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Development of Patient Profiling, Record of Refills, and Medication Adherence Application (MAPA) for Botika NG Barangay of San Antonio, San Pedro, Laguna

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Abstract

MAPA, or "Medication Adherence and Patient Profiling Application," is a pharmaceutical technological innovation that aims to improve patient profiling by mapping patient information to medication and refill records. The application, developed using a descriptive development method, aims to improve efficiency and acceptability in patient care. The study used data from patient information and medication refill records in the Botika ng barangay of San Pedro City Laguna. The level of acceptance and efficiency of MAPA was evaluated using a structured questionnaire. The current system is manual and paper-based, with inefficiencies and a lack of integrated tracking systems. MAPA, a web-based application, aims to record patient data, track medication intake, send automated refill reminders, and allow real-time updates and patient reporting. Key features include real-time monitoring, automatic alerts, patient medication profiles, a pharmacist dashboard for prioritizing interventions, and secure data management. Feedback from 30 users showed MAPA to be highly efficient, with a strong positive reception of its interface, usability, and functionality.

Keywords: Botika ng Barangay (BnB), Medication Adherence and Patient Profiling Application (MAPA), Medication Adherence, Patient Profiling, Record Refills

1. INTRODUCTION

The Philippine Pharmacy Law mandates that all prescriptions dispensed in a pharmacy must be recorded in an appropriate system, including patient profiling and medication records. However, most community pharmacies, including Botika ng Barangays, still use manual records and do not have patient profiles. This results in pharmacists dispensing drugs only, with some providing patient counseling. Despite advancements in telepharmacy, online medication purchasing, and delivery services, pharmacists often overlook the healthcare aspect of their role.

This study aims to develop and implement a pharmaceutical technological innovation in patient profiling, called "MAPA." The application will map from patient profiling to medication and refill records, enabling monitoring of a patient's adherence. The application will store patient information and demographics, maintain a record of all new and refilled prescriptions in each patient's profile, record the quality and quantity supplied at the Botika ng Barangay, include remarks made by pharmacists to every patient's



profile, and sync the application calendar with all patient medication records and refill schedules, sending individualized notifications to patients and pharmacists before their refill dues.

2. Methodology

2.1 Research Design

The researcher used a descriptive development method. This approach is most suited for this study, particularly in product development, because the purpose, according to Gillaco (2014), is to gather deep insights prior to presenting innovative solutions. Furthermore, prioritizing user demands and behaviors when developing new features. This methodology helped the researcher aligned the procedures step-by-step such that the researcher focused first on observing the current practice of patient profiling and recording of mediation and refills in Barangay San Antonio, San Pedro City, Laguna pre-MAPA era - gathering documentation and collecting data from patient profiles and medication dispensing records of the Botika, and understanding the natural and existing conditions of the system prior setting foot on the development of the MAPA and putting it into trial.

2.2 Sources of Data

The data used are patient information and records of medication refills manually recorded in the Botika ng barangay of Barangay San Antonio in San Pedro City Laguna three months prior a.k.a pre-MAPA era (October 1 – December 27, 2024) to the development of MAPA, as well as patient information and records of medication refills from the same patients when MAPA was developed and became operational (January 2 - March 31, 2025). Survey results from eligible users are used in this study to identify level of acceptance and efficiency of MAPA in the Botika ng Barangay. In addition, issues and challenges encountered during trial phase were noted for future features updating and improvement.

2.3 Population of the Study

The respondents of the survey were the eligible MAPA users during the trial phase consists of two (2) pharmacists, eight (8) pharmacy assistants / Botika aids and 20 healthcare volunteers in the Botika ng Barangay.

2.4 Instrumentation

The researcher designed a structured questionnaire with both closed and open-ended questions that cover the level of acceptance and efficiency of MAPA, while on trial period, and recommendations of users for updates and further enhancements of the application.

