Enhancing non-communicable disease management through digital patient registries: Insights from the Multi-Programme Local Mapping Tool (MuPLoMT) in Pasig City — A policy brief

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ABSTRACT

Objectives: This study aimed to explore the barriers and facilitators influencing the implementation of the Multi-Programme Local Mapping Tool (MuPLoMT) among healthcare workers, to inform strategies for strengthening health information systems, advancing universal health care, and supporting the Philippines' commitment to Sustainable Development Goals.

Methodology: A qualitative research design was employed using semi-structured interviews with healthcare workers engaged in primary healthcare delivery in the Philippines. Thematic analysis, following the six-step process of Vaismoradi et al. (2024), was used to systematically examine and interpret participants' narratives, providing a comprehensive understanding of their experiences with MuPLoMT.

Results: The findings revealed that MuPLoMT enhances healthcare delivery by streamlining patient monitoring, improving service coordination, and supporting equity in access. However, challenges emerged, including limited infrastructure, technical barriers, and the need for capacity-building among healthcare workers. Facilitators included user adaptability, leadership support, and the system's potential to integrate with existing health information platforms.

Conclusion: Overall, the results highlight the transformative potential of MuPLoMT in primary healthcare delivery, particularly in strengthening digital patient registries and supporting universal health care. Addressing infrastructural gaps, fostering human resource capacity, and ensuring policy support are critical for scalability and sustainability. To translate these findings into actionable strategies, a policy brief has been developed as part of this study. This brief underscores the importance of investing in infrastructure, continuous training, and national-level integration of MuPLoMT, providing evidence-based guidance for policymakers and healthcare leaders to strengthen digital health adoption and improve health system resilience in the Philippines.

INTRODUCTION

Non-communicable diseases (NCDs), such as cardiovascular diseases, diabetes, chronic respiratory diseases, and cancers, remain the leading causes of mortality and morbidity worldwide. They account for more than 70% of deaths (World Health Organization [WHO], 2023). In the Philippines, the escalating burden of NCDs continues to strain the health system. It also poses barriers to the achievement of Universal Health Coverage (UHC) and sustainable health development (Department of Health [DOH], 2023). Addressing these challenges is aligned with Sustainable

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KEYWORDS

Non-Communicable Diseases (NCDs), Digital Patient Registry, Multi-Programme Local Mapping Tool (MuPLoMT), Healthcare Data Management, Universal Health Care, Health Information Systems, Primary Healthcare Innovation, Health Technology Adoption

Development Goal (SDG) 3, which aims to ensure healthy lives and promote well-being for all at all ages. It is also consistent with the National Unified Health Research Agenda (NUHRA), which emphasizes innovations and evidence-based solutions for equitable, efficient, and quality healthcare delivery.

The integration of digital health technologies has become an essential strategy for improving the efficiency, accessibility, and quality of care in primary healthcare systems (Yao et al., 2022). Among these technologies, digital patient registries have emerged as powerful tools for consolidating health data and streamlining clinical workflows. They also enable patient monitoring and support data-driven decision-making (Batangan et al., 2023). Despite this potential, the implementation of such systems in low- and middle-income settings is often hindered by fragmented health information systems, lack of interoperability, insufficient training, and limited infrastructure (Torab-Miandoab et al., 2023; Bautista, 2023). Empirical evidence that specifically captures the lived experiences of frontline healthcare workers in adopting these systems within the Philippine primary care context remains scarce.

Health information systems (HIS) are indispensable for aggregating data across health programs and generating actionable insights for planning and policy-making (WHO, 2023). However, persistent issues such as fragmented registries, inefficient workflows, and inequitable access undermine their effectiveness (Batangan et al., 2023; Torab-Miandoab et al., 2023). In response to these challenges, the Multi-Programme Local Mapping Tool (MuPLoMT) was developed under the UK Better Health Programme. It was developed in partnership with Pasig City and the Ateneo de Manila University–Institute of Philippine Culture. MuPLoMT is a centralized digital patient registry and mapping tool designed to integrate health program data and stratify patients based on risk. It also supports NCD management through improved monitoring, surveillance, and targeted interventions (Bautista, 2023).

Since its pilot implementation in Pasig City and Iloilo City, MuPLoMT has demonstrated promise in streamlining workflows and enhancing the monitoring of patient adherence. It has also supported more precise allocation of healthcare resources (Batangan, 2022; Bautista, 2023). However, limited empirical evidence remains available on its impact on healthcare workers' daily practice, the challenges of implementation, and the adequacy of training and institutional support. Evidence is also limited regarding its potential scalability to other local government units. Addressing these knowledge gaps is vital to optimizing MuPLoMT's functionality, strengthening digital health governance, and informing national health policy.

Therefore, this study explores the experiences of healthcare workers in Pasig City in using MuPLoMT for NCD management. Specifically, it examines their perceptions of the tool's impact on daily workflows and patient adherence. It also identifies barriers and strategies to address them and assesses the adequacy of training and support systems. Finally, it formulates recommendations to enhance usability, sustainability, and scalability. By generating policy-relevant evidence, this study contributes to the advancement of UHC and supports the priorities of both NUHRA and SDG 3.

MATERIALS AND METHODS

Study Design

This study employed a descriptive qualitative research design to explore the lived experiences of healthcare workers using the Multi-Programme Local Mapping Tool (MuPLoMT) for non-communicable disease management in Pasig City. This design is particularly suited to capturing rich, detailed narratives that reveal how the tool has influenced daily workflows, patient adherence, and healthcare delivery. By allowing key informants to openly share their perspectives, a descriptive qualitative approach provides a holistic understanding of both the benefits and challenges of MuPLoMT integration (Polit & Beck, 2018; Nieswiadomy & Bailey, 2017). This aligns with the study's objectives to assess perceptions of impact, identify challenges, evaluate training and support, and formulate recommendations for improving implementation. The flexible and open-ended nature of this design enables in-depth exploration of these objectives, offering valuable insights for optimizing the usability, sustainability, and scalability of MuPLoMT in line with Universal Health Coverage and the National Unified Health Research Agenda.

Setting and Key Informants

This study was conducted in Pasig City, Philippines, a rapidly urbanizing metropolis recognized for its economic growth and innovative public health initiatives. Pasig City serves as the pioneering pilot site for the Multi-Programme Local Mapping Tool (MuPLoMT), making it a highly relevant setting for examining the impact of digital healthcare solutions (Batangan et al., 2023). The city's systematic approach to health service integration is evident in its implementation of Universal Health Care (UHC) under Republic Act 11223 and its commitment to the No Balance Billing Policy, reinforcing its goal of providing high-quality, accessible healthcare services (Pasig City Government, n.d.). Pasig City's proactive healthcare reforms have earned national recognition, including a plaque of appreciation from the Department of Health, acknowledging its contributions toward advancing UHC in Metro Manila (Canlas, 2023). These achievements position Pasig City as an ideal setting to evaluate the integration and impact of MuPLoMT, aligning with the study's objectives to assess system usability, workflow impact, patient adherence, and scalability.

The study involved ten healthcare professionals from various health centers in Pasig City who actively use MuPLoMT. Key informants were selected through purposive sampling to ensure alignment with the study's objectives (Nieswiadomy & Bailey, 2017; Campbell et al., 2020). The sample comprised nine nurses and one midwife, aged 28 to 55 years (mean age: 39 years). Despite differences in professional background, the homogeneity of data was ensured as all participants were healthcare providers who met the inclusion criteria, regardless of specific profession. All participants underwent the same standardized training and utilized the MuPLoMT digital record system in a consistent manner, allowing for comparable experiences across the group. Participants were selected based on predefined inclusion and exclusion criteria, ensuring they had relevant experience using MuPLoMT. Some key informants engaged with the platform during its pilot phase before its official rollout three years ago, while others joined later, ensuring a balance of early-adopter and recent-user insights.

The inclusion criteria required key informants to be licensed healthcare workers between 22 and 59 years old, actively using MuPLoMT for at least six months, and willing to participate in the study. Exclusion criteria included absence during the data-gathering process and unwillingness to provide informed consent.

Research Instrument

To collect rich, in-depth data, the researchers employed one-on-one semi-structured interviews with each informant. Interviews are an effective qualitative method for eliciting narrative data because they allow key informants to articulate their perspectives and experiences in their own words (Monday, 2020). This approach was particularly suited to the study's objective of exploring

healthcare workers' lived experiences with the Multi-Programme Local Mapping Tool (MuPLoMT) in Pasig City.

The semi-structured interview format included an outline of topics and guiding questions designed to align with the study's objectives and research questions (Stuckey, 2013). This flexible approach enabled the researchers to adapt the questions and pose follow-up questions based on the informants' responses. It ensured a thorough exploration of emerging themes while maintaining focus on the research objectives.

To ensure methodological rigor and trustworthiness, the interview guide underwent a systematic development and validation process. First, the guide was translated into Filipino through a forward-translation process to ensure cultural and linguistic appropriateness (Beaton et al., 2000). Experts then reviewed the translated guide to assess its clarity, relevance, and capacity to capture the richness and complexity of the research context. A back-translation into the original language was performed by a different bilingual translator. This process helped identify and resolve discrepancies between the two versions and ensured accuracy and conceptual equivalence.

Further, expert validation involved a panel consisting of two nurse educators specializing in public health nursing, one nurse researcher, a Department of Health (DOH) program manager, and one physician who also served as the Department of Science and Technology (DOST) ethics chair. The validation process included the completion of a trustworthiness certification form to affirm the adequacy of the research instrument. These procedures followed established qualitative research standards — credibility, transferability, dependability, and confirmability. This reflects recent literature's emphasis on trustworthiness in qualitative inquiry (Creswell & Poth, 2021). Collectively, these steps ensured that the instrument was capable of eliciting comprehensive and meaningful insights that directly addressed the study objectives while maintaining methodological rigor.

A pilot interview was subsequently conducted with a community health nurse who met the inclusion criteria but was excluded from the final sample. The pilot evaluated the clarity, neutrality, and comprehensibility of the interview questions. It also helped identify potential sources of bias or misinterpretation. The pilot further supported transferability by demonstrating the applicability of the interview guide to participants with similar professional and cultural contexts. Feedback from the pilot interview informed refinements in probing techniques and interview flow. These refinements enhanced the overall effectiveness of the data collection process and supported the generation of rich, reliable qualitative data.

Data Gathering Procedures

The data collection process followed a structured sequence designed to ensure methodological rigor and adherence to ethical standards. Prior to commencing the study, the researchers obtained written approval from the Dean's Office of the College of Nursing, secured ethical clearance from the Institutional Review Board, and acquired additional permission from the Pasig City Health Office. These approvals ensured compliance with institutional and governmental regulations governing research involving human key informants.

To uphold rigor and trustworthiness, the researchers implemented measures aligned with qualitative research standards, including credibility, transferability, dependability, and confirmability (Creswell & Poth, 2021). Credibility was ensured by accurately representing informants' experiences; transferability was addressed through detailed contextual descriptions; dependability was maintained by documenting research procedures; and confirmability was strengthened through peer debriefing and expert review. Experts completed trustworthiness forms to validate the research instrument and process, further safeguarding the accuracy and consistency of the study.

In coordination with the Pasig City Health Office, the researchers arranged data collection schedules and disseminated a memorandum to the participating health facilities, namely: Santolan Super Health Center, Bagong Ilog Health Center, Bagong Ilog Primary Care Facility, Bagong Katipunan Health Center, CHAMP Super Health Center, Kalawaan Health Center, Ismar Health Center, and Oranbo Health Center. The MuPLoMT system is integrated across all eight (8) health centers in Pasig City, allowing each center to access data from other pilot centers, thereby supporting coordinated and interconnected service delivery. A total of ten (10) healthcare workers were recruited from selected health centers in Pasig City. The distribution of participants per facility was as follows: CHAMP/Pasig Wellness & Renal Center contributed the largest group with five (5) nurses, while the Bagong Ilog–Katipunan Health Center, Oranbo Health Center, Kalawaan Health Center, and Ismar Health Center each contributed one (1) nurse. Additionally, one (1) midwife was recruited from the Bagong Katipunan Health Center. Healthcare professionals meeting the inclusion criteria — licensed practitioners actively using MuPLoMT in routine service delivery — were purposively selected in consultation with unit supervisors.

Interviews were conducted on agreed dates in designated private spaces within each facility to ensure confidentiality and minimal disruption to regular operations. Sessions lasted approximately 25–30 minutes and were held during the agreed schedule of the day to accommodate key informants' schedules. Before each interview, informed consent was obtained from all participants, who were fully briefed on the study's purpose, procedures, and confidentiality measures. Participants were explicitly asked for permission to audio-record the interviews, and recording commenced only after they voluntarily agreed. This ensured accuracy in transcription and analysis while upholding ethical standards.

Open-ended questions guided the conversations, allowing key informants to freely share their lived experiences and perspectives regarding MuPLoMT. After each session, key informants' identities were protected through the assignment of secure alphanumeric codes. Transcriptions were completed promptly, and all data were stored in a password-protected digital folder accessible only to the research team. These procedures ensured that data collection was conducted ethically, systematically, and in alignment with the study's objectives.

All data collected in this study were managed in accordance with ethical and data privacy standards. Audio recordings, transcripts, and related research files were securely stored in a password-protected digital repository accessible only to the research team, while any hard copies were kept in a locked and secure location. The data will be retained for a maximum period of five (5) years Batangan following the completion of the study to allow for verification and potential future scholarly use. After this retention period, the proponent will be responsible for the proper disposal of all data, including the permanent deletion of electronic files and the shredding of any hard copies, ensuring full compliance with data privacy regulations and ethical research guidelines.

Data Analysis

Data were analyzed using thematic analysis, a qualitative method designed to identify, examine, and interpret patterns of meaning (themes) within a data set (Vaismoradi et al., 2024). The researchers followed a six-step process adapted from Vaismoradi

et al. (2024), which provides a systematic yet flexible framework for qualitative inquiry. This approach allowed the researchers to break down the rich narratives of informants into smaller analytical units, enabling a thorough exploration of similarities, differences, and relationships within the data.

Thematic analysis was selected for its ability to produce rich, detailed, and nuanced interpretations of complex qualitative data (Özden, 2024). It was particularly suited to this study's aims of exploring healthcare workers' lived experiences with the Multi-Programme Local Mapping Tool (MuPLoMT) and understanding its impact on workflow, patient adherence, and health service delivery. According to Brulé (2020), thematic analysis facilitates a structured examination of qualitative data while retaining interpretive flexibility, making it ideal for uncovering meaningful patterns in healthcare contexts.

Through this method, the researchers systematically coded and categorized data to construct themes that reflected the informants' perspectives and experiences. This process not only ensured rigor and transparency but also generated insights directly relevant to improving the usability, implementation, and sustainability of digital patient registry systems in primary healthcare settings. Thematic analysis thus served as a robust analytical tool to align the findings with the study's objectives and contribute to the evidence base for digital health transformation.

RESULTS

Profile of Key Informants

Table 1 presents the profile of ten healthcare professionals from various health centers who actively utilize the MuPLoMT system in their practice. The majority were nurses (9 out of 10), with one midwife. Participants' ages ranged from 28 to 55 years, with a mean age of 39 years, indicating a mature and experienced cohort. Their length of system use varied from 6 months to 6 years. Although the official rollout of MuPLoMT began three years ago, some pioneer users had prior exposure through pilot testing, explaining the longer durations of use. This diversity in age, professional background, and system experience provided a well-rounded perspective on the usability, challenges, and implementation of MuPLoMT across different contexts. Sex was not collected as a variable, as it was deemed not relevant to the objectives of the study.

Table 1: Profile of Key Informants

Informant Code	Profession	Age (years)	Duration of MuPLoMT Use
A_1	Midwife	53	3 years
A_2	Nurse	37	6 months
A_3	Nurse	34	6 years
B_1	Nurse	28	3 years
C_1	Nurse	38	3 years
D_1	Nurse	55	3 years
F_1	Nurse	36	3 years
G_1	Nurse	41	3 years
H_1	Nurse	34	3 years
E_1	Nurse	37	4 years

Note: Some informants used MuPLoMT during its pre-rollout pilot phase; hence, their reported duration of use may exceed the official three-year rollout period.

Presentation of Themes

Table 2 presents an overview of the codes, subthemes, and themes that emerged from the thematic analysis. Four overarching themes encapsulate the lived experiences of stakeholders and end-users: (1) Streamline the Process, Amplify the Impact, (2) Where the Systems Fail, the Human Effort Begins, (3) Laying the Groundwork through Knowledge and Resources, and (4) Toward a Future-Ready MuPLoMT: Continuous Improvements and Scalability. Together, these themes highlight the intersection of technological capability, human adaptability, and strategic foresight—critical elements for building a responsive and sustainable public health monitoring platform.

Table 2: Summary of Main Themes, Subthemes, and Definitions in MuPLoMT Implementation

Main Theme	Subthemes	Definition
Theme 1: Streamline the Process, Amplify the Impact	Efficient and streamlined workflow; Coordinated patient care and monitoring; Accessible and user-friendly systems; Vulnerability mapping for public health	Highlights how MuPLoMT enhances efficiency, improves coordination, and optimizes workflows, thereby amplifying its positive impact on healthcare delivery.
Theme 2: Where the Systems Fail, the Human Effort Begins	External barriers: connectivity and resource limitations; Internal barriers: feature gaps; Resilient responses and human workarounds	Emphasizes the limitations of the system and how health workers compensate through resourcefulness, adaptability, and additional human effort.
Theme 3: Laying the Groundwork through Knowledge and Resources	Turning potential into performance; Peer and self-led efforts in learning by doing	Focuses on the importance of training, resources, and peer support as foundations for sustaining effective and long-term system use.
Theme 4: Toward a Future-Ready MuPLoMT: Continuous Improvements and Scalability	Refine system foundation; Enhance connectivity and capacity building; Standardizing through nationwide policy integration	Stresses the need for continuous refinement, stronger infrastructure, and policy integration to ensure scalability and future readiness of MuPLoMT.

Theme 1: Streamline the Process, Amplify the Impact

The first theme emphasizes how MuPLoMT has transformed clinical workflows by reducing redundancy and increasing efficiency. Under the subtheme of efficient and streamlined workflows, informants highlighted how the system replaced multiple logbooks with a single, centralized patient profile. One participant explained: *"Dati kasi yung Non-Comm natin may mga logbook per health center… kung may system ka, isang pangalan, pag-click mo ng pangalan, andun na lahat ng logbooks sa loob ng profile niya"* [Previously, our Non-Communicable Disease records had separate logbooks for each health center. With the system, one patient's name provides access to all the records within their profile.] (A_3) This transition not only simplified the process of documentation but also reduced the time needed for retrieving patient records.

The theme also captured the subtheme of coordinated patient care and monitoring, wherein the system's ability to provide real-time data facilitated continuity of care. Healthcare providers emphasized that the registry allowed them to anticipate follow-ups and monitor adherence more effectively: *"Pag mag-eencode kami sa MuPLoMT… napapadali naming mamonitor yung mga pasyente na dapat babalik"* [When we encode information into MuPLoMT, it becomes easier for us to monitor the patients who need to return for follow-up.] (E_1) Such features ensured proactive rather than reactive patient management.

A third subtheme, accessible and user-friendly systems, was repeatedly cited as critical for sustained adoption. Informants described the platform as intuitive and easy to navigate, enabling even those with limited digital literacy to use it confidently. Finally, MuPLoMT's integration with social protection databases highlighted the subtheme of vulnerability mapping for public health. This function enabled healthcare providers to identify socially vulnerable groups and prioritize them for interventions, supporting the broader goals of Universal Health Coverage (Better Health Programme, 2022). Together, these subthemes underscore MuPLoMT's role in amplifying impact by strengthening workflows, coordination, accessibility, and equity.

Theme 2: Where the Systems Fail, the Human Effort Begins

The second theme illustrates the ongoing tension between technological limitations and human resourcefulness. Informants frequently mentioned external barriers, such as unstable internet connectivity, defective devices, and limited access to hardware. One nurse recounted: *"Internet talaga pinaka challenge namin, kasi meron kaming time na almost a month na walang internet"* [Internet connectivity is really our biggest challenge because there was a period when we had almost a month without internet.] (E_1) These barriers disrupted workflow and forced staff to find alternative ways to continue service delivery.

Beyond external factors, internal barriers were equally evident. Participants reported recurring issues such as system glitches, duplicate entries, incomplete address fields, and the lack of dropdown options for certain conditions and medications. One participant remarked: *"May glitches minsan… na-enter yung dalawang name… kung nagkaroon ng space, dun magkakaron ng duplicate"* [There are sometimes glitches; entering a name with an extra space can result in a duplicate record.] (A_3) Such challenges not only complicated patient management but also affected data accuracy and continuity.

Despite these setbacks, health workers demonstrated remarkable adaptability through resilient responses and human workarounds. Many reported using personal mobile data, pocket Wi-Fi, or task-sharing to overcome connectivity and workload issues: *"Kanya-kanyang data or pocket Wi-Fi"* [We had to use our own mobile data or pocket Wi-Fi.] (E_1) Others relied on peer troubleshooting and informal IT support networks to maintain system use. These experiences reflect a broader reality in digital health—that while technology provides the framework, its success ultimately hinges on the perseverance and creativity of frontline workers (Scheibner et al., 2021).

Theme 3: Laying the Groundwork through Knowledge and Resources

The third theme focuses on the foundational role of training, peer support, and infrastructure in sustaining system use. A major subtheme was turning potential into performance, where participants highlighted how institutional investment in resources, such as functional computers, encoders, and internet connections, directly enabled MuPLoMT utilization: *"…Every health center station naglagay sila ng mga encoders… naglagay sila ng internet accessibility tapos yung walang PC or laptop, pinoprovide naman ni city"* (D_1) […Every health center station was provided with encoders, internet access was made available, and the city provided PCs or laptops where needed.] The availability of these resources allowed healthcare workers to maximize the platform's potential in daily practice.

Equally important was the subtheme of peer and self-led learning by doing. Several informants explained that they had not undergone formal training but instead learned through experimentation and observation: *"Wala akong formal training… I just figured nung andito ako, kung paano gamitin"* [I did not have formal training; I learned how to use it by figuring it out when I was here.] (C_1) Peer-to-peer knowledge sharing further facilitated collective competence, fostering a culture of collaboration and resilience despite training gaps. These findings echo evidence that sustainable adoption of digital health systems requires not only technological infrastructure but also the cultivation of digital literacy and professional self-efficacy (Elepaño JR et al., 2025).

Theme 4: Toward a Future-Ready MuPLoMT: Continuous Improvements and Scalability

The final theme highlights healthcare workers' aspirations for system refinement, expansion, and national integration. Under the subtheme of refining system foundations, informants emphasized the need for more complete and accurate data entry fields, particularly for street-level addresses: *"Gusto ko po sana malagyan siya ng street… mas okay kasi kung may street kahit street lang"* [I would like the system to include the street address; it would be better if the street information were available.] (H_1) Address accuracy was seen as vital for patient tracking, continuity of care, and population health management.

The subtheme of enhancing connectivity and capacity building underscored repeated calls for stable internet, technical upgrades, and structured, continuous training programs. Participants emphasized that while they could adapt, a more reliable infrastructure would reduce inefficiencies and improve confidence in the system.

A third subtheme, standardizing through nationwide policy integration, revealed strong support for scaling MuPLoMT to the

national level. Many participants expressed the need for a unified system across all cities and health facilities to prevent fragmentation and redundancy: *"Mas better kung isa lang yung ginagamit namin na software… para united"* [It would be better if we used only one software so that the system would be unified.] (B_1) Others envisioned MuPLoMT as a universal tool to achieve more equitable healthcare: *"Dapat meron din silang ganito para maging universal siya… meron kayo doon, meron din kami dito"* [They should also have a system like this so that it can become universal; if you have it there, we should also have it here.] (C_1) These insights underscore that the system's sustainability and scalability depend not only on technical improvements but also on strong policy backing and nationwide adoption (Elepaño JR et al., 2025).

DISCUSSION

Taken together, the four themes suggest that MuPLoMT's value lies in the interaction between technological functionality, frontline adaptability, and organizational support. Rather than functioning solely as a digital repository, the system appears to influence how healthcare workers document, retrieve, monitor, and coordinate patient care. The centralized patient profile reduced the need to manage multiple records. It also facilitated more immediate access to patient information. This finding is consistent with evidence that integrated digital health systems can improve patient monitoring, information retrieval, and continuity of care by making relevant data more accessible to healthcare providers (Khatri et al., 2024; Rodriguez et al., 2023). The system's capacity to support vulnerability mapping further suggests that digital registries can contribute not only to individual patient management but also to more targeted population-level interventions.

However, the findings also demonstrate that the effectiveness of a digital health platform is shaped by the environment in which it is implemented. Unstable internet connectivity, inadequate hardware, system glitches, feature limitations, and restrictions in user access disrupted the otherwise streamlined workflow. These challenges indicate that the benefits of digitalization cannot be fully realized when basic technological and organizational conditions remain inadequate. Similar barriers have been documented in low- and middle-income settings. Fragmented systems, limited infrastructure, insufficient resources, and implementation constraints can impede the sustained use of electronic health technologies (Torab-Miandoab et al., 2023; Batangan et al., 2023). The findings therefore suggest that MuPLoMT should be understood as part of a broader health information system rather than as a standalone technological intervention.

An important finding was the capacity of healthcare workers to compensate for these limitations through practical workarounds. The use of personal mobile data, pocket Wi-Fi, task delegation, and peer assistance demonstrated that frontline users actively adapted their practices to maintain service delivery despite technological constraints. Such responses highlight the importance of human factors in digital health implementation. The successful adoption of digital systems depends not only on system functionality but also on users' digital confidence, problem-solving capacity, and ability to adapt to changing circumstances (Blondino et al., 2024; Scheibner et al., 2021). At the same time, reliance on personal resources and informal workarounds should not be viewed as a sustainable substitute for institutional support. Rather, these practices reveal areas where organizational and technical systems need to be strengthened.

The findings further indicate that capacity building should be viewed as an ongoing implementation process rather than a one-time training activity. Participants described both formal and peer- or self-directed learning. This suggests that users develop competence through a combination of structured instruction, experience, and collaboration. This pattern is consistent with evidence emphasizing the importance of digital literacy, professional self-efficacy, and organizational support in sustaining health information systems (Elepaño JR et al., 2025). In this context, continuous training and accessible technical assistance may help transform users' existing adaptability into more consistent system competence. These measures may also reduce dependence on informal troubleshooting.

Participants' recommendations for improving address-level information, expanding system functions, strengthening connectivity, and integrating MuPLoMT with other platforms also provide insight into the conditions required for long-term system development. Complete and accurate patient information is particularly important for effective tracking and continuity of care. Interoperability can also reduce fragmentation across health information platforms. The participants' preference for a more unified system is consistent with broader priorities for interoperable and scalable health information systems capable of supporting coordinated primary healthcare (Batangan et al., 2023; Kawi et al., 2024; Elepaño C., 2025). Proposed enhancements such as QR code scanning, e-signatures, and additional program modules should therefore be considered within a broader user-centered development process. Such a process should respond to actual workflow requirements.

Overall, the findings indicate that MuPLoMT has the potential to strengthen primary healthcare delivery by improving information accessibility, workflow efficiency, patient monitoring, and coordination. However, its impact depends on the alignment of technology with human and organizational capacity. The experience in Pasig City illustrates that digital health implementation is not simply a matter of introducing a functional platform. It requires an enabling environment in which infrastructure, user capability, technical support, and system development evolve together. This interpretation reinforces the broader view that sