



Republic of the Philippines  
Polytechnic University of the Philippines  
College of Computer and Information Sciences  
Sta. Mesa, Manila



# **Little Heart Angel**

## **Medical Laboratory Management System**

A research paper presented to  
College of Computer and Information Science of  
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Information Management (COMP 2009)

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## ABSTRACT

### 1.1 Project Description

A medical laboratory test is a method in which a medical professional collects information about a patient by taking a sample of the patient's blood, urine, or other bodily fluid or tissue in order to examine it. The results are analyzed by the medical staff to determine whether or not they are within the normal range of laboratory results. These tests may be used to assist in diagnosing or screening for various illnesses and conditions, which is a huge benefit to our health.

The Little Heart Angel Medical Laboratory was established in 2006, and they have already constructed a strategy for managing their tests and keeping the data they have, with the aim of providing more general information about our body's processes or, more specifically, our health and well-being. Unfortunately, the laboratory acquires a patient's laboratory request by utilizing paper, a pen, and multiple templates to be filled up for each transaction. It is necessary for them to improve their work practices in order to improve the quality of the services they provide to their patients and encourage them to take better care of and monitor themselves as well.

### 1.2.Objectives

#### 1.2.1. General Objective

The project aims to provide an alternative method of storing and manipulating information and transactions of Little Heart Angel Medical



laboratory, with the goal of improving speed and efficiency of their daily operations.

### 1.2.2. Specific Objective

- Provide an all-in-one platform in which tests and transactions can be easily added, modified, and retrieved.
- Provide an organized way to show the list of laboratory tests, and their corresponding details including the price, normal range, and units.
- Increase speed of operation by adding a feature which automatically calculates the patient's bill based on the tests they availed.
- Store information about the examiners and physicians (since it has been mentioned that they are regularly entered on the system)
- Generate a comprehensive laboratory result form that shows only the tests availed and organizes the tests in terms of their categories.
- Provide an option to store and display the transactions.
- Option to provide a digital copy of the results upon patient or doctor's request.



### 1.3 Scope and Limitation

The system will be created for the purpose of speeding up the daily operations (in terms of encoding data and computation) of Little Heart Angel Medical Laboratory located in Brgy. San Gabriel Teresa, Rizal. Furthermore, this laboratory management system should be able to meet the following purposes:

- Log in and log out of the system.
- Store basic information of the patients, examiners, and doctors.
- Store information about individual laboratory tests and their categories.
- Automate calculation of amount to be paid.
- View transaction history.

However, the system will not cover:

- Inventory for laboratory supplies or medicine.
- Equipment and supplier information.
- Patient's medical diagnosis or treatment history (Since this will depend on their personal physicians, not the laboratory itself)

The system is exclusively designed for the owner and trusted staff only; It is off limits to the patient. Patients do not have access to their recorded transaction history unless requested and permitted.



#### 1.4 Statement of the Problem

Currently, no database system has been implemented in Little Heart Angel Medical Laboratory. The laboratory uses the paper and pen method to acquire a patient's laboratory request. Then, they select ready-made templates (separate templates for every category) and fill out the results for each selected test before printing. After which, they use a calculator to manually sum up the patient's total bill. Then, they would have to erase the previous data (one by one) in order to empty the template for the next transaction. For this reason, the management process is inefficient, time-consuming, and unorganized. Since the Examiners (Medical Technologists) not only take the lab requests, but also handle the tests themselves, this leads to a stressful environment for both the employees and patients.

##### **Problems with the current system**

- **Time-consuming:** Difficulty and inefficiency in data entry and information retrieval (from taking laboratory request, encoding patient information and their test results on multiple templates, searching old records, and keeping track of tests details)

#### 1.5. Proposed Solution(s)

The recommended solution is to utilize a more organized digital system. Enhancing the management system of the laboratory may improve its overall workflow by providing advantages such as:

- Limiting access to data to the owner and trusted staff.



- Data retrieval with a few clicks to save time.
- Examiners can easily add new tests if the laboratory decides to offer more services.
- Examiners can easily assign tests to patients.
- Examiners can easily update any changes with the tests information ( for instance, if the cost for a test changes)
- Speed up the process by automatically calculating the patient's bill.
- Provide a laboratory result form that is organized and can therefore be easily understood by the referred physician.

Little Heart Angel Medical Laboratory staff includes its owner (also a medtech), three other medical technologists or examiners. The medical technologists of the laboratory are responsible for patient registration and updating of transaction history.

**User ID and password** must be maintained to restrict data access. The new system should be very user friendly so that it can be intuitively used without a lot of pre-training.

### 1.6 Activity Plan

The method that will be applied for implementing this system is the waterfall method, which includes a strict sequence of steps where the output of one step is the input of the next, and all the steps have to be completed before moving onto the next. We will first conduct an interview to gather data. From this,



we'd utilize tools such as data flow and ER diagrams to represent the data flow of the system.

#### 1.6.1. Planned Activities

- Data Collection through interview

Consultation and agreement with the client about what persistent data they want to store, as well as agreement on the meaning and interpretation of the data elements (taking into consideration the laboratory's legal and ethical practices).

- Analysis

The description of data requirements is followed by the creation of a conceptual data model. The goal of this analysis is to obtain a complete description of the data that meets user needs.

- Design

The data model conceptualized during the analysis phase, will now need specification of a logical schema; this will determine the specific type of database system (network, relational, object-oriented) that is required.

- Implementation

This involves the construction of a database according to the specification of a logical schema mentioned earlier. This will include the specification of an appropriate storage, security enforcement, and external schema,



among others. It may also involve additional flexing of the design to overcome software or hardware limitations.

### 1.6.2 Assignments/Tasking

For this project, our project manager is Prado. And our database administrators and programmers are Fortit, Olasiman and Olmo.

### 1.6.3 Schedule of Activities

The chart below shows the schedule of activities for the project:

TASK NAME	May 2022	June 2022				July 2022			
	05/24	06/07	06/14	06/21	06/28	07/05	07/12	07/19	07/26
Project Proposal	→								
Planning		→							
Analysis			→						
Design				→					
Implementation						→			





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## Chapter 1

### Organization Analysis

#### 1.1 Vision

- “A medical laboratory that complies to quality and regulatory practices that can serve the community of Teresa, Rizal and other nearby municipalities.”

