Medical Health Tracking and Medicine Delivery System in Urban City

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Abstract

As a result of the growing population of persons with disabilities and senior citizens in the city of Makati City Philippines, there is a high-demand for medical consultations and medication. The need for process improvement that will answer the health tracking and prescriptive medicine delivery monitoring system is needed. Previous studies relating to delivery systems and automated scheduling has influenced the research in regards to building a web-based system that allows persons with disabilities and senior residents to easily maneuver around the restrictions of COVID-19. Data collected for the research was done by sampling technique through a descriptive research design to be able to collect surveys, and data in the presence of COVID-19 where social distancing is required. Results of the user acceptance testing shows that the developed web application passed all the requirement set in this study and the process included followed the Makati City local governments process, as well as the standard medical practice.

Keywords
e-Medical Service Management, Medical Health Tracking, Medicine Delivery System, Senior Citizen, Covid-19.

1. Introduction
In the situation brought by COVID-19 (Official Philippine Gazette, n.d.), the Philippines had to undergo Enhanced Community Quarantine (ECQ) where the country is under lockdown and no Filipino is allowed to go out (except when necessary) to contain the virus. Filipinos are compelled to stay at home, and this brought different opportunities to bring necessities like food and water straight to their homes (Habamwabo, D. and Mpagazi, 2017). Directly accessing pharmaceutical goods is of prime importance especially to those not feeling well. Not only during COVID-19 is it necessary to have medications but for everyday use as well because many depend on medications to fight diseases and viruses, and also to stay strong. Many companies and businesses prove that delivery of products online is possible therefore opening opportunities to have other daily necessities delivered.

Based from the current process of the Barangay Health Center (Garfin et al. 2017), the main objective of this study is to be able to develop a Web-based application that will function as automated medical health tracking through prescriptions of medications and medicine delivery tracking. The following are the specific objectives of the study: 1) To develop a Web-based application for the doctors and pharmacists with the intent to add, update, and remove information relating to the requesting and prescribing medications; 2) To enhance the issuance of prescriptions to yellow cardholders; 3) To generate a systematic delivery schedule for the partner pharmacy to follow and to implement it with every medicine delivery; 4) To monitor the acknowledgment of the recipient's confirmed medicine delivery; 5) To track the yellow cardholders' health in every medicine delivery fulfilled. The existing process flow of medicine delivery before and during COVID-19 are shown in Figures 1 and 2 respectively. The developed system's process flow is shown in Figure 3.
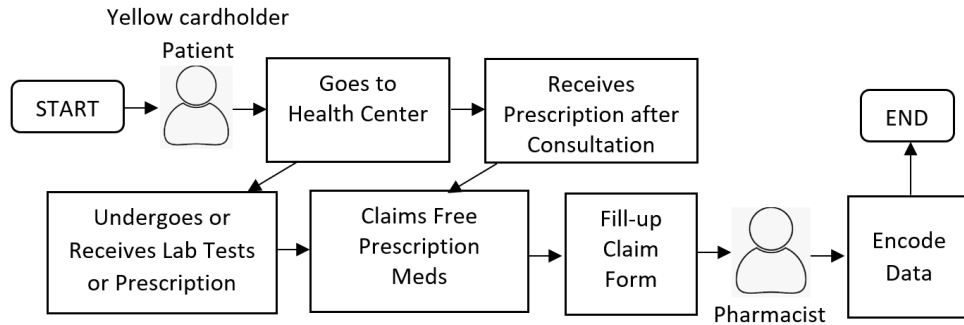
Figure 1. Current Process of Claiming Prescription Medicine in Makati (Before COVID-19)
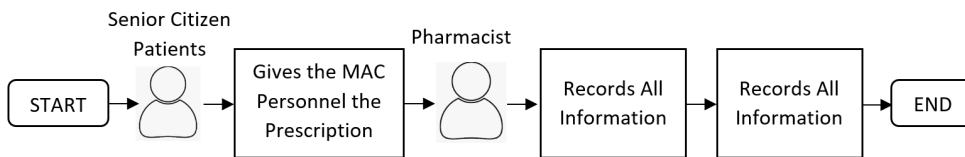
Figure 2. Current Process of Claiming Prescription Medicine in Makati (During COVID-19)

