

## Public Health Record Management System: An Up-Close Monitoring System



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### ABSTRACT

The researchers developed a public health record management system for the barangay health center of Sto. Rosario, Paombong, Bulacan, recognize the existing problem, circumstances and reduce the risk of data lost due to unprecedented accidents or human errors and decrease the probability of data redundancy for the patients. The developers used an illustrative and user-friendly design that presents the data in the easiest way possible. Public Health Record Management System (PHRMS) aims to elevate the current state of record management of the public health center by incorporating technology to further enhance the productivity securely and a faster way of data processing to save time and serve more patients. For the acceptability of the developed health information system, the researchers consulted with IT professionals from different fields, IT instructors from Bulacan State University, and the end-users or clients of the developed system such as the midwife, and barangay health workers. The evaluation form has the following criteria for software quality evaluation as follows: (1) functional suitability; (2) performance efficiency; (3) usability; (4) reliability; (5) security; and (6) portability.

**Key words:** Health Record Management, Management Information System, Monitoring System

### 1 INTRODUCTION

Sto. Rosario Barangay Health Center plays an important role in the residents of the community. It is in charge of monitoring, consulting, and investigating the health status of its residents to identify and solve their health problems. They also inform and educate the residents about the different health practices and health issues to make them more aware.

As of January 2022, the barangay health center of Sto. Rosario doesn't have a health information system. The said health center is using the manual recording of data in terms of conducting medical services, health monitoring, and health programs. These transactions are conducted by the BHW (Barangay Health Workers), municipal doctors,

and nurses. The health programs involved in the transactions are family planning; medical services: consultation, vaccination, childcare, postpartum and prenatal. These services are more likely to be recorded as patients' medical history. In the case of the barangay of Sto. Rosario relies on papers, the patient's relevant information is written on a form that is stored on a cabinet along with their respective folders. Every transaction made by the patients would take minutes due to manual searching on records which is an inconvenience and a waste of time for both the BHW and patients. In some circumstances, the patient's record is misplaced in other cabinets. Another occurrence that the health center faces is the duplication of patients' records, which adds additional space to their storage cabinets. Their inventory system lacks a monitoring system on their medicine supply since it is usually manual inventory, the BHW most likely fails to monitor their supplies since they can't easily identify which medicines have too many and least stocks.

A manual healthcare system processes its operation by recording the patient's information using pen and paper which can be a hassle, and time-consuming [1]. Accessing patient information takes a lot of time and also there is a possibility of data redundancy. Mapping a health issue in every street of barangay and finding a medical history for a patient is hard because all of the information is on the paper and not well organized using a database. It also introduces a problem with maintenance because when the volume of data increases it becomes a problem and the only solution is to have a lot of paper. Data handling using a manual information system is a big problem.

A Health Information System (HIS) is a type of computer-based system. A health information system refers to a system designed to manage healthcare data [2]. The said type of system can help the barangay health workers to easily store, process, manipulate, and retrieve patient information in times of need. Using HIS is the most effective way to handle all of the patient's information because it is not time-consuming. The data stored in any computer-based system is safe and can be easily retrieved. The health center can easily analyze the patient's information that they have and identifying the health issues

and tracking the medical history is made possible. Data handling and profiling are made easier via computer-based systems like Health Information System [3].

The public health record management system has three ways of user access. A super admin, admin, and patient. The super admin is created only for the midwife to handle all the existing admin and patient accounts. It can create an admin account for a new barangay health worker (BHW) and archive if that BHW leaves or resign.