#### 1.2 Mission

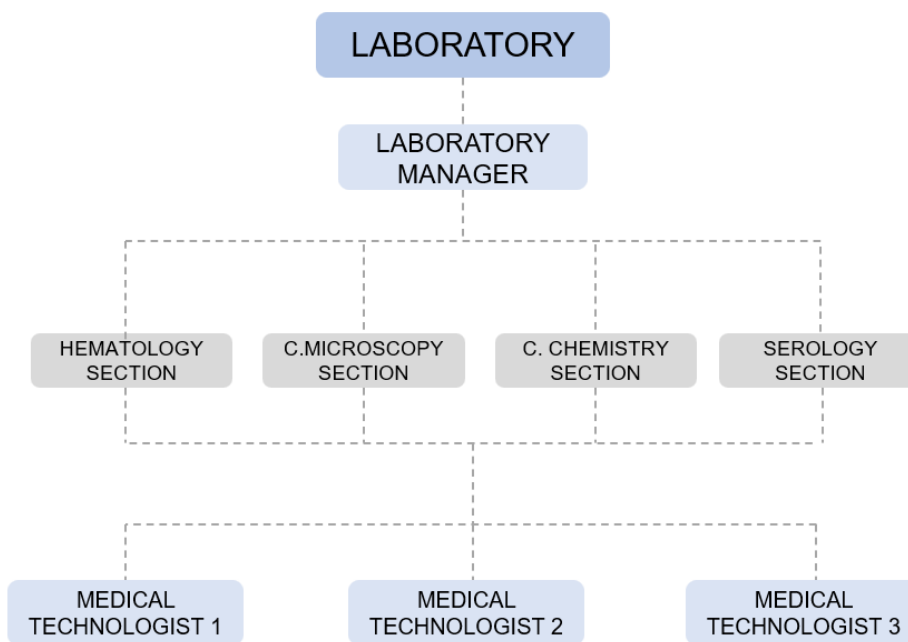
- “To offer accessible, reliable, quality, and affordable laboratory tests, performed in accordance with regulations and quality-controlled facilities and giving precise results with clinical significance.”

#### 1.3 Strategic Plan (Goal)

- Ensure a safe and therapeutic environment for every patient, staff member, and visitor.
- Work with the government and healthcare professionals to improve the way healthcare is delivered in Teresa, Rizal.
- Promote the greatest level of responsibility, professionalism, integrity, reliability and technical excellence in the performance of laboratory services for the benefit of patients.
- Maintain patient data privacy and test results confidentially.



## 1.4 Organizational Chart



## 1.5 Present ICT Situation

Little Heart Angel Medical Laboratory does not have a database system, so a hybrid of a digital system (through MS Word templates) and paper-based system is currently their primary method for processing daily lab requests from patients. The results of lab tests of a patient are then filled out on pre-made templates for each category and then printed; For this reason, the previous data would need to be manually deleted in order to clear the template for the next transaction. In addition, the Examiners manually calculate the total bill using a calculator during the payment process. As a result, the laboratory's present management method is inconvenient for patients and examiners' workload since it takes up too much time and is unorganized.



## 1.6 Strategic Concerns For ICT Use

### **Proposed Project: Little Heart Angel Medical Laboratory Management System**

The developers of this project will maintain the integrity of the laboratory's protocols and privacy and follow the objectives of the project by designing a database management system that will fulfill and lessen the daily workload of Examiners (Medical Technologists). The developers will also guide them as they incorporate the system into their laboratory process, check for maintenance, and design further system improvements.

The system will include the ability to store data and records while reducing common human error when storing, and to keep up in a crucial and demanding environment. This will allow the medical laboratory to improve their speed and efficiency. In addition, it will be able to organize tests according to their categories, generate comprehensive laboratory results with the total bill of all availed tests, generate digital copies of results upon request from patients or doctors, and store and show a patient's transaction history.

With a system specifically created and designed for their laboratory procedure, this system will significantly enhance the medical laboratory's quality, reliability, organization, and security of data, further improving their regulatory practices.



## Chapter 2

### Information Systems Strategy

#### 2.1 Description of Database

The Little Heart Angel Medical Laboratory's database system will provide a complete mechanism for quickly encoding patient information. The system will have the capability of adding tests, patients, and categories, examiners, and doctors, as well as storing and viewing previous transactions. The patient's payment may be automatically calculated, and the transaction can be displayed. Additionally, the system will provide the manager with the ability to simply add, edit, delete, sort, and search any data that has been selected. Given this, it will provide an overview of all of the patient's information regardless of whether the tests that will be performed are completely new or not.

#### 2.2 List of Forms and Reports

##### 2.2.1 Forms

Form Name	Descriptions	User
User Log-in	Inputting the system's username and password.	Employee
New Patients	This will contain and collect patients' information.	Employee





New Tests	An existing patient will be chosen, and a new test will be added.	Employee
Test Table	This will include specifications for the new test for the laboratory.	Employee
Add Categories	This will include specifications for the new categories for the laboratory.	Employee
Examiners	It contains the medical laboratory examiner's data from which it can select specific examiners.	Employee
Doctors	It contains the partner doctor's data from which it can select specific doctors.	Employee



### 2.2.2 Reports

Report Name	Descriptions	User
Transaction	This will provide the patients' data with their laboratory test records.	Employee
Result	This will record and store the transaction bill made by the patient for each laboratory test they acquired.	Employee
Invoice	This will automate a record showing a breakdown of cost of availed tests or services.	Employee



## 2.2.3 Actual Forms from the Medical Laboratory

### 2.2.3.1 Test Result for Hematology (with Results)

PH: 76 30

Little Heart Angel Medical Laboratory  
87 Brgy San Gabriel Magisway Avenue  
Ternate Rizal

Name: AYESSA FAITH PRADO Date: 04/22/2022  
Requested by: DR. FREDERICK P. LLANERA Age/Sex: 21/FEMALE

**HEMATOLOGY**

RESULT	NORMAL VALUE
Hemoglobin: <u>135</u> gms/L	Male: 140-180 gms/L Female: 120-160 gms/L
Hematocrit: <u>0.41</u>	Male: 40-54 Female: 37-47
RBC: <u>10.2</u> $\times 10^{12}/L$	Male: 4.6-6.2 $\times 10^{12}/L$ Female: 4.2-5.4 $\times 10^{12}/L$
WBC: <u>10.2</u> $\times 10^9/L$	5-10 $\times 10^9/L$
Differential Count	
Neutrophils: <u>0.59</u>	50-70%
Lymphocytes: <u>0.40</u>	25-40%
Monocytes: _____	3-8%
Eosinophils: _____	1-4%
Basophil: <u>0.01</u>	0-1%
Platelet Count: <u>289</u>	150-450 $\times 10^9/L$
Blood type: _____	RH type: _____
Bleeding time: _____	1-3 minutes

Mary Rose Stefanie R. Rosales, RMT  
Lic # 0085846

### 2.2.3.2 Test Result for Serology (Empty)

Little Heart Angel Medical Laboratory  
87 Brgy San Gabriel Magisway Avenue  
Ternate Rizal

Name: \_\_\_\_\_ Date: \_\_\_\_\_  
Requested by: \_\_\_\_\_ Age/Sex: \_\_\_\_\_

**SEROLOGY**

RESULT	NORMAL VALUE
Pregnancy Test: _____	
HBsAg: _____ IU/mL	0.05-250
Anti-Syphilis Test: _____	
Typhoid Test: _____	anti-TH <160, & anti-TO <180
HbA1C: _____ mmol/mol	< 42
CRP: _____ mg/L	< 10
ASOT: _____ counts	0-1440
TSH: _____ mIU/L	0.5-5.0
T3: _____ ng/dL	60-180
T4: _____ ng/dL	5.0-12

Lic # \_\_\_\_\_



### 2.2.3.2 Test Result for Clinical Microscopy (Empty)

Little Heart Angel Medical Laboratory  
87 Bragg Lane, Cubatong Magway, Marikina  
Teresa Rizal

Name: \_\_\_\_\_ Date: \_\_\_\_\_  
Requested by: \_\_\_\_\_ Age/Sex: \_\_\_\_\_

**CLINICAL MICROSCOPY**

RESULT	NORMAL VALUE
Routine Urinalysis: _____ mL	1200-3000
Routine Fecalysis: _____ pH	7-7.5
Fecal Occult Blood: _____ mg/gm	2-3
Semen Volume: _____ mL	1.5-5
Sperm Motility: _____ %	25-30

Lic # \_\_\_\_\_

### 2.2.3.2 Test Result for Clinical Chemistry (Empty)

Little Heart Angel Medical Laboratory  
87 Bragg Lane, Cubatong Magway, Marikina  
Teresa Rizal

Name: \_\_\_\_\_ Date: \_\_\_\_\_  
Requested by: \_\_\_\_\_ Age/Sex: \_\_\_\_\_

**CLINICAL CHEMISTRY**

RESULT	NORMAL VALUE
Blood Sugar(FBS,RBS): _____ mg/dl	80-100
Blood Uric Acid: _____ mg/dl	5-6
Creatinine: _____ mg/dl	0.6-1.3
Blood Urea Nitrogen: _____ mg/dl	7-22
SCPT/ALT: _____ U/L	7-55
SCOT/AST: _____ U/L	4-40
Sodium: _____ mEq/L	135-145
Potassium: _____ mmol/L	3.6-5.2
Calcium: _____ mg/dl	8.6-10.3

Lic # \_\_\_\_\_

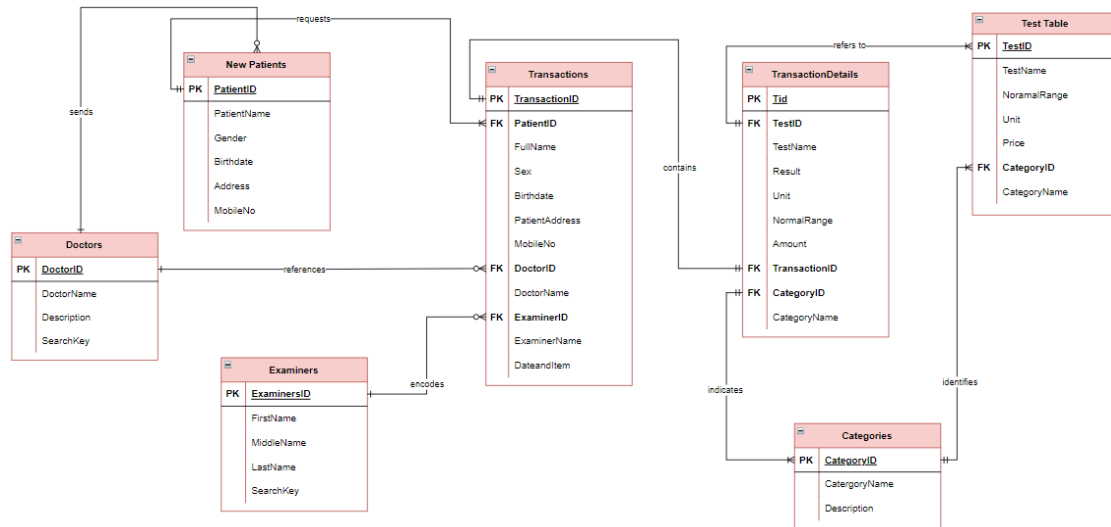


### 2.3 Business rules

- Tests are categorized into hematology, clinical microscopy, clinical chemistry, and serology.
- Each test may or may not have normal range and unit.
- The patients provide their name, gender, birthdate, address, and mobile.
- The Examiners (Medical Technologists) input the patient information, tests they availed, and their laboratory results.
- The Examiners can update any changes with the patient details and tests information (for instance, if the cost for a test changes)
- The Examiners give the patient a comprehensive laboratory result form that contains only the tests availed and organizes them according to their categories.
- Along with the laboratory result form, a patient's total bill or amount to be paid should be displayed.
- The Examiners can provide a digital copy of the results upon patient or doctor's request.
- The Examiners have an option to store and display patient transaction history (if the patient requires successive testings).



## 2.4 Conceptual Framework

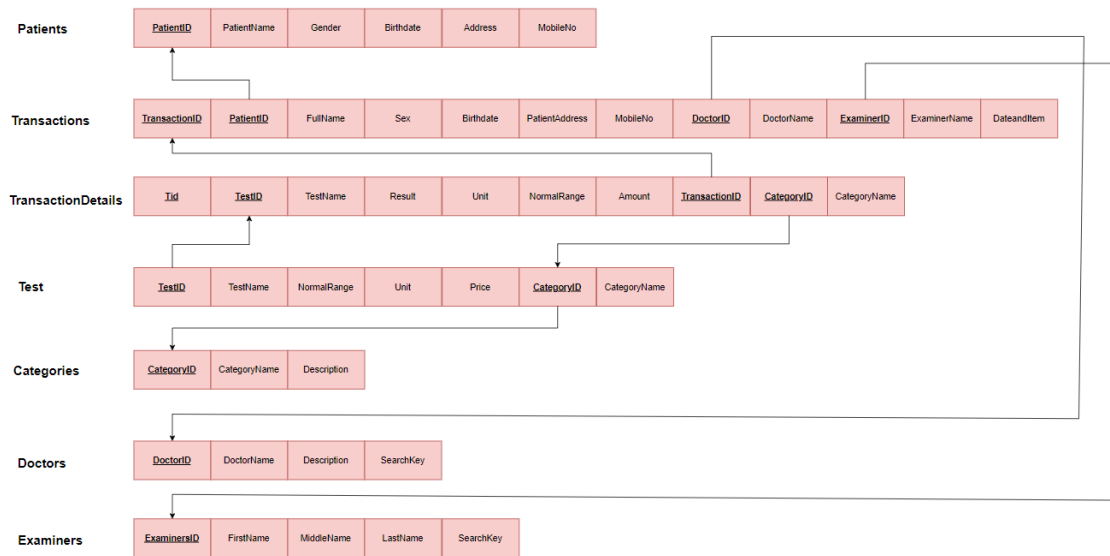




## Chapter 3

### Prototype

#### 3.1 Relational Schema



#### 3.2 Table Definition Dictionary

Table 1 Doctor Table Data Dictionary

<b>Table Name:</b> Doctors						
<b>Table Description:</b> Contains basic doctor's information						
<b>Related Table:</b>						
<b>Id</b>	<b>Field</b>	<b>Description</b>	<b>Data Type</b>	<b>Length</b>	<b>Allowed Null</b>	<b>Sample Data</b>
<b>PK</b>	DoctorID	Doctor's unique identifier	autonum	30	Not Null	1



	DoctorName	Doctor's name	Short text	150	Null	Dr. Ross Batol Sr.
	Description	Doctor information	Short text	255	Null	M.D. General Physician
	SearchKey	For searching	Short text (calculated)	255	Not Null	1M.D. General Physician DR. Ross Batol Sr.

