STA. TERESITA MEDIC-LINE: TELEMEDICINE SOLUTION

A Project Study Presented to the
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In Partial Fulfillment of the Requirements for the Courses:
IT311: Systems Administration and Maintenance
IT312: System Integration and Architecture
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IT314: Web Systems and Technologies

By:

Name1
Name2
Name3
Name4
Name5

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CHAPTER 1
Introduction

I.1. Project Context

Over the past decades, health care providers, researchers, and IT professionals have been investigating how to integrate telecommunications and computer technologies to improve health care services. The accumulation of those efforts gave birth to telemedicine. As defined by the World Health Organization (WHO), telemedicine refers to the use of telecommunication and information technologies to provide health care and consultation given to patients at a distance. Telemedicine includes a variety of applications and services using two-way video, smartphones, and wireless devices. Over the years, big hospitals and various health-related institutions have integrated telemedicine for delivering health care service from a distance.

In terms of health care services, most health care institutes still use face-to-face services. For that reason, patients need to travel to the nearest hospital to their area. It is more frustrating and challenging, especially if the health services that the patients need are not available in their vicinity. Another concern is the large gap in health care access between the rural population and urban population. Rural residents who need medical attention receive medical care more slowly than their urban counterparts. It's even slower and harder today since the nation's health care system is undergoing profound changes ever since the novel coronavirus (COVID-19) hits. For records and patient management, most health care institutions, especially Rural Health Unit, still use manual operations. Although it is acceptable, it may not be viable during the pandemic. Before, health care institutions could accommodate patients regardless of their conditions. But now, it may be difficult due to some restrictions.

Due to that, online and technological solutions that can address these problems are on-demand, and one of these is Telemedicine. Telemedicine not only reduces the amount of travel time for patients, from rural to urban healthcare facilities. It also provides connectivity, availability, and accessibility for healthcare providers and patients. If the patient wants an immediate health consultation but having a hard time traveling to their health care unit, telemedicine is the solution. It allows low-cost access but provides easy, flexible, interactive, and fast dissemination in terms of information and support. Aside from that, telemedicine has timely information updating and a reliable alternative to face-to-face interaction.

The researchers developed a web-based telemedicine for Santa Teresita Rural Health Unit (RHU) in Santa Teresita Batangas, and is called Santa Teresita Medic-Line. Santa Teresita is a municipality in Batangas, which consists of 17 barangays but the health care services can't reach most of it. On a daily basis, Santa Teresita RHU is catering 15-20 patients per day in their face to face consultations. With its existing materials such as desktop computers and laptops, the web-based telemedicine will connect the residents to the one resident doctor, dentist, and nurses in the RHU over the internet through a website. Aside from the mentioned benefits of telemedicine, it will also provide electronic scheduling, appointment, records systems, and a list of available medicines in the RHU.

I.2. Purpose and Description

The purpose of the developed web-based system is to connect Santa Teresita residents to a healthcare professional designated in their municipality's healthcare center. The researchers believe that it will be beneficial to the doctor, dentist, nurses and staff of Sta. Teresita RHU as well as to the municipality's residents.

The web-based system will help Sta. Teresita RHU in improving their data and records management, resulting in paperless documentation and more accurate and secured collection and storage.

It aims to help the municipality's residents by providing them a platform that allows them to check the available time of appointments and health care specialists, and health-related products, services, and inquiries. The web-based system will lessen the physical transaction and inquiry, but at the same time, increase its coverage of services through the use of the internet.

The developed system allows the system administrators, which are the nurses or barangay officials, to provide services to a wide variety of users whether they use a desktop or mobile version.

Services that the developed system will provide are still the same regardless of their devices as long as they access it through a web browser. The patients, specifically the Santa Teresita residents, must create an account to use the website features, like appointment scheduling and viewing of available medicines in the RHU.

Moreover, the developed system integrated a dashboard which generates reports through data visualizations based on the patients' information. This will enable Sta. Teresita RHU to create useful conclusions and will serve as a guide in making decisions as they reach their patients in providing their medical services.

Furthermore, the web-based application was designed as user-friendly, meaning it is easy to use and understand.

I.3. Objectives

The main objective of this study is to design and develop a web-based telemedicine platform for the residents and healthcare providers of Santa Teresita.

Specifically, it aims to achieve the following objectives to:

1. Provide Electronic Medical Records.

2. Create a module wherein a patient can set up an appointment or Reservation.

3. Create a two-way communication via Live Chat

4. Provide a dashboard for healthcare professional that will generate reports that will show the following:

   a. Stocks of Medicine

   b. Age(Age group of patients)

   c. Gender

   d. Barangay that have the most patients

I.4. Scope and Limitations

The "Medic-Line: Telemedicine Solution" is a web-based solution dedicated to Sta. Teresita Rural Health Unit (RHU) of Municipality of Santa Teresita in Batangas Province. It focuses on client user appointments, reservation scheduling of medical equipment, and online consultation via Live Chat. The system allows the user to create an account to have access to the services offered at Sta. Teresita RHU. The information collected from patients' health accounts will be included in their electronic medical records. The web-based solution allows the client's

users to appoint and communicate along with the network to two medical professionals, a dentist and a resident doctor, for their concerns. The solution also has an admin account allowing the admin user to manage and monitor the system. Sta. Teresita Medic-Line: Telemedicine Solution can only accept and admit appointments and consultations from residents of the said municipality. Conducting an interview and survey questionnaire from each representative in 17 barangays is used to gather necessary data. Data visualization is used as the data model for the electronic records as well as the medicine stock report stored in the system. The client's users can only be able to set one appointment per account at a time wherein they can update or cancel it. The patients who have medical concerns outside the offered medical services are outside the scope of the system. Furthermore, since it is a rural area, internet accessibility and strength might limit residents to access the web-based solution.

CHAPTER 2

System Analysis

II.1. Development Model

A software development methodology enabled a well-structured plan and total control of the processes throughout the entire project. The researchers chose the Agile Development Methodology as guidance in developing the system to achieve the objectives of the study.

Figure 1. Agile Development

Figure 1 illustrated the Agile Model and included phases like the requirements, design, development, testing, deployment, and review. The researchers used such a model mainly because of its flexibility. This model allows changes within a short period and adjustments to changing demands. The agile methodology provided a better and stable system, made the client more involved, and distinguished what works and not. Because of that, the researchers had focused on a specific set of tasks while considering the task's importance.

II.2. Development Approach

Fish Bone Analysis

The researchers carefully checked the essential criteria to specify the exact demand by the clients and developed a functional system that was efficient and effective. As shown in Figure 2, the fishbone diagram, were the causes of the main problem of having poor access to the Santa Teresita Rural Health Unit.
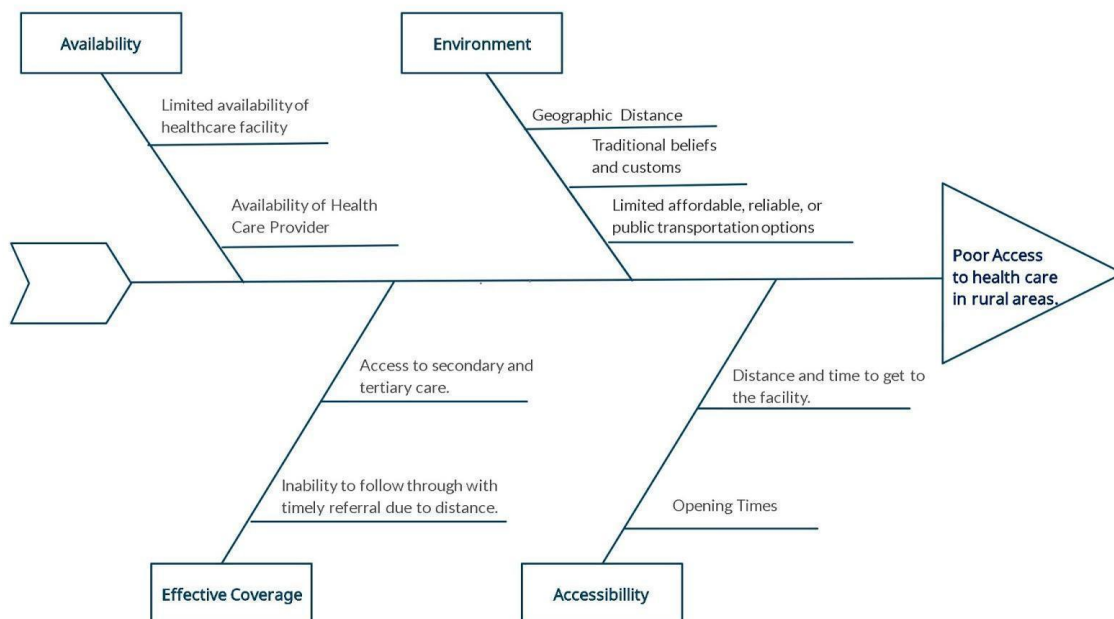

Figure 2. Fish Bone Diagram

The respondents believed that the developed web-based system was a solution to this kind of challenge. Moreover, it showed that four roots were causing the problem of the Santa Teresita Rural Health Unit.

