TB DIAGNOSIS LABORATORY INFORMATION SYSTEM – Surveillance & Tracking

BY

LAW JIA WEI

A REPORT

SUBMITTED TO

Universiti Tunku Abdul Rahman

in partial fulfillment of the requirements

for the degree of

BACHELOR OF INFORMATION SYSTEMS (HONS)

INFORMATION SYSTEMS ENGINEERING

Faculty of Information and Communication Technology

(Kampar Campus)

JAN 2020

UNIVERSITI TUNKU ABDUL RAHMAN

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Date: 23 April 2020

Date: 23 April 2020

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DECLARATION OF ORIGINALITY

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Name : Law Jia Wei

Date : 23 April 2020

ACKNOWLEDGEMENTS

I would like to express my sincere thanks and appreciation to my supervisors, Ms Yap Seok Gee who has given me this bright opportunity to engage in a Medical Management System field. It is my first step to establish a career in Medical Management System field. A million thanks to you.

ABSTRACT

This project is a TB Diagnosis Laboratory information project. This project will provide laboratory users with the coordination of multiple laboratory, accuracy and easy to understand data. This project is designed for the Universiti Tunku Abdul Rahman's new specialist training hospital (operational by 2021). From the design point of view, emphasis is laid on the better detection and prevention of the TB (Tuberculosis) disease. As we know, TB (Tuberculosis) is of the disease frequently affects the human's lung and it can easily spread through the air. TB is extremely dangerous if we do not do any relevant action on it. Hence, this TB Diagnosis Laboratory information project is focus on resolve TB problem by allowing the relevant users to coordinate from different laboratory and enhance the data accuracy. This project is also trying to resolve the traditional paperwork of the medical staff since all the task will be done through the electronic system. The major motivation of the TB Diagnosis Laboratory Information project is to reduce the TB disease cases occurrence gradually. This project is expected to act as a useful tool for the TB medical domain in helping to resolve the TB disease problem

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF ABBREVIATIONS

DR TB	Drug-Resistant Tuberculosis
DST	Drug Susceptibility Testing
MDR	Multi-drug-resistant tuberculosis
SDLC	System Development Life Cycle
TB	Tuberculosis
WHO	World Health Organization
XDR	Extensively drug-resistant

Chapter 1: Introduction

Project title: TB Diagnosis Laboratory Information System (Back-End)

1.1 Problem Statement and Motivation

World Health Organization (WHO) which represent the specialized agency of the United Nation that was concerned with global public health, has published an international 2018 edition TB report which indicated about 1.7 billion people (23% population of world), were estimated to have a latent TB infection, and these people are having the risk of developing active TB disease during their lifetime. TB disease has now become an extreme serious problem that people cannot choose to ignore it.

The shortage of early detection and prevention of TB disease has become the critical problem currently. As we know *"prevention is better than cure",* it is better to prevent disease rather than to try to find the better cure for the new disease after they occur. Before the evil issues appear happened unexpectedly and become even worst, we need to make early prevention and detection plan for this kind of issues.

Besides, the problem of coordination of different laboratory occur in some existing system such as **e-Chasqui Laboratory Information** and **Web Based MIS for Drug Resistance Tuberculosis and Laboratory Information System** which will be further discuss in **Chapter 2** below. Some of the lab test will be conducted in different laboratory, it might take some extra time and cost in order to carry out the sequentially testing from one lab to another lab. In some worst case, the related data or result might occur some error in the intermediary process.

Last but not least, the researches and investigation of the TB medical works are inefficient without a proper electronic computer system, especially for the hospital's staff or physician who want to acquire the results of drug susceptibility test and multi-drug resistant bacteria on admission and hospitalization, without a proper hospital/lab management system, these important data may not be fully carried out it's information to the doctor and relevant investigator.

1.2 Project Scope

This system is design for the Universiti Tunku Abdul Rahman's new specialist training hospital (operational by 2021). This system will be instrumented to the UTAR hospital's Tuberculosis Laboratory after the infrastructure of the hospital is fully completed. This system will only concentrate on the Kampar, Perak area.

The fundamentally function such as account maintenance, registration, integrated report generalization will be included to the TB Diagnosis Laboratory Information System. Besides, this system able to analyze on the TB disease related data, a graph or a hotspot map will have carried out for early detection and outbreak prevention activities. For example, the address and district of the TB disease carrier will be stored into database of the designed system, after the analyzing on these healthcare data, we can know that which specific area or district might become the potential area of TB disease occurrence.

In this designed system, it allows user to complete workflows and manage clinical communications on one single platform. Multiple care teams from different labs can collaborate to improve care coordination. This system also provides the most effective way for the patient to directly find the information on their respectively health conditions and give them a better guidance to treat conditions.

1.3 Project Objectives

The objective of this project is to develop a system that can perform the work of early detection and prevention of TB disease and lead to a decrement cases of TB disease. Besides, multiple care teams from different labs can perform the better care coordination by using this proposed system which allow relevant user to complete workflows and manage clinical (laboratory) communications. Finally, the aim of this system is to provide the efficiency and effective relevant data that help to improve the treatment/therapy decision.

1.4 Impact, significance, and contribution

The biggest impact of this project is expected to the **reduce the TB infection rate** of the public through the way of collecting all the relevant TB data and generate the specific information that will provided to user to perform some further safeguard action since the TB disease has now become the global worries day by day. Despite this is not an easy work, but this is all about the survival of the human being and our next generation.

Besides, this project will eventually act as a **useful tool for the physician or relevant medical care personnel to analyze the TB data** and make a nearest hundred percent of correct decision for the treatment or therapy to the specific patients all the time. This will directly enhance the decision quality during the therapy making process.

Last but not least, this project system will **decrease the workloads for the staff (**paperwork**)** since it can automate the manual steps within the process of identifying, notifying and tracking with infectious disease. This project is contributed to help the specific hospital or laboratory staff to save their time, resources and energy since the traditional paperwork is eliminated. A proper **Graphical Representation** like formal **Dashboard** that include different chart (Line Chart, Bar Chart), table and Maps (Google Maps) in this project will help the user to visualize the TB data easier effective and efficiency.

1.5 Background information

Tuberculosis (TB) is a type of disease caused by *Mycobacterium tuberculosis (MTB)* which frequently affects the lung of the human. TB can be spread through the air when the people who have active TB in their lungs spit, cough, sneeze, or speak. The spreading method of the TB disease make it become a significant worldwide illness. TB can be categorized with two main types which are **Latent TB infection and Active TB disease**. TB bacteria can survive in human body without making people feel sick. This is called latent TB infection. Latent TB infection carrier do not have any symptoms and cannot spread TB bacteria to others. However, Active TB disease is contrary to Latent TB infection, people who have Active TB disease usually getting symptoms and may spread TB bacteria to other people. TB bacteria commonly grow in the lungs and cause the symptoms such as a bad cough (3 weeks) or longer, pain in the chest (abnormal chest x-ray), coughing up blood or sputum. A lot of people fall sick with TB every year. If a single person who resulted in having latent TB infection after the relevant testing, he or she should take medicine to keep from developing Active TB Disease.

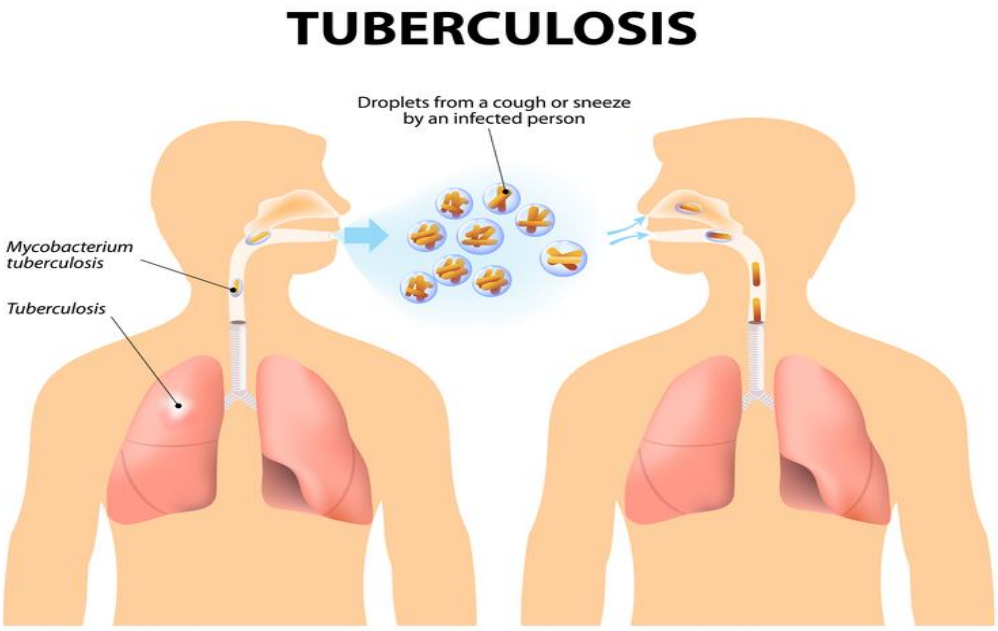


Figure 1.1: Tuberculosis's sketch.

Typically, a doctor or a medical staff who want to inspect a patient whether he or she is contracted by the TB disease, the very first step taken by them is to check the medical history and have a physical exam, the next step is to do a **chest x-ray** in order to let health worker to examine the lung of the particular person with suspected TB. However, this specific person might need further test to prove he or she is suffered with the TB disease by the ***sputum and culture test***.

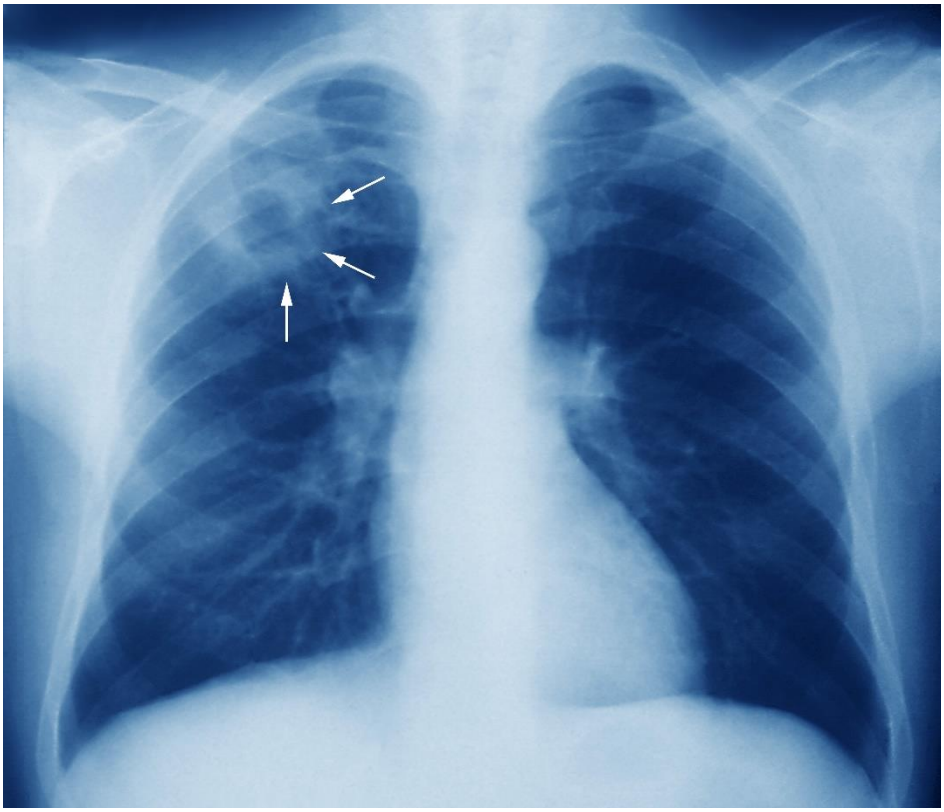


Figure 1.2: Tuberculosis's Chest X-Ray Sample.

Sputum test is often the first TB disease test to be used in many countries, especially for the countries with high TB infection rate. The sample of the sputum is often collected by the person coughing. In order to test for the TB several, at least 3 samples of sputum will normally be collected with the same person. It is because the results of the sputum are available within hours, the sensitivity though is only 50-60%.

Culture test involves studying TB bacteria by growing the bacteria on different substance. The substances are solid substances on culture plates or bottles of liquid. These substances are chosen to make higher chances growing of the bacteria. Culture test can also provide ***Drug-susceptibility testing (DST)***. DST is to find out if a person has got drug resistant TB. DST can perform rapid discovering of a person who has the drug resistant TB in order to let this person can be provided with effective TB treatment.

Besides, ***TB skin test*** and ***TB blood test*** are the two types of test for the TB infection which are TB Skin Test and TB blood test. However, it is not recommended that to test a same person with both TB skin test and Tb Blood test. TB skin test has two result which is positive skin test and negative skin test, these two results depend on the size of the raised, hard area or swelling. Positive skin test means the person's body was infected with TB bacteria; negative skin test means person did not react to the test. The TB skin test can be repeated on the same person, but the additional test should be placed in different body's location. For the TB blood test, the result is exactly same as the skin test which also having positive and negative blood test.

TB disease related data such as basic information of the TB patient (age, gender, religion, living area etc.), results of the respectively TB test, rates of infection by multi-drug resistant bacteria on admission and during hospitalization, patient admission and discharge diagnosis, and etc. are so important to the hospital management because these data can be further analyzing for the early detection and prevention of TB disease and decrement cases of TB disease. Hence, This TB Diagnosis Lab management system is design to partially automated the collection, analysis, and utilization of hospital data. Besides, this system will able to ease inter-facility communication among clinical, laboratory and public health activities, leading to faster disease reporting, outbreak detection and intervention.

1.6 Report Organization

The details of this research are shown in the following chapters. In Chapter 2, some related background and similar system are reviewed. In Chapter 3, describes the system overview, the design of the system, the flow chart of the system, the system flow diagram of every module, the entity-relationship diagram, the data dictionary, and the SQL of the database. Then, the design specification of the system includes the methodology involved in this system, the project phases, the tools for the developer and the requirements in this system such as hardware, software and user requirement are presented in Chapter 4. And then, Chapter 5 describes the system implementation included how to download and install XAMPP. Furthermore, Chapter 6 reports the system testing. Lastly, the conclusion of the whole project and the future work of the system are described in Chapter 7.

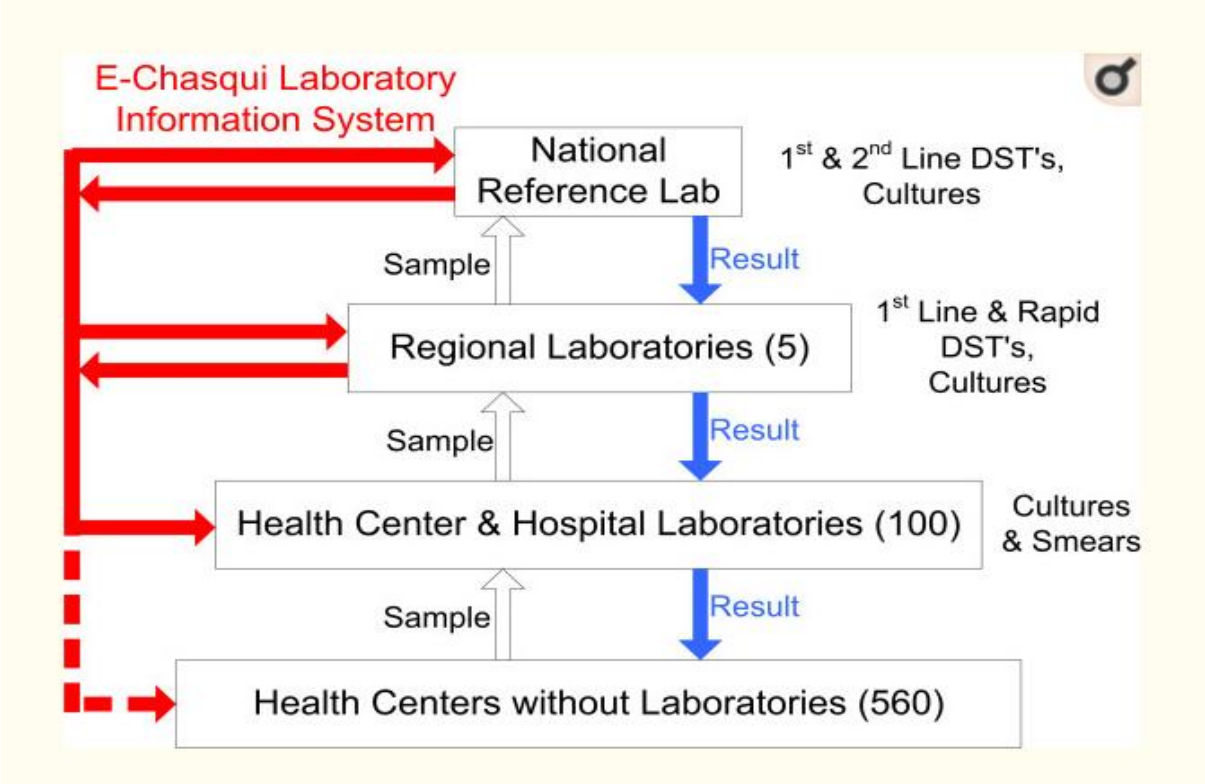
Chapter 2 Literature Review

2.1 Review on Similar System

2.1.1 e-Chasqui laboratory information system

e-Chasqui laboratory information system in reducing reporting errors compared to the paper system. **e-Chasqui** laboratory information system tends to communicate TB results to clinicians and public health administrators. This system implements to improve the quality of laboratory data in Lima, Peru such as patient's full bacteriological history and full result details of the selected sample.

Apart from the quality control, reports on tests performed, warnings about delayed reporting of results. This system also intends to protect patient confidentiality by incorporating extensive encryption, web security feature for the relevant medical record and logging of pages viewed. Besides, users required to sign a confidentiality agreement before being given access. As a result, medical users confirmed that the e-Chasqui laboratory information system provided them with the results not available



through the paper system.

Figure 2.1.1.1 Tuberculosis Laboratory Structure/Workflow in Lima and Locations of e-Chasqui Implementation.

Figure 2.1.1.2 e-Chasqui main patient page. This page shows the patient's full bacteriological history on the left sidebar and with bolded sample date for the sample whose results were being displayed on main part of page.

The key feature of this system is using one patient information page which contain all the historical test of the patient which be placed at the left-hand side (sidebar). Every of the results are displayed in this patient information page in order to obtain a full historical sample of the patients. Besides, this system also provides a flexible search engine which allow related user to key in the patient's name or key in of the sample's IC number to improve the searching time of the system.

By using this information page, user can select specific tests to print the official report format paper come out. Besides, each HC can print the report quickly after the lab verification. Because of the high load of the TB patient, the HC personnel requested the ability to view their latest results on a single page and track the status of all sample being process.

Report	Informed	Purpose	Type of Access
Frequency of e-Chasqui access by HC personnel	Regional laboratory and TB director	Encourage frequent utilization of IS to access real-time laboratory data	Monthly report prepared by data administrator
Number of laboratory results entered at regional laboratory	Regional laboratory and TB director	Identify delays in data entry	Monthly report prepared by data administrator
Number of laboratory results verified and released to providers	Regional laboratory and TB director	Identify delays in verification	Monthly report prepared by data administrator
DST results for any specified period grouped by every variable in request form	Regional and INS laboratory director	Report and identify trends in laboratory performance	Constant access**

Figure 2.1.1.3 Sample reports generated by e-Chasqui

Strength e-Chasqui laboratory information system

Chasqui laboratory information system also aims to protect patient confidentiality by incorporating extensive encryption, web security feature for the relevant medical record and logging of pages viewed. The system uses a flexible searching algorithm by enter the patient's name or any of the sample's identification numbers. This algorithm can speed up the searching time of acquires a particular data.

Weakness and Resolvent with the e-Chasqui laboratory information system

The balance between appropriate entry of results and electronic verification with high data quality remains to be a major problem. The average number of days between a DST result being read, its entry, and verification is 5.8. Hence, the additional step of result verification is needed to ensure the data is remain its quality.

Besides, system addresses the actual end user needs or to have user appropriation may occur some error sometimes, Hence, medical related people must be involved from the beginning to the end make sure the probabilities of the mistakes (error) will be minimized.

2.1.2 Web Based MIS for Drug Resistance Tuberculosis and Laboratory Information System

First of all, Web Based MIS for Drug Resistance Tuberculosis and Laboratory Information System is a system that design by the DHIS2, DHIS2 is an open source software platform established by the Health Information Systems Program (HISP) and supported by the University of Oslo's Department of Informatics. This software a modular web-based software package built with free and open source Java framework; tool for collection, validation, and presentation of aggregate and patient based statistical data.

The Web Based Management Information System is design for the purpose of effective management and monitoring Drug-Resistant TB for the Multi-Drug Resistance Tuberculosis patient. This system is proposed to automate the patient tracking and some analytical and report generation tasks in Drug-Resistance TB management program. Besides, this system is also intent on storing vital patients' information as long as other related data, tracking of Drug-Resistant TB also being one of the important tasks for this system.

Core Functionality of the Web Based MIS for Drug Resistance Tuberculosis and Laboratory Information System as below:

i) Capability report, analysis, and dissemination via dashboards of data for Drug-resistant (DR) TB management
ii) Ability to track DR TB patients and show real-time data about their treatment stage, progress, and status.
iii) Role based access to the users of the system

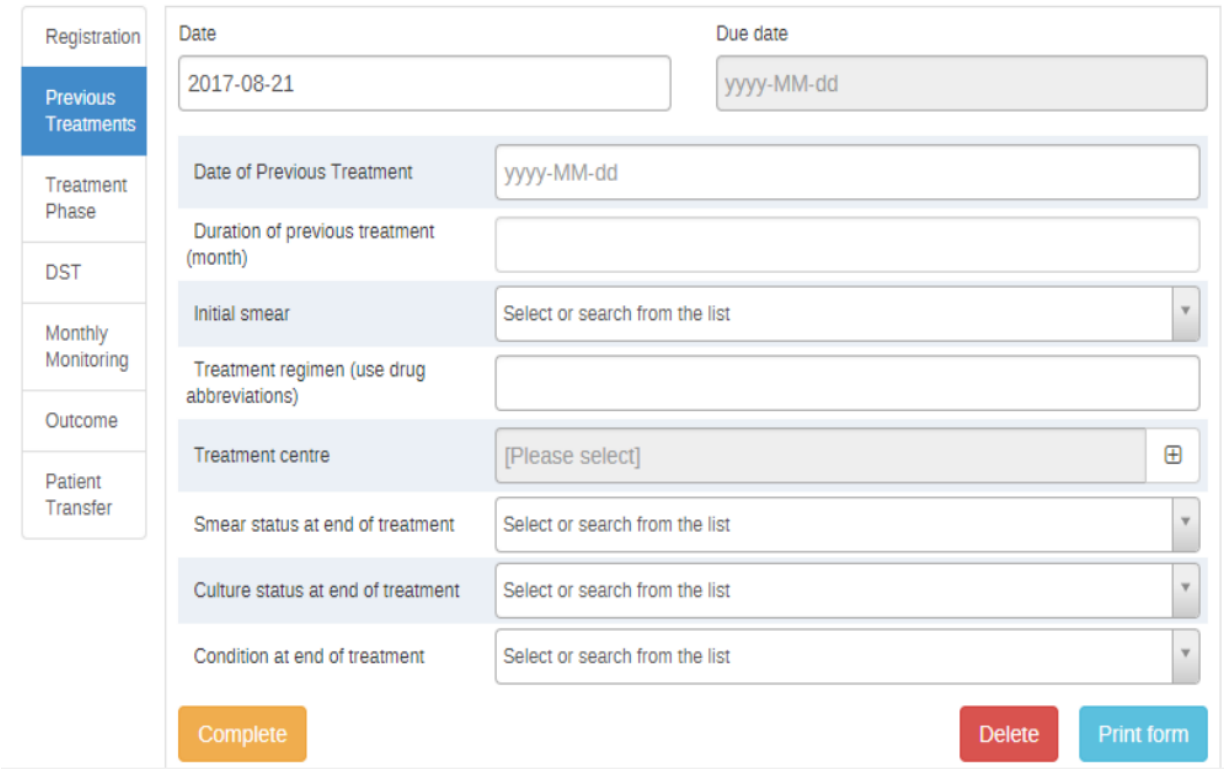


Figure 2.1.2.1 Sample Interface of the Web Based MIS for Drug Resistance Tuberculosis and Laboratory Information System

Form this figure (left panel of the interface), user can perform the task like registration, previous treatments, Drug-susceptible Test, Monthly Monitoring, Outcome and Patient transfer.

Registration stage is accomplished during the period of registration. In this stage, user can insert the record such as patient name, age, ethnicity, district, contact number etc. This is repeatable stage. It consists of 3 treatment stages of patient, Intensive phase I, Intensive phase II and Continuation Phase. For Intensive Phase I, it should be completed at the time of registration. Once the Intensive phase is completed, system automatically scheduled for next update. The next stage is previous treatment, user can record down the date of previous treatment, duration of previous treatment, what type of the drugs have been received by a patient previously, and etc.

DST is typically completed when the DST result is available. Monthly monitoring is normally completed each month during intensive phase and bimonthly during continuation phase. A detail for 0 month is completed at the time of registration. After that, the system automatically schedules the following update. Besides, the

outcome stage is completed after the treatment of the patient is completed or the patient is switched to other treatments. System asks you to accomplish the enrolment when you complete the outcome stage, do agree and click on the complete enrolment. Patient transfer stage is completed when the patient is required to transferred out or in.

Strength of Web Based MIS for Drug Resistance Tuberculosis and Laboratory Information System

The strength of this system is having the ability to report, analysis and dissemination through dashboards of data for DR TB management. This system is able to track DR TB patients and show real-time data about their treatment stage, progress and status, directly help users to gain an efficiency way of patient tracking (stage, status) management.

Weakness Web Based MIS for Drug Resistance Tuberculosis and Laboratory Information System

This system is still lacking with routine surveillance and outbreak prevention activities. Although this system can keep track the real-time data of the patient, but these data never be used for further analysis to come out with the early detection and prevention on the TB disease.

Chapter 3: System Design

3.1 System Design (Block Diagram)

In this project, it consists of 7 modules, login module act as an 'common first layer module' that restrict the access rule for each user. Besides, there are 6 major module which are **maintenance module**, **reception module**, **skin/blood test module**, **chest X-ray module**, **smear/culture/DST module** and **treatment/analysis & reporting module**.

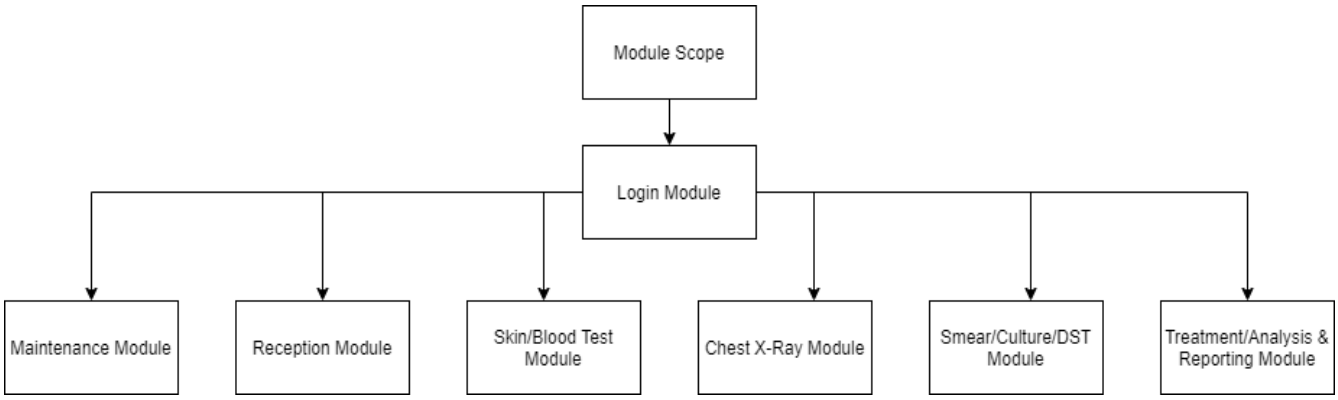


Figure 3.1: Modules of the project.

First of all, since this project will be the team based (2 person) project. Hence, me and my teammate **- Tan Sin Ping,** both of us will handle different part modules. The Login module and **Maintenance module** will be handled by me, the **Tests module** (skin-test, blood test, smear & culture test and etc.) will be handled by **Sin Ping.**

1. Login Module

The login module is important for the TB Diagnosis Laboratory Information System because this module act as the first line interface for every user to perform the login process in order to directed themselves to their main page and access to other module based on their position. The design of the login interface is remaining consistent for every user, each user will be required to key in their unique credentials (Username and Password) during the login process. The user position will generally be divided into admin, doctor, nurse, lab scientist and radiologist. When the credential is mismatch, the system will ask for the credential from user again, until the user key in with the correct username and password.

2. Maintenance Module

This module is typically performed by the **admin**. The module will have 4 majors functionalistic, which are **create/edit user position's, create/edit user information based on their position, review the historical user (**inactive user**)** and **activate the inactive user**.

This maintenance module will handle the tasks like creation of the user, edition of the user (username, password and etc.), and keep track all the existing users within the TB Diagnosis Laboratory Information System.

3. Reception Module

This reception module is generally performed by the **nurse** who handle the patient reception task. Each of new patient will be registered through this module, all the important information will be record down, for example likes personal information, currently address, country or state travelling (latest) before, and emergency contact of the patient. Each of the record will stored into the database once the registration work is done. Besides, user who handle patient reception will be able to search through the specific patient record by using patient's IC number or passport number (foreign patient) in order to access patient's info profile. Moreover, each of the new patient record will be updated to other different test module in order to perform the further needed medical test.

4. Skin/Blood Test Module

This skin/blood test module is basically performed by the **nurse** who handle the skin or blood test process. Each of the new patient specific's record will be updated to this module once the patient's reception process has been done properly, which will be showing in the dashboard. Nurse will confirm a test (skin test or blood test) based on the patient willingness at first. After that, Nurse can search through the specific patients by using their IC number or passport number then insert the skin or blood test information and result once the test's result is come out. Each of the skin or blood test

result information will be updated to the specific patient record and stored into the database in order to do further relevant decision and analysis.

6. Chest X-Ray Test Module

The functionalities of the chest X-Ray test module are basically same as the **skin/blood test module**. The different is that this module is perform by the **radiologist**, and the test result will be the chest X-Ray picture of the patient and other relevant chest x-ray result information.

7. Smear/Culture/ DST (Drug susceptibility Test) Test Module

Again, the functionalities of this Smear/Culture/DST test module are typically same as the **skin/blood test module.** However, this module is performed by the **lab scientist**, a few sample (sputum) will be collected from the particular patients and this sample will be further analyze by the lab scientist. Once the result is come out, all the smear and culture test result information will be updated to the specific patients record and stored into the database.

Besides, **DST** test can be performed concurrently along with the **Smear and Culture** test. A few sample (sputum) is needed from the patient in order to perform the DST test. Once the test result is come out, all the test information and result will be updated to the specific patient record and stored into the database.

8. Treatment/Analysis and Reporting Module

This module is performed by the **doctor** which he or she can handle several tasks in this module. Firstly, the dashboard of this module will contain all the patient information who have been gone through the relevant test. The patient number, IC number and each of the test's result will be showed up in the dashboard. The priority sequence of the showing patient list will be based on the test result which indicated positive (High chances of getting TB). Hence, doctor can quickly click on this patient record and insert all the relevant data like treatment, drug, comment and etc. Besides,

the ‘history record’ functionality will be provided in this module in order to let doctor to keep track all the patient record previously which contain all the important result of all the individual patient.

Besides, this module is the most important part of the **TB Diagnosis Laboratory Information System.** This module includes all the related analysis part based on the database’s data which collect from all the module mention previously and display on the “Dashboard” pages.

Analysis

- No. of Overall Local and Foreign TB cases (TB tester).
- No. of TB diagnosed (positive) cases, TB suspected cases, and non-diagnosed. (negative) cases.
- TB Tester and TB Diagnosed Demographic Analysis (Age, Gender, Race).
- No. of TB (TB Tester) cases per day, per month and per year.
- No. of TB (TB Diagnosed) cases per day, per month and per year.
- No. of Multiple Drug Resistance (MDR) Cases.
- No. of Extensively Drug-Resistant TB (XDR TB) Cases.
- DST’s drugs Analysis (susceptible/resistance and contaminated cases).

All the **data** from the database will be transformed to **useful information** for the medical personnel through this analysis and reporting module. Last but not least, all the information can be presented via report format which generated by this module.

3.2 System Flow Diagram

3.2.1 General Flow Diagram (non-system flow chart)

The general flow diagram (as below) describes the procedures of people going through the TB test process.

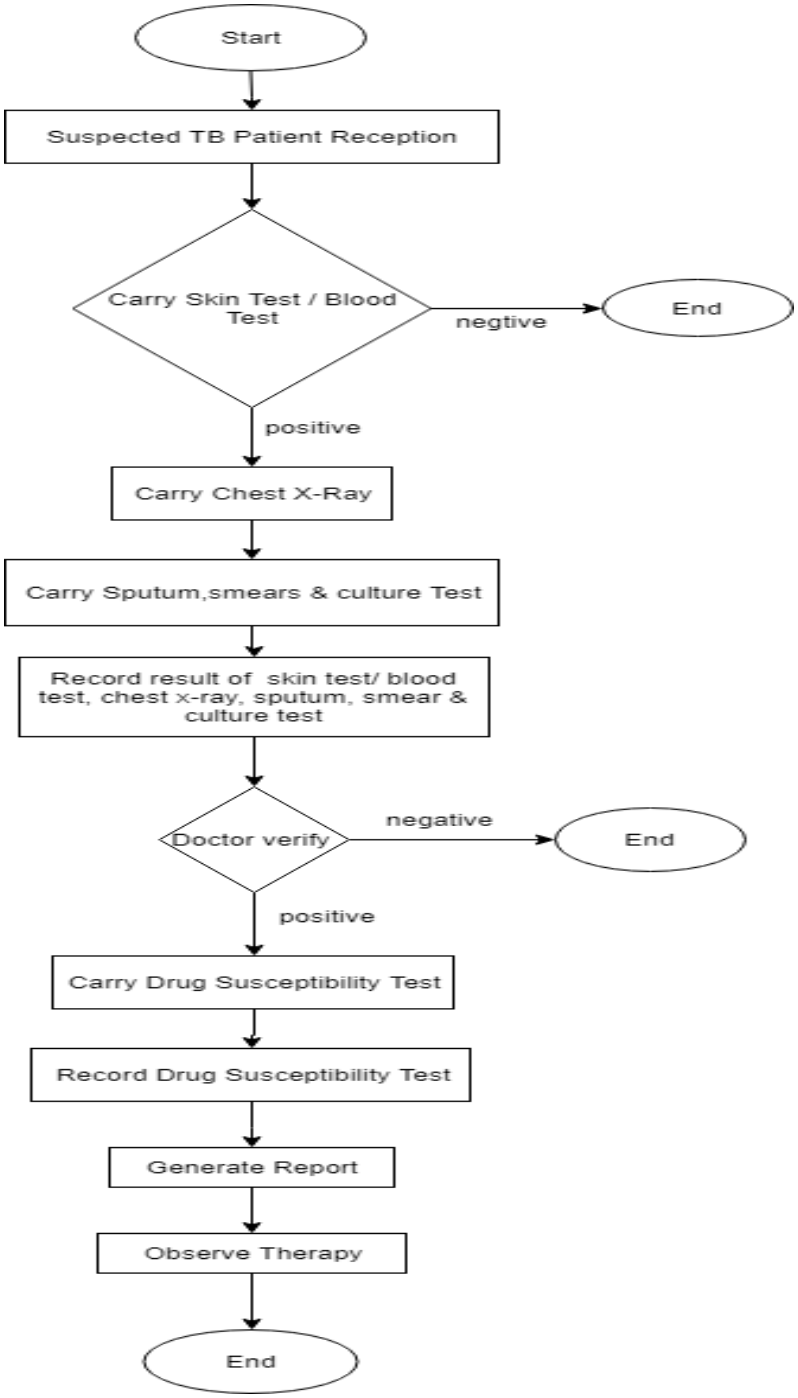


Figure 3.2.1 General Flow Chart of Diagnosis Laboratory Information System.

3.2.2 System Flow Diagram (Maintenance Module)

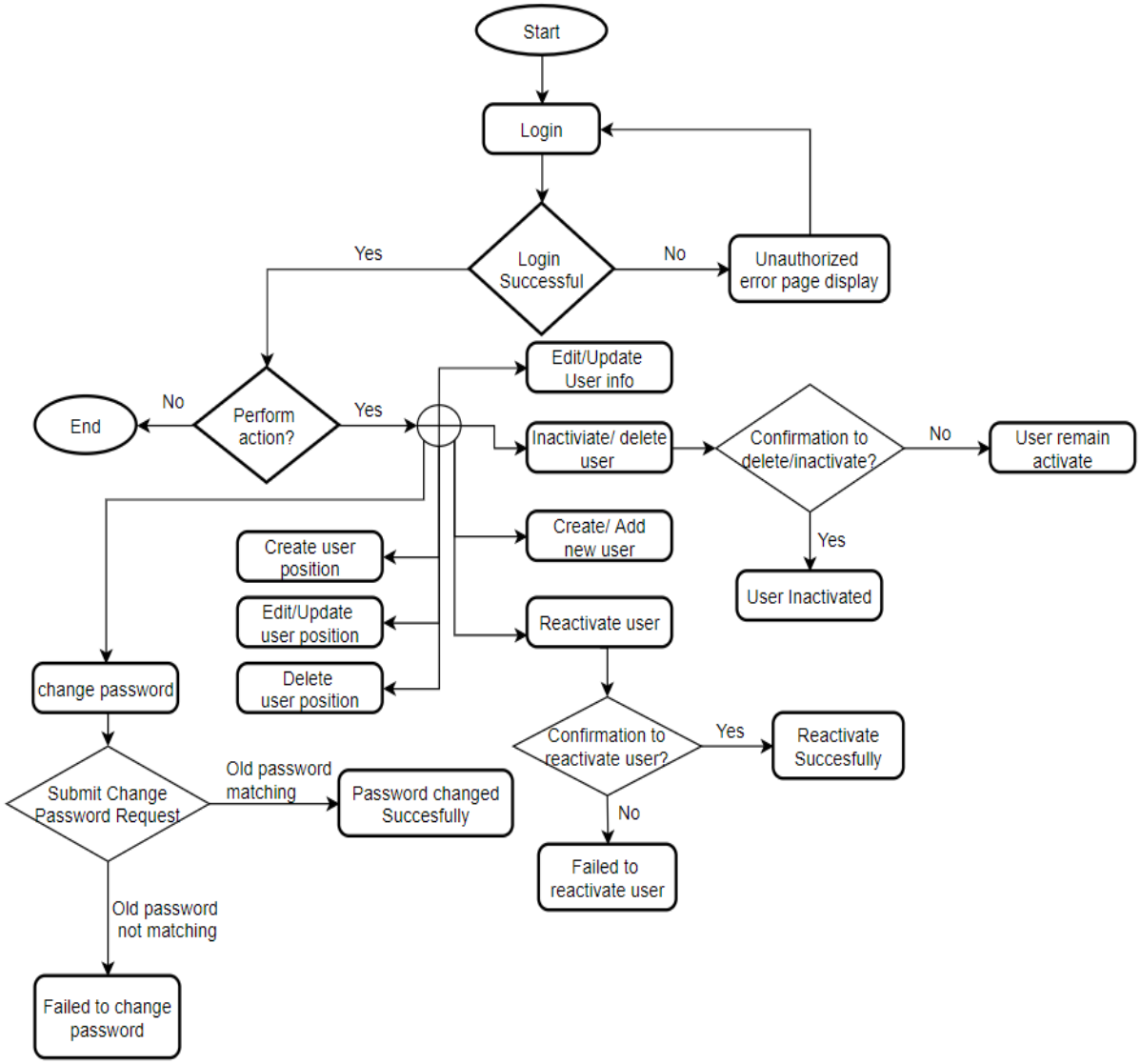


Figure 3.2.2.1 System Flow Diagram of Diagnosis Laboratory Information System (Maintenance Module).

3.2.3 System Flow Diagram (Reception Module)

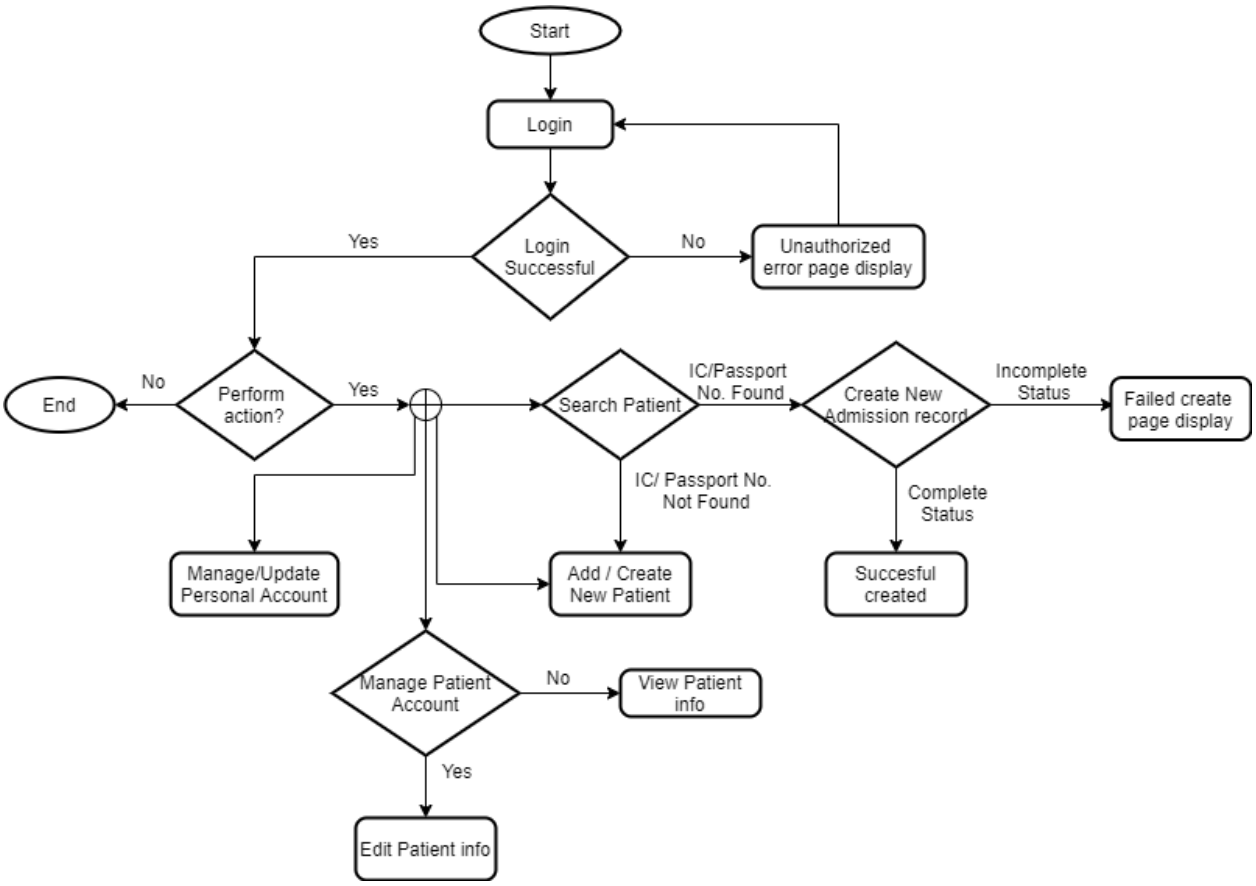


Figure 3.2.3.1 System Flow Diagram of Diagnosis Laboratory Information System (Reception Module).

3.2.4 System Flow Diagram (Skin/Blood Test Module)

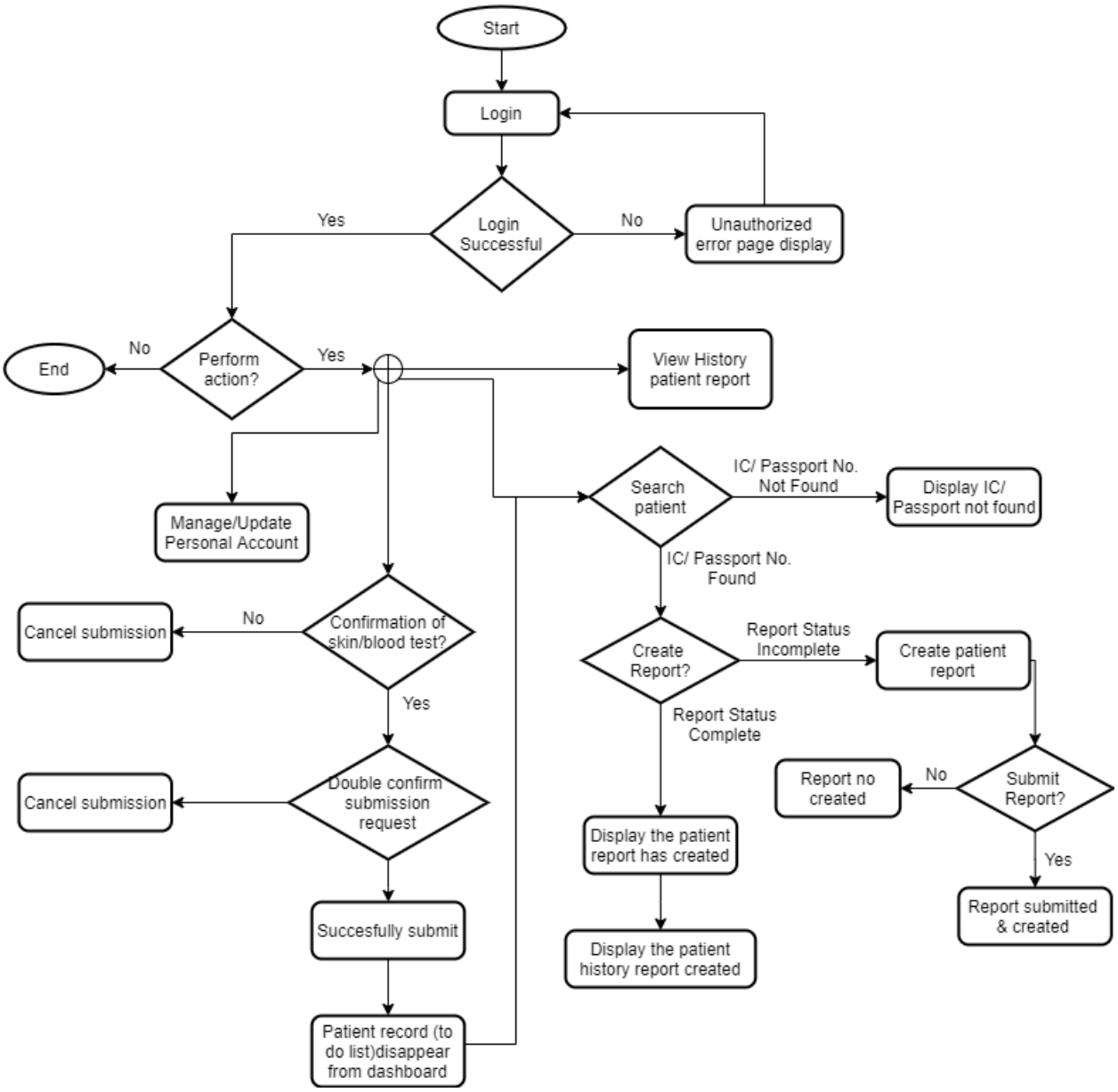


Figure 3.2.4.1 Flow Diagram of Diagnosis Laboratory Information System (Skin/Blood Module).

3.2.5 System Flow Diagram (Chest X-Ray Test Module)

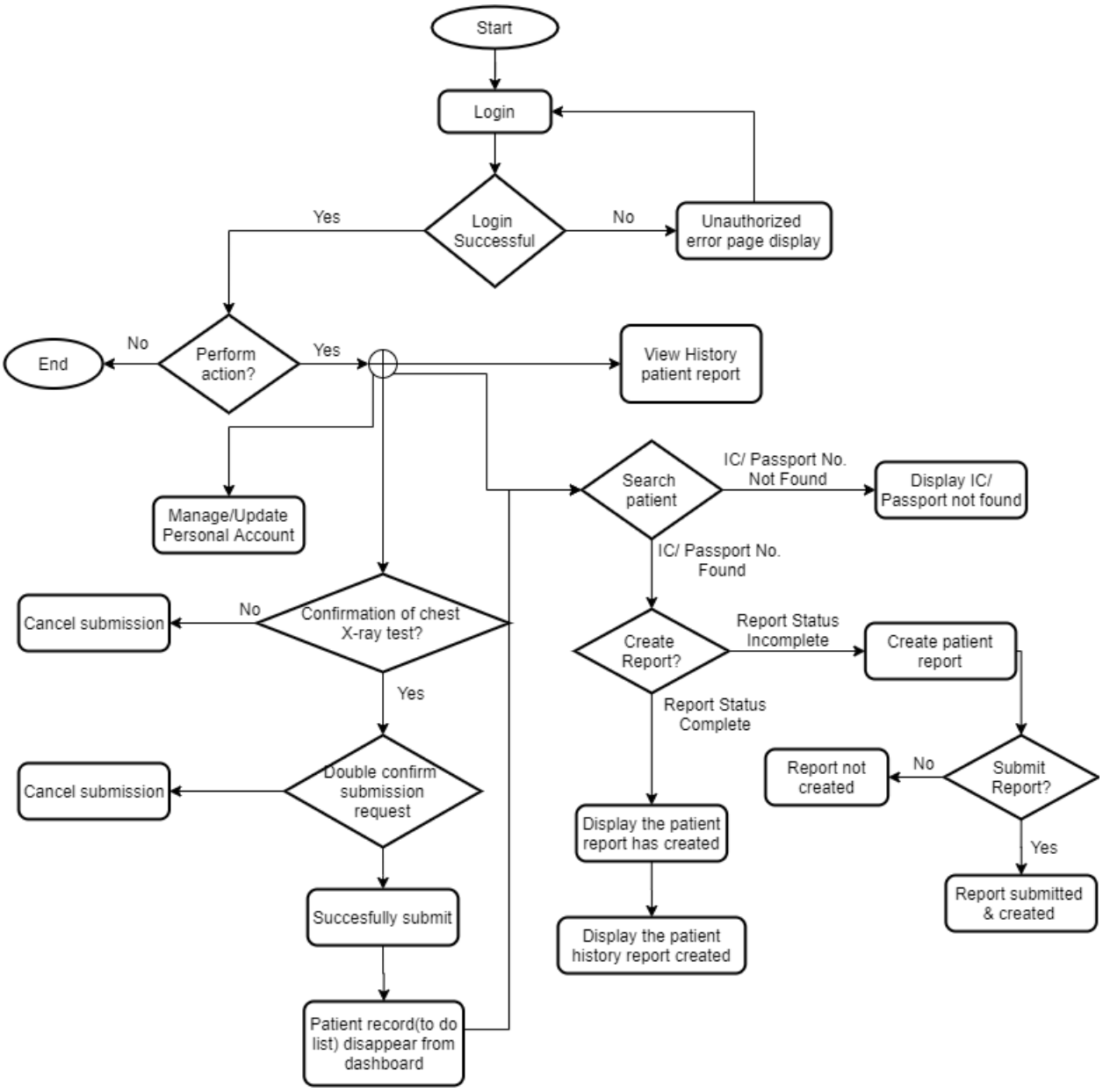


Figure 3.2.5.1 Flow Diagram of Diagnosis Laboratory Information System (Chest X-Ray Test Module).