**Table 2** *Examiner's Table Data Dictionary*

<p><b>Table Name:</b> Examiners</p> <p><b>Table Description:</b> Contains basic information about the examiner (Medical Technologist)</p> <p><b>Related Table:</b></p>						
Id	Field	Description	Data Type	Length	Allowed Null	Sample Data
<b>PK</b>	ExaminerID	Examiner's unique identifier	autonum	30	Not Null	1
	FirstName	Examiner's last name	Short text	100	Null	Kim





	MiddleName	Examiner's middle name	Short text	100	Null	Reyes
	LastName	Examiner's last name	Short text	100	Null	Cruz

**Table 3** *Categories Table Data Dictionary*

<b>Table Name:</b> Categories <b>Table Description:</b> Contains information about each medical category <b>Related Table:</b> Test						
<b>Id</b>	<b>Field</b>	<b>Description</b>	<b>Data Type</b>	<b>Length</b>	<b>Allowed Null</b>	<b>Sample Data</b>
<b>PK</b>	CategoryID	Category's unique identifier	autonum	30	Not Null	2
	CategoryName	Name of the medical category	Short text	150	Not Null	Serology
	Description	Information or purpose of category	Short text	255	Not Null	Blood test to detect anti-bodies against microorganisms

**Table 4** *New Patients Table Data Dictionary*

<b>Table Name:</b> New Patients <b>Table Description:</b> Contains Patients Information						
--	--	--	--	--	--	--



**Related Table:**

Id	Field	Description	Data Type	Length	Allowed Null	Sample Data
PK	PatientID	Patient's unique identifier	autonum	30	Not Null	1
	PatientName	Name of the patient	Short text	255	Null	Lea S. Cabrera
	Gender	Patient's gender	Short text	50	Null	Female
	Birthdate	Patient's DOB	datetime	—	Null	22/07/1988
	Address	Patient's Address	Short text	255	Null	12 Sampaloc Street
	MobileNo	Patient's contact info	Short text	11	Null	09283893491

**Table 5** *Test Table Data Dictionary*

**Table Name:** Test Table

**Table Description:** Contains Test Information

**Related Table:** Categories

Id	Field	Description	Data Type	Length	Allowed Null	Sample Data
PK	TestID	Test unique identifier	autnnum	30	Not Null	1
	TestName	Test name	Short text	255	Not Null	Bleeding Time
	NormalRange	Normal range of	Short text	50	Not Null	2



		every type of test				
	Unit	Measurement of sample	Short text	50	Not Null	mins
	Price	Price per test	number	50	Null	85
<b>FK</b>	CategoryID	Category unique identifier	autonum	30	Null	1
	Category	Name of the category	Short text	255	Null	Hematology

**Table 6** *Transactions Table Data Dictionary*

<b>Table Name:</b> Transactions <b>Table Description:</b> Contains basic background information about the transaction <b>Related Table:</b> TransactionDetail, Patient, Doctors, Examiners						
Id	Field	Description	Data Type	Length	Allowed Null	Sample Data
<b>PK</b>	TransactionID	Transaction unique identifier	autonum	30	Not Null	3
<b>FK</b>	PatientID	Patient's unique identifier	autonum	30	Null	1
	FullName	Patient's name	Short text	50	Null	Lea S. Cabrera
	Sex	Patient's sex	Short text	50	Null	Female
	Birthdate	Patient's DOB	datetime	—	Null	22/07/1988



	PatientAddress	Category unique identifier	Short text	255	Null	#12 Sampaloc Street
	MobileNo	Patient's contact	number	11	Null	09283893491
<b>FK</b>	DoctorID	Doctor's Unique Identifier	autonum	30	Null	1
	DoctorName	Doctor's name	Short text	255	Null	DR. Ross Batol Sr.
<b>FK</b>	ExaminerID	Examiner's Unique Identifier	autonum	30	Null	2
	ExaminerName	Examiner's name	Short text	255	Null	Jules Lopez Lagrama
	DateandItem	Date and time of transaction	datetime	—	Not Null	25/07/2022 3:43:37 pm

**Table 7** *TransactionDetails Table Data Dictionary*

<b>Table Name:</b> TransactionDetails <b>Table Description:</b> A subform of Transactions table. Contains the test information availed by the patient <b>Related Table:</b> Transaction, Patient, Doctors, Examiners						
<b>Id</b>	<b>Field</b>	<b>Description</b>	<b>Data Type</b>	<b>Length</b>	<b>Allowed Null</b>	<b>Sample Data</b>
<b>PK</b>	Tid	Transaction-Detail unique identifier	autonum	30	Not Null	7



<b>FK</b>	TestID	Test's unique identifier	autonum	30	Null	2
	TestName	Name of availed test	Short text	50	Not Null	Erythrocyte Sedimentation
	Result	Result of patient's test	Short text	50	Null	7
	Unit	Measurement of sample	Short text	50	Not Null	mm/hr
	NormalRange	Normal range of every type of test	Short text	50	Not Null	0-29
	Amount	Total amount due	num	100	Null	110
<b>FK</b>	TransactionID	Transaction's unique identifier	autonum	30	Null	3
<b>FK</b>	CategoryID	Categories's unique identifier	autonum	30	Null	1
	Category	Name of category	Short text	255	Null	Hematology

**Table 8** *User Data Dictionary*

**Table Name:** User

**Table Description:** Contains information about the users of the system

**Related Table:**

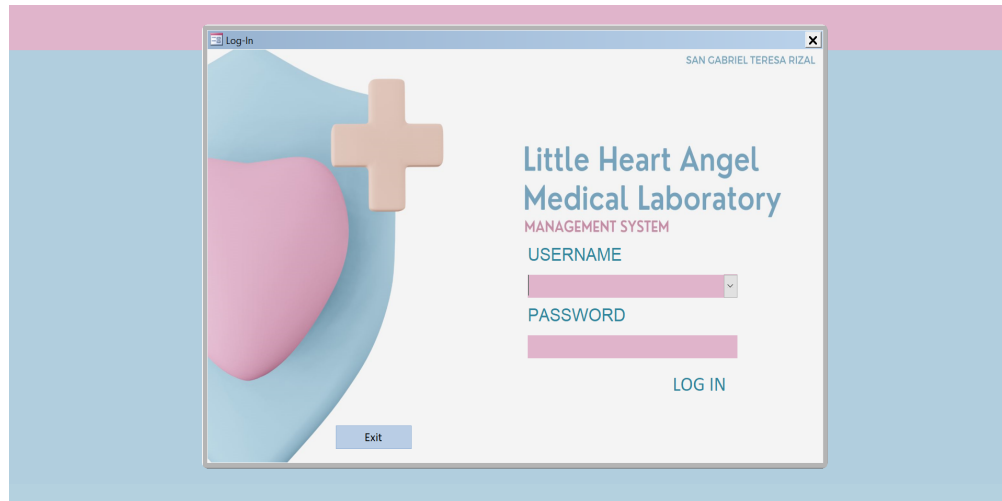


<b>Id</b>	<b>Field</b>	<b>Description</b>	<b>Data Type</b>	<b>Length</b>	<b>Allowed Null</b>	<b>Sample Data</b>
	UserID	User's unique identifier	autonum	30	Not Null	1
<b>PK</b>	UserName	Name assigned to user	shor text	50	Null	RMT
	UserSecurity	Password to access system	short text	50	Null	admin
	UserIdle	Automatic lock when the system is left unattended for a defined time.	num	50	Null	30