The first reason dealt with the environment, which was composed of the geographic distance of the health care unit, the traditional beliefs and customs, and the limited affordable

transportation options. The municipality of Sta. Teresita has 17 barangays, and not all cannot access and afford medical services because of environmental challenges. Those residents who live in remote areas had only limited public transportations.

Other things that were considered were the availability of the facility and the healthcare providers. The health center facility cannot cater to and accept patients simultaneously since it only has one resident doctor and a dentist.

Additionally, having an effective coverage that steams into two, which are the inability to follow through with timely referral due to the distance because as per having a consultation or follow-up check-up, not all patients could get access to secondary and tertiary care that the health center provides.

Furthermore, it also showed the accessibility as a cause of the problem wherein, most of the time, the waiting times of the clinic are inconsistent. Likewise, the distance and time that the residents must travel to the facility may cause delays for appointment or consultation. The clients need to arrive at the center in advance or before it opens because the waiting line took too long before getting what the patients wanted to consult or to appoint.

System Boundary

The system boundary which separated the system activities existing within the environment was illustrated on Figure 3. The figure summarized the overall components which were interrelated to each other.
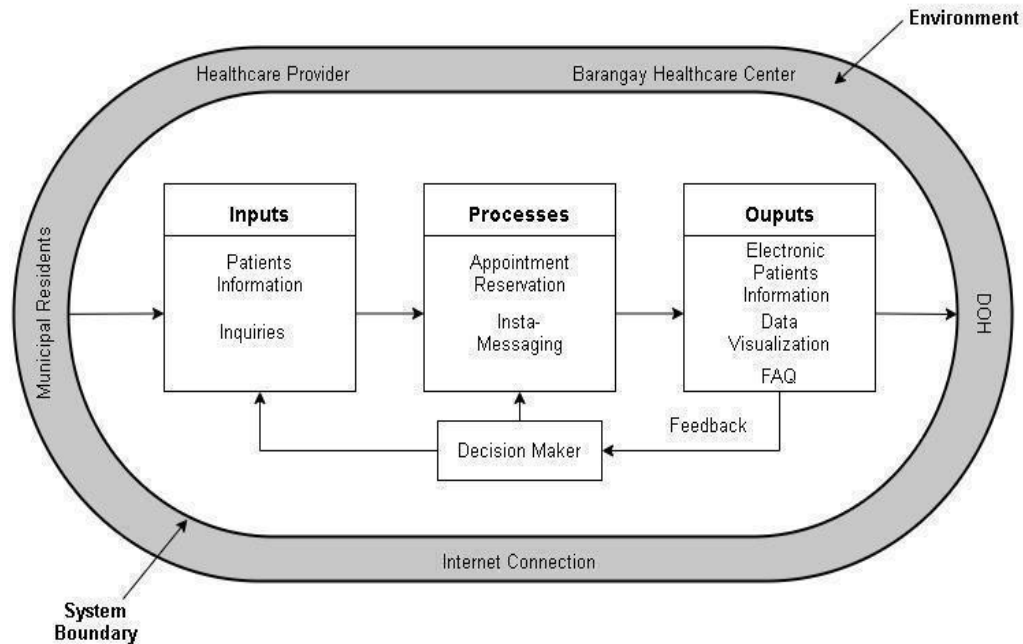
Figure 3. System Boundary

The inputs of the telemedicine solution, which was dedicated to Sta. Teresita Rural Health Unit, were the patients' information and municipal residents' inquiries that underwent processes for scheduling an appointment or equipment reservation. Communication may also happen via Live Chat wherein inquiries were open for residents to be answered by healthcare providers. Here, Frequently Asked Questions (FAQ) answered the common questions of the residents about the clinic and even recommendations on how to cure or aid simple diseases and injuries.

The system generated outputs such as the electronic patients' information, including the patient/residents' demographics, progress notes, age, and history medications. Likewise, from the patients' information and several medicine stocks, the system generated useful data visualizations for decision-making that the client used for further needs.

All of the system components and operations were separated by a boundary from its environment, which embodied the stakeholders affected by the website solution. Mainly, the

system benefits the municipal medical center and its residents, as well as its healthcare providers for it automated their processes in handling their patients' information and providing services for residents with concerns. Moreover, each barangay health center within the municipality were affected as they were interconnected with the services that a health center provides. The researchers also considered the role of the Department of Health of the National Government as medical centers were under their supervision. Furthermore, the accessibility and system performance of the telemedicine solution also depends on internet connectivity.

II.3 Schedule and Timeline

The schedule of each activity that helped the researchers develop the system was illustrated on Figure 4.

NO	TASK	December																														
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
1	Deployment	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█																
1.1	Prepare the infrastructure	█																															
1.2	Meeting with Santa Teresita RHU		█																														
1.3	Implementation of the Training			█																													
1.4	The actual system deployment				█																												
1.5	Review comments & suggestions					█	█																										
1.6	Implement new processes and procedure.						█																										

Figure 4. Deployment Phase Gantt Chart

This figure encompasses the required tasks, as described in the Action Plan, in chronological order, with the beginning and end dates of each task.

II.4 Project Teams and Responsibilities

II.4.1   Responsibilities

(cite all the tasks for each member of the group)

II.4.2   Activities and Tasks

(cite all the activities and duration of the system development as discussed in the CPM Chart)

CHAPTER 3
System Design

III.1. System Analysis and Design

Hardware Requirements

Hardware specification referred to the system requirements of the device for accessing the system. The tables of minimum hardware requirements, both internal and external, for the clients and their users were indicated below.

Table 1
User Minimum Internal Hardware Requirements

Name of Internal Hardware	Specification
Central Processing Unit	Intel (R) Pentium Dual Core, 3.00 GHz
Random Access Memory	2GB - 4GB (desktop and laptop users) 2GB (mobile users)
Hard Disk Driver	500 GB

Table 1 indicated the Minimum Internal Hardware Requirements with the desired specification needs, which supported the development of the developed system. These requirements were used in the system design to ensure its behavior's efficacy and efficiency.

Table 2
User Minimum External Hardware Requirements

Name of External Hardware	Specification
Mouse	Any optical mouse; Or trackpad for laptop users
Keyboard	Any universal Serial Bus keyboard; Or built-in keyboards in laptop
Display & Resolution	720p image resolution; Touch screen display for mobile users

Table 2 indicated the Minimum External Hardware Requirements, including the mouse, keyboard, and display & resolution together with its desired specifications. Mouse and keyboard

were external hardware that were used by laptop or computer users in managing the telemedicine solution while the display and resolution requirements were for mobile users to provide them good experience in accessing the web solution.

Software Requirements

The software specification in Table 3 was the minimum software requirements for its clients and their users to access the system. The researchers highly recommended the doctor and the admin to use a Windows OS to utilize and manage the system.

Table 3
User Minimum Software Specification

Name of Software	Specification
Operating System	64-bit or 32-bit Windows 7 and above; Android 7 +; iOS 12.4.7
Web Browser	Microsoft Edge Google Chrome Mozilla Firefox

In Table 3, Minimum Software Specification, Operating System's desired specification was vital to the development of the system as to how the system behaves, and the effectiveness of its functions also depend on it. Additionally, the web browser's specifications were crucial as the developed system runs in different browsers in providing medical services to users.

III.1.1. Functional Requirements

This section entailed the functional requirements that defined the things and activities that the system accomplished and executed. In other words, it described the functions and services supported by the system. The functional requirements were derived directly from the capabilities identified in the planning phase.

