RHCONNECT: A WEB-BASED ELECTRONIC MEDICAL RECORDS (EMR) SYSTEM FOR LAUR RURAL HEALTH CENTER

A Special Problem Presented to the Faculty
Of the Institute of Computer Science
University of the Philippines
Los Baños

In Partial Fulfillment of the Requirements for the Degree of
Bachelor of Science in Computer Science

By:
Marian Stephanie C. Vergara
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The Faculty of the Institute of Computer Science
University of the Philippines Los Baños
Accepts this Special Problem Entitled

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ABSTRACT

With the emergence of digital technology, creating and storing health records is essential to enhance patient care and efficiency. This study has developed a web-based electronic medical records system for the rural health center of Laur, Nueva Ecija. The system digitizes the record management process and automates administrative tasks such as the generation of medical certificates and referral letters in order to help the rural health center improve and become a better provider of high-quality, patient-centered care that enhances the quality of life for all members of the community. Usability testing conducted with healthcare professionals in the health center yielded a System Usability Scale (SUS) score of 84, indicating an above-average and excellent user experience for the developed system.

INTRODUCTION

A. Background of the Study

The Philippines has been undergoing constant efforts to improve the quality of health services being delivered to Filipinos. However, factors such as socioeconomic and financial deficits act as hindrances to furthering the quality being provided. Employing rural health units, health centers, and barangay health stations, municipal governments offer primary care, preventive and promotive health services, and other public health programs (Dayrit et al., 2018).

"Establishing a health information system" is one of the six governance challenges found that affect the service being delivered in the country's rural areas (Bernal-Sundiang et al., 2023). The World Health Organization has proposed ensuring the establishment of electronic patient health records and the development of "global minimum standards for electronic health records" in their 2020 - 2025 global strategy for digital health's long-term and short-term plans, respectively (World Health Organization, 2021). In 2016, the Philippine government institutionalized the adoption and implementation of the Department of Health's (DOH) platform called Philippine Health Information Exchange (PHIE) which aims to "secure electronic access and efficient exchange of health data" (Department of Health, 2016). Exposing the interoperability of Electronic Medical Records (EMR), known as internal organizational systems used to improve healthcare standards and keep expenses in check, during COVID-19, it has been found that the healthcare system must improve the functionalities anticipating problems brought about by inevitable scenarios like the pandemic (Pryor et al., 2020).

Aside from the general improvement in healthcare services, EMRs are used as systems for disease surveillance and monitoring which assists the community (Dornan et al., 2019). Focusing on Person-Centered Care Planning (PCCP) could improve the quality of data and information being provided. Systems should be "responsive to and reflective of the unique needs of the service user" (Stanhope & Matthews, 2019).

In this day and age, rural health clinics must use EMRs since they enhance patient care and efficiency. By removing barriers and realizing the full potential of EMRs, the healthcare system may improve and become a better provider of high-quality, patient-centered care that enhances the quality of life for all members of the community. This ensures the access to quality service reaching every part of the country.

B. Statement of the Problem

With the emergence of technological tools, there exists a need for the medical field to catch up with such changes. EMRs support both data management and service delivery at a high standard. Nonetheless, some places, particularly in rural regions, still maintain records of the manual and traditional methods. This may be because of a lack of resources or an aversion to technological improvements. The rural health center in Laur, Nueva Ecija continues to use paper records. Making the switch to an electronic one will facilitate data access and perhaps enhance service delivery as a whole. This study will address the lack of EMR in Laur Rural Health Center (LRHC) by developing and implementing a web-based EMR that would help refine services.

C. Objectives

The general objective of this study is to design and develop a web-based EMR system for the rural health center in Laur, Nueva Ecija. Specifically, the system aims:

- to electronically keep and manage patient records;
- to automate administrative tasks;
- to generate reports to help see patterns and summary; and
- to evaluate the usability of the system using the System Usability Scale (SUS).

D. Significance of the Study

Communities have been proven to benefit from EMRs, particularly in the areas of knowledge sharing and records management in healthcare facilities. There has been an existing Electronic Health Record (EHR) system implemented in the Philippines, PHIE intends to be inter-organizational and has a wider range as opposed to EHRs being internal. The absence of EMR in the rural health center in the municipality of Laur, Nueva Ecija, is proof of the research that says that rural areas lag behind in technical improvements. The goal of designing and developing this web-based system is to assist with administrative tasks and adopt an improved system inside the organization in line with the ongoing advancements in healthcare service approaches.

The system's primary goal is to support administrators by making it feasible to reduce the complexity of their jobs. Information can be easily obtained through digital technologies because it can be accessed anywhere there is internet access. Reduced user tasks would also result in the optimal care being given to the patients. This system would act as a data

repository for patients and resource information, offering summaries and patterns that might be necessary to comprehend trends within the health center.

E. Scope and Limitation

The main goal of this study is to create an EMR system specifically for Laur, Nueva Ecija's rural health center. The system's implementation was concentrated on work automation and records management, which will assist the health center's administration. The system has the capacity to provide data, create reports, and maintain medical records.

F. Date and Place of the Study

The study was conducted during the second semester of the academic year 2023 - 2024 at the Institute of Computer Science under the College of Arts and Sciences, University of the Philippines Los Baños, and in Laur, Nueva Ecija.

REVIEW OF RELATED LITERATURE

Health is one of the fundamental human rights, and several studies have been conducted to improve care coordination, specifically in handling and managing patient records. Providing a properly-designed EMR system to healthcare providers would help with administrative tasks and deliver outstanding quality care leading to better resource utilization encompassing human and financial resources. However, there has been limited literature on the execution of such advancement which caters to the needs of these services, especially in the rural areas. To ensure the most up-to-date information, only resources from the last five years were considered for this review. However, due to the scarcity of readily available data on EMR features and to provide a proper historical background for the previous implementations of EMR, no restrictions were placed on the publication year of the selected related literature.

A. Electronic Medical Records System

Technological advancements in the medical field are emerging which provide assistance and help quickly adapt to internal and external changes especially in global progress albeit in varying degrees. A properly implemented EMR was reported to provide a reliable and improved service as long as interoperability and standardization concerns are taken care of (De Benedictis et al., 2020). The rapid growth of EMR was seen to be promising in terms of developing patient care and improvements in healthcare settings.

Compared to the traditional paper-based system, the implementation of EMR systems was revealed to further improve overall patient satisfaction as seen by the cross-sectional study conducted by Wali et al. (2018) in the Primary Health Centers

(PHC) in the Western Region of Saudi Arabia. The labor-intensive nature of manually recording patient data contributes to delays in patient care and the reduction of the overall quality of service. However, it is important to note that while the EMR system yields high benefits, it should be considered that the factor related to entirely shifting into the digital process as completeness and reliability are affected due to "dual documentation" where providers were still managing both systems at the same time. The efficiency of an EMR system is still dependent on the execution, practice, and the extremity of adoption of the organization (Abiy, 2018).

In terms of expectations and perceptions between the two existing systems (i.e. paper-based and EMR), Ayaad et al. (2019) did a comparative analysis of two public hospitals in Jordan where one adopted an EMR system while the other had a paper-based system. The former was revealed to produce a higher quality service compared to the latter in terms of efficiency, availability, fulfillment, and privacy. EMR systems have been developed to facilitate ease of providing service by automating manual tasks. It was found that younger computer-literate primary care physicians (PCP) are more inclined to EMR implementation as compared to older PCPs which shows the disparity in the technological competencies affects how EMRs are accepted. Improved clinical productivity, patient safety, and care quality are revealed to be potential benefits of using EMR systems (O'Donnell et al., 2018).

Despite the favorable perceptions of EMR, its implementation continues to face challenges one of which is the the providers' lack of training. Although the EMR system adopted by Ayder Hospitals in Ethiopia functioned effectively, users identified a lack of training and follow-up as the most significant challenge (Bisrat et al., 2021). In Tri-service General Hospital in northern Taiwan, the data from 2013 - 2018 showed that the implementation of a pure EMR system resulted in a notable decrease in the

14-day readmission rate and inpatient mortality rate as compared to no EMR system. The integration facilitated ease of inquiry and patient information access. Reduction of reliance on paperwork streamlined immediate data transfer and accessibility (Lin et al., 2020). Moreover, for the healthcare practitioners practicing in Arizona, USA, utilization of EMR was said to "reduce medical errors, wrong site surgery, improper dosage delivery to a patient, wrong medication, etc. by 50-60 percent" (Jindal & Raziuddin, 2018).

As an emerging technology, several approaches have been done and used in the development of EMR. Usability and operability is the main concern when developing an EMR and it is imperative to prioritize users' perspectives to create a system fit for their needs. Clarity is important as well as fault tolerance and suitability for learning (Jindal & Raziuddin, 2018). These requirements are essential to create a system catered to what the users are looking for. Furthermore, faithful recording of information and its permanence should be included when designing and developing ERM systems as these positively contribute to communication and decision support (Rector et al., 1991).

These studies tackled the implementation of EMR systems, highlighting their benefits and challenges in comparison to traditional paper-based systems. The predominance of foreign implementations and the scarcity of Philippine-based samples underscore the current state of technological advancements in this field. To put it in a local perspective, several pieces of literature are examined, shedding light on the current status of EMR implementation in the Philippines.

B. Electronic Medical Records in the Philippines

In their 2019 study, Ebardo and Celis employed the Technology-Organization-Environment (TOE) framework to categorize the barriers to EMR adoption in the Philippines. Complexity, weak infrastructure, and poor interface design were under the technology category while the organization had user resistance and a lack of appropriate skills. The environment category contained two barriers which are difficulty in regulatory compliance and inadequate medical school orientation (Ebardo & Celis, 2019). These help with establishing a better system that would be fit for the needs of the practitioners.

While the establishment of the Philippine Health Information Exchange (PHIE) by the Department of Health (DOH) represents a significant step towards digitizing the healthcare sector, it still falls short of meeting the needs of medical professionals, particularly those working in remote and underserved areas. Various database products within the organization of the different departments in the country contribute to its continuing interoperability which deems it impractical (Canlas, 2009). It is important to note that its initial and main purpose was as an Electronic Health Records (EHR) system which is different from EMRs.

Moreover, to further advance with the constant improvement in the digital world, there should be a “mutual alignment” between the resources and the speed of improvement. The ingrained reliance on paper-based systems, deeply embedded in Philippine culture and bureaucracy, poses a significant challenge in this endeavor (Macabasag, 2023).

Despite significant advancements in EMR adoption worldwide and the Philippine government's initiatives to modernize healthcare, the country still lags in its implementation. This lack of adoption poses a major challenge for medical

professionals especially in rural areas, hindering their ability to provide efficient and effective care.

C. Synthesis

The preceding review highlights the crucial role of a well-designed and implemented EMR system in enhancing care coordination by facilitating the transition from paper-based records to a digital platform. Despite DOH's initiative towards a digital healthcare system through the PHIE, its effectiveness and influence remain limited, failing to reach remote areas such as Laur, Nueva Ecija. This study aimed to address this gap by designing and developing a tailored EMR system specifically for Laur, Nueva Ecija. The proposed system will have medical record management functions, report generation tools, and data exchange functionalities.

METHODOLOGY

As the primary objective of the study, this research aimed to provide a well-designed and useful web-based EMR system called RHConnect for Laur Rural Health Center. This system is designed to enhance the quality of care coordination and service delivery by improving record management processes.

A. Development Tools

A laptop with the following specifications was used in the development of the EMR system:

- Operating System: Windows 10 64-bit
- Processor: Intel® Core™ i5-8300H 2.30 GHz
- Memory: 8.00 GB DDR4

The following software development tools and technologies was used in the development of the EMR system:

- *Visual Studio Code*. A source-code editor that will serve as the integrated development environment (IDE) during the development of the system.
- *Laravel 5.2 Framework for PHP: Hypertext Preprocessor (PHP)*. The primary programming language, a server-side program for scripting languages, will be used in developing the web-based EMR system focusing on the backend side.
- *HyperText Markup Language 5 (HTML5), Cascading Style Sheets (CSS), and Bootstrap*. These are going to be used to develop the system's frontend side focusing on creating and designing the user experience (UX) and user interface (UI).