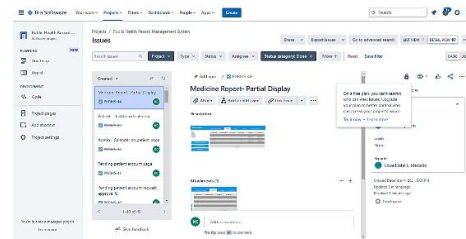
The admin allows the BHW users to view the live data of the total number of vaccinated persons, total number of patients, specifically the number of senior citizens, adult, minor, infant, persons with disability (PWD), and pregnant patients on the dashboard. The admin can also create an account for the walk-in patients that does not have the resources for a laptop, cellphone, internet or other means of online usage. There is also a calendar on the patient page where any information inputted by the admin will reflect on the patient's account to be reminded on what, how often, how many medicines should the patient take. There is also a separate tab where the patient's vaccination schedule will appear. A report page that shows a table of patient that consulted within the day. Within the reports page, there are buttons for medicine released, patient consulted, and vaccinated patient which all has the options to be viewed as daily, weekly, monthly, quarterly, and annually. All three reports are printable and downloadable as CSV and PDF file. Furthermore, the system has a vaccination tracking for the 7 puroks handled by the health center. A drop-down setting where the user has the option to navigate to the settings page, approve electronic medical record (EMR) page, and logout. Lastly, there is an inventory page that lets the admin see the stocks and notifies when there is a medicine or a vaccine that is expired, will expire, and is low on stocks. It can also be sorted via the first in and first out method so the system can configure which medicine or vaccine should be given first. The patient account has a calendar where any information inputted by the admin on his account from the patient page from the admin, will reflect. A current medication tab to remind them what medication the patient is currently taking, how many times a day, and the duration of the treatment. There is also a vaccination schedule tab whose purpose is only to be a reminder for the patient on when is their next vaccination schedule. Lastly, there is a drop-down setting where the user can select the request EMR or the logout page

## 2. METHODS AND DESIGN

### Software Development Methodology

The research techniques and strategies used by the researchers in the development of the system are discussed in the methodology. Agile Software Development methodology is used in the development of the system. Agile software development -- also referred to simply as Agile -- is a type of development methodology that anticipates the need for flexibility and applies a level of pragmatism to the delivery of the finished product [4]. Agile software development requires a cultural shift in many companies because it focuses on the clean delivery of individual pieces or parts of the software and not on the entire application. The researchers resort to using the Agile

Software Development. The processes of agile are more effective and efficient than the other methodologies due to the client's feedback that will help the team to understand the exact priorities, the shift toward individuals and interactions can create harmony and quick results, encourage members to work around innovation and efficacy, inspection and adaptation help the team to lessen from their mistakes and the said methodology are adaptable to a variety of methods [5]. The study will use a survey method through the use of google forms. In this study, the researchers will use an online survey for collecting data; using this method, the researchers would evaluate the advantage and usefulness of the health record management system using the factors of accuracy, reliability, usability, consistency, efficiency, quality, and secured data management as a basis.



**Figure 1:** Jira Software (Agile Project Management Tool)

Agile innovation methodologies have significantly improved software development success rates, enhanced quality, and speed to market, and boosted IT team motivation and productivity [6]. Those methodologies are being used in a wide range of sectors. The Agile technique is a practice that encourages continuous development and testing throughout the project's software development lifecycle. Unlike the Waterfall methodology, the Agile model allows for parallel development and testing. Agile models divide a project into small, incremental steps. Iterations of these builds are available. Each phase lasts anywhere from one to three weeks. Every iteration contains cross-functional teams working on several areas at the same time, such as planning, requirements analysis, design, coding, unit, and acceptance testing (SDLC-Agile Model, n.d).

### Planning Phase

The scope of the project is the focus of the planning phase. The researcher must have a project plan, schedule, and procurement requirements that will serve as a guide in developing the entire system. To finish the system and achieve the desired outcome, the researchers produced a project plan that includes the schedules to follow and who will be in charge of each work. In this phase, the researcher planned to interview the Sto. Rosario Barangay Health Center to gather information about the types of data they are processing and what functionalities they need so it can be implemented in the system.

### Design Phase

The design phase includes a system flowchart, user interface, database, and code design. The output of this phase is a system design with clear specifications that emphasize the physical solution to the user's

requirements. In this phase, the researcher made a prototype of the system that is used in the next stage which is the development phase. This phase includes designing and implementing features in the system where manual tracking and updating records to an automated public health information management system happens.