1. **Doctor**

   1.1. The doctor shall have the privilege to manage his account and schedule based on his availability.

   1.2. The doctor shall have the privilege to view and monitor the health records of the patients.

   1.3. The doctor shall have the privilege of viewing the overall records of the patient and medical supplies.

   1.4. The doctor shall be able to view the consultation and workday schedule and upcoming list of appointments.

   1.5. The doctor shall be able to communicate and do consultation with the patient through Live Chat function.

2. **Nurse**

   2.1. The nurse shall have the privilege to manage the registered users' accounts on the website.

   2.2. The nurse shall be able to view, add, edit, update, and delete the patients' information and available medical supplies of the municipality's Rural Health Unit.

   2.3. The nurse shall be able to view the data visualization reports generated from the patient's health care records and medical supplies.

   2.4. The nurse shall be able to view the doctors' consultation and workday schedule and upcoming list of appointments.

2.5. The nurse shall have the privilege of using the Live Chat to communicate with the resident's inquiry.

3. Patient/Resident

3.1. Patient/Resident shall be available to create their accounts to access the system and they are required to log-in their account.

3.2. The patient/resident shall be able to select an appointment to their desired time and date.

3.3. The patient/resident shall be able to communicate with the nurse or with the doctor through Live Chat function.

3.4. The patient/resident shall be able to view the list of available medicines stocks in the municipality's Rural Health Unit.

III.1.2. Non-Functional Requirements

The system also considered other non-functional requirements to test its capability to cater the users' needs.

1. Performance

1.1. The web-based application shall be able to run without any fault in the service and doesn't have down time to wait for it to complete an action.

1.2. All the functions of the system shall be available to the user every time the system is turned on.

2.   Usability

2.1. The system shall be able to be accessed online and unregistered users will not be allowed to access the website.

2.2. The menus of the system are easily navigable by the users with buttons that are easy to understand.

3.   Reliability

3.1. The system shall be able to give accurate schedule time for appointments & inventory status of medicine continuously.

3.2.   All the information shall be found in the system exactly what it is and the generated reports shall be reliable.

4.   Security

4.1. The system shall be able to provide a password enabled login for the user to avoid any unauthorized access to the data in the system.

III.2. Data Flow Diagram

The context level diagram and data flow diagram of the system that explained the interaction between the system and the users were illustrated on Figure 5 and Figure 6.
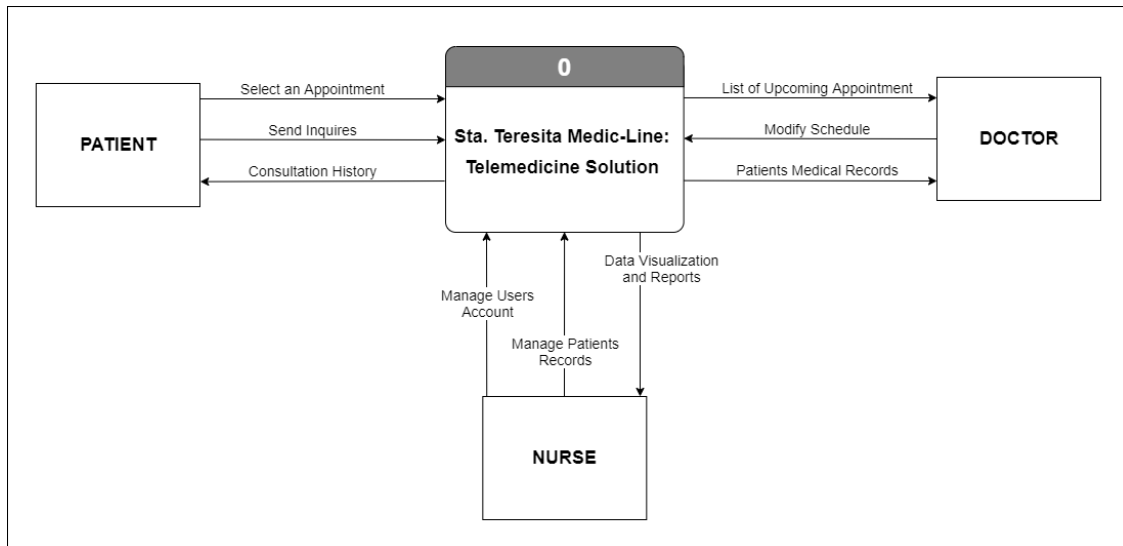
Figure 5. Context Diagram

The system consisted of three actors: the patient, nurses and staff, and doctor. Aside from the patients, other potential users of the system were the barangay officials. For those people who didn't have an account, barangay officials can provide for them to access the system. Nurses and other authorized personnel were responsible for managing the administrator side of the system. The admin role, which were the nurses and authorized personnel, also depends on the decision of the head of the Rural Health Unit.
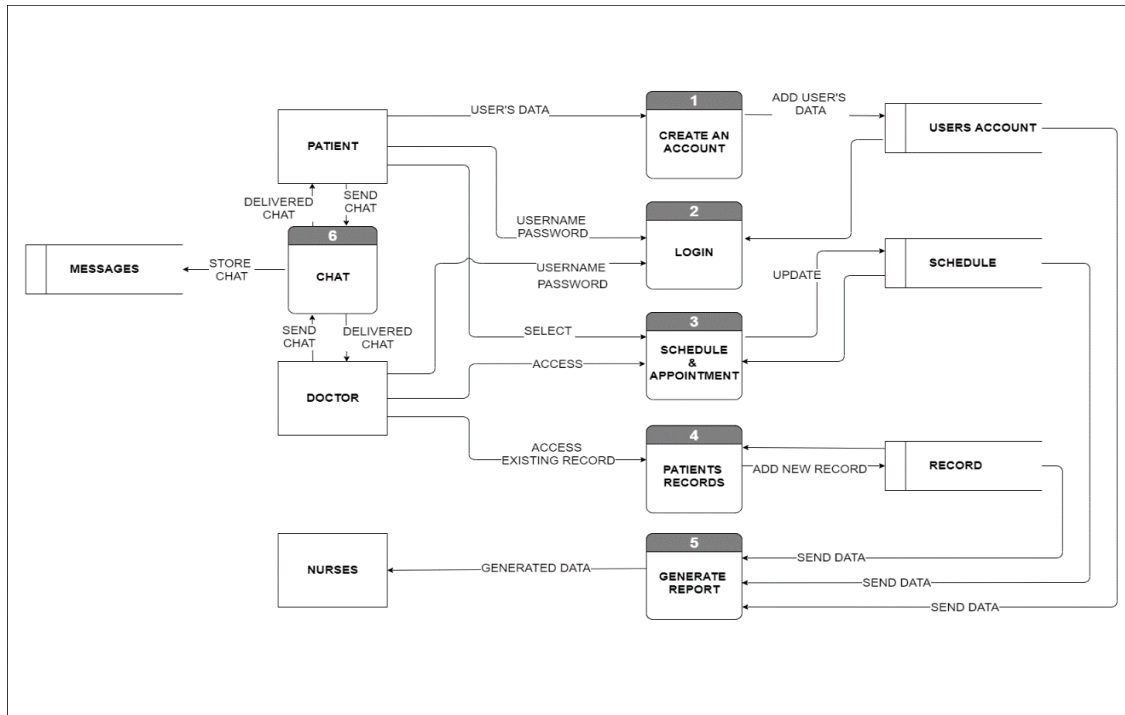
Figure 6. Level 0 Diagram

Figure 6, however, showed the Level 0 Data Flow Diagram (DFD) of the system. It depicted the entire process of the whole system. Compared to the previous diagram, the Context Diagram, the Level 0 DFD was more detailed because each process was broken down into subprocesses. These sub processes work together and form the entire flow and operation of the system.

