

# **Web Based System for General Healthcare under the Supervision of a Physician**

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# **Web Based System for General Healthcare under the Supervision of a Physician**

**A dissertation submitted for the Degree of  
Master of Information Technology**

**A P Premathilake  
University of Colombo School of Computing  
2021**



## **Declaration**

The thesis is my original work and has not been submitted previously for a degree at this or any other university/institute.

To the best of my knowledge it does not contain any material published or written by another person, except as acknowledged in the text.

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Date: 04/09/2021

This is to certify that this thesis is based on the work of Ms. A P Premathilake under my supervision. The thesis has been prepared according to the format stipulated and is of acceptable standard.

Certified by:

Supervisor Name: Dr. H K T C Halloluwa

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Signature:

Date:

# Preface

In today's world where everything is automated, the goal of the project is to make an application that can automate self-administration under the supervision of a doctor. Therefore, it focuses on the practical challenges that patients face in the process of self-medication. When the patient takes the drug on the recommendations of other people, without having an advice from a doctor, it brings risks, such as incorrect self-diagnosis, drug interactions, and polypharmacy.

In this case, the focus of the project is to avoid incorrect self-diagnosis and monitor the health of patients. Then after establishing a collaboration between patients, doctors and pharmacists. It also provides primary medical care during this COVID 19 pandemic without the risk of infection spreading. Finally it moves patients towards considerable self-determination in making conclusion about management of minor sicknesses.

# Abstract

The aim of the ‘Web Based System for General Healthcare under the Supervision of a Physician’ system is producing delivery of safe drugs further with acceptable commandments about its use and if seek advice from a physician. Not only that, to provide primary healthcare during this pandemic without having risk of infection spread. The ‘Web Based System for General Healthcare under the Supervision of a Physician’ system is scalable in telemedicine scenarios involving different user roles in the application such as patients, doctors, pharmacists and the telemedicine provides easy-to-use options. The app can be accessed from anywhere. It will primarily reduce the day today activities and develop the best quality of reports and information or bills related to physicians and patients. It lessens time frame in entering any details related to hospital and thereby reduce the complication too.

This application is presenting the implementation of self-medication and remote control practices treatment in reaction to the COVID-19 epidemic in Sri Lanka including the technical implementations of data processing, manipulating and integrating.

# Acknowledgements

In fact, without a powerful encouragement crew, I would not have reached current success. In the first place, my supervisor Dr. H K T C Halloluwa who has gave forgiving advice, guidance and feedback throughout this project. Secondly, my family tree, my colleagues, who supported me with warmth and kindness. Much obliged for your steady support.

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# List of Acronyms

WBSGHSP

Web-based system for general  
healthcare under the supervision of a  
physician

# Chapter 1 - Introduction

For good health, we do self-medication in the expression of personal-care every day<sup>1</sup>. In the West around the 1960s, self-care and self-medication were considered unessential and even harmful practices<sup>2</sup>. Self-medication is normally defined as "taking medicine, herbs, or home remedies on your own or with the advice of others without consulting your doctor<sup>3</sup>".

Recommendations from family, friends, neighbors, pharmacists, previous prescription drugs, or advertisements in popular newspapers and magazines are usual roots of self-medication. This is why self-medication is becoming more and more important in today's healthcare field. It encourages patients to be more independent when making decisions about managing such minor illnesses. Some governments encourage the strengthening of self-care for mild diseases, together with self-medication<sup>45</sup>. Responsible self-medication can support lessen nursing costs, travel time and doctor time. In other words, consultation time<sup>6</sup>.

However, self-medication carries risks such as self-diagnosis errors, delays in seeking medical awareness if needed, drug overdose, long-term use, drug interactions, and multidrug properties. The latter has particular problems for the elderly. Antibiotic drug is currently a universal issue, mainly in developing countries where antibiotics are available without a recommendation. Therefore, the government must take the required standards to control responsible self-medication. This can be achieved by given safe medications, providing appropriate directions for use, and consulting a physician if necessary<sup>78</sup>.

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<sup>1</sup> Kayalvizhi: Evaluation of the perception, attitude... - Google Scholar

<sup>2</sup> Benefits and Risks of Self Medication | SpringerLink

<sup>3</sup> Dentistry and self-medication: a current challenge. - Abstract - Europe PMC

<sup>4</sup> [The physician and self medication]. - Abstract - Europe PMC

<sup>5</sup> [Self medication: does information to users increase at the same rate as consumption] - Abstract - Europe PMC

<sup>6</sup> How and why are non-prescription analgesics used in Scotland? | Family Practice | Oxford Academic (oup.com)

<sup>7</sup> Self-medication and health insurance coverage in Mexico - ScienceDirect

<sup>8</sup> WHO | World Health Organization

Furthermore, COVID-19 has had a revealing hit on healthcare internationally. Recently, many medical institutions have dropped or rescheduled outpatient treatment due to this COVID-19 virus. During this epidemic, because of the threat of spreading infection to patients and doctors, the providing of primary care appears to be hampered by poor control and interruption of medical care. Hospitals are now acknowledging to COVID-19 virus by rapidly providing digital devices and technologies to provide digital healthcare, or remotely using data and communication technology (ICT) to treat patients.

As a result, it is recommended to establish a partnership between patients, doctors and pharmacists to provide education and information on safe self-medication strategies to increase profits and minimize risks. Doctors are able to use a web-based general healthcare application to provide timely care with minimal contact and remote medical assistance. However, this platform is not suitable for emergency medical treatment.

### **1.1. Motivation**

According to the "Self-medication practices and misuse of medicine among mothers of young children attending a teaching hospital in Sri Lanka" article which was published by Faculty of Medical Sciences, University of Sri Jayewardenepura, Self-medication and misuse of medicines is a growing trend in current Sri Lankan society. 95% of participants self-medicated their children. Paracetamol was the drug used for self-medication by 92% throughout the time 8% used salbutamol, amoxicillin and chlorpheniramine. 95% of mothers who participated in OPD during this period conducted self-drug research on their children. There were scientifically remarkable relationship between higher academic level of mothers, unoccupied mothers, increasing age of child and increasing number of children with the habit to self-medicate the child<sup>9</sup>.

Self-medication is a self-initiated behavior. Therefore, in order to improve and expand the knowledge base of behaviors seeking medical care, it is necessary to understand the knowledge

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<sup>9</sup> (PDF) Self-medication practices and misuse of medicine among mothers of young children attending a teaching hospital in Sri Lanka (researchgate.net)

