure 15 Create Table Blood Pressure Chart 75
Figure 16 Create Table Blood Pressure Abnormal History 75
Figure 17 Insert Blood Glucose Level Chart 76
Figure 18 Insert Blood Pressure Chart 76
Figure 19 Environment Setup 79


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# LIST OF DIAGRAMS


Diagram 1 Consultation Process 34
Diagram 2 Use Case Diagram 36
Diagram 3 Entity Relationship Diagram 49
Diagram 4 Check Abnormal BP Signs Range Sequence Diagram 64
Diagram 5 Measure and Alert BP Abnormal Sign Range Sequence Diagram 65
Diagram 6 Check Abnormal BG Signs Range Sequence Diagram 65
Diagram 7 Measure and Alert BG Abnormal Sign Range Sequence Diagram 66
Diagram 8 Test Organization 85
Diagram 9 Test Environment 87
Diagram 10 Sign Up Module 96
Diagram 11 Login Module 97
Diagram 12 Check Abnormal Sign Module 98
Diagram 13 Measure Abnormal Sign Module 99
Diagram 14 Generate Graph Module 100
Diagram 15 Alert Message 101


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CHAPTER I

CHAPTER I INTRODUCTION

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## 1.1. Introduction

Preventive care or prophylaxis is any medical or public health procedure whose purpose is to prevent a disease, rather than treat or cure a disease. Preventive care measures are divided between primary prophylaxis and secondary prophylaxis. Primary prophylaxis means the prevention development of a disease, while secondary prophylaxis means the diseases has already developed and the patient is protected against worsening of this process.

Blood pressure, sometimes called hypertension is a common disease in which blood flows through arteries at higher pressures than normal

pressures. Blood glucose is a sugar that is transported through blood stream. Higher level of blood sugar is known as hyperglycemia. It normally occurs when there is not enough insulin in the body. Blood pressure and glucose is worldwide unsolved problems due to unhealthy lifestyle. Preventive action can be taken to avoid a person getting the diseases.

Preventive Care Tool for Hypertension and Glucose project is to analyse, develop preventive care model and integrate and test the tool with e-CSS system. Roughly, the tool will analyse information on patient's records of blood pressure and glucose and generate result from the analysis. The result is very useful for patient to know their current health status. From the result, patients able to follow and plan their healthy lifestyle in order to prevent the development of the diseases and avoid from the diseases worsening.

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## 1.2. Problem Statement(s)

i. Preventable death includes hypertension and high cholesterol is unsolved problem due to unhealthy lifestyle habit.
ii. Lack of study on ICT and decision model to assist patient on controlling the diseases.

## 1.3. Objective

This project embarks on the following objectives:

i. To analyse preventive care model for blood pressure and glucose
ii. To develop preventive care model for Preventive Care Tool for Hypertension and Glucose
iii. To integrate and test Preventive Tool for Blood Pressure and Glucose with e-CSS

## 1.4. Scope

### 1.4.1. System's functionality

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The system is expected to handle two type of disease; there are blood pressure and blood glucose. For blood pressure and blood glucose, the system should analyse systolic and diastolic reading (for blood pressure) and blood glucose level (for blood glucose) for each patients in every 30 minutes. System will get all required data from database. If the result from the analysis is match certain condition, the system should send alert message to patients' mobile phone. The system will run for next 30 minutes, this time, system will only read data that never been read/analyse before.

The system also expected to be able to send alert message to patient's mobile phone if the result match certain condition. The message body must

contain short and precise alert message to make sure patient do not have difficulty to read the message and does not take too much time to understand the message.

### 1.4.2. System's user

The user of Preventive Care Tool for Hypertension and Glucose is patient who have registered in eCSS. Patient will get alert message if their health status, either blood pressure or blood glucose reach abnormal state. Patient then, need to follow advice given in the message.

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## 1.5. Project Significance

Diabetes mellitus and hypertension is a major public health concern in Malaysia. The National Health and Morbidity Survey (NHMS) 2011 have indicated that the prevalence of diabetes in Malaysia has increased by 31% in the space barely 5 years starting from 2006 to 2011. The adult prevalence of hypertension in 2000 is 26.4%, by 2025 it is expected will up to 29.2%. Hypertension and diabetes is leading risk factor for mortality, in charge of 13% of deaths globally. Thus, this project idea is to help people with hypertension or diabetes to personalize their health care to avoid or reduce death cause by hypertension and diabetes.

## 1.6. Expected Output

The main expected output for this project is personalized health care tools for preventive purpose. This tool also contains a model to analyse abnormal state of patient's blood pressure and blood glucose. The system able to analyse exsiting data from eCSS then generate result, if result match speficied condition the tool will generate alert message. This tool able to generate automatic alert message via short message service.

## 1.7. Conclusion

As conclusion, Preventive Care Tool for Hypertension and Glucose can help user to track their hypertension and/or diabetes status and they able to take recommended action to ensure their health is in good condition. Besides that, this tool also might help to reduce death cause by hypertension and diabetes as the alert message is sent to user and user can take preventive action as early as possible.

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# CHAPTER II

# LITERATURE REVIEW

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## 2.1 Introduction

This chapter will discuss facts and finding about blood glucose and its problems, blood pressure and its problems, preventive health care technology, mobile phone usage in Malaysia, mobile phone and health care service and existing system and technology in preventive health care technology. The chapter also will list out the project requirements including software and hardware requirements. Lastly the chapter contains project's milestone and project's Gantt chart.

## 2.2 Facts and findings

This section will focused on previous research on sub topic below made by other researcher that related to this project.

### 2.2.1 Blood glucose and its problem

According to Ministry of Health Malaysia, blood glucose or diabetes mellitus is a common chronic disorder, as for now there is no known cure for the disease, yet the disease can be controlled enabling the person to lead a healthy and productive life. The accompanying graph traces the standard blood glucose ranges for a man who does and does not have diabetes.

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**Table 1 Blood Glucose Reading Chart**

| **Blood Glucose Level** | | **Excellent** | **Good** | **Acceptable** | **Poor** |
|---|---|---|---|---|---|
| Before meal | mmol/L | 4.0 – 6.0 | 6.1 – 8.0 | 8.1 – 10.0 | >10 |
| | mg/dl | 72 -109 | 110 – 144 | 145 – 180 | >180 |
| 2 hours after meal | mmol/L | 5.0 – 7.0 | 7.1 – 10.0 | 10.1 – 13.0 | >13 |
| | mg/dl | 90 – 126 | 127 – 180 | 181 – 234 | >235 |

The National Health and Morbidity Survey (NHMS) 2011 has demonstrated that the commonness of diabetes in Malaysia has increase by 31% in the space only 5 years, from 11.6% in 2006 to 15.2% in 2011. This implies there are right now around 2.6 million grown-ups age 18 years and above living with diabetes (abnormal blood glucose). Toward the end of

December 2012, the registry contained 657 839 records which 653 326 were determined to have diabetes.

### 2.2.2 Blood pressure and its problem

Blood Pressure is defined by four blood pressure reading classifications: normal, pre-hypertensive, first hypertensive and second hypertensive reading. Below is a table of recommended blood pressure follow-up table.

**Table 2 Blood Pressure Reading Chart**

| BP Classification | Systolic BP (mmHg) | | Diastolic BP (mmHg) |
|---|---|---|---|
| Normal | < 120 | And | < 80 |
| Pre-hypertension | 120 – 139 | Or | 80 - 89 |
| First Hypertensive | 140 – 159 | Or | 90 - 99 |
| Second Hypertensive | 160 | Or | 100 |

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From the Management of Moderately Elevated Blood Pressure Report stated that, in Malaysia, many patients who have hypertension are under-diagnosed. 30% of the have never been diagnosed and reported to hospitals. It was found that 41% of hypertensive patients have never been on medication and present with life-threatening complication (National Health and Morbidity Survey).

Datuk Seri Liow Tiong Lai, Malaysia Health Minister said that during the study on the intake of salt through urine analysis last year found that one in three or about 32.7% of Malaysians aged 18 years and above are now

diagnosed to have high blood pressure. He then advised the public to take steps in reducing salt intake by having routing health screening.

### 2.2.3 Preventive health care technology

Preventive health care must be planned and executed, even when illness is absent. The best method to properly maintain a good health is concern about food and practice healthy lifestyle. As time goes by and technology evolved very quickly, technology can help to keep people healthy and out of the hospital.

"Expanding the capabilities of our cell phones would bring prevention and early diagnosis directly to us. These devices could monitor blood pressure, EKG and heart rhythms, glucose levels, pacemakers, vaccination schedules, colonoscopies, breast exams, doctors' visits and a host of other possibilities."(Ferenc, Jeff, 2013)

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Technology could help doctors to monitor patients' status. This statement is supported by Riley. Riley said advanced technology already is helping doctors manage patients' diabetes through the use of wireless blood glucose meters, which transmit data to health professionals.

### 2.2.4 Mobile phone and health care services

Nowadays, mobile phone has become need to each of us, because these technology help to enhance the productivity of our daily task. There is a huge opportunity around personal devices being used to send reminders and alerts to patients about preventive care measures, said Laura Kreofsky, principal of Impact Advisors, a health care technology consulting firm.