Use Case Diagram

Use case diagram portrays the summary of the relationship between the actors and the system, including its features and cases which was illustrated on Figure 7. This diagram did not display the proper order to perform in the system.
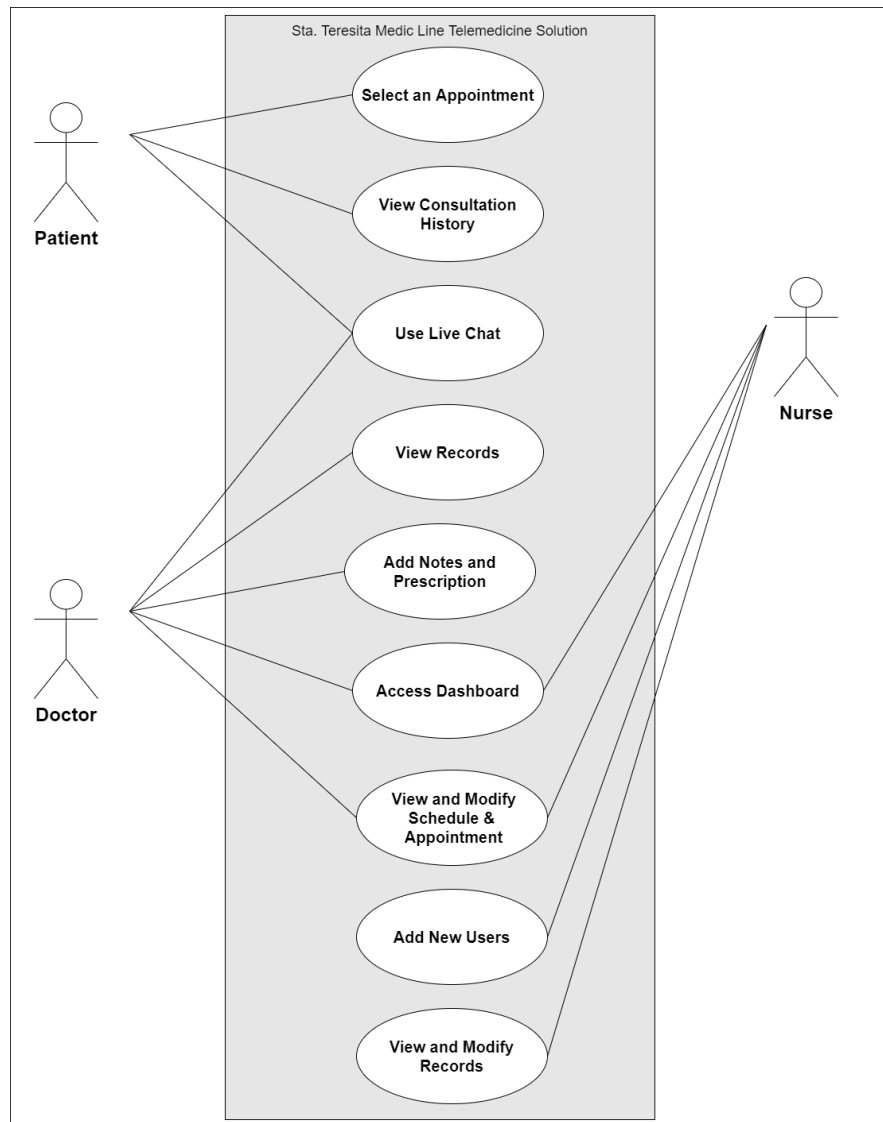
Figure 7. Use Case Diagram

Discussed here was the Case diagram of the developed system and summarized the details for the actors, which were the Patient, Nurse, and Doctor. It displayed what interactions were viable and available for each actor included in the graph.

Sequence Diagram

The detailed interaction between actors to actors or with the system was illustrated on Figure 8 which showed the sequence diagram of the system.
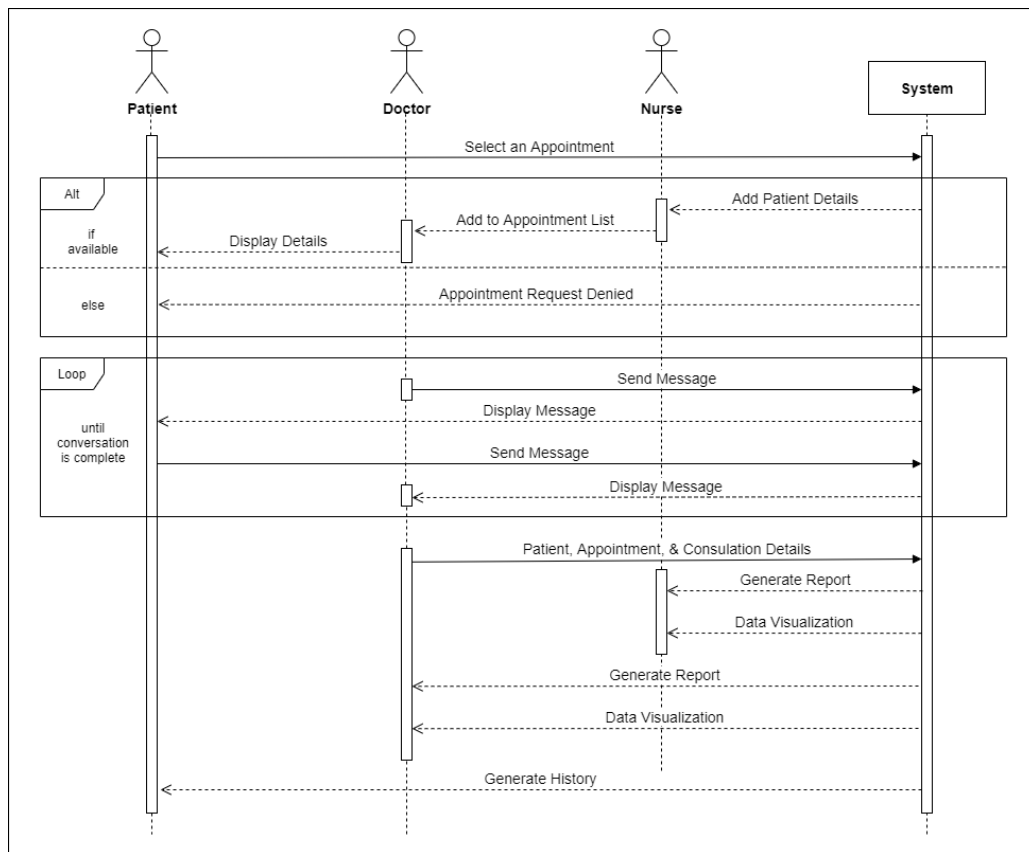
Figure 8. Sequence Diagram

In the sequence diagram, the patients must select an appointment first. If the schedule was available, the system would return the patient and appointment details to the nurse and doctor. Otherwise, the patients would be notified about the unavailability of the appointment.

The loop in the sequence diagram referred to the exchange of messages between the doctor and the patient. It also referred to the teleconsultation features, specifically the Live Chat, of the system.

After that, the meeting details, including the patients and doctor details, time and date, doctor's findings, and all other record requirements, were recorded in the developed system.

Database Design

The database design of the developed system encompasses how the system stores the data with the relationship between every attribute or tables and dimensions that was illustrated on Figure 10.

For the database design, the researchers used MySQL to fully manage the web database, and also, the decision was due to the previous analysis of various database software. To create the database design, the researchers used the MySQL Workbench, a unified visual tool for databases. In the figure, there were a total of 16 database tables. Wherein, 9 of them had relationships with other tables, and 7 had no relationship at all.

Figure 10.1. Database Design

In Figure 10.1, the database tables illustrated in the figure used a foreign key to connect and link the data inside each table. In the figure, it is also noticeable that the connections mainly come from two tables which are the table for patient information and RHU employee information.

Figure 10.2 Database Design
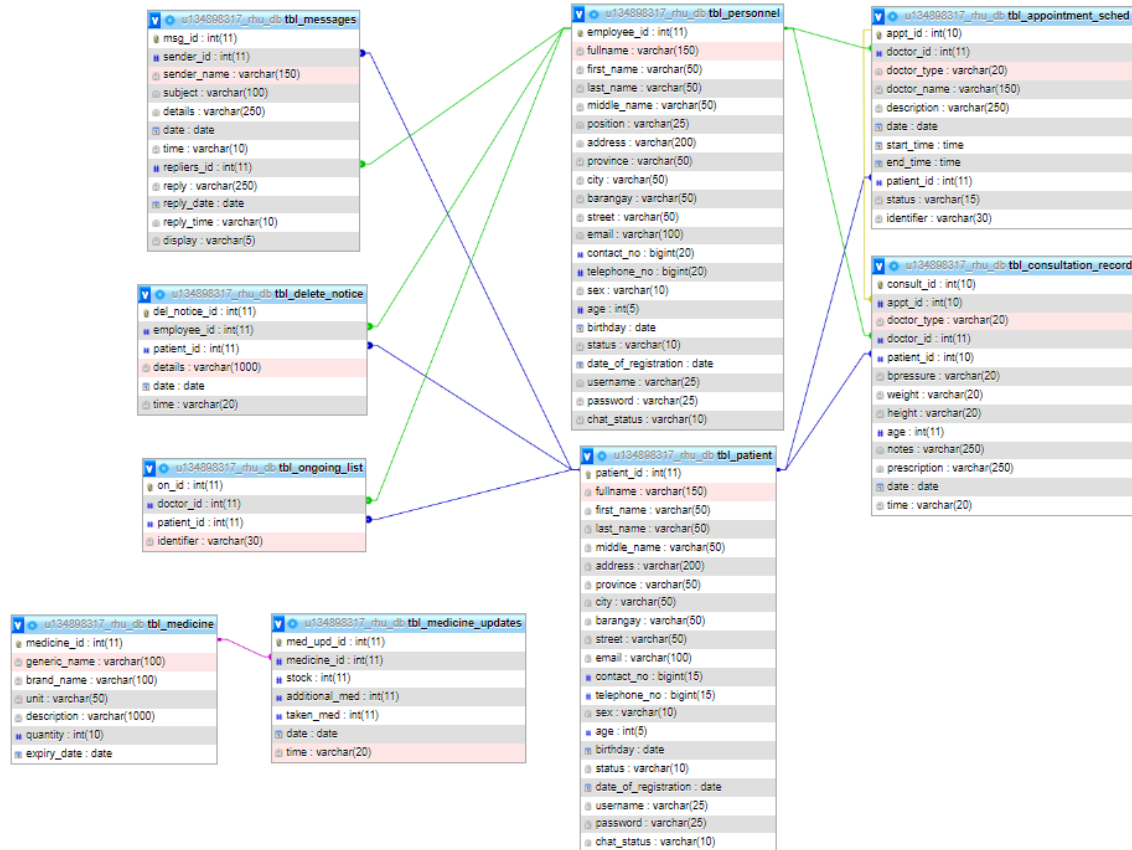
In Figure 10.2, however, the database tables shown in the figure depicts a no relation table meaning it doesn't use foreign key or link to any other tables. The tables included in the figure table for dashboard or graphs for age, address, sex, and medicine stocks report.

III.3. Graphical User Interface

Figure 13. Patient Records Page

Figure 13 shows the Sta. Teresita RHU's Patient Records. This is accessible by the resident doctor, dentist and nurse on their designated pages. Patient Records include the name, address, sex and age. Upon clicking the View button, the medical professionals were able to view the patient's account and contact details as well as the medical records of their appointment history. But only the authorized nurse as the RHU administrator has the privilege to make changes on the patient records. The resident doctor or the dentist has to contact the system administrator if they want to do some changes on the record. On the other hand, all the medical professionals could download the Patient Records in PDF and Excel files.

Figure 14. Personnel Records

Shown in Figure 14 is the Sta. Teresita RHU's Personnel Records. This is accessible by the resident doctor, dentist and nurse on their designated pages. On top of the table, there is a search bar where the medical professional can easily find a specific person or record. Personnel Records include their name, address and position. The resident doctor, dentist and nurse were able to view other personnel's information like their contact details such as phone number, telephone number and email address by clicking on View button. But only the authorized nurse as the system administrator has the privilege to make changes on the patient records. The authorized RHU administrator only has the privilege to add an account by clicking on the Create New Account button and it will be included in the record. The resident doctor or the dentist has to contact the system administrator if they want to do

some changes on the record. On the other hand, all the medical professionals could download the Patient Records in PDF and Excel files.

Figure 15. Medicine Stocks

The Figure 15 shows Sta. Teresita RHU's Medicine Stocks Record. Provided in the table are the available medicines in the health center with its generic and brand name, unit and quantity. This is accessible by the resident doctor, dentist and nurse on their designated pages. On top of the table, there is a search bar where the personnel can easily find and check if there is still a stock of a particular medicine. The medical professionals could view other details such as the medicine's expiration date and its description by clicking on the View button. But only the authorized nurse as the system administrator has the privilege to make changes on the patient records. The authorized RHU administrator only has the privilege to add medicines by clicking on the Add New Stock button and it will be included in the list. The resident doctor or the dentist has to contact the system administrator if they want to do some changes on the record. On the other hand, all the medical professionals could download the Patient Records in PDF and Excel files.

The researchers were able to provide electronic medical records for the RHU. Shown on Figure 13 is the patients' medical records, on Figure 14 is the personnel information and on Figure 15 is medicine stocks available in the health center that medical professionals could view. The doctor, dentist and nurses are the authorized personnel who could access the patients, personnels and medicine stock records but only the RHU administrator could make updates or changes on these records.

The medical professionals on their designated pages have three options such as opening patient records, personnel records and medicine stocks. If he or she wants to open patient records, click the Patient Records button. Upon clicking the button, a table list of the patients' profile will be displayed. If the resident doctor or dentist wants to look for a specific patient faster, click on the search bar and type the patient's name. If he or she wants to view their patient's existing medical records, click the View button then it will be displayed.

On the other hand, if the medical professional wants to view the personnel records, he or she has to click the Personnel Records button then, a table list of personnel records will be displayed. If he or she wants to find personnel faster, then click and type on the search bar.

Otherwise, if the medical professional wants to view the available medicine stocks on the RHU, he or she has to click the Medicine Stocks button. It will display a table list of medicine stocks in the RHU. If he or she wants to look for a specific medicine easily, click and type on the search bar.

Note that if the resident doctor or dentist wants to make changes on these records, he or she must contact the system admin or use an admin account. If that's the case, as an admin, he or she could now be able to add a new account on personnel records by clicking the Create New Account button, add new medicine to medicine stocks by clicking the Add New Stock button and update records by clicking on the Edit button.

This helped the medical professionals and nurses in updating their patients' records, when necessary, which lessened the use of a new set of paper records on the manual operation of the RHU. With this, they could also track their patients' old records up to the current one. The developed system provided them easy access to their patient's records which made the RHU's operation more flexible than before.

Moreover, the researchers created a module wherein a patient can set up an appointment or Reservation. The developed system enabled the residents of Sta. Teresita, Batangas to book in advance to the RHU. This helped them as the system became the best way in setting up their appointment without the hassle of travel, long wait and avoid other health problems in this time of pandemic. Patients were relieved that they had an accessible and very interactive system in which they were able to use in the long run allowing them to connect with Sta. Teresita RHU's medical professionals and avail their services.
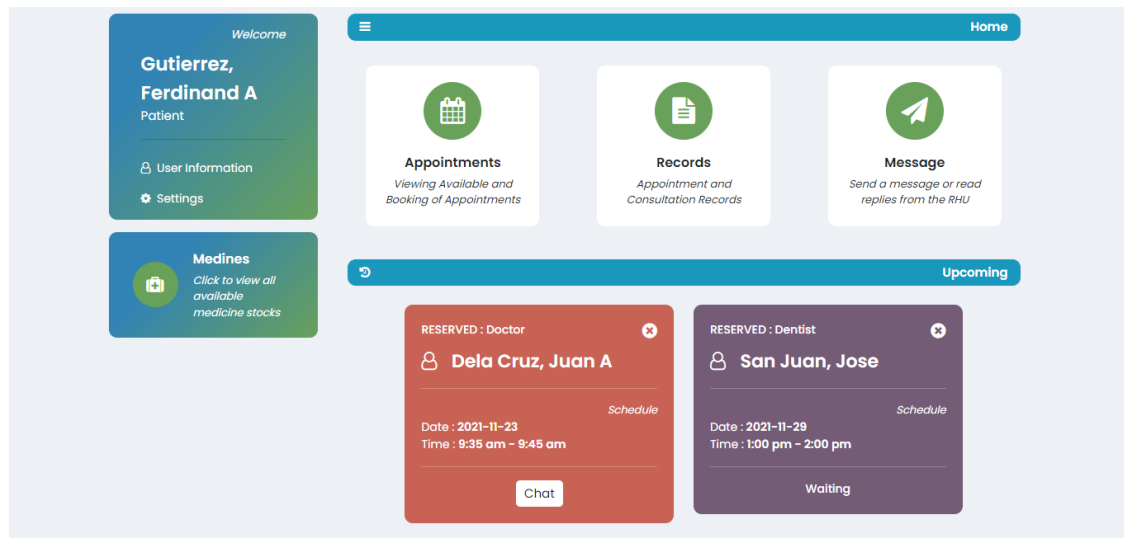
Figure 16. Patient's Homepage