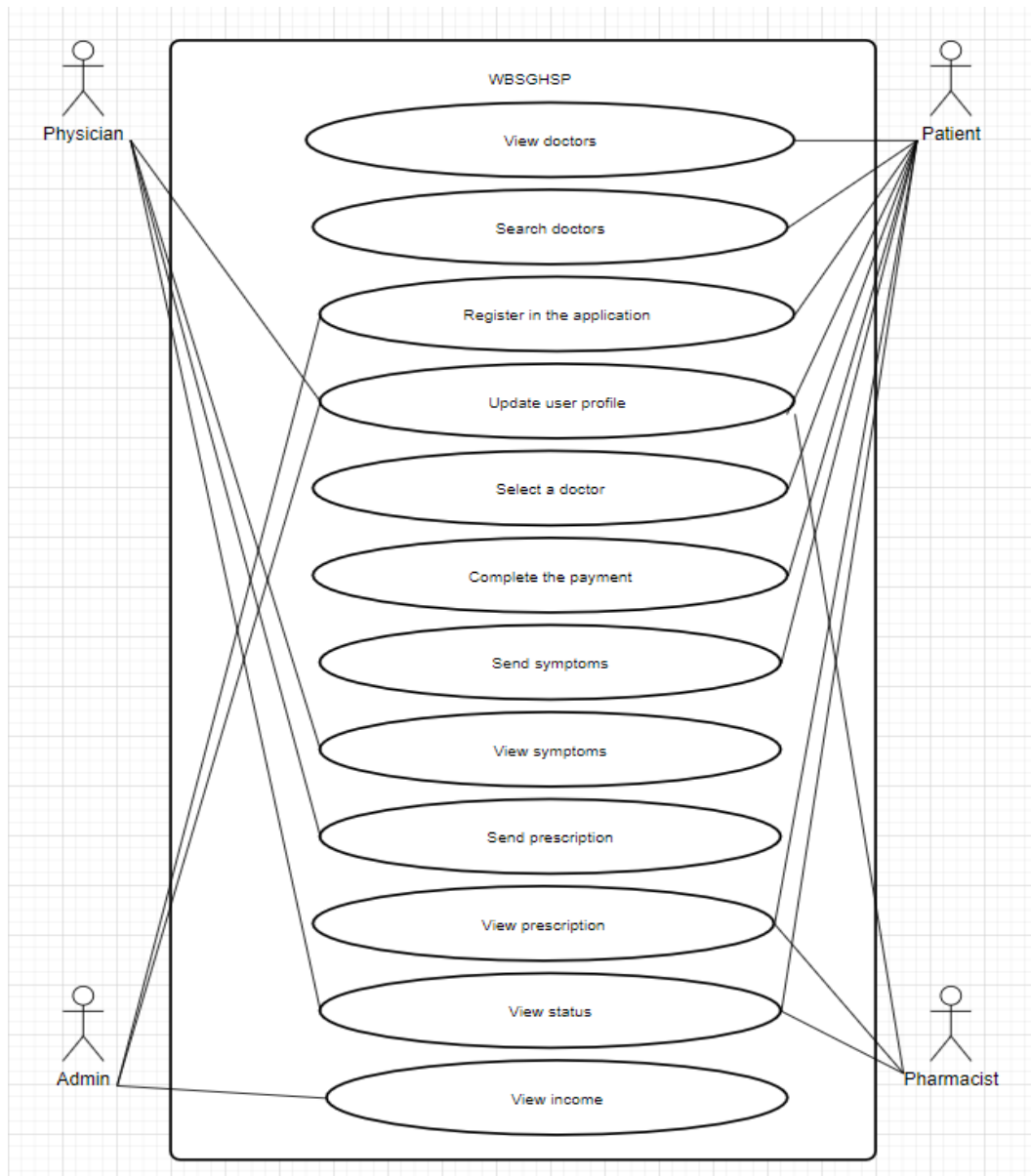
of behaviors related to substance use. The 'Web Based System for General Healthcare under the Supervision of a Physician' will be implemented taking into account the potential risks of self-medication and remote control practices treatment corresponds to the COVID-19 pandemic in Sri Lanka.

## **1.2. Objective**

- Avoid inaccurate self-diagnosis
- Avoid delays in seeking medical advice when needed
- Avoid use of uncontrolled drug dosage
- Avoid make longer duration of use
- Avoid drug interactions and multiple medications
- Monitoring patient health status
- Build partnerships between patients, doctors and pharmacists
- Avoid cancelling and postponing physically outpatient medical visits
- Delivering basic healthcare during this pandemic without having risk of infection spread

# Chapter 2 - Background

## 2.1. Requirement Analysis



**Figure 2.1:** Use Case diagram of 'Web Based System for General Healthcare under the Supervision of a Physician'

Admin has all the privileges in the system. Simply after login to the system, admin will manage the doctors, patients and the pharmacists. He has the power to add new doctors and pharmacists. And also admin will update the doctor information. Admin has the privilege to inactive any user doctor, patient or pharmacist from the system. The payments processed by the patients will be received to the admin.

- Admin will manage the doctors
  - Add new doctors to the system
  - Update doctor information
  - Inactive doctors from the system
- Admin will manage the patients
  - Inactive patients
  - Received payments from the patient
- Admin will manage the pharmacy
  - Add new pharmacy
  - Inactive pharmacy

Patients can sign up to the application by providing their basic information. And also they can maintain their own profile after sign in to the system. They have option to select various categories of physician. After selecting a category they will be able to choose their favorite doctor from the given list of doctors. Before sending a message to the doctor they will have to pay for it. After a successful payment process patient will get a chance to send their symptoms to the doctor by attaching their lab reports if it is necessary. Then after they will receive a doctor prescription from the doctor and also the necessary drugs physically from the pharmacy.

- Sign up to the application
- Update patient's profile
- Complete payment process
- Select a doctor
- Send a message and lab reports to the doctor

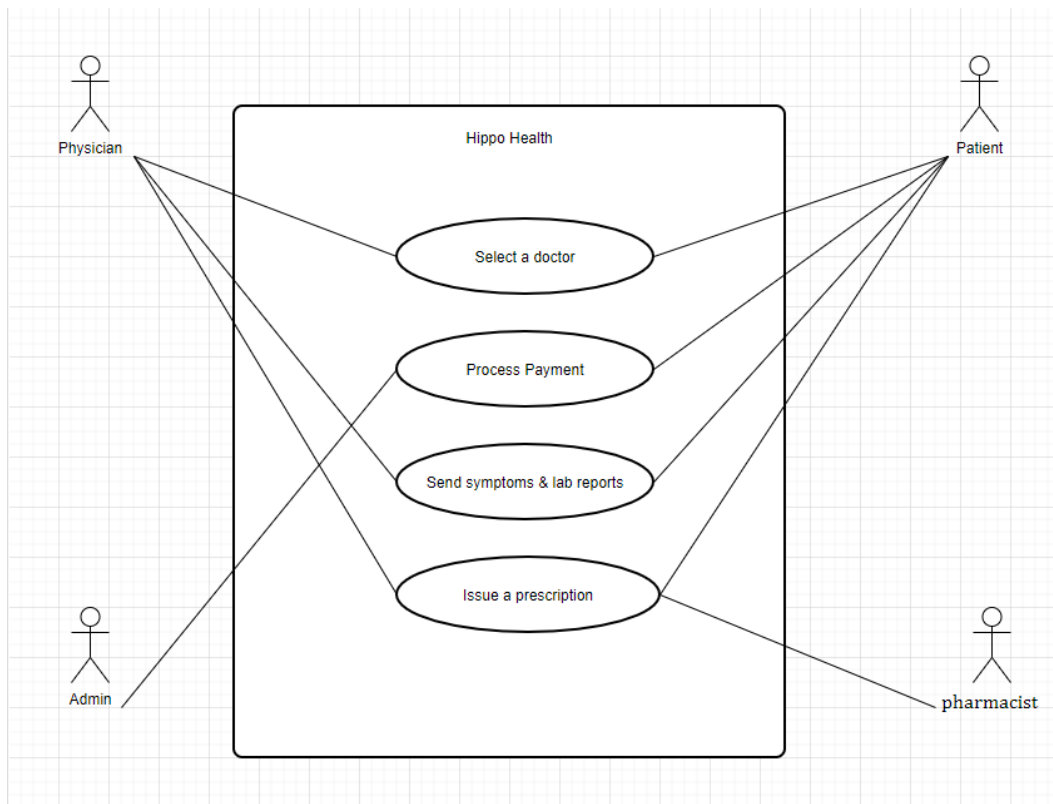
Doctors can login to the system with their own login credentials. Then they will be able to view the messages they received from the patients. According to the symptoms and the attached lab reports, they will be able to predict the illness. So the doctor prescription will be sent to the patient and the pharmacist. Given after doctor prescription, the process status will changed into done.

- View message and lab reports from the patient
- Issue drugs via message to the patient
- Send drug details to the pharmacy
- Update the status into done after a successful process

Login after with valid user credentials, pharmacist can view the doctor prescription. According to it they will physically delivered those drugs to the patients. After a successful process they can update the status into done.

- View the doctor statement
- Deliver medicine to the patient physically, and update the status in to 'Done' after a successful process.

## 2.2. Review of Similar Systems



**Figure 2.2:** Use Case diagram of existing system 'Hippo Health'

“Hippo Health is a safe, affordable, and easy-to-use approach to virtual medical care that offers open care networks for patients and care professionals. Hippo was founded and built by doctors who work to improve access to care, reduce unnecessary costs and improving quality outcomes for patients with complicated medical problems. It is available for both consumer use and licensing for doctors. Through the Hippo Health platform, patients attending the clinic can enter tap through conversations, messages without having to leave the house. It's a fast and intuitive way to connect with a doctor and receive expert medical care from the phone or desktop computer. Having private and secure chats with a real local doctor, receive treatment, including an assessment of the patient's symptoms, a diagnosis, and even a prescription at the local pharmacy. A transparent and open network platform allows patients and providers to

connect and communicate easily with the best local assistance professionals. Hippo Health aspires to help people feel cared for every step of the way when battling complex diseases through care network technology that seamlessly interfaces with each other virtual assistance. Hippo Health is currently only available to Colorado residents of the United States<sup>10</sup>”.

### **2.3. Quality of the solution**

Using the basic concept of the Hippo Health application, the 'Web Based System for General Healthcare under the Supervision of a Physician' will be implemented taking into account the potential risks of self-medication and the potential computer literacy rate and the remote control practices treatment in reaction to the COVID-19 epidemic in Sri Lanka.

The prevalence of Self-medication is higher in city region than in countryside zones of Sri Lanka. Admit to health care, contentment with pharmacy services and understanding of the seriousness of the disease were found to be important criteria for self-medication. Nearly 64% of families in Sri Lanka's urban backgrounds have taken self-medication. In these families, nearly one-third of acute illnesses act as a source of self-medication. Mothers who self-medicate their children also reach up to 85% in an urban area<sup>11</sup>.

Sri Lanka currently has a weak telecommunications infrastructure. Evidence of this is the lack of telephone contact with some parts of the country. Sri Lanka's general computer literacy disclosed in 2019 was 30.8%. It an increase of 3.2 percentage points from 2016 to 2019<sup>12</sup>. Therefore the 'Web Based System for General Healthcare under the Supervision of a Physician' will be implemented taking into account the potential computer literacy rate with easy to use customizable options and reduce the complexity too.

The COVID-19 epidemic has completely and rapidly changed the way doctors treat patients. Patients are concurrently reacting to COVID-19 with the fast use of digital tools and

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<sup>10</sup> Hippo Health

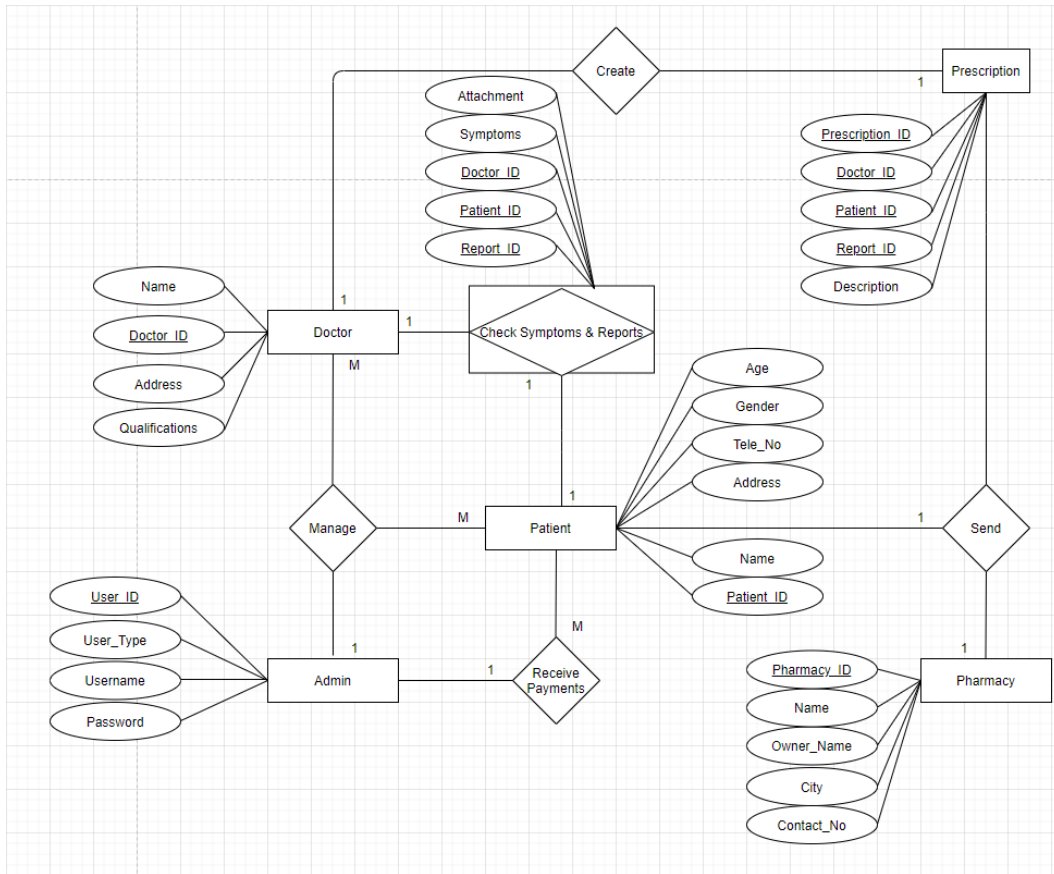
<sup>11</sup> WHO South-East Asia Journal of Public Health: Free full text articles from WHO South-East Asia Journal of Public Health ([who-seajph.org](http://who-seajph.org))

<sup>12</sup> Department of Census and Statistics

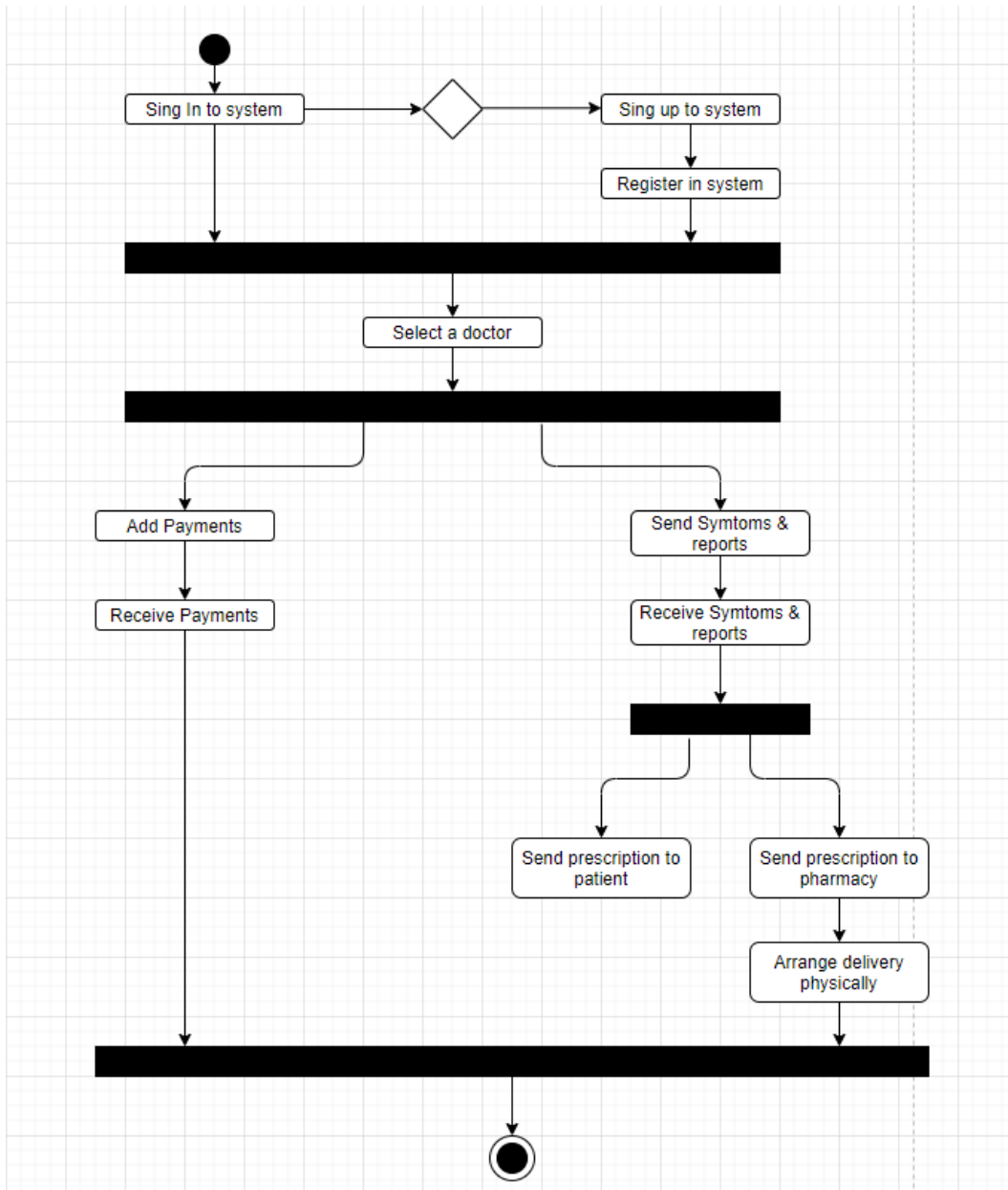
technologies. The 'Web Based System for General Healthcare under the Supervision of a Physician' should be given timely treatment at the same time reducing disclosure to protect physicians and patients. And also this can be integrated into the healthcare system as a procedure to maximizing the efficiency of healthcare delivery. It encourages social distance measures and enables to manage the long wait and the threat of disease development. By minimizing personal visits and minimizing face to face contact between doctors and patients, the use of 'Web Based System for General Healthcare under the Supervision of a Physician' can assist reduce the transmission of the virus and preserve physicians from infections.

Therefore the use of 'Web Based System for General Healthcare under the Supervision of a Physician' is the best solution for the intended problem.

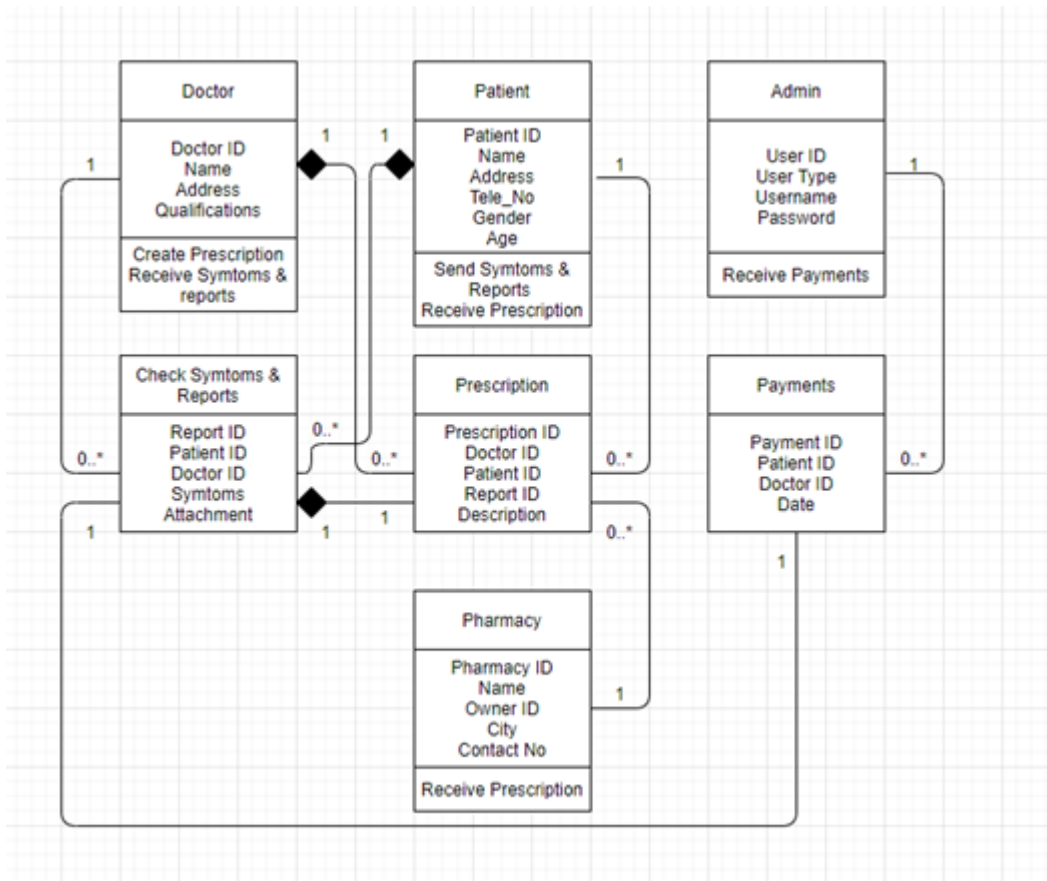
## Chapter 3 - Design



**Figure 3.1:** ER diagram of 'Web Based System for General Healthcare under the Supervision of a Physician'



**Figure 3.2:** Activity diagram of 'Web Based System for General Healthcare under the Supervision of a Physician'



**Figure 3.3:** Class diagram of 'Web Based System for General Healthcare under the Supervision of a Physician'

user

|                |           |          |          |
|----------------|-----------|----------|----------|
| <u>user_id</u> | user_type | username | password |
|----------------|-----------|----------|----------|

patient

|                   |                     |                   |                        |                           |               |         |
|-------------------|---------------------|-------------------|------------------------|---------------------------|---------------|---------|
| <u>patient_id</u> | patient_name        | contact_number    | address                | NIC                       | DOB           | weight  |
| height            | contact_person_name | home_phone        | work_phone             | address                   | chicken_pox   | measles |
| hepatitis_B       | medical_problem     | medical_insurance | insurance_company_name | insurance_company_address | policy_number |         |
| expiry_date       | allergies           | medication        | <u>user_id</u>         |                           |               |         |

doctor

|                     |                |                     |                         |                             |          |     |
|---------------------|----------------|---------------------|-------------------------|-----------------------------|----------|-----|
| <u>doctor_id</u>    | doctor_name    | residential_address | institute_address       | email                       | mobile   | DOB |
| sex                 | marital_status | nationality         | education_qualification | experience_after_graduation | position |     |
| registration_number | <u>user_id</u> |                     |                         |                             |          |     |

pharmacy

|                    |            |           |                     |            |                |         |
|--------------------|------------|-----------|---------------------|------------|----------------|---------|
| <u>pharmacy_id</u> | first_name | last_name | registration_number | email      | contact_number | address |
| pharmacy_name      | address    | city      | phone_number        | fax_number | <u>user_id</u> |         |

payment

|                   |                   |                  |      |
|-------------------|-------------------|------------------|------|
| <u>payment_id</u> | <u>patient_id</u> | <u>doctor_id</u> | date |
|-------------------|-------------------|------------------|------|

report

|                  |                   |                  |          |            |
|------------------|-------------------|------------------|----------|------------|
| <u>report_id</u> | <u>patient_id</u> | <u>doctor_id</u> | symptoms | attachment |
|------------------|-------------------|------------------|----------|------------|

prescription

|                        |                  |                   |                  |             |
|------------------------|------------------|-------------------|------------------|-------------|
| <u>prescription_id</u> | <u>doctor_id</u> | <u>patient_id</u> | <u>report_id</u> | description |
|------------------------|------------------|-------------------|------------------|-------------|

**Figure 3.4:** Database table structures of 'Web Based System for General Healthcare under the Supervision of a Physician'

# Chapter 4 - Implementation

## 4.1. System Architecture

MVC is a design pattern originated for implementing applications mainly web applications. MVC is well liked because it separates application logic from the user interface layer and helps separation of concerns<sup>13</sup>. Here, the controller gets all requests from the application and prepares the data needed by the view together with the model. The view then uses the data prepared by the controller to generate the final presentable feedback. MVC is one of the most commonly utilize industry excellence web development framework for creating scalable and extensible projects<sup>14</sup>.

- Model

Model components correspond to all data-related analytic that you interact with. It can be the representative of the data transmitted between the view and the controller component, and it can also represent any other data related to business logic. For example, a patient object will retrieve the patient data from the database, manipulate it and update it data back to the database or use it to manifest data.

- View

View components is applied for all UI analytic in the application. For example, the patient view contains all UI components, such as text boxes and drop-down lists. The content the end user interacts with.

- Controller

The controller proceed as an interface between the model and the view component, processing all business analytic and arriving requests, using the model component to manipulate the data, and interacting with the view to display the final output. For example, the patient controller

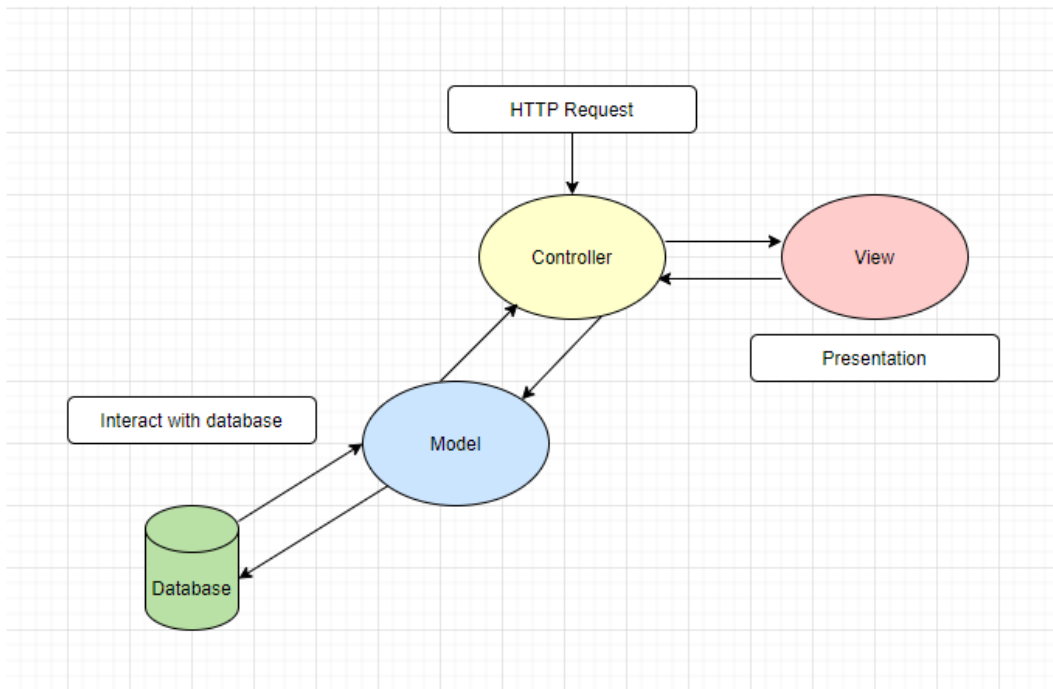
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<sup>13</sup> MVC Framework - Introduction - Tutorialspoint

<sup>14</sup> What is MVC Architecture? (w3schools.in)

will control all the interactions and inputs from the patient View and update the database using the patient Model. Use the same controller to view patient data.

The MVC abstraction can be graphically represented as follows.



**Figure 4.1:** MVC architecture of 'Web Based System for General Healthcare under the Supervision of a Physician'.

# Chapter 5 - Testing and Evaluation

The test evaluates the general quality of the "Web-based system for general healthcare under the supervision of a physician" application, in terms of accuracy, perfectness, usability, performance and other functional and non-functional attributes. The tests provide a confidence to the final user that the application is performing as expected. Preventable bugs disclosed to the final user without right testing, add a bad influence to this application<sup>15</sup>.

Evaluations can be performed whichever manually or using automation tools. For the application "Web-based system for general health care under the supervision of a physician", tested using manual tests. It includes verification of requirements, implement of the strategy and test plan, implementation of TCs, execution of TCs, creation of defects, testing of defects and finally confidence in the quality of the developed software.

Tests performed in parallel with the application development phase "Web-based system for general health care under the supervision of a physician" as follows.

| Development Phase of WBSGHSP | Testing Activity of WBSGHSP   |
|------------------------------|-------------------------------|
| Requirement Design           | Acceptance test case creation |
| Functional Specification     | Functional test case creation |
| Implementation               | Unit test case creation       |
| Code Complete                | Test case execution           |

**Table 5.1:** Tests performed of 'Web Based System for General Healthcare under the Supervision of a Physician'

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<sup>15</sup> Software Testing Methodologies (smartbear.com)

Closing the "Web-based system for general health care under the supervision of a physician" testing phase depended on achieving an agreed pass rate test case.

### **5.1. Related Testing Types**

**Unit testing:** Unit testing was the earliest degree of testing carry out on separate modules, components, or chunks of code. In the unit test, the separate modules were tested as independent components to make sure they function properly and proper integration with other components. For example, the patient component, the doctor component and the pharmacist component were tested as separate components to make sure they function properly and then integrated with each other.

Drive test cannot be carry out manually. Unit tests were every time automated and used the White-box testing methodology as awareness of the segment of code and inner building was required to test the code. The unit tests passed the required inputs to the test script and affirmed the actual output with the expected results.

Using the unit test for the "Web-based system for general health care under the supervision of a physician", issues within a module discover in the prior phase of development and also the testing of a module are begin without waiting for other modules to complete. Not only that, modules successfully tested were comfortably integrated with other modules. But the unit tests could not discover integration or interface problems between two modules. For example, after a successful payment process for a patient, the integration part of the administrator receiving the payment was not detected. In addition, non-functional attributes such as usability could not be tested.