3.2.6 System Flow Diagram (Smear/Culture/ DST Test Module)

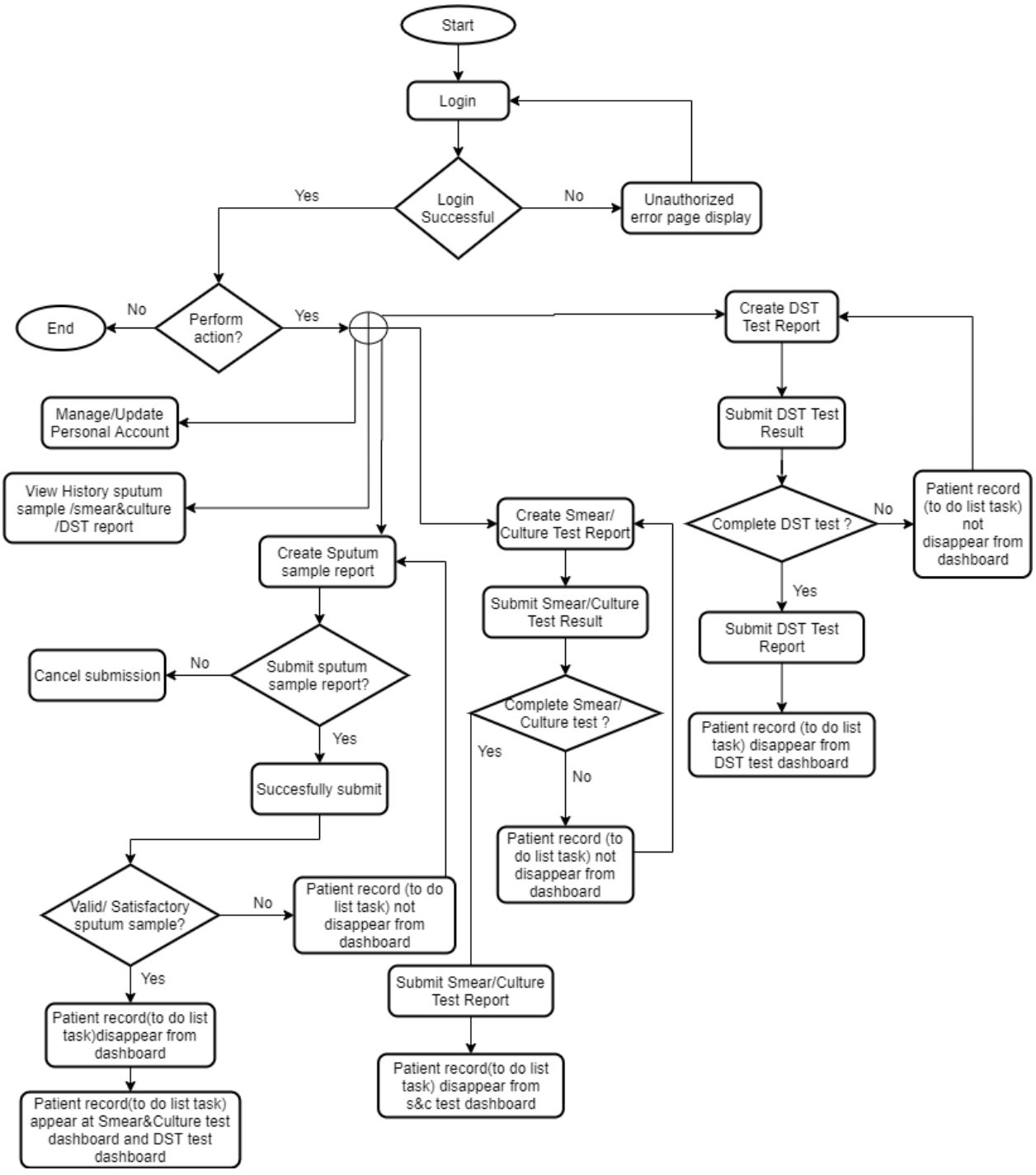


Figure 3.2.6.1 Flow Diagram of Diagnosis Laboratory Information System (Smear/Culture/ DST Test Module).

3.2.7 System Flow Diagram (Treatment/Analysis and Reporting Module)

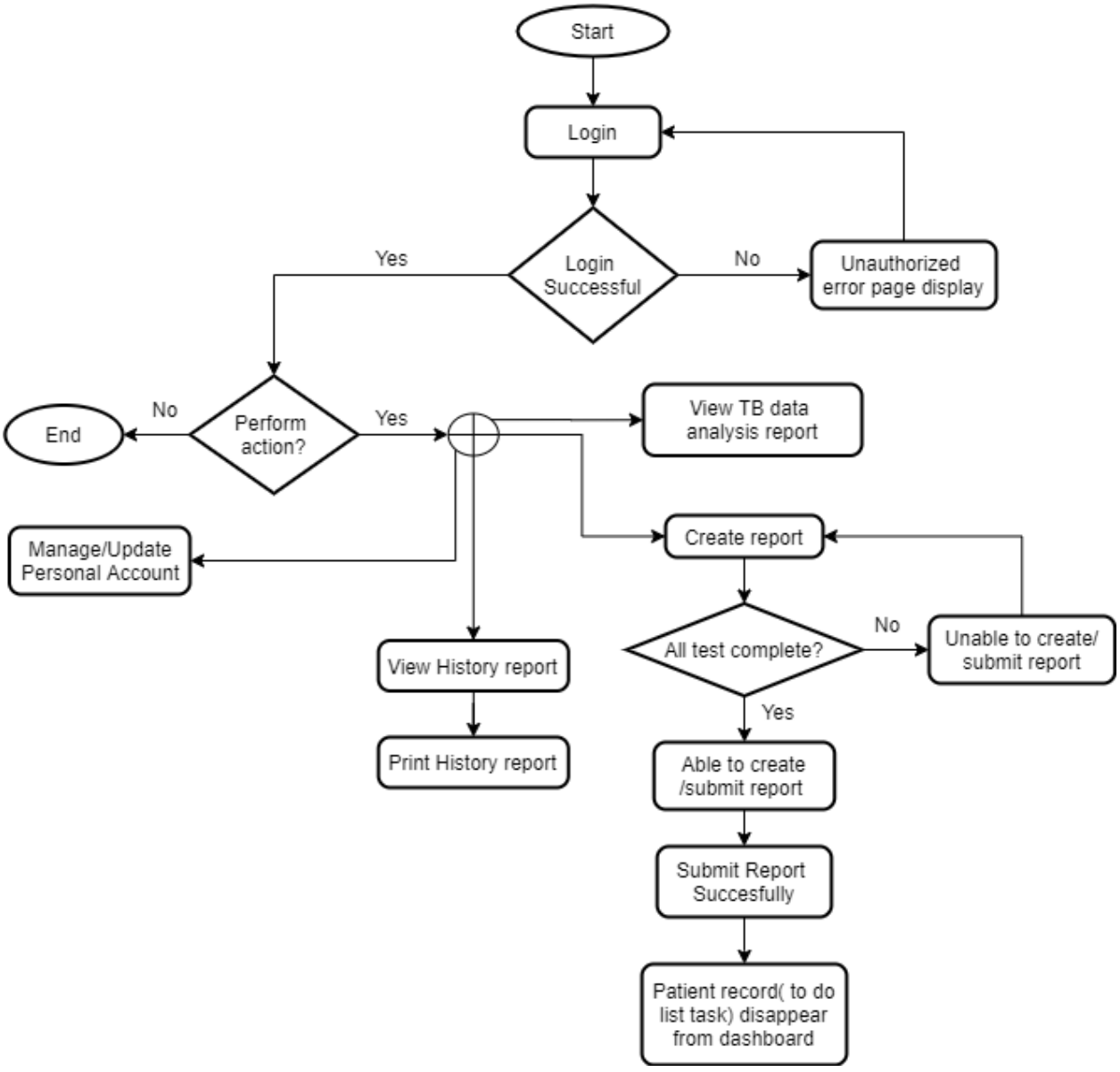


Figure 3.2.7.1 Flow Diagram of Diagnosis Laboratory Information System (Treatment/Analysis and Reporting Module).

3.3 ERD Diagram

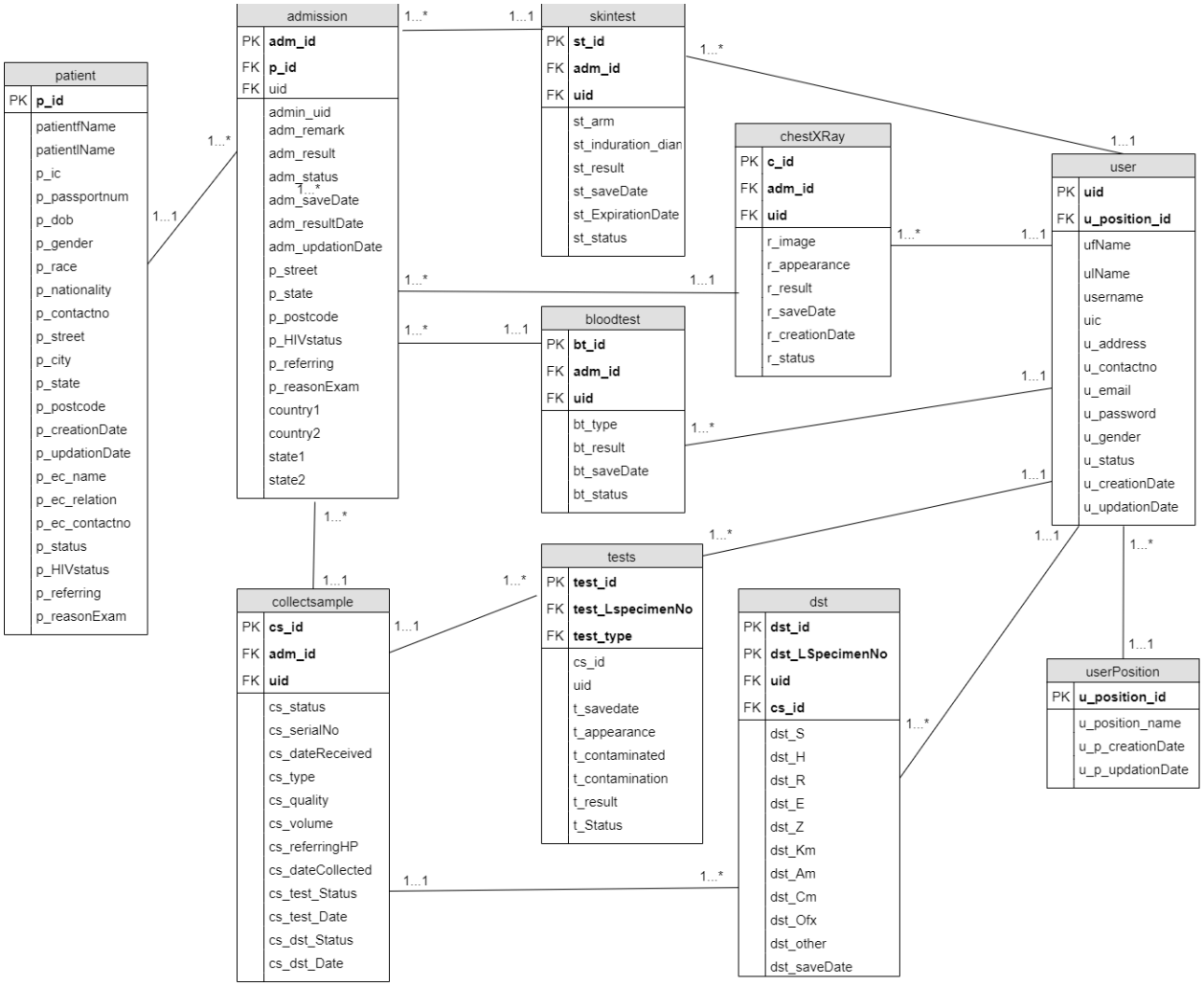


Figure 3.3.1 ERD Diagram of the TB Laboratory Management System.

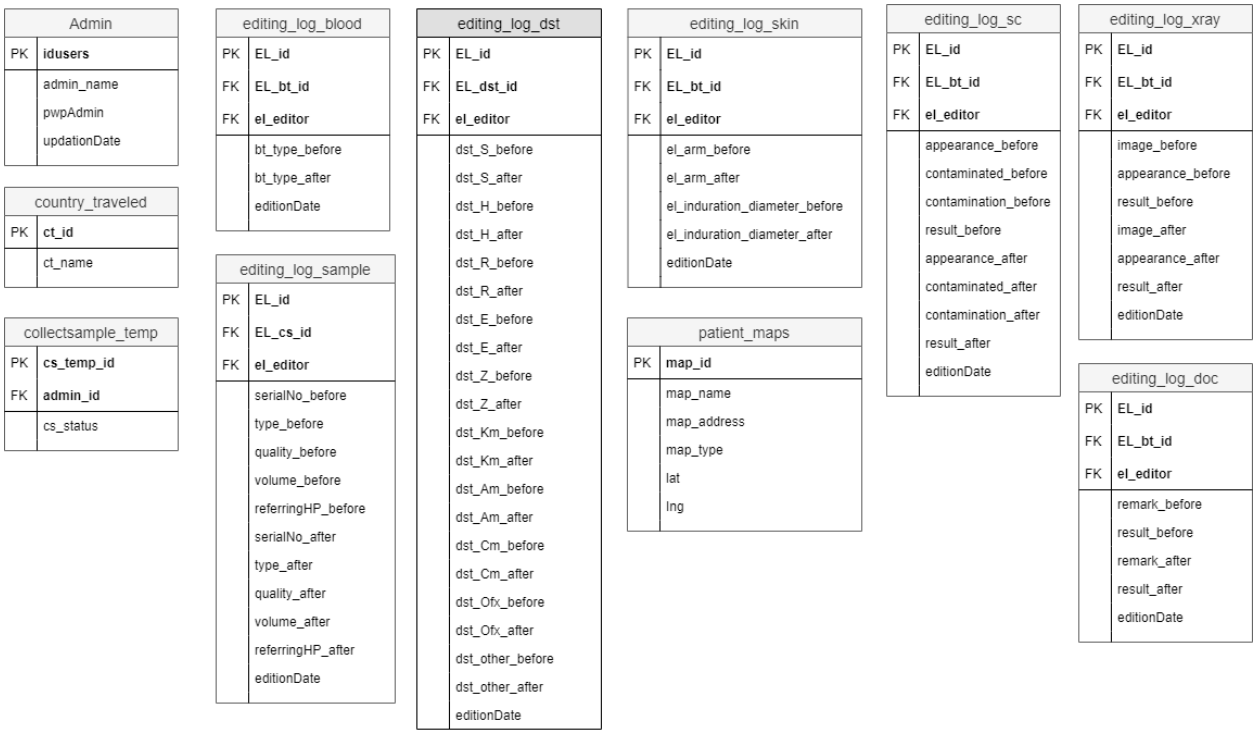


Figure 3.3.2 ERD Diagram of the TB Laboratory Management System (Cont.).

3.4 Data Dictionary

Table 3-4-1: Admin table

TABLE: admin

Column Name	Key	Data type	Size	Default	Null	Description	Sample Data
idusers	PK	int	10		NN	Unique ID for user	1
admin_name		tinytext			NN	Name of administer	jiawei
pwdAdmin		varchar	50		NN	Password of administer	lawjiawei0829
updationDate		timestamp		current_timestamp()	N	Date store administer's info	3/31/2020 19:31

Table 3-4-2: Admission table

TABLE: admission

Column Name	Key	Data type	Size	Default	Null	Description	Sample Data
admin_id	PK	int	15		NN	Unique ID for admission	1
p_id	FK	int	15		NN	Unique ID for patient	1
uid	FK	int	11		NN	Unique ID of user key in patient info	2
admin_uid	FK	int	15	Null	N	Unique ID of user key in admission result	1
adm_remark		varchar	##	Null	N	Doctor's remark	Null
adm_result		varchar	##	Null	N	Final TB test result	Positive
adm_status		varchar	15	Null	N	Status of admission	Complete
adm_saveDate		timestamp		current_timestamp()	N	Save date of admission	3/31/2020 19:31
adm_resultDate		timestamp		Null	N	Result date of admission	4/3/2020 8:53
adm_updationDate		timestamp		Null ON UPDATE current	N	Updation date of admission	4/3/2020 8:53
p_street		longtext		Null	N	street of patient	222, Jalan Jarak
p_city		longtext		Null	N	city of patient	Taiping
p_state		longtext		Null	N	state of patient	Perak
p_postcode		longtext		Null	N	postcode of patient	34000
p_HIVstatus		varchar	50	Null	N	HIV status of patient	Yes
p_referring		varchar	##	Null	N	Referring hospital of patient	Pantai Hospital
p_reasonExam		longtext		Null	N	Reason exam of patient	Diagnosis
country1		varchar	##	Null	N	1st country's patient travel before	Australia
country2		varchar	##	Null	N	2nd country's patient travel before	Singapore
state1		varchar	50	Null	N	1st state's patient travel before	Johor
state2		varchar	50	Null	N	2nd state's patient travel before	Kelantan

Table 3-4-3: Blood test table

TABLE: bloodtest

Column Name	Key	Data type	Size	Default	Null	Description	Sample Data
bt_id	PK	int	15		NN	Unique ID for blood test	1
adm_id	FK	int	15		NN	Unique ID for admission	4
uid	FK	int	11		NN	Unique ID for user	3
bt_type		varchar	30	Null	N	Type of blood test	QFT
bt_result		varchar	15	Null	N	Result of blood test	Negative
bt_saveDate		timestamp		NULL ON UPDATE currer	N	Save date of blood test	4/3/2020 8:54
bt_status		varchar	15	Null	N	Status of blood test	Complete

Table 3-4-4: Chest X-Ray table

TABLE: chestxray

Column Name	Key	Data type	Size	Default	Null	Description	Sample Data
c_id	PK	int	15		NN	Unique ID for chest x-ray	1
adm_id	FK	int	15		NN	Unique ID for admission	1
uid	FK	int	11	Null	N	Unique ID for user	5
r_image		blob			NN	Image of chest x-ray	[file image location]
r_appearance		varchar	50	Null	N	appearance of chest x-ray	Unclear
r_result		varchar	15	Null	N	result of chest x-ray	Positive
r_saveDate		timestamp		NULL ON UPDATE currer	N	save date of chest x-ray result	4/3/2020 8:57
r_creationDate		timestamp		Null	N	creation date of chest x-ray test	4/3/2020 8:57
r_status		varchar	15	Null	N	status of chest x-ray test	Complete

Table 3-4-5: Collect sample table

TABLE: collectsample

Column Name	Key	Data type	Size	Default	Null	Description	Sample Data
cs_id	PK	int	15		NN	Unique ID for sputum sample	1
adm_id	FK	int	15		NN	Unique ID for admission	1
uid	FK	int	11	Null	N	Unique ID for user	4
cs_status		varchar	15	Null	N	status of collect sample	Complete
sc_serialNo		varchar	50		NN	Sputum sample of serial No	S001
cs_dateReceived		timestamp		NULL ON UPDATE currer	N	Receive date of sputum sample	4/3/2020 9:00
cs_type		varchar	50	Null	N	Type of sputum sample	Extrapulmonary
cs_quality		varchar	30	Null	N	Quality of sputum sample	Unsatisfactory
cs_volume		varchar	40	Null	N	Volume of sputum sample	More Than 3ml
cs_referringHP		varchar	40	Null	N	Referring hospital of patient's sputum	Pantai Hospital
cs_dateCollected		timestamp		Null	N	Date collected of sputum sample	4/3/2020 9:00
cs_test_Status		varchar	15	Null	N	Status of collect sputum sample	Complete
cs_test_Date		timestamp		Null	N	Date of complete sputum collected	4/3/2020 9:00
cs_dst_Status		varchar	15	Null	N	Status of DST test	Complete
cs_dst_Date		timestamp		Null	N	Date of DST	4/3/2020 9:00

Table 3-4-6: Temporary collect sample table

TABLE: collectsample_temp

Column Name	Key	Data type	Size	Default	Null	Description	Sample Data
cs_temp_id	PK	int	11		NN	Unique ID for temporary collect sample	1
adm_id	FK	int	11	Null	N	Unique ID for admission	12
cs_status		varchar	##	Null	N	status of collect sample	Complete

Table 3-4-7: Country travelled before table

TABLE: country_traveled

Column Name	Key	Data type	Size	Default	Null	Description	Sample Data
ct_id	PK	int	11		NN	Unique ID for country traveled before	12
ct_name		varchar	##	Null	N	Name of the country traveled before	Hong Kong

Table 3-4-8: DST test table

TABLE: dst

Column Name	Key	Data type	Size	Default	Null	Description	Sample Data
dst_id	PK	int	15		NN	Unique ID for DST test	1
dst_LspecimenNo	PK	int	5		NN	Laboratory specimen no of DST test	1
uid	FK	int	11	Null	N	Unique ID for user	4
cs_id	FK	int	5	Null	N	Unique ID for sputum sample	3
dst_status		varchar	15	Null	N	Status of DST test	Complete
dst_S		varchar	50	Null	N	Value of Streptomycin	Resistance
dst_H		varchar	50	Null	N	Value of Isoniazid	Resistance
dst_R		varchar	50	Null	N	Value of Rifampin	Resistance
dst_E		varchar	50	Null	N	Value of Ethambutol	Resistance
dst_Z		varchar	50	Null	N	Value of Pyrazinamide	Resistance
dst_Km		varchar	50	Null	N	Value of Kanamycin	Resistance
dst_Am		varchar	50	Null	N	Value of Amikacin	Resistance
dst_Cm		varchar	50	Null	N	Value of Cpreomycin	Resistance
dst_Ofx		varchar	50	Null	N	Value of Ofloxacin	Resistance
dst_other		varchar	50	Null	N	Other remark	Remark
dst_saveDate		timestamp		Null	N	Save date of DST test	4/3/2020 9:42

Table 3-4-9: Blood test editing log table

TABLE: editing_log_blood

Column Name	Key	Data type	Size	Default	Null	Description	Sample Data
EL_id	PK	int	11		NN	Unique ID for blood test log table	1
EL_bt_id	FK	int	15		NN	Unique ID for blood test	6
el_editor	FK	int	11		NN	Unique ID for user	6
bt_type_before		varchar	10	Null	N	Type of blood test edit before	QFT
bt_type_after		varchar	10	Null	N	Type of blood test e after edit	QFT
editionDate		timestamp		current_timestamp()	N	Edition date of blood test	4/3/2020 8:54

Table 3-4-10: Doctor module editing log table

TABLE: editing_log_doc

Column Name	Key	Data type	Size	Default	Null	Description	Sample Data
EL_id	PK	int	11		NN	Unique ID for doctor log table	1
EL_admin_id	FK	int	15		NN	Unique ID for admission	6
el_editor	FK	int	11		NN	Unique ID for user	6
remark_before		varchar	40	Null	N	Doctor's remark edit before	Null
result_before		varchar	10	Null	N	Final TB test result edit before	Positive
remark_after		varchar	##	Null	N	Doctor's remark after edit	Null
result_after		varchar	10	Null	N	Final TB test result after edit	Negative
editionDate		timestamp		current_timestamp()	N	Edition date of doctor module	4/3/2020 8:54

Table 3-4-11: Skin test editing log table

TABLE: editing_log_skin

Column Name	Key	Data type	Size	Default	Null	Description	Sample Data
EL_id	PK	int	11		NN	Unique ID for tests log table	1
EL_st_id	FK	int	15		NN	Unique ID for skin test	6
el_editor	FK	int	11		NN	Unique ID for user	6
el_arm_before		varchar	10	Null	N	Injection on which arm of patient edit before	Right
el_induration_diameter_before		int	10	Null	N	Induration diameter of patient edit before	15
el_arm_after		varchar	10	Null	N	Injection on which arm of patient after edit	Left
el_induration_diameter_after		int	10	Null	N	Induration diameter of patient after edit	13
editionDate		timestamp		current_timestamp()	N	Edition date of skin test	4/3/2020 9:00

Table 3-4-12: DST test editing log table

TABLE: editing_log_dst

Column Name	Key	Data type	Size	Default	Null	Description	Sample Data
EL_id	PK	int	11		NN	Unique ID for dst test log table	1
EL_dst_id	FK	int	50	Null	N	Unique ID for DST test	6
el_editor	FK	int	50	Null	N	Unique ID for user	6
dst_S_before		varchar	50	Null	N	Value of Streptomycin edit before	Resistance
dst_H_before		varchar	50	Null	N	Value of Isoniazid edit before	Resistance
dst_R_before		varchar	50	Null	N	Value of Rifampin edit before	Resistance
dst_E_before		varchar	50	Null	N	Value of Ethambutol edit before	Resistance
dst_Z_before		varchar	50	Null	N	Value of Pyrazinamide edit before	Resistance
dst_Km_before		varchar	50	Null	N	Value of Kanamycin edit before	Resistance
dst_Am_before		varchar	50	Null	N	Value of Amikacin edit before	Resistance
dst_Cm_before		varchar	50	Null	N	Value of Cpreomycin edit before	Resistance
dst_Ofx_before		varchar	50	Null	N	Value of Ofloxacin edit before	Resistance
dst_other_before		varchar	50	Null	N	Other remark edit before	Remark
dst_S_after		varchar	50	Null	N	Value of Streptomycin after edit	Resistance
dst_H_after		varchar	50	Null	N	Value of Isoniazid after edit	Resistance
dst_R_after		varchar	50	Null	N	Value of Rifampin after edit	Resistance
dst_E_after		varchar	50	Null	N	Value of Ethambutol after adit	Resistance
dst_Z_after		varchar	50	Null	N	Value of Pyrazinamide after edit	Resistance
dst_Km_after		varchar	50	Null	N	Value of Kanamycin after edit	Resistance
dst_Am_after		varchar	50	Null	N	Value of Amikacin after edit	Resistance
dst_Cm_after		varchar	50	Null	N	Value of Cpreomycin after edit	Resistance
dst_Ofx_after		varchar	50	Null	N	Value of Ofloxacin after edit	Resistance
dst_other_after		varchar	50	Null	N	Other remark after edit	Remarks
editionDate		timestamp		current_timestamp()	N	Edition date of dst test	4/3/2020 8:54

Table 3-4-13: Collection sputum sample editing log table

TABLE: editing_log_sample

Column Name	Key	Data type	Size	Default	Null	Description	Sample Data
EL_id	PK	int	11		NN	Unique ID for collect sputum sample log table	1
EL_cs_id	FK	int	15		NN	Unique ID for sputum sample	6
el_editor	FK	int	11		NN	Unique ID for user	6
serialNo_before		varchar	50	Null	N	Sputum sample of serial No edit before	S001
type_before		varchar	50	Null	N	Type of sputum sample edit before	Extrapulmonary
quality_before		varchar	30	Null	N	Quality of sputum sample edit before	Unsatisfactory
volume_before		varchar	40	Null	N	Volume of sputum sample edit before	More Than 3 ml
referringHP_before		varchar	40	Null	N	Referring hospital of patient's sputum edit before	Pantai Hospital
serialNo_after		varchar	50	Null	N	Sputum sample of serial No after edit	4/3/2020 9:00
type_after		varchar	50	Null	N	Type of sputum sample after edit	Extrapulmonary
quality_after		varchar	30	Null	N	Quality of sputum sample after edit	Unsatisfactory
volume_after		varchar	40	Null	N	Volume of sputum sample after edit	More Than 3 ml
referringHP_after		varchar	40	Null	N	Referring hospital of patient's sputum after edit	Pantai Hospital
editionDate		timestamp		current_timestamp()	N	Edition date of collect sputum sample	4/3/2020 9:00

Table 3-4-14: Smear and culture test editing log table

TABLE: editing_log_sc

Column Name	Key	Data type	Size	Default	Null	Description	Sample Data
EL_id	PK	int	11		NN	Unique ID for tests log table	1
EL_test_id	FK	int	15		NN	Unique ID for tests	6
el_editor	FK	int	11		NN	Unique ID for user	6
appearance_before		varchar	40	Null	N	Appearance of tests edit before	Blood-Stained
contaminated_before		varchar	10	Null	N	Contaminated of test edit before	Yes
contamination_before		varchar	##	Null	N	Contamination of test edit before	Bacteria
result_before		varchar	10	Null	N	Result of test edit before	Positive
appearance_after		varchar	40	Null	N	Appearance of tests after edit	Blood-Stained
contaminated_after		varchar	10	Null	N	Contaminated of test after edit	Yes
contamination_after		varchar	##	Null	N	Contamination of test after edit	Bacteria
result_after		varchar	10	Null	N	Result of test after edit	Positive
editionDate		timestamp		current_timestamp()	N	Edition date of tests	4/3/2020 9:00

Table 3-4-15: Chest x-ray test editing log table

TABLE: editing_log_xray

Column Name	Key	Data type	Size	Default	Null	Description	Sample Data
EL_id	PK	int	11		NN	Unique ID for chest x-ray test log table	1
EL_c_id	FK	int	15		NN	Unique ID for chest x-ray	6
el_editor	FK	int	11		NN	Unique ID for user	6
image_before		blob		Null	N	Image of chest x-ray edit before	[file image location]
appearance_before		varchar	50	Null	N	appearance of chest x-ray edit before	Unclear
result_before		varchar	15	Null	N	result of chest x-ray edit before	Positive
image_after		blob		Null	N	Image of chest x-ray after edit	[file image location1]
appearance_after		varchar	50	Null	N	appearance of chest x-ray after edit	Unclear
result_after		varchar	15	Null	N	result of chest x-ray after edit	Negative
editionDate		timestamp		current_timestamp()	N	Edition date of chest x-ray test	4/3/2020 8:57

Table 3-4-16: Patient table

TABLE: patient

Column Name	Key	Data type	Size	Default	Null	Description	Sample Data
p_id	PK	int	15		NN	Unique ID for patient	1
patientfName		varchar	##	Null	N	First name of patient	Vince
patientlName		varchar	##	Null	N	Last name of patient	Tan
p_ic	U	varchar	15	Null	N	Malaysian Identity Card No. of patient	980307018932
p_passportnum	U	date	20	Null	N	Passportnumber of foreign patient	A123456
p_dob		varchar		Null	N	Date of birth of patient	3/7/1998
p_gender		varchar	15		NN	Gender of patient	Male
p_race		varchar	25	Null	N	Race of patient	Malay
p_nationality		varchar	55	Null	N	Nationality of patient	Malaysian
p_contactno		varchar	15	Null	N	Contact No of patient	012345678
p_street		longtext		Null	N	Street of patient	219,Jalan Perdana 14
p_city		longtext		Null	N	City of patient	Kampar
p_state		longtext		Null	N	State of patient	Perak
p_postcode		int	10	Null	N	Postcode of patient	31900
p_creationDate		timestamp		current_timestamp()	N	Creation date of patient info	3/30/2020 16:35
p_updationDate		timestamp		NULL ON UPDATE currer	N	Updation date of patient info	4/5/2020 16:35
p_ec_fname		varchar	##	Null	N	First name of emergency contact person	Johnson
p_ec_lname		varchar	##	Null	N	Last name of emergency contact person	Tan
p_ec_relation		varchar	55	Null	N	Relation between patient & EC person	Father
p_ec_contactno		varchar	15	Null	N	Contact No. of emergency contact person	01232728472
p_status		varchar	55	Null	N	Status of patient	NULL
p_HIVstatus		varchar	55	Null	N	HIV status of patient	No
p_referring		varchar	##	Null	N	Referring hospital of patient	Pantai Hospital
p_reasonExam		longtext		Null	N	Reason exam of patient	Diagnosis

Table 3-4-17: Patient maps table

TABLE: patient_maps

Column Name	Key	Data type	Size	Default	Null	Description	Sample Data
map_id	PK	int	11		NN	Unique ID for map	1
map_name		varchar	##	Null	N	Patient name on map	Yi Lim
map_address		varchar	##	Null	N	Address of patient on map	4,Jln ABC,78100,Perak
map_type		varchar	20	Null	N	Type of map	Null
lat		float	10,6	Null	N	The latitude on map	2.434784
lng		float	10,6	Null	N	The longitude on map	102.10611

Table 3-4-18: State travelled before table

TABLE: state_traveled

Column Name	Key	Data type	Size	Default	Null	Description	Sample Data
st_id	PK	int	11		NN	Unique ID for State traveled before	1
st_name		varchar	##	Null	N	Name of the state travelled before	Johor

Table 3-4-19: Skin test table

TABLE: skintest

Column Name	Key	Data type	Size	Default	Null	Description	Sample Data
st_id	PK	int	15		NN	Unique ID for skin test	1
adm_id	FK	int	15		NN	Unique ID for admission	5
uid	FK	int	11		NN	Unique ID for user	3
st_arm		varchar	10	Null	N	Injection on which arm of patient	Right
st_induration_diameter		int	10	Null	N	Induration diameter of patient	15
st_result		varchar	15	Null	N	Skin test result of patient	Positive
st_saveDate		timestamp		NULL ON UPDATE currer	N	Save date of skin test	4/3/2020 8:55
st_ExpirationDate		timestamp		Null	N	Expiration Date of skin test	4/6/2020 2:44
st_status		varchar	15	Null	N	Status of skin test	Complete

Table 3-4-20: Tests table

TABLE: tests

Column Name	Key	Data type	Size	Default	Null	Description	Sample Data
test_id	PK	int	15		NN	Unique ID for tests	1
test_LspecimenNo	PK	int	5		NN	Laboratory specimen no of tests	2
test_type	PK	varchar	30		NN	Type of test	Smear
cs_id	FK	int	5	Null	N	Unique ID for sputum sample	3
uid	FK	int	11	Null	N	Unique ID for user	4
t_savedate		timestamp		Null	N	Save date of tests	4/3/2020 9:03
t_appearance		varchar	40	Null	N	Appearance of tests	Blood-Stained
t_contaminated		varchar	10	Null	N	Contaminated of test	Yes
t_contamination		varchar	##	Null	N	Contamination of test	Bacteria
t_result		varchar	10	Null	N	Result of test	medium
t_Status		varchar	10	Null	N	Status of test	Complete

Table 3-4-21: User position table

TABLE: userposition

Column Name	Key	Data type	Size	Default	Null	Description	Sample Data
u_position_id	PK	int	11		NN	Unique ID for user position	1
u_position_name		varchar	##	Null	N	Name of user position	Doctor
creationDate		timestamp		current_timestamp()	N	Creation date of user position	8/8/2019 9:23
updationDate		timestamp		NULL ON UPDATE currer	N	Updation date of user position	1/8/2020 13:36

Table 3-4-22: Users table

TABLE: users

Column Name	Key	Data type	Size	Default	Null	Description	Sample Data
uid	PK	int	11		NN	Unique ID for user	1
ufName		varchar	##	Null	N	First name of user	Ru Sian
ulName		varchar	##	Null	N	Last name of user	Tey
username	U	varchar	##	Null	N	Username of user	teyrusian
u_gender		varchar	6		NN	Gender of user	Male
u_position_id		int	11	Null	N	Unique ID for user position	1
uic	U	varchar	50		NN	Malaysian Identity Card No. of user	97123456782
u_contactno		Varchar	11	Null	N	Contact No. for user	0123456999
u_address		longtext		Null	N	Address of user	123,Jalan ABC
u_email		varchar	##	Null	N	Email of user	teyrusian@gmail.com
u_password		varchar	##	Null	N	Password of user	123456
u_status		varchar	10	'Active'	N	Status of user	Active
u_creationDate		timestamp		current_timestamp()	N	Creation date of user	3/30/2020 12:31
u_updationDate		timestamp		NULL ON UPDATE currer	N	Updation date of user	3/30/2020 12:31

Chapter 4: Design Specification

4.1 Methodologies

4..1.1 Prototyping Methodology

Methodology is a set of general principles that guide a people to choose a specific method suited to a project. A methodology is formalized approach and is a list of steps and deliverables to implementing the SDLC.

For the proposed system, the prototyping method will be involved as the system development approach. Prototyping is one of the categories of the methodology, A prototyping -based methodology performs the analysis, design, and implementation phase concurrently, and all three phases are performed repeatedly in a cycle until the system is fully completed. Prototyping methodology can reassure user working on system and quickly refine all the related requirement of the system. Quicker user feedbacks always lead to better solutions as missing functionality or errors can be detected much earlier.

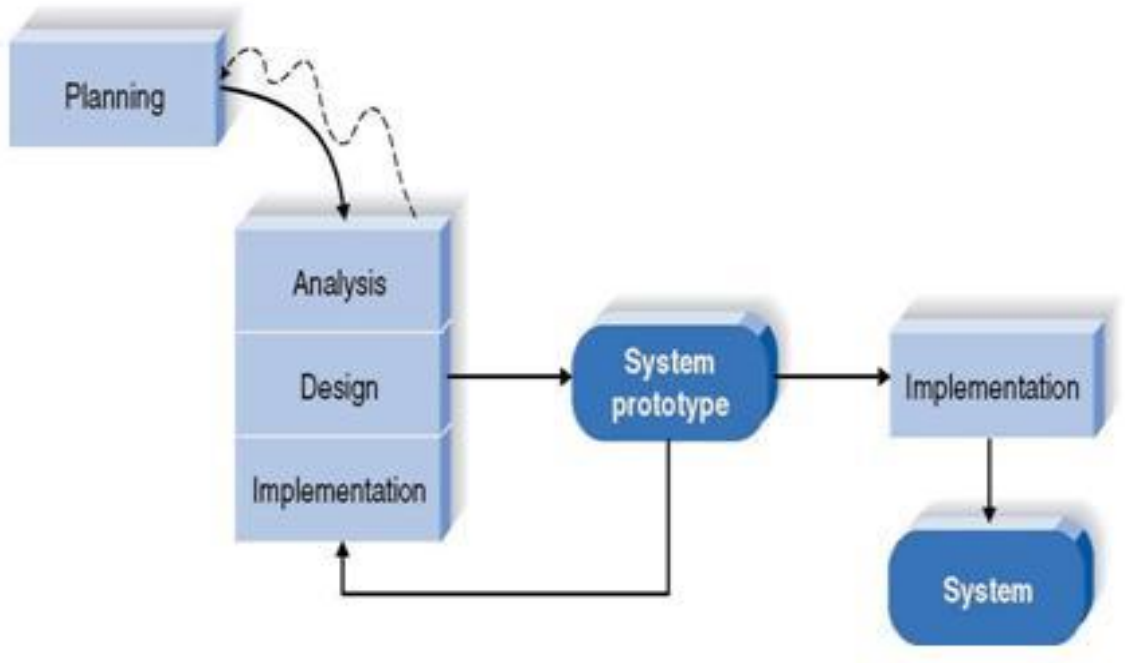


Figure 4.1.1 Flow diagram of the Prototyping Methodology.

4.1.2 Project Phase

1. Planning Phase

This is the very first step (phase) of the prototyping, the approach is to have a basic understanding on the system and user requirement. Starting by an interview with the user (interviewee). Selecting the relevant interviewee (laboratory staff or administrator, hospital manager) to interview to acquire the important information or requirement. All the requirement and information should be record down for the next phase.

Outcome for this project: **Cantt Chart for the FYP2**

2. Analysis Phase

The second phase is analysis phase, having a well-known about the existing system is necessary for this phase. Perform the action of investigation and definition for the requirements for new development and enhancement.

Outcomes for this project: **User requirements**

3. Design Phase

This third phase is sign phase, this phase provides a comprehensive approach to the design of the system, ensuring the design meet all user and system requirement. The outcome will be the physical design, interface design, database, and file design and etc.

Outcomes for this project: **Storyboard, ERD Diagram**

4. System Prototype Phase

After the basic of the analysis and design are performed, and work immediately begins on the system prototype, a “quick-and-dirt” program that provides some features. After that, it will proceed to the next phase (implementation phase).

Outcomes for this project: **Login Module, Maintenance Module and etc.**

5. Implementation Phase

This phase comes after understanding of system requirement and specification, the construction process after having a complete and illustrate design for the requested system. The coding and testing are included within this phase. The outcome of this project might be the maintenance plan.

Analysis, design, and implementation phase, all these three phases are performed repeatedly in a cycle of the prototyping methodology. The basic of analysis and design are performed, and work rapidly begins on the system prototyping phase. The first prototype normally is the first part of system used by the user, If the first system results in some error or some shortage. The first system will be re-analyzing, re-design, re-implement to a second prototype until refinement of the system is occur.

4.2 Tools for Developer

4.2.1 Software/Technology

1. Programming Language

I. JavaScript as the client-side scripting language to make the system interacts with the user dynamically and jQuery library to improve the structure of code as it simplifies the complex DOM manipulation to shorter and easier code.

II. PHP for open-source server-side scripting language that able to create the dynamic websites as it can be embedded into HTML. It also works with MySQL to create, read, update, delete the data from/to the database. Other advantages included the widely available community support and is a user-friendly language.

2. Database

MySQL and MySQL Workbench to create our database for the system. MySQL is selected as it is a free and open-source database management system that manages databases and connects the database to the system. MySQL workbench is used to design, model and generate our entity-relationship diagram because it follows the MySQL-specific physical design standards, so no mistakes are made when building new ER diagrams.

3. Editor / IDE

Visual Studio Code as text editor because it supports all the languages for our system development. It also comes with syntax highlighting, bracket-matching, auto-indentation, and includes an interactive debugger to step through source code, inspect variables, view call stacks, and execute commands in the console.

4. Markup Language & Style Sheet Language

HTML5 and CSS3 as the front-end language to structure the elements of the system and at the same time styling all the elements to make the system more user-friendly.

5. Framework

Bootstrap library to improve the design of the system and shorten the time for system designing without the need to create every style used in the system.

6. API

- **Maps JavaScript API**

  The Maps JavaScript API allow clients to customize maps with their own content and descriptions for display on web pages and mobile devices. Maps JavaScript API will mainly be used on "Dashboard" of **Treatment/Analysis and Reporting Module.**

- **Geocoding API**

  The Geocoding API is a package that supports geocoding and reverse geocoding of addresses. This API will be used to convert the diagnosed patient address into "Latitude" and "Longitude".

7. Other Technology (server)

XAMPP is a free and open-source cross-platform web server solution stack package that include the server application (Apache), database (MySQL) and scripting language (PHP) to run the system locally without the need to worry about the platform being used.

4.2.2 Hardware

The hardware used in this project are:

- Personal Computer/Laptop

The PC/Laptop will be primarily used to program the system. The processor and RAM of the PC/Laptop need to be in a standard performance since it may be several software opened simultaneously such as XMAPP, and Visual Studio Code. The Table 4-1 below shows the minimum requirement of the device. PC/Laptop can also test the basic function of the system and debug the error of the system.

Table 4-1: Minimum requirements of the PC/Laptop.

Components	Specification
OS	Window 7.0
RAM	4GB
Processor	Intel(R) Core (TM) i7-3537U CPU @ 2.00Ghz 2.50Ghz

4.3 User Requirements

4.3.1 Connectivity Requirements

Table 4-2: Connectivity Requirements for Users

Connectivity	Requirement
WiFi/Data Connection	Recommended

As table 4-2 shown, WiFi/Data connection is recommended using the dashboard of the Diagnosed Patient Pin Maps (Google Maps) feature to improve the accuracy of the location information as it can help to convert the patients' locations address into longitude and latitude format data from Geolocation API. Besides, the WiFi/Data is needed to display the Diagnosed Patient Pin Maps (Google Maps) on the Dashboard.

4.3.2 Hardware Requirements

Table 4-3: Minimum Hardware Requirements for Users.

Hardware	Requirement
Memory	4GB RAM or higher
Storage	50GB or higher
Processor	Intel Core i3 or higher (RECOMMENDED Core i5/i7 Processor)

Table 4-3 shows the minimum hardware requirements of a laptop in order to run the proposed system smoothly. 4GB RAM and Intel Core i3 (Minimum) of a device make sure that the system able to run. The proposed system size is expected to be within 150MB and the XAMPP size is about 700 MB, and thus, the device should have a minimum of 50GB storage size so that it can install the XMAPP and include the proposed project file to operate it.

4.3.3 Software Requirements

Table 4-4: Minimum Software Requirements for Users.

Software	Requirement
XMAPP	7.2.29 / PHP 7.2.29 newer version

For the software requirements, the laptop or PC has to be able to support the XMAPP that can be found in the Download XAMPP - Website (see Table 4-4).

4.4 User requirements

As an Administrator

1. Manage TB Diagnosis Laboratory Information System users record
    I. Add user position
    II. Add and edit user
    III. Review historical user
    IV. Activate historical user
2. System Maintenance

As a Nurse

1. Manage TB Diagnosis Laboratory Information System patient record.
    I. Insert patient record
    II. Edit patient record
    III. Search patient record
2. Manage Skin Test and Blood Test.
    I. Insert skin or blood test result
    II. Review patient skin or blood test result
    III. Edit skin or blood test result

As a Lab Scientist

1. Collect test sample (sputum) from patient.
2. Manage smear and culture Test.
   I. Upload smear and culture test result
   II. Review patient smear and culture test result
   III. Edit smear and culture test result
3. Manage DST (Drug Susceptibility Test).
   I. Upload DST test result
   II. Review patient DST test result
   III. Edit DST test result

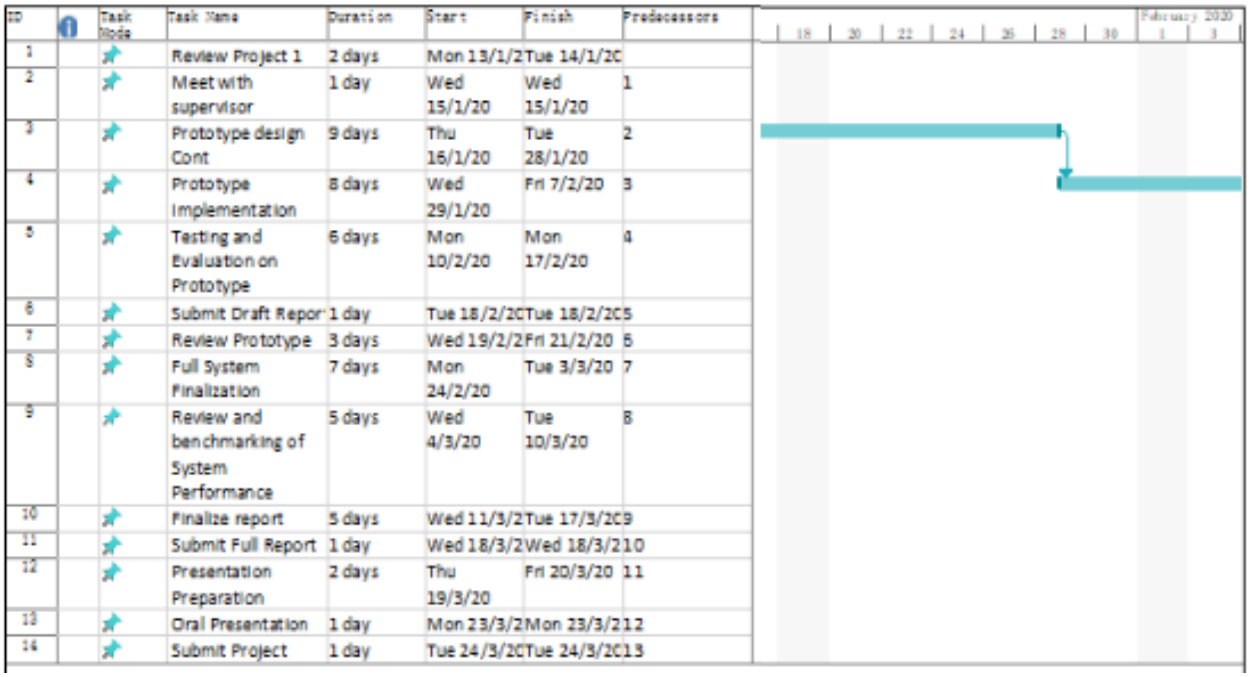
As a Radiologist

1. Manage Chest X-Ray Test.
   I. Upload chest X-Ray test image
   II. Upload chest X-Ray test result
   III. Review chest X-Ray test result
   IV. Edit chest X-Ray test result

As a Doctor

1. Review all the patient record.
2. Manage final result of the patient.
   I. Examine patient
   II. Insert comment or give remark to patient
3. Generate final diagnosis based on clinical, radiological and laboratory evidence.
4. Get the data about total number of the TB tester and patient.
5. Acquire the information about differences between suspected patient and actual (diagnosed) patient.
6. Acquire the information about TB Multi-Drug cases and XDR (Extensively drug-resistant) cases.
7. Get the State and Country diagnosed patient traveled before.

4.5 Timeline



ID	Task Mode	Task Name	Duration	Start	Finish	Predecessors
1		Review Project 1	2 days	Mon 13/1/2	Tue 14/1/20	
2		Meet with supervisor	1 day	Wed 15/1/20	Wed 15/1/20	1
3		Prototype design Cont	9 days	Thu 16/1/20	Tue 28/1/20	2
4		Prototype Implementation	8 days	Wed 29/1/20	Fri 7/2/20	3
5		Testing and Evaluation on Prototype	6 days	Mon 10/2/20	Mon 17/2/20	4
6		Submit Draft Repor	1 day	Tue 18/2/20	Tue 18/2/20	5
7		Review Prototype	3 days	Wed 19/2/2	Fri 21/2/20	6
8		Full System Finalization	7 days	Mon 24/2/20	Tue 3/3/20	7
9		Review and benchmarking of System Performance	5 days	Wed 4/3/20	Tue 10/3/20	8
10		Finalize report	5 days	Wed 11/3/2	Tue 17/3/20	9
11		Submit Full Report	1 day	Wed 18/3/2	Wed 18/3/2	10
12		Presentation Preparation	2 days	Thu 19/3/20	Fri 20/3/20	11
13		Oral Presentation	1 day	Mon 23/3/2	Mon 23/3/2	12
14		Submit Project	1 day	Tue 24/3/20	Tue 24/3/20	13

Figure 4.5.1 Gantt Chart of TB Laboratory Information System project 2 development

4.6 Implementation Issues and Challenges

A well understanding/researching on TB diagnosis information and TB diagnosis laboratory's workflow that required to build a TB Diagnosis Laboratory Information System is extremely. Without the specific knowledge or information related to the TB field, it is hard to develop a system accurately for the TB Diagnosis Laboratory's user.

The second implementation issues will be the "requirements gathering" as some of the data or information are hard to obtain it from the journal or online article, it requires a long time period to discover the information through online searching. In this project, a meeting or interviewing end-user is strongly required to have a clear requirement. Moreover, it is difficult to collect the sample data of form to develop accurate ERD because it may offend the personal data privacy policy. It is also important to clearly understanding the usage of each form and the importance of data or value need to collect from the form for further analysis.