The study focuses on the automation of medicine delivery requests from issued prescriptions, and health tracking through issuing prescriptions. The developed system allows the doctors to use the Web-based application in issuing medical prescriptions and update the quantity of the prescribed medicines. The system generated a systematic delivery schedule according to a first come first serve basis and priority cases. The system displays information for the Makati residents to track the delivery status of their prescriptions like date of the deliveries, the duration of their prescriptions, and to indicate whether the delivery has been successfully confirmed and delivered. The study is for users who are yellow cardholder residents of Makati City.
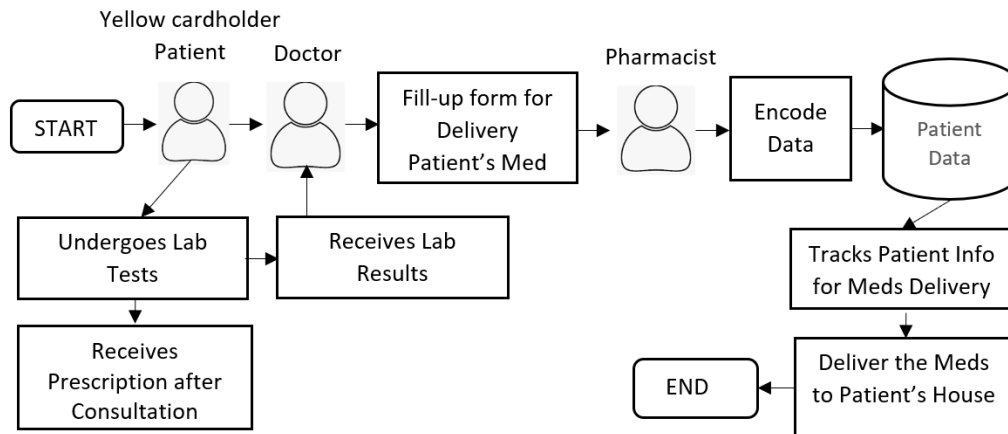
Figure 3. Process Flow of the Developed System

1.1 Objectives

The objective of the study is to develop a medical health tracking and medicine delivery system for urban city in times of Covid-19. This study designed a web-based application that function as automated tracking of prescriptions and other medical services for a local city government of Makati City Philippines. The goal of the study was to adapt on medicine delivery process during the pandemic.

1.2 Scope of the Study

The project focused on the development of web-based automation of medicine delivery requests of issued prescriptive medicines, and health tracking through issuing prescriptions as well to urban city residents of Makati City Philippines. The system allows the doctors to use the web-based application in issuing medical prescriptions and update the quantity of the prescribed medicine/s as a sign of the patient's health progress in the database. The system generates a systematic delivery schedule, according to a first come first serve basis and urgent cases.

2. Literature Review

2.1 Background of Philippine Health System and Makati City

In the Philippines, the government offers health programs such as PhilHealth (Lam et al. 2020), Social Security System (SSS) (Tang et al. 2017), and Government Service Insurance System (GSIS) (Su et al. 2020) ranging from calamity loans, pensions, emergency, and financial assistance for the residents of the country (Lam et al. 2020). Other existing government programs support health and their processes are from The Department of Social Welfare and Development (DSWD) has begun medical assistance from the funding of the Office of the President called Assistance to Individuals in Crisis Situations (AICS) (Reyes et al. 2018).

The population of Makati has more than 500,000 people with 61% of legal age (Abueg. 2020) allowed for a residency where 5% are senior residents. The city of Makati has health programs that offer free benefits to all its residents (Diokno-Sicat et al, 2018). In Makati, it is said that "Barangay Health Centers in the city provide pregnant women with free prenatal and postnatal check-ups, as well as vitamin supplements during pregnancy and after delivery. Infants are given free vaccines for common childhood diseases, as well as other special vaccines." They also have a health program that allows specific residents to utilize other benefits the city offers. The Barangay Health Center has provided cards that identify beneficiaries. These cards are categorized as white cards, BLU cards, and yellow cards. Each of these cards provides specific benefits, in these cards' basic information, and specific validity dates are indicated. Only yellow cards in specific are offered healthcare benefits (Flores. 2019). With that, in specific to residents with yellow cardholders, their benefits are the following: free consultations, checkups, medicines, and hospitalizations for residents of Makati City. To comply with the Barangay Health Center regulations, patients need to present their yellow card to maximize the benefits. If the yellow card is not available, a government-issued ID such as a passport or driver's license can be used to verify that they are a resident of Makati or represent as the authorized person for the cardholder. In using the health benefits of the Barangay Health Center, the patients first need to undergo consultations or lab tests to be able to receive a prescription that is given by doctors. These prescription medicines can be claimed for free under the health programs of the Barangay Health Center as long as the patients are yellow cardholders. With all these government-led benefits, there is no automated system available to make processes of applying or receiving materials available.

The process in Makati will serve as a reference for the development of the proposed system and is not directed towards the clients (LGU's) since it is a research-based paper where the proposed study presents a Medical Health Tracking and Medicine Delivery System: Case of Makati Health Office that will use the currently existing process of the local government of Makati City as a reference to be able to create and develop the proposed study. The proposed study is for Makati City doctors, the partner pharmacy, and yellow cardholders who are: senior residents of Makati, government workers in Makati (relocated or resident), or registered voters who are residents of Makati all even after Enhanced Community Quarantine (ECQ). Yellow cardholders are mostly residents with a pre-existing White and/or BLU card (Paguirigan, 2019) which would mean many of the residents may already have. The study is about creating a web-based application to inform its users. These users are doctors: who can issue a prescription, pharmacists: to access the delivery and update the status, and yellow cardholder patients to view their basic information, prescriptions with health tracking, and status of delivery of prescription medicines.

Providing medical and other health assistance in the Philippines has been made available both via public and private channels (Noda. 2021). Barangay health centers provide basic medical assistance, beginning form the infant check-ups and vaccines (Hayden. 2020). Midwifes are known to be the local doctors in the smallest unit of the society, which are under the supervision of municipal doctors (Hayden. 2020). Health centers are primarily known for pre-natal services and other government health projects like rabies and anti-tetanus vaccines, tuberculosis medicines and first aid services (Titus. 2018).

2.2 Review of Related Literature

Information and Communication technologies have been a big help in the advancement of healthcare services or what we call e-health. As Eysenbach G stated "e-health is an emerging field in the intersection of medical informatics, public health, and business, referring to health services and information delivered or enhanced through the Internet and related technologies (Bloomfield and Fisher, 2019). In a broader sense, the term characterizes not only a technical development, but also a state-of-mind, a way of thinking, an attitude, and a commitment for networked, global thinking, to improve health care locally, regionally, and worldwide by using information and communication technology".

Healthcare centers are a vital part of the lifestyle of a person as it mainly revolves around the person's life and safety. However as stated in the study by Kurnianingsih, Muhammad Anif et al, "Many medication problems often occur in hospitals such as the slow response in the treatment to the patient and medication errors by medical personnel can cause fatal for the patients". Due to the slow processes in treatments and requests in healthcare centers, the researchers of this study made a Radio-Frequency Identification (RFID) technology in identifying the patient's medications to lessen the slow responses of the nurses in requesting the type of medications needed by the patient. The system includes a medicine with an RFID chip on its container where it will be used to track the prescribed medications to lessen the procedures in requesting the needed product for the patient. Given that there is also an RFID on the patient to easily track their schedule for taking their medicines. As the researchers created the system, it got successful results because of providing proper medical management in healthcare centers through the use of the system's tracking capabilities for both regular and emergency medicines (He et al. 2021).

Health centers are a major part of an individual's life. Health risks are constantly able to attack any individual at any given time. The most vulnerable individual commonly attacked by health risks are the elderly. These health risks cause many medical issues that prevent the elderly from physical activities to even the simplest tasks. Nowadays, there are new ways for technology to adapt to different scenarios regarding health that could aid the lives of the people daily even if it is a simple form of notification or a more proactive way to maintain protocols. The researchers from the previous studies created a system that helps track the schedule of the patient's scheduled medicine in which increases their health status and the applications of the system can be used in a wide variety of networks even if it is from an urban to a rural setting. Tracking the medicine is a huge part of this study where the patient's information is needed to be updated to follow the scheduling of the prescribed medicine that can be delivered or given to the patient. Delay in obtaining medical supplies can lead to worsening of health or may lead to the death of the patient.

The current research being provided is a system that could solve the way for health services aid medications to people, but the key question is, will the proposed system efficiently aid citizens with appropriate medications and services as well as the health workers who will be using the system? In this project, the researchers aim to address the services that the current healthcare and welfare system provides to the citizens according to their special needs.

3. Methods
3.1 Research Design, Locale and Respondents
A descriptive research design is a type of research that describes and focuses more on how, what, when, and where of the research. The study was conducted online prior to the current community quarantine situation during COVID-19 as there are limits for gathering data in a face-to-face mode. The study was conducted with the cooperation of doctors and other personnel in Barangay Health Centers, and pharmacist of the authorized drugstore of Makati City local government. The participants in this study are residents with yellow cards, Barangay Health Centers, and employees in pharmacies in Makati City.