**Integration testing:** A module can function completely in separation but can have integration problems while associate with another module. There may be data type problems or valid data ranges between forms. The integration test was the second level test performed after the unit test where it tested the associating between the modules along with the overall testing of the

combined elements. It was executed using white box and black box testing methods. For example, after a patient's payment process is successful, it should be received by the administrator and the administrator should be able to view that payment from the patient. This part of the integration of the patient, payment and administration components was tested using integration tests. So it helped identify integration issues between modules. Not only that, it helped ensure that the built-in modules are working properly before moving on to the full application system test. Bugs found at this level were easier to fix than those found in later stages of testing. So it improved test coverage and provided an extra layer of reliability.

**Usability testing:** This was very critical to the success of the "Web-based system for general health care under the supervision of a physician" application. How does it measure how easy it is for users to perform activities. This in turn is directly related to revenue and other business goals. Usability testing is a non-functional test.

In this phase the usability tests have helped,

- *Ease of use:* Check how easy it is for users to use different functions of the application.
- *Ease of learning:* Check how easy it is for users to learn to use the application.
- *Memorability:* Check how easy it is for the user to remember the different processes of the application after exploring the application for the first time.
- *Error rate:* Check how often users make mistakes and how easy it is for them to recover from those mistakes.
- *Level of satisfaction:* Check user satisfaction or general comments on the product.

For example, in the Ease of Use case, usability test scenario:

As a physician, after completing a prescription process for a particular patient, the record automatically updates to "Checked".

For example, in the Ease of Learning case, usability test scenario:

Without completing the patient profile, the patient registered as a user in the application. Then the system will not allow user to send symptoms to the doctor. Even if user search for a doctor, the user will be redirected to the complete patient profile page. This behavior guides the user to complete the patient profile and indicates that completion of the patient profile is mandatory.

For example, in the Memorability case, usability test scenario:

As a patient, the user can send symptoms to the doctor and have a prescription. In addition, the patient can view previous symptoms and prescription records in the request list. These two different streams the user can easily remember after exploring it for the first time.

For example, in the Error rate case, usability test scenario:

As a patient, doctor or pharmacist, when user try to register with an existing email, the system will notify user as it is an existing email. So the user can easily recover from this error.

For example, in the Satisfaction level case, usability test scenario:

As a patient, the user can view the current statuses of the process after sending successful symptoms to a physician. Once the doctor has completed the prescription, the status is updated to "Checked" and once it is in pharmacy status updated to "Packaging" and once it is in delivery, the status is updated to "Delivery". The patient can view all these steps and it will be the satisfaction that the user will have on this application.

By using usability tests for this application it was possible to get direct feedback from potential users. This helped create a product that meets the user's expectations.

**Regression Testing:** Regression testing is the type of test performed to ensure that a fix or change did not affect previously functioning functionality. Then, after a fix in the previously tested "Web-based system for general healthcare under the supervision of a physician" application, a limited number of test cases were run while ensuring adequate test coverage. So it ensured that the fix does not adversely affect the working functionality.

**System testing:** During the system test the entire "Web-based system for general healthcare under the supervision of a physician" application was tested overall and no understanding of coding or inner architecture was required. Therefore, the system test is covered by the Black-box Testing technique. Still after successful unit and integration tests, some scenarios had problems not detected by the previous testing phases. System tests helped uncover these flaws. And the functional and non-functional requirements have also been tested for the complete system have been tested for the initial time at this stage.

## 5.2. Test Cases

The test case is a scenario consisting of a series of steps with conditions or variables, in which a test input is provided and the software product is run using the inputs to see how it works. An expected result is defined and the actual result is compared with the expected result. Each requirement is expected to pass the test case.

| Testcase ID | Test Scenario                         | Test Steps                                                                                                                                                      | Expected Results                                  |
|-------------|---------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------|
| 1           | Check Patient login with valid data   | <ol style="list-style-type: none"> <li>1. Open the url</li> <li>2. Enter valid email</li> <li>3. Enter valid password</li> <li>4. Click on Login</li> </ol>     | Patient should login into patient application     |
| 2           | Check Patient login with invalid data | <ol style="list-style-type: none"> <li>1. Open the url</li> <li>2. Enter invalid email</li> <li>3. Enter invalid password</li> <li>4. Click on Login</li> </ol> | Patient should not login into patient application |

**Table 5.2:** Patient login testcase of 'Web Based System for General Healthcare under the Supervision of a Physician'

| Testcase ID | Test Scenario                | Test Steps                                                                                                                                                                           | Expected Results                                                          |
|-------------|------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------|
| 3           | Validate success new inquiry | <ol style="list-style-type: none"> <li>1. Navigate to Search Doctors</li> <li>2. Click on Inquiry</li> <li>3. Enter the patient note</li> <li>4. Click on Book Now</li> </ol>        | Patient should navigates to payment page                                  |
| 4           | Validate failure inquiry     | <ol style="list-style-type: none"> <li>1. Navigate to Search Doctors</li> <li>2. Click on Inquiry</li> <li>3. Do not enter any patient note</li> <li>4. Click on Book Now</li> </ol> | Validation message "The patient note field is required." should displayed |

**Table 5.3:** Add a new inquiry testcase of 'Web Based System for General Healthcare under the Supervision of a Physician'

| Testcase ID | Test Scenario                    | Test Steps                                                                                                                         | Expected Results                                                          |
|-------------|----------------------------------|------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------|
| 5           | Validate success payment process | 1. Navigate to Inquiry<br>2. Enter valid inputs<br>3. Click on Book Now<br>4. Enter valid payment details<br>5. Click on Process   | Patient should able to send symptoms to the selected doctor successfully. |
| 6           | Validate failure payment process | 1. Navigate to Inquiry<br>2. Enter valid inputs<br>3. Click on Book Now<br>4. Enter invalid payment details<br>5. Click on Process | Validation message is displaying to enter the valid payment details       |

**Table 5.4:** *Payment process testcase of 'Web Based System for General Healthcare under the Supervision of a Physician'*

### 5.3. User Evaluation

Basically, the composition of the participants in the user ratings reflected all the target groups of this application. The application "Web-based system for general health care under the supervision of a physician" aims at the elderly, middle-aged people, adolescents, in general, to cover as large a user group as possible.

Easy-to-read text and meaningful symbols were helped, which was crucial for users who were unfamiliar with the interface language. Finally, it must be said that there are many different user groups for accessible applications that need to be considered and an adaptation that provides an improvement for one group could also negatively affect the performance of another group. For example, many older people were not very familiar with handling a computer. Therefore, they were a good indicator for a good user interface in general. On top of that, they had limited dexterity due to arthritis and also had vision and hearing problems. The user interface of the application "Web-based system for general health care under the supervision

of a physician" works very well for this type of user group and is the right direction towards the accessibility of this application.