The challenge in this project includes the implementation of Chest-X Ray in Tests Module because the function to store the Chest X-Ray is needed further study to integrate it in our proposed system. Another possible challenge could be the combination of all the module for a complete system which may raise some problem when come to the compound process, it may need a long-time duration to figure out the bugs and do action of fixing.

Finally, the TB data analysis is the more challenging part in this project. The process of figuring out the way for presenting the data to the user is essential and important to the project All the graphical representation of data such as bar chart, line chart, table, maps etc. need to be undergo through some research and eventually implement to the proposed system.

Chapter 5: System Implementation

5.1 Setup and Configuration

5.1.1 Download XAMPP Apache Server

For this project, the XAMPP version used is XAMPP Version 7.4.4. Please open the XAMPP Website to download XAMPP: https://www.apachefriends.org/index.html

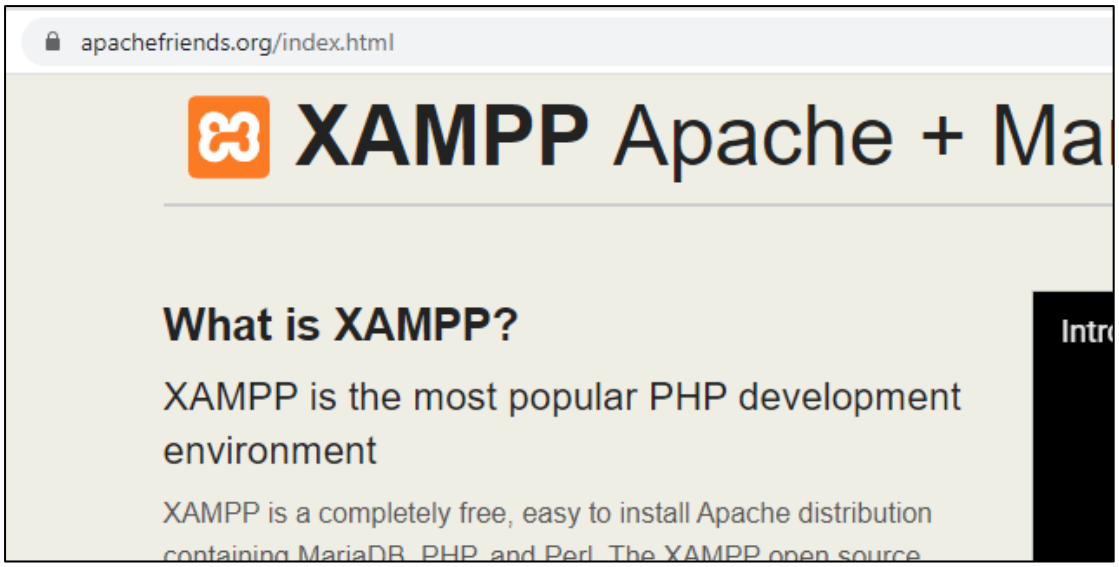


Figure 5.1.1 Screenshot of XAMPP Hyperlink.

Click on the "XAMPP for Windows" a Grey button which at the bottom of the page. After that, this is depending on the browser used, some may ask user to choose the save location first or verify the download first.

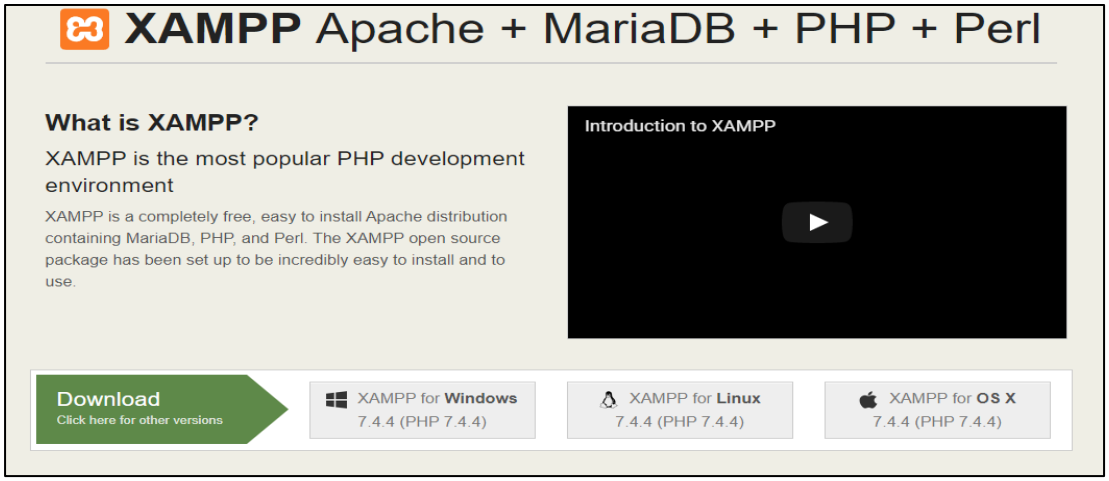


Figure 5.1.2 Screenshot for interface of "XAMPP for windows" button.

5.1.2 Install XAMPP Apache Server

Find and double-click on the downloaded file, basically user will find it at the "Downloads folder" or the desktop. The file name will be named likely as **xampp-windows-x64-7.2.26-0-VC15-installer.**

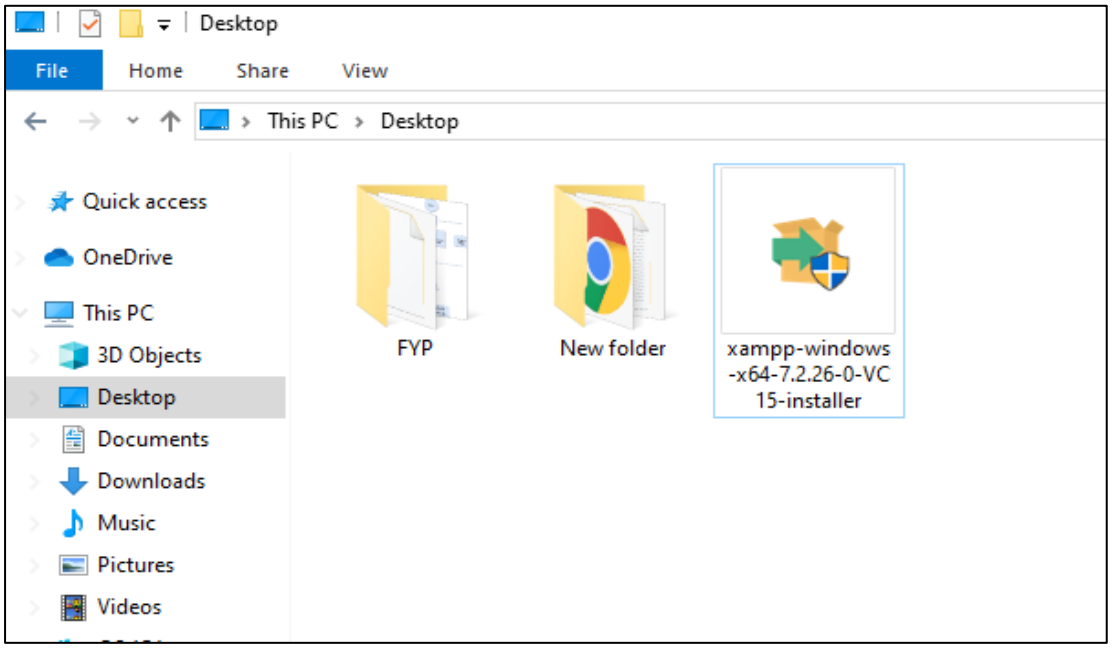


Figure 5.1.3 Screenshot for downloaded file in desktop.

Click on the "Yes" button when the figure 5.1.4 pop-up so that the XAMPP setup window will open.

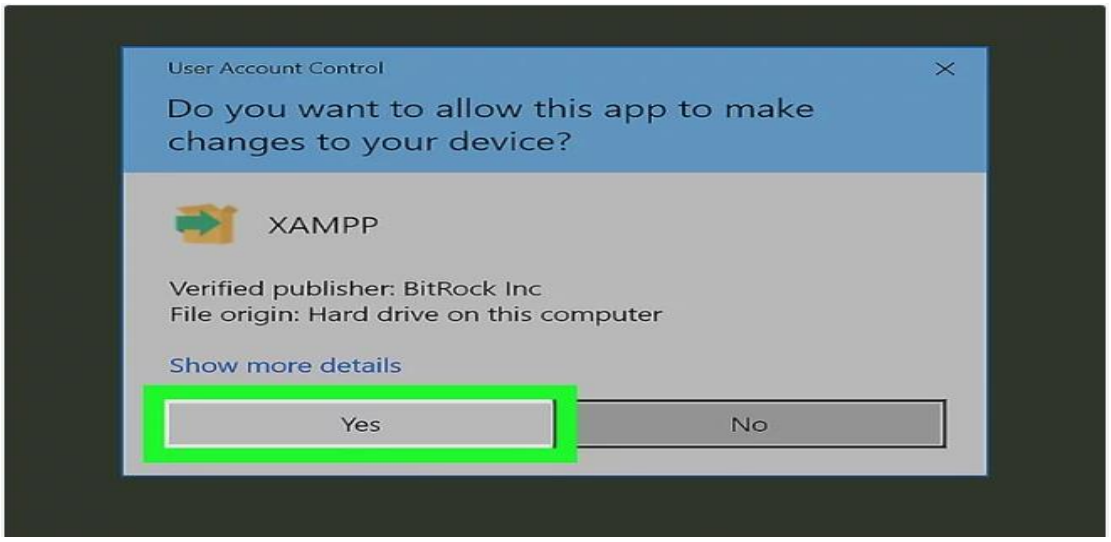


Figure 5.1.4 Screenshot of XAMPP ask for permission make changes on device.

Click the “Next” button which at the bottom of the setup window to continue the installation of XAMPP as shown at the figure 5.1.5 below.

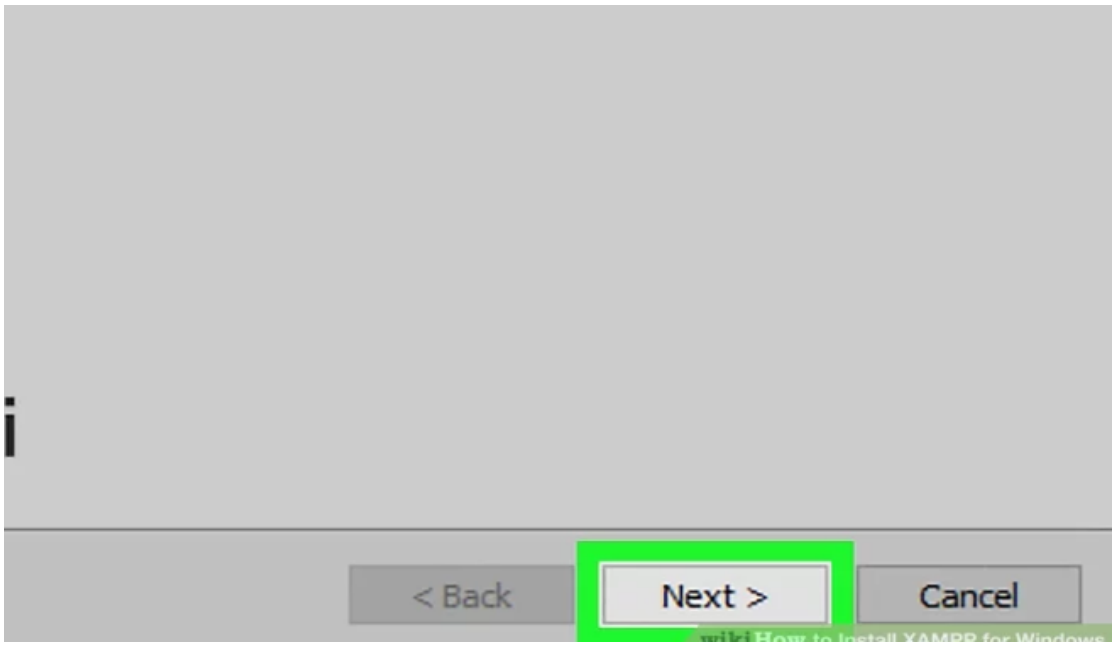


Figure 5.1.5 Screenshot of the XAMPP setup window.

Thus, the figure 5.1.6 below will be shown after the setup window. User can review and select the list of XAMPP attributes on the left side of the window to install. For this project, users are suggested to select the aspects as default. By default, all attributes are included in the XAMPP installation.

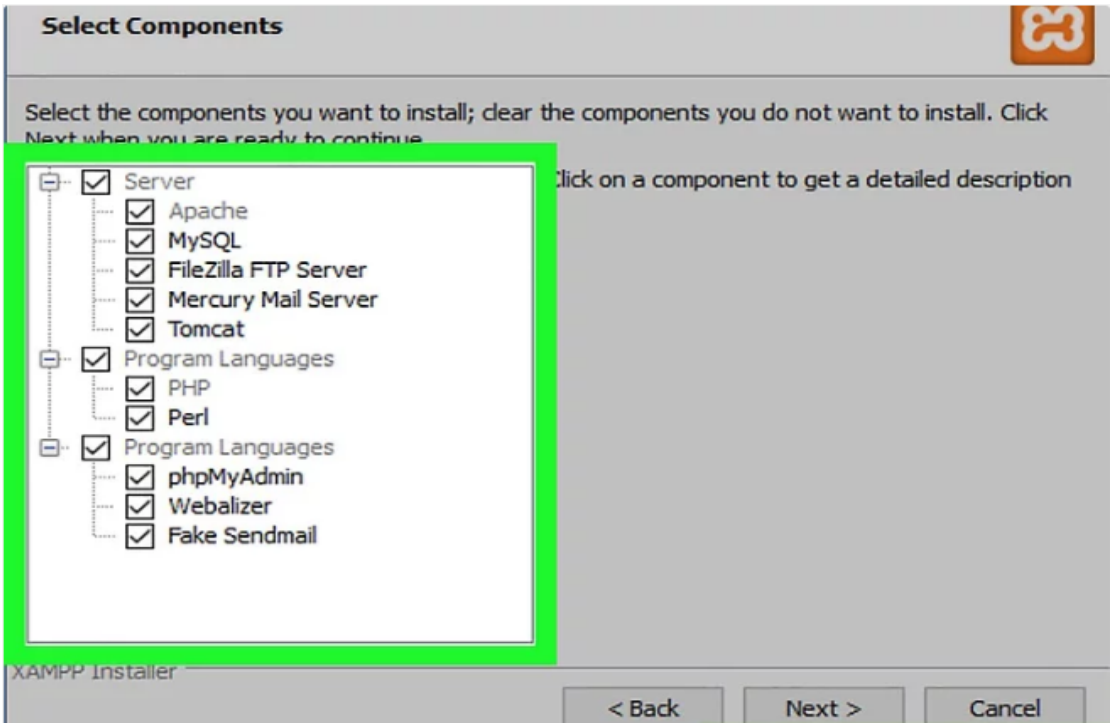


Figure 5.1.6 Screenshot Select components of XAMPP to install.

The figure 5.1.7 below will be shown after that, click on the folder icon to select an installation location. User should avoid installing XAMPP in hard drive's folder such as OS (C:) if the user had activated the UAC on computer. User can create a new folder on the desktop side as the installation destination.

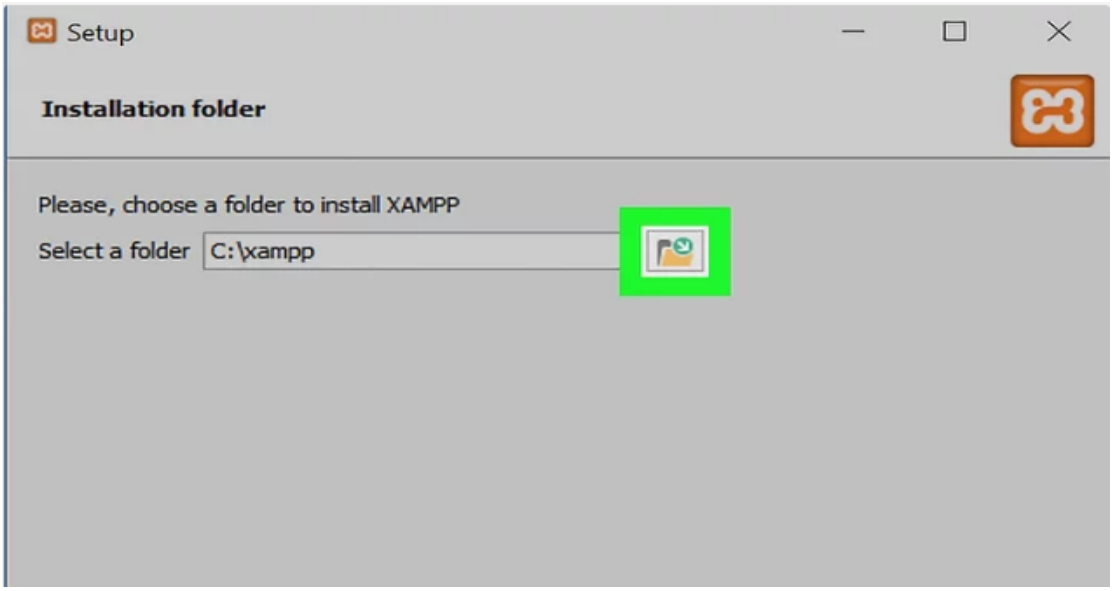


Figure 5.1.7 Screenshot of select installation location for XAMPP.

Click “OK” button after confirms the selected folder as the XAMPP installation location.

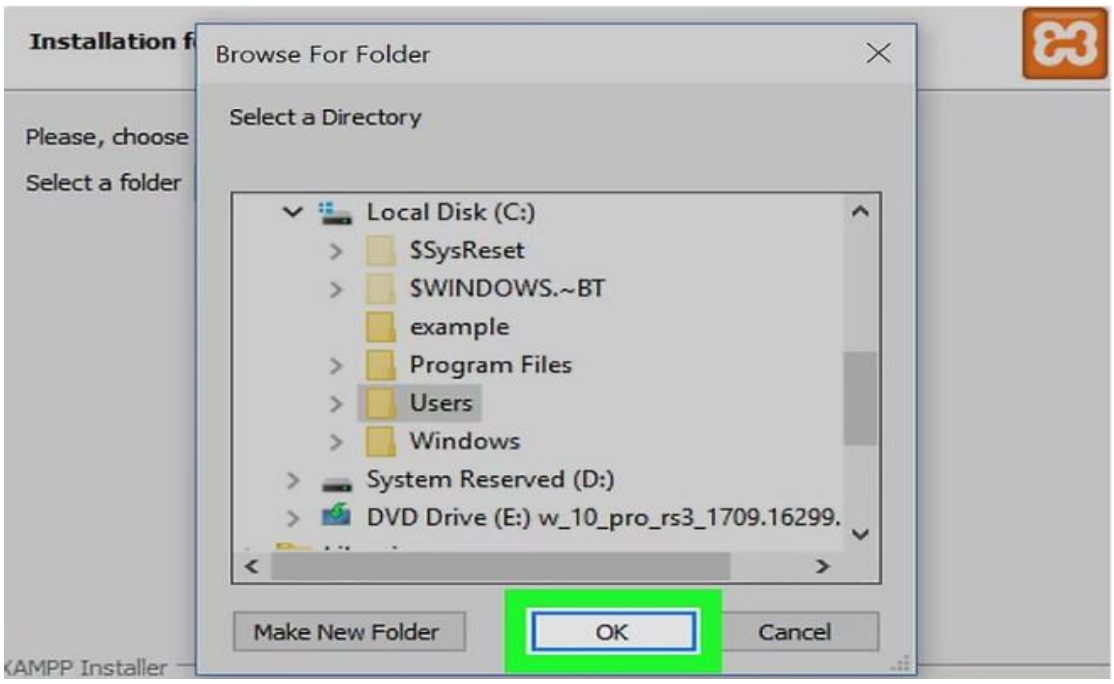


Figure 5.1.8 Screenshot of browse for folder in XAMPP.

The learn more about Bitnami for XAMPP checkbox is at the middle of the page. Uncheck the “Learn more about Bitnami” box, then click on the “Next” button to continue the installation of XAMPP.

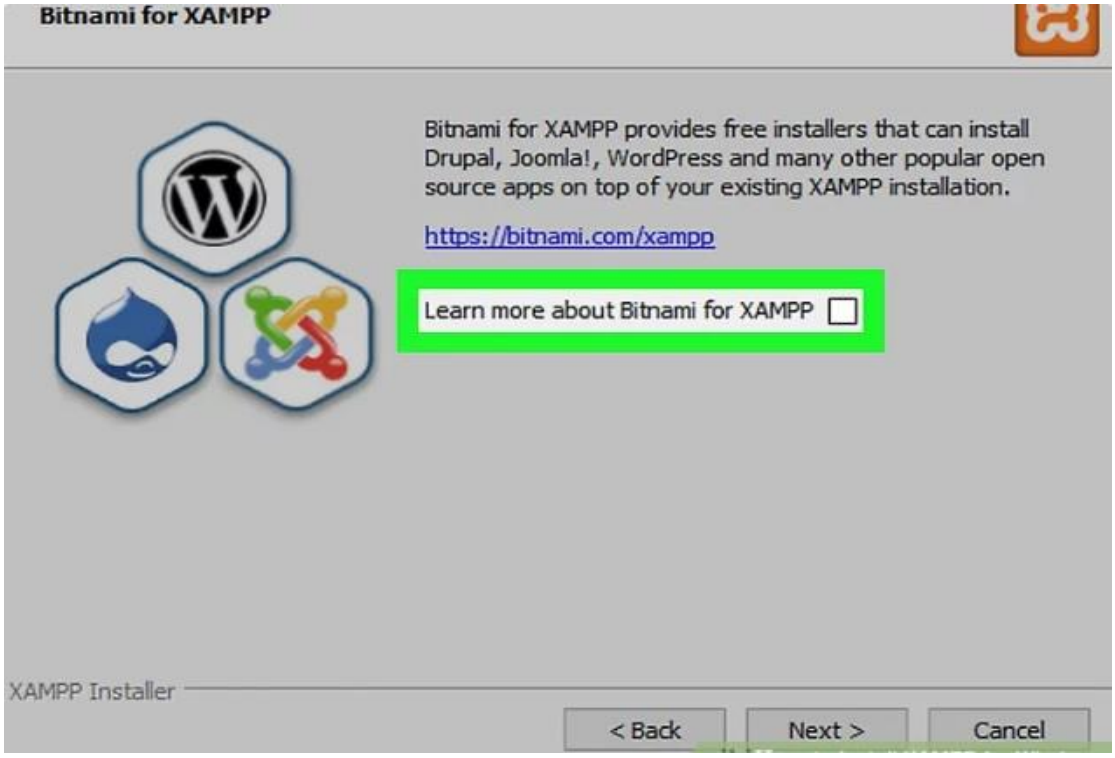


Figure 5.1.9 Screenshot of Bitnami for XAMPP.

The window will be shown as the figure 5.1.10 below, user needs to click "Next" button at the bottom of the window so that XAMPP will start installing the files into the installation location/folder selected before.

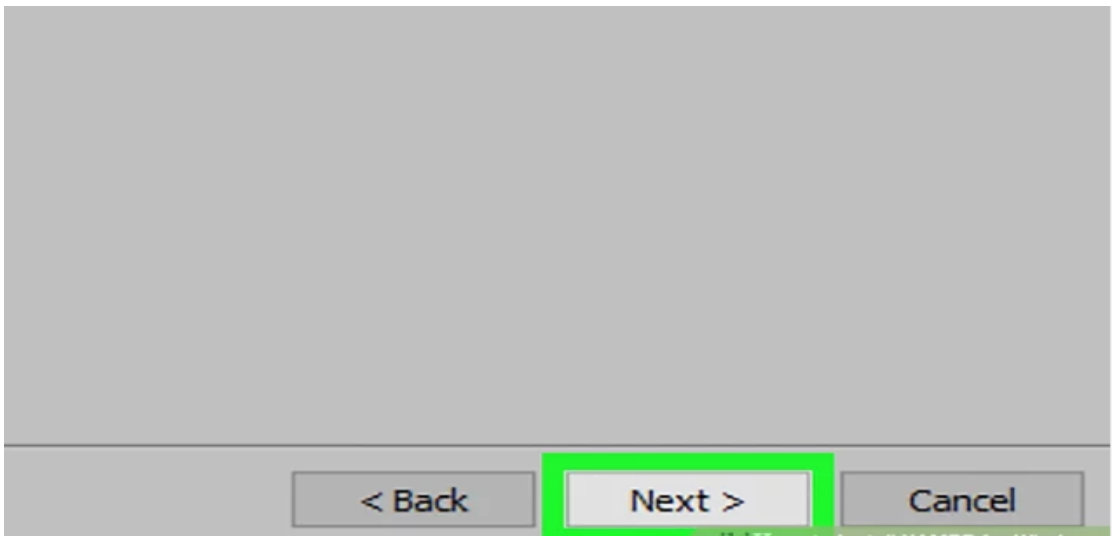


Figure 5.1.10 Screenshot for Begin Installing XAMPP.

Click on the “Finish” button when the window prompted out as shown as the figure 5.1.11 below. The “Next” button will be shown at the bottom of the XAMPP window. The window will be close after user click on the “Next” button.

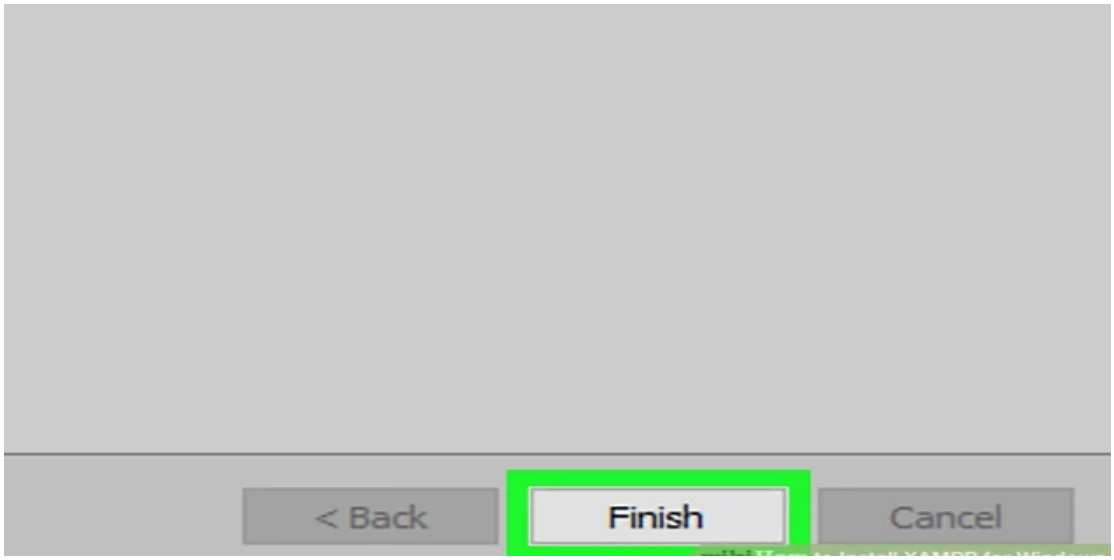


Figure 5.1.11 Screenshot of the XAMPP installation window with “Finish” button.

XAMPP Control Panel is the way to access the server, click on the XAMPP Control Panel to open it. After open, the XAMPP Control Panel, the figure 5.1.12 will be shown as below to select the language for the Control Panel. For English language, check the box under the American flag else check the box under the German flag for German language. Click the “Save” button to confirm the selected language.

Figure 5.1.12 Screenshot for select language in XAMPP.

Open the XAMPP installed folder, click on the “xampp-control”. If prompt out a window, clicking “Run as administrator” and clicking “Yes” for open the XAMPP Control Panel in the future.

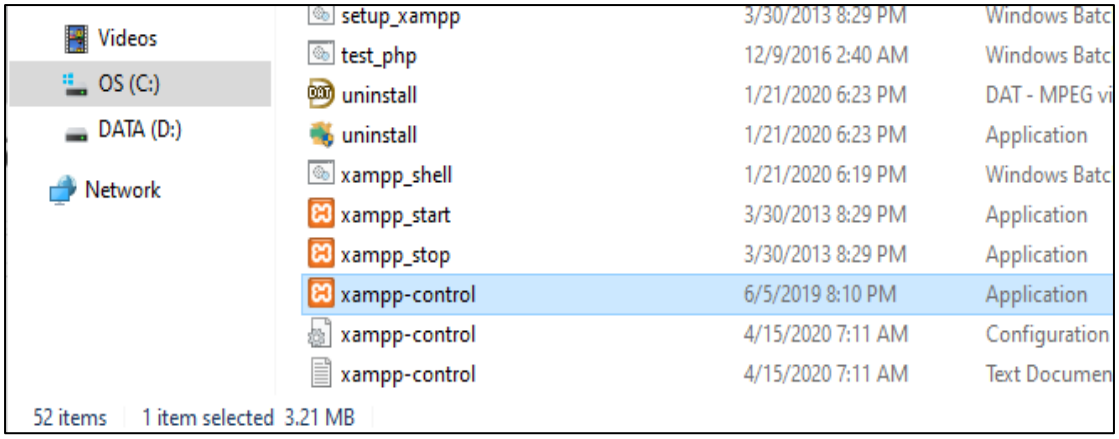


Figure 5.1.13 Screenshot of xampp-control.

Click “Start” on Apache and MySQL to run the TB Lab System as shown as the figure 5.1.4 below.

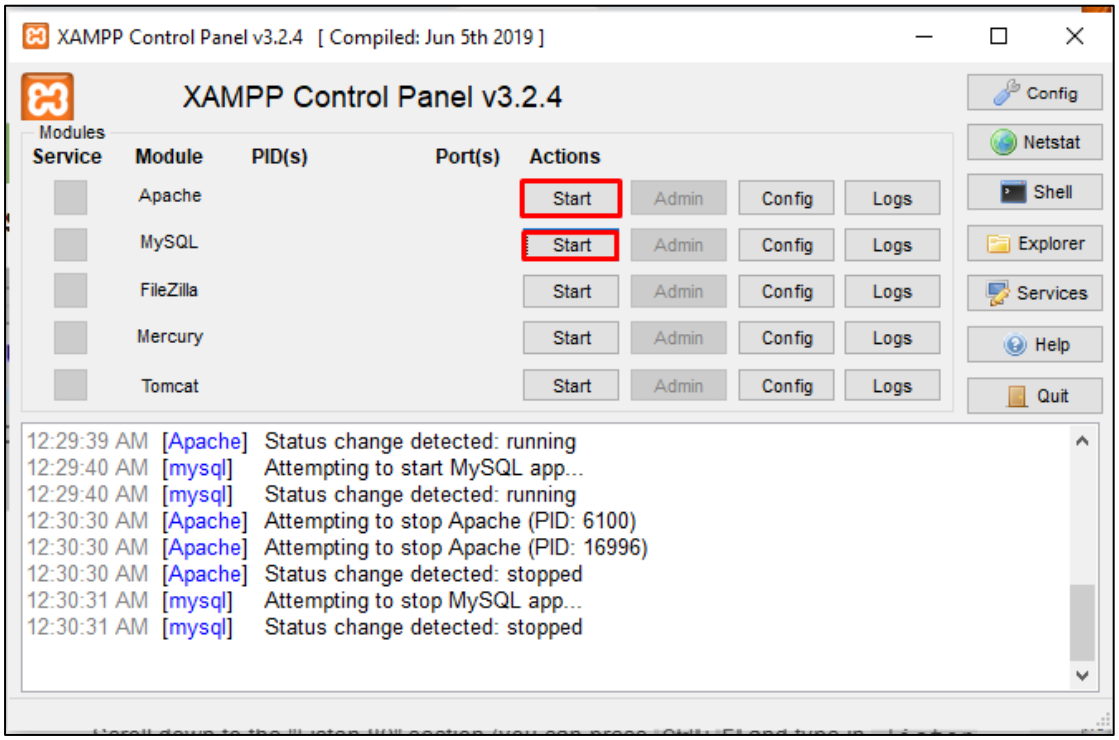


Figure 5.1.14 Screenshot of main XAMPP Control Panel Page.

5.2 Login Module

The figure 5.2.1 showed the login interface which had been built in our system. In this system, user with different positions will have the different functionalists to access. Every user requires to login their account before accessing the functionality of system, user cannot create an account with their own, but they can require an account with the system administration. In the login page, the feature enables user to see the password by clicking the "eyes" icon, this allows user to check the password they have entered.

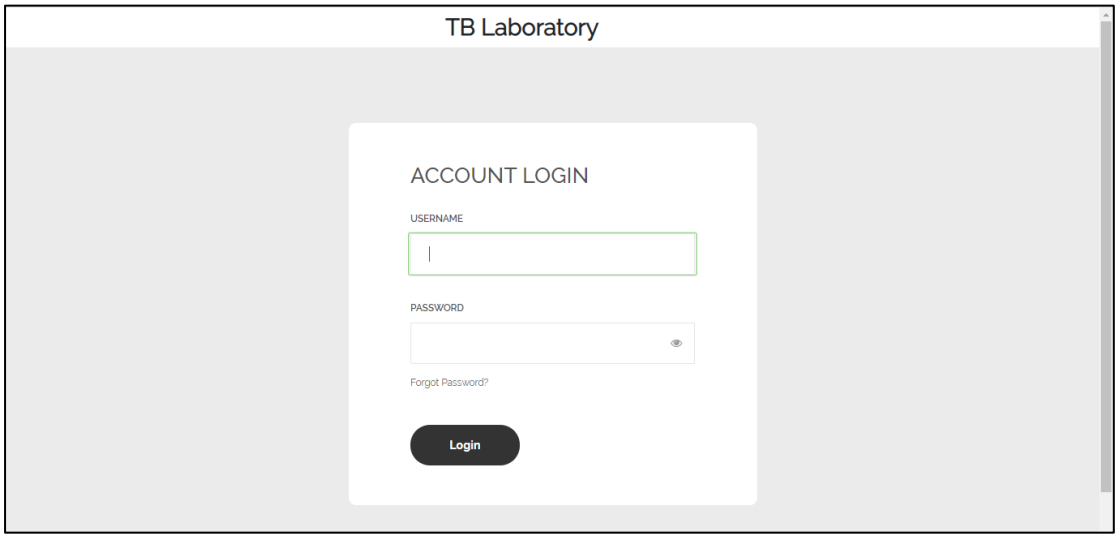


Figure 5.2.1 Login page of TB Laboratory.

When user key in the valid username and valid password then clicks on the "login" button, system will prompt a message "Login successfully" as figure 5.2.2 below shown.

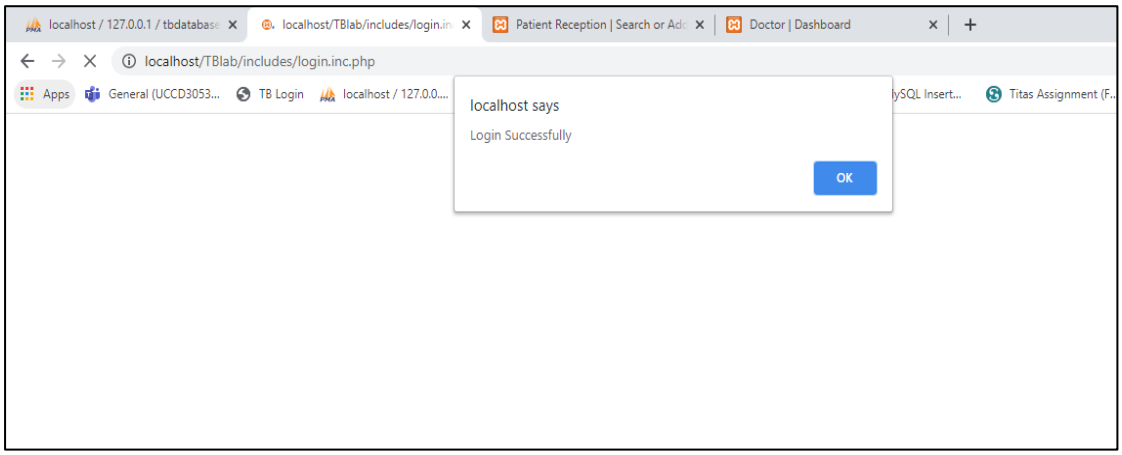


Figure 5.2.2 System prompt a message "Login Successfully".

5.3 Administrator Module

After system administrator login into the system, the first interface is the dashboard interface as shown in the figure5.3.1 below. In the administration module, administrator able to create a new user, manage the user's account, create a new user position, and manage the user position. The admin dashboard will show the total number of users in the system and total number of users for each position.

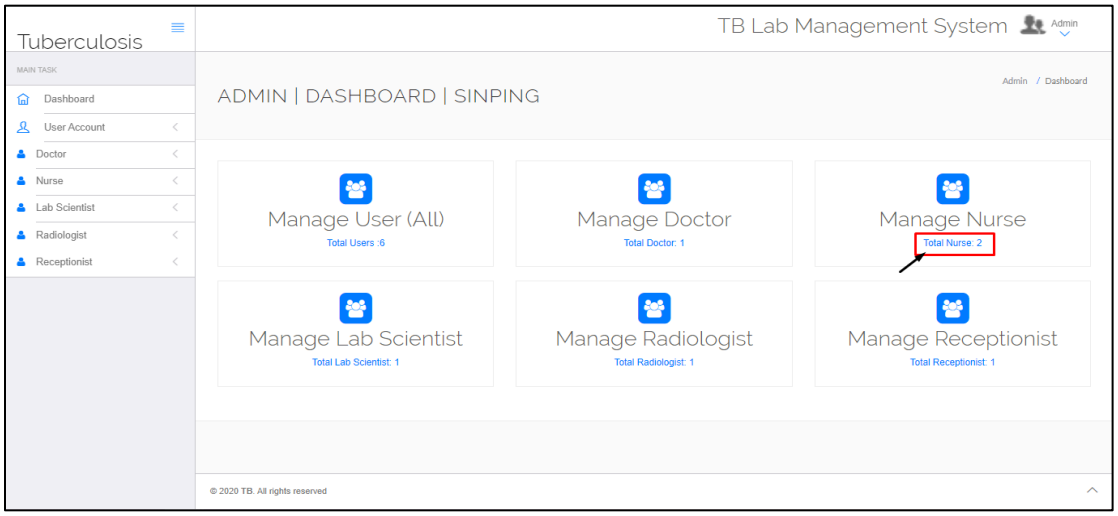


Figure 5.3.1 Dashboard of Administrator.

Users are group by each user position, and this will easier for administrator to keep track the total number for each user position and easier to find a user. Administrator can click on the "Total number: 2" under "Manage Nurse", doing so it will bring administrator to the figure 5.3.2 as shown below.

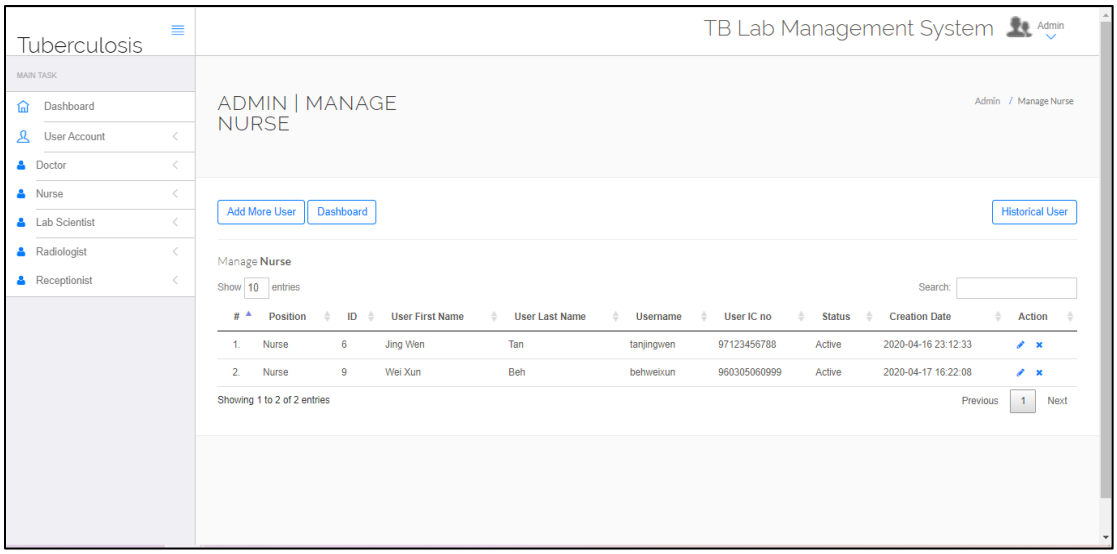


Figure 5.3.2 Screenshot for Manage Nurse.

On the left-hand side, click on the "User Account" a drop-down list will be shown with create user, manage user, and manage/ create user position as figure 5.3.3 below.

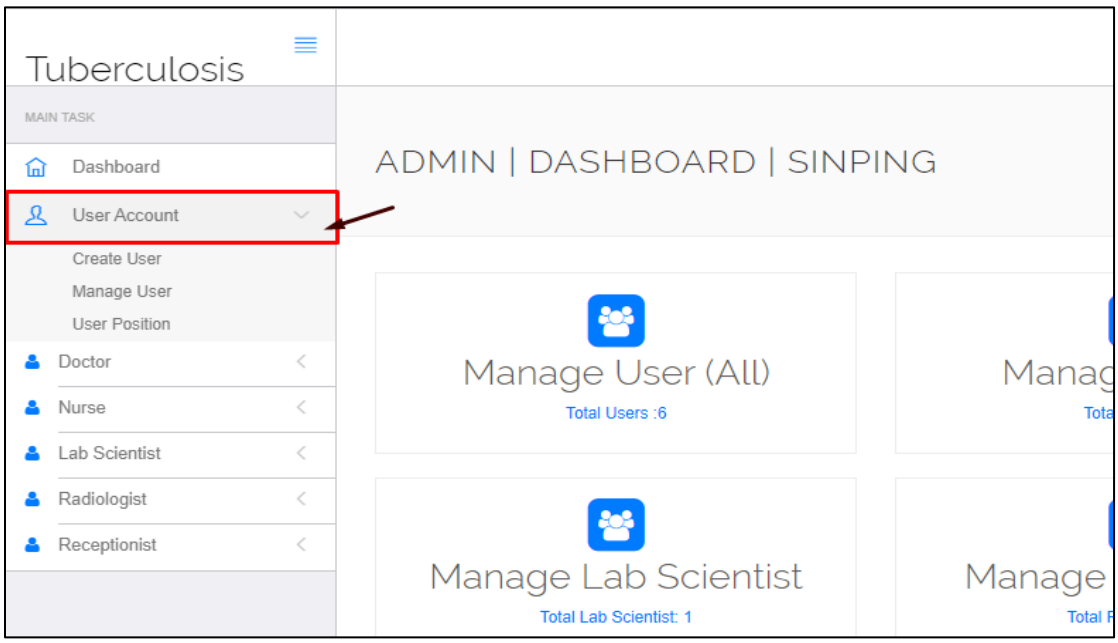


Figure 5.3.3 User Account's drop-down list.

The figure 5.3.4 below showed the create user account interface, system will check the username and user Identity Card Number to avoid duplicate the account created. System will also check the availability of email key in. After created successfully, system will prompt a message "User Create Successfully".

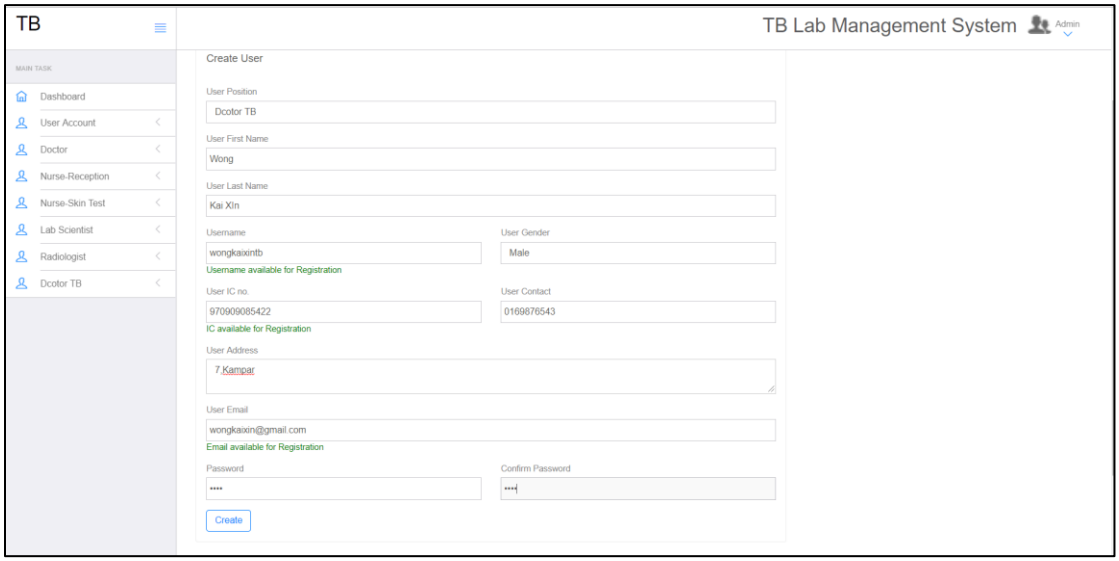


Figure 5.3.4 Create User Interface.

After successfully create the user account, the account will show in the manage user account table, administrator can modify and delete the account as shown in the figure 5.3.5 below. When the administrator wishes to delete/inactivate the account, the system will prompt a message to confirm with the action. The deleted account will remove from the manage user account table and prompt a message "User Inactive" at the top of the table.

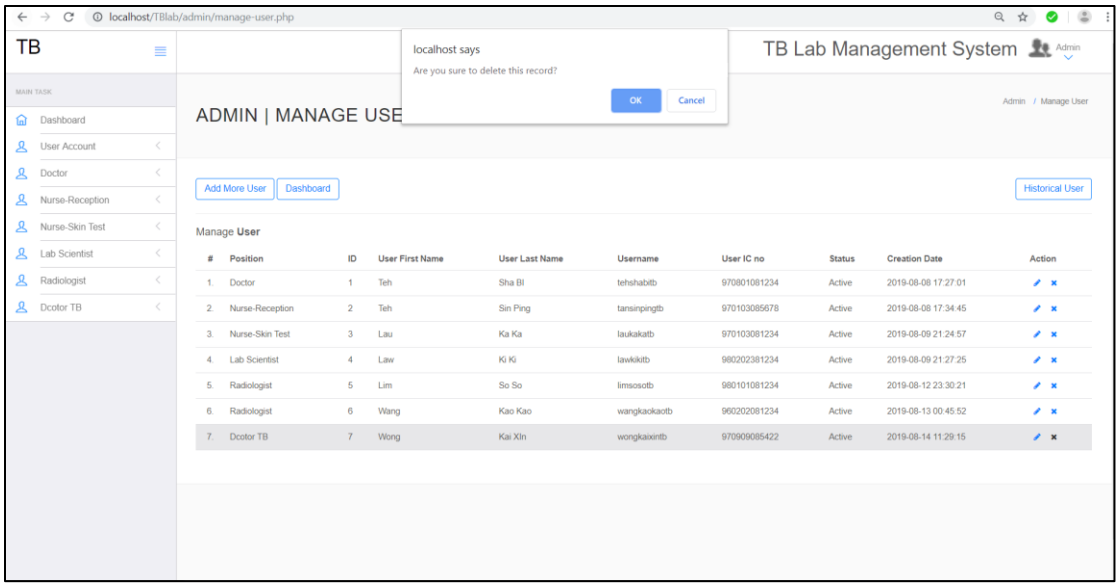


Figure 5.3.5 Manage user account interface.

The removed account will show in the historical user interface. System administrator can reactivate the account and the system will prompt a message to confirm the action as figure 5.3.6 below. The reactivate account will show in the user account table.

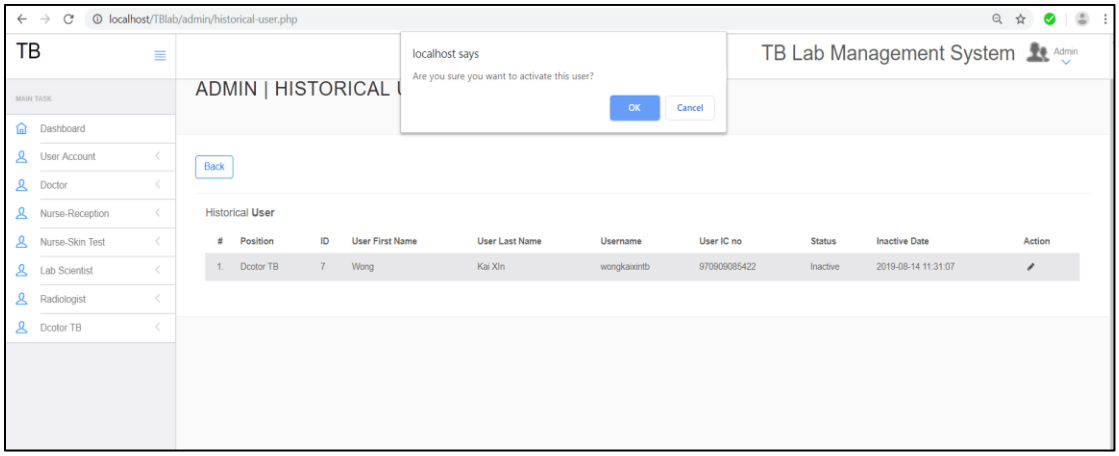


Figure 5.3.6 Historical user interface.

The figure 5.3.7 below showed the interface for administrator to add user position, user also can modify the user position and remove the user position. System will also check the availability for new position to avoid the overlap of the user position in the system.

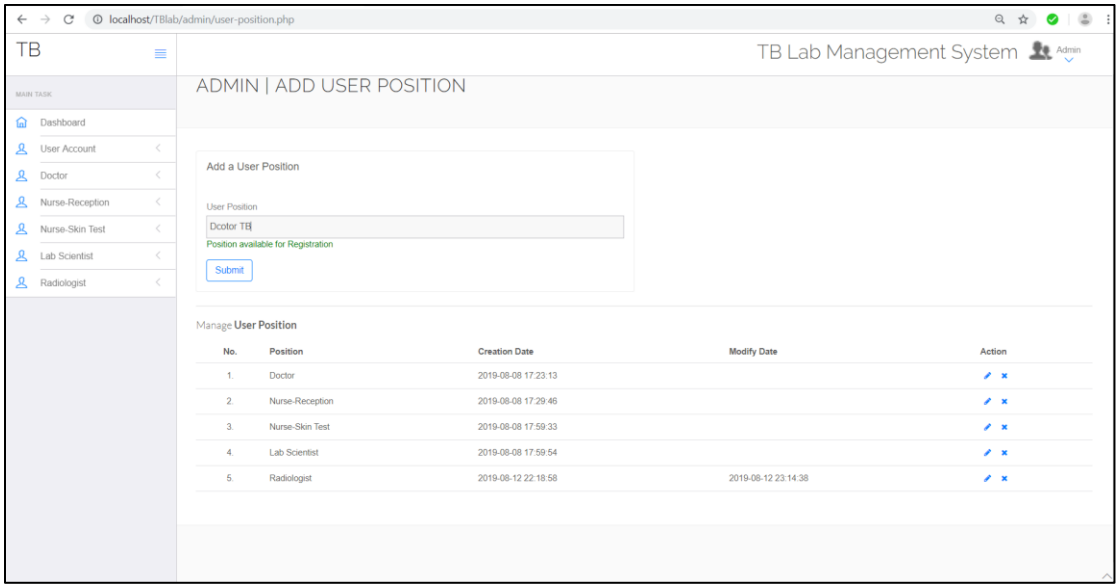


Figure 5.3.7 Add User Position.

System will prompt out a message to inform user if the user position added successfully and the new added user position will show in the side bar and manage user position table as shown in the figure 5.3.8 below.

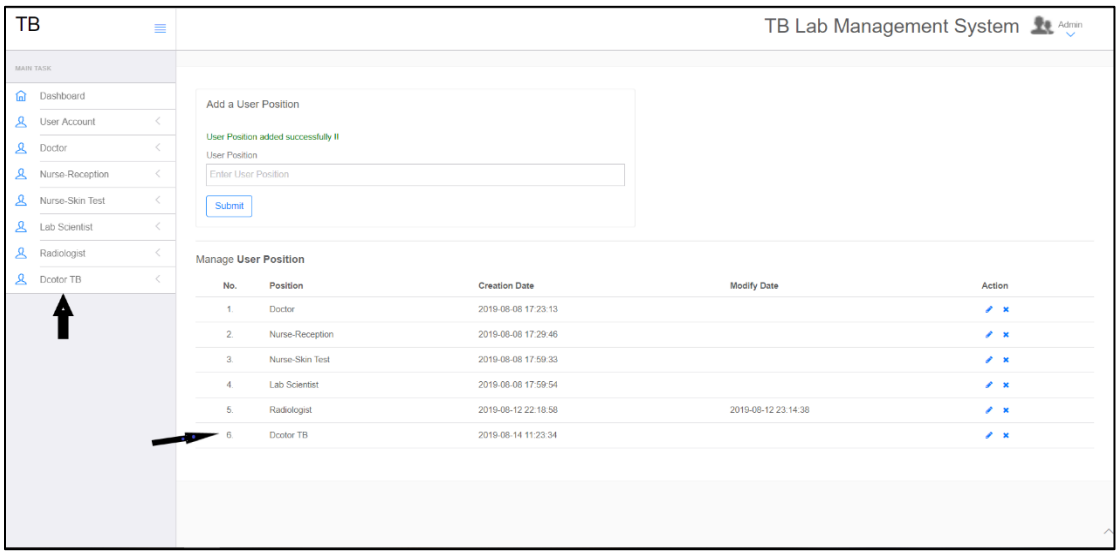


Figure 5.3.8 Add User Position Interface (Cont.)

Besides that, system also allows user to change their password by clicking on the "change password" which shows in the drop-down list at the top of the right. From the drop-down list, user can also log out from the system as shown in figure 5.3.9.

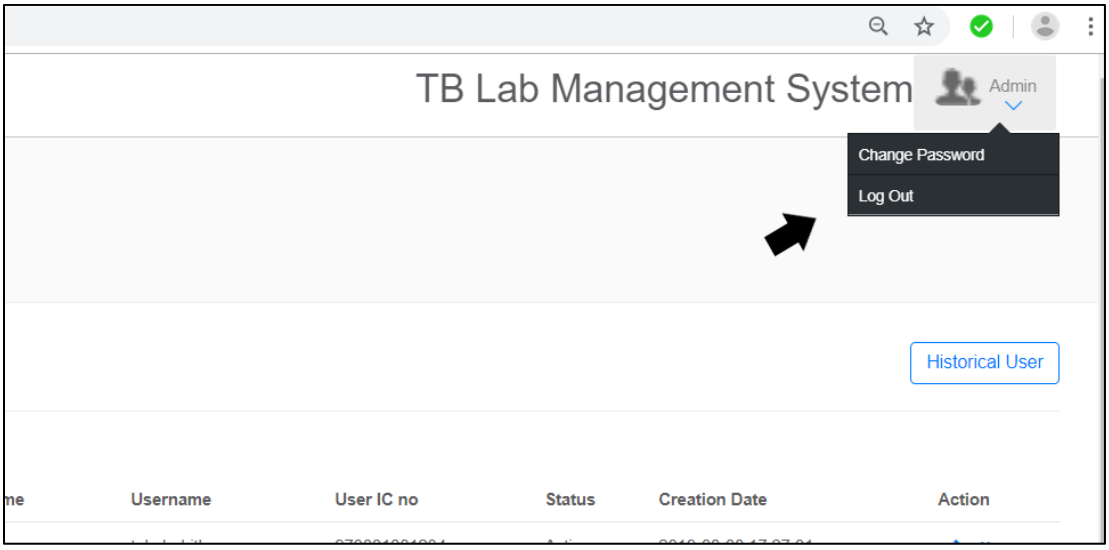


Figure 5.3.9 Drop down list with "Change Password" and "Log Out".

The figure 5.3.10 below showed the change password interface, user can modify the password by key in the correct current password and enter the new password for the account. If the user keys in the current password wrongly or the new password are not consistent with the confirm password, the request of change password will be rejected.

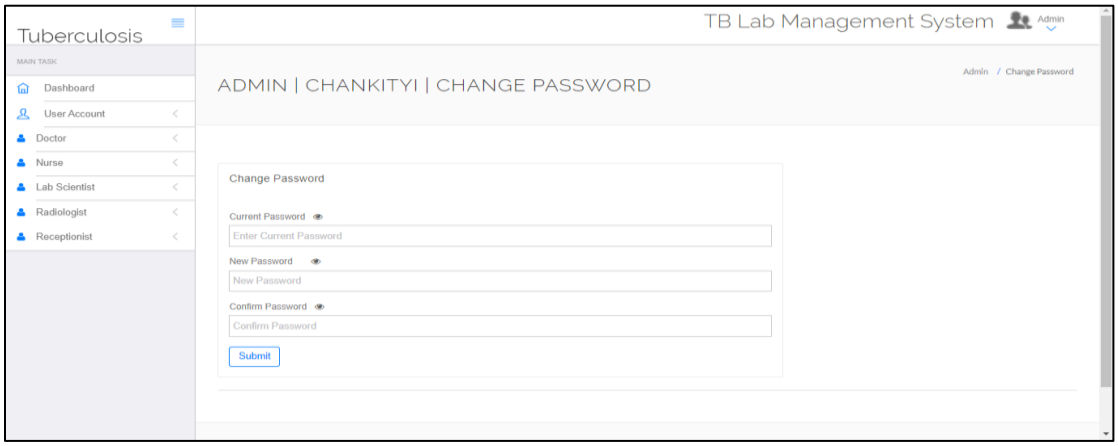


Figure 5.3.10 Change Password interface.

When user submitted the change password request with key in the correct current password and new password is matching with confirm password, system will pop-up a message “Password changed Successfully !!” as shown in figure 5.3.11.

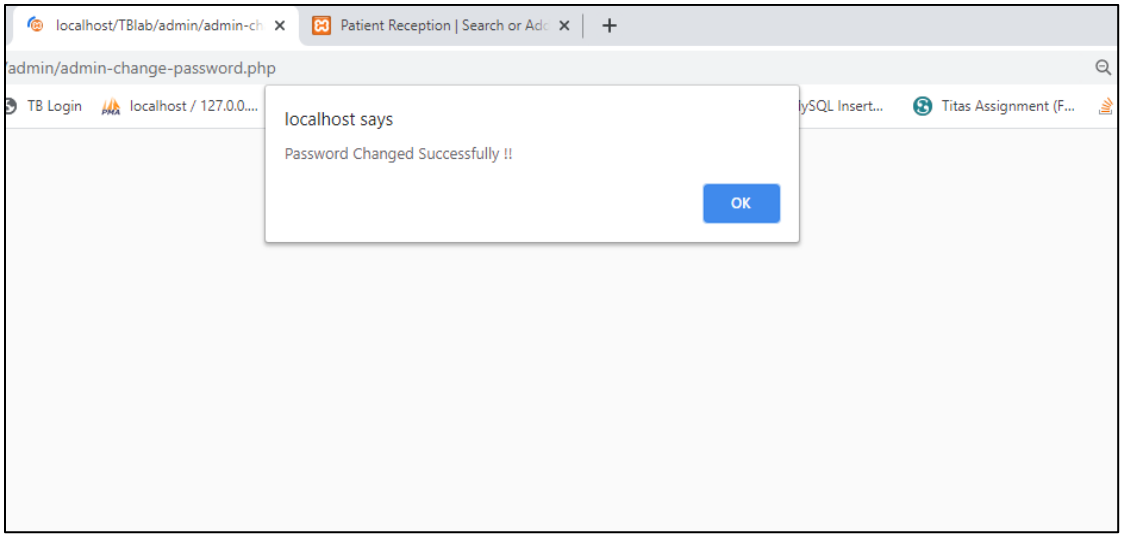


Figure 5.3.11 System prompt a message “Password Changed Successfully”.

5.4 Receptionist Module

After receptionist login into the system, the first interface is the Search or Add interface as shown in the figure5.4.1 below. In the Receptionist module, Receptionist able to search patient, create a new patient account and manage patient account.

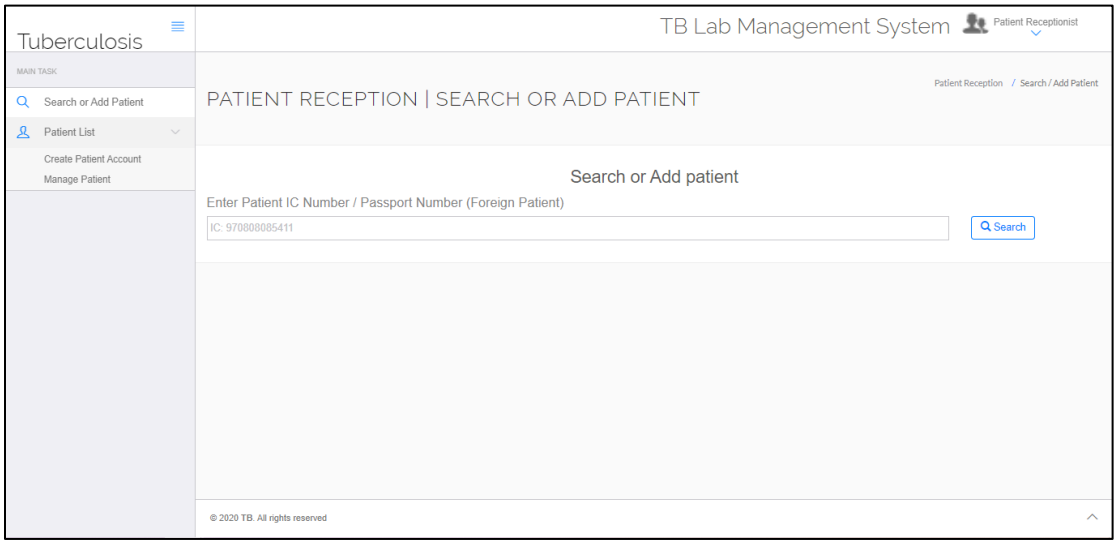


Figure 5.4.1 Search or add patient interface in Receptionist module.

Receptionist will register every patient with their Malaysian Identity Card No. or Passport No. for foreign patient. Receptionist will key in their IC no. / Passport No. and press “Search” button to check whether the patient registered before or not. By doing so, if it is a new patient a create patient interface will be shown as figure 5.4.2 below. The patient IC no. keyed in at the search patient interface will automatically fill in the patient IC Number field.

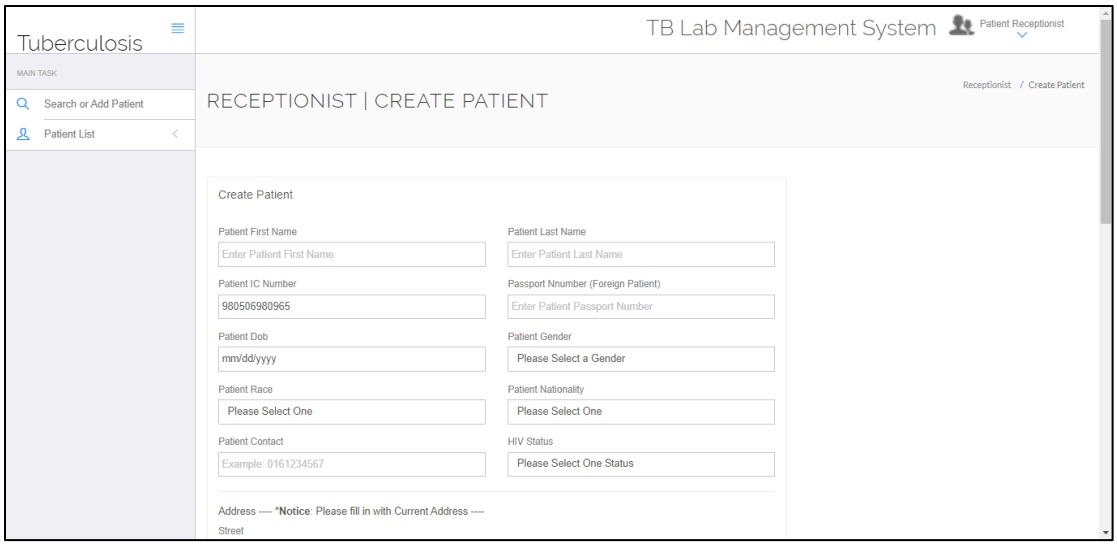


Figure 5.4.2 Create patient interface.

After filled in all required entry field and patient necessary information, press “Create” button to create a new patient account in TB Lab Management system. The system will prompt a message “Patient created Successfully” as shown in figure 5.4.3 below, after submitted the created patient form.

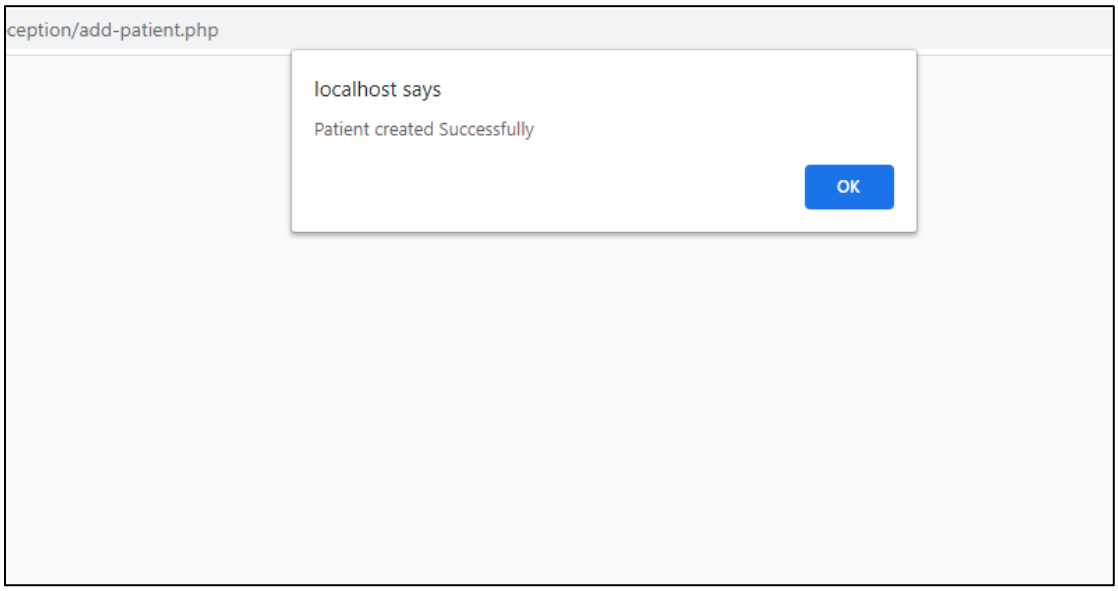


Figure 5.4.3 A pop-up message display “Patient created successfully”.

When an existing IC No./ Passport No. (e.g. Connie's IC no.) has searched, the system will lead receptionist to the existing patient interface (e.g. Connie's Profile) shown as figure 5.4.4 below.

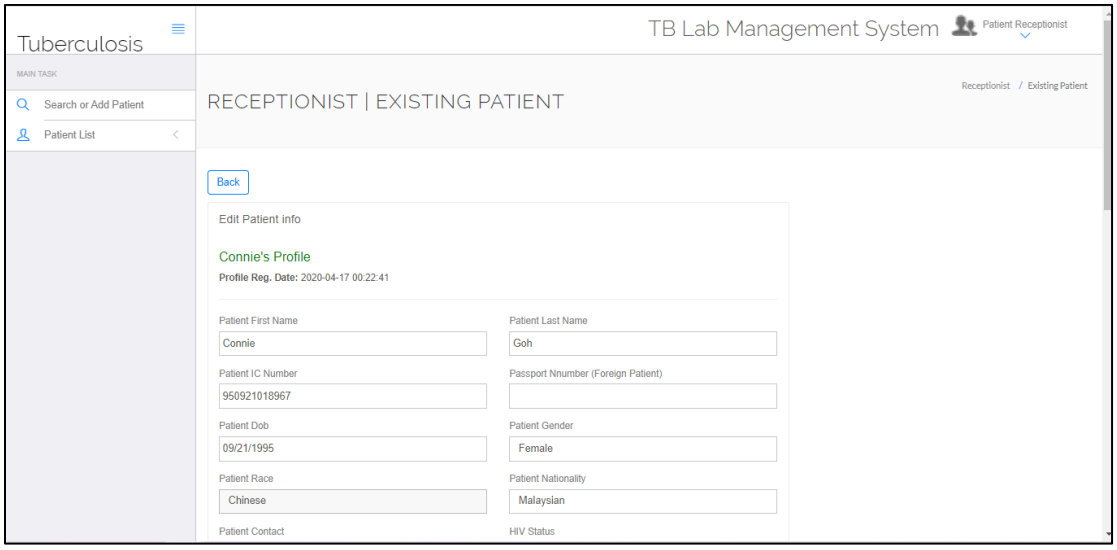


Figure 5.4.4 Existing patient's profile interface.

Receptionist can recheck and update the latest patient information, especially for the other information section. Receptionist also can click on the "Re-examination" / "Follow-up examination" or fill in other necessary reason in the text box then press "Create New Admission Record" button to submit as shown in figure 5.4.5 below.

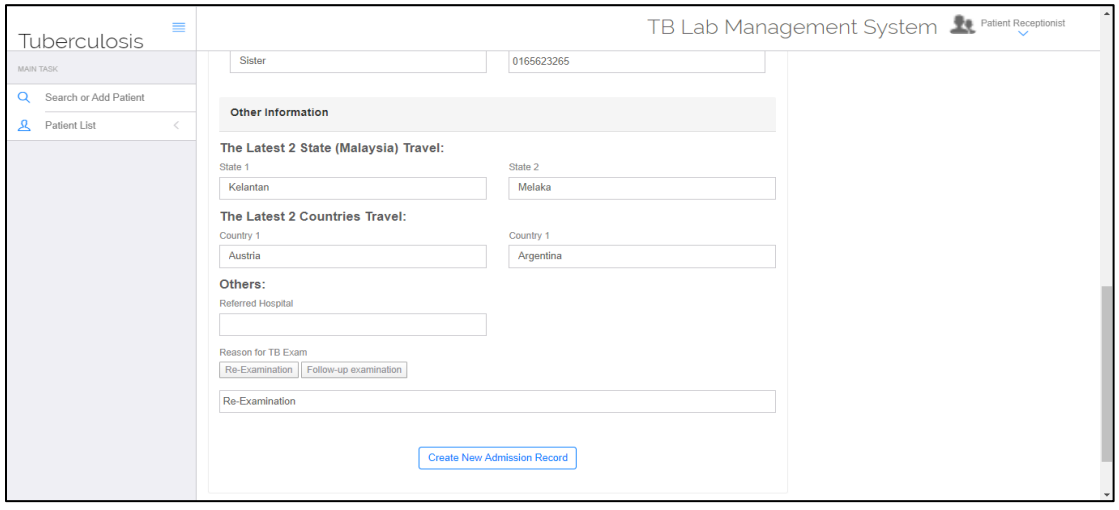


Figure 5.4.5 Existing patient's profile interface cont.

The receptionist will submit successfully the create new admission record's request only if the patient previous admission status is completed or failed on the TB skin test. If receptionist successfully submits the new admission record request, the system will prompt the message "New Admission Record Inserted Successfully" as figure 5.4.6 below.

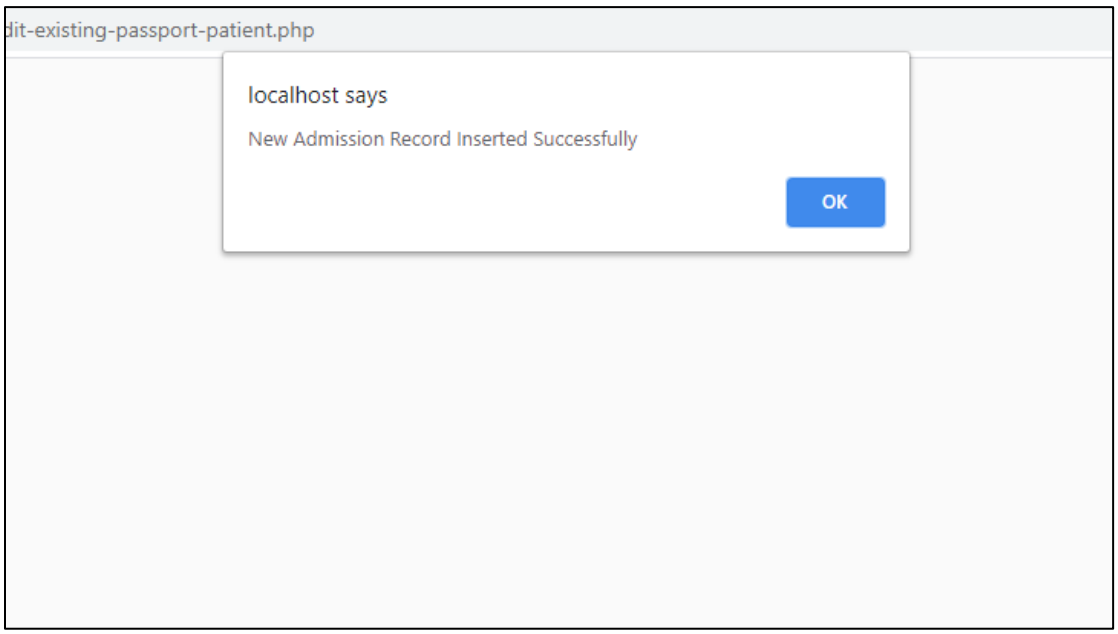


Figure 5.4.6 A pop-up message display "New Admission Record Inserted Successfully".

Manage patient interface will display all the patient list in the system, receptionist can search a specific patient by patient IC no./passport no. with the search function built in at the top of the patient list as figure 5.4.7 below.

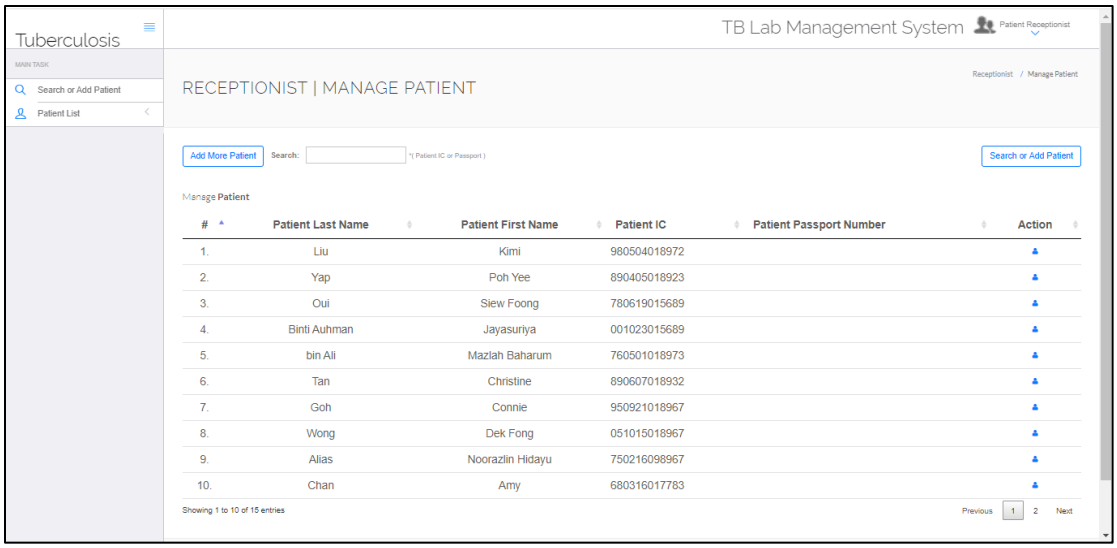


Figure 5.4.7 Manage patient interface.

The receptionist can click on the icon at the "Action" column as shown in figure 5.4.8 below to view the selected patient's admission records and patient information.

Figure 5.4.8 Manage patient interface (cont.).

The figure 5.4.9 below show the selected patient's admission records, receptionist can view the patient information by click on the "eye" icon at the "Action" column. Thus, receptionist also

can edit/ modify the patient information by click on the “Pen” icon at the right of the “eye” icon. Receptionist can edit the patient information only if the patient account/admission record is created by them.

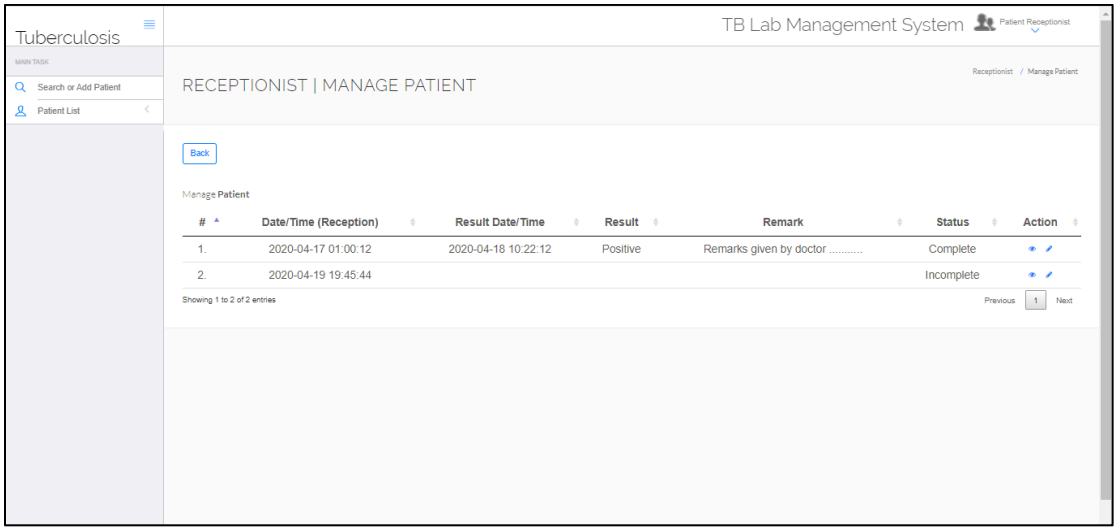


Figure 5.4.9 Selected patient’s admission records interface.

The figure 5.4.10 will be shown if the receptionist clicks the “Pen” icon.

Figure 5.4.10 Edit Patient interface.

After modifying the patient's information, receptionist can click "Update" button to submit the edit patient information request as shown in Figure 5.4.11 below.

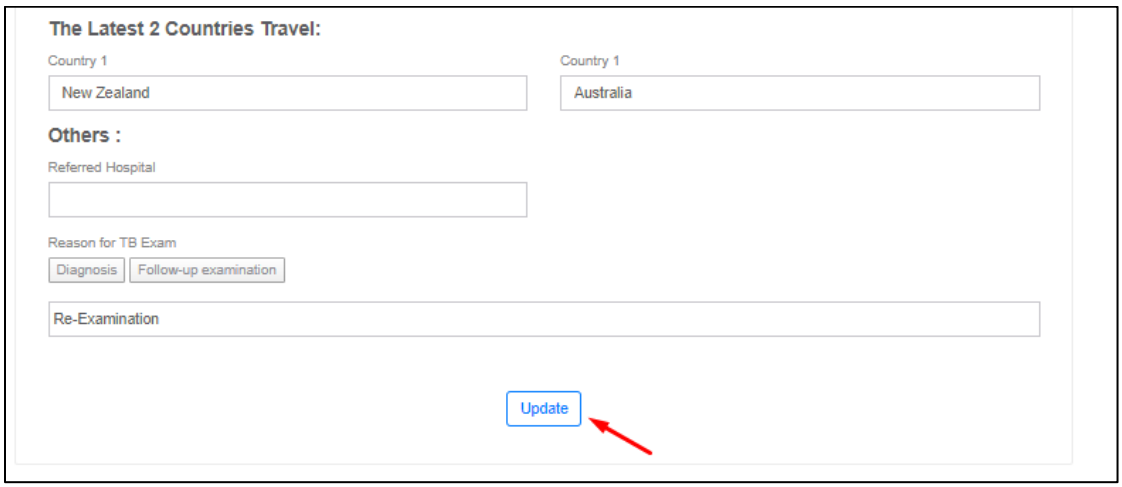


Figure 5.4.11 Edit Patient interface (cont.).

Besides that, system also allows receptionist to manage their personal account by clicking on the "Manage Account" which shows in the drop-down list at the top of the right. From the drop-down list, user can also log out from the system as shown in figure 5.4.12.

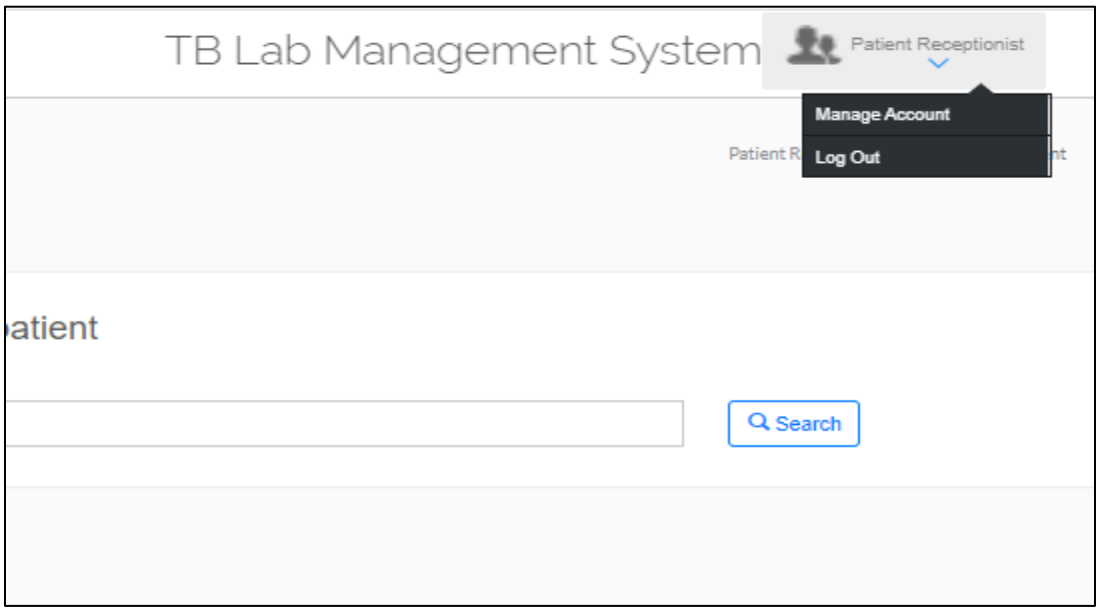


Figure 5.4.12 Drop-down list with "Manage Account" and "Log Out".

The figure 5.4.13 below showed the profile of current receptionist/user, the receptionist can edit their user account with make changes on their first name, last name username, contact no., address, email, and password. Receptionist requested to key in the correct current password in order to make changes successfully on their personal account. If the receptionist makes changes on username, system require user to re-login system with the new username.

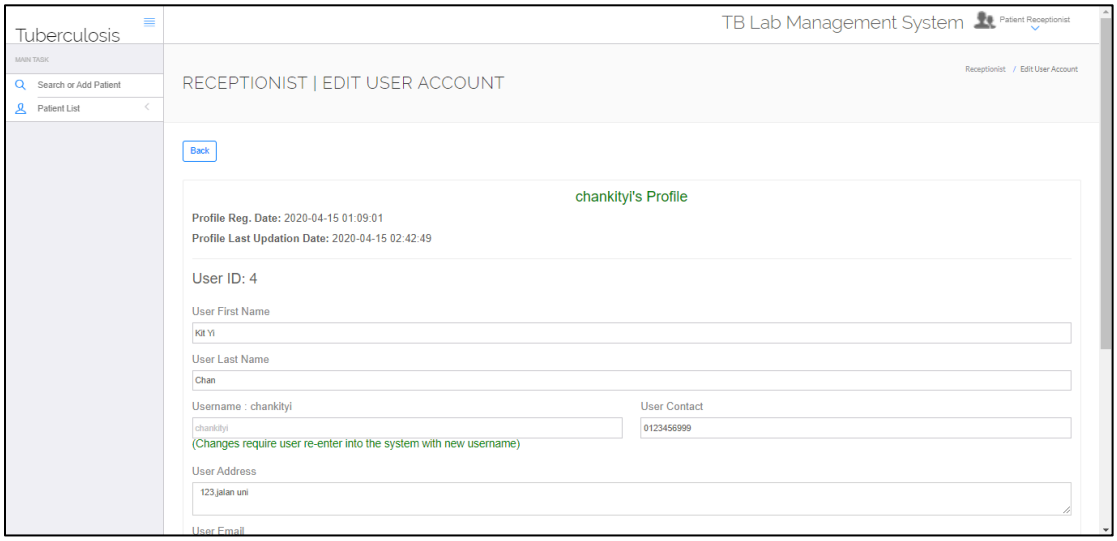


Figure 5.4.13 Edit user account interface.

The figure 5.4.14 below showed the change password section for the receptionist personal account, receptionist can modify the password by key in the correct current password and enter the new password for the account. If the receptionist keys in the current password wrongly or the new password are not matching with the confirm password, the request of change password will be rejected.

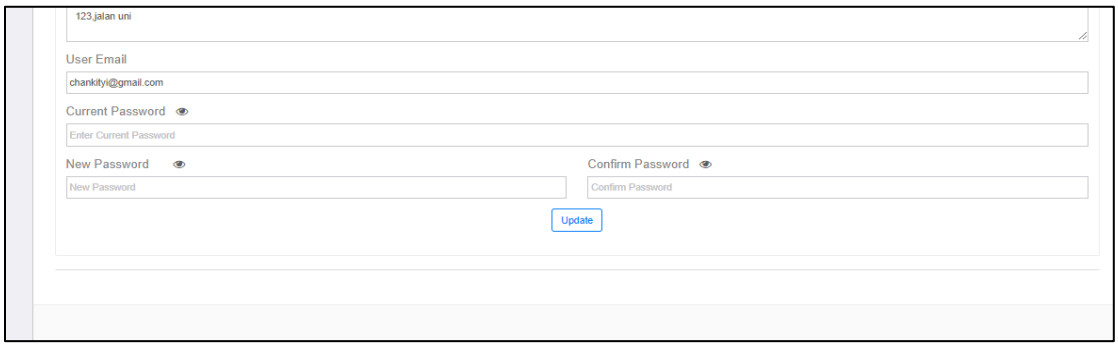


Figure 5.4.14 Edit user account interface cont.

5.5 Skin/Blood Test Module

After nurse login into the system, the first interface is the dashboard interface as shown in the figure5.5.1 below. The skin/blood test's dashboard will show a patient waiting list (to do task), the patient is waiting for nurse to help them do injection for skin test or carry blood test.

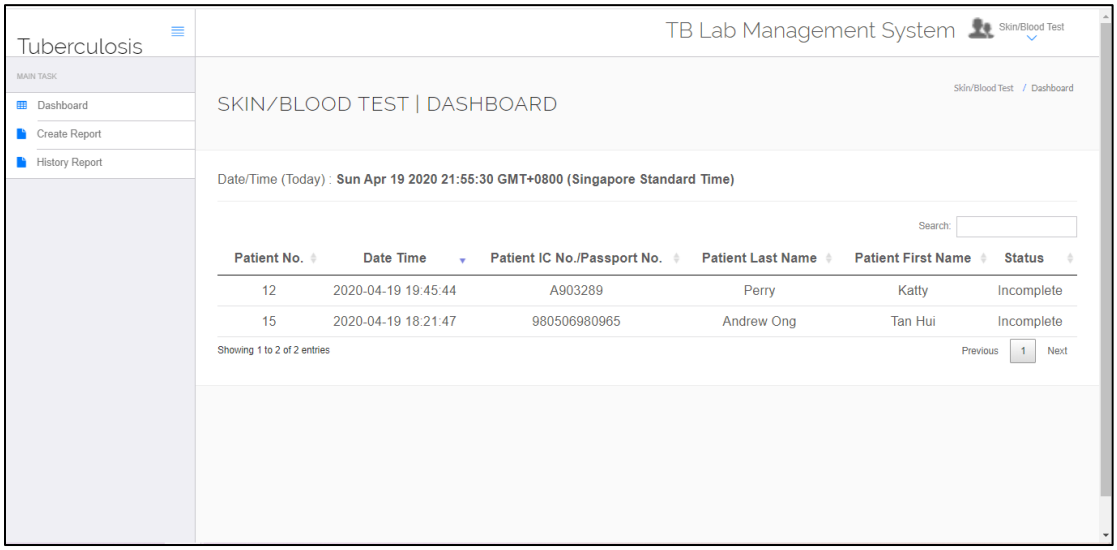


Figure 5.5.1 Dashboard of skin/blood test.

The prompt window as figure 5.5.2 will be shown if the nurse clicks on the selected patient's row/record. Before carrying the test, the nurse needs to confirm the patient identity with checking their IC no./Passport no. is matching with the IC no./Passport no. given from the pop-up window thus choose the test type to carry and press the "Submit" button to submit it. After submitting the confirmation of TB skin/blood test, the selected patient record will be removed from the patient waiting list in the dashboard and can find in the History report.

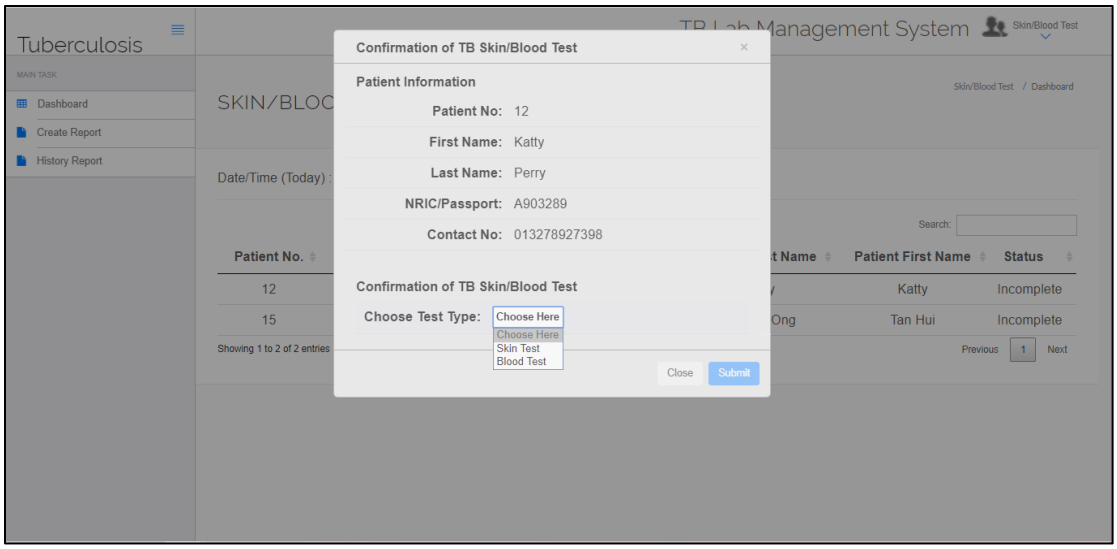


Figure 5.5.2 Confirmation of TB Skin/Blood Test interface.

After completing the test, the nurse needs to create a report for the patient. The nurse can click on the "Create Report" at the left side, the screen as figure 5.5.3 below will shown. The nurse needs to key in the patient IC no. / Passport number in order to the create report page. If the patient has not completed the test before, the nurse does not have the right to create a report for the patient and the IC no./Passport no. of the patient will not found while searching.

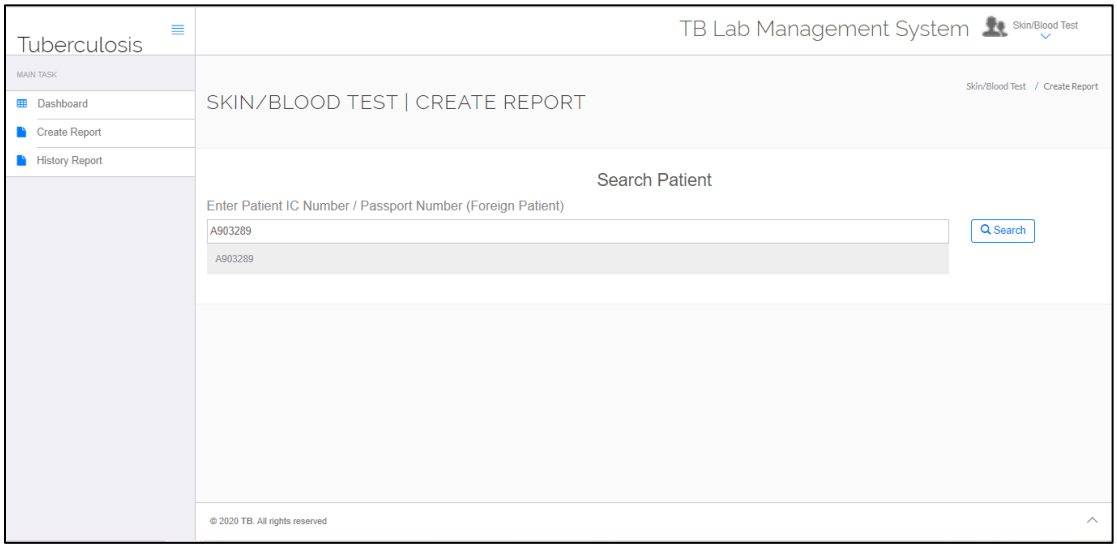


Figure 5.5.3 Search patient interface in skin/blood test module.

The figure 5.5.4 below will shown after the nurse click “Search” button and the test type chosen before is TB Skin Test. After filled in all field and test result, press the “Submit” button to submit the report.

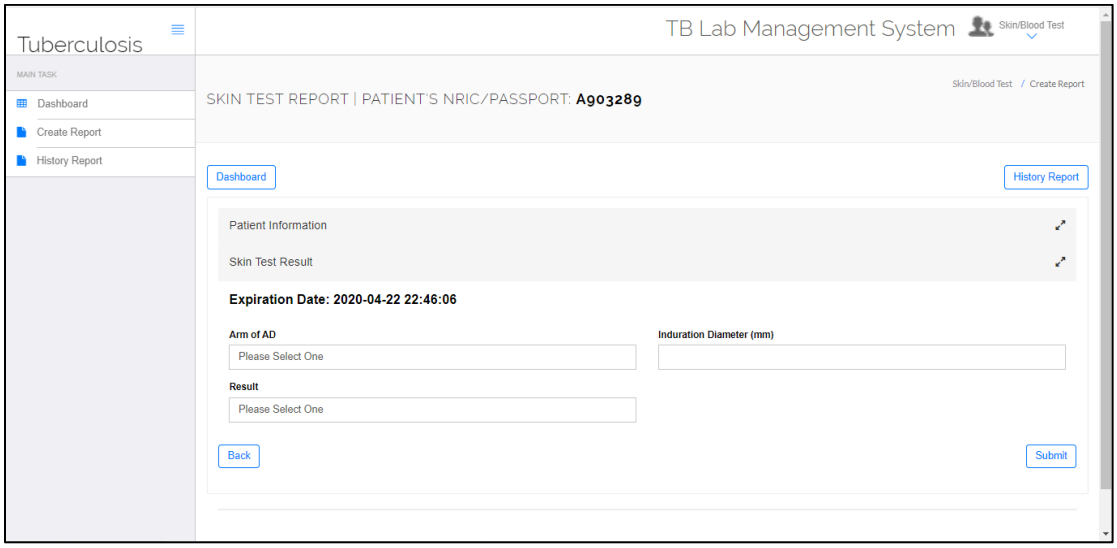


Figure 5.5.4 Create TB skin test report interface.

After successfully created the report, the system will prompt a message “Patient Record Updated Successfully (Skin-Test)” as shown in figure 5.5.5 below.

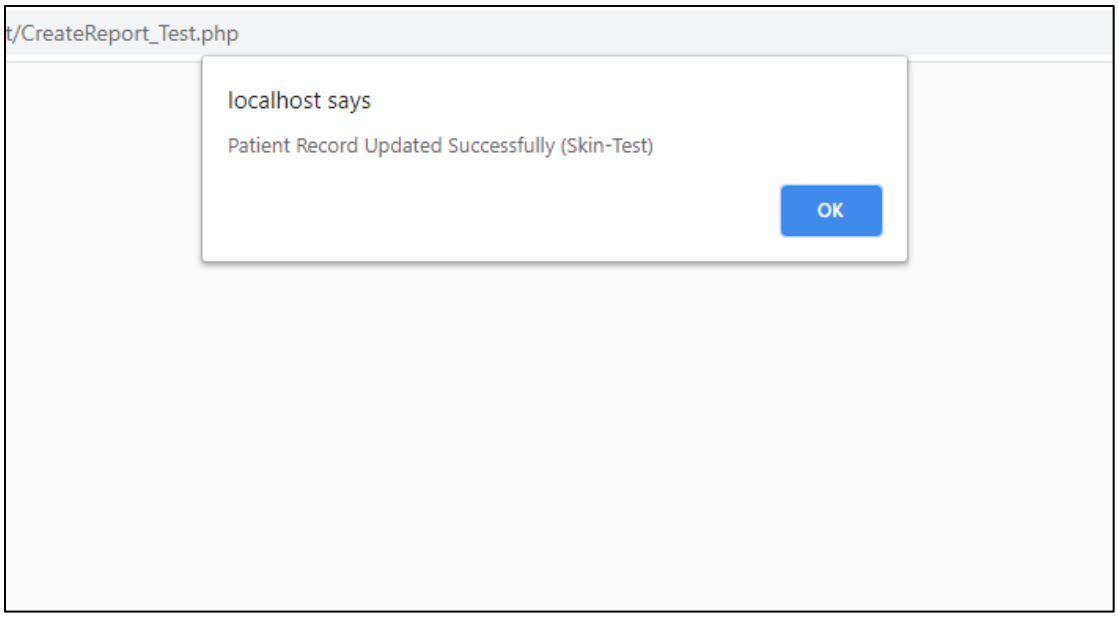


Figure 5.5.5 Create TB skin test report interface cont.

The figure 5.5.6 below will shown after click “Search” button and the test type chosen before is TB Blood Test. After filled in all field and test result, press the “Submit” button to submit the report.

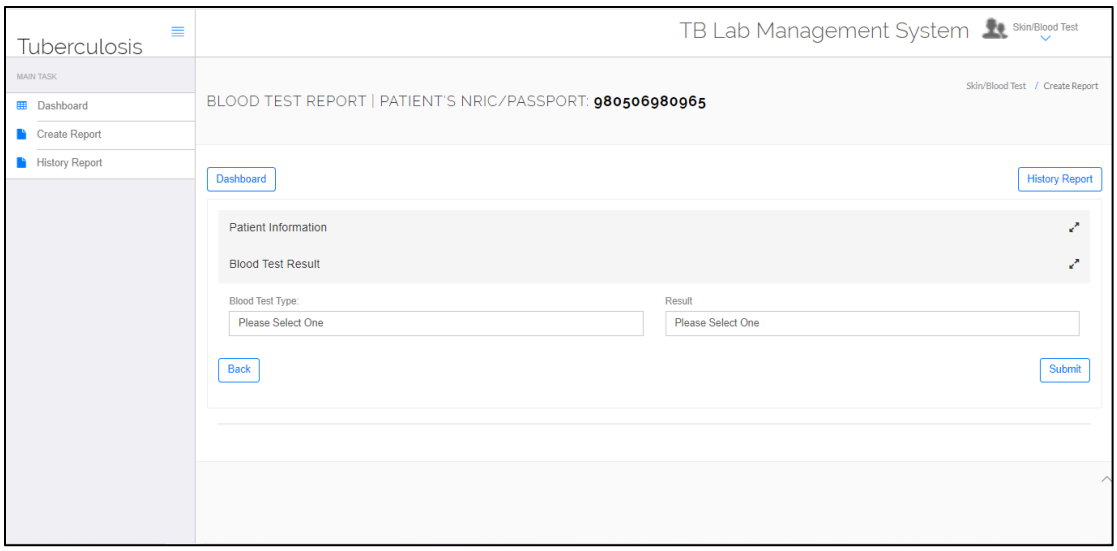


Figure 5.5.7 Create TB blood test report interface

After successfully created the report, the system will prompt a message “Successfully Update Patient Record (Blood-Test)” as shown in figure 5.5.8 below.

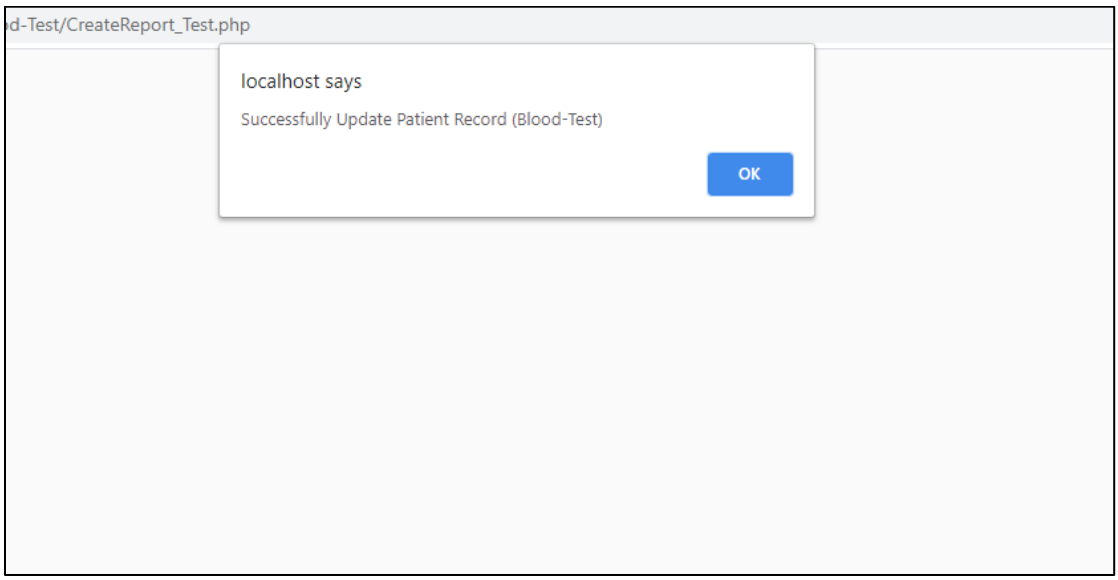


Figure 5.5.8 Create TB blood test report interface cont.