2.5 Evaluation and Scoring

To determine the Level of Acceptance of Eligible Users of MAPA (Medication Adherence and Patient Profiling Application) the following scale was used:

Scoring and Evaluation							
Rate	Numerical Value	Verbal Interpretation					
5	4.50-5.00	Highly Acceptable (HA)					
4	3.50-4.49	Acceptable (A)					
3	2.50-3.49	Neutral (N)					
2	1.50-2.49	Unacceptable (UA)					
1	1.00-1.49	Highly Unacceptable (HU)					

Scoring and Evaluation



To determine the Level of Efficiency of MAPA (Medication Adherence and Patient Profiling Application) and in terms of whether the users have experienced any issues or problems using MAPA, the following scale was used.

	Scoring and Dynamion						
Rate	Numerical Value	Verbal Interpretation					
5	4.50-5.00	Strongly Agree (SA)					
4	3.50-4.49	Agree (A)					
3	2.50-3.49	Neutral (N)					
2	1.50-2.49	Neutral (N)					
1	1.00-1.49	Strongly Disagree (SD)					

Scoring and Evaluation

2.6 Data Gathering Procedure

The process for gathering data began with the consent papers issued to patients during their visit to the Botika ng Barangay. These consent forms provided the researcher access to patients' personal data, which includes basic medical information and prescription records. Once the trial phase began, each patient who agreed was given a patient profile created in the MAPA.

In terms of MAPA Prototype Development, the researcher created and tested an early functioning prototype of the MAPA incorporating basic functionality such as patient profile, refill monitoring, and adherence reminders. Application users (2 pharmacists, 8 pharmacy assistants, and 20 healthcare volunteers) tested MAPA's front-end functionalities (like getting reminders and modifying profiles).

At the completion of the trial period, the researcher surveyed MAPA users using structured forms to collect thorough input on the prototype's level of user acceptability, efficiency, application issues, and challenges encountered while using MAPA. Survey was distributed employing Google Forms. The QR code and link to the form were made accessible in the BnB at the end of the trial phase (March 31, 2025).

Aside from the aforementioned data, the researcher also gathered numbers from the pre-MAPA era (October 1 - December 27, 2024), which consist of the total number of patients served during this period - this includes several patients with maintenance medications, patients with maintenance medications who were refilled more than once, and patients with maintenance medications who were refilled on time. This data could be a backup data for the researcher and can be utilized for assessing and evaluating the success of a pharmaceutical intervention undertaken during the MAPA trial period (January 2 - March 31, 2025) in contrast to pre-MAPA figures.

2.7 Statistical Treatment of Data

Weighted mean was used to describe the level of acceptance of eligible users of MAPA, and the level of efficiency of MAPA among the users.

Tuble 1. Thematic Thatysis of Theory and Observation Data							
Variables	Observations						
Interviews and observations were reviewed multiple times							
1. Familiarization with the Data	Key points were highlighted, particularly regarding current processes, difficulties encountered, and suggestions for improvement.						

3. Results and Discussion

Table 1. Thematic Analysis of Interview and Observation Data



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2. Initial Coding	Commonly identified codes from the data: "Manual recording takes time" "Lost or incomplete patient records" "Difficulty tracking medication stocks" "No system for refill reminders" "Need for training in digital tools"				
	"Patients forget their refill schedules"				
3. Searching for Themes	From the codes, the following themes were formed: Theme 1: Inefficiency and Errors in Manual Recordkeeping Respondents cited that handwritten patient records were prone to errors, incomplete information, and misplacement. Staff found it tedious to retrieve past medication histories during consultations. Some records were even lost during flood in barangay health center. Theme 2: Lack of Refill Monitoring and Patient Follow-Up No organized way to monitor refill schedules. Patients sometimes missed doses because they were not reminded when to return. Health workers expressed the need for a notification or alert system. Theme 3: Limited Technological Integration Observations showed that no digital devices (computers, tablets) were being used for records. Some staff were willing but lacked the skills to use even basic spreadsheets. Respondents indicated openness to training if tools were made available. Theme 4: Medication Inventory Management Challenges Without integrated patient data, monitoring of medication stock versus actual patient needs was inaccurate. Overstocking or shortages happened because it was hard to predict refills accurately.				
4. Reviewing and Defining the Themes	Each theme was refined and clearly defined: Theme Description - Example Quotes/ Observations Manual Inefficiency - Manual records cause delays and inaccuracies. "Sometimes the patient records are missing or hard to read." Refill Tracking Gaps - No structured method for managing patient refill schedules. "We don't know if they already finished their medicines unless they come back "				