On Figure 16, it displayed the patient's homepage where the patients could view and select from the available appointments. If they already had their consultations before, it would be listed on their consultation history inside the records where they can see the notes and prescriptions given by the resident doctor or dentist which the patients can download in PDF that can be used when buying medicines. Once the patient has booked an appointment, the Live Chat will be activated with either a resident doctor or the dentist. Once the patient has reserved an appointment, it will be posted on his or her homepage with the appointment details and a status of "Upcoming" and "Waiting". On the other hand, the patient can also remove the appointment only if it is not yet conducted. Once the doctor is in a meeting with the patient, the status of the booked appointment is "In Meeting" which means that the dentist cannot proceed to the appointment with the same patient. Once the appointment ends, then it will be the turn of the interaction between the dentist and the

same patient. Likewise, they could also interact with the Sta. Teresita RHU through messages.

On the left side, the patient could see his or her name. By clicking on the User Information, the patient can view his or her profile while by clicking on the Settings, the patient can change his or her username and password as well as the contact details. The patient could also click the FAQ button if he or she wanted to find answers to most asked questions. Below the profile section, the patient can view the available medicines in Sta. Teresita RHU by clicking on the Medicines button.

The patients found it significant that they could view their history so that they could also track when they had their consultation and be aware of when they should go to the RHU again which enabled them to book for reservation in advance.
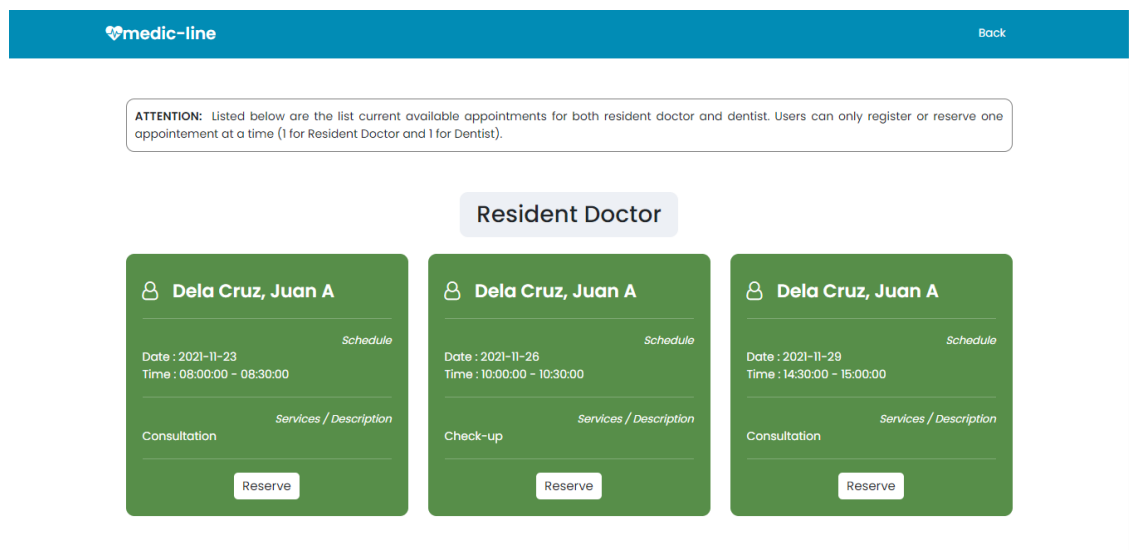

Figure 17. Appointment Reservation

Upon clicking the Appointment button, the patient would be directed to this page shown in Figure 17 where the registered patients could view the available appointments of

the resident doctor and the dentist. They can choose the day and time from the available appointments given with the offered services with whom medical professional they wanted to consult for and click on the Reserve button. Then, it will be posted on the patient's homepage which was shown on Figure 16. Once the appointment has been booked by another patient, it will be automatically removed from the given available appointments. Likewise, the doctor or the dentist as well as the RHU administrator could also remove or give the scheduled appointment to another patient by clicking on the Edit button on their pages as they remove or input the Patient ID and change the Status of the appointment to either "Available" or "Booked". When the time of the appointment has come, the Chat button will be activated. After clicking on the Chat button, the patient will be directed to the Live Chat where the patient can now interact with the resident doctor or dentist. If the consultation is done, the doctor or dentist will click on the Finish Appointment button. The doctor or dentist will give notes or prescriptions to patients and will be recorded on the patient's records wherein the patients can download it in PDF and use the prescription to buy the prescribed medicines from boutiques. The patient records can be seen by clicking on the Records button.

Note that, the registered patients can only chat with the doctor or dentist during the appointment hours but they are free to chat with the RHU admin or nurse anytime without expected time of response by clicking on the Message button on their homepage.

Furthermore, two-way communication was made possible by the researchers by implementing a live chat. This feature is reliable in the instance wherein the patient has

some medical concerns or questions for the doctors or nurses. Patients must set up an appointment first for the chat feature to be available for them. In that appointment time frame, patients can use that time to ask the questions or concerns to either a resident doctor or a dentist that he/she has. Additionally, the benefits of these features were not limited to the patient; it also has benefits to the doctors.
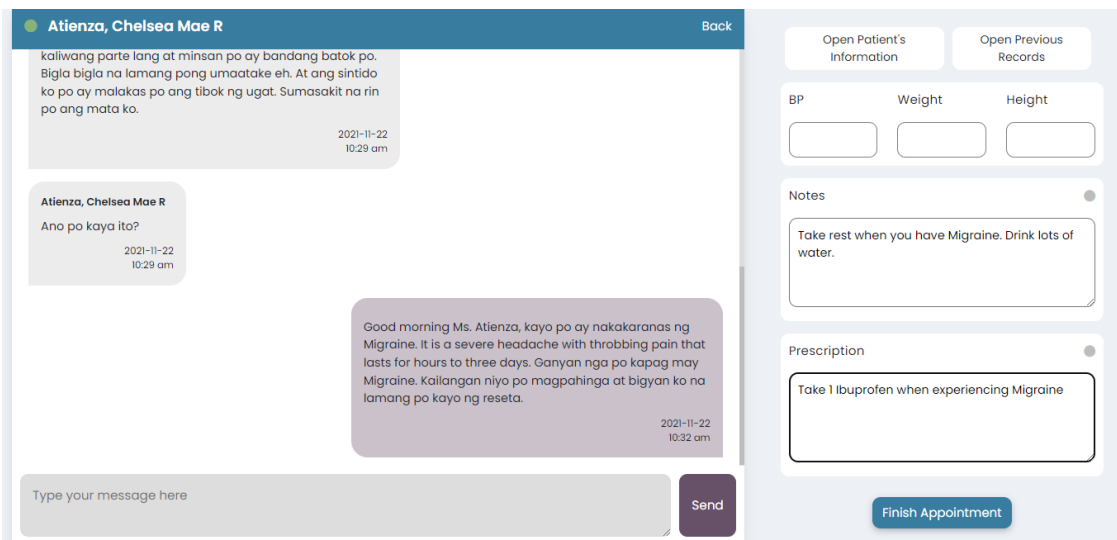

Figure 18. Doctor's Live Chat

Figure 18 shows the Doctor's LiveChat functionality of the system. This would only be enabled if and only if the patient had already made an appointment to the resident doctor or a dentist. The patient had the chance to consult through live chat to the doctor during the appointment schedule. Once the appointment has been booked by a patient, it will be posted on the homepage of the resident doctor or dentist with the status of "ON QUEUE". When the scheduled time arrives, the doctor or dentist will click on the Start Appointment button to begin with the appointment. Displayed on the left side is where the communication or chatting takes place wherein the doctor could see the name of the patient, message as well

as the time and date on when the message had been sent. On the upper left corner, the patient's name is displayed with green light or red light as green light indicates that the patient is online whereas, the red light indicates that the patient is offline and is aligned with the back button on the right side of the live chat that directs the doctor to the homepage. On the right section, there are the two options wherein the doctor had the capability to open and view some patient's details and view the existing records if the doctor wished to do so. Upon checking on the medical records and making conclusions based on what the patients had experienced, the doctor could write notes and prescriptions addressing the patient's worries. After the consultation had finished, the doctor could now be able to click the Finish Appointment button.