History Report interface will display all the patient list with carried skin/blood test before or created report before in the system, the nurse can search a particular patient by patient IC no./passport no. with the search function built in at the top of the patient list as figure 5.5.9 below. The nurse also can click on the patient record/row to see the patient history report or patient information.

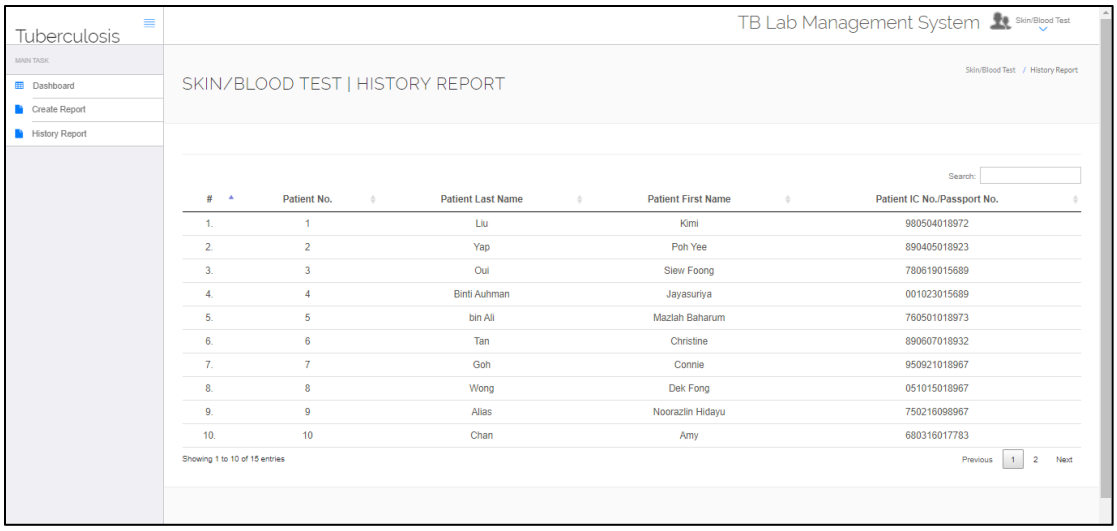


Figure 5.5.9 History report of TB skin/blood test interface

The figure 5.5.10 will be shown after click on the patient record/row, the screen shows the selected patient information and skin/blood test result. User also can click "Edit" button on the right to edit the test information.

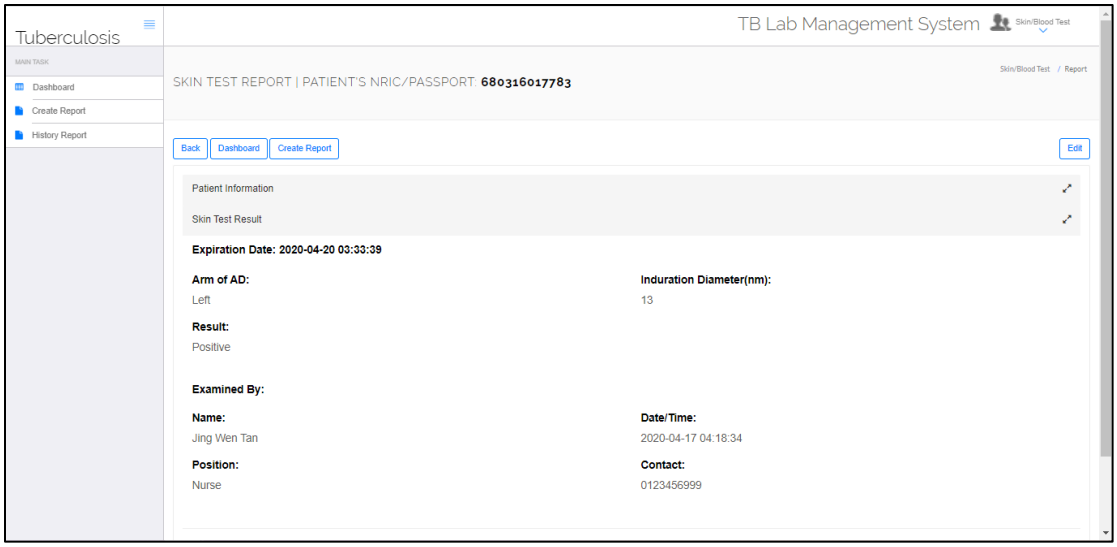


Figure 5.5.10 History report of TB skin/blood test interface cont.

The figure 5.5.11 will be shown after the "Edit" button has been clicked, the nurse is allowed to edit the patient test information that created by them before. The nurse is not allowed to edit

patient's test information created by other user and the test result are also not allowed to make changes.

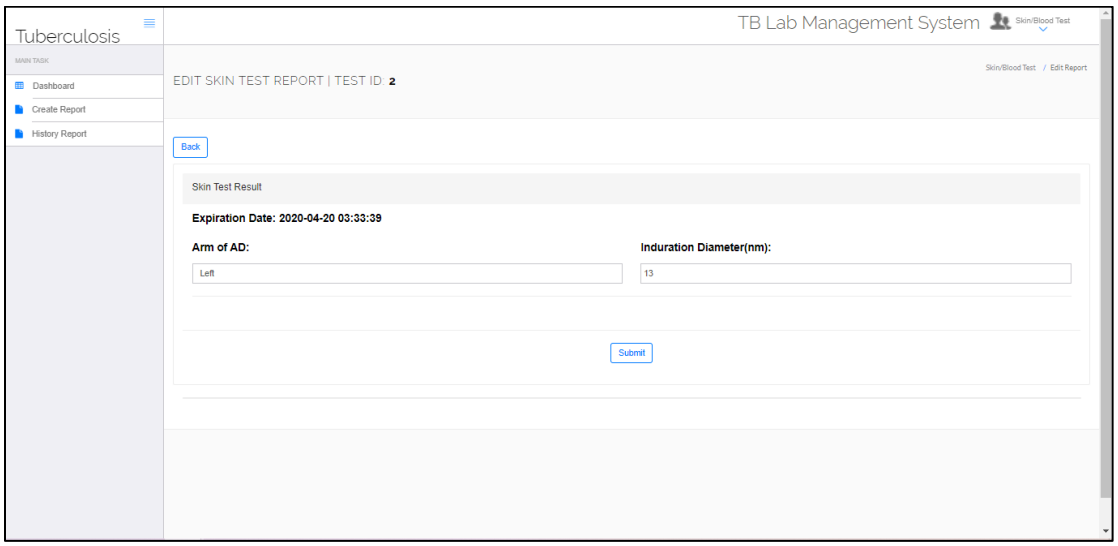


Figure 5.5.11 Edit skin test report interface.

After the nurse click the "Submit" button, a window will be prompted as shown in figure 5.5.12 below. This will help the nurse to taking serious on the edit test information's action and not simply to modify the test. Press the "OK" button, system will display "Update Patient Record Successfully".

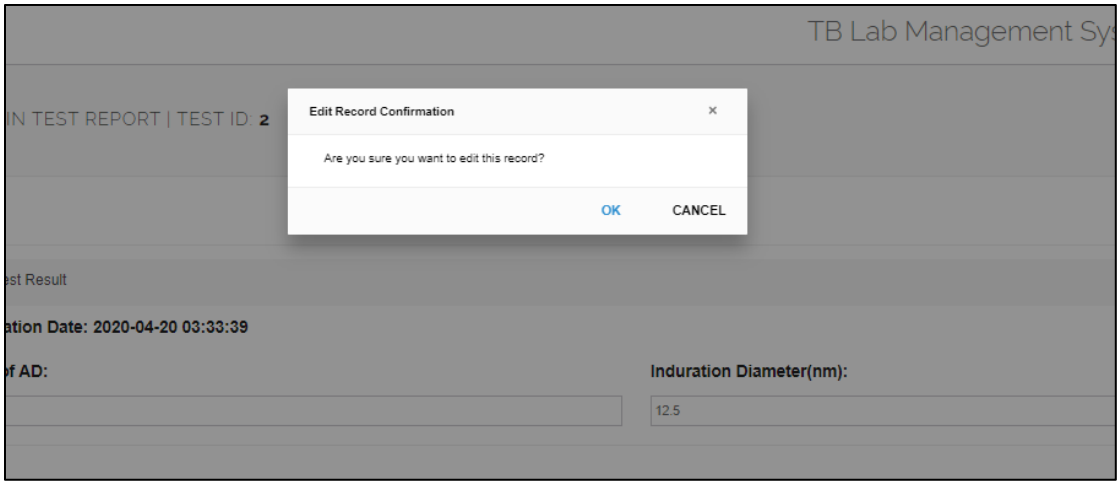


Figure 5.5.12 Pop up window to confirm the edit skin test action.

The nurse also can keep track the edit history by clicks on the “Edited” button beside the tittle “Skin Test Result” as shown in Figure 5.5.13.

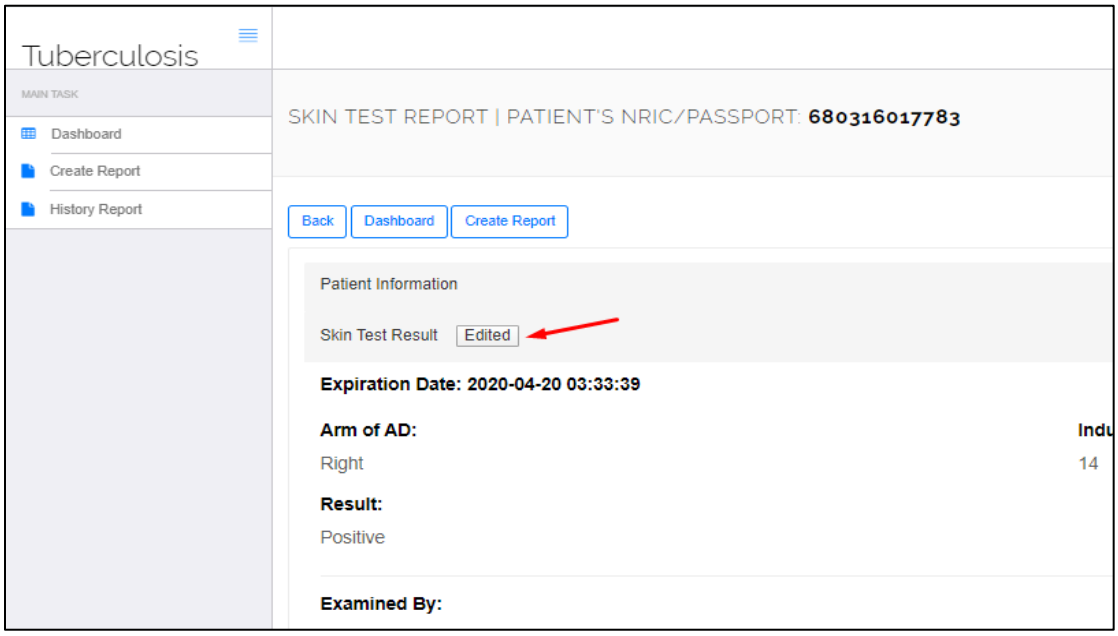


Figure 5.5.13 “Edited” button beside title “Skin Test Result”.

After clicks on the “Edited” button, the test information edits before and after will be stored in the log table. The edition date is also an important information stored in the log table as shown in figure 5.5.14 below.

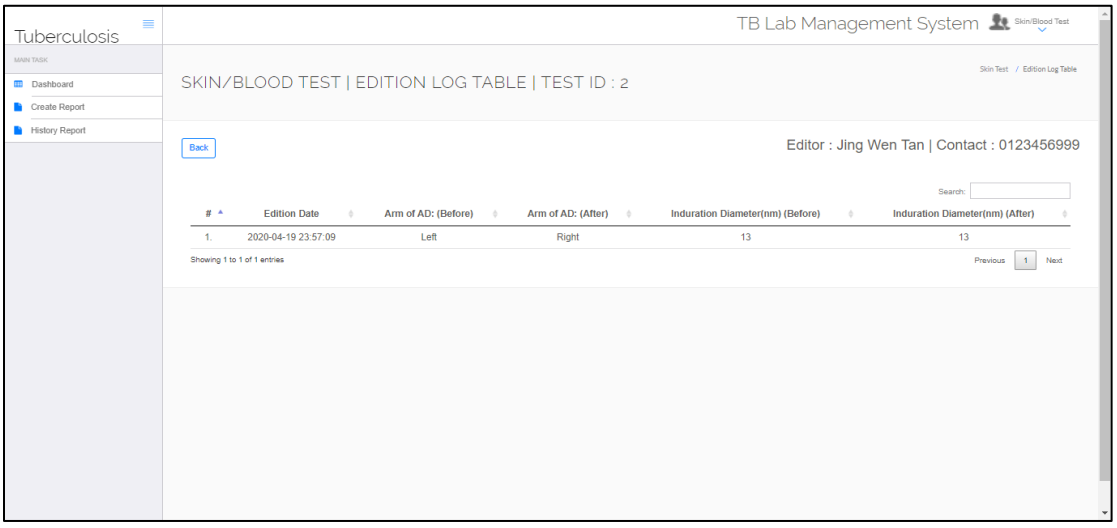


Figure 5.5.14 Edition log table in TB skin test

Besides that, system also allows nurse to manage their personal account by clicking on the "Manage Account" shows in the drop-down list at the top of the right. The "Manage Account" function designed was same with the Receptionist module and the functionality has mentioned before in the receptionist module. From the drop-down list, user can also log out from the system as shown in figure 5.5.14.

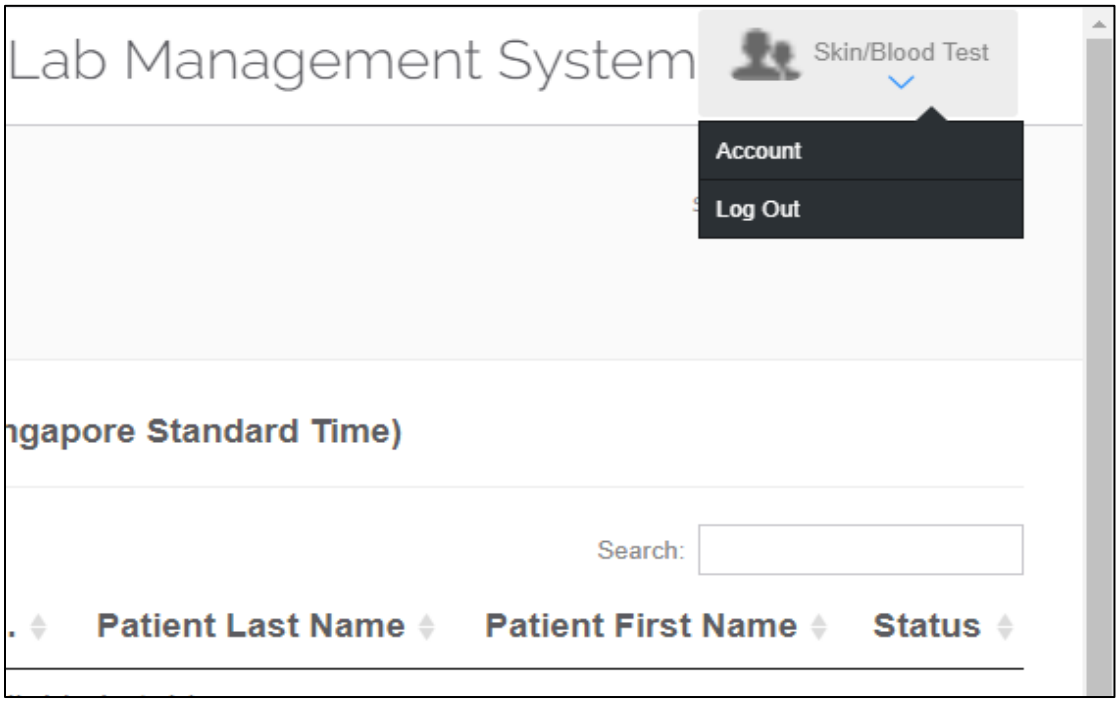


Figure 5.5.15 Drop down list on the top right of skin/blood test.

5.6 Chest X-Ray Test Module

After radiologist login into the system, the first interface is the dashboard interface as shown in the figure5.6.1 below. The chest x-ray test dashboard will show a patient waiting list (to do task), the patient is waiting for radiologist to help them to carry chest x-ray test.

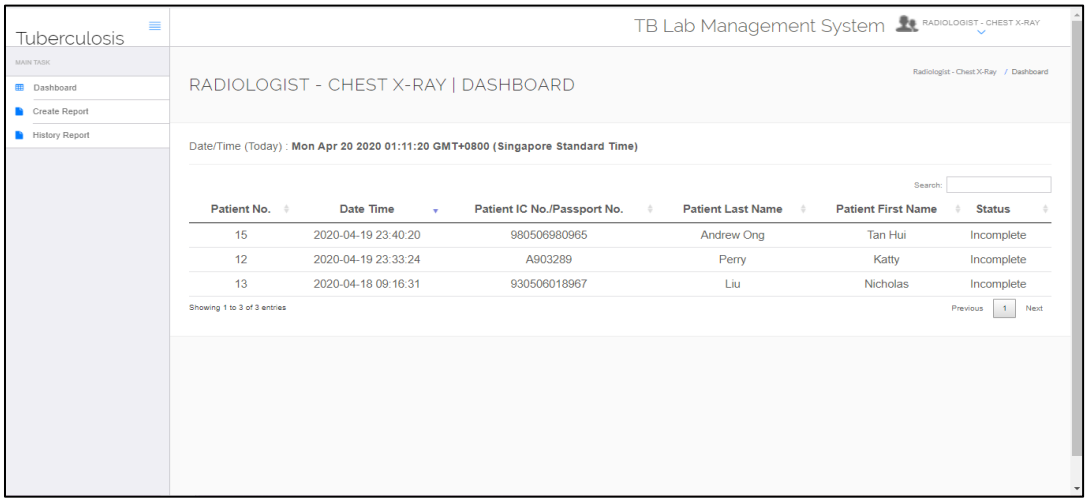


Figure 5.6.1 Dashboard of Chest X-Ray test.

The pop-up window as figure 5.6.2 will be shown if the nurse clicks on the selected patient's row/record. Before carrying the test, the nurse needs to confirm the patient identity with checking their IC no./Passport no. is matching with the IC no./Passport no. given from the pop-up window thus press the "Submit" button to submit it or not. After submitting the confirmation of Chest X-Ray test, the selected patient record will be removed from the patient waiting list in the dashboard and user can find it in the history report.

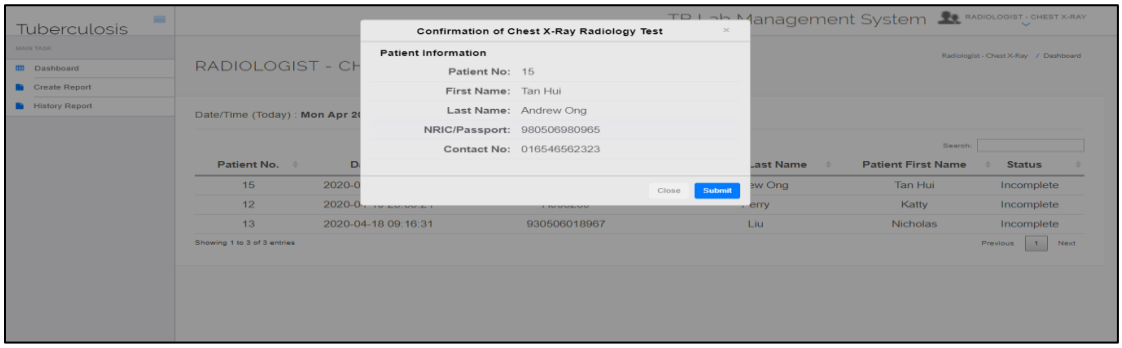


Figure 5.6.2 Confirmation of Chest X-Ray Test interface.

After completing the test, the radiologist needs to create a report for the patient. The radiologist can click on the "Create Report" at the left side, the screen as figure 5.6.3 below will be shown. The radiologist needs to key in the patient IC no. / Passport number in order to the create report page. If the patient has not completed the test before (confirmation of chest x-ray test), the nurse does not have the right to create a report for the patient and the IC no./Passport no. of the patient will not found while searching.

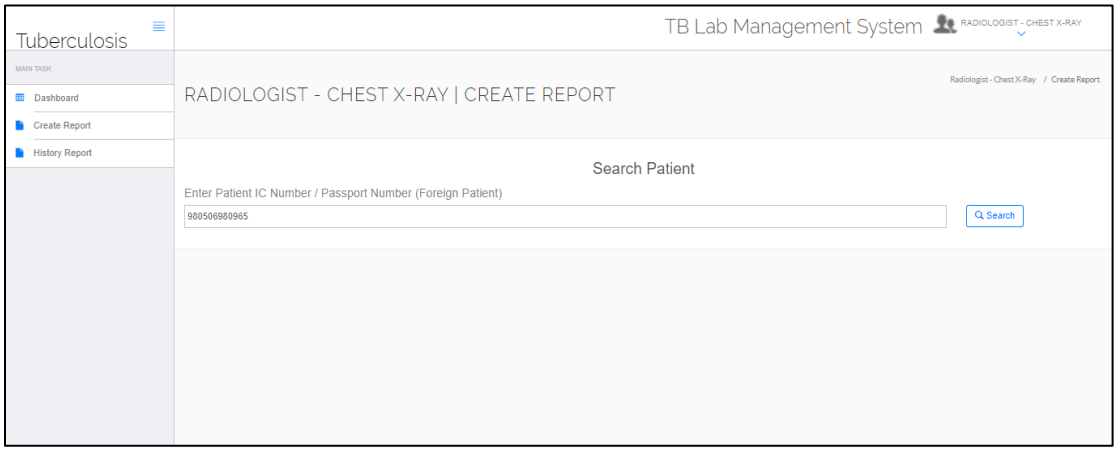


Figure 5.6.3 Search patient interface in chest x-ray test module.

The figure 5.6.4 below will be shown after the radiologist click "Search" button and the IC no. is found. Radiologist can click on the "Choose file" to choose the chest x-ray test image from their desktop and upload it. After filled in all field and test result, press the "Submit" button to submit the report.

Figure 5.6.4 Create chest x-ray report interface

After successfully created the report, the system will prompt a message "Patient Record Updated Successfully (Chest X-Ray)" as shown in figure 5.6.5 below.

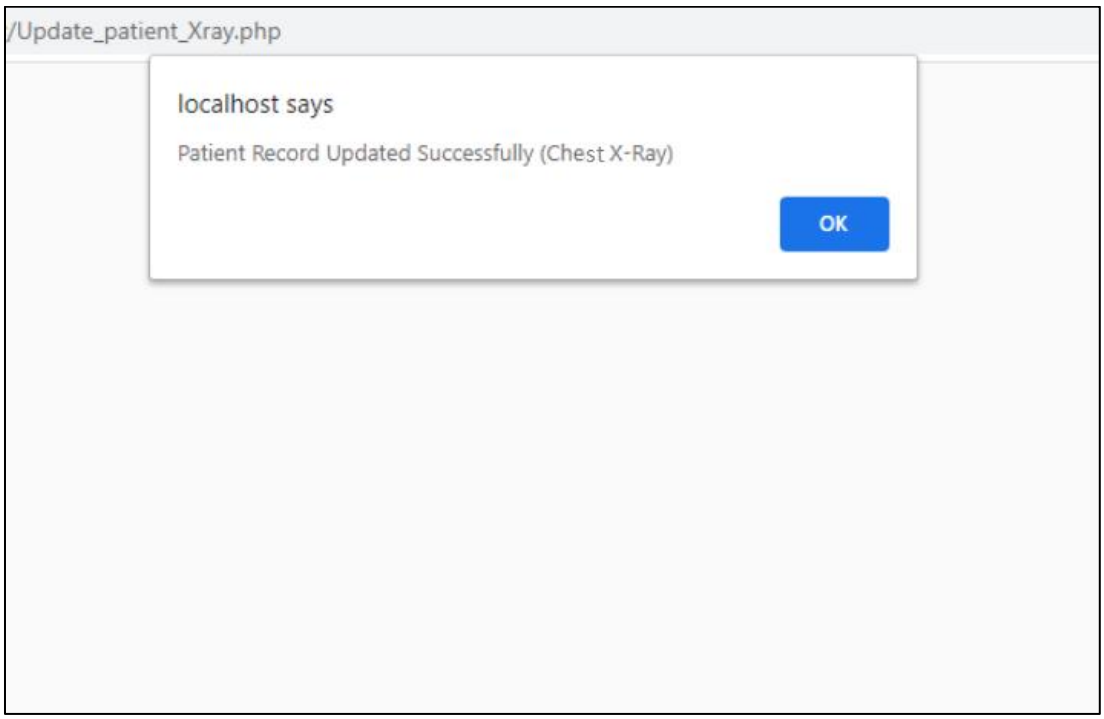


Figure 5.6.5 Create chest x-ray report interface cont.

History Report interface will display all the patient list with carried chest x-ray test before or created report before in the system, the radiologist can search a particular patient by patient IC no./passport no. with the search function built in at the top of the patient list as figure 5.5.9 below. The radiologist also can click on the patient record/row to see the patient history report or patient information.

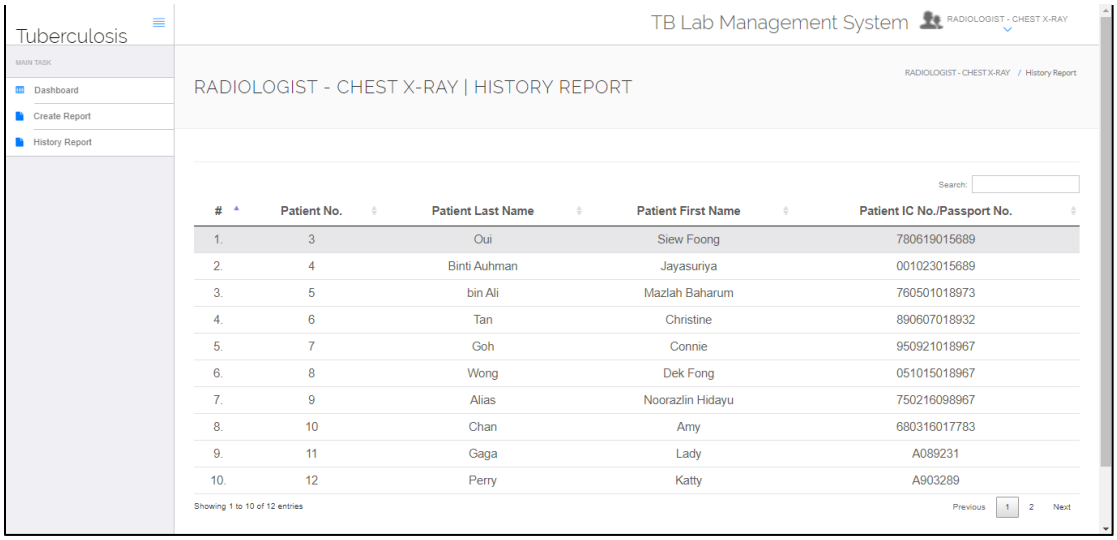


Figure 5.6.6 History report of chest X-Ray screen.

The figure 5.6.7 will show after the patient record/row has been clicked, the screen shows the selected patient information, chest x-ray image and chest x-ray result. User also can click “Edit” button on the right to edit the test information.

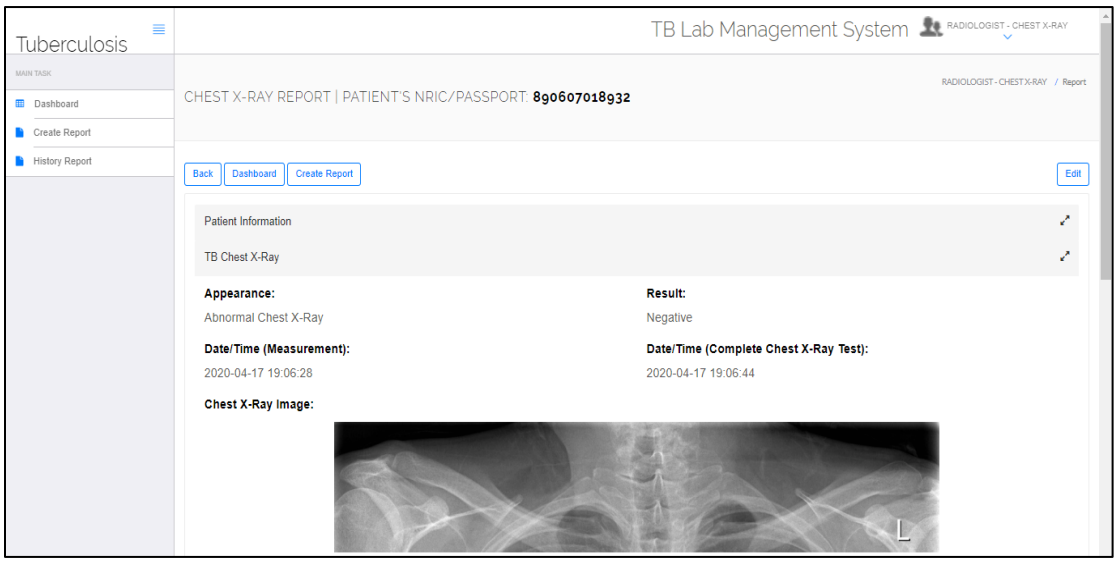


Figure 5.6.7 History report of chest x-ray screen cont.

The figure 5.6.8 will be shown after the “Edit” button has been clicked, the radiologist can edit the patient test information that created by them before. The radiologist is not allowed to edit patient’s test information created by another user.

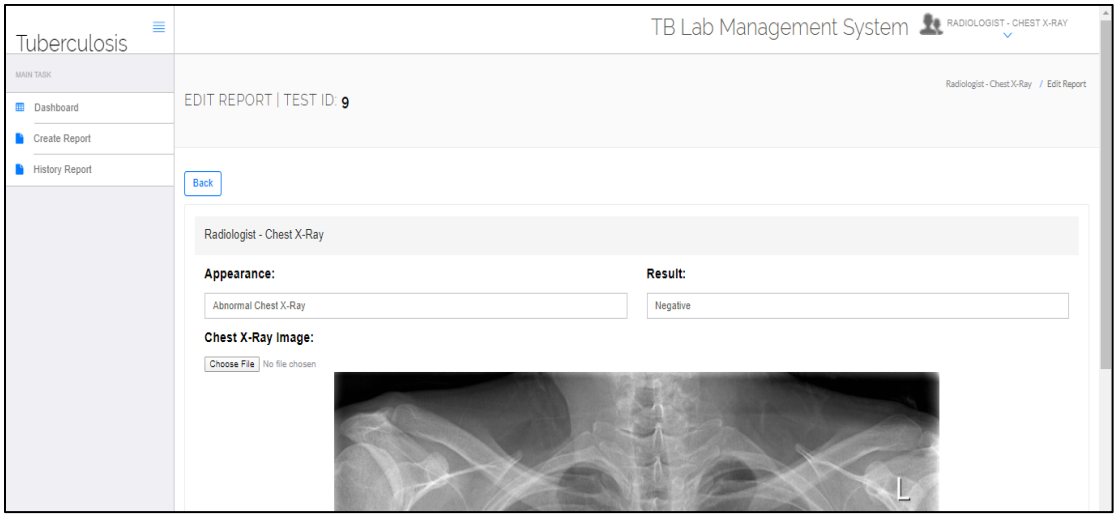


Figure 5.6.8 Edit chest x-ray report interface.

After the radiologist click the “Submit” button, a window will be prompted as shown in figure 5.6.9 below. This will help the radiologist to taking serious on the edit test information’s action and not simply to modify the test. After press the “OK” button, system will display “Update Patient Record Successfully”.

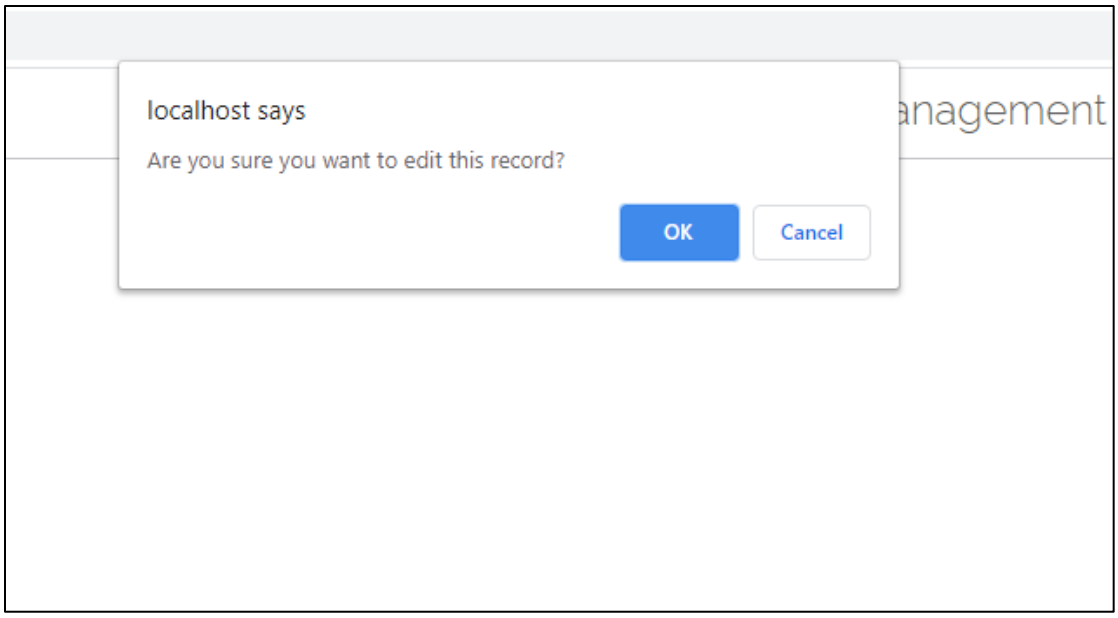


Figure 5.6.9 Edit chest x-ray report interface cont.

The radiologist also can keep track the edit history by clicks on the "Edited" button beside the tittle "TB Chest X-Ray" as shown in Figure 5.6.10.

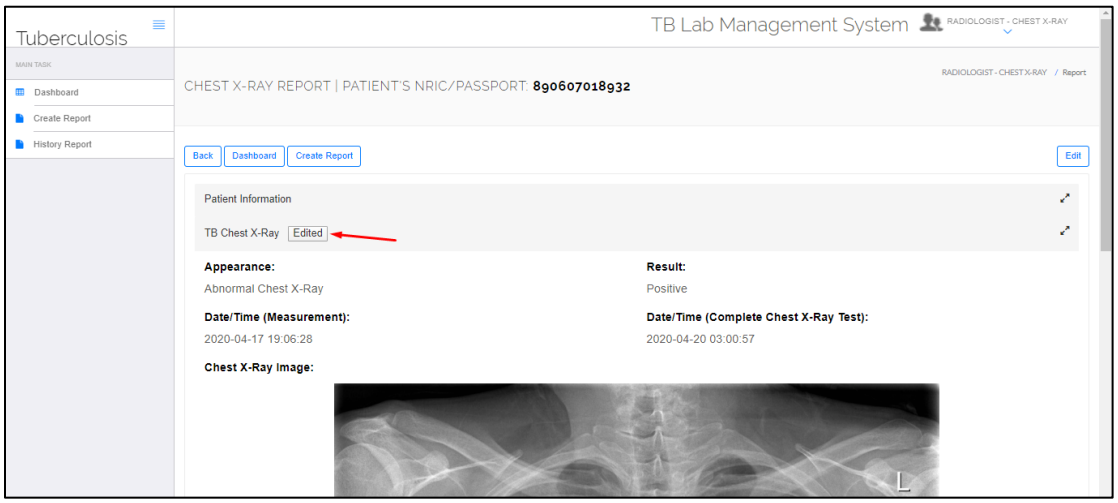


Figure 5.6.10 "Edited" button beside title "TB Chest X-Ray".

After clicks on the “Edited” button, the test information edits before and after will be stored in the log table. The edition date is also an important information stored in the log table as shown in figure 5.6.11 below. The editor information will also display at the top of the right on the log table.

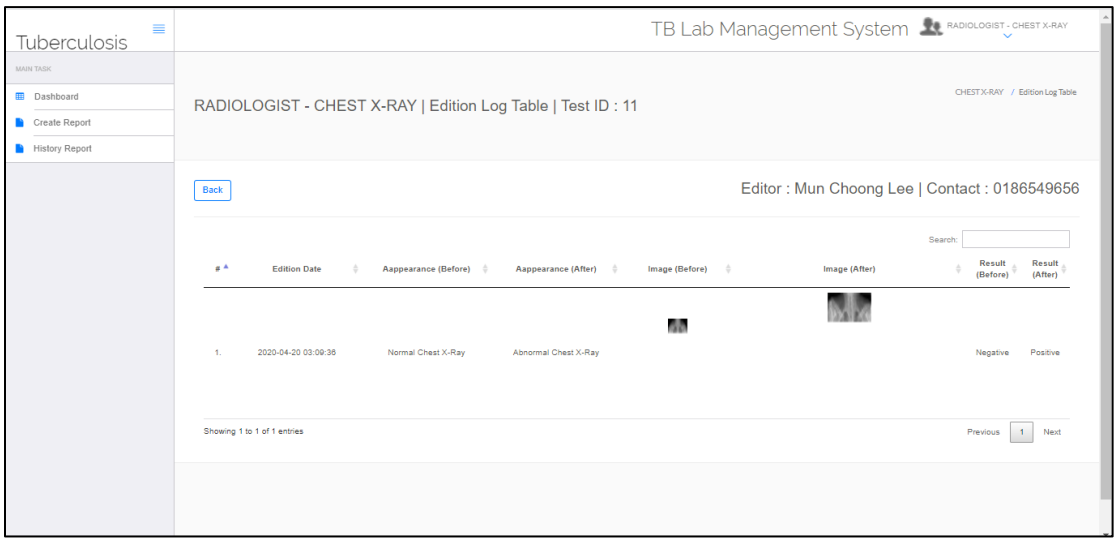


Figure 5.6.11 Edition log table of chest x-ray test.

Besides that, system also allows radiologist to manage their personal account by clicking on the “Manage Account” shows in the drop-down list at the top of the right. The “Manage Account” function designed was same with the Receptionist module and the functionality has mentioned before in the receptionist module. From the drop-down list, user can also log out from the system as shown in figure 5.6.11.

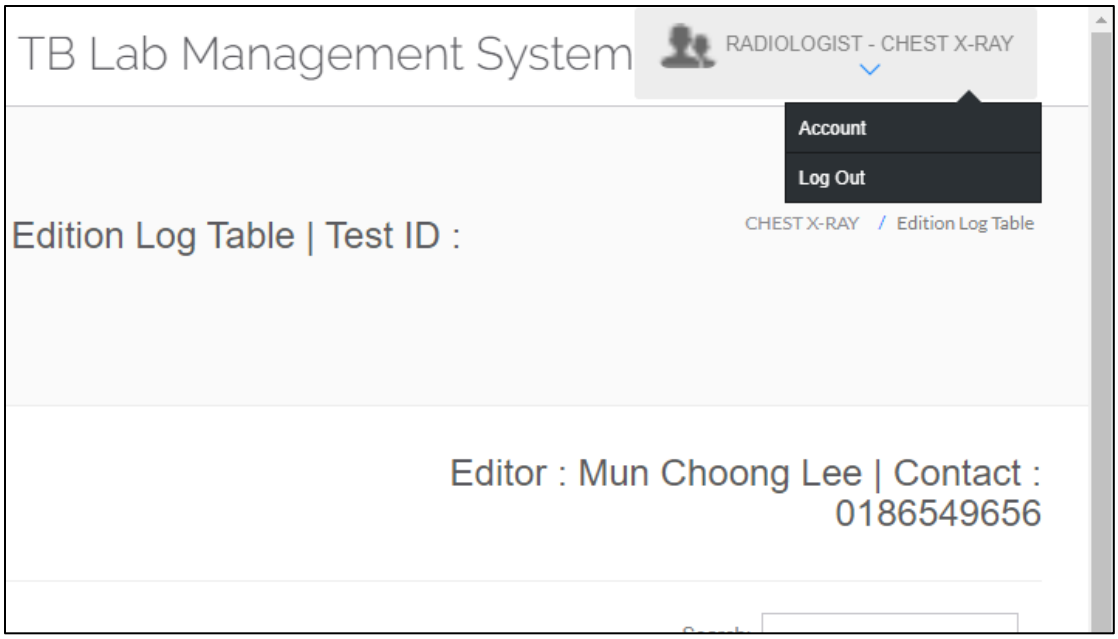


Figure 5.6.12 Drop down-list at the top of the right in chest x-ray module.

5.7 Lab Scientist Module

5.7.1 Collection Sample Sputum Test

After lab scientist login into the system, the first interface is the collect sputum sample's dashboard interface as shown in the figure5.7.1.1 below. The dashboard will showed a patient waiting list(to do task), the lab scientist can click on the "View icon" to see more patient information or click on "Create Sample Report" to record and create a report for the patient after received the sputum sample.

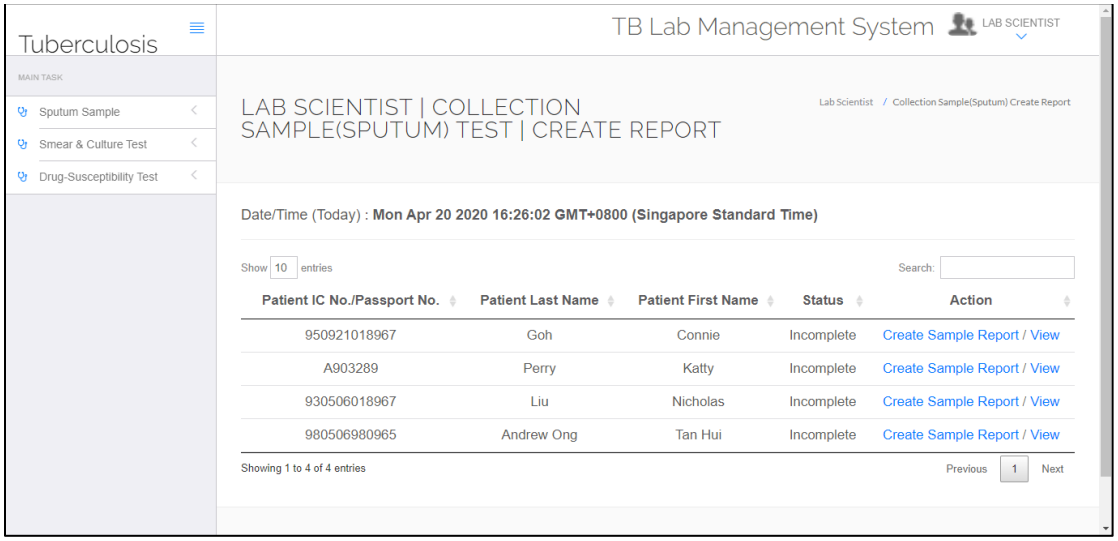


Figure 5.7.1.1 Dashboard of collection sputum sample interface.

After lab scientist click on the "Create Sample Report", the figure 5.7.1.2 will be shown. Every sputum sample will have a unique serial number on the sputum sample bottle. The lab scientist should key in all the correct information and press the "Submit" button to submit the report.

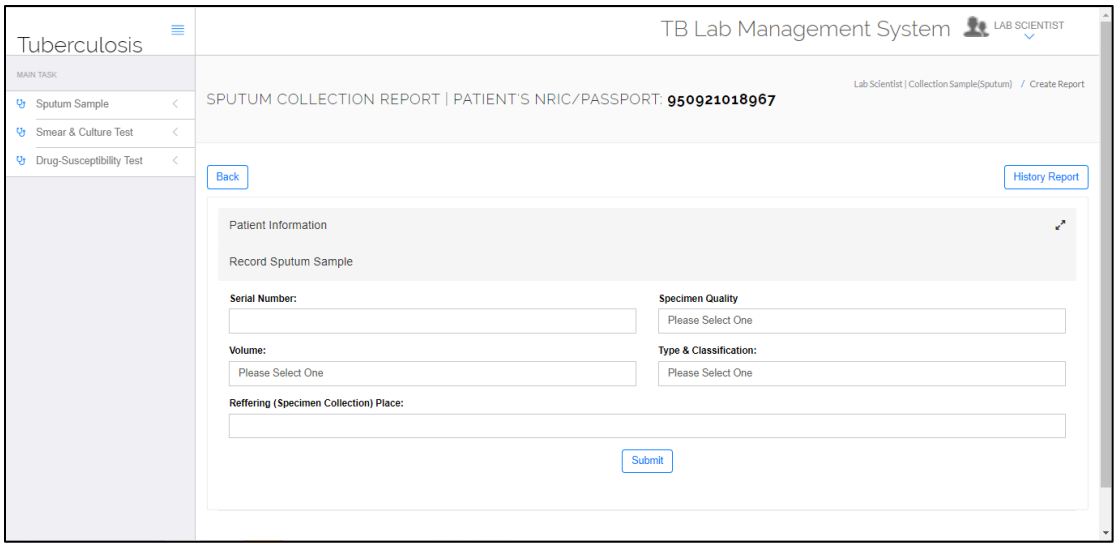


Figure 5.7.1.2 Create sputum sample report interface.

The system will prompt a message “Patient Record Updated Successfully (Sputum Specimen Collection)” when the report submitted successfully as shown in figure 5.7.1.3. After submitting the report, the selected patient record/row will be removed from the dashboard and added in history report. The patient record/row will not disappear only if the sputum sample quality is not acceptable (unsatisfactory). The lab scientist will recollect sputum sample with patient and make a new report again.

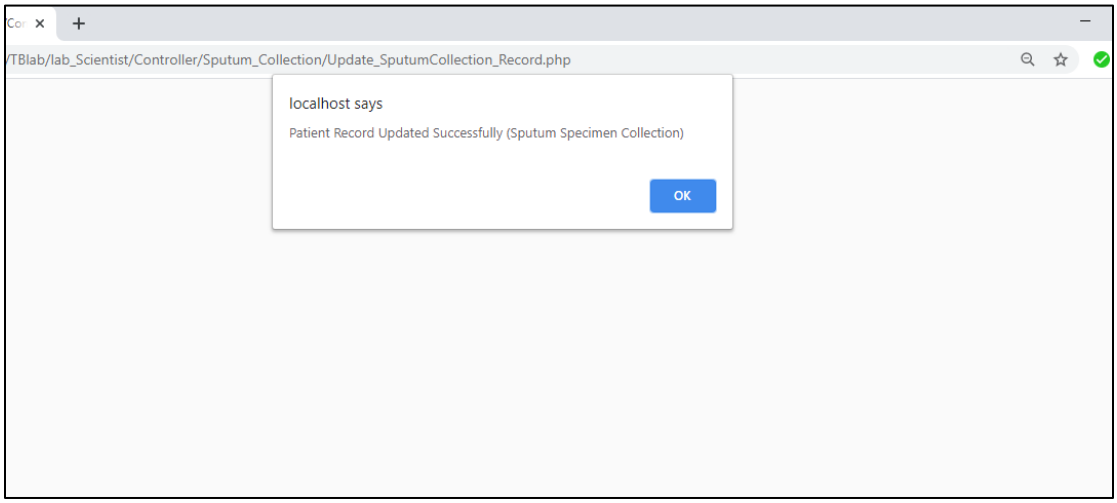


Figure 5.7.1.3 Create sputum sample report interface cont.

History Report of collection sample sputum interface will display all the patient list with created report before in the system, the lab scientist can search a particular patient by patient IC no./passport no. with the search function built in at the top of the patient list as figure 5.7.1.4 below. The lab scientist also can click on the patient record/row to see the patient history report or patient information.

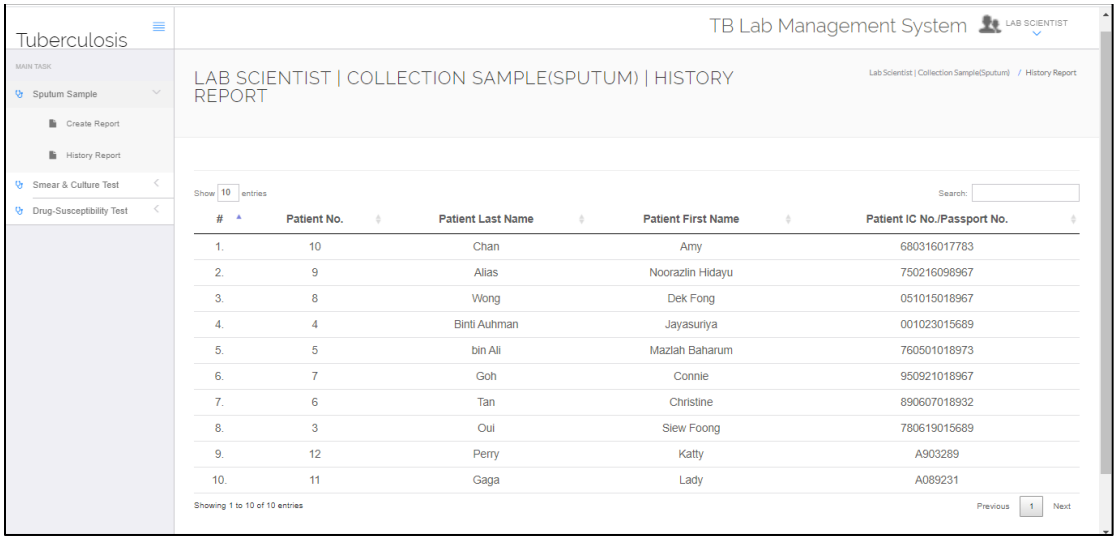


Figure 5.7.1.4 History report of collection sample sputum interface.

The figure 5.7.1.5 will shown after click on the patient record/row, the screen shows the selected patient information and sample Collection (Sputum) result. User also can click “Edit” button on the right to edit the test information.

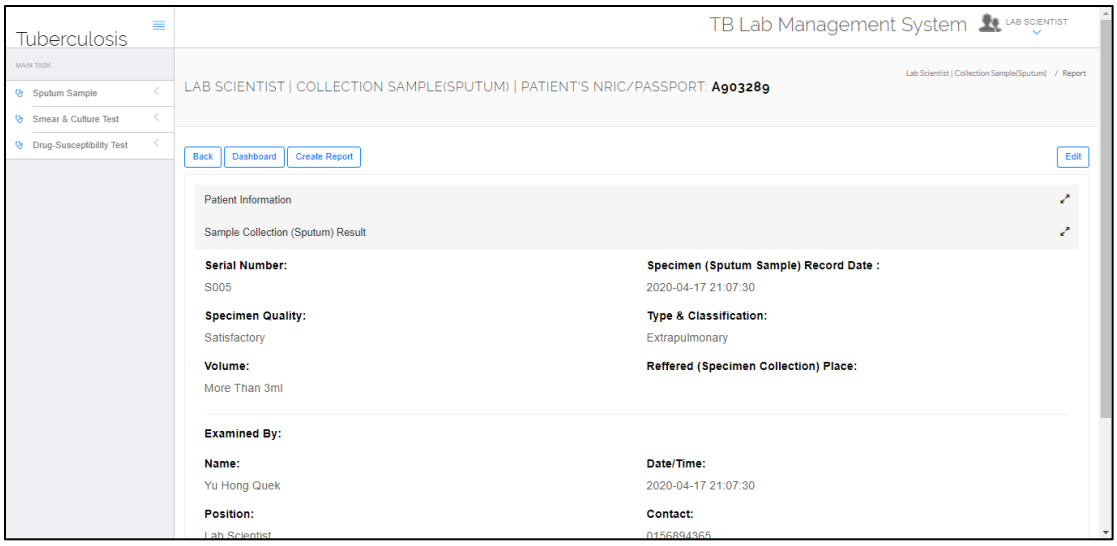


Figure 5.7.1.5 History report of collection sample sputum interface.

The figure 5.7.1.6 will be shown after the "Edit" button has been clicked, the lab scientist is allowed to edit the patient test information that created by them before. The lab scientist is not allowed to edit patient's test information created by another user.

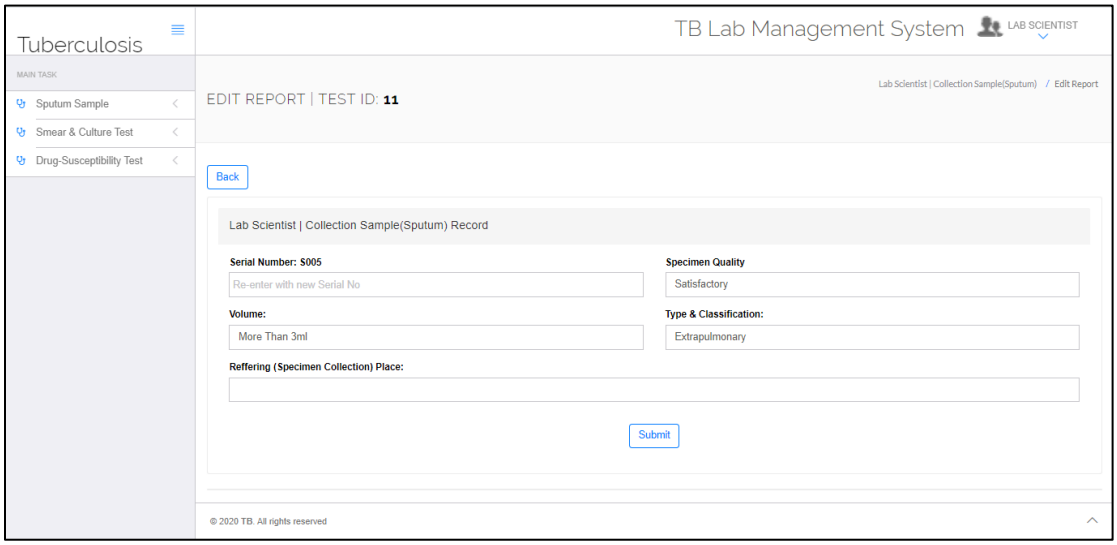


Figure 5.7.1.6 Edit report of collection sputum sample test interface

After the lab scientist click the "Submit" button, a window will be prompted as shown in figure 5.7.1.7 below. This will help the lab scientist to taking serious on the edit test information's action and not simply to modify the test. After press the "OK" button, system will display "Update Patient Record Successfully".

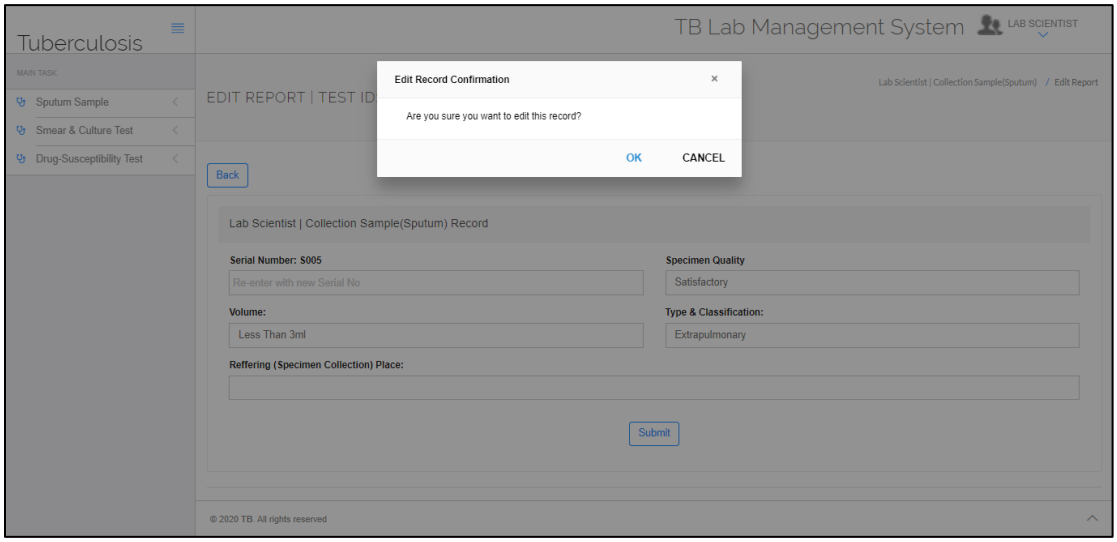


Figure 5.7.1.7 Edit report of collection sputum sample test interface.

The lab scientist also can keep track the edit history by clicks on the "Edited" button beside the tittle "Sample Collection (Sputum) Result" as shown in Figure 5.7.1.8.

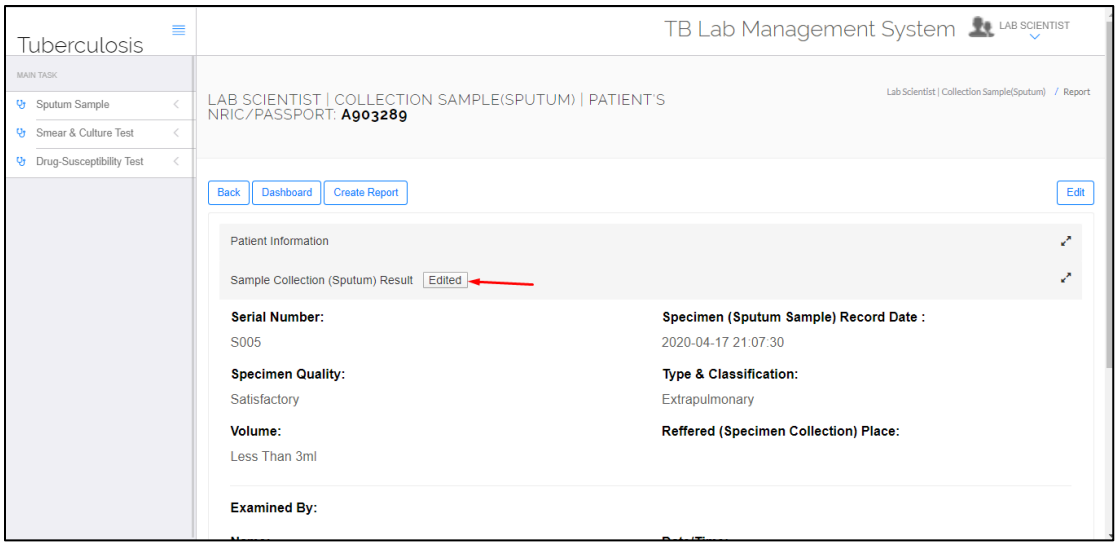


Figure 5.7.71.8 "Edited" button beside the tittle "Sample Collection (Sputum) Result".

After clicks on the "Edited" button, the test information edits before and after will be stored in the log table. The edition date is also an important information stored in the log table as shown in figure 5.7.1.9 below.

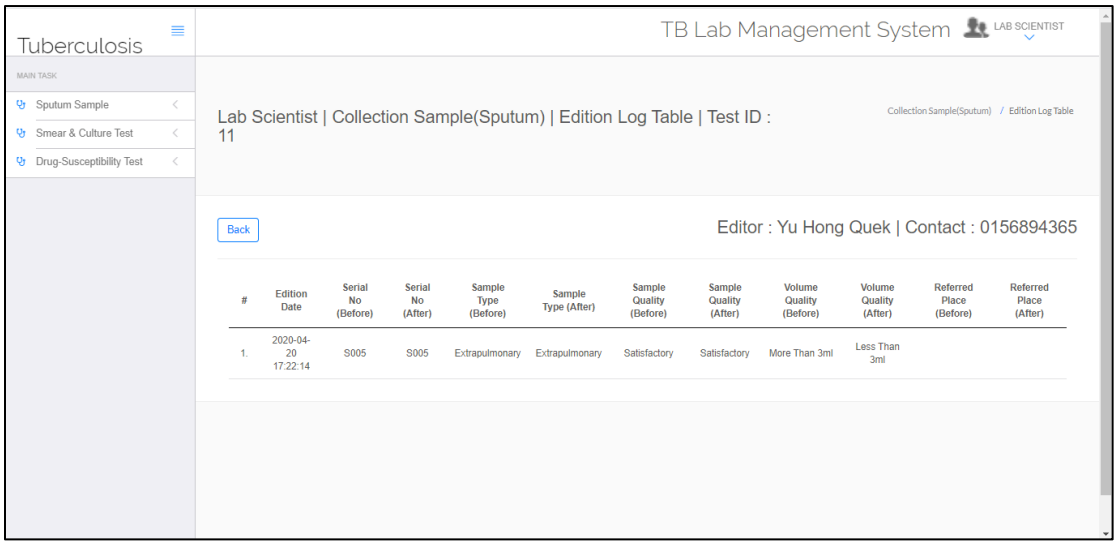


Figure 5.7.1.9 Edition Log Table of Collection Sample (Sputum).

5.7.2 Smear & Culture Test

After the collection of sputum sample, the patient record/row will be added in the dashboard of Smear & Culture test and DST test. Click on the "Smear & Culture Test" a drop-down list will be shown with "Create Report" and "History Report" then click on the "Create Report". The patient record/row shown in the report creation dashboard are waiting for carry Smear & Culture test as shown in figure 5.7.2.1.

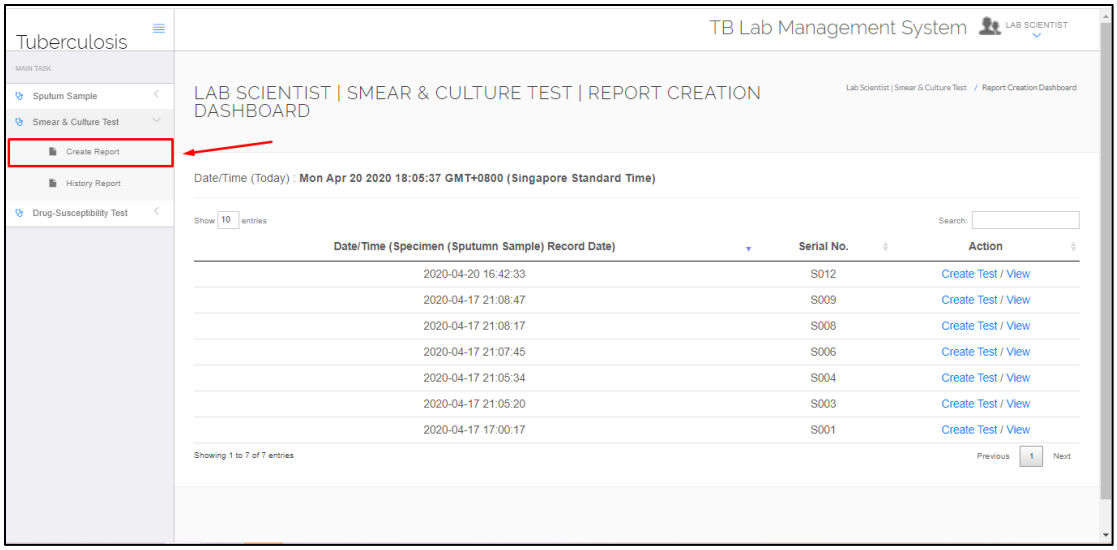


Figure 5.7.2.1 Dashboard of Smear & Culture test.

The figure 5.7.2.2 will be shown after lab scientist click on the "Create Test" button. The lab scientist can choose the test type and filled in all the test information then submit it by press on the "Submit" button.

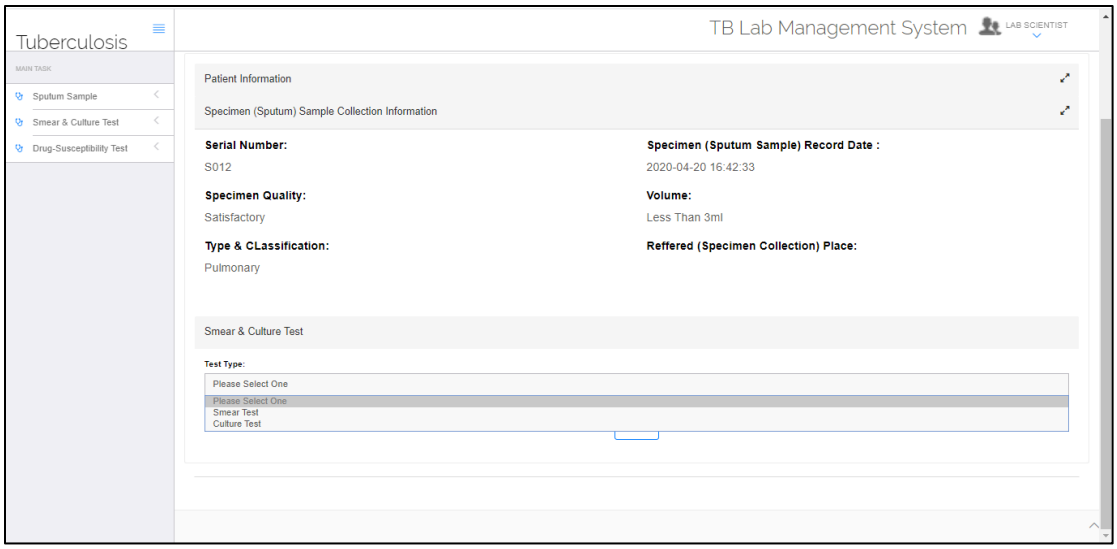


Figure 5.7.2.2 Create report of Smear & Culture test interface.

After the test record submitted successfully, the system will prompt a message “Record Import Successfully” if the record submitted successfully in the system as shown in figure 5.7.2.3 below.

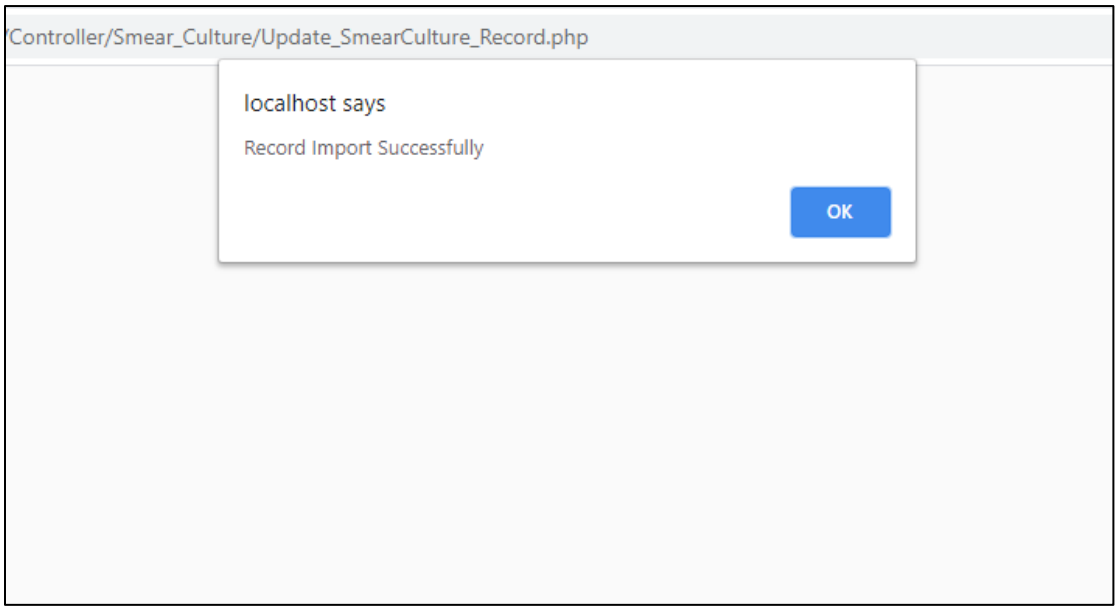


Figure 5.7.2.3 Create report of Smear & Culture test interface cont.

Click on the “History Report”, The history report of Smear & Culture test interface will display all the patient list with created Smear & Culture test record before in the system. The lab

scientist can search a particular patient by patient IC no./passport no., Serial No., or date time with the search function built in at the top of the patient list as figure 5.7.2.4 below. The lab scientist can set the number of record show in a page. The lab scientist also can click on the patient record/row to see the patient history report or patient information.

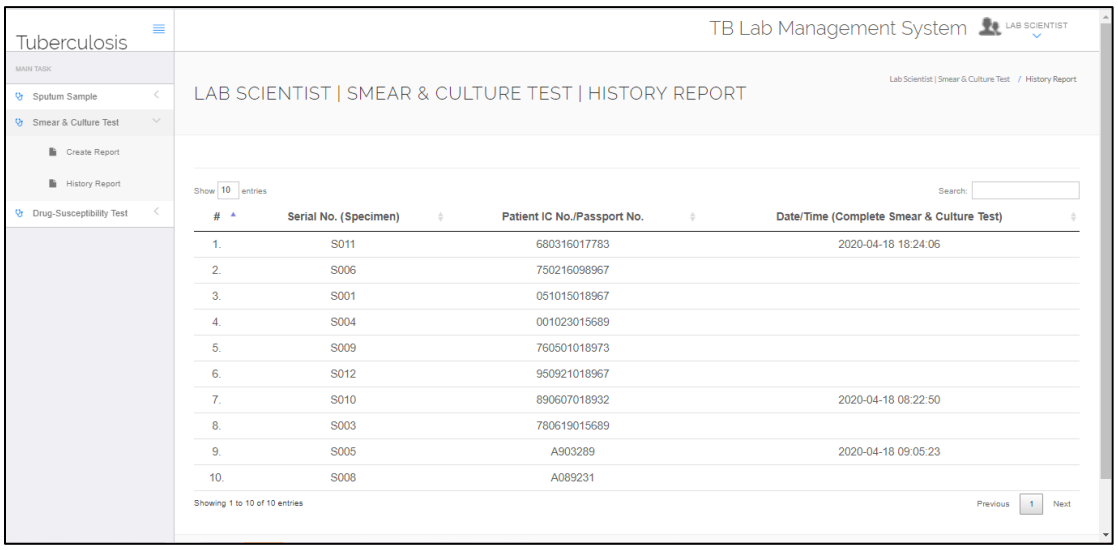


Figure 5.7.2.4 History report of smear & culture test interface.

The figure 5.7.2.5 will be shown after click on the patient record/row, the screen shows the selected patient information, sample Collection (Sputum) information and the Smear & Culture test records. User also can use the built-in search function to sort the test record or search for the specific test record. User can sort/search the test records with the date/time, test type, result, appearance, contaminated or contamination. The lab scientist also can press “view” button to see more information of the selected patient row’s test record. Moreover, the lab scientist also can clicks “Edit” button on selected patient row/record to edit the test information/result.

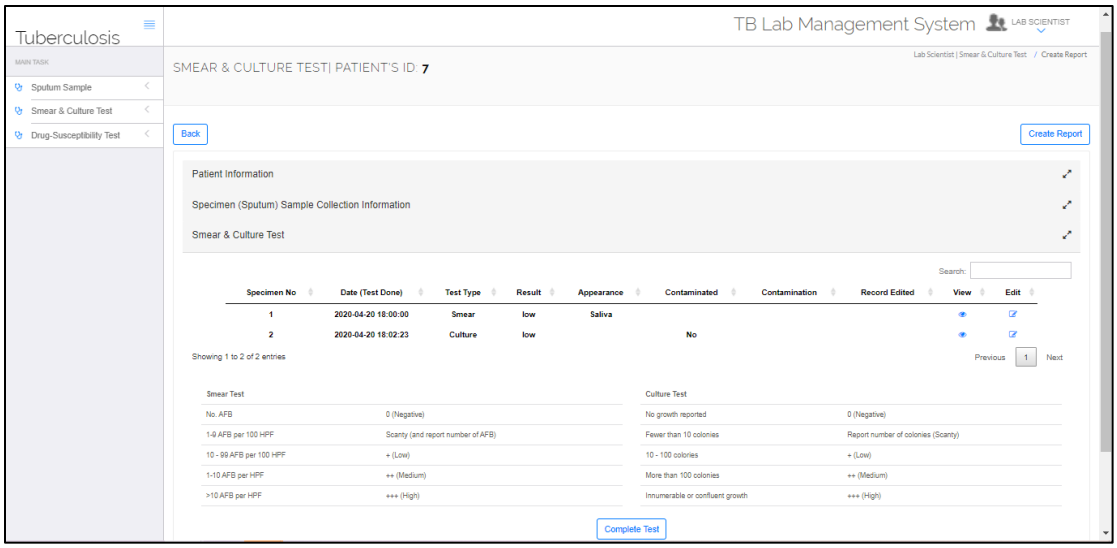


Figure 5.7.2.5 Selected patient's history report of smear & culture test interface.

The figure 5.7.2.6 will be shown the "Edit" button has been clicked, the lab scientist is allowed to edit the patient test information that created by them before. The lab scientist is not allowed to edit patient's test information created by another user.

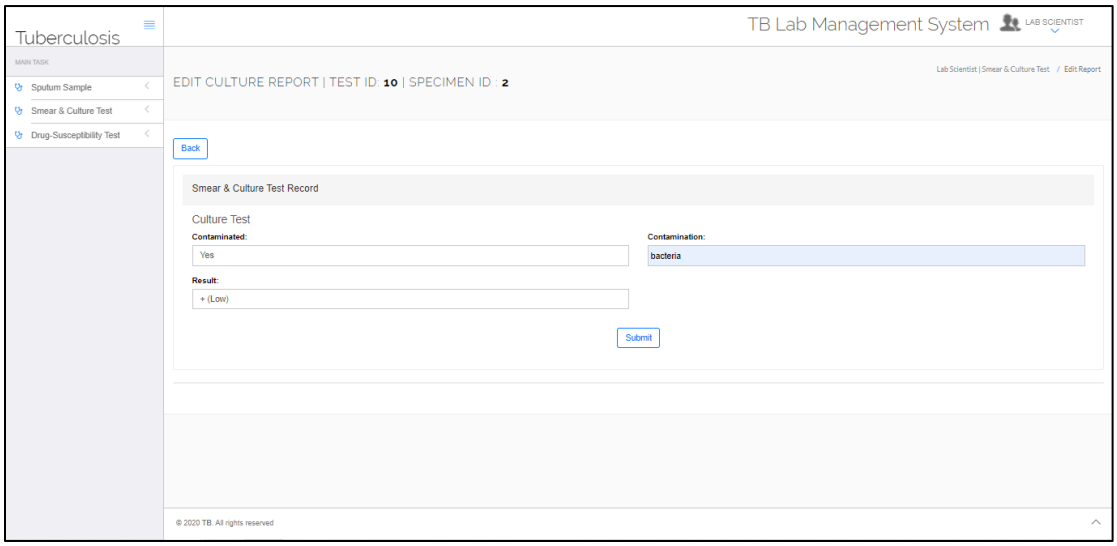


Figure 5.7.2.6 Edit Culture Report interface.

After the lab scientist click the "Submit" button, a window will be prompted as shown in figure 5.7.2.7 below. After press on the "OK" button, system will display "Patient Record Updated

Successfully". If the lab scientist clicks on the "Cancel" button, the edit request will not submit to system and edit action will seems as failed.

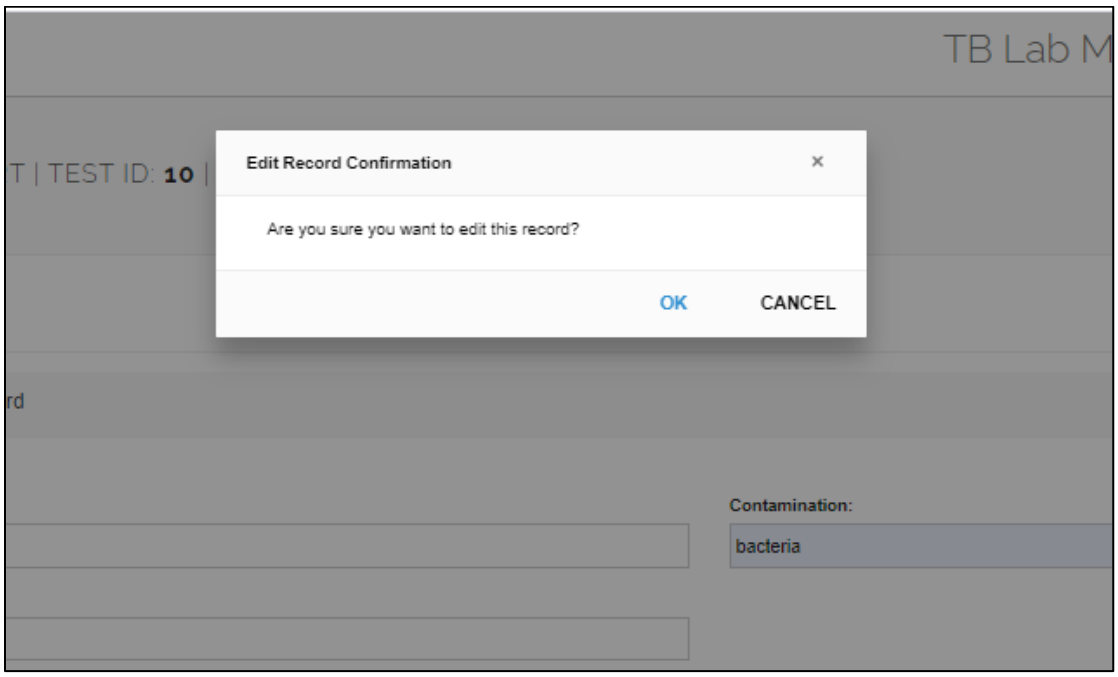


Figure 5.7.2.7 Edit Culture Report interface cont.

The lab scientist also can keep track the edit history of every test record by clicks on the "Edited" button as shown in Figure 5.7.2.8

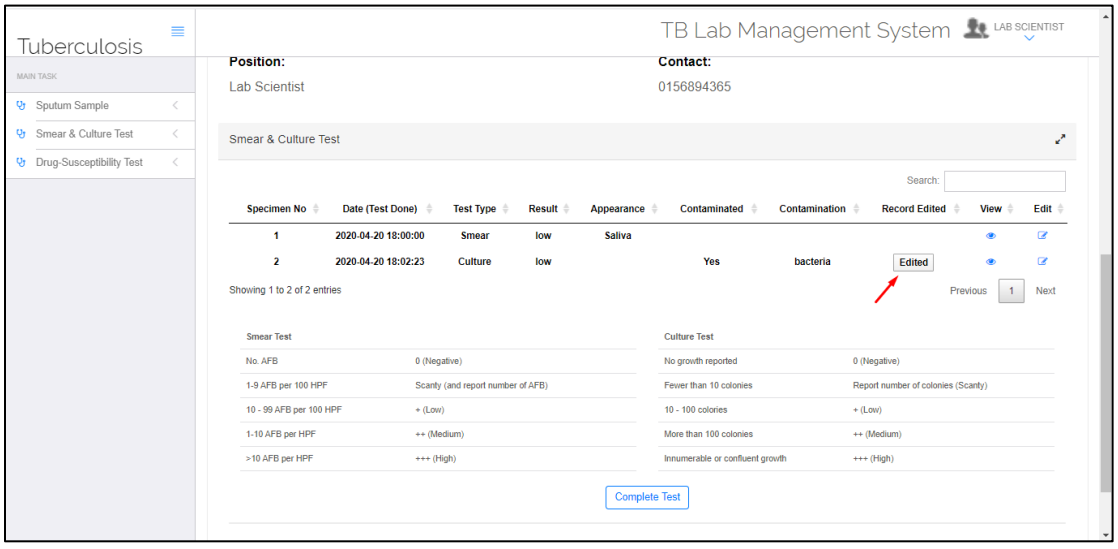


Figure 5.7.2.8 "Edited" button on the selected patient's history report interface

After clicks on the “Edited” button, the test information edits before and after will be stored in the log table. The edition date is also an important information stored in the log table as shown in figure 5.7.2.9 below. The editor information will also display at the top of the right on the log table.

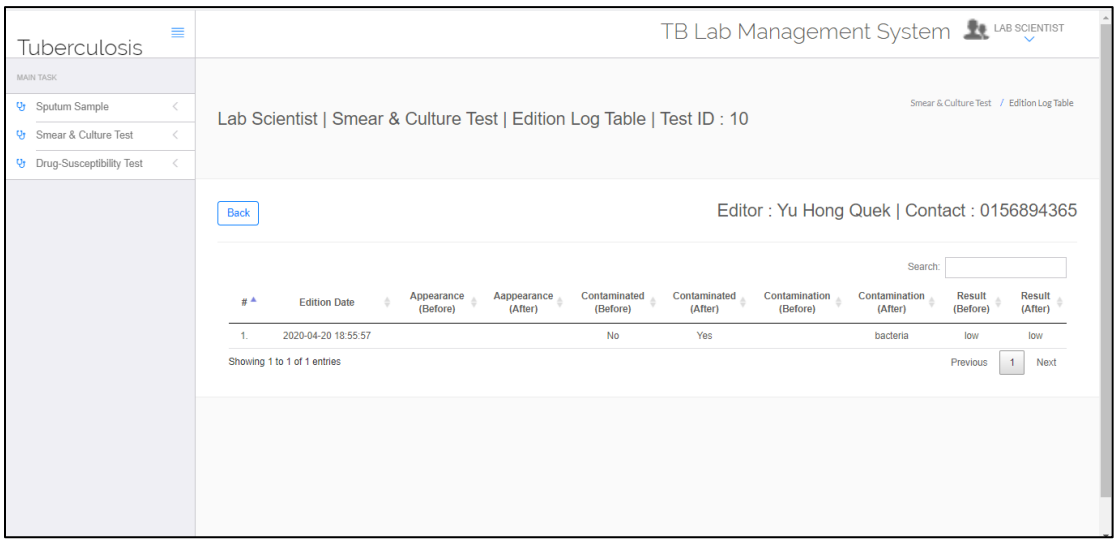


Figure 5.7.2.9 Edition log table of Smear & Culture test interface

Every patient will carry difference times of smear tests and culture tests, the lab scientist can click the “Complete test” button as a close test or completion of create report for the specific patient as shown in figure 5.7.2.10 below. Before click on the “Complete Test” button, the lab scientist needs to confirm all the test result recorded are correct. The lab scientist is not allowed to add more test result for the patient after clicks the button.

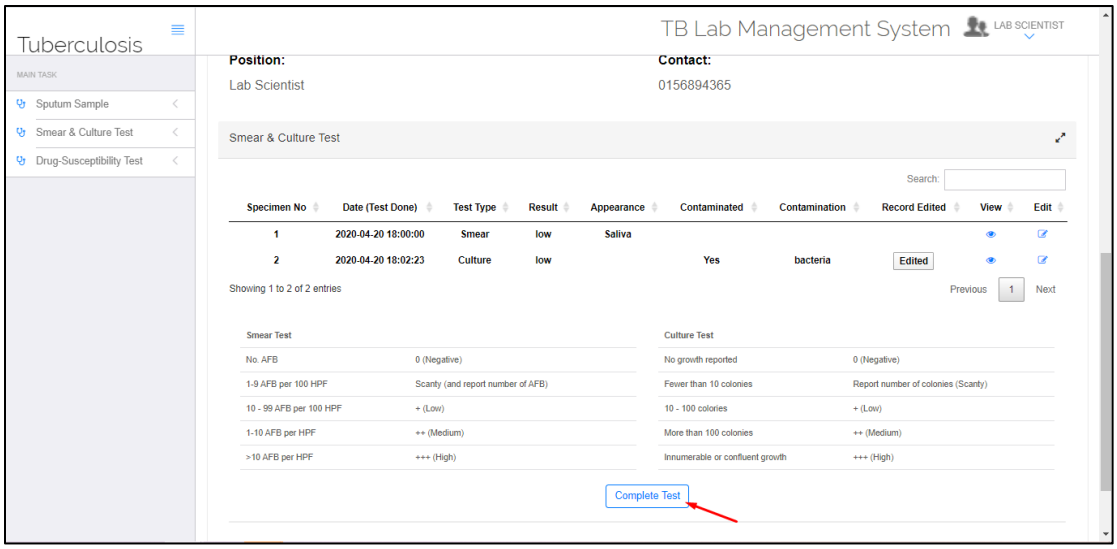


Figure 5.7.2.10 "Complete Test" button on the selected patient's history report interface

The figure 5.7.2.11 will be shown after click on the "Complete Test" button to ensure that the lab scientist confirms to complete the Smear & Culture test and will not add any test result for the selected patient later.

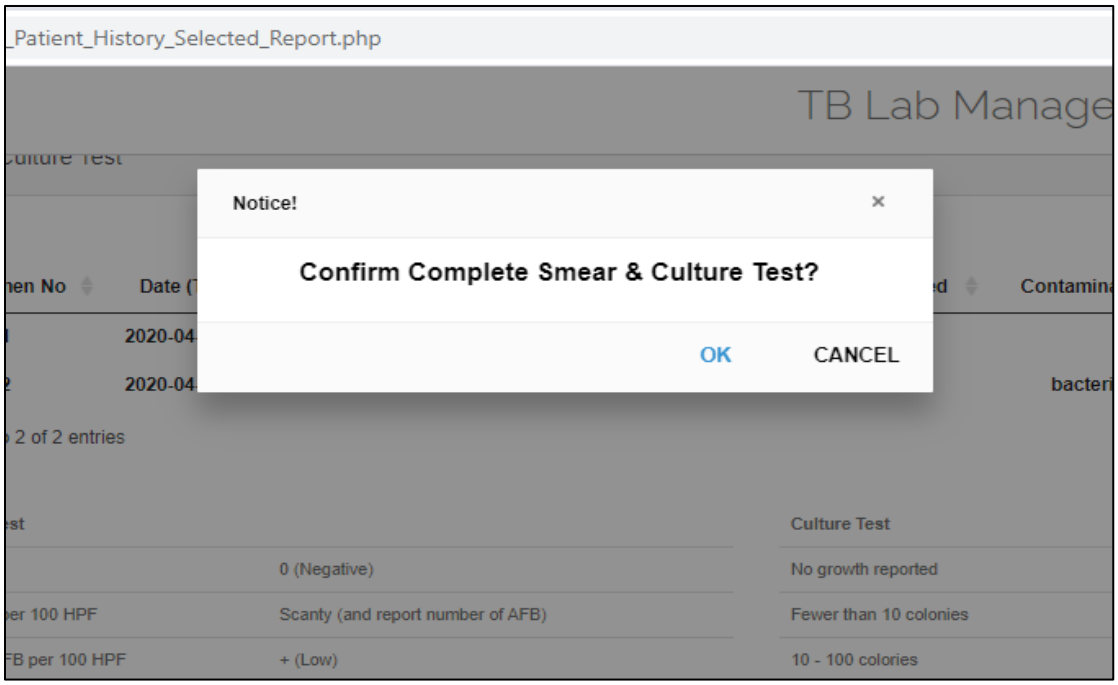


Figure 5.7.2.11 "Complete Test" button on the selected patient's history report interface cont.

5.7.3 DST Test

After the collection of sputum sample, the patient record/row will be added in the **Figure 5.7.2.4** and DST test. Click on the "DST Test" a drop-down list will show with "Create Report" and "History Report" then click on the "Create Report". The patient record/row shown in the report creation dashboard are waiting for carry DST test as shown in figure5.7.3.1 below.

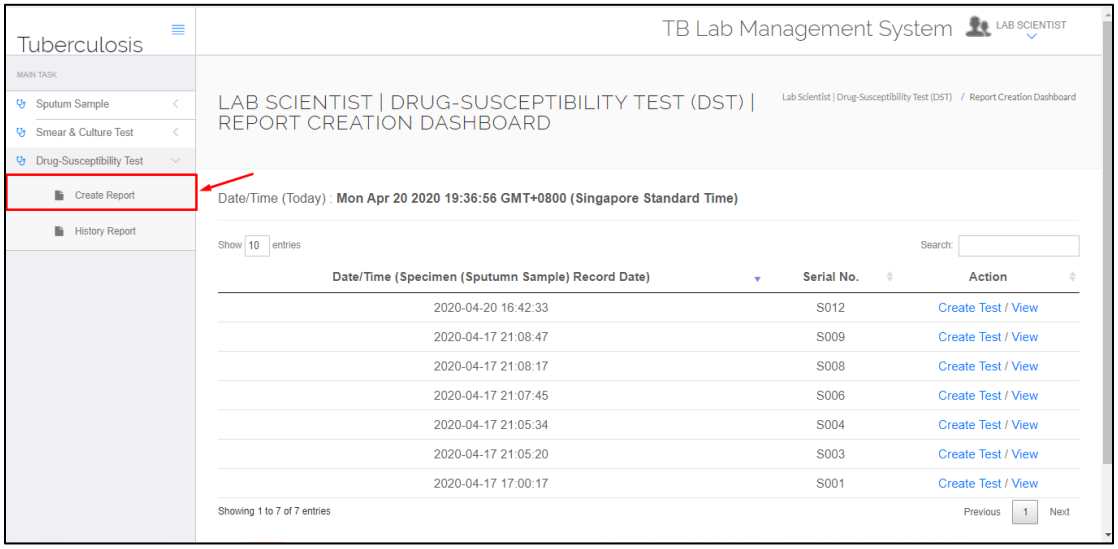


Figure 5.7.3.1 DST Test Report Creation Dashboard interface.

The figure 5.7.3.2 will shown after lab scientist click on the "Create Test" button. The lab scientist can fill in all the test information then submit it by press on the "Submit" button at the bottom of the page. The bottom of the page also attached the description/explanation of the test result 'S', 'R' and 'C'.

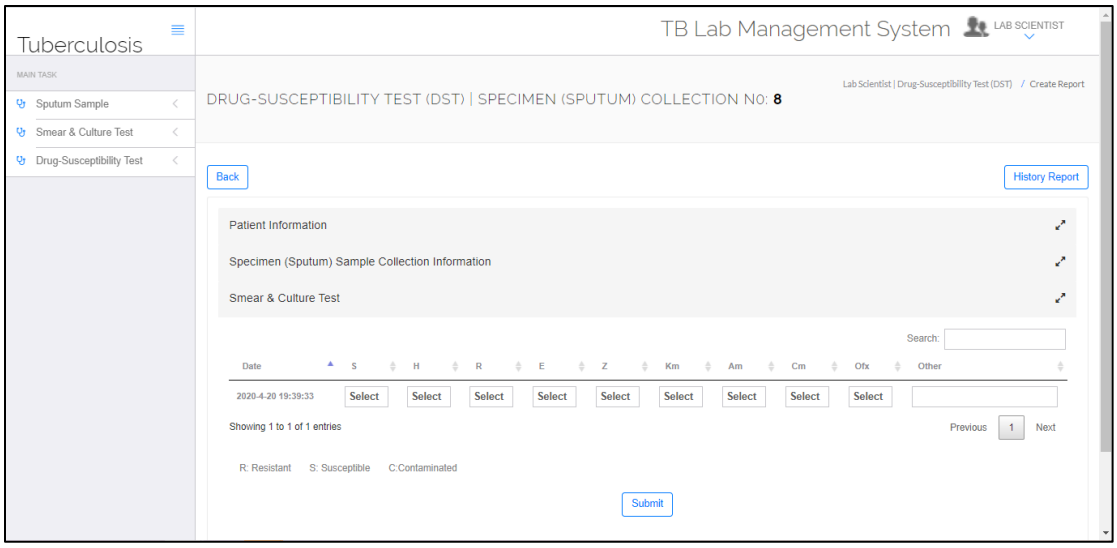


Figure 5.7.3.2 Create report of DST Test interface.

After test record has been submitted successfully, the system would prompt a message "Record Import Successfully" if the record submitted successfully in the system as shown in figure 5.7.3.3 below.

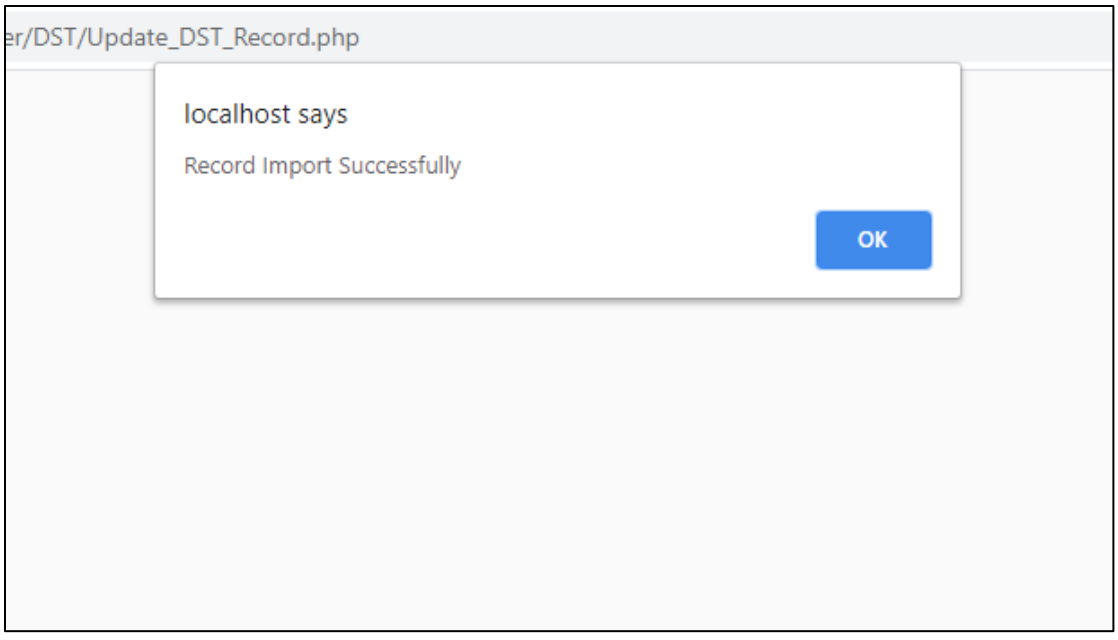


Figure 5.7.3.3 Create report of DST test interface cont.

Click on the “History Report”, The history report of DST test interface will display all the patient list with created DST test record before in the system. The lab scientist can search a particular patient by patient IC no./passport no., Serial No., or date time with the search function built in at the top right of the patient list as figure 5.7.3.4 below. The lab scientist can set the number of record show in a page. The lab scientist also can click on the patient record/row to see the patient history report or patient information.

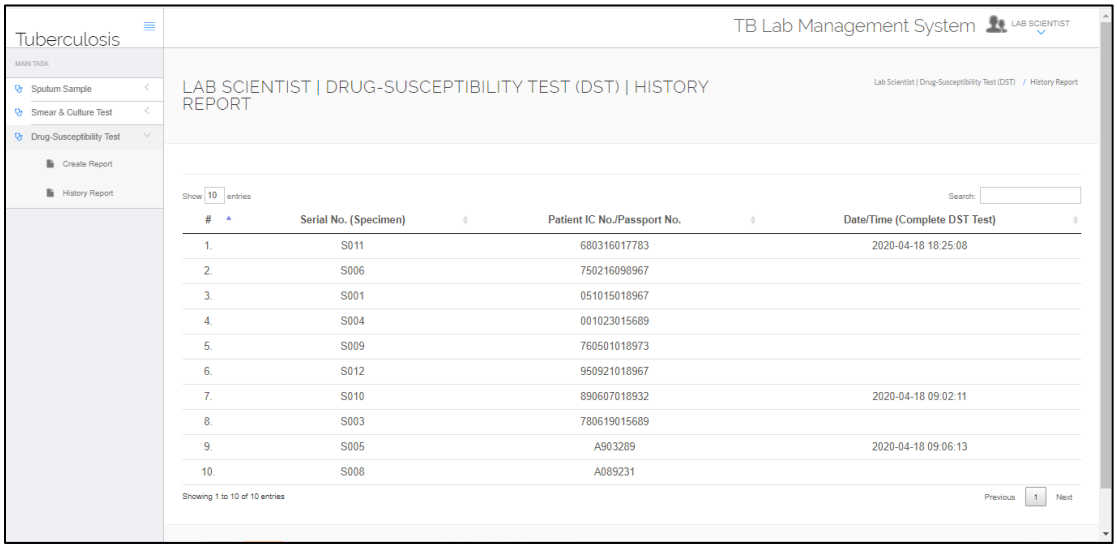


Figure 5.7.3.4 History report of DST test interface.

The figure 5.7.3.5 will be shown after click on the patient record/row, the screen shows the selected patient information, sample Collection (Sputum) information and the DST test records created. The lab scientist also can press “view” button to see more information of the selected patient row’s test record. Moreover, the lab scientist also can clicks “Edit” button on selected patient row/record to edit the test information/result.

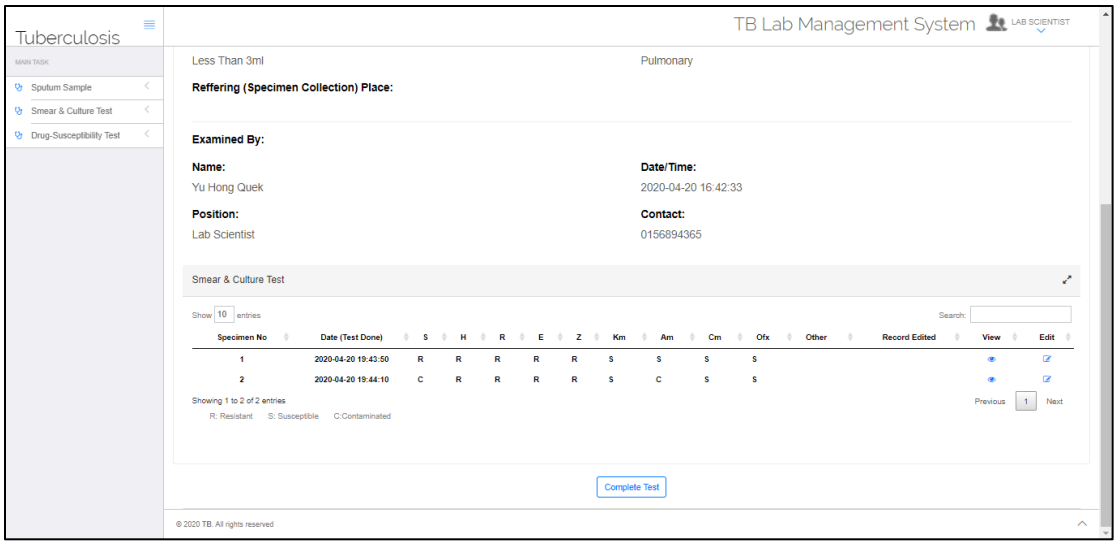


Figure 5.7.3.5 Selected patient's history report of DST test interface.

The figure 5.7.3.6 will be shown after the "Edit" button has been clicked, the lab scientist can edit the patient test information that created by them before. The lab scientist is not allowed to edit patient's test information created by another user.

Figure 5.7.3.6 Edit DST Test Report interface.

After the lab scientist click the "Submit" button, a window will be prompted as shown in figure 5.7.3.7 below. After press the "OK" button, system will display "Patient Record Updated

Successfully". If the lab scientist clicks on the "Cancel" button, the edit request will not submit to system and edit action will seems as failed.

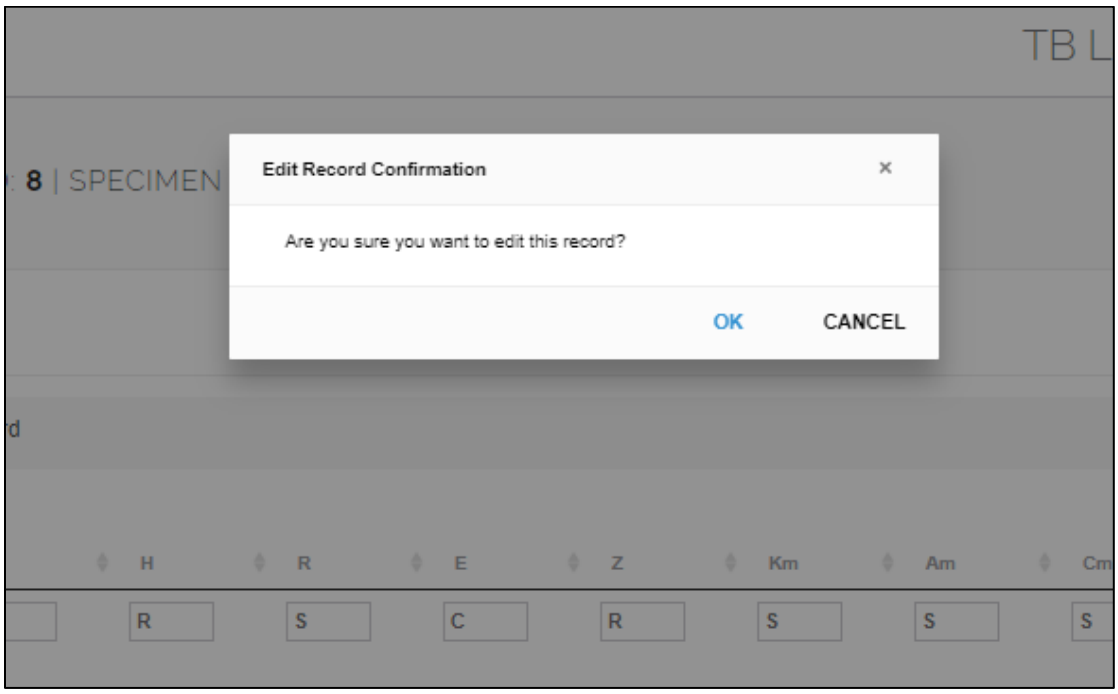


Figure 5.7.3.7 Edit DST Test Report interface cont.