	Tech Skills and Resource Gap- Staff lack digital tools and					
	training but are open to learning. "If there's a simple system, we					
	would be happy to use it."					
	Inventory Mismanagement - Stocking medicines isn't					
	synchronized with actual refill demands. "There are times					
	medicines expire because we ordered too much."					
	Based on the themes, the needed developments are:					
	Development of a Digital Patient and Medication Refill System					
	(to address inefficiency and record loss)					
5. Interpretation and Linking to	Implementation of Refill Monitoring Tools (calendar alerts to					
Developments	BnB staff, email and SMS reminders to patients)					
	Provision of Basic Technology and Digital Skills Training					
	(computers, tablets, and simple tutorials)					
	Integration of Inventory Management with Patient Refills					
	(automated tracking tied to actual medication dispensing)					

The thematic analysis identified major challenges in patient profiling and medication refill processes at the Botika ng Barangay in Barangay San Antonio, including manual inefficiencies, lack of refill monitoring, limited use of technology, and unlinked inventory systems. To address these issues, the implementation of low-cost digital solutions is recommended. These include establishing a digital patient information system, creating a medication refill management system with automated alerts, and assigning unique patient identifiers. Additionally, the use of cloud-based storage will ensure secure and accessible data, while standardized electronic forms will streamline data entry. Regular training for barangay health workers and pharmacists will improve digital literacy and system use, and periodic evaluations will help update and improve the system based on user feedback. Overall, these developments aim to enhance the efficiency, accuracy, and accessibility of patient and medication records, leading to better service delivery and improved health outcomes in the community.

Table 2. Englority to use WATA in the Did						
Eligibility	Applications like MAPA are intended for:					
Pharmacists	Pharmacists on duty in the Botika ng Barangay serves as the MAPA					
1 narmacists	administrator who oversees activities and log use within the application.					
Pharmacy Assistants /	Authorized personnel who manage patient records and monitor medication					
Botika Aids	adherence.					
Community Health	Individuals who encoded patient profiles and assists in patient education and					
Workers	follow-up.					
Application developers	IT experts who initially developed the application and who constantly provide					
Application developers	software updates for the improvement of MAPA.					

Table 2. Eligibility to use MAPA in the BnB

Eligibility requirements can differ depending on local health regulations and the particular goals of a program in a specific location. Typically, data management in medication adherence applications like MAPA involves handling sensitive health information to support patients in adhering to their prescribed



medications. Key aspects include data collection, storage, processing, sharing, privacy, security, and establishing an effective feedback system for continuous monitoring and improvement.

Data Encoding	Usage
Doto Entry	Healthcare providers input patient information, including personal details, medical
Data Ellu y	history, and prescribed medications.
	The application tracks medication schedule via in-sync calendar in the app,
Monitoring	medication adherence through review of patient profile and records, and sending
	automated daily reminders to patients 3 days prior their next refill due.
Poporting	Aggregated data helps in assessing program effectiveness and identifying areas
Reporting	needing intervention.
Data privacy	Aspect paramount in ensuring compliance with health information regulations.
and security	

Table 3. Results of how the existing and new data are encoded and used in the application

The Medication Adherence Application (MAPA) serves as a clinical support tool that strengthens patientpharmacist collaboration by providing accurate, real-time data on patients' medication-taking behavior. Its primary role is to track, record, and report adherence patterns, enabling early detection of nonadherence and timely pharmacist intervention. MAPA allows patients to log medication intake, receive reminders, and report side effects, while pharmacists can access this data to understand adherence challenges and tailor their responses. This continuous communication fosters stronger relationships, supports personalized care, and improves health outcomes. By identifying non-adherence early, MAPA helps prevent complications and enables proactive, targeted interventions such as counseling, regimen adjustments, or medication synchronization.

Monitoring	Pharmacists' Interventions					
Parameters						
1. Real-Time Monitoring of Patient Adherence	Daily automated notifications: MAPA sends automated reminders (via email or SMS) to patients daily 3 days before their next refill is due. Patient Self-Reporting: Patients can log when they take their medication. Patient's individualized inventory of medications on-hand via profile review: thread of refills can be reviewed in the patient profile and prior dispensing, during counselling, patients are asked of quantity they still have, (including logged missed dose if applicable) then adding quantity to be given on the visit, summing up to compute medication quantity therefore identifying patient's due for next refill schedule. Automatic Tracking: Missed doses or delays in intake are flagged in the system. Several repeated missed doses and patterns of non-adherence are subject to pharmacist's counselling or referral to healthcare provider whereby medical re- assessment is needed as intervention.					

Table 4. Monitoring Parameters for Patient's Medication Adherence and Pharmacist's Interventions



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	Medication Records: MAPA stores a list of each patient's prescribed					
2. Centralized Patient	medications, dosages, frequency, and duration.					
Data Collection	Adherence History: It builds a thread of recorded patient's medication-refills					
	over time, highlighting trends like consistent late doses or frequent missed					
	medications.					
	Alerts to Pharmacists: 3 days prior to a patient's due refill, MAPA sends an					
	automated notification to the Botika's email for staff review of the profile and					
	to the patient's email as a reminder to visit the BnB for a refill. In addition, the					
3. Pharmacist	patient's name, patient ID number, and contact number are shown in the					
Dashboard and Alerts	application's dashboard in "to-do list" / "checklist" style removed only when					
	ticked "fully served".					
	Access to Adherence Reports: Pharmacists can view summaries by searching					
	within the app (patient name/patient ID), and/or filtering needed information in					
	Google Sheets (the application's database).					
	With these reports, pharmacists can:					
	Prioritize Patients: Identify high-risk patients who need immediate counseling					
	or follow-up.					
4. Data-Driven	Tailor Interventions: Use the patient's history to suggest:					
Pharmacist	Changes in dosage timing (e.g., aligning doses with daily routines)					
Interventions	Switching to more convenient formulations (e.g., long-acting drugs)					
	Educating the patient on the importance of adherence specific to their condition					
	Document Interventions: MAPA can allow pharmacists to record interventions					
	made, outcomes, and follow-up plans via the 'remarks' section in each patient's					
	profile.					
	Aggregate Data: At the community (Botika ng Barangay) level, MAPA can					
	generate reports to:					
	Evaluate overall adherence rates in the barangay.					
5. Program-wide	Adjust health education programs.					
Monitoring and	Advocate for better resources or support from the local government.					
Improvements	For patients, MAPA acts like a "smart assistant" ensuring they don't forget their					
	medication.					
	For pharmacists, it acts like a "clinical radar" — showing exactly who needs					
	help, why, and how urgently.					





Figure 3. Medication Adherence and Patient Profiling Application (MAPA)

The MAPA process begins when a patient receives a prescription and visits the Botika ng Barangay for a medication refill. The system first checks if the patient already has a profile in MAPA. New patients must provide their information and sign a consent form allowing Botika to manage their data. Upon registration, the app generates a unique patient ID to facilitate tracking. Existing patients can be located using their ID or name. Once registered, authorized Botika staff can access the patient's personal and medication data. Each medication entry is assigned a unique dispensing ID, and refill dates are synchronized with a Google Calendar integrated into MAPA. This calendar generates task lists for staff and sends automated email reminders to both patients and Botika users starting three days before the next refill is due. After dispensing medication, pharmacists can review and update refill records, marking previous refills as "fully-served" where appropriate, allowing for organized and efficient medication tracking.

Pharmacists are encouraged to complete a "remarks" section when updating patient profiles, noting the previous medication ID if fully served, as well as any counseling notes or observed adherence patterns. Over time, MAPA collects data to assess its effectiveness, including metrics like response rates to refill



notifications and overall medication compliance. These insights help researchers refine strategies and make continuous improvements to the system.

Indicators	SA	Α	Ν	D	SD	Wm	VI	Rank
	5	4	3	2	1			
1. Does MAPA make it easier for you to record patient details?	27	3	0	0	0	4.90	SA	2
2. Does finding a patient's record in MAPA become easier compared to the previous system used in BnB?	29	1	0	0	0	4.97	SA	1
3. Does MAPA make it easier to record the medications taken by patients in BnB?	23	4	0	0	0	4.67	SA	3
Overall weighted mean						4.85	SA	

Table 5. Level of Efficiency of MAPA (N=30)

Scoring and Evaluation:						
Rate	Numerical Value	Verbal Interpretation				
5	4.50-5.00	Strongly Agree (SA)				
4	3.50-4.49	Agree (A)				
3	2.50-3.49	Neutral (N)				
2	1.50-2.49	Disagree (D)				
1	1.00-1.49	Strongly Disagree (SD)				

A survey of 30 respondents evaluated MAPA's efficiency in recording and retrieving patient information based on three key indicators. The results showed that the most significant improvement was in locating patient records, with a top-ranked, near-perfect weighted mean of 4.97, indicating strong agreement that MAPA is much more effective than the previous system. This was followed by ease of recording patient details, and then the recording of medications taken, which, while slightly lower at 4.67, still fell within the "Strongly Agree" range. The overall weighted mean was 4.85, reflecting very high user satisfaction and perceived efficiency. These findings indicate that MAPA greatly enhances the accuracy, speed, and ease of managing patient and medication data in the Botika ng Barangay.

 Table 6. Level of Acceptance of Eligible Users of MAPA

Indicators		Α	Ν	UA	HU	Wm	VI	Rank
	5	4	3	2	1			
1. Overall appeal (aesthetic) of the application interface of MAPA.		3	1	0	0	4.80	HA	1
2. How was your overall experience using MAPA?		4	2	0	0	4.73	HA	2
Overall weighted mean						4.77	HA	



Scoring and Evaluation:

Rate	Numerical Value	Verbal Interpretation
5	4.50-5.00	Highly Acceptable (HA)
4	3.50-4.49	Acceptable (A)
3	2.50-3.49	Neutral (N)
2	1.50-2.49	Unacceptable (UA)
1	1.00-1.49	Highly Unacceptable (HU)

Survey results show that respondents evaluated MAPA based on its interface design and overall user experience. The interface design received the highest rating, with a weighted mean of 4.80, indicating that users found the app visually appealing and user-friendly. The overall experience was also rated highly, with no negative responses, though slightly lower than the design aspect. The minimal difference between the two ratings suggests consistently positive user feedback. With an overall weighted mean of 4.77, MAPA was deemed "Highly Acceptable" in both aesthetics and functionality, supporting its effective use and potential for broader implementation in the Botika ng Barangay system.

Added Features	Improvement of the Medication Adherence			
	Application (MAPA) in the future			
1. Smart Refill Notifications	Automatic Refill Reminders based on pill counts or prescription duration. Direct Link to Reorder from Botika ng Barangay (BnB) when stock is low			
2. Two-Way Communication with Pharmacists	Enable patients to download the app and review their adherence progress by logging in the app their medication intake real-time. Allow patients to message or chat directly with the pharmacist through the app. Enable pharmacists to send personalized counseling tips when non-adherence is detected.			
3. Caregiver Access Mode	Family members or caregivers could monitor medication adherence remotely. Alerts could be sent to both the patient and a designated caregiver for better oversight.			
4. Gamification and Reward System	Points, badges, or small incentives for consistent medication logging and adherence. Monthly leaderboard for adherence (could boost motivation for some patients).			
5. Offline Capability	Enable MAPA to function even without internet access, syncing data once a connection is available. Crucial for remote barangays where internet may be unstable.			

Table 7. Potentia	l Added Features and	Updates that	Could Im	prove MAPA	in the future
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	Reminders could be:		
Contantina de Damindan	- Sound alarms		
6. Customized Reminder	- Vibrations		
Settings	- Visual pop-ups,		
	Personalized messages ("Hi <u>name</u> , it's time to take		
	your heart medicine!").		
	Short, simple videos or infographics about:		
7. Integrated Educational	- The importance of adherence,		
Modules	- How the prescribed medicines work,		
	Managing side effects properly.		
8. Medication Interaction	If a patient adds a new over-the-counter (OTC) or		
Warnings	herbal medicine, MAPA could warn about potential		
-	drug interactions based on their existing regimen.		
	Option to track blood pressure, blood sugar, weight,		
9. Health Metric Tracking	etc., alongside medication adherence.		
	Helps pharmacists detect early signs if a patient's		
	health worsens.		
	Compatibility with voice assistants (like Siri, and		
10. Voice Assistant Integration	Google Assistant) for hands-free medication		
	reminders — helpful for older adults or visually		
	impaired users		
	Allow users to report any difficulty in following		
11. Periodic Patient Feedback	prescriptions (e.g., side effects, confusion) easily		
Surveys	within the app.		
	Data could guide future pharmacist interventions.		

Incorporating additional features could transform MAPA from a basic reminder tool into a comprehensive, patient-centered health management platform. This would enhance patient autonomy, strengthen pharmacist support, and ultimately lead to improved health outcomes and greater community trust in pharmacists' roles and expertise.

4. Conclusion and Recommendations Conclusion

The study suggests that the Botika ng Barangay's outdated manual system needs modernization due to its inefficiency, data loss, and inability to track refills, monitor adherence, or manage inventory systematically. Digital solutions, such as MAPA, can address these challenges through low-cost digital innovations. MAPA enhances medication management and professional practice by digitizing patient profiles, automating refill reminders, allowing real-time monitoring, and creating a pharmacist dashboard for prioritizing interventions. It is highly efficient and user-friendly, improving data recording and retrieval speed. The application's high acceptance indicates readiness for implementation, with users rating its interface and user experience as "Highly Acceptable." MAPA has strong potential for scalability, with future integration of features like two-way communication, gamification, offline access, health metric



tracking, and caregiver access expanding its functionality into a full-fledged patient-centered digital health platform. This could be adopted in other barangays and low-resource communities.

Recommendations

The researcher recommends the full implementation of the MAPA system in San Antonio's Botika ng Barangay, replacing the outdated manual system. This includes allocating resources for hardware, internet access, and technical maintenance. Regular digital literacy and MAPA usage training for pharmacists, pharmacy assistants, and barangay health workers is recommended to ensure efficient use and data accuracy. Regular evaluation and feedback loops are suggested, with a quarterly system audit and feedback mechanism involving users and patients to identify improvement areas. Future updates should incorporate patient-focused tools, such as educational modules, customizable reminders, and interaction alerts, to encourage patient empowerment and strengthen the pharmacist-patient relationship. Collaboration with local government units and health departments is suggested to explore the potential of scaling MAPA to other Botika ng Barangay branches and integrating it with broader community health information systems. Compliance with Health Information Privacy Standards is also emphasized, ensuring strict access control, encryption, and consent protocols for patient data.

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