Provided on the doctor's homepage, he or she could click on the Chat button and it will direct him or her to the to platform in order to address the patient whom he or she had an appointment with. He or she can also go back to other appointments that he did not finish yet. Click on Open Patient's Information button if he or she wants to view the patient's information otherwise, click on Open Previous Records to view the patient's existing medical records.

The doctor or dentist types the message on the text box and sends it by clicking the Send button. Their exchanged messages had date and time included. As the consultation progresses, the doctor or dentist could write notes by typing on the text box on Notes. He or she could also type on Prescription to give the patients prescriptions. Once the

appointment is done, he or she has to click the Finish Appointment button to end the appointment. Then click on the Back button to go back to the homepage.

With the system, the doctor found it convenient by delivering services and addressing health problems of their patients, where they could pay attention to their patient's needs while at the RHU, at home or wherever they are in real time.
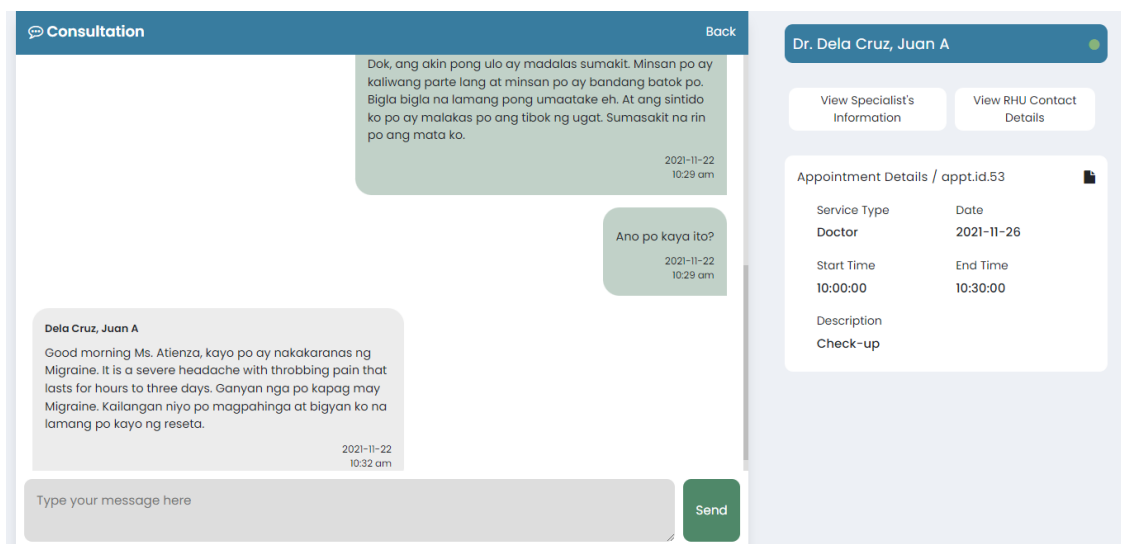

Figure 19. Patient's Live Chat with Doctor/Dentist

Shown in Figure 19 is the patient's live chat feature of the system wherein the Consultation button is located on the upper left corner beside the back button where the patient could go back to home. Below it is where the conversation happens in which the medical professional's name comes with the message. The messages of the patient and the medical professional also came with the date and time. On the right side, the medical professional's name is displayed with either green or red light. Below it are two options wherein the patient could view some of the specialist's information and view RHU contact details. The appointment details made by the patient are also transparent here that includes

the service type, date, start and end time as well as the description of the appointment. More importantly, if the patient would want to message either a doctor or a dentist, he or she must have a scheduled appointment wherein the patient could only consult during the appointment hours. On the other hand, if the patient wants to make conversation with a nurse, he or she can chat with the nurse anytime but there is no assurance when the nurse would respond because of their availability.

The patient clicks on the Chat button and it will direct him or her to the chat platform of the system and display the appointment details. Click on the View Specialist's Information button and a prompt or window will appear displaying some details about whom the patient has an appointment with. Otherwise, click on the View RHU Contact Details button and a prompt or window will appear displaying the contact information of Sta. Teresita RHU.

The patient types the message on the text box and sends it by clicking the Send button. The exchanged messages include the date and time it was sent. Click on the Back button to go back to the patient's homepage.

With the system, the patients found it very reliable for them as it gave them a fast way to communicate with any of Sta. Teresita RHU medical professionals that provide transparency to details.
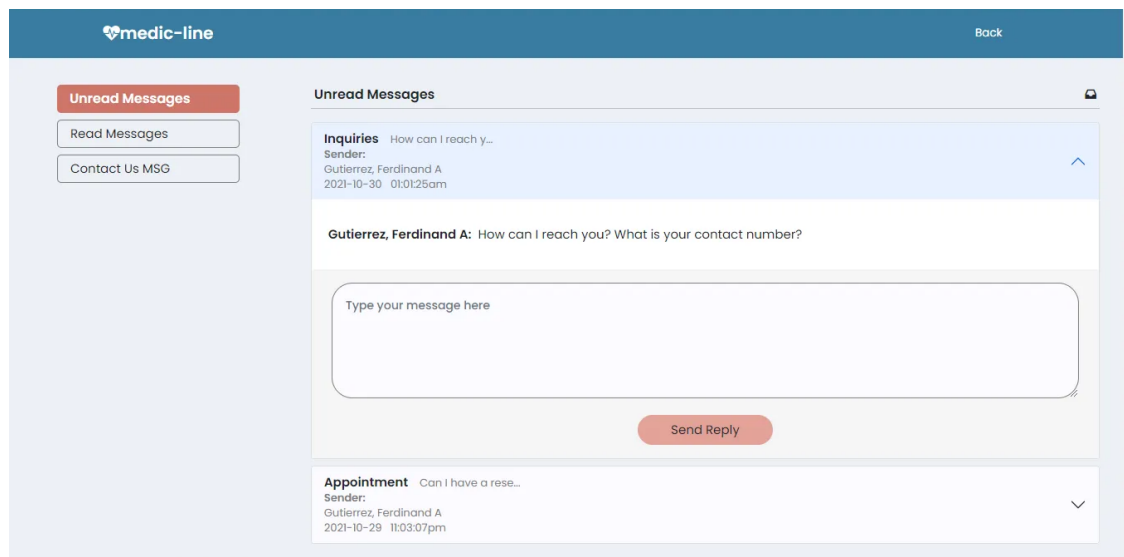
Figure 20. Admin Unread Messages

Shown on Figure 20 is the Chat feature of the system designed for the admin or the nurse of Sta. Teresita RHU. On the left side, seen are the three buttons such as Unread Messages button, Read Messages button and Contact Us MSG. This particular section displayed the messages that the admin did not read yet. The message from the patient lies under concern categories or subjects such as Inquiries, Services, Medicine and Appointment. The nurse can see the subject, sender's name, date and time on the upper part of the chat section. The nurse could type his or her response for the patient's concerns on the textbox then click on the Send Reply button. On the other hand, seen at the lower part are the messages that are still unread. After the nurse has sent his or her message, it would be received by the recipient.
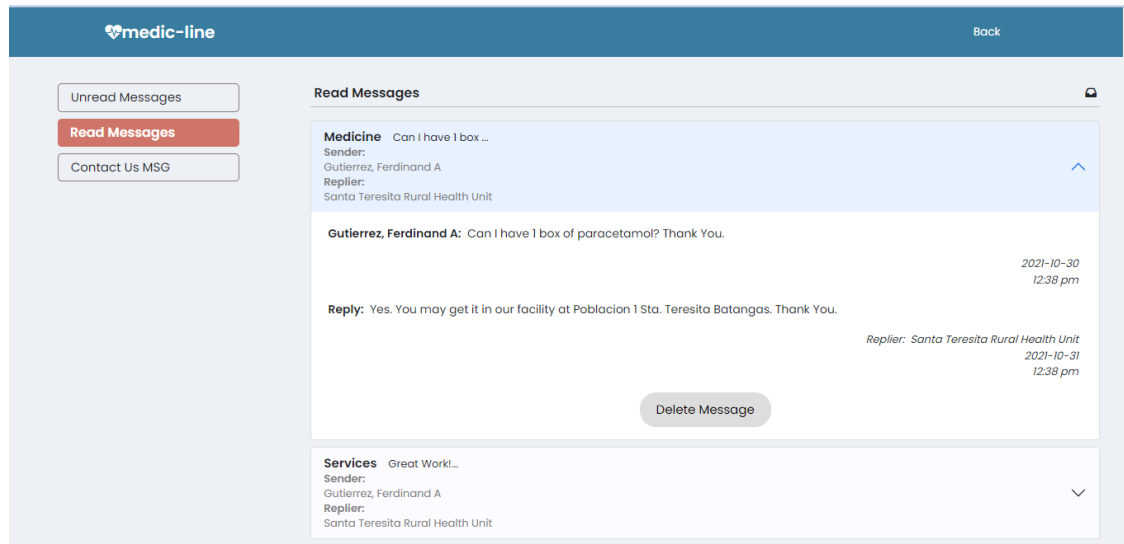
Figure 21. Admin Read Messages