- *Cross-Platform, Apache, MySQL, PHP, and Perl (XAMPP).* A cross-platform web server to be used in setting up the local web server environment.
- *PHPMyAdmin.* A free PHP software program designed to manage MySQL over the Web which is chosen to be used for handling the system's database.

With the developer's expertise and alignment with the spe-cific needs of the EMR system and its intended functionalities,the selection of machines and tools was carefully undertaken.

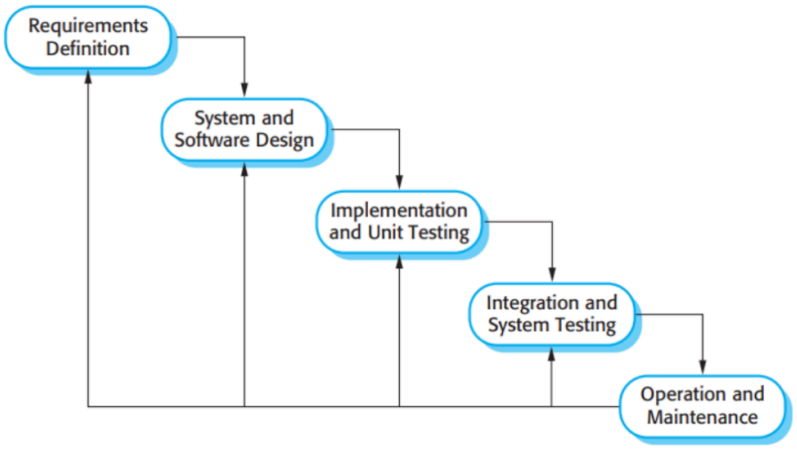

Fig. 1: Phases of the waterfall model development.

The image was created to show the stages of a waterfall model development. From Software Engineering (9th ed., p. 30), by I. Sommerville, 2011, Pearson. Copyright 2011, 2006, 2005, 2001, 1996 Pearson Education, Inc., publishing as Addison-Wesley.

B. System Development Methodology

To prioritize a personalized system while recognizing the time constraints of the development, this research utilized a Waterfall Model in the development process encompassing design, development, and deployment. At an early stage, it is essential to establish and define the required functionalities through the help of the inputs coming from the stakeholders who are the potential users in the future. Minimal changes during the development phase are anticipated as it is fundamental in this model to clearly understand the requirements. The Waterfall Model aligns well with the project's constraints and essential requirements due to its upfront establishment of project scope and goals through user consultation, facilitating the creation of comprehensive system specifications.

As Sommerville (2011) discussed in his book Software Engineering, this method comprises five fundamental stages (See Fig. 1) (Sommerville, 2011). It is expected for the researcher to undergo the first four stages as the operation and maintenance fall beyond the scope of this research.

1. *Requirements Definition*, the researcher engaged in consultations with various stakeholders within the health center, including administrative personnel and healthcare providers, to identify the specific needs and challenges they face. The primary need of the health center was to have a personalized process-centered system that caters to their protocol and daily routine such as recording of patient treatment reports and file generation.
2. *System and Software Design*, once the user requirements were gathered and clearly defined, the overall system architecture was designed. This involved considering both the hardware and software components that was needed to fulfill the system's requirements. PHP along with Laravel as the framework

was used to code the system as it suffices what the established user requirements. Security is the most important aspect considered in the creation of the system which is why an encryption library Ciphersweet was utilized.

3. *Implementation and Unit Testing*, following the completion of the requirements definition phase, the system's implementation and unit testing started. Unit testing involves verifying that the individual modules and components of the system function as intended, adhering to the established specifications.
4. *Integration and System Testing*, upon completing the system's implementation, comprehensive testing was conducted to ensure that the software requirements were fully met. This testing phase involved evaluating the system's overall functionality, and performance in adherence to the research questions. Since this research focuses on a specific stakeholder, known as the client, the system will be rigorously tested within the organization it is intended to serve, the Laur Rural Health Center.

While this approach may appear linear, each stage inevitably overlapped, as insights gained from earlier stages informed the subsequent ones. However, it is crucial to acknowledge that encountering problems may necessitate pausing one stage to address another, such as the specifications, as discussed by Sommerville in his discussion of this model.

C. Research Design

This research employed a mixed-method design, primarily utilizing the convergence approach. Data collection commenced with gathering essential functionalities directly from the target users, namely the members of the Laur Rural Health Center. This was be achieved through one-on-one interviews with a diverse range of potential users coming from their administrative team and healthcare providers.

After the development of the system was finished, its usability was evaluated using the System Usability Scale (SUS), which gathered quantitative data by having users rate each survey item (Lewis, 2018). Descriptive statistics, particularly the mean score, was used to study these scores. Using an overview of user replies, this method highlighted trends and offered insights into how users felt about the system as a whole.

The calculated scores were subjected to a thematic analysis to uncover the underlying patterns and relationships between the scores and their corresponding insights. This analysis will delve into the qualitative data gathered from the SUS responses, aiming to extract meaningful themes that shed light on the reasons behind the users' ratings.

D. System Features

This research primarily aimed to provide a user-centric EMR system that would help run Laur Rural Health Center in Laur, Nueva Ecija to improve the care coordination and quality of service being provided. It provides a platform to manage patient records and help automate tasks in relation to patient care. Table 1 provides a list of the functionalities and the user access is aimed to be implemented to the system in order to accomplish its goals.

Feature	Access	Usage
User Sign-In	HCW, Administrators	Users will enter the provided credentials by the administrators to access the features of the system created for them.
View Schedule	HCW	Users will be able to view their schedule for the month along with the specific appointments per day.
Add Appointment to Schedule	HCW	Users will be able to create a new appointment for a specific patient. The system will show a prompt asking if the patient is already in the database, otherwise, the user will be prompted to the Add New Patient Page
View List of Patients	HCW, Administrators	Users will be able to see the current list of patients.
Add New Patient	HCW	Users will be able to add patients that are not yet on the database.
Edit Patient Information	HCW	Users will be able to edit patient information for updates and corrections.
Remove Patient Records	HCW	Users will be able to remove a currently existing patient from the database.
Generate a Medical Certificate and/or Referral Letter	HCW	Users will be able to generate the needed report based on the input coming from them.
Create New Account	Administrator	Users will be able to create new credentials to be used by a new user to access the system.
Edit HCW Data and	Administrator	Users will be able to edit the

Account		information of each HCW for updates and corrections.
Delete HCW Data and Account	Administrator	Users will be able to permanently delete the account of any HCW.
View List of Resources and Transactions	HCW, Administrator	Users will be able to see the current list of resources the center holds.
Add New Resource Entry and Transactions	Administrator	Users will be able to add resources that are not yet on the database.
Edit Resources Information	Administrator	Users will be able to edit resource information for updates and corrections.
Remove Resources Information	Administrator	Users will be able to remove a currently existing resource entry from the database.

Table 1: Application features, type of user for feature access, and feature usage.

The system's features primarily revolved around managing records and keeping them accessible to the users. These features are selected in compliance with the results of the interview conducted with the members of Laur Rural Health Center. Being able to implement these features ensured the specific needs of the intended users of the system.

Healthcare Information and Management Systems Society (HIMSS) is a global organization that aims to improve healthcare via information technology. HIMSS established seven stages in fully adopting EMR systems (Furukawa, 2020). However, due to the limitations within the health center and the objective to achieve a

more personalized system, only some of the stages are going to be achieved in this research, particularly on data repository and computerized files.

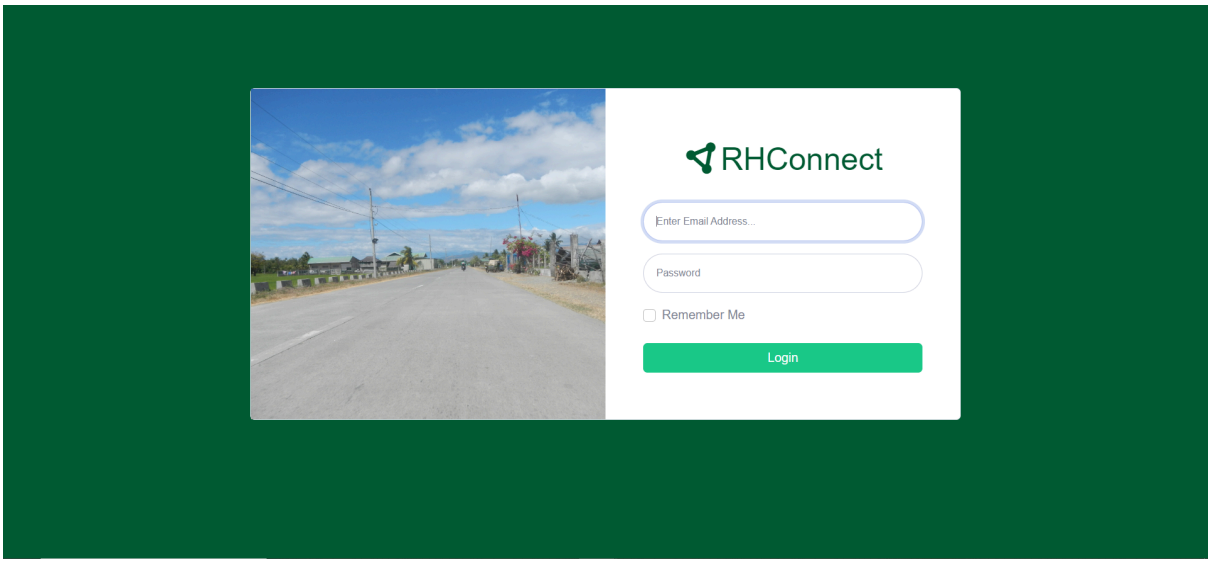

Fig. 2: Login page.

The system prompts the user to log in before being able to access the dashboard or any of the services provided. In case a user is already logged in, it will redirect to the dashboard page.

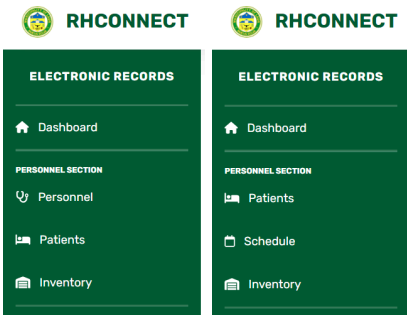

Fig. 3: Sidebar of the admin (left) and sidebar of the healthcare worker (right).

A difference between the offered sidebar is evident in the side-by-side comparison of the component. This is to aid the filtering of the tasks and help make the system more straight to the point with the assigned tasks exclusive to each user role.