**Development Phase**

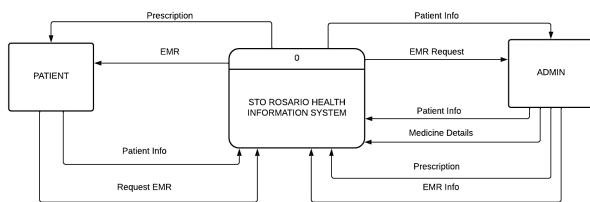
This phase is where the actual development of the system occurs. The expected output of the development phase must be functional and testable software. In this phase, the researcher started to develop the system which includes the actual programming, implementing the database design into the system, and transforming the prototype into a real working system.

**Testing Phase**

This phase tested the developed system. The testing phase aims to test if the developer commits a mistake while developing the system or if the system meets the requirements. Since the researcher used the agile model, the testing involves unit and acceptance testing. It is the most crucial part of the software development cycle because producing a quality system without testing is difficult. In this phase, the researcher tested each component of the system to determine if there are errors and then after that, the system is tested and evaluated by Sto. Rosario barangay health center to check if the system is acceptable to them. They will test both the system’s input and output capability and check if it has served its expected response.

**Release Phase**

This phase deployed the system that underwent the testing phase. The output of this phase is a finished system that is ready to use. In this phase, the researcher released the fully functional system to the selected barangay health center.



**Figure 2: Context Diagram**

Figure 2 illustrates all the information inputted and what information returns to each entity.

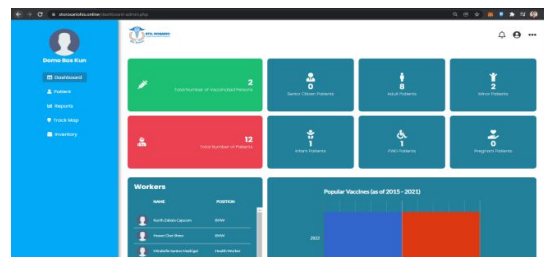
**3. RESULTS AND DISCUSSION**

An Up-close Monitoring System for Barangay Health Center of Sto. Rosario Paombong, Bulacan. All the information gathered from the respondents has been tabulated and analyzed to have a comprehensive presentation and interpretation of the data gathered. The data were organized from the questions as stated on the objective. The first part describes how the Public Health Record Management System helped to improve the current data storage system of the health center. The second part is about the functionalities of the developed system. The third

part shows how the researchers will include the previous documents of the patients into the system for accurate tracking and updating of information. Lastly, the fourth part consist of the level of acceptability of the developed system using the ISO 25010, the Software Quality Assurance Model in the following criteria, functional suitability, performance efficiency, usability, reliability, security, and portability.

**Part I. To upgrade the current data storage system of Sto. Rosario barangay health center to prevent mishandling and mixing of information.**

The Sto. Rosario Barangay Health Center caters to its patients and stores their documents and information manually via logbook and notes which are prone to data loss and duplication of data. The researchers developed the PHRMS (Public Health Record Management System) as an answer to the problem the health center encounters. The PHRMS is divided into three parts. The Super admin account, which is responsible for managing all the admin and patient account. The Admin account, which is responsible for managing the patient accounts as well as prescribing medicine and scheduling vaccines. It is also made to track and monitor the medicines and vaccines released by the health center and to have an inventory alert that notifies the admins if medicine or a vaccine is out of stock, expired, or low on stocks. Last is the patient account, which exists to allow patients to request an EMR (Electronic Medical Record) and to see their calendar if there is a notification or reminder if there is a medicine to be taken or a vaccination scheduled.



**Figure 3: Admin – Dashboard**

Figure 3 shows the dashboard page of the admin side, where the user can see the total number of patients, vaccinated patients, the total number of senior citizens, adult, minor, infant, PWD, and pregnant patients that are registered in the system. The user can also view the names and positions of the workers/admin users. Furthermore, there is a graph where it displays the most popular vaccines distributed by the health center.