The lab scientist also can keep track the edit history of every test record by clicks on the "Edited" button as shown in Figure 5.7.3.8

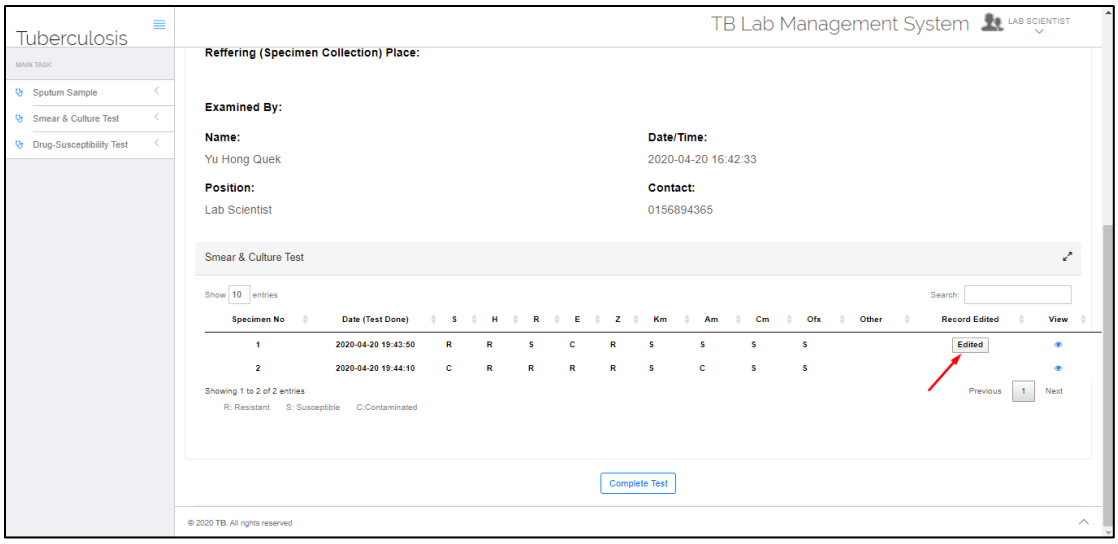


Figure 5.7.3.8 "Edited" button on the selected patient's history report interface.

After clicks on the "Edited" button, the test information edits before and after will be stored in the log table. The edition date is also an important information stored in the log table as shown in figure 5.7.3.9 below. The editor information will also display at the top of the right on the log table.

Figure 5.7.3.9 Edition log table of DST test interface.

Every patient will carry difference times of DST tests, the lab scientist can click the "Complete test" button as a close test or completion of create report for the specific patient as shown in figure 5.7.3.10 below. Before click on the "Complete Test" button, the lab scientist needs to confirm all

the test result recorded are correct. The lab scientist is not allowed to add more test result for the patient after clicks the button.

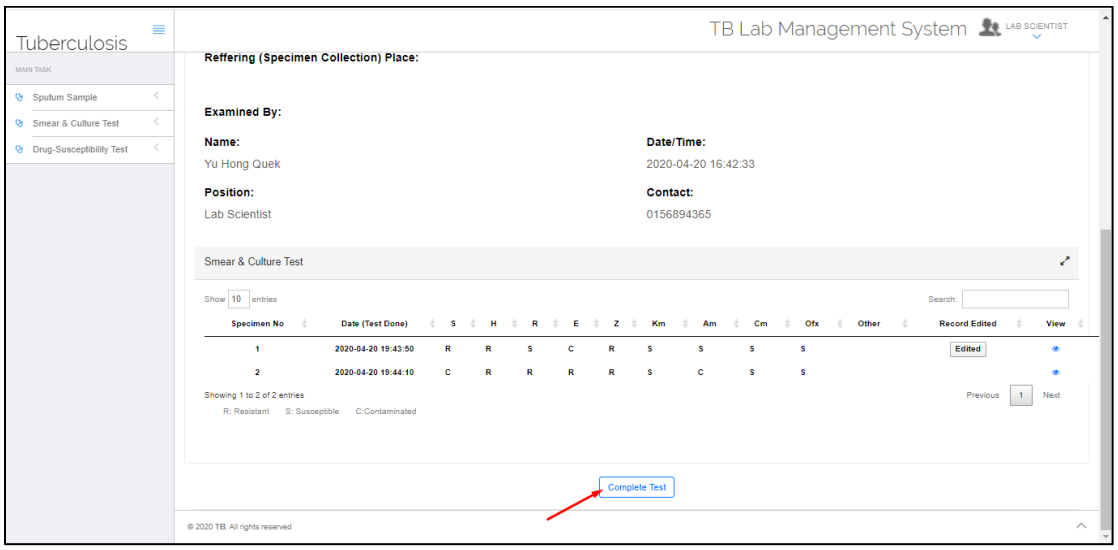


Figure 5.7.3.10 "Complete Test" button on the selected patient's history report interface.

The figure 5.7.3.11 will be shown after click on the "Complete Test" button to ensure that the lab scientist confirm complete the DST test and will not add any test result for the selected patient later.

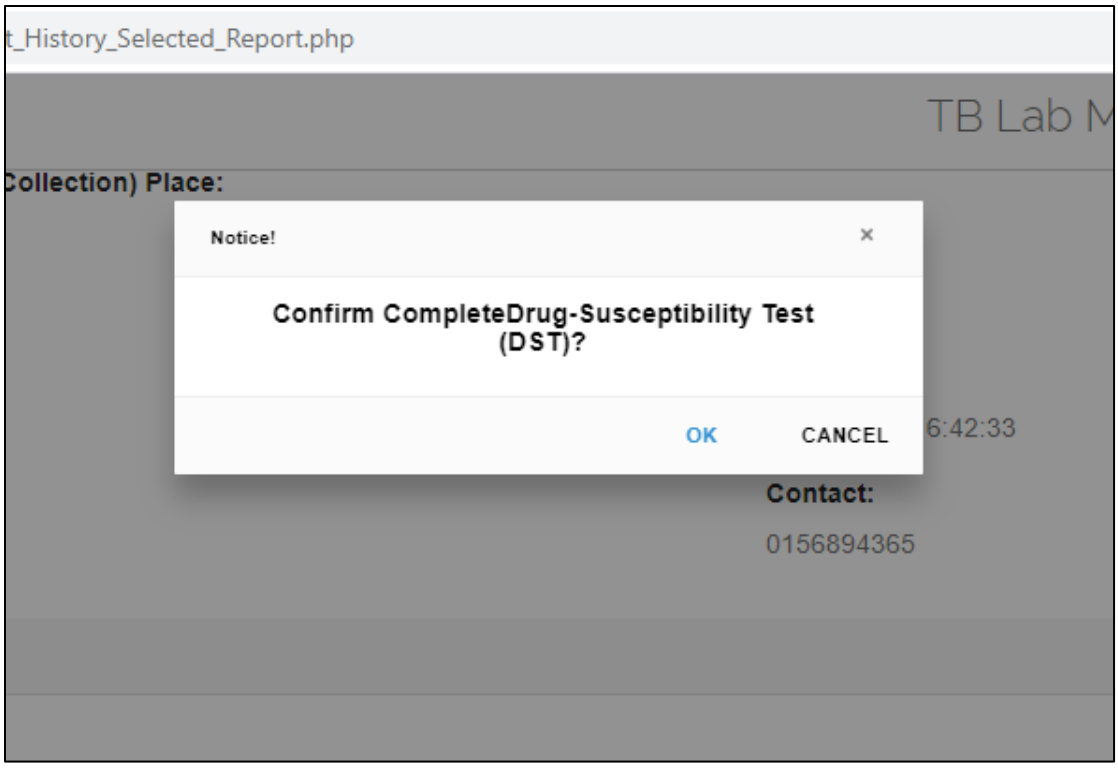


Figure 5.7.3.11 "Complete Test" button on the selected patient's history report interface cont.

Besides that, system also allows lab scientist to manage their personal account by clicking on the "Manage Account" shows in the drop-down list at the top of the right. The "Manage Account" function designed was same with the Receptionist module and the functionality has mentioned before in the receptionist module. From the drop-down list, user can also log out from the system as shown in figure 5.7.3.11.

Figure 5.7.3.12 Drop down list on the top right of the lab scientist module

5.8 Doctor Module (Treatment/Analysis and Reporting Module)

After doctor login into the system, the first interface is the data analytic dashboard as shown in the figure 5.8.1 below. In the Doctor module, the doctor able to search patient, create a new patient account and manage patient account.

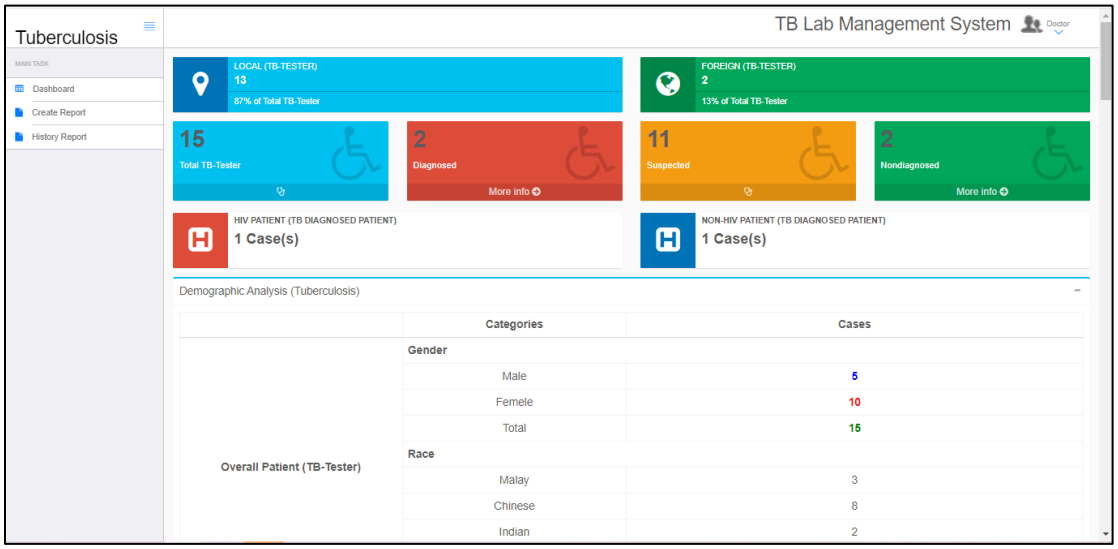


Figure 5.8.1 Dashboard of doctor module interface.

The figure below describes the total number of local TB-tester and the total number of foreign TB-tester, the probability of the total number of local TB-tester and total number of foreign TB-tester will also be shown in figure 5.8.2 below. Out of the 15 patients, 13 (87%) were local TB-tester and 2 (13%) were foreign TB-tester. The doctor can be based on this diagram keep up to date with the latest total number.

Figure 5.8.2 Total number of local TB-tester and total number of foreign TB-tester.

The figure 5.8.3 below shows the total number of TB tester in this system and divided into three categories: Diagnosed, Suspected and Non-diagnosed. The suspected TB patient are those

TB-tester still carrying TB tests and the total number of 11 suspected TB patient. After carried the test, we can identify and verify the TB-tester whether diagnosed with TB or not. Based on the diagram, there were 2 TB diagnosed patient with the positive final TB test result thus 2 Non-diagnosed patients with the negative final TB test result.

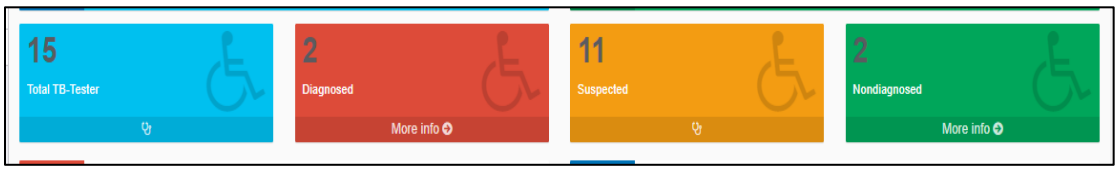


Figure 5.8.3 Number of diagnosed, suspected and non-diagnosed TB patient.

The interface as figure 5.8.4 will show if the doctor clicks on the “More info” button under the non-diagnosed. The table will display the patient information which was verified as a non-diagnosed TB patient. The doctor also can sort and search the patient with the built-in search function at the top right of the table by date, first name, last name, and remarks. The doctor also can click on the patient record/row, the selected patient’s full report will show.

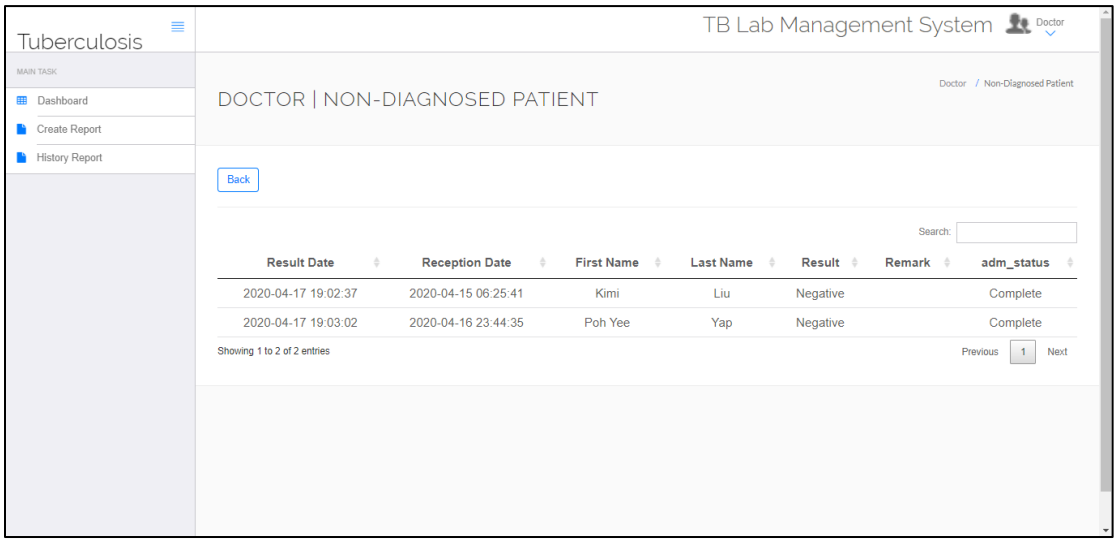


Figure 5.8.4 Non-diagnosed patient interface.

Based on the research, we knew that a HIV patient will have greater probability than a non-HIV patient to get a positive final TB result so HIV is also one of the importance data should be keep track. The figure 5.8.5 shows the table records the latest number of TB diagnosed patient with HIV and the latest number of TB diagnosed patient with non-HIV.

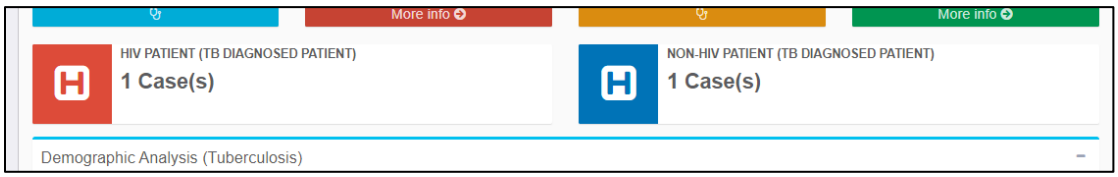
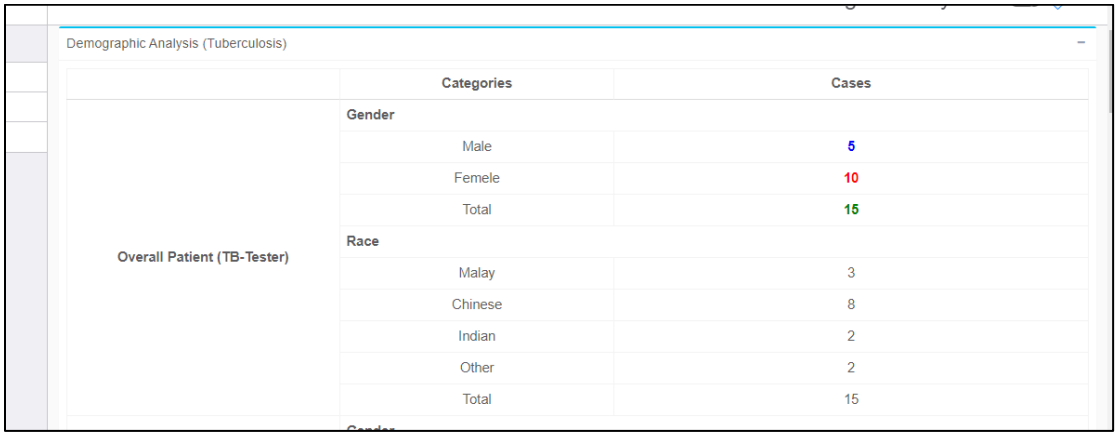


Figure 5.8.5 Total number of TB diagnosed patient with HIV and Non-HIV.

The demographic analysis as shown in figure 5.8.6 below is focused on overall patient/TB-tester in system and categories it in 2 group: Gender and Race. There are 5 male's TB tester and 10 female's TB tester. The analysis of the race distribution indicated that the majority were 8 Chinese TB-tester, followed by 3 Malay TB-tester and 2 Indian TB-tester. Only 2 TB-Tester from other races, including foreign patients from other countries such as American and England.


Demographic Analysis (Tuberculosis)

	Categories	Cases
Overall Patient (TB-Tester)	**Gender**	
	Male	5
	Femele	10
	Total	15
	Race	
	Malay	3
	Chinese	8
	Indian	2
	Other	2
	Total	15

Figure 5.8.6 Demographic analysis (1).

Patient (DIAGNOSED)	**Gender**	
	Male	0
	Female	2
	Total	2
	State (Malaysia)	
	Johor	0
	Kedah	0
	Kelantan	0
	Melaka	1
	Negeri Sembilan	0
	Pulau Penang	0
	Pahang	0
	Perak	1
	Perlis	0
	Sabah	0
	Sarawak	0
	Selangor	0
	Kuala Lumpur	0
	Labuan	0
	Putrajaya	0
	Terengganu	0
	Total	2
	Group of Age	
	Below 9 year old	0
	10 - 19 year old	0
	20 - 29 year old	0
	30 - 39 year old	0
	40 - 49 year old	1
	50 - 59 year old	1
	60 - 69 year old	0
	70 - 79 year old	0
	80 year old and above	0
	Total	2

Figure 5.8.7 Demographic analysis (2).

Figure 5.8.7 present the data about TB Diagnosed Patient's demographic analysis, as the figure 5.8.7 showing above, user can acquire the information about TB Diagnosed patient's gender, from which state and the group of age.

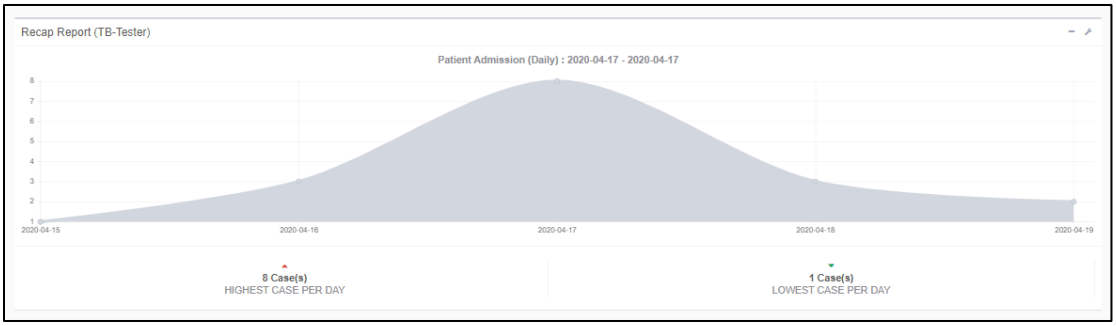


Figure 5.8.8 TB Tester (Admission) Daily Recap Report.

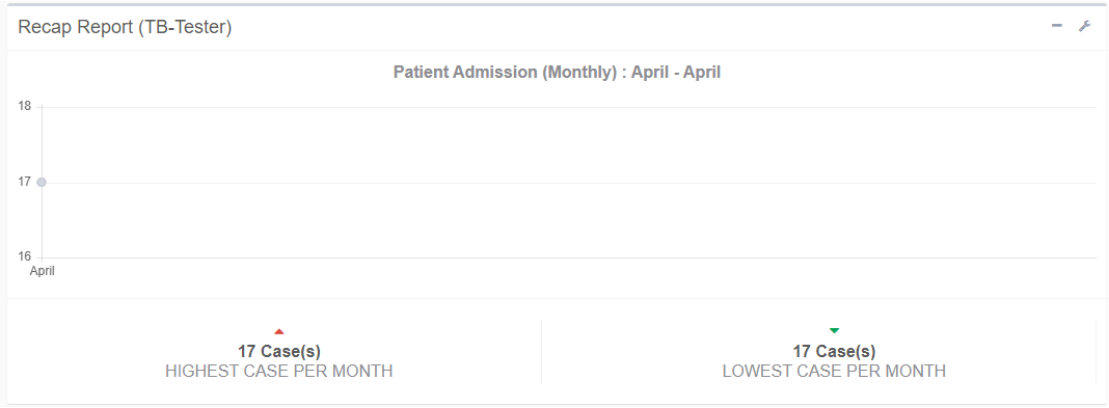


Figure 5.8.9 TB Tester (Admission) Monthly Recap Report.

Figure 5.8.10 TB Tester (Admission) Yearly Recap Report.

Figure 5.8.8 – Figure 5.8.10 present the Recap Report (Line Chart) about the TB tester who has register for TB disease testing. All these data will be group by day, month and year which will

present to the user by using the Line Chart. From these recap reports, user can acquire the information about which day/month/year is the peak season of the TB suspected cases.

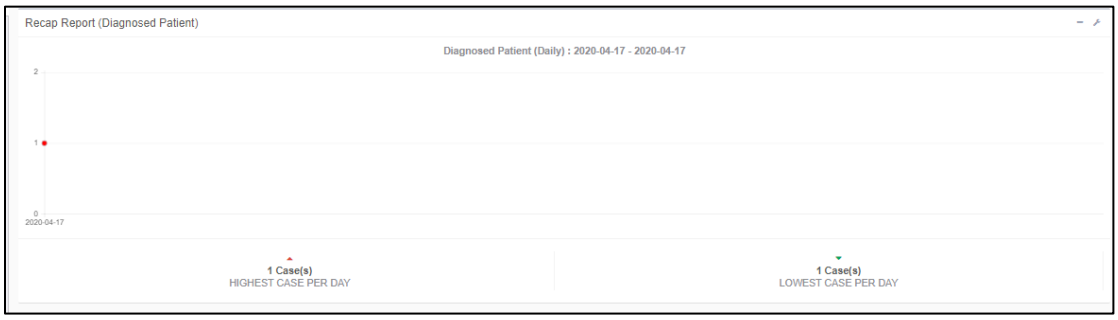


Figure 5.8.11 TB Diagnosed Patient Daily Recap Report.

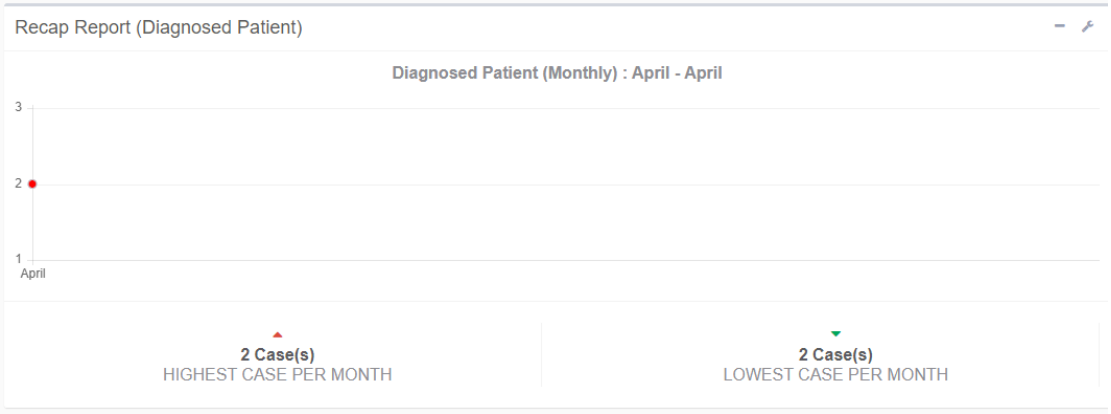


Figure 5.8.12 TB Diagnosed Patient Monthly Recap Report.

Figure 5.8.13 TB Diagnosed Patient Yearly Recap Report.

Figure 5.8.11 – Figure 5.8.13 present the Recap Report (Line Chart) about the TB Diagnosed patient who has confirmed to the TB infection after going through all the relevant test. All these data will be group by day, month and year which will present to the user by using the Line Chart.

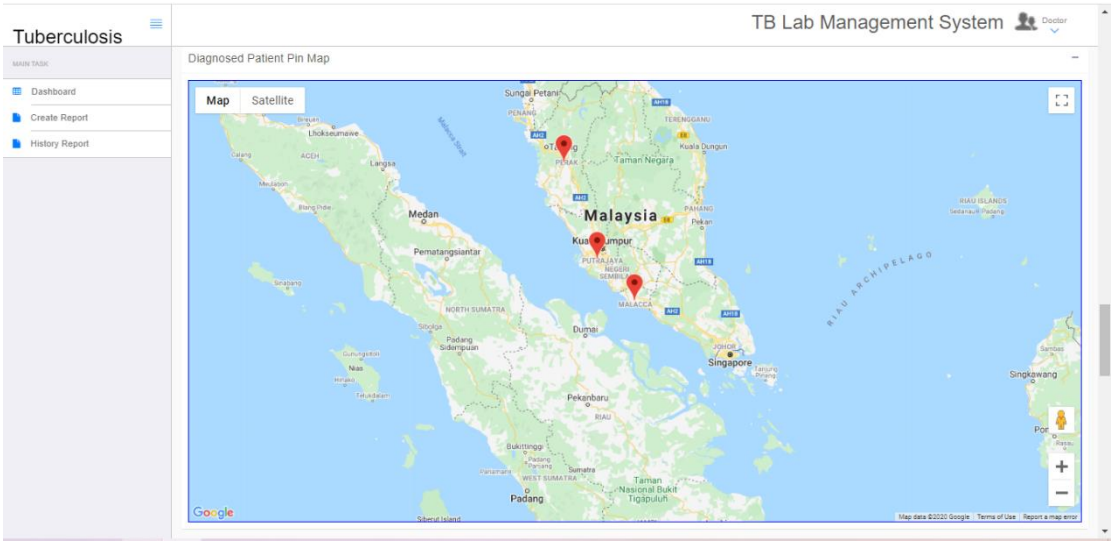


Figure 5.8.14 Google Pin Maps (Diagnosed Patient).

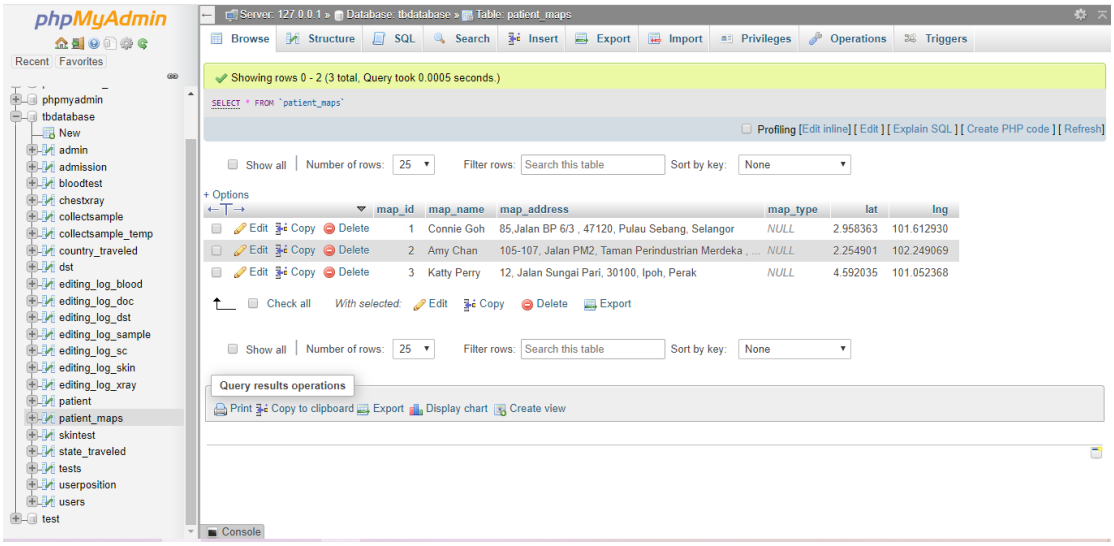


Figure 5.8.15 Database (Diagnosed Patient's actual address) of Google Pin Maps.

Figure 5.8.14 present the diagnosed patient's address by using the Google Maps (Pin), the TB Laboratory Management System will automatically generate the diagnosed patient current "Lat" (Latitude) and "lng" (Longitude) based on the current address of them through the Google Maps API and store these data into the database as figure 5.8.15 showing above, these data will be used for forming the Google Pin maps and display it on the "Dashboard".

Figure 5.8.16 Bar Chart (Displaying the state(s) of Malaysia that diagnosed patient traveled).

Figure 5.8.17 Table describes the DST (Drug-susceptibility testing) relevant data (1).

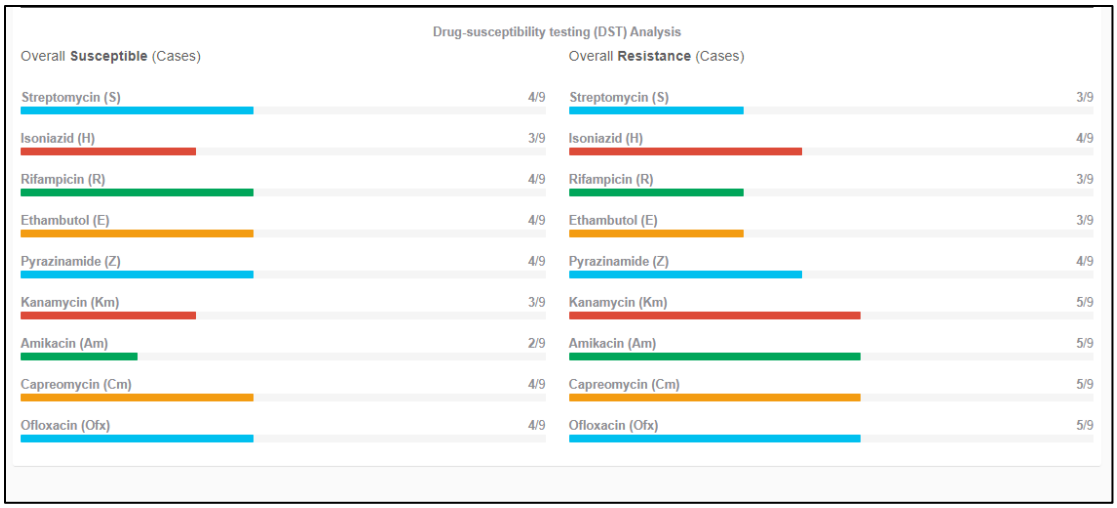


Figure 5.8.18 Table describes the DST (Drug-susceptibility testing) relevant data (2).

When doctor clicks on the "Create report", the interface will show as figure 5.8.19 below. The table shows the patient waiting list (to do list), the doctor will create the report for the patient had complete the TB tests. The yellow highlighted patient row/record are completed test with the negative test result in Chest X-ray while the red highlighted patient row/record are completed all TB tests with the Chest X-ray result's positive.

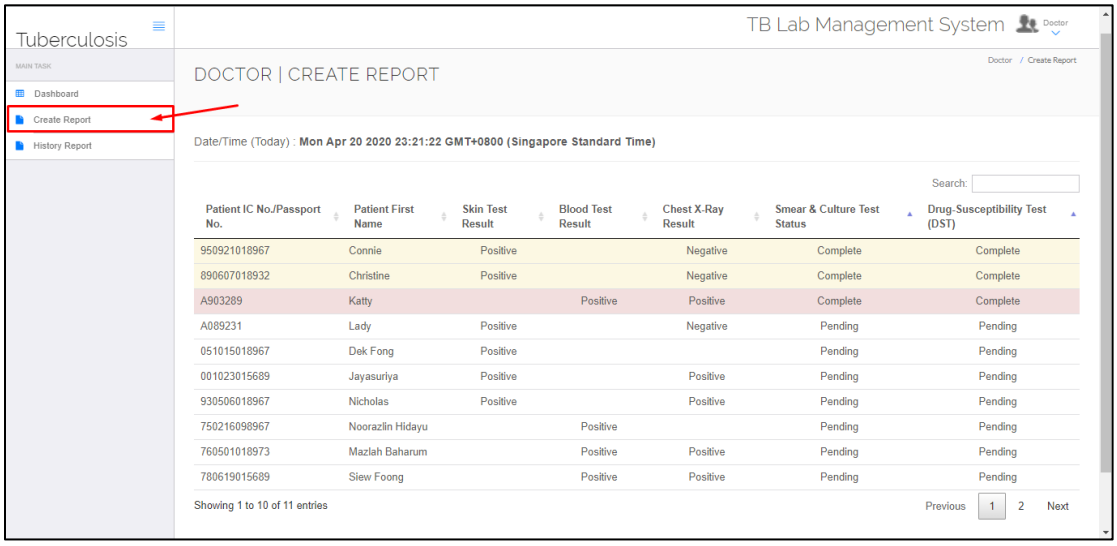


Figure 5.8.19 Create report in doctor module.

The figure 5.8.20 will be shown after doctor clicks on the patient row/record. The doctor can review the patient information and all the tests carried by the patient before, doctor also can minimize the tab to hide the complete information of the section or choose the test he/she preferred to review and maximize it. The doctor can base on the tests results and his/her judgment to give the final review and diagnosis. The doctor needs to fill in the final TB result and give any remarks then press the "Submit" button to submit the report.

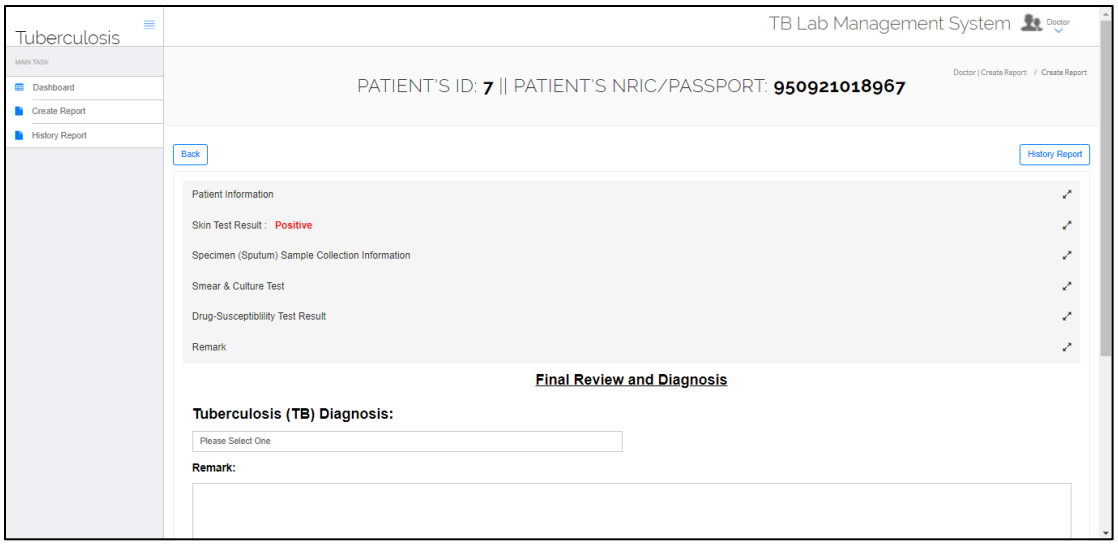


Figure 5.8.20 Create report in doctor module cont.

Click on the "History Report", the interface will display the patient list with full report created. The doctor can search a specific patient by patient IC no./passport no., patient first name, patient last name and patient no. with the search function built in at the top of the patient list as figure 5.8.21 below. The doctor can set the number of record show in a page. The doctor also can click on the patient record/row to see the patient full history report.

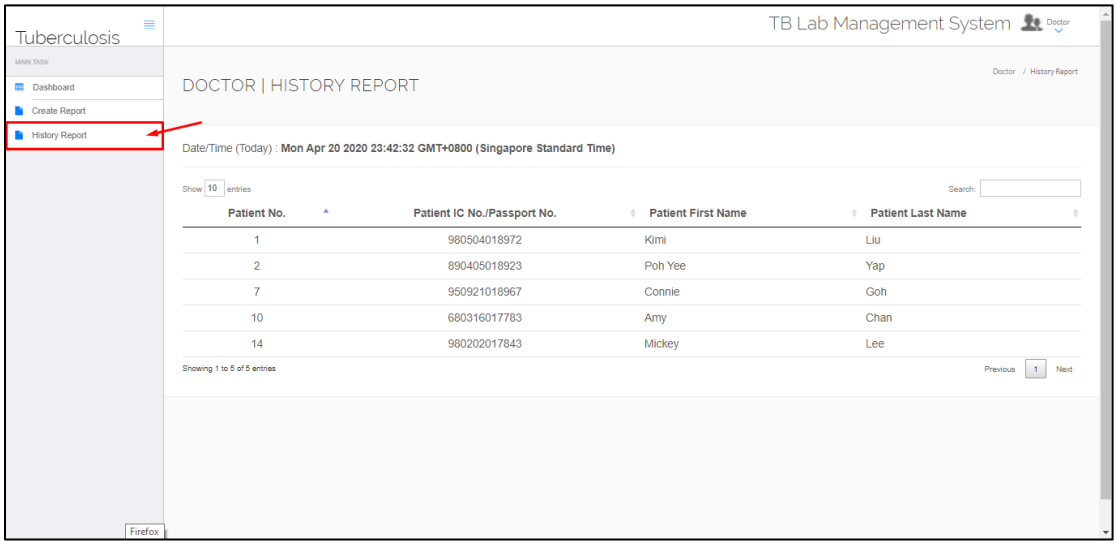


Figure 5.8.21 Full history report in doctor module.

The figure 5.8.22 will shown after click on the patient record/row, the screen shows the selected patient information, all tests record and final diagnosis result. The doctor also can press "print this page" button to print the full report or save the full report as PDF in desktop. Moreover, the doctor also can clicks "Edit" button on the top left to edit the final diagnosis result and remarks given before.

Figure 5.8.22 The selected patient's full history report in doctor module.

The figure 5.8.23 will be shown after click the "Edit" button, the doctor is allowed to edit the report that created by them before. The doctor is not allowed to edit patient's report created by another user.

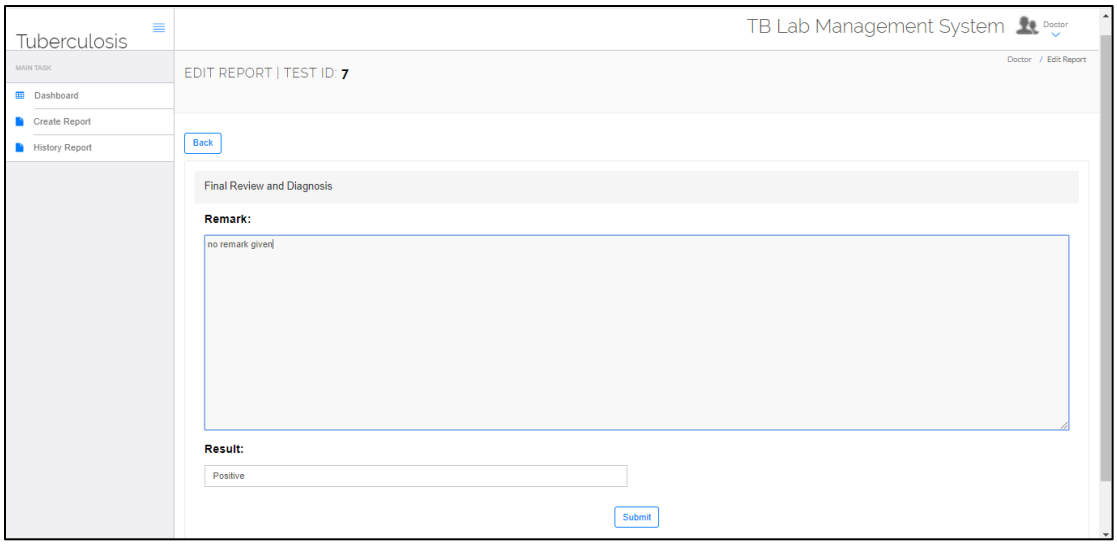


Figure 5.8.23 Edit report in doctor module interface.

After the doctor click the "Submit" button, a window will be prompted as shown in figure 5.8.24 below. After press the "OK" button, system will display "Patient Final Review and Diagnosis Update Successfully". If the doctor clicks on the "Cancel" button, the edit request will not submit to system and edit action will seems as failed.

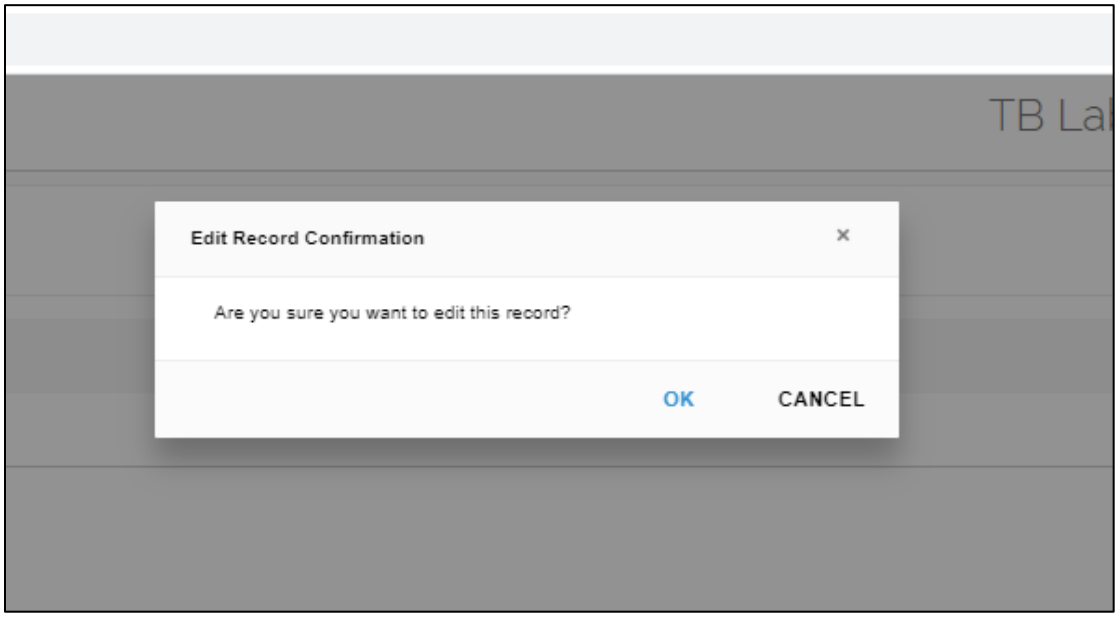


Figure 5.8.24 Edit report in doctor module interface cont.

The doctor also can keep track the edit history by clicks on the “Edited” button as shown in Figure 5.8.25.

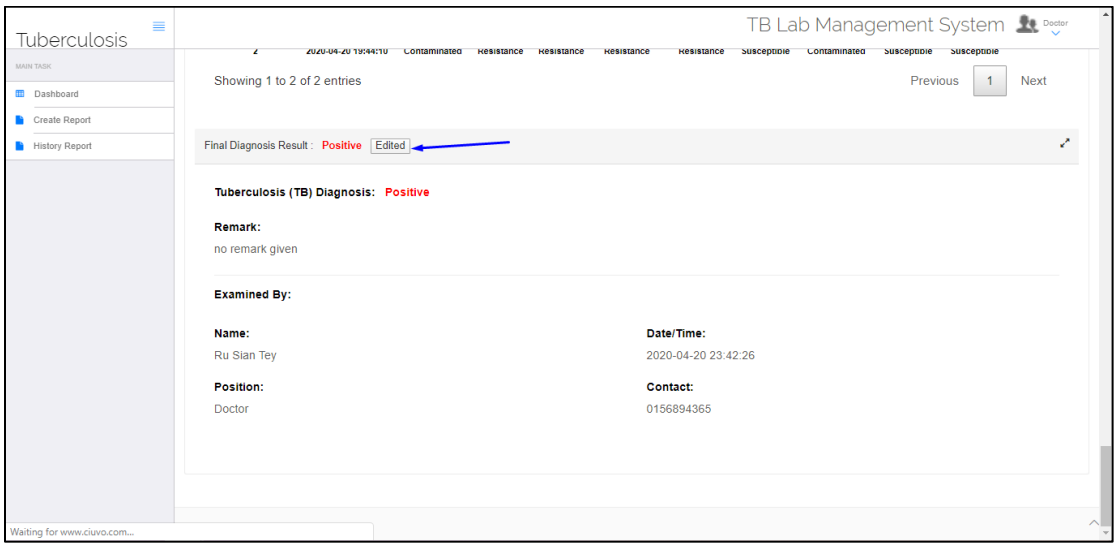


Figure 5.8.25 “Edited” button on the selected patient’s full history report interface.

After clicks on the “Edited” button, the test information edits before and after will be stored in the log table. The edition date is also an important information stored in the log table as shown in figure 5.8.26 below. The editor information will also display at the top of the right on the log table.

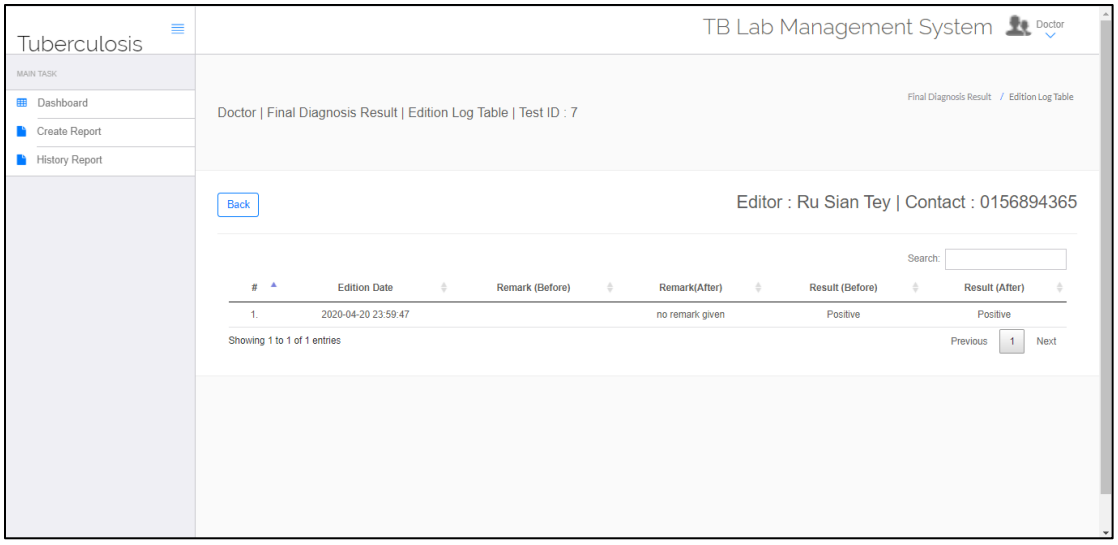


Figure 5.8.26 Edition log table interface in doctor module

Thus, system also allows doctor to manage their personal account by clicking on the “Account” shows in the drop-down list at the top of the right. The “Account” function designed was same with the “Manage Account” function in Receptionist module and the functionality has mentioned before in the receptionist module. From the drop-down list, user can also log out from the system as shown in figure 5.8.27.

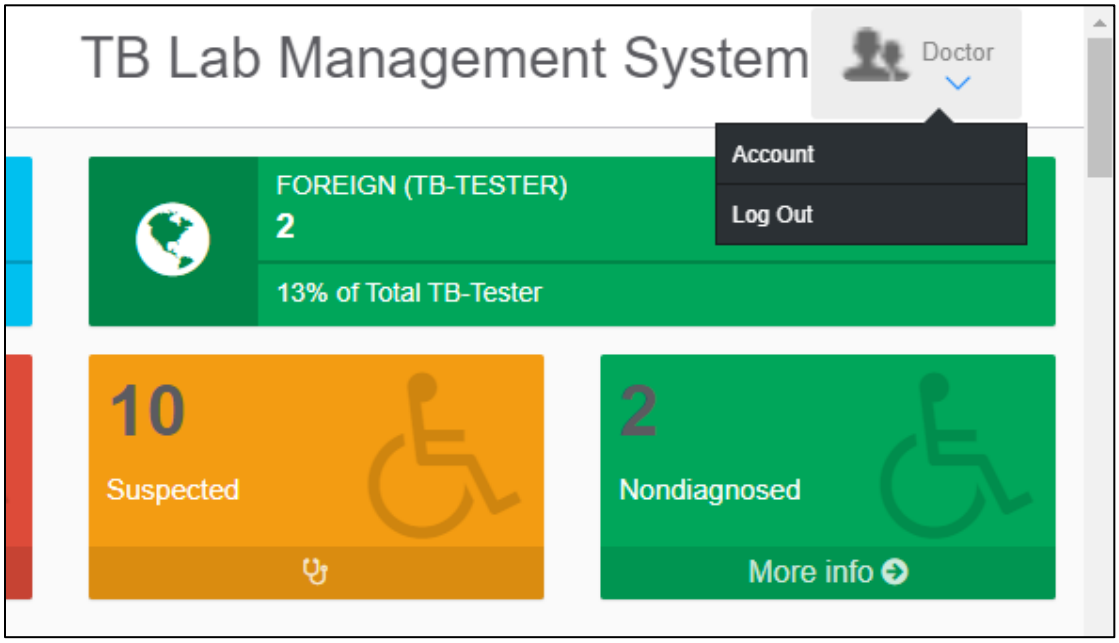


Figure 5.8.27 Drop-down list on the top right of the doctor module.

Chapter 6 System Testing

6.1 Login Module Testing

Table 6-1-1 Login Module Testing Table.

No.	Testing Method	Action Done	Expected Result	Actual Result	Meet Expectation (√ / ×)
1	Login with a valid account username and valid password.	Login the user account with the correct username and the correct password.	User successfully login into the system.	A pop-up message display "Login Successfully" and system allow the user to login.	√
2	Login with an invalid account username and valid password	Login the user account with incorrect username and correct password.	User does not allow to login into the system.	A pop-up message display "No User Found" and not allowed user to login into the system.	√
3	Login with incorrect/ invalid password and valid username	Login the user account with the correct username and the incorrect password	User does not allow to login into the system	A pop-up message display "Wrong Password" and not allowed to login into system.	√
4	Login with the both field is empty	Press the login button without key in the username field and password field.	User does not allow to login into the system.	The system denies user to login into the system.	√
5	Login with an inactivate/deleted user	Login the inactivate/ deleted user with correct password and correct username.	User does not allow to login into the system.	A pop-up message display "Inactive User" and not allowed to login into system.	√
6	Login with an reactivate user	Login the reactivate user with correct password and correct username.	Reactivate user successfully login into system.	A pop-up message display "Login Successfully" and system allow the user to login.	√

Table 6-1-2 Login Module Testing Table Cont.

7	Login with a new password after changed the password	Login with the correct username and new password after changed the password.	User successfully login into the system.	A pop-up message display "Login Successfully" and system allow the user to login.	√
8	Login with the old password after changed the password	Login with the correct username and old password after changed the password.	User does not allow to login into the system.	A pop-up message display "wrong password" and user not allowed to login into the system.	√
9	Verify the visible function in password field	Press the 'Eye/Visible' icon after key in the password.	The password is visible/ not hidden.	The system will show the password key in after user clicks on the eye icon.	√

6.2 Maintenance Module Testing

Table 6-2-1 Maintenance Module Testing Table.