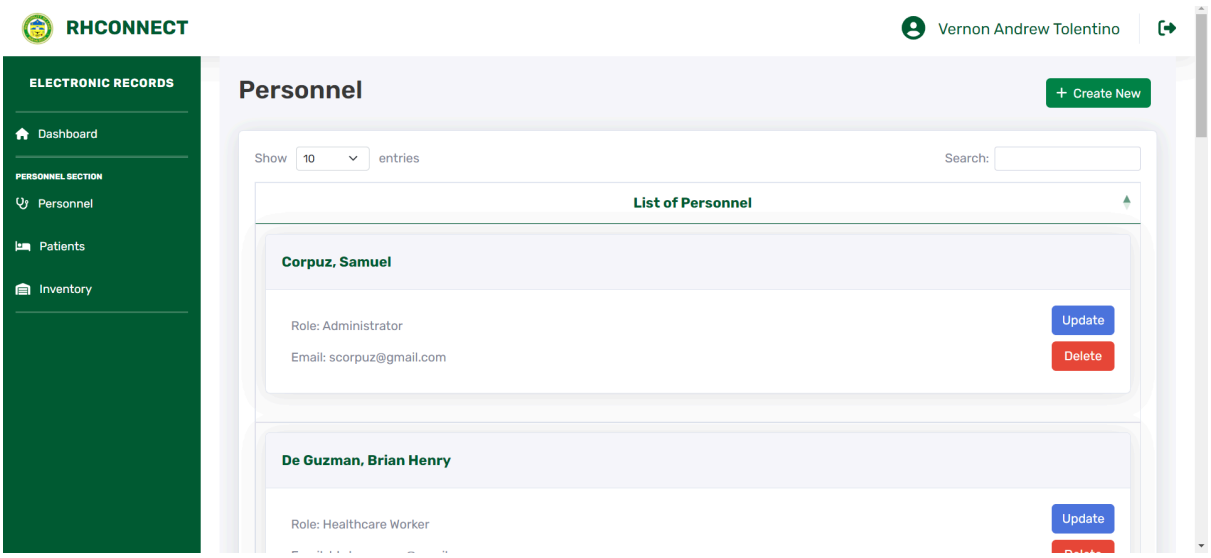

Fig. 4: Personnel page of the admin.

As part of an administrator's job, an admin can create, remove, update, and display the information of the personnel inside the health center. This is a page exclusive to the admin and is not accessible to other user roles despite accessing via URL.

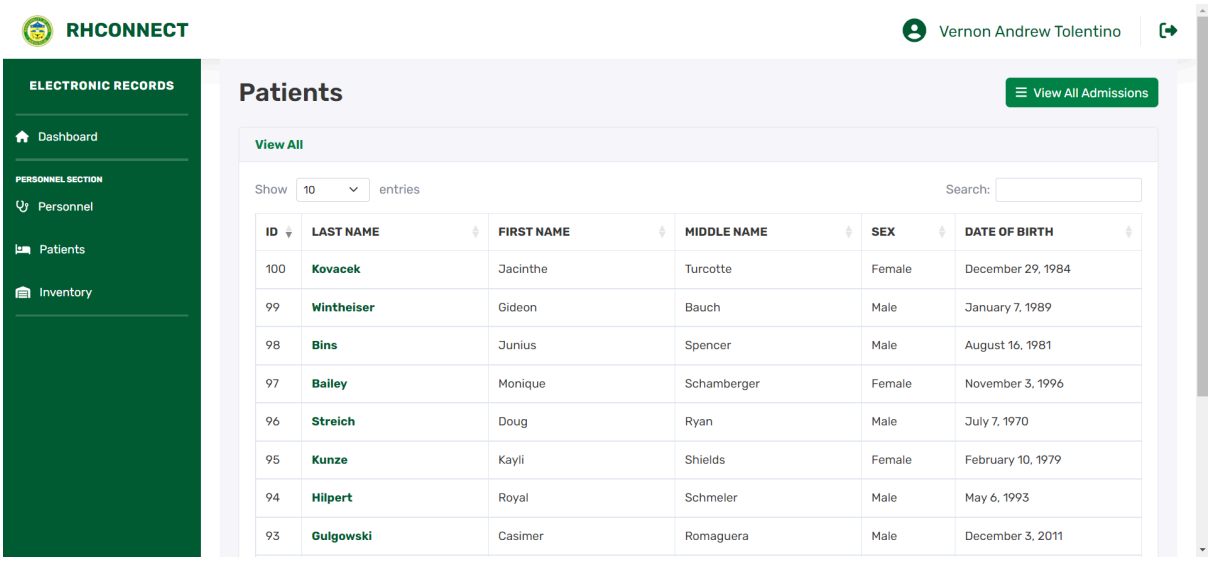

Fig. 5: Patients page of the admin.

This section only displays the overall list of patients regardless of the healthcare worker assigned to each patient. However, one restriction in the administrator is being able to

view the details for each patient. This is done in order to adhere with the privacy and confidentality entailed with the patients' health records.

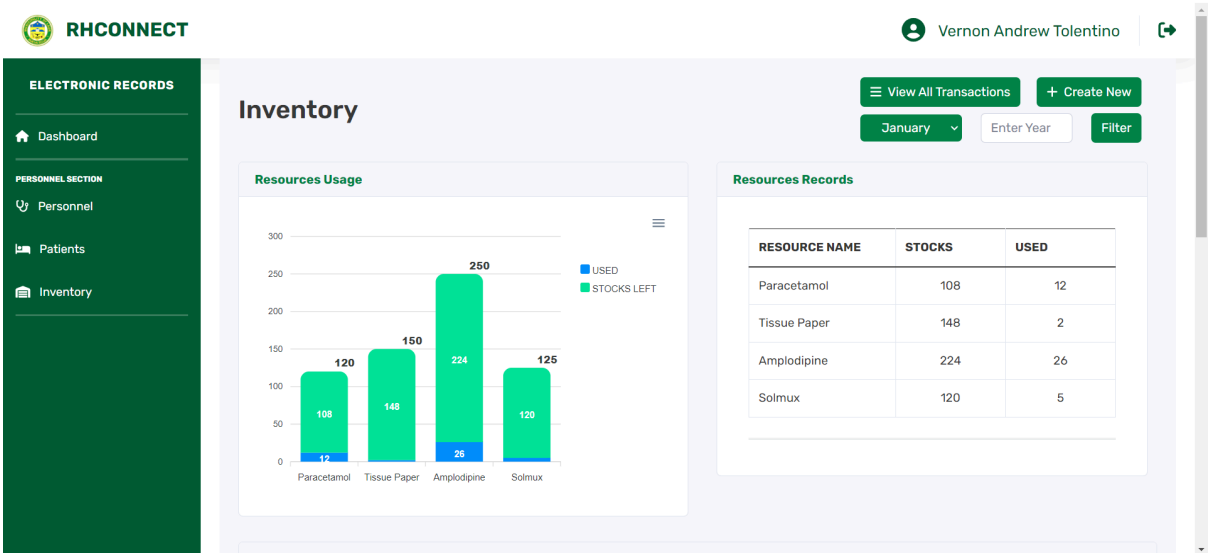

Fig. 6: Inventory page.