#### 5.4. Results of the Testing

The "results" are the results of a test case where the result is the expected results. The expected result indicates what the user should experience as a result of the test steps. This is how it determines whether the test case is a "pass" or "fail".

| Testcase ID | Test Scenario                         | Test Steps                                                                                  | Expected Results                                  | Actual Results | Pass/Fail |
|-------------|---------------------------------------|---------------------------------------------------------------------------------------------|---------------------------------------------------|----------------|-----------|
| 1           | Check Patient login with valid data   | 1. Open the url<br>2. Enter valid email<br>3. Enter valid password<br>4. Click on Login     | Patient should login into patient application     | As expected    | Pass      |
| 2           | Check Patient login with invalid data | 1. Open the url<br>2. Enter invalid email<br>3. Enter invalid password<br>4. Click on Login | Patient should not login into patient application | As expected    | Pass      |

**Table 5.5:** Patient login test result of 'Web Based System for General Healthcare under the Supervision of a Physician'

| Testcase ID | Test Scenario                | Test Steps                                                                                                       | Expected Results                                                          | Actual Results | Pass/Fail |
|-------------|------------------------------|------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------|----------------|-----------|
| 3           | Validate success new inquiry | 1. Navigate to Search Doctors<br>2. Click on Inquiry<br>3. Enter the patient note<br>4. Click on Book Now        | Patient should navigates to payment page                                  | As expected    | Pass      |
| 4           | Validate failure inquiry     | 1. Navigate to Search Doctors<br>2. Click on Inquiry<br>3. Do not enter any patient note<br>4. Click on Book Now | Validation message "The patient note field is required." should displayed | As expected    | Pass      |

**Table 5.6:** Add a new inquiry test result of 'Web Based System for General Healthcare under the Supervision of a Physician'

| Testcase ID | Test Scenario                    | Test Steps                                                                                                                         | Expected Results                                                          | Actual Results | Pass/Fail |
|-------------|----------------------------------|------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------|----------------|-----------|
| 5           | Validate success payment process | 1. Navigate to Inquiry<br>2. Enter valid inputs<br>3. Click on Book Now<br>4. Enter valid payment details<br>5. Click on Process   | Patient should able to send symptoms to the selected doctor successfully. | As expected    | Pass      |
| 6           | Validate failure payment process | 1. Navigate to Inquiry<br>2. Enter valid inputs<br>3. Click on Book Now<br>4. Enter invalid payment details<br>5. Click on Process | Validation message is displaying to enter the valid payment details       | As expected    | Pass      |

**Table 5.7:** *Payment process test result of 'Web Based System for General Healthcare under the Supervision of a Physician'*

## Chapter 6 - Conclusion

The day is not far off when a lot of health-related encounters 'actually' using telemedicine technology. The use of telecare to supply health care is not recently developed. Telemedicine is an exciting technology and continues to promise to truly transform health care delivery for the benefit of all. This helps solve many of the issues that currently plague manual systems. Telemedicine can undoubtedly improve communication and satisfaction. Telemedicine technology is broadly used and cheap in cost, and is broadly agreed to be received by doctors and patients. Because of the emergence of COVID-19, the country is in a state of infection lockdown, requiring the application of telemedicine from doctors and patients as a medical care method. The application of 'Web Based System for General Healthcare under the Supervision of a Physician' even now is an important move in the accurate direction to manage the COVID-19 state in Sri Lanka. In addition, the use of telemedicine technology can have a positive impact on the medical life of patients. For example, it can provide convenient medical services according to patient schedules, thereby saving travel time for people in rural areas. It also reduces the cost of healthcare for patients and improves access to healthcare professionals. The 'Web Based System for General Healthcare under the Supervision of a Physician' delivers a secure, reachable, and appropriate medical-care.

Future work will include more published work searches on how to upgrade telemedicine use. The technology being implemented has made huge advance, but more research needs to be done to see all the possibilities the technology has to offer. Specifically, how will these communication technologies be implemented in healthcare systems, and what are the implications for them? How can such an implementation be implemented in a community where individuals do not have access to the Internet or mobile phones? Telemedicine and its various technologies are a new type of medical care. With more investigation and research on risks and benefits, healthcare professionals and patients will become more aware and skilled in how telemedicine can change their healthcare lives. In summary, various technologies can help patients control their medical care through telemedicine. The goal of the 'Web Based

System for General Healthcare under the Supervision of a Physician' that inspired this new technologies. The most important thing is to find ways to transform patients into different healthcare models that require technology.

# References

[1] SK Vizhi, R Senapathi. Evaluation of the perception, attitude and practice of self-medication among business students in 3 select Cities, South India. International Journal of Enterprise and Innovation Management Studies (IJEIMS) [Online]. 1(3), July 2010, pp. 4-40.

Available:

[https://scholar.google.com/scholar\\_lookup?journal=International+Journal+of+Enterprise+and+Innovation+Management+Studies+\(IJEIMS\)+JulyDecember&title=Evaluation+of+the+perception,+attitude+and+practice+of+selfmedication+among+business+students+i+n+3+select+Cities,+South+India&author=SK+Vizhi&author=R+Senapathi&volume=1&issue=3&publication\\_year=2010&pages=40-4&](https://scholar.google.com/scholar_lookup?journal=International+Journal+of+Enterprise+and+Innovation+Management+Studies+(IJEIMS)+JulyDecember&title=Evaluation+of+the+perception,+attitude+and+practice+of+selfmedication+among+business+students+i+n+3+select+Cities,+South+India&author=SK+Vizhi&author=R+Senapathi&volume=1&issue=3&publication_year=2010&pages=40-4&) (Accessed: 28 September 2020)

[2] CM Hughes, JC McElnay, GF Fleming. Benefits and risks of self-medication. Drug Saf. [Online]. 24, 2001, pp. 1027–37.

Available:

<https://link.springer.com/article/10.2165/00002018-200124140-00002> (Accessed: 28 September 2020)

[3] M Hernandez-Juyol, JR Job-Quesada. Dentistry and self-medication: A current challenge. Med Oral. [Online]. 7, 2002, pp. 7-344.

Available:

<https://europepmc.org/article/med/12415218> (Accessed: 28 September 2020)

[4] JR Laporte, JM Castel. The physician and self-medication. Med Clin (Barc). [Online]. 99, 1992, pp. 6-414.

Available:

<https://europepmc.org/article/med/1469938> (Accessed: 28 September 2020)

[5] JR Laporte. Self-medication: Does information to users increase at the same rate as consumption. Med Clin (Barc). [Online]. 109, 1997, pp. 6-795.

Available:

<https://europepmc.org/article/med/9493159> (Accessed: 10 December 2020)

[6] T Porteous et al. How and why are non-prescription analgesics used in Scotland? *Fam Pract.* [Online]. 22, 2005, pp. 78–85.

Available: <https://academic.oup.com/fampra/article/22/1/78/440473?login=true>  
(Accessed: 10 December 2020)

[7] JA Pagán et al. (2006). Self-medication and health insurance coverage in Mexico. *Health Policy.* [Online]. 75, 2006, pp. 7-170.

Available:  
<https://www.sciencedirect.com/science/article/abs/pii/S0168851005000692> (Accessed: 10 December 2020)

[8] (1995). World Health Organization: Report of the WHO Expert Committee on National Drug Policies. [Online].

Available: <https://www.who.int/> (Accessed: 10 December 2020)

[9] BPD Silva et al. Self-medication practices and misuse of medicine among mothers of young children attending a teaching hospital in Sri Lanka. *Sri Lanka Journal of Child Health.* [Online]. 46 (2), 2017, pp. 122-127.

Available:  
[https://www.researchgate.net/publication/317350176\\_Selfmedication\\_practices\\_and\\_misuse\\_of\\_medicine\\_among\\_mothers\\_of\\_young\\_children\\_attending\\_a\\_teaching\\_hospital\\_in\\_Sri\\_Lanka](https://www.researchgate.net/publication/317350176_Selfmedication_practices_and_misuse_of_medicine_among_mothers_of_young_children_attending_a_teaching_hospital_in_Sri_Lanka) (Accessed: 21 February 2021)

[10] (2016). Kevin McGarvey: Hippo Health, Inc [Online].