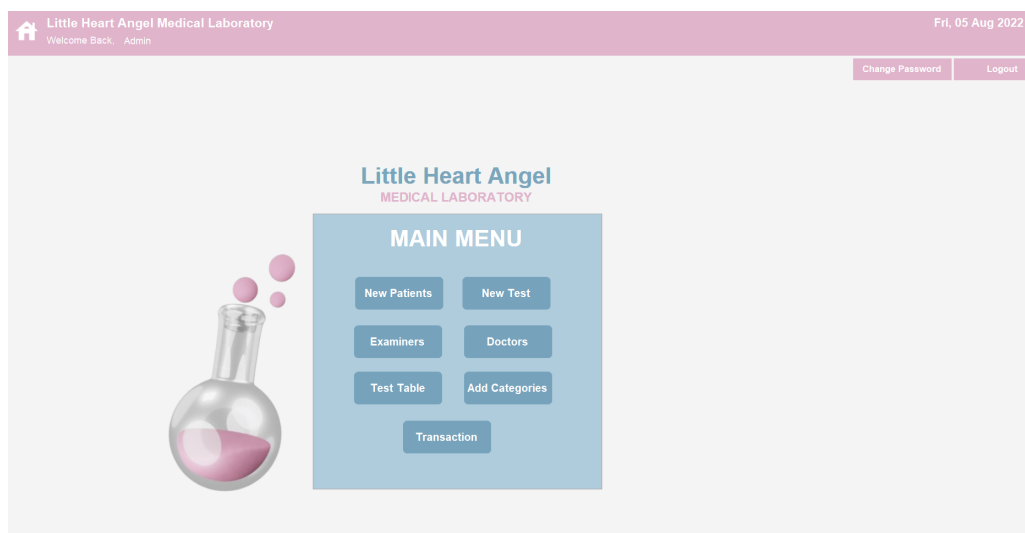
### 3.3 System Design

#### 3.3.1. Screen Design

*Figure 1. Log-in Interface*



*Figure 2. Main Menu*





**Figure 3.** After selecting ‘New Patients’ from Main Menu

Provides buttons to add, edit or delete records.

Shows the complete list of registered patients.

FULL NAME	SEX	BIRTHDATE	ADDRESS	MOBILE
Lea S. Cabrera	FEMALE	22/07/1988	#12 Sampaloc Street	09283893491
Leo M. Santos	MALE	02/02/2002	#13 Santol Street	09347891274
Pinky S. Pilar	FEMALE	01/08/2001	#14 Pinya Street	09294189242
Carlo Inovero	MALE	05/08/1997	Teresa, Rizal	0912345589
Paula Martinez	FEMALE	04/08/1999	#15 Pinya Street	09242108408





**Figure 3.1. 'Search' option to find specific patient**

**PATIENTS**

PATIENTS NAME

Search

PATIENTS LIST + ADD + EDIT 🗑 DELET

FULL NAME	SEX	BIRTHDATE	ADDRESS	MOBILE
Pinky S. Pilar	FEMALE	01/08/2001	#14 Pinya Street	09294189242

CLOSE

**Figure 3.2. 'Edit' button to edit information of a specific patient**

**PATIENTS**

PATIENTS NAME

Search

PATIENTS LIST + ADD + EDIT 🗑 DELET

PATIENT DETAILS

FULL NAME

SEX

BIRTHDATE

ADDRESS

MOBILE

CLOSE



**Figure 3.3. ‘Add’ button to add a new patient**

PATIENT DETAILS

⌂ PATIENT DETAILS

FULL NAME

SEX

BIRTHDATE

ADDRESS

MOBILE

**Figure 4. After selecting “New Test” from Main Menu**

frmTransactions

⌂ NEW TEST

+ ADD PATIENT

📄 INVOICE

🖨 RESULT

🗑 DELETE

✅ SAVE

PATIENT INFORMATION

TEST

FULL NAME

SEX

BIRTHDATE

ADDRESS

MOBILE

DOCTOR

EXAMINER

TEST DATE and TIME

09/08/2022 4:53:35 pm

TEST NAME	RESULT	UNIT	NORMAL RANGE
X			



**Figure 4.1** Selecting the ‘Add Patient’ Button

frmTransactions

NEW TEST

ADD PATIENT INVOICE RESULT DELETE SAVE

PATIENT INFORMATION TEST

FULL NAME  
SEX  
BIRTHDATE  
ADDRESS  
MOBILE  
DOCTOR  
EXAMINER

TEST DATE and TIME  
09/08/2022 4:53:35 pm

TEST NAME	RESULT	UNIT	NORMAL RANGE
X			

**Figure 4.1.2** ‘Patient Search’ window will pop up upon clicking

PATIENT SEARCH

PATIENT SEARCH Type to Search...

FULL NAME	SEX	BIRTHDATE	ADDRESS	MOBILE
Lea S. Cabrera	FEMALE	22/07/1988	#12 Sampaloc Street	09283893491
Leo M. Santos	MALE	02/02/2002	#13 Santol Street	09347891274
Pinky S. Pilar	FEMALE	01/08/2001	#14 Pinya Street	09294189242
Carlo Inovero	MALE	05/08/1997	Teresa, Rizal	0912345589
Paula Martinez	FEMALE	04/08/1999	#15 Pinya Street	09242108408

CHOOSE NEW PATIENT



**Figure 4.1.3.** Clicking ‘Choose’ button to enter patient information

PATIENT SEARCH

**X PATIENT SEARCH** Type to Search...

FULL NAME	SEX	BIRTHDATE	ADDRESS	MOBILE
Lea S. Cabrera	FEMALE	22/07/1988	#12 Sampaloc Street	09283893491
Leo M. Santos	MALE	02/02/2002	#13 Santol Street	09347891274
Pinky S. Pilar	FEMALE	01/08/2001	#14 Pinya Street	09294189242

**CHOOSE** **NEW PATIENT**

**Figure 4.1.4.** ‘Patient Information’ automatically fills up

fmTransactions

**NEW TEST**

**+** ADD PATIENT **📄** INVOICE **🖨** RESULT **🗑** DELETE **✅** SAVE

**PATIENT INFORMATION** **TEST**

	TEST NAME	RESULT	UNIT	NORMAL RANGE
FULL NAME	Pinky S. Pilar	X		
SEX	FEMALE			
BIRTHDATE	01/08/2001			
ADDRESS	#14 Pinya Street			
MOBILE	09294189242			
DOCTOR				
EXAMINER				
TEST DATE and TIME	09/08/2022 4:53:35 pm			



**Figure 4.1.5. Selecting ‘Doctor’ and ‘Examiner’ from drop-down menu**

Doctor’s name can also be typed/filled on the textbox.

frmTransactions

**NEW TEST**

**PATIENT INFORMATION**

FULL NAME: Pinky S. Pilar

SEX: FEMALE

BIRTHDATE: 01/08/2001

ADDRESS: #14 Pinya Street

MOBILE: 09294189242

DOCTOR: DR. Annie Ramos

EXAMINER: Kim Reyes Cruz

TEST DATE: 09/08/2022 4:53:35 pm

**TEST**

TEST NAME	RESULT	UNIT	NORMAL RANGE
X			

**Figure 4.1.6. Selecting ‘Test Name’ from drop-down menu**

Test can also be typed and then it’ll automatically find its match through the tests list.

frmTransactions

**NEW TEST**

**PATIENT INFORMATION**

FULL NAME: Pinky S. Pilar

SEX: FEMALE

BIRTHDATE: 01/08/2001

ADDRESS: #14 Pinya Street

MOBILE: 09294189242

DOCTOR: DR. Annie Ramos

EXAMINER: Kim Reyes Cruz

TEST DATE and TIME: 09/08/2022 5:41:19 pm

**TEST**

TEST NAME	RESULT	UNIT	NORMAL RANGE
X Platelet Count		mcl	150,000-450,000
X Erythrocyte Sedimentation Rate		mm/hr	0-29
X MCH		g/dL	33.4-35.5
X T4		ng/dL	5.0-12
X Routine Urinalysis			
X Routine Urinalysis			
Routine Fecalysis			
Fecal Occult Blood			2-3
Semen Volume			1.5-5
Sperm Motility			25-30
Blood Sugar(FBS,RBS)			80-100
Blood Uric Acid			6-8
Creatinine			0.6-1.3
Blood Urea Nitrogen			7-22
SGPT/ALT			7-55
SGOT/AST			4-40
Sodium			135-145
Potassium			3.6-5.2
Calcium			8.6-10.3
Blood Type			



**Figure 4.1.7. ‘Units’ and ‘Normal Range’ automatically fills up based on selected test**

**PATIENT INFORMATION**

FULL NAME: Pinky S. Pilar  
SEX: FEMALE  
BIRTHDATE: 01/08/2001  
ADDRESS: #14 Pinya Street  
MOBILE: 09294189242  
DOCTOR: DR. Annie Ramos  
EXAMINER: Kim Reyes Cruz  
TEST DATE and TIME: 09/08/2022 5:41:19 pm

**TEST**

TEST NAME	RESULT	UNIT	NORMAL RANGE
Platelet Count		mcl	150,000-450,000
Erythrocyte Sedimentation Rate		mm/hr	0-29
MCH		g/dL	33.4-35.5
T4		ng/dL	5.0-12
Routine Urinalysis			
Routine Fecalysis			
Fecal Occult Blood	2-3		
Semen Volume	1.5-5		
Sperm Motility	25-30		
Blood Sugar(FBS,RBS)	80-100		
Blood Uric Acid	5-6		
Creatinine	0.6-1.3		
Blood Urea Nitrogen	7-22		
SGPT/ALT	7-55		
SGOT/AST	4-40		
Sodium	135-145		
Potassium	3.6-5.2		
Calcium	8.6-10.3		
Blood Type			

**Figure 4.1.8. ‘Result’ to be filled by the examiner based on test results**

(Section showing test with multiple results [Urinalysis] is envisioned only, ergo not functional)

**PATIENT INFORMATION**

FULL NAME: Pinky S. Pilar  
SEX: FEMALE  
BIRTHDATE: 01/08/2001  
ADDRESS: #14 Pinya Street  
MOBILE: 09294189242  
DOCTOR: DR. Annie Ramos  
EXAMINER: Kim Reyes Cruz  
TEST DATE and TIME: 09/08/2022 5:53:51 pm

**TEST**

TEST NAME	RESULT	UNIT	NORMAL RANGE
Platelet Count	160,000	mcl	150,000-450,000
Erythrocyte Sedimentation Rate	14	mm/hr	0-29
MCH	30	g/dL	33.4-35.5
T4	9	ng/dL	5.0-12
Routine Urinalysis			
Color: Yellow		---	Yellow
Transparency: Clear		---	Clear/Cloudy
Specific Gravity: 1.015		---	1.000-1.060
pH: 6		---	5-9
Glucose: 0		mg/dL	<20
Blood: 0		md/dL	<0.02



Figure 4.1.9. 'Save' button saves the transaction on 'Transaction'

TEST NAME	RESULT	UNIT	NORMAL RANGE
Platelet Count	160,000	mcL	150,000-450,000
Erythrocyte Sedimentation Rate	14	mm/hr	0-29
MCH	30	g/dL	33.4-35.5
T4	9	ng/dL	5.0-12
Routine Urinalysis			
Color: Yellow	---	---	Yellow
Transparency: Clear	---	---	Clear/Cloudy
Specific Gravity: 1.015	---	---	1.000-1.060
pH: 6	---	---	5-9
Glucose: 0	---	---	<20
Blood: 0	---	---	<0.02

Figure 4.2.1 'Invoice' button generates an invoice of the record showing a breakdown of cost of availed tests

WE HAVE THE RIGHT TO REFUSE SERVICES FOR FAILURE TO PAY

**Little Heart Angel**  
MEDICAL LABORATORY

Transaction No: 18

**INVOICE**

Requested on: 09/08/2022 6:21:00 pm  
Amount due: P75.00

Examiner: Kim Reyes Cruz  
Doctor: DR. Annie Ramos  
Patient: Pinky S. Pilar Sex: FEMALE Age: 01/08/2001

TESTS ORDERED	COST OF TEST
CLINICAL MICROSCOPY	
Routine Urinalysis	P110.00
HEMATOLOGY	
MCH	P80.00
Erythrocyte Sedimentation Rate	P110.00
Platelet Count	P90.00
SEROLOGY	
T4	P485.00



**Figure 4.2.2 'Result' button generates the result form and a bill with automated calculation**

*(Section showing test with multiple results [Urinalysis] is envisioned only)*

OFFICIAL AND CERTIFIED COPY

DATE: 09/08/2022 6:21:00 pm  
AMOUNT: 875.00

**Little Heart Angel**  
MEDICAL LABORATORY  
57 Brgy. San Gabriel Magsaysay Avenue Teresa Rizal  
75540465 / 09903938561

Examiner: Kim Reyes Cruz  
Doctor: DR. Annie Ramos  
Patient: Pinky S. Pilar

(should be 'age')  
Sex: FEMALE Birth date: 01/08/2001

TEST NAME	TEST RESULT	UNIT	NORMAL RANGE
CLINICAL MICROSCOPY			
Routine Urinalysis	Blood: 0	mg/dL	<0.02
	Glucose: 0	mg/dL	<20
	pH: 6	---	5-9
	Specific Gravity: 1.015	---	1.000-1.060
	Transparency: Clear	---	Clear/Cloudy
	Color: Yellow	---	Yellow
HEMATOLOGY			
MCH	30	g/dL	33.4-35.5
Erythrocyte Sedimentation Rate	14	mm/hr	0-29
Platelet Count	160,000	mcL	150,000-450,000
SEROLOGY			
T4	9	ng/dL	5.0-12





**Figure 4.2.3. CTRL+P command gives the option to physically print the form or export as a digital file (through PDF etc)**

OFFICIAL AND CERTIFIED COPY

DATE: 09/08/2022 6:21:00 pm  
AMOUNT: 875.00

**Little Heart Angel**  
MEDICAL LABORATORY

Printer: Microsoft Print to PDF  
Status: Ready  
Type: Microsoft Print To PDF  
Where: PORTPROMPT:  
Comment: ☐ Print to File

Print Range: ☒ All  
☐ Pages From: To:  
☐ Selected Record(s)

Copies: Number of Copies: 1  
☒ Collate

Setup... OK Cancel

Examiner: Kim R  
Doctor: DR. A  
Patient: Pinky

TEST N  
Routine U

01/08/2001

Normal Range

<0.02  
<20  
5-9  
1.000-1.060  
Clear/Cloudy  
Yellow

Specific Gravity: 1.015  
Transparency: Clear  
Color: Yellow

HEMATOLOGY

MCH 30 g/dL 33.4-35.5  
Erythrocyte Sedimentation Rate 14 mm/hr 0-29  
Platelet Count 160,000 mcL 150,000-450,000

SEROLOGY

T4 9 ng/dL 5.0-12

**Figure 4.2.4 'Delete', 'Save'.**

frmTransactions

NEW TEST

+ ADD PATIENT INVOICE RESULT DELETE SAVE

PATIENT INFORMATION

FULL NAME  
SEX  
BIRTHDATE  
ADDRESS  
MOBILE  
DOCTOR  
EXAMINER

TEST DATE and TIME  
09/08/2022 6:52:34 pm

TEST

TEST NAME	RESULT	UNIT	NORMAL RANGE
X			



**Figure 5. After selecting ‘Examiner’ from Main Menu**

The underlined section shows a range of buttons to exit, save, add new, delete, refresh & navigate.

The upper part shows a mini fill-up section to input or edit records.

The lower part shows the full list of the examiners.

ID	FULL NAME
4	Cynthia Delia Salazar
3	Jillian Delos Reyes
2	Jules Lopez Lagrama
1	Kim Reyes Cruz












**Figure 6. After selecting ‘Doctors’ from Main Menu**

The underlined section shows a range of buttons to exit, save, add new, delete, refresh & navigate.

The upper part shows a mini fill-up section to input or edit records.

The lower part shows the full list of the doctors.

 **DOCTOR**



DoctorID:

Doctor Name:

Description:

ID	DOCTOR NAME	DESCRIPTION
1	DR. Ross Batol Sr.	M.D. General Physician
2	DR. Ma. Cynthia Arellano	M.D. Internal Medicine
3	DR. Leila Santiago	M.D Endocrinologist



**Figure 7. After selecting 'Test Table' from Main Menu**

The underlined section shows a range of buttons to exit, save, add new, delete, refresh & navigate.

The upper part shows a mini fill-up section to input or edit records.

The lower part shows the full list of the tests.

When adding test, category can be specified by typing or using the the drop-down menu.

TEST NAME	NORMAL RANGE	UNIT	PRICE
Platelet Count	150,000-450,000	mcL	90.00
Erythrocyte Sedimentation Rate	0-29	mm/hr	110.00
Bleeding Time	2-7	mins	85.00
Clotting Time	10-13	seconds	85.00
WBC count	4-15.5	cmm	110.00
Hemoglobin	9.9	g/dL	40.00
Hematocrit	38-50	%	40.00
MCV	80-100	fl	70.00
MCH	33.4-35.5	g/dL	80.00
Pregnancy Test	---	---	150.00
HBsAg	0.05-250	IU/mL	150.00
Anti-Syphilis Test	---	---	200.00
Typhoid Test	anti-TH <160, & anti-TO <180	---	390.00



**Figure 7. 1. ‘Filter by Category’ option allows to sort tests listed on the test table according to the typed/entered category**

TEST DETAILS

**TEST DETAILS**

Test ID: 1

Test Name: Platelet Count

Unit: mcL

NormalRange: 150,000-450,000

Price: 90.00

Category: Hematology

Filter by Category: Hematology

TEST NAME	NORMAL RANGE	UNIT	PRICE
Platelet Count	150,000-450,000	mcL	90.00
Erythrocyte Sedimentation Rate	0-29	mm/hr	110.00
Bleeding Time	2-7	mins	85.00
Clotting Time	10-13	seconds	85.00
WBC count	4-15.5	cmm	110.00
Hemoglobin	9.9	g/dL	40.00
Hematocrit	38-50	%	40.00
MCV	80-100	fl	70.00
MCH	33.4-35.5	g/dL	80.00



**Figure 8. After selecting ‘Add Categories’ from Main Menu**

The underlined section shows a range of buttons to exit, save, add new, delete, refresh & navigate.

The upper part shows a mini fill-up section to input or edit records.

The lower part shows the full list of the categories.

PATIENT DETAILS

**CATEGORY**

Category ID:


Category Name:

Description:

ID	CATEGORY NAME	DESCRIPTION
1	Hematology	Blood test to detect blood-related diseases
2	Serology	Blood test to detect anti-bodies against microorganisms
3	Clinical Chemistry	Measure levels of body fluids and tissues
4	Clinical Microscopy	Routine and special tests urine and fecal samples




9. After selecting 'Transaction' from Main Menu


 **TRANSACTION**


**PATIENTS NAME**


Search



**PATIENTS DATA**

 **ADD**

 **EDIT**

 **DELETE**

ID	TRANSACTION DATE	TESTS ORDERED
6	03/08/2022 3:10:13 pm	Platelet Count
6	03/08/2022 3:10:13 pm	Erythrocyte Sedimentation Rate
6	03/08/2022 3:10:13 pm	MCH
6	03/08/2022 3:10:13 pm	T4
6	03/08/2022 3:10:13 pm	Routine Fecalalysis
6	03/08/2022 3:10:13 pm	Fecal Occult Blood



### 9.1. Proposed 'Transaction' from Main Menu

'Transaction' should have ID, Patient Name, Date & Time, and Status.

If 'Patient Name' is clicked, the Test Transaction form should pop up.

'Status' checkbox should be used to verify if transaction is completed.

RECORD OF APPROPRIATION AND OBLIGATIONS

## TRANSACTION

### PATIENTS NAME

Search

### PATIENTS DATA

**+** ADD **EDIT** **DELETE**

ID	PATIENT NAME	DATE & TIME	STATUS
6	Juan Dela Cruz	05/08/2022 7:30:33 pm	<input type="checkbox"/>
7	Pinky S. Pilar	05/08/2022 8:00:20 pm	<input type="checkbox"/>





### 3.3.2 Screen Inventory

No.	Name of Screen	Description
1.	LOG IN SCREEN	This is the first page which prompts the user to enter a username and a password in order to be granted access onto the system.
2.	MAIN MENU	This is the homepage which displays the other pages which the user chooses to access.
3.	NEW PATIENTS	This is where the user has the option to <i>add, edit, delete and search</i> for patient information. It also displays the list of patients entered into the system.
4.	NEW TEST	This is where the user may generate the result form itself. In this page, the user can encode Patient Information (fetching data from other tables) and select the doctor and examiner assigned to the patient. This is also where the user can select the tests requested, save the record for later modifications, and print the laboratory result form (which serves as the bill)



5.	NEW EXAMINERS	This is where the user can <i>add, edit, or delete</i> basic information about the laboratory examiners (or medical technicians)
6.	NEW DOCTORS	This is where the user can <i>add, edit, or delete</i> basic information about the referred physicians who prescribed the tests to the patients.
7.	TEST TABLE	This is where the user can <i>add, edit, or delete</i> information about specific tests (including the name of the test, unit, normal range) . Also displayed on this page is the list of tests entered on the system.
8.	ADD CATEGORIES	This is where the user can <i>add, edit, or delete</i> information about the primary categories which encompass the tests.
9.	TRANSACTION	This is where the user can see saved transactions which they can later modify. It contains the TransactionID for reference, and also has a <i>Status</i> (in the form of a checkbox) to help the examiners keep track of transactions that have



		been encoded, billed and completed.
10.	CHANGE PASSWORD	This is a small window which may provide the user the option to change the database's log-in credentials (password).

### 3.3.3 List of Intelligent Queries

#### 3.3.3.1 Inquiries/Questions (Sentence Format)

Questions (in Sentence Form)
a. Get username credentials from the User Table in order to allow access to the system
b. Get the user's password from the User Table in order to allow access to the system.
c. Get information from the Doctors Table to display in the Doctors Form
d. Display a list in the Doctors Form with the selected information from Doctors Table
e. Get information from the Examiners Table to display in the Examiner Form



f. Display a list in the Examiner Form with the selected information from the Examiner Table. The Examiner name should be displayed in full.

g. Make a list in the History Form with the selected information from the History Search Query

h. Get information from the Categories Table to display in the Category Form

i. Display a list in the Category Form with the selected information from Categories Table

j. Generate a new test form containing the information from Transactions Table

k. Make a subform containing selected basic information from the Test Table

l. Select particular set of availed tests from the TransactionDetails Table

m. Display a list in the Patient Search Form with the selected information from the Patient Search query.

n. Display the complete list of tests using the data from the Test Table



o. Connect Transactions Table and TransactionDetails Table in order to display selected details from both tables in the Transactions Form

p. Get and display a list of availed test and cost of each test, to be generated in an Invoice form

q. Sort the lists of tests according to the user's entered category.

r. Display the new list of tests after sorting according to the entered category.



### 3.3.3.2 Answer (SQL Statements)

#### Answers (in SQL Form)

a. SELECT tblUser.UserName\*FROM tblUser;

b. SELECT tblUser.UserSecurity\*FROM tblUser;

c. SELECT tblDoctors.\* FROM frmDoctors;

d. SELECT frmDoctors.DoctorID, frmDoctors.DoctorName, frmDoctors.Description

e. SELECT frmExaminers.\* FROM frmExaminers;

F. SELECT frmExaminers.ExaminersID,  
IIf(IsNull([LastName]),IIf(IsNull([FirstName]),[FirstName]),IIf(IsNull([FirstName]),[  
LastName],[FirstName] & " " & [MiddleName] & " " & [LastName])) AS [Full Name]  
FROM frmExaminers  
  
ORDER BY  
IIf(IsNull([LastName]),IIf(IsNull([FirstName]),[FirstName]),IIf(IsNull([FirstName]),[  
LastName],[FirstName] & " " & [MiddleName] & " " & [LastName]));



g. SELECT HistorySearch.TransactionID, HistorySearch.DateAndItem,  
HistorySearch.TestName, HistorySearch.FullName, HistorySearch.DoctorName,  
HistorySearch.Examiner

FROM HistorySearch;

h. SELECT tblCategories.\* FROM tblCategories;

i. SELECT tblCategories.CategoryID, tblCategories.CategoryName,  
tblCategories.Description

j. SELECT tblTransactions\* FROM tblTransactions;

k. SELECT tblTest.TestID, tblTest.TestName, tblTest.NormalRange, tblTest.Unit,  
tblTest.Price, tblTest.CategoryID, tblTest.Category

FROM tblTest;

l. SELECT tblTransactionDetails.\* FROM tblTransactionDetails;

m. SELECT PatientSearchQry.PatientID, PatientSearchQry.PatientName,  
PatientSearchQry.Gender, PatientSearchQry.Birthdate, PatientSearchQry.Address,  
PatientSearchQry.MobileNo



FROM PatientSearchQry;

n. SELECT tblTest.TestID, tblTest.TestName, tblTest.NormalRange, tblTest.Unit,  
tblTest.Price

FROM tblTest;

o. SELECT tblTransactions.TransactionID, tblTransactions.DateAndItem,  
tblTransactionDetails.TestName, tblTransactions.FullName,  
tblTransactions.DoctorName, tblTransactions.Examiner

FROM tblTransactions INNER JOIN tblTransactionDetails ON  
tblTransactions.TransactionID = tblTransactionDetails.TransactionID

WHERE (((tblTransactions.TransactionID) Like "\*" &  
[forms]![frmHistory]![SrchText] & "\*")) OR (((tblTransactionDetails.TestName) Like  
"\*" & [forms]![frmHistory]![SrchText] & "\*")) OR (((tblTransactions.FullName) Like  
"\*" & [forms]![frmHistory]![SrchText] & "\*")) OR (((tblTransactions.DoctorName)  
Like "\*" & [forms]![frmHistory]![SrchText] & "\*")) OR (((tblTransactions.Examiner)  
Like "\*" & [forms]![frmHistory]![SrchText] & "\*"));

p. SELECT tblTransactionDetails.Tid, tblTransactionDetails.TransactionID,  
tblTransactionDetails.TestID, tblTransactionDetails.TestName,  
tblTransactionDetails.Result, tblTransactionDetails.Unit,  
tblTransactionDetails.NormalRange, tblTransactionDetails.Category,  
tblTransactionDetails.Amount





FROM tblTransactionDetails;

q. SELECT tblTest.TestID, tblTest.TestName, tblTest.NormalRange, tblTest.Unit,  
tblTest.Price, tblTest.CategoryID, tblTest.Category

FROM tblTest

WHERE (((tblTest.Category) Like "\*" & [Forms]![TestDetails]![SearchBox] & "\*"));

r. SELECT TestSearch.TestName, TestSearch.NormalRange, TestSearch.Unit,  
TestSearch.Price

FROM TestSearch;



## Chapter 4

### Findings, Conclusion and Recommendation

#### 4.1 Findings

A database is important because it serves as the main framework for storing information and records. The implementation of databases provides the way for easier navigation to the rendered and stored information. And the database management system that was created for this project is functional and easy to use, and it meets the client's requirements. In addition, the newly designed database offers a secured system that limits access to data to the owner and other Examiners (Medical Technologists). Information about patients and other data may now be registered, retrieved, and updated more quickly and easily. In order to fulfill and lessen the daily workload of Examiners, provide a pleasant experience for patients, and adhere to the strategic goal of the laboratory, this system was specifically created in accordance with Little Heart Medical Laboratory's daily lab procedure.

#### 4.2 Conclusions

The implementation of the Little Heart Angel Database System, the confidentiality of their files has been secured, and they have gained an advantage when it comes to maintaining a record of the information pertaining to their patients and the condition of their health. The developers were able to carry out all of the functions well and were making good progress on the duties that the clients expected. Additionally, it provides a way to address the issue of having the simplest method to store data and transact with the patient while yet having its own control of the system.



### 4.3 Recommendations

To enhance its effectiveness and usefulness within this laboratory, we'd want to recommend including and adding some more features: This includes adding a feature in which examiners have the option to add parameters to certain tests, in order to accurately list down tests with multiple results. Since the laboratory processes a huge volume of tests in their daily operations, it becomes inevitable for some of the tests to be in a queue. That said, it would provide some benefit to add a feature which can send a notification to the patient that their laboratory result is ready to be retrieved.

Furthermore, future researchers should place their primary emphasis on discovering methods to enhance the user interface, database security, and functionality based on the feedback they get from clients. When it comes to system navigation and design, the present developers recommend updating and adding new features that will assist in making the database system more efficient and simpler to use. This will allow users to not have a difficult time finding out how to utilize the system.



## Appendixes

- **Database** - is an organized collection of structured information, or data, typically stored electronically on a computer system.
- **Visual Basic Application** - is an event-driven programming language and environment from Microsoft that provides a graphical user interface (GUI) which allows programmers to modify code by simply dragging and dropping objects and defining their behavior and appearance.
- **Structured Query Language** - is a standardized programming language that is used to manage relational databases and perform various operations on the data in them



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