As part of an administrator's job, an admin can create, remove, update, and display the inventory in each selected month in a specific year. Creating a transaction is also available to be created in every changes happening in the inventories handled within the health clinic. This is to help track the number of stocks and resources used by the clinic. The healthcare worker could access this section however is only restricted for displaying the stocks of each resource available.

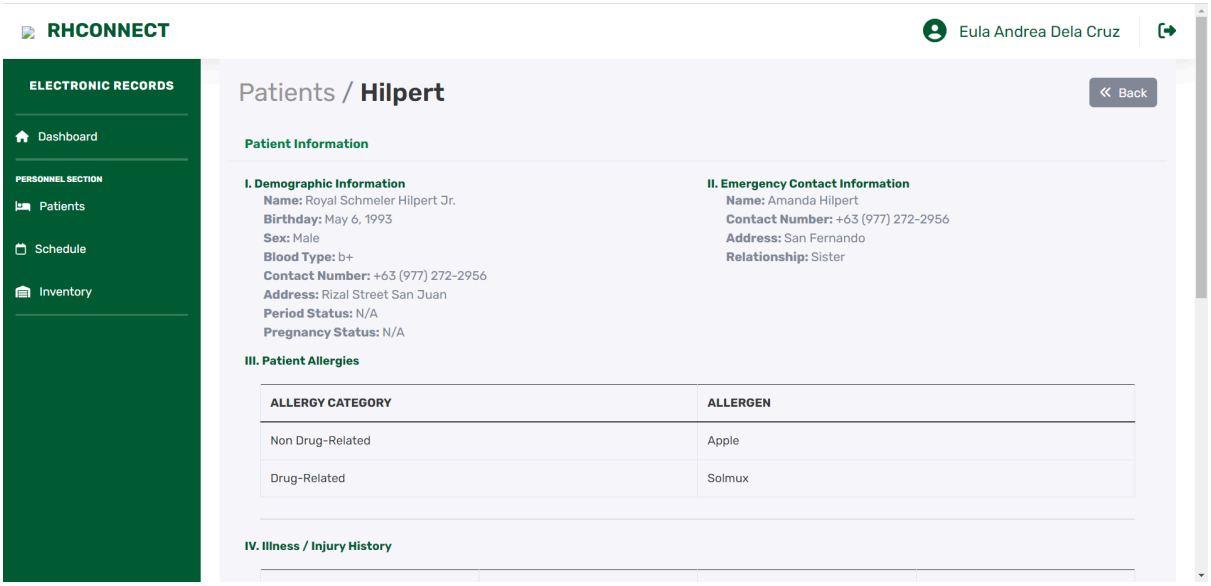

Fig. 7: Patients page of the healthcare worker.

A healthcare worker providing service for a specific patient can create, update, remove, and display all the health information available for each patient under their care. This helps in accessing and storing information.

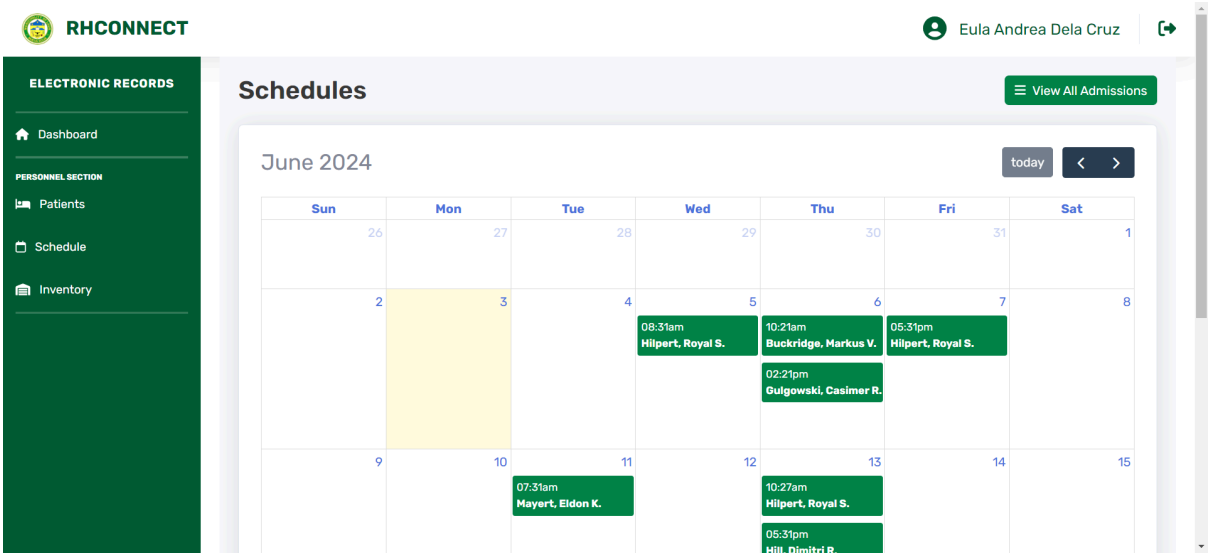

Fig. 8: Schedule page of the healthcare worker.

To aid with the systematic process of providing patient care, a scheduling system is available for each healthcare worker in aiding for the creation of service done per patient in a

specific date. This helps with overseeing the number of patients each day in order to help the healthcare worker in managing their workload.

