

Breast Cancer Case Monitoring and Mapping System for Decision Support

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Abstract—The Breast Cancer Case Monitoring and Mapping System for Decision Support is an information system that aims to address the need for consistent monitoring of breast cancer patients' progress from initial diagnosis and treatment plans, to death. In the process of gathering data, relevant statistics, graphical analysis, and maps are generated by the system. These are powerful tools to mobilize authorities to initiate and materialize programs that intensify breast cancer awareness and prevention campaigns, early detection and diagnosis, and treatment assistance. The concept of the project is inspired by facts such as the Philippines, among other Asian countries, currently having the highest age standardized incidence for breast cancer with a rapid increase of 5% annually.

Index Terms—Breast cancer case monitoring, decision support system, women's health in the Philippines.

I. INTRODUCTION

Breast cancer is a non-communicable disease (NCD) that can exacerbate poverty and increase health inequities. Patients from the indigent, low-income and even the lower-middle-income class are the most burdened because of the expensive health care costs of this disease. Health care expenses became one of the main causes of poverty in India and cancer inflicted household member does not help [1]. Similarly, the Philippines being a lower-middle-income country faces these socio-economic burdens.

70% of breast cancer patients in the Philippines belong in classes D and E. Meaning, these are the people who do not have enough money to finance their treatments or travel to a breast care center. Hence, their access to breast care is limited considering several factors:

- Series of tests that needs to be done upon diagnosis are expensive such as Bone Scan which range from PHP4,000 to PHP6,000.
- For patients diagnosed with breast cancer, chemotherapy sessions costs from PHP5,000 to PHP100,000 per cycle depending on the grade of the disease. Surgery on the other hand, costs PHP10,000 to PHP100,000 .
- Only four public health institutions offer breast care services with discounted prices of treatments and medications namely: East Avenue Medical Center

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(EAMC), Rizal Medical Center (RMC) and the Jose R. Reyes Memorial Medical Center and Philippine General Hospital (PGH). However, all centers are concentrated in the metro which makes it hard for patients in provinces to access.

The socioeconomic status of a patient is an independent predictor of breast cancer survival. Monitoring the trends is an important aspect in lowering the breast cancer mortality rate. These trends serve as a factor for organizations on where to put up breast cancer prevention and awareness programs. Breast cancer survival has a number of factors different in nature. The social economic status of a person is adamantly the greatest independent factor that determines breast cancer survival. It is notable in developing countries; there is a lack of breast screening policies, as supported by statistics of the World Health Organization.

Monitoring of breast cancer incidence rates is also vital in order to determine the trends. There are two ways in obtaining this information which are passive and active methods. Passive method pertains to gathering data regarding cancer incidence rates involuntarily from the respective sources. On the other hand, active method is a means of collecting data from other sources voluntarily [2]. Population-based survival rates are important information and can be used for health care planning activities.

Medical records contain information regarding the medical history of the patient. It could either save a breast cancer patient's life, or if not produced in time, could lead to the patient's death. Information could be used by doctors in order to make a final decision on what type of treatment the patient must undergo [3]. Records generated every after surgery should be kept and managed effectively. Without these records, doctors would have no knowledge on what treatments the patient has already undergone. There are a lot of cases regarding this present in Philippine General Hospital. As stated by the head nurse of the Breast Care Center, "patient chart plays a vital role in every stage of the treatment process. It is the first data to be checked by the doctors in order to determine the stage of the cancer and what treatments they already underwent." Once these patient charts are misplaced or tampered, retrieval of the said information is difficult for there are no duplicate records available. Incidents regarding loss of these medical records can be prevented in a number of ways. One is to ensure that all patients should have a mean of managing their medical records.

Statistics and census reports also play a vital role in order to keep the monitoring of the current trends on breast cancer, which is considered crucial. These serve as information for

organizing awareness for widely affected areas. Breast cancer is now the leading cause of mortality in the Philippines [4]. Few studies were conducted to plan for specific actions to be undertaken to reduce mortality rate caused by breast cancer.

The most important defense that every woman should uphold is awareness. According to Dr. Chan, "We know that the early detection and management of a disease like breast cancer becomes even more difficult in areas characterized by a shortage of data, a shortage of doctors, a shortage of screening services, a shortage of treatment facilities and, above all, a shortage of awareness [5]."

With the use of relevant information gathered from statistics, government institutions and private sectors would easily determine where to organize breast cancer prevention and awareness programs. According to a report made by the World Health Organization, low survival rates in developing countries could be attributed to lack of early detection programs, as well as lack of adequate diagnosis and treatment facilities [6].

According to National Cancer Institute, common types of cancer that has been diagnosed with the greatest frequency in the United States alone are bladder cancer, breast cancer, colon and rectal cancer, endometrial cancer, and kidney cancer [7]. In African indigenous women, breast cancer is linked as the second most common type of cancer. In the Philippines, breast cancer is now the leading cancer site overtaking lung cancer for both sexes. Incidence rates of breast cancer increase by as much as 5% annually, more than 40% of cancers could be prevented. In addition, 40% could be cured and 20% could be attended by palliative care. These figures suggest that early detection and awareness is an important aspect in order to halt the increase of breast cancer mortality rates.

Mammography screening and consistent follow-up by the patient is one of the several methods available in order to detect breast cancer symptoms. Evidence shows that women aged 50-69 years who have gone through mammography screening could reduce breast cancer mortality by fifteen to twenty-five percent. But among the different cancer sites, breast cancers together with cervical, colorectal, and oral cancers are the only one seen to have reduced mortality of the said disease according to a report by World Health Statistics.

The authors conducted series of interviews with the head and assistant nurses of the Breast Care Center regarding the whole process of breast cancer treatment and how it is transformed to produce relevant data information and statistics, that would help in monitoring breast cancer cases and provide wealthy information for further research on the disease, implement advanced breast care prevention and awareness programs. The authors initially found a problem in the documents management or record keeping in the office. According to the interview, an average of 140 patients is present every weekday except Wednesday. From the start of the process, document retrieval has been the problem since nurses will need to get patients' chart in the records section which is located outside the office. Moreover, nurses and doctors are having a hard time tracking the patients' condition because of loss of documents, inaccurate or lack of data in forms.

In analyzing the existing process, the group has come to a realization that the systemic problem in the Breast Care center resembles similarities with the burden of being a lower- middle income country in facing this disease: *difficulty in monitoring and mapping breast cancer cases.*

II. THEORETICAL FRAMEWORK

The Breast Cancer Case Monitoring and Mapping System for Decision Support is a multi-purpose information system for the Breast Care Center (BCaC) of Philippine General Hospital. It is perceived by the authors to be a stepping stone towards intensifying efforts in the providing cure and prevention of breast cancer among those diagnosed, and helping raise awareness and early detection and enforcing tracking procedures in the area of breast cancer. Through producing all the necessary and relevant information obtained from recorded data that will aid in decision support of NGOs, government officials, potential sponsors/donors for resource allocation, project implementations, and for further studies and research developments.

The system contains the following main components that aim to target the different problems mentioned above: case mapping and report generation, schedule monitoring board, case monitoring board, records management with real-time access, and breast cancer outcome reporting. These components are discussed below. The authors used in the following concepts: records management, case monitoring and mapping that aims to solve the following problems:

- Difficulty in tracking patients that need follow-ups and monitoring
- Inadequate presentation of relevant information
- Inefficient storing procedures that cause delay in retrieval of patient records when needed (1-2 days)
- Delay and obstruction in decision-making for procedures (e.g. treatment, medications)

A. Monitoring Board Generation

Through previously encoded patient information, it will be easier to track those who need a follow-up regarding treatments or medications through the monitoring board. It will have two types that have different purposes: a schedule monitoring board and a case monitoring board. The schedule monitoring board is similar to a calendar-planner that consists the following: basic patient information (e.g name, age, sex), treatment or test scheduled, scheduling physician, date and time of schedule. This will enable breast care personnel or volunteers to contact these patients to remind them of their treatment schedule. For example, patients that are scheduled for second cycle chemotherapy for the week will be contacted through SMS or phone a week before to remind them of their upcoming schedule. The case monitoring board on the other hand is more individual centered is more case-centered, as the name implies. The records of the patients that include diagnosis (e.g. changes in tumor size, physical changes, etc), treatments, tests, medications, test results, and others will be treated as cases. In an individual case, the progress of the patient can be determined from the first day of visit to present thus making it easier for monitoring. It is a given the fact that most

patients are indigents and their socio-economic status hinder them from accessing breast health care as needed. This is one of the reasons why patients do not pursue the next level of treatment or medication upon prescription of the doctor. Other reasons would include subjective reasons such as having forgotten the scheduled treatment, not being able to prepare for it emotionally and of course financially, not having transportation means because of their location, and others. However, when patients who need follow-up decides to visit the doctor again it is most likely that they have already advanced stages upon presentation. This is where the case monitoring board would serve its purpose. From the time the patient was scheduled for a treatment to completion, on-schedule or not, the diagnosis (e.g. changes in tumor size, physical changes, etc) of the patient will be recorded.

Provided that there is a sufficient number of cases recorded, which is most likely, multiple cases analysis can be done. Similar cases, specific measures taken into consideration for unique cases (e.g. the patient has breast cancer and hypertension), effectiveness of treatments and medications as well as positive and negative reactions, and other breast cancer related information can be easily identified and compared. In this way, doctors will have a wide range of references based on the cases of patients that could aid them in making decisions that could greatly help the patient progress positively in curing the disease or either be detrimental to the patient's life.

B. Records Management with On-the-Spot Access

Internal records management provides a more secure and efficient way to store, process and retrieve patient medical data. Considering that consultations per day would range from 150-200, it will be easier for breast care personnel to retrieve medical records as needed by physician without the delay caused by the centralized repository system of PGH in accommodating requests.

C. Case Mapping and Trends

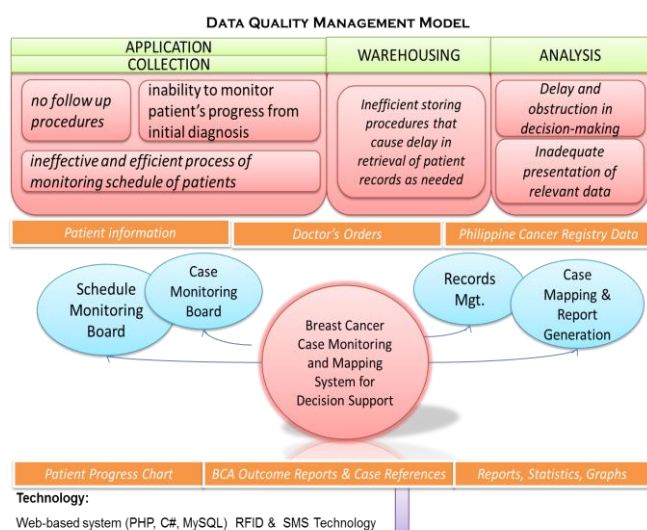


Fig. 1 Theoretical Framework.

Statistical data is very important in determining trends in medical research especially in diseases such as cancer. Statistics was linked as the driving force that led medicine to extensive research on epidemiology. It transforms

uninterruptable raw data to meaningful results when used.

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