ID	Name	Patient Type	Age	Gender	Date of Birth
2021-03-032867	Coronado, George Carlo	Adult	5	M	1916-03-05
2021-03-036030	Affredo Perez Gonzalez	Infant	5	M	2016-03-05
2021-03-036648	Uyaran, Acuña Agustin	Adult	22	M	1999-03-05
2021-03-038914	Lopez, Carlos Benedicto	Adult	35	M	1986-03-05
2021-03-039336	Alonzo, Edgardo	Adult	32	M	1989-03-05

**Figure 4: Patient table**

Figure 4 illustrates the patient table of the admin account, where the admin can see all the patients registered in the PHRMS.

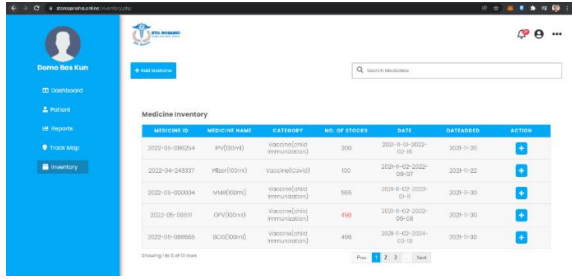


Figure 5: Add Patient for Walk-ins

Figure 5 shows the process of how can the admin users add patient that does not have the necessary resources to register through the register page. This applies only to the residents that came to the health center to be registered. The resident is required to bring their valid ID with their address since it is also needed on the register page.

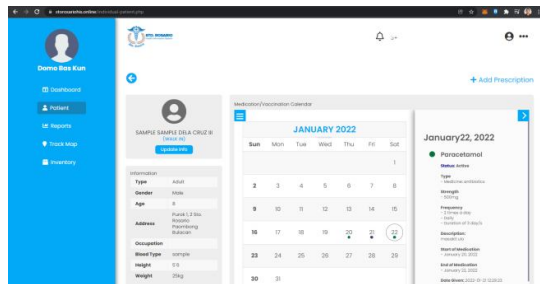


Figure 6: Individual Patient

Figure 6 shows the individual patient page of the admin side where the admin can view the specific information of the patients.

**Part II. Develop an Information System with the following functions:**

The researchers consulted their clients and capstone adviser on what features should they include in the PHRMS. The researchers then came up with and organized a plan and a time frame for developing the system. These are the following functionalities of the developed system. Patient information is secured and private data that should and can only be accessed by the developers and admins of the system. The database used by the researchers is MySQL.

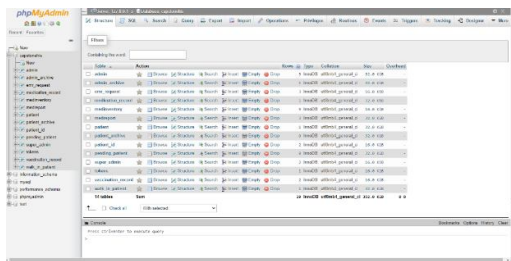


Figure 7: MySQL database

Figure 7 shows the database of the PHRMS where all the information is secured.

**Part III. Include previous documents of the patient inside the system for accurate tracking and updating of information**

The developed system will include all of the previous documents and information from the sto. Rosario, public health center to ensure that with the transition from manual recording of data to a progressive system, some of the files will not be left out. Instead, the developed system will serve as a guide or an aid for the admin users to find what they need in a short amount of time compared to the time it takes to find a file from a stack of papers. It will also save a lot of time finding a patient’s record. The admin user can also change the patient’s information depending on the situation.

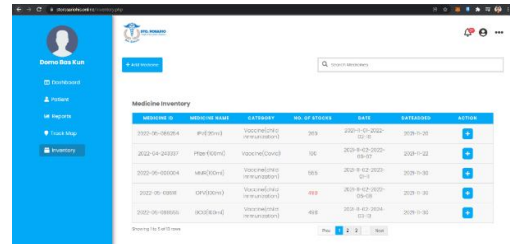


Figure 8: Inventory

Figure 8 shows the inventory page of the PHRMS. It includes all the medicine and vaccine that the health center provides for their patients.

**Part IV. Evaluate the quality of the developed health information system based on the following ISO/IEC 25010 software quality model.**

It consists of five (5) tables and five (5) column charts that present the performance of the Public Health Record Management System: An Up-close Monitoring System for Barangay Health Center of Sto. Rosario, Paombong, Bulacan. The developed system was evaluated using the ISO 25010 the Software Quality Assurance Model in terms of functional suitability, performance efficiency, usability, reliability, security, and portability. The evaluation procedure used a five-score rating scale which is 1 for Strongly Disagree, 2 for Disagree, 3 for Moderately Agree, 4 for Agree, and 5 for Strongly Agree. The five-score rating with its frequencies was collected from eleven (11) evaluators and the computed mean. Table 6 shows the functionality criterion; Table 7 shows the performance efficiency criterion; Table 8 shows the usability criterion; Table 9 shows the reliability criterion, Table 10 shows the security criterion, and Table 11 shows the portability criterion.

**Evaluators of the System.**

The following table will show the frequency and percentage of the evaluator the developed system.

Table 1: Evaluators of the Developed System

Evaluators	Frequency (f)	%
CICT Faculty	4	36.36
IT Experts	4	36.36
End-Users	3	27.27
	<b>11</b>	<b>100%</b>

The developed system has 11 evaluators, the CICT faculty with the frequency of 4 and 36.36 percent of

the evaluators. IT expert with the frequency of also 4 and 36.36 percent of the evaluators. And the clients with the frequency of 3 and 27.27 percent of the evaluators.

**Table 2:** Evaluation Result

Criteria	Weighted Mean	Descriptive Interpretation
Functional Suitability	4.47	Agree
Performance Efficiency	4.55	Agree
Usability	4.36	Agree
Reliability	4.43	Agree
Security	4.69	Strongly Agree
Portability	4.67	Strongly Agree

Based on the data gathered from the evaluators, and the weighted mean of the following frequency distribution and descriptive measures in terms of Functional Suitability with a weighted mean of 4.47 interprets as Agree, Performance Efficiency with 4.55 that interprets as Agree, Usability with 4.36 that interprets as Agree, Reliability with 4.43 that also interprets as Agree, Security with a weighted mean of 4.69 that interprets as Strongly Agree, and Portability with 4.67 that also interprets as Strongly Agree, the developed system proves that it meets the criteria.

#### 4. CONCLUSION

Based on the data gathered, the proponents conclude that the system is usable and functional. Clients also agree that the developed system provides user-friendly easy access even for the elder workers to understand.

According to the data gathered, evaluators and end-users strongly agree that the developed HIS is reliable and secured. From the two-factor authenticator every time a user will log in, to an input of password for every major changes. The respondents distinguish the developed system's latent capability to ensure that the records are kept safe.

The developed system will completely put an end to a manual process of record management. Therefore, it is concluded that the developed Health Information System will have an immense effect in storing and protecting the records of the barangay public health center.

#### 5. RECOMMENDATIONS

With the findings and conclusion of the study, the following recommendations were established and can serve as the basis for future researchers who would want to develop a similar if not the same type of health information system.

- Sto. Rosario, barangay health center is strongly advised that the HIS is implemented for better security and management of patient documents.
- The college of Information and Communication Technology may consider the capstone project as part of the research and extension program to ensure that the developed system will be implemented and sustained.
- To feature an additional authentication such as SMS OTP to provide further security and to give a faster way of signing in without opening their email for the email OTP.
- Research related to the present study is encouraged to be conducted, to find flaws that can be improved, features that may be added, and use of other technology that will emerge due to the rapid progress of innovation in the technology era.
- To add an additional feature that consist of geographical tracking map that can pin point the exact location of each patient alongside their illness.

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