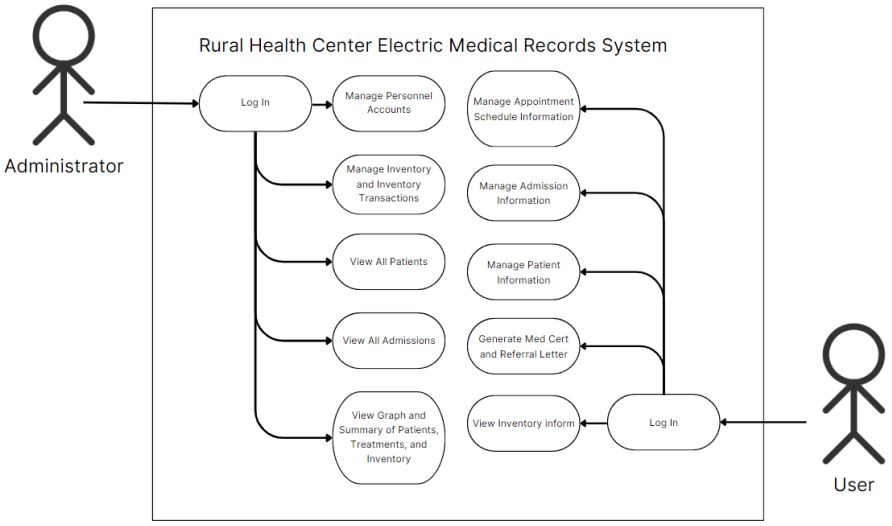

Fig. 9: Types of users for the system.

E. Types of Users

The use case diagram is shown in Fig 9. The following are the users that use the system:

1. Administrator

- The administrator is in charge of the account creation of the users in the system.
- The administrator can view the list of patients, inventory, and personnel.
- The administrator can update the details of the inventory and personnel.
- The administrator can delete an account of personnel without deleting the patient data of the specific personnel.

- In the case of the inventory, the administrator can add transactions related to the inventory usage and stocking up.
- The administrator can view the graph summary of the patients, treatments, and inventory usage.

2. User (Healthcare Worker)
    - A user can log in to the system using the credentials given by the administrator.
    - A user can view the list of patients under their care and the information related to them.
    - A user can add a schedule for patient appointments and admission details for that specific schedule.
    - A user can update and delete patient and patient information.
    - A user can view a monthly schedule of the appointments under them.
    - A user can generate a medical certificate and referral letter on specific patient admission.
    - A user can view the graph summary of the patients, treatments, and inventory usage.

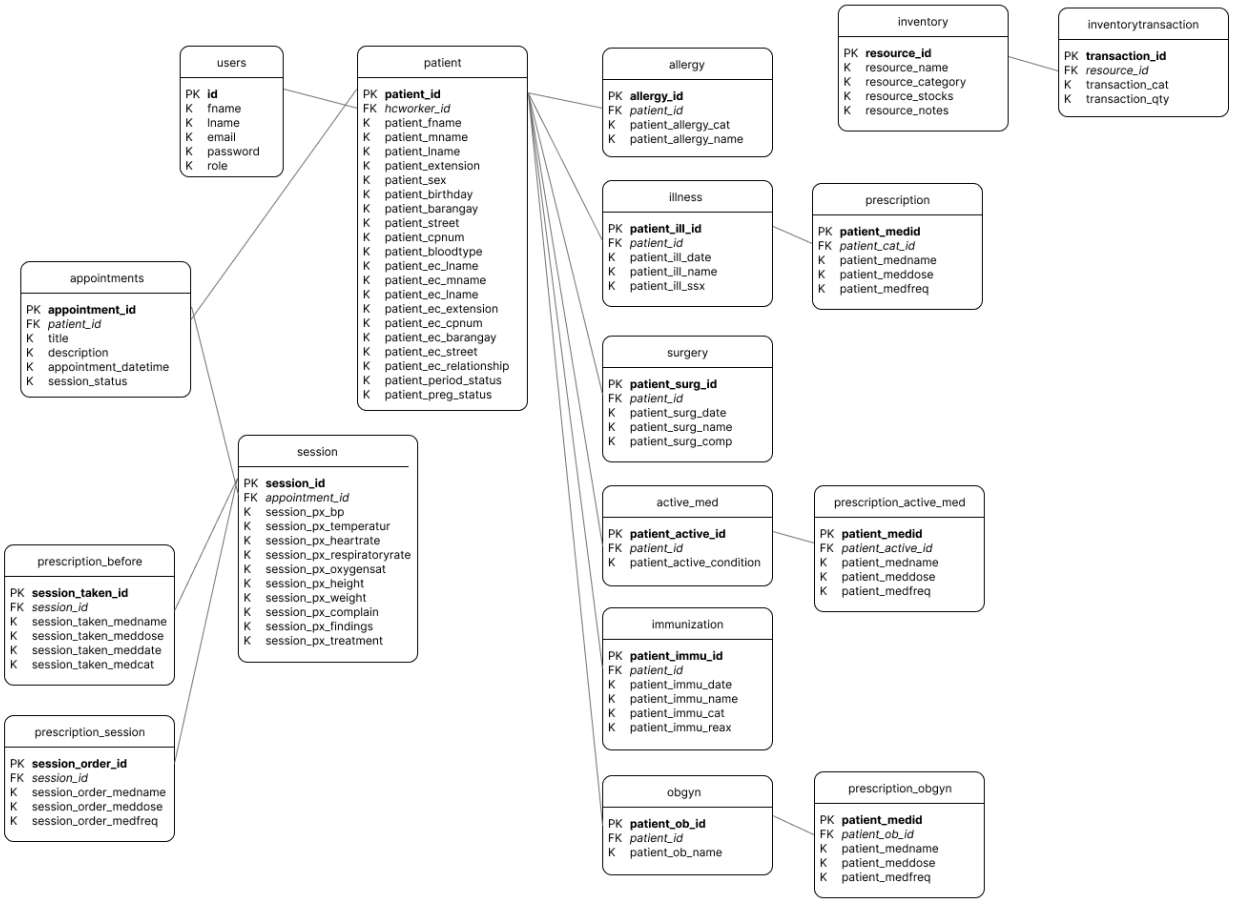

Fig. 10: Entity relationship diagram for the system.

F. Database Design

The database consists of 17 tables to handle the information needed in every creation of a patient and the information needed in every check-up or admission. The data are based on the current data being taken by the health center and are minimized based on the primary and important data to the organization to simplify the system which is one of its priorities as a personalized system. The diagram is shown in Fig. 10.