Displayed on Figure 21 is the Admin Read Messages which is under the chat feature of the system. The subject of the message, sender's name as well as who replied on the name of Santa Teresita Rural Health Unit. Messages are classified as read messages if there is already a reply. The message from the patient comes with the date and time it was received and for the reply, the date and time were also specified with the replier's name. The message can be deleted by clicking on the Delete button.

On the other hand, other read messages history were placed below the current read messages. As the nurse clicks on the arrow down button, he or she can see the messages he or she had with a particular patient on a particular subject matter of concern.
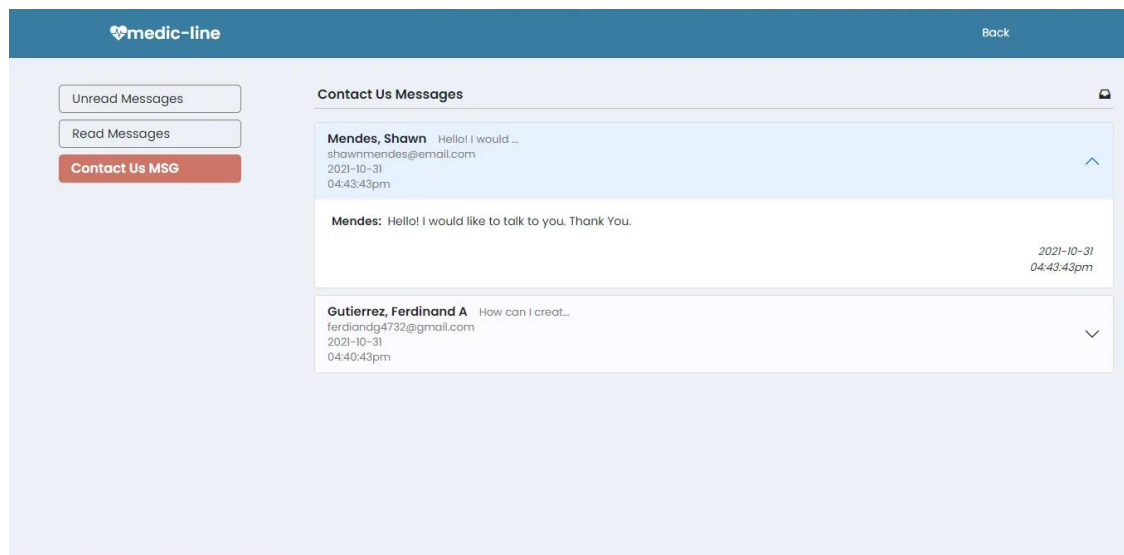
Figure 22. Admin Contact Us Message

Figure 22 showed the Contact Us Message as one functionality of the chat feature of the system for the admin to talk with the patient. The Contact Us page provides the users either registered or not on the system, about how they can be in touch with Santa Teresita RHU. The users are required to fill up a form including their name, address and contact details. Additionally, the Contact Us page also serves a purpose for business matters where other users can talk to RHU staff. With regards to this, the Contact Us Message would bridge those registered and unregistered users to Santa Teresita RHU services.

On the screenshot, the sender's name and his or her email address were displayed along with the message, date and time. After the nurse had read the message, the exchange of concerns and addressing those would happen through email between the sender and the admin.

Note that, on the admin chat page, whomever the nurse is, the patients' messages for the admin are visible to each nurse at the RHU. Anyone can send responses to the patients who are seeking help to them. As they send back their messages, the nurse's name is displayed on the admin chat page but the patient will not know who the nurse that replied to them. Since the conversation between the nurse and the patient is not in real time, the researchers made it this way as patients' messages are visible to all nurses so that there will be more possibility that the patient will get a response faster as any nurse can see and reply to their messages.

The admin or the nurses found it very useful and helpful as the system serves them with support to communicate the needs of the patients on addressing their concerns.

Sta. Teresita Medic-Line also provided a dashboard for healthcare professionals that would generate reports showing the stocks of medicine, age (age group of patients), gender and barangay who had the most patients.
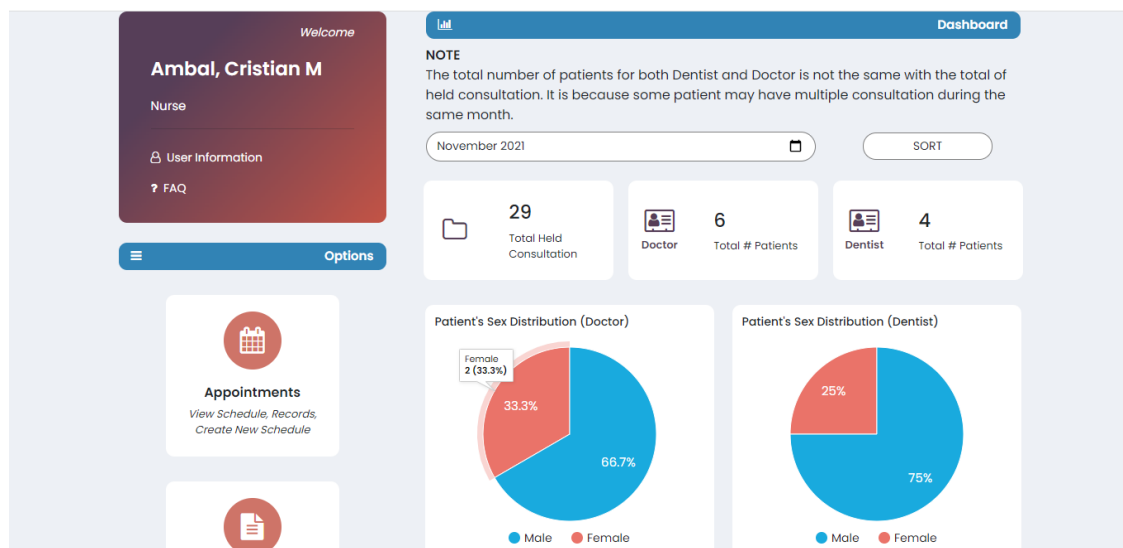
Figure 23. Dashboard

Figure 23 illustrated the Dashboard which could be accessed by the resident doctor, dentist and RHU administrator. This section embodies the total number of consultations conducted by the resident doctor and the dentist which is different from the total number of patients per doctor and dentist because there are multiple consultations made by some patients. The illustrated graphs or charts are the reports which shows the patient's sex distribution, address distribution and age group per doctor and dentist. Upon clicking on the Open Medicine Reports button, the doctor, dentist or RHU administrator would be directed to the list of Changes in Medicine Stocks records and Most Used Medicine records which they can download in PDF or Excel file.

CHAPTER 4
System Integration

IV.1. Integration Support
  IV.1.1. Resources and their Allocation
  IV.1.2. Training
  IV.1.3.Testing
  IV.1.4.Change procedures and history

(c/o System Integration Instructor)

CHAPTER 5
System Administration and Maintenance

(c/o SAM Instructor)