3.2 Design
The network diagram shown in Figure 4 presents how data will be gathered and processed between doctors, residents, and the drugstore, where it allows real-time updates in providing medicine services in a web application.
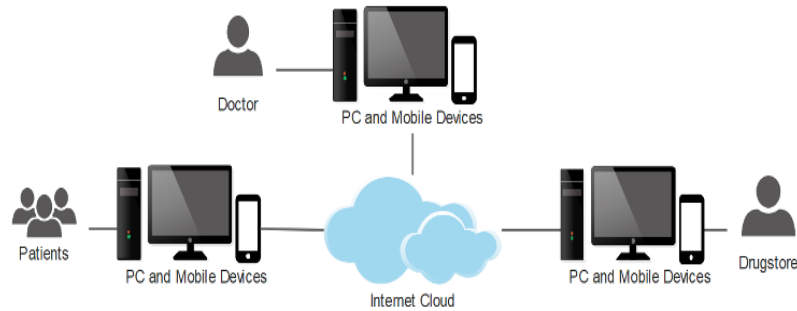
Figure 4. Network Diagram of the Web Application.

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3.2.1 System Actors
The system actors in the developed system are the following: Pharmacists: They will process the electronic prescriptions coming from the doctors for the Makati residents/patients for delivery and distribution; Doctors: They conduct health consultations, prescribes medicine, and initializes requests of deliveries for processing; Patients: They are the residents of Makati who got a prescription and requests in claiming the prescribed medicines and other medical services. Yellow cardholders are the only ones who can avail of the free vaccines and other medical consultations given by the local government, as non-yellow cardholders can avail of free first aid; and Administrator: They monitor the fulfillment of medicine deliveries.

3.2.2   Functionalities of the System
The different functionalities of the developed system are: Update Records: This feature updates the records with the frequent edits made by pharmacists in charge of updating the records for the Web-based application to use and give information about data to the consumer side; Use of Data to Web-based application: The data stored in the database is processed and analyzed data to be used in the web-based application such as the user's basic information, prescription information, and history of deliveries; Registration: This is where the Web-based application users can create an account using their Makati resident card number and other user information; Login: This is where the web-based application user can use the account credentials made from the registration form to be able to log in. Another option is by using the guest login if the user wants to use the application; Tracking: This is the schedule of requests for deliveries of medical prescriptions, tracking the health of the patient through the quantity of the prescribed medicine and the status of the delivery can be viewed through the web-based application; Prescriptions: This allows the doctors to create a prescription just like a paper prescription; Delivery Confirmation: This system's function is to verify resident's delivery acknowledgment.

The sample screenshots of Health Tracking Page for patients or residents of Makati is shown in Figure 5. Health or medical tracking provides the copy of their original prescription with the basic medical record, date of patient's visit, current sickness, laboratory test assigned, and basic results (or prescription medications) made by the doctor. Here, they also will be able to view their health progress in a way whether they need more prescription medications or not that is updated by the doctor. Residents or patients can see the status of whether or not their prescription medicines have been delivered stating "pending" or "confirmed". The Prescription Page for doctors allows them to input their prescribed medications, type, and quantity. This includes the schedule of the said prescription with an assigned start date, end date, and the duration of the prescription. Information here is only allowed to be manipulated by the doctors. They are the ones who are in control of the prescriptions whether a patient needs more or needs less which indicates the progress of the patient. The Delivery Page for the pharmacist will allow them to view the pending prescription medicines that need to be delivered. They can also update the status to "pending" or "confirmed".
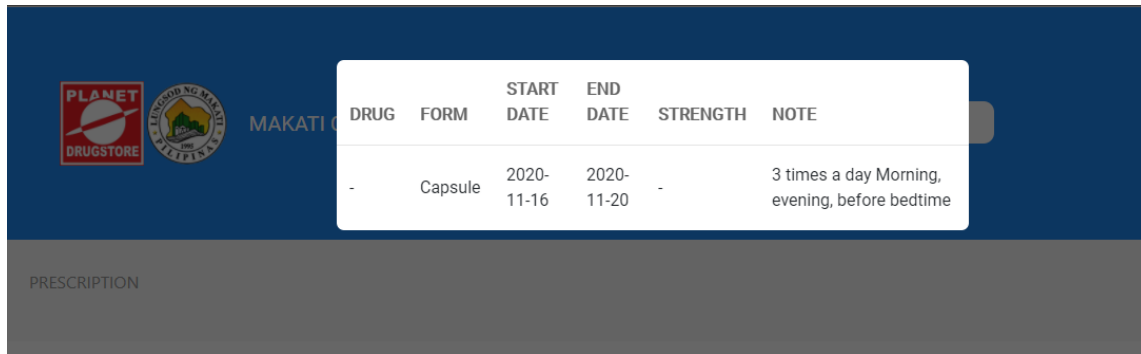
Figure 5. Health Tracking page

While the Delivery Confirmation will be used when the patient is going to receive their medications. It will present the owner's information, list of medications, date of request and date delivered that is signed by both receiver and deliverer. A representative can claim this by inputting their information (verified with a valid ID) or the yellow card number of the owner themselves if they are to claim it.

3.2.3 User Acceptance Testing (UAT)
The Web-based application achieved all testing requirements based on the process workflow like functionality, usability, cross-browser testing. The study conducted a user acceptance testing (UAT) with thirty (30) respondents to test the web-based application. The system was tested and validated by the users during an interview to fully explain the details of the study and guide them throughout the process, from the user interface to backend processes of the study. Healthcare practitioners such as pharmacists and clinical social workers from pharmacies and IT professionals validated the functional and non-functional requirements in following the standard rules in a web application working environment.

4. Results and Discussion
The questionnaire provided in the user acceptance testing are the following with four (4) point scale (Strongly Agree, Agree, Disagree, or Strongly Disagree): 1. The web-based application is easy to use and navigate; 2. The web-based application has a user-friendly interface; 3. The web-based application is responsive; 4. The information generated by the web-based application is/are detailed and thorough; 5. The web-based application met its objectives in line with the study's requirements; 6. All parts of the web-based application were accessible to all devices used; 7. The web-based application will be able to improve the daily lifestyle of the user; 8. The web-based application can be accessed on any device that has a browser; 9. The web-based application met the accuracy of the location. The result of the survey is shown in Figure 6.
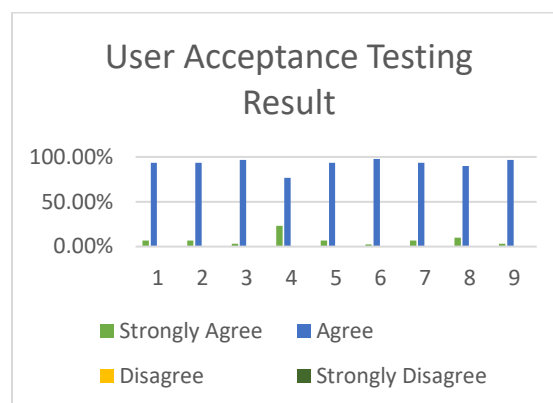

Figure 6. The web-based application is easy to use and navigate.

5. Conclusion

The medical health tracking and medicine delivery system focuses on health tracking of the patient's prescriptions and medicine delivery system. The information on the prescription drugs prescribed by the doctors to the patients after consultation is immediately sent to the pharmacy for delivery to the patient's home. After this has been implemented, respondents from the survey have recommended trying virtual consultations and appointments made through the web-based application.

The yellow card system offered mostly to persons with disabilities and senior citizens, and the benefits it comes with given by the local government of Makati - allowing their residents to obtain free prescriptions and consultations - has proved through the documents and facts stated in this study that their current system can further be improved. The case study presents a problem in the current system with the yellow cardholders who are classified as either a person with a disability or an elderly who are considered not physically competent which is a complication in picking up their prescription medicine. This study used these problems to create a web-based application that would allow medical health tracking and medicine delivery for yellow cardholders to simplify the process for all involved. The results of the survey concluded that the web-based application developed made it possible to provide a systematic process of keeping track of the Makati residents and barangay health center patient's prescriptions, as well as the delivery status of their upcoming prescriptions, rather than having to travel to the pharmacy repeatedly. The developed application also enabled doctors to keep track of their patient's prescriptions if there is a need to update the prescriptions. The web-based application allows a lesser need to travel to pharmacies and consultations. This proves that the developed system reduced the need for physical contact between patients and physicians benefitted yellow cardholders who are physically incapable especially during Covid-19 restrictions or lockdown. It is also suggested to further involve more people in the study to lessen face-to-face interaction and movement especially for those not physically capable.

Despite the creation of a new system, there can be further study needed for the improvements of this system that focus more on data analysis of health records that can project future legislation with informed decisions, not only in Makati City.

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Biographies

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