G. Data Collection

Prior to commencing the development process, the client was presented with a written consent form for their approval to initiate the first stage of development containing their approval for conducting the research with their organization’s participation. Additionally, informed consent was obtained from the testers, primarily comprising administrative personnel and healthcare providers. This ensured that they were fully informed about the specific tools employed to gather the required data.

In compliance with Republic Act 10173, also known as the Data Privacy Act of 2012, the testers' identities have remained anonymous throughout the study. Only the researcher has access to the data, which applicable laws and regulations safeguard. This ensures that confidential information is treated with the utmost care and solely utilized for research purposes.

The identified users assessed the system's usability using the SUS, a 10-statement questionnaire with a five-point Likert scale ranging from "Strongly Agree" to "Strongly Disagree." This evaluation provided insights into the effectiveness of the application in meeting the initial development objectives.

H. Data Analysis

Individual survey results were computed and examined to obtain a comprehensive picture of the users' experiences. The mean scores of all the testers were examined in order to gauge the general viewpoint and system experience. Further inquiries on recommendations for improvements and adjustments were made in order to resolve any deficiencies found in the study and offer more information about the fundamental causes of the scores that have been assigned.

RESULTS AND DISCUSSIONS

The output is an electronic medical records system, which consists of an administrator and a user whose functionalities differ based on the role.

A. Development Stage

In the development of a system related to medical records, security must be prioritized. With that, the system utilized a backend encryption library named Ciphersweet. This encrypts the information being sent to the database. This is to protect the data from live attacks on the database server the database holds sensitive information.

For a more efficient implementation and development, libraries such as Datatables for easier searching and pagination, Fullcalendar for the monthly appointment view of the users, and Select2 to handle the dropdown boxes. These libraries are utilized to help the developer for a more straightforward and efficient development. These serve only as supplementary materials, and would not replace the whole coding process.

B. Administrator-side System

The administrators are asked to log in using their credentials (email and password). It is seeded into the system which helps in having default credentials for the administrator which prevents the credentials from being lost.

Administrators can create personnel but not patients and patient records to ensure that the data of the patients are secured and are not easily viewable to the people outside the service. However, patients' basic information (name and birthday) is viewable to the administrator but not the

intricate and sensitive information in adherence to doctor-patient confidentiality.

As part of an administrator's job in the health center, they manage the inventories which is why the creation of inventories and transactions are restricted to the administrators. This is to ensure the job specifications are reflected in the restrictions of the functionalities based on roles. Administrators are only allowed to oversee the system to ensure everything is working properly.

C. User-side System

The users of the system are expected to be healthcare professionals working in the health center. They are asked to log in using the credentials given to them by the administrators.

Users are allowed to create appointments and patients. The system has four tabs on the sidebar available to the user: Dashboard, Patients, Schedule, and Inventory. The Dashboard consists of relevant information to see trends and patterns important in the analysis of the current health status in Laur, Nueva Ecija, and its citizens. The schedule consists of appointments which would lead to the creation of admission data collected on every visit a patient makes to the health center. In case a patient is still not in the records, the user is prompted to create a record for the patient. This is to record the patient's history and the important information relevant to patient care. The user is only restricted to viewing the inventory list filtered based on month and year this is due to the nature of people working on the inventory management. This helps

in specifying the job only related to the user by denying access to some of the system's functionalities.

	R1	R2	R3	R4	R5	
Q1	5	4	5	5	5	
Q2	2	2	1	3	1	
Q3	5	5	5	5	5	
Q4	3	2	5	2	1	
Q5	5	5	5	5	5	
Q6	2	2	2	2	1	
Q7	4	5	4	5	5	
Q8	2	2	2	2	2	
Q9	5	5	4	5	5	
Q10	2	2	4	2	2	
	82.50	**85.00**	**72.50**	**85.00**	**95.00**	**84**

Fig. 11: Individual scores table.

D. Testing

The system was evaluated and tested by 5 respondents, mainly personnel from Laur Rural Health Center, using the System Usability Scale (SUS). The test consists of 10-statement questionnaire with a five-point Likert scale ranging from "Strongly Agree" to "Strongly Disagree." This evaluation provided insights into the effectiveness of the application in meeting the initial development objectives. The testing yielded an average score of 84.

The individual scores and the mean score were calculated. The summary of the rating and the resulting individual scores are shown in Fig. 11. A score of 84 classifies the system as above average as it is within the range of 80.3 - 100.

At the last part of the testing process, comments and suggestions were collated to further improve the system in future developments. Suggestions were made on the future expansion of the system which is to possibly add file attachments in case the rural health center's protocol improves.

CONCLUSION

This study was developed to provide an electronic medical records system aligned with the specific needs of Laur Rural Health Center. The users, mainly the healthcare workers, can log in using the credentials provided to them and can do the recording and management of patient data inside the system. The administrator side of the system can create the personnel and the credentials to be distributed to the personnel.

This system's aim to reduce the unnecessary tasks and functionalities in systems to ensure that it provides a straight-to-the-point and simple method of record management system was reflected in the creation of functionalities only based on the recommendation of the workers in the health center. This is to ensure that every functionality is utilized and will not serve only as clutter to the workers.

As a digital record management system, the healthcare personnel were able to easily look for records, speeding up the process and being able to focus on providing patient care service. Furthermore, the previously done manual process of administrative tasks is digitized and automated for an easier process for paperwork. The summary and graphs are easily accessible in the dashboard to provide input on the current trend concerning the patients and treatments done, as well as the resources in the health center.

RECOMMENDATIONS

For future work, as suggested by a respondent, a possible expansion by adding a feature for file attachments would be ideal. While the health center still does not need the specific functionality due to the scarcity of resources and facilities, future developments might consider adding one. Furthermore, as the health clinic expands, a possibility of a need for information-sharing across different users would arise.

As designed for a health center in a municipality where resources and facilities are not as advanced compared to the cities and hospitals, this system is limited to be adapted by the health center having the same needs as Laur Rural Health Center. This is a system designed for this specific health center but with minor fixes and the addition of functionalities, different health centers could adopt this as a way to digitize their records and automate their tasks.

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