Available: <https://www.hippohealth.com/> (Accessed: 21 February 2021)

[11] PR Wijesinghe, RL Jayakody, RA Seneviratne. Prevalence and predictors of self-medication in a selected urban and rural district of Sri Lanka. *WHO South-East Asia Journal of Public Health.* [Online]. 2012, pp. 28-41.

Available: <http://www.who-seajph.org/> (Accessed: 11 March 2021)

[12] (2019). Department of Census and Statistics Sri Lanka: Computer Literacy Statistics. [Online].

Available: <http://www.statistics.gov.lk/> (Accessed: 11 March 2021)

[13] (2021). tutorialspoint: MVC Framework Tutorial. [Online].

Available:

[https://www.tutorialspoint.com/mvc\\_framework/mvc\\_framework\\_introduction.htm](https://www.tutorialspoint.com/mvc_framework/mvc_framework_introduction.htm)

(Accessed: 11 March 2021)

[14] (2021). w3schools: What is MVC Architecture? [Online].

Available: <https://www.w3schools.in/mvc-architecture/> (Accessed: 11 March 2021)

[15] (2021). SmartBear Software: Software Testing Methodologies [Online].

Available: <https://smartbear.com/learn/automated-testing/software-testing-methodologies/> (Accessed: 27 May 2021)

# Appendix A

## Management Reports

There are three types of Management Information System (MIS) reports generated by the 'Web-based System for General Healthcare under the Supervision of a Physician' application. Those are,

- Income report generation under a given date range
- Income report generation under a given name of physician
- Income report generation under a given payment type

These MIS reports are used by the system administration to coordinate, control and visualize data for better decision making. MIS reports focus on past information and current data. They are prepared periodically with a specified frequency, the most common would be monthly. By regularly tracking business operations through MIS reports, the administrator can make informed decisions, avoid problems, and leverage business strategies, helping to improve application performance in the long and short term. This way, MIS report generation no longer takes time. In addition, the administrator can track business operations in real time and make the most recent decisions.

## Income report generation under a given date range

Happy Health Care

Welcome Administrator! Logout

Dashboard / Reports

### Income Report

From Date: 05/01/2021

To Date: 06/30/2021

Doctor Name: All Doctors

Payment Type: All Payment Methods

**Generate Report**

**Figure A.1:** Income report generation under a given date range - UI

## Income Report

Date From: 2021-05-01 To 2021-06-30      Payment Method: All  
Doctor: All

| No                 | Date       | Pyament Method | Doctor         | Patient               | Amount           |
|--------------------|------------|----------------|----------------|-----------------------|------------------|
| 1                  | 2021-05-27 | VISA           | Anne Perera    | Piyumika Premathilake | 1500.00          |
| 2                  | 2021-05-10 | VISA           | Samatha Perera | Piyumika Premathilake | 1500.00          |
| 3                  | 2021-06-07 | VISA           | Samatha Perera | Piyumika Premathilake | 1500.00          |
| 4                  | 2021-06-10 | VISA           | Bruno Silva    | Piyumika Premathilake | 1500.00          |
| 5                  | 2021-05-11 | MASTER         | Bruno Silva    | Piyumika Premathilake | 1500.00          |
| 6                  | 2021-05-20 | MASTER         | Anne Perera    | Piyumika Premathilake | 1500.00          |
| 7                  | 2021-06-01 | AMEX           | Samatha Perera | Piyumika Premathilake | 1500.00          |
| 8                  | 2021-06-17 | VISA           | Anne Perera    | Piyumika Premathilake | 1500.00          |
| 9                  | 2021-06-17 | AMEX           | Anne Perera    | Piyumika Premathilake | 1500.00          |
| 10                 | 2021-06-12 | MASTER         | Anne Perera    | Piyumika Premathilake | 1500.00          |
| 11                 | 2021-06-17 | AMEX           | Samatha Perera | Supun Silva           | 1500.00          |
| 12                 | 2021-06-17 | VISA           | Samatha Perera | Supun Silva           | 1500.00          |
| 13                 | 2021-06-13 | MASTER         | Samatha Perera | Supun Silva           | 1500.00          |
| 14                 | 2021-06-17 | VISA           | Samatha Perera | Supun Silva           | 1500.00          |
| 15                 | 2021-06-17 | MASTER         | Samatha Perera | Shammi Perera         | 1500.00          |
| 16                 | 2021-06-17 | VISA           | Anne Perera    | Shammi Perera         | 1500.00          |
| <b>Grand Total</b> |            |                |                |                       | <b>24,000.00</b> |

**Figure A.2:** Income report generation under a given date range - PDF

## Income report generation under a given name of physician

Happy Health Care

Welcome Administrator! Logout

Dashboard / Reports

### Income Report

From Date: 05/01/2021

To Date: 06/30/2021

Doctor Name: Anne Perera

Payment Type: All Payment Methods

**Generate Report**

Figure A.3: Income report generation under a given name of physician – UI

Income Report

Date From: 2021-05-01 To 2021-06-30

Payment Method: All

Doctor: Anne Perera

| No          | Date       | Pyament Method | Doctor      | Patient               | Amount   |
|-------------|------------|----------------|-------------|-----------------------|----------|
| 1           | 2021-05-27 | VISA           | Anne Perera | Piyumika Premathilake | 1500.00  |
| 2           | 2021-05-20 | MASTER         | Anne Perera | Piyumika Premathilake | 1500.00  |
| 3           | 2021-06-17 | VISA           | Anne Perera | Piyumika Premathilake | 1500.00  |
| 4           | 2021-06-17 | AMEX           | Anne Perera | Piyumika Premathilake | 1500.00  |
| 5           | 2021-06-12 | MASTER         | Anne Perera | Piyumika Premathilake | 1500.00  |
| 6           | 2021-06-17 | VISA           | Anne Perera | Shammi Perera         | 1500.00  |
| Grand Total |            |                |             |                       | 9,000.00 |

Figure A.4: Income report generation under a given name of physician – PDF

## Income report generation under a given payment type

Happy Health Care

Welcome Administrator! Logout

Dashboard / Reports

### Income Report

From Date: 05/01/2021

To Date: 06/30/2021

Doctor Name: All Doctors

Payment Type: Visa Cards

**Generate Report**

Figure A.5: Income report generation under a given payment type - UI

## Income Report

Date From: 2021-05-01 To 2021-06-30      Payment Method: VISA

Doctor: All

| No                 | Date       | Pyament Method | Doctor         | Patient               | Amount           |
|--------------------|------------|----------------|----------------|-----------------------|------------------|
| 1                  | 2021-05-27 | VISA           | Anne Perera    | Piyumika Premathilake | 1500.00          |
| 2                  | 2021-05-10 | VISA           | Samatha Perera | Piyumika Premathilake | 1500.00          |
| 3                  | 2021-06-07 | VISA           | Samatha Perera | Piyumika Premathilake | 1500.00          |
| 4                  | 2021-06-10 | VISA           | Bruno Silva    | Piyumika Premathilake | 1500.00          |
| 5                  | 2021-06-17 | VISA           | Anne Perera    | Piyumika Premathilake | 1500.00          |
| 6                  | 2021-06-17 | VISA           | Samatha Perera | Supun Silva           | 1500.00          |
| 7                  | 2021-06-17 | VISA           | Samatha Perera | Supun Silva           | 1500.00          |
| 8                  | 2021-06-17 | VISA           | Anne Perera    | Shammi Perera         | 1500.00          |
| <b>Grand Total</b> |            |                |                |                       | <b>12,000.00</b> |

Figure A.6: Income report generation under a given payment type - PDF