No	Testing Method	Action Done	Expected Result	Actual Result	Meet Expectation (√ / ×)
1	Add User Position	Create a new user position after press the submit button.	New user position created.	A new user position created in the system.	√
2	Edit User Position	Edit a user position and press the update button to submit.	User position edited and updated.	The edited user position successfully update in the system.	√
3	Delete User Position	Press the delete button and confirmed to delete a user position.	User position deleted.	The user position is deleted/ inactivated in the system.	√
4	Add a new user	Create a new user with filled in all field provided.	New user created.	The new user is created in the system.	√
5	Add a new user with username already existed	Create a new user with filled in all field and key in username already existed.	No new user created.	No new user created in system and 'Username already existed' display under the username field.	√
6	Add a new user with not matching password	Create a new user with filled in all field and not matching password and confirmed password.	No new user created.	No new user allow to created in system. A pop-up message "Password and confirm password do not match" display after user click on the "Create" button.	√
7	Add a new user with IC already existed	Create a new user with filled in all field and key in IC already existed.	No new user created	No new user allow to created in system and display 'IC already existed' under the User IC no. field.	√

Table 6-2-2 Maintenance Module Testing Table Cont.

8	Add a new user with email already existed	Create a new user with filled in all field and key in email already existed.	No new user created	No new user allow to create in the system and the "Create" button has been disable.	√
9	Edit user info	Edit existing user info and press update button to submit.	User details successfully updated	The edited user details successfully updated in system.	√
10	Edit user's username with username already existed in system	Edit user's username with key in username already existed in system.	Username failed to update to the system.	Update failed, system does not allow duplicate username exist.	√
11	Edit user's email address with email address already existed in system	Edit user's email address with key in email address already existed in system.	Email failed to update to the system.	Updated failed, system does not allow duplicate email address exist.	√
12	Delete/inactivate a user	Inactivate a user by click on the button 'X'.	Successfully inactivate a user.	The system successfully inactivate the user and move it in the 'Historical User' side.	√
13	Reactivate a user	Reactivate a user from historical user.	Successfully reactivate a user.	The system successfully reactivate the user and remove it from the 'Historical user'.	√
14	Verify the total number of user	Add/ Delete an user to calculate the total number of user on dashboard.	Display the accurate total number of user in system on Dashboard.	The system can display the correct total number of user and the total number of each user position.	√

6.3 Manage User Account Function Testing

Table 6-3-1 Manage User Account Function Testing.

No	Testing Method	Action Done	Expected Result	Actual Result	Meet Expectation (√ / ×)
1	Edit personal account with correct current password	Edit info at manage account side with key in correct current password .	Successfully update edited info.	The system successfully update the edited info.	√
2	Edit personal account with incorrect current password	Edit info at manage account side with key in incorrect current password.	Failed to update edited info.	The system failed to update the edited info and display "Password incorrect".	√
3	Edit personal account with blank/empty current password field	Edit info at manage account side without key in current password.	Failed to update edited info.	The system failed to update the edited info and display “Current password field is empty”.	√
4	Change username	Edit and change username.	Successfully change username and re-login into system.	Successfully change username and re-login into system.	√
5	Change username with existing username in system	Edit and change username with key in username already existed in system.	Failed to change username.	The system failed to change the username.	√
6	Change password with matching password	Edit and change password with key in matching password and confirm password.	Successfully change password.	Successfully change password.	√
7	Change password with not matching password	Edit and change password with key in difference new password and confirm password.	Failed to change password.	The system failed to change the password and display“Password and Confirm Password Field do not match !!”.	√

6.4 Reception Module Testing

Table 6-4-1 Reception Module Testing Table.

No	Testing Method	Action Done	Expected Result	Actual Result	Meet Expectation (√ / ×)
1	Search using new IC no./passport no.	Enter the IC no. or passport no. of patient which does not exist in system before.	Brings user to the create new patient form.	System will display "IC no./Passport no. Not found" under the field. Clicks on the "Search" button, it will lead user to a create new patient form.	√
2	Search using existing IC no./ passport no.	Enter the IC no. or passport no. of patient which exist in system before.	Display the patient info created in system before.	After key in the IC no/ passport no. ,click on the "Search" button, it will lead user to the page which show the patient info created in system before.	√
3	Create new admission record (with Complete Status)	Searching IC/Passport no. of existing patient with complete status and key in/update the patient info then click on the button 'Create new admission record'.	Successful created a new admission record.	Successful created a new admission record.	√
4	Create new admission record (with Incomplete Status)	Searching IC/Passport no. of existing patient with incomplete status and key in/update the patient info then click on the button 'Create new admission record'.	Failed to create a new admission record.	Failed to create a new admission record.	√
5	Edit patient info	From the manage patient side to edit/update the existing patient info.	Successful to edit/update the patient info.	The system successfully edit/update the patient info.	√

Table 6-4-2 Reception Module Testing Table Cont.

6	Create a patient account	Fill in all the patient info at the create patient form and click the “Create” button to submit.	Successfully create a new patient account.	The system successfully create a new patient account.	√
7	Create a patient account (with existing IC no./password)	Fill in all the patient info and IC/ Password which already existed in system and click the “Create” button to submit.	Fail to create a new patient account.	Display message “IC / Password already exists” under IC/ Passport Field,user unable to press the “Create” button to submit and failed to create a new patient account.	√
8	"Reason for TB Exam" text box in Create Patient Form	Key in any text in the "Reason for TB Exam" textbox.	User able to key in any text in the "Reason for TB Exam" textbox.	User able to key in any text in the "Reason for TB Exam" textbox.	√
9	The functionality of "Diagnosis" selection	Click on the "Diagnosis" selection.	Show/display "Diagnosis" in the "Reason for TB Exam" textbox.	Click on the 'Diagnosis' selection, it will appear "Diagnosis" in the "Reason for TB Exam" textbox.	√

6.5 Common Function in Dashboard - Function Testing

Table 6-5-1 Common Function in Dashboard - Function Testing Table.

No	Testing Method	Action Done	Expected Result	Actual Result	Meet Expectation (√ / ×)
1	Dashboard paging/pagination setting	Add more than 10 patients from the reception side.	10 record/ entries to display on a single page.	Every 10 records display on a page.	√
2	Order of column on dashboard	Press on the button "↕" to check the functionality of the order in every column.	The order fo thecolumn will become descending/ascending after press the button"↕".	The order of column will make changes once press the button "↕".	√
3	Search function on the dashboard(IC/Passport no.)	Search for specific patient info and sorting with patient ic/passport no.	Search and display the matching patient info in the system	The system is able to sort ing,searching and display the. matching/specific patient info.	√
4	Search function on the dashboard(date time)	Search for specific patient info and sorting with the date time.	Search and display the matching patient info in the system.	The system is able to sort ing, searching and display the matching/specific patient info.	√
5	Search function on the dashboard(patient first name)	Search for specific patient info and sorting with the patient first name.	Search and display the matching patient info in the system.	The system is able to sort ing, searching and display the matching/specific patient info.	√
6	Search function on the dashboard(patient last name)	Search for specific patient info and sorting with the patient last name.	Search and display the matching patient info in the system.	The system is able to sort ing, searching and display the matching/specific patient info.	√
7	Search function on the dashboard(Report status)	Search for specific patient info and sorting with the report status.	Search and display the matching patient info in the system.	The system is able to sort ing, searching and display the matching/specific patient info.	√

Table 6-5-2 Common Function in Dashboard - Function Testing Table Cont.

8	Search function on the dashboard(patient no.)	Search for specific patient info and sorting with the patient no.	Search and display the matching patient info in the system.	The system is able to sort ing, searching and display the matching/specific patient info.	√
9	The current date/Time	The current date/time display in the system.	The accurate current date/time is display in the system.	The system display the correct current date/time at the top of the dashboard.	√

6.6 Common Function in History Report - Function Testing

Table 6-6-1 Common Function in History Report - Function Testing Table.

No	Testing Method	Action Done	Expected Result	Actual Result	Meet Expectation (√ / ×)
1	History report paging/pagination setting	If 5 records removed from the dashboard, then history report should added 5 new history record.	10 record/ entries to display on a single page.	Every 10 records display on a page.	√
2	Order of column on history report	Press on the button "↕" to check the functionality of the order in every column.	The order fo thecolumn will become descending/ascending after press the button"↕"	The order of column will make changes once press the button "↕".	√
3	Search function on the history report(IC/Passport no.)	Search for specific patient info and sorting with patient ic/passport no.	Search and display the matching patient info in the system.	The system is able to sort ing,searching and display the. matching/specific patient info.	√
4	Search function on the history report (date time)	Search for specific patient info and sorting with the date time.	Search and display the matching patient info in the system.	The system is able to sort ing, searching and display the matching/specific patient info.	√
5	Search function on the history report (patient first name)	Search for specific patient info and sorting with the patient first name.	Search and display the matching patient info in the system.	The system is able to sort ing, searching and display the matching/specific patient info.	√
6	Search function on the history report (patient last name)	Search for specific patient info and sorting with the patient last name.	Search and display the matching patient info in the system.	The system is able to sort ing, searching and display the matching/specific patient info.	√
7	Search function on the history report (Report status)	Search for specific patient info and sorting with the report status.	Search and display the matching patient info in the system.	The system is able to sort ing, searching and display the matching/specific patient info.	√

Table 6-6-2 Common Function in History Report - Function Testing Table Cont.

8	Search function on the history report (patient no.)	Search for specific patient info and sorting with the patient no.	Search and display the matching patient info in the system.	The system is able to sort ing, searching and display the matching/specific patient info.	√
9	Search function on the history report (specimen no.)	Search for specific patient info and sorting with the specimen serial no.	Search and display the matching patient info in the system.	The system is able to sort ing, searching and display the matching/specific patient info.	√
10	History report keep up to date	Complete the test and check with the history report.	The completion of test will remove patient info from dashboard and added in history report side.	Complete the test will remove the patient info from dashboard and added in history report side.	√
11	Edit History Report	Press the "Edit" button to edit the chest x-ray test result and press "Submit" button to submit.	The system should update the edited history patient report succesfully.	The system succesfuly update the edited history patient report.	√
12	Edit the patient history report created by other user	Press the "Edit" button to edit the patient history report created by other user.	The system does not allow user to edit/update report created by other users.	User unable to click the "Edit" button if the report is created by other users.	√

6.7 Skin/Blood Test Module Testing

Table 6-7-1 Skin/Blood Test Module Testing Table.

No	Testing Method	Action Done	Expected Result	Actual Result	Meet Expectation (√ / ×)
1	Confirmation of TB Skin/Blood Test	Click on the selected patient in the dashboard, choose the test type and submit.	The selected patient should removed from the dashboard, and available to create a report for the patient.	The selected patient has been removed from the dashboard and available now to create a report for the patient.	√
2	Search IC/Passport No. (Not in system)	Searching the IC/ Passport No. not store in system in create report side.	The system should not jump to create report page if IC/passport number not found.	Display "IC/Passport number not found" under the field and it could not jump to create report page.	√
3	Search existing IC/Passport No. (with confirmation of TB Skin/Blood Test)	Searching the IC/ Passport No.store in the system with the confirmation of TB Skin/Blood Test in create report side.	The system should jump to the create report form page if IC/Passport number is found.	After clicks on the "Search" button, system leads the user to the create report form page.	√
4	Search existing IC/Passport No. (without confirmation of TB Skin/Blood Test)	Searching the patient IC/ Passport No.store in the system without the confirmation of TB Skin/Blood Test in create report side.	The system should not jump to create report page without the confirmation of TB skin/blood test.	The system won't leads user to the create report form page.	√
5	Search existing IC/ Passport No. (With expired confirmation of TB Skin/Blood Test)	Searching the patient IC/ Passport No. store in the system with the expired confirmation of TB Skin/Blood Test.	The system should not jump to create report page if confirmation of TB skin/blood test is expired.	The system won't leads user to the create report form page and a pop-up message "Expired Skin Test ! Please redo the test again" will display.	√
6	Submit TB skin/blood test report form	Fill in the test result/data and click on the "Submit" button to submit the report.	The report should submitted into the system.	The report was submitted into the system and a pop-up message display "patient record update succesfully".	√

6.8 Chest X-Ray Test Module Testing

Table 6-8-1 Chest X-Ray Test Module Testing Table.

No	Testing Method	Action Done	Expected Result	Actual Result	Meet Expectation (√ / ×)
1	Confirmation of Chest X-Ray Radiology Test	Click on the selected patient in the dashboard, check the patient info and click on"Submit" button to submit.	The selected patient should removed from the dashboard, and available to create a report for the patient.	The selected patient has been removed from the dashboard and available now to create a report for the patient.	√
2	Search IC/Passport No. (Not in system)	Searching the IC/ Passport No. not store in system in create report side.	The system should not jump to create report page if IC/passport number not found.	Display "IC/Passport number not found" under the field and it could not jump to create report page.	√
3	Search existing IC/Passport No. (with confirmation of Chest X-Ray Test)	Searching the IC/ Passport No.store in the system with the confirmation of Chest X-Ray Test in create report side.	The system should jump to the create report form page if IC/Passport number is found.	After clicks on the "Search" button, system leads the user to the create report form page.	√
4	Search existing IC/Passport No. (without confirmation of Chest X-Ray Test)	Searching the petient IC/ Passport No.store in the system without the confirmation of Chest X-Ray Test in create report side.	The system should not jump to create report page without the confirmation of Chest X-Ray test.	The system won't leads user to the create report form page.	√
5	Search existing IC/Passport No. (created report)	Key in the patient IC/ passport number with a report created and press "Search" button.	The system should leads user to the patient history report if the user already created a report for the patient.	A pop-up message display "This Patient Report has been Created" and leads the user to the selected patient history report.	√
7	Submit Chest X-Ray Test Report Form	Fill in the test result/data and click on the "Submit" button to submit the report.	The report should submitted into the system.	The report was submitted into the system and a pop-up message display "patient record update succesfully".	√

6.9 Lab Scientist - Sputum Sample Module Testing

Table 6-9-1 Lab Scientist - Sputum Sample Module Testing Table.

No	Testing Method	Action Done	Expected Result	Actual Result	Meet Expectation (√ / ×)
1	Create sample report	Fill in the create sample sputum report form and press the "Submit" button to submit.	Succesfully submit the report and the selected patient info disappear from dashboard.	User sucessfully submit the report, a pop -up message Patient Record Updated Successfully (Sputum Specimen Collection)" and system removed the patient info from dashboard.	√
2	Create sample report (with existing serial no.)	Fill in the create sample sputum report form with existing serial no. and submit.	Failed to submit the report.	User failed to submit the report and system display the "Serial No. already exist " under the serial no. field.	√
3	Create sample report (with unsatisfactory specimen quality)	Fill in the create sample sputum report form with unsatisfactory specimen quality and submit.	Succesfully submit the report and the selected patient info does not disappear from dashboard.	User sucessfully submit the report, a pop up message display "Patient Record Updated Successfully (Sputum Specimen Collection)" but system does not remove the patient info from dashboard and the patient's status will changed to "FAILED".	√

6.10 Lab Scientist – Smear & Culture Test Module Testing

Table 6-10-1 Lab Scientist – Smear & Culture Test Module Testing Table.

No	Testing Method	Action Done	Expected Result	Actual Result	Meet Expectation (√ / ×)
1	Create Smear&Culture Test	Create Smear/Culture Test and press the "Submit" button to submit.	Succesfully submit the test result.	User successfully submit the test result.	√
2	Repeating Create Smear & Culture Tests	Create smear / culture tests 6 times.	Succesfully create and store 6 smear/culture tests result.	User succesfully create and store 6 smear/ culture tests result in system.	√
3	View more information of the history test result	From the history report side, press the "eye" icon to view more information about the test result .	Succesfully to view more information about the selected test result.	User successfully to view more information about the selected test result such as examinator information.	√
4	Edit History Test Result	From the history report side, press the "edit" icon to edit the test result and press the "submit" button to submit.	Succesfully to edit the selected test result and updated to the system.	User succesfully edit the test result and update the test result to the system.	√
5	View Record Edited	From the history report side, press the "edited" button to view the record edited.	Succesfully to view the record edited.	User succesfully to view the record edited before.	√
5	Complete Test	Press the "Complete Test" button to complete the test.	Succesfully complete the smear&culture test.	Succesfully complete the smear&culture test.	√
6	Complete test without create smear&culture test	Press the "Complete Test" button to complete the test.	Failed, unable to complete the smear & culture test.	Failed, unable to complete the smear & culture test.	√

Table 6-10-2 Lab Scientist - Smear&Culture Test Module Testing Table Cont.

7	Create smear & culture test after complete test	Create Smear/Culture Test and press the "Submit" button to submit.	Unable to create smear& culture test after complete test.	User unable to create smear & culture test for a patient who had complete the test, the patient info had been removed from dashboard.	√

6.11 Lab Scientist - DST Test Module Testing

Table 6-11-1 Lab Scientist - DST Test Module Testing Table.

No	Testing Method	Action Done	Expected Result	Actual Result	Meet Expectation (√ / ×)
1	Create DST Test	Create Smear/Culture Test and press the "Submit" button to submit.	Succesfully submit the test result.	User successfully submit the test result.	√
2	Repeating Create DST Tests	Create DST tests 6 times.	Succesfully create and store 6 DST tests result.	User succesfully create and store 6 DST tests result in system.	√
3	View more information of the history test result	From the history report side, press the "eye" icon to view more information about the test result .	Succesfully to view more information about the selected test result.	User successfully to view more information about the selected test result such as examinator information.	√
4	Edit History Test Result	From the history report side, press the "edit" icon to edit the test result and press the "submit" button to submit.	Succesfully to edit the selected test result and updated to the system.	User succesfully edit the test result and update the test result to the system.	√
5	View Record Edited	From the history report side, press the "edited" button to view the record edited.	Succesfully to view the record edited.	User succesfully to view the record edited before.	√
5	Complete Test	Press the "Complete Test" button to complete the test.	Succesfully complete the DST test.	Succesfully complete the DST test.	√
6	Complete test without create DST test	Press the "Complete Test" button to complete the test.	Failed, unable to complete the DST test.	Failed, unable to complete the DST test.	√

Table 6-11-2 Lab Scientist - DST Test Module Testing Table Cont.

7	Create DST test after complete test	Create DST Test and press the "Submit" button to submit.	Unable to create DST test after complete test.	User unable to create DST test for a patient who had complete the test, the patient info had been removed from dashboard.	√

6.12 Doctor (Treatment/Analysis and Reporting Module) Module Testing

Table 6-12-1 Doctor Module Testing Table.

No	Testing Method	Action Done	Expected Result	Actual Result	Meet Expectation (√ / ×)
1	Create Report (with complete all tests)	Fill in the info and click "Submit" button to submit the report.	Succesfully submit the report and remove the selected patient info from the create report waiting list.	User succesfully created the report and the patient info had dissapear from the ceate report waiting list.	√
2	Create Report (with pending smear&culture test)	Fill in the info and click "Submit" button to submit the report.	Failed to submit the report.	User unable to click the "Submit" button to submit the report.	√
3	Create Report (with pending DST test)	Fill in the info and click "Submit" button to submit the report.	Failed to submit the report.	User unable to click the "Submit" button to submit the report.	√
4	Create Report (with complete of skin/blood test and Chest X-Ray test only)	Fill in the info and click "Submit" button to submit the report.	Failed to submit the report.	User unable to click the "Submit" button to submit the report.	√
5	Create Report (with complete of skin/blood test only)	Fill in the info and click "Submit" button to submit the report.	Failed to submit the report.	User unable to click the "Submit" button to submit the report.	√
6	Edit History Report	Press the "Edit" button to edit the patient report from history report and submit it.	Succesfully edit the patient report and submit it to the system.	User succesfully edit the patient report and a pop- up message display "Patient Final Review and Diagnosis Update Successfully" after submit the edited report.	√

Table 6-12-2 Doctor Module Testing Table Cont.

7	Edit History Report(Other user)	Press the "Edit" button to edit the patient report created by other user.	Failed to edit the patient report.	User unable to edit the patient report created by other user.	√
8	Keep track the edited history record	Press the "Edited" button to keep track.	View the changes has made on the records and the edition date.	User able to keep track and view the changes has made on the records and also the edition date.	√
9	Print History Report	Press the "Print this page" button tp print the report.	Succesfully print out the patient full report.	User succesfully print out the patient full report.	√

Chapter 7: Conclusion and Discussion

7.1 Project Overview

As we know, the current world health situations are facing the biggest challenging issue which is COVID – 19 (Coronavirus). This infections disease brings challenges to all human being domains nowadays. Unfortunately, once again, this disease reminds us or even can say as 'bring motivations' to us to develop a healthcare system is required in this global state.

Similar to the concepts that stated above. The current **TB Diagnosis Laboratory Information System** act as a healthcare system that is able to performs the task such as basic patients' data input update, delete, insert, and edit functionalities as well as some further analytic capabilities based on those patients' data input. This TB laboratory system intends to help user to complete workflows and manage clinical communications on one single platform which allow multiple care teams (Nurse, Lab Scientist, Radiologist and Doctor) from different labs can collaborate to improve care coordination.

Other than taking effort to do the paperwork on recording the patient's relevant information and TB test results. This laboratory system helps to reduce the likelihood of result insertion wrongly and increase the effectiveness and efficiency of each TB test process during the TB testing period.

7.2 System Strengths and Limitations

Although the proposed system successfully achieved all the modules' functionality, the functionalities of each modules can still be improved. Each module can be added in more feature functionalities on it.

Strengths

Other than the exist strengths that mentioned earlier such as enable user to complete workflows and manage clinical communications on single platform, allowing multiple care teams from different labs can collaborate to improve care coordination. The TB Diagnosis Laboratory Information System (Skin/Blood Test Module) also provided the functionality like automate the results that derived from the inputs key in previously which helping for reduce the possibilities of data insertions wrongly. Besides, this module also provides the automated functionality for checking the skin test expirations date to avoid those patients who come for skin test testing that exceed the expirations date and staff may miss out of this issue. The system will auto update the patient record as a failed result, patient required to do the skin test again. Moreover, Treatment/Analysis and Reporting Module includes all the related analysis part based on the database's data which collect from all the module mention previously and display on the "Dashboard" pages. Apart from the analysis that stated in chapter 3.1, One of the feature functionalities called 'TB Diagnosed Pin Maps' which will graphically present all the TB diagnosed patients' by using the 'Google Maps'. Relevant user can see through all the TB diagnosed patient current locations and then perform some surveillance prevention action based on these locations address (Pin).

Limitations

There exist some limitations in the system in term of cloud storage issues, this project still relies on XMAPP (own PC/Laptop) as database server which may not enough storage spaces for the fully development system. Besides, the TB **Diagnosis Laboratory Information System** design is strongly depending on the end user requirement, some of the new requirement such as new drugs or new treatment flow might be invented in the future. This system having the limitation that when

the new features come out, it need to be changed some part of the coding manually. Besides, the TB data analysis section is still under development, still have the spaces that can be strengthened.

7.3 Future Work

The database storage can be changed to cloud storage since the current system relies on XMAPP (own PC/Laptop) as database server which may not enough storage spaces for the fully development system. The current proposed TB system has provided the fundamental concepts and development of the TB information system. All the database script and query has been set up in the system. Hence, a further enhancement can be implemented to the system which is changing the local storage to the cloud storage services.

The functionalities of the maintenance module can be increased since the current system supports only basic insert, delete (inactivate user), update (edit/activate user). More functionalities like create new drug or new options provided for each of the option selections input of the system.

Card Scanner can be applied to support the efficiency of the system. A card scanner can be implemented to the current system to shorten the TB receptions process since the scanning process is consider fast compare with the action of manually insert the patient record during the reception time. The relevant staff (nurse) can just only scan the patient Identity Card, all the patient's specific record will automatically be inserted into the system which might increase the accuracy of the data insertion.

Finally, **the analysis of the TB data can be further strengthen/improve.** Although the current system provides some of the functionality that allow the TB data graphically presented by using the bar chart, line chart, table, and Google Maps to user. However, data analysis is not an easy road, it required a lot of study and patient to discover additional useful tools or implements that can be unified with the TB Diagnosis Laboratory Information System to analyse and present those useful data for the relevant user. For example, more chart or graph can further use by the system, World Maps (figure 6.3.1) can be applied in future works.

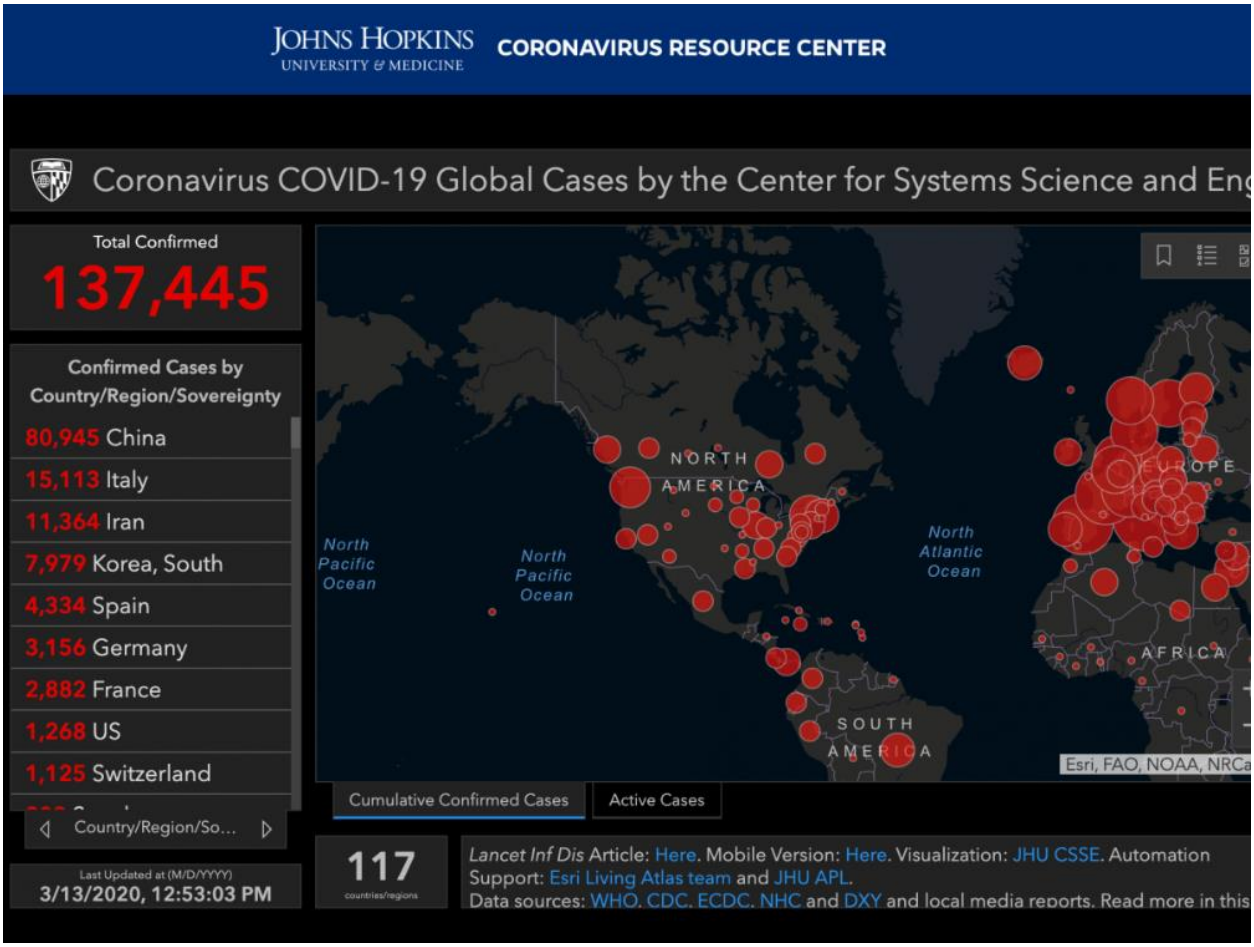


Figure 7.3.1 World Hotmaps (Coronavirus)

7.4 Conclusion

The infections disease brings challenges to all human being domains nowadays. TB disease has now become the seriously problem which existing all around the world. The shortage of early detection and prevention of the TB disease is one of the major problems which enhanced the TB cases happened in every hole and corner. Hence, a proper TB diagnosis laboratory management system is strong needed for every health care organization in order to effectively and efficiency to resolve the critical TB problem. The proper actions such as coordination by collaborating multiple care teams from different labs and offering the high accuracy data for the medical decision and analysis are strongly required for the relevant TB medical domain nowadays.

Last but not least, the major motivation of the TB Diagnosis Laboratory Information System is to reduce the TB disease cases occurrence gradually. I hope that the TB Diagnosis Laboratory Information System is expected to act as a useful tool for the TB medical domain in helping to resolve the TB disease problem.

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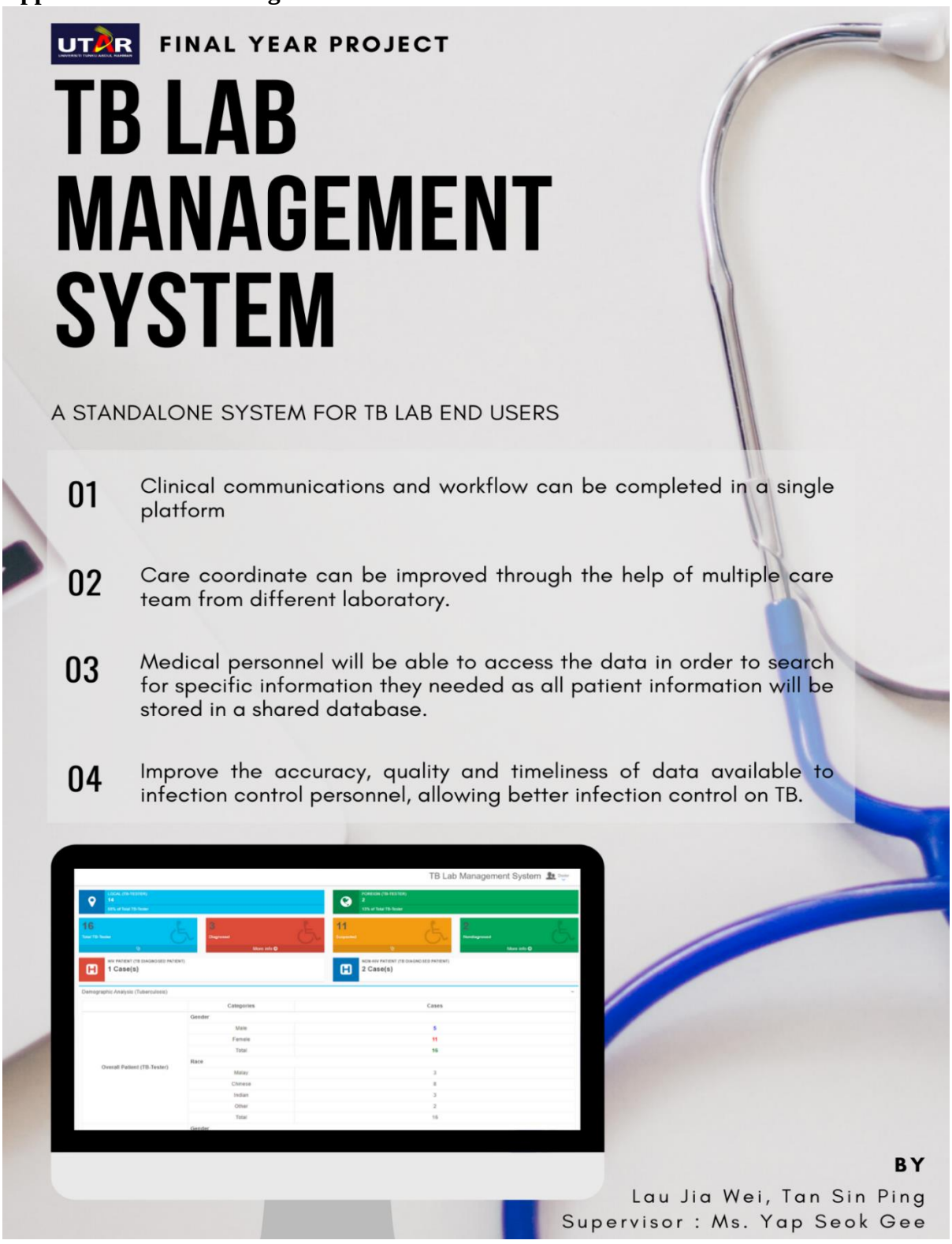
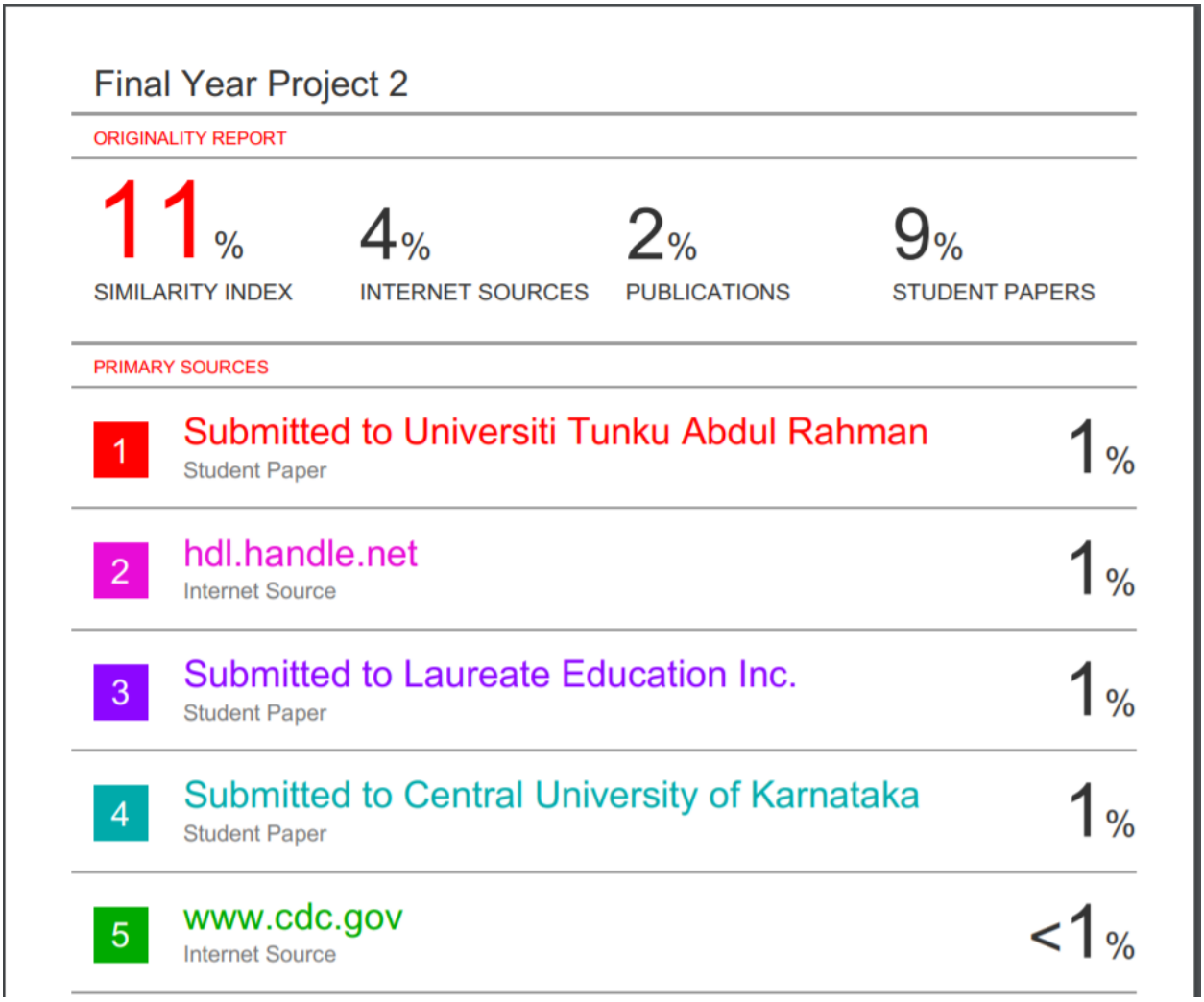
Appendix

Appendix A: Poster Design



Appendix B: Plagiarism Check Result



Final Year Project 2

ORIGINALITY REPORT

11%	4%	2%	9%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

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Appendix : Plagiarism Check Result

Universiti Tunku Abdul Rahman			
Form Title : Supervisor's Comments on Originality Report Generated by Turnitin for Submission of Final Year Project Report (for Undergraduate Programmes)			
Form Number: FM-IAD-005	Rev No.: 0	Effective Date: 01/10/2013	Page No.: 1of 1

FACULTY OF INFORMATION AND COMMUNICATION TECHNOLOGY

Full Name(s) of Candidate(s)	Law Jia Wei
ID Number(s)	16ACB05867
Programme / Course	BACHELOR OF INFORMATION SYSTEMS (HONS) INFORMATION SYSTEMS ENGINEERING
Title of Final Year Project	TB DIAGNOSIS LABORATORY INFORMATION SYSTEM – Surveillance & Tracking

Similarity	**Supervisor's Comments (Compulsory if parameters of originality exceeds the limits approved by UTAR)**
Overall similarity index: 11 % **Similarity by source** Internet Sources: 4 % Publications: 2 % Student Papers: 9 %	
Number of individual sources listed of more than 3% similarity: 0	

Parameters of originality required and limits approved by UTAR are as Follows:

(i) Overall similarity index is 20% and below, and
(ii) Matching of individual sources listed must be less than 3% each, and
(iii) Matching texts in continuous block must not exceed 8 words

Note: Parameters (i) – (ii) shall exclude quotes, bibliography and text matches which are less than 8 words.

Note Supervisor/Candidate(s) is/are required to provide softcopy of full set of the originality report to Faculty/Institute

Based on the above results, I hereby declare that I am satisfied with the originality of the Final Year Project Report submitted by my student(s) as named above.

Signature of Supervisor

Name: Ms Yap Seok Gee

Date: 24 April 2020

Signature of Co-Supervisor

Name: _____

Date: _____

Appendix C : Weekly Report

FINAL YEAR PROJECT WEEKLY REPORT

(~~Project I~~ / Project II)

Trimester, Year: Y3S3	**Study week no.:** Week 2
Student Name & ID: Law Jia Wei, 1605867	
Supervisor: Ms. Yap Seok Gee	
Project Title: TB DIAGNOSIS LABORATORY INFORMATION SYSTEM - Surveillance & Tracking	

1. WORK DONE

Do some of the TB DIAGNOSIS LABORATORY INFORMATION SYSTEM's system.

2. WORK TO BE DONE

Contact and arrange a time to meet up Miss Saw and Miss Saw's sister to conduct a short meeting, report our progress and have a short presentation.

3. PROBLEMS ENCOUNTERED

We need to complete the system within 12 weeks and also submit the full report, these might be a bit difficult for us because all these are time consuming work.

4. SELF EVALUATION OF THE PROGRESS

I think the progress of this system is quite slow because we still have a lot of module of system need to code and complete it.

Supervisor's signature

Student's signature

Appendix C : Weekly Report

FINAL YEAR PROJECT WEEKLY REPORT

(Project I / Project II)

Trimester, Year: Y3S3	**Study week no.:** Week 3
Student Name & ID: Law Jia Wei, 1605867	
Supervisor: Ms. Yap Seok Gee	
Project Title: TB DIAGNOSIS LABORATORY INFORMATION SYSTEM - Surveillance & Tracking	

1. WORK DONE

We had meet with Miss Saw, conduct a short meeting and report our progress to them. We also received some feedback and recommendation, we will modified our system and report according their feedback.

2. WORK TO BE DONE

After met with Miss Saw, we had record down their feedback and recommendation, we will modified our system and report according their feedback.

3. PROBLEMS ENCOUNTERED

Some of the function need to code in the system a bit challenge for us.

4. SELF EVALUATION OF THE PROGRESS

I think the progress of this system is quite slow because we still have a lot of task need to complete.

Supervisor's signature

Student's signature

Appendix C : Weekly Report

FINAL YEAR PROJECT WEEKLY REPORT

(~~Project I~~ / Project II)

Trimester, Year: Y3S3	**Study week no.:** Week 4
Student Name & ID: Law Jia Wei, 1605867	
Supervisor: Ms Yap Seok Gee	
Project Title: TB DIAGNOSIS LABORATORY INFORMATION SYSTEM - Surveillance & Tracking	

1. WORK DONE

We had modified some changes on our system based on Miss Saw's suggestion and feedback. For example, placed the specific picture to identify the difference of the position/ person.

2. WORK TO BE DONE

Miss Yap recommend us to try Oracle database as our system database. We will find the person and evaluate whether the database is suitable for our system or not.

3. PROBLEMS ENCOUNTERED

We need to complete skin test module and blood test module within this week.

4. SELF EVALUATION OF THE PROGRESS

I think our progress is moderate, we can complete this project within the deadline.

Supervisor's signature

Student's signature

Appendix C : Weekly Report

FINAL YEAR PROJECT WEEKLY REPORT

(~~Project I~~ / Project II)

Trimester, Year: Y3S3	**Study week no.:** Week 5
Student Name & ID: Law Jia Wei, 1605867	
Supervisor: Ms Yap Seok Gee	
Project Title: TB DIAGNOSIS LABORATORY INFORMATION SYSTEM - Surveillance & Tracking	

1. WORK DONE

We had find the person recommend by Miss Yap, and we had try to register an account and use it. After discussion with my group mate, we decided not using oracle database because we are not familiar with oracle database and we need the guide of the person to explore the way to use oracle database and it will take some time.

2. WORK TO BE DONE

Meet with Miss Yap, report our decision and present our system's progress.

3. PROBLEMS ENCOUNTERED

We need to modify the skin test and blood test module, if the result is negative then at the admission table it will automatically apply adm_result = negative else will pass the patient's data for the following test.

4. SELF EVALUATION OF THE PROGRESS

I think our progress is moderate, we can complete this project within the deadline.

Supervisor's signature

Student's signature

Appendix C : Weekly Report

FINAL YEAR PROJECT WEEKLY REPORT

(~~Project I~~ / Project II)

Trimester, Year: Y3S3	**Study week no.:** Week 6
Student Name & ID: Law Jia Wei, 1605867	
Supervisor: Ms Yap Seok Gee	
Project Title: TB DIAGNOSIS LABORATORY INFORMATION SYSTEM - Surveillance & Tracking	

1. WORK DONE

We had met with Miss Yap and tell her our concern and our decision why not using oracle database and continue using XAMPP. We also present our system to Miss Yap and received some feedback and recommendation from Miss Yap.

2. WORK TO BE DONE

Modify the system based on Miss Yap's feedback and recommendation. For example, make the field smaller and shorten the patient's information display with display three column in a row.

3. PROBLEMS ENCOUNTERED

How to store the X-Ray image is a problem for us, we will ask Miss Saw about it.

4. SELF EVALUATION OF THE PROGRESS

I think the progress of the project overall is good.

Supervisor's signature

Student's signature

Appendix C : Weekly Report

FINAL YEAR PROJECT WEEKLY REPORT

~~(Project I~~ / Project II)

Trimester, Year: Y3S3	**Study week no.:** Week 7
Student Name & ID: Law Jia Wei, 1605867	
Supervisor: Ms Yap Seok Gee	
Project Title: TB DIAGNOSIS LABORATORY INFORMATION SYSTEM - Surveillance & Tracking	

1. WORK DONE

We had modified our system based on Miss Yap's feedback.

2. WORK TO BE DONE

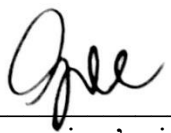
Meet with Miss Saw for our enquiry and also complete radiologist and lab scientist module within this week.

3. PROBLEMS ENCOUNTERED

Beside the problem of how to store the X-Ray image, we will also like to ask about what if the 1st sample sputum is cannot be use, what should the lab scientist do next? Recollect a new sample sputum or ?

4. SELF EVALUATION OF THE PROGRESS

The progress is slower than few weeks before, we need to spend more time to catch up in order to complete the Final Year project before deadline.



Supervisor's signature

Student's signature

Appendix C : Weekly Report

FINAL YEAR PROJECT WEEKLY REPORT

(~~Project I~~ / Project II)

Trimester, Year: Y3S3	**Study week no.:** Week 8
Student Name & ID: Law Jia Wei, 1605867	
Supervisor: Ms Yap Seok Gee	
Project Title: TB DIAGNOSIS LABORATORY INFORMATION SYSTEM - Surveillance & Tracking	

1. WORK DONE

We had met with Miss Saw, we just need to kept the X-Ray normally as image format. The radiologist will transfer the X-Ray into image by themself. Thus, if the sample sputum could not be use, it will recollect with the patient in order to complete the following test. Thus, we are still doing the lab scientist module as it's much more complex compared with the previous module.

2. WORK TO BE DONE

Complete the lab scientist module within this week.

3. PROBLEMS ENCOUNTERED

The hardest part in this module is how should we code it and design the interface to store the DST test result and Smear & Culture test result because different patient might need to carry different times of tests but basically a DST and smear & culture test will carry 3 times.

4. SELF EVALUATION OF THE PROGRESS

The progress is slower than few weeks before, i need to spend more time to catch up in order to complete the Final Year project before deadline.

Supervisor's signature

Student's signature

Appendix C : Weekly Report

FINAL YEAR PROJECT WEEKLY REPORT

(~~Project I~~ / Project II)

Trimester, Year: Y3S3	**Study week no.: Week 9**
Student Name & ID: Law Jia Wei, 1605867	
Supervisor: Ms Yap Seok Gee	
Project Title: TB DIAGNOSIS LABORATORY INFORMATION SYSTEM - Surveillance & Tracking	

1. WORK DONE

We had complete the lab scientist module successfully.

2. WORK TO BE DONE

Meet with Miss Yap to report our system's progress and complete the doctor's module.Thus, meet with Miss Saw for the data analysis part to understand what information needed to further elaborate.

3. PROBLEMS ENCOUNTERED

The patient who has negative in skin test and blood test result will not pass to doctor module. Thus, the doctor can create report only when the patient's complete all the test.

4. SELF EVALUATION OF THE PROGRESS

The progress is slower than few weeks before, we need to spend more time to catch up in order to complete the Final Year project before deadline.

Supervisor's signature

Student's signature

Appendix C : Weekly Report

FINAL YEAR PROJECT WEEKLY REPORT

(~~Project I~~ / Project II)

Trimester, Year: Y3S3	**Study week no.: Week 10**
Student Name & ID: Law Jia Wei, 1605867	
Supervisor: Ms Yap Seok Gee	
Project Title: TB DIAGNOSIS LABORATORY INFORMATION SYSTEM - Surveillance & Tracking	

1. WORK DONE

We already met with Miss Saw and understanding what we need to do for analysis part. Thus, we also report to Miss Yap our system progress.

2. WORK TO BE DONE

Miss Yap has give us some feedback on our system, we need to make some changes on our system such as display the result at the bottom and moved the result definition at the right side. Thus, we also need to complete the doctor module which are the last module in our system.

3. PROBLEMS ENCOUNTERED

A patient with all positive tests' result should shows at the top of the table and highlighted so that the doctor can review it at the first time.

4. SELF EVALUATION OF THE PROGRESS

The progress is slower than few weeks before, we need to spend more time to catch up in order to complete the Final Year project before deadline.

Supervisor's signature

Student's signature

Appendix C : Weekly Report

FINAL YEAR PROJECT WEEKLY REPORT

(~~Project I~~ / Project II)

Trimester, Year: Y3S3	**Study week no.: Week 11**
Student Name & ID: Law Jia Wei, 1605867	
Supervisor: Ms Yap Seok Gee	
Project Title: TB DIAGNOSIS LABORATORY INFORMATION SYSTEM - Surveillance & Tracking	

1. WORK DONE

Complete part of the coding in the doctor module.

2. WORK TO BE DONE

Complete the coding for the analysis part in the doctor module and complete the full report.

3. PROBLEMS ENCOUNTERED

We need to register a API account so that e can use the Google map to shows the patient's location and knowing that how many's patient in a same area/ city.

4. SELF EVALUATION OF THE PROGRESS

The progress is slower than few weeks before, we need to spend more time to catch up in order to complete the Final Year project before deadline.

Supervisor's signature

Student's signature

Appendix C : Weekly Report

FINAL YEAR PROJECT WEEKLY REPORT

(~~Project I~~ / Project II)

Trimester, Year: Y3S3	**Study week no.: Week 12**
Student Name & ID: Law Jia Wei, 1605867	
Supervisor: Ms Yap Seok Gee	
Project Title: TB DIAGNOSIS LABORATORY INFORMATION SYSTEM - Surveillance & Tracking	

1. WORK DONE

The coding for the analysis part completed but the report still in progress because while doing the system testing there are some bugs inside the system.

2. WORK TO BE DONE

Solve the bugs inside the system and try to complete the report within this week.

3. PROBLEMS ENCOUNTERED

Needs to open edition log table for form in each module, in order the user able to keep track the history editing records.

4. SELF EVALUATION OF THE PROGRESS

The progress is slower than few weeks before, we need to spend more time to catch up in order to complete the Final Year project before deadline.

Supervisor's signature

Student's signature

Appendix C : Weekly Report

FINAL YEAR PROJECT WEEKLY REPORT

(~~Project I~~ / Project II)

Trimester, Year: Y3S3	**Study week no.: Week 13**
Student Name & ID: Law Jia Wei, 1605867	
Supervisor: Ms Yap Seok Gee	
Project Title: TB DIAGNOSIS LABORATORY INFORMATION SYSTEM - Surveillance & Tracking	

1. WORK DONE

Succesfully solved the bug inside the system and complete the system testing. .

2. WORK TO BE DONE

Complete the remaining report such as system implementation and conclusion.

3. PROBLEMS ENCOUNTERED

During the MCO, hard to meet with teammate and all communication needs to relied on the online chatting tools.

4. SELF EVALUATION OF THE PROGRESS

The progress is slower than few weeks before, we need to spend more time to catch up in order to complete the Final Year project before deadline.

Supervisor's signature

Student's signature

Appendix D: Check List

UNIVERSITI TUNKU ABDUL RAHMAN

FACULTY OF INFORMATION & COMMUNICATION TECHNOLOGY (KAMPAR CAMPUS)

CHECKLIST FOR FYP2 THESIS SUBMISSION

Student Id	16ACB05867
Student Name	LAW JIA WEI
Supervisor Name	Ms Yap Seok Gee

TICK (√)	DOCUMENT ITEMS Your report must include all the items below. Put a tick on the left column after you have checked your report with respect to the corresponding item.
√	Front Cover
√	Signed Report Status Declaration Form
√	Title Page
√	Signed form of the Declaration of Originality
√	Acknowledgement
√	Abstract
√	Table of Contents
√	List of Figures (if applicable)
√	List of Tables (if applicable)
	List of Symbols (if applicable)
√	List of Abbreviations (if applicable)
√	Chapters / Content
√	Bibliography (or References)
√	All references in bibliography are cited in the thesis, especially in the chapter of literature review
√	Appendices (if applicable)
√	Poster
√	Signed Turnitin Report (Plagiarism Check Result - Form Number: FM-IAD-005)

*Include this form (checklist) in the thesis (Bind together as the last page)

I, the author, have checked and confirmed all the items listed in the table are included in my report. _____ (Signature of Student) Date: 23 April 2020	Supervisor verification. Report with incorrect format can get 5 mark (1 grade) reduction. _____ (Signature of Supervisor) Date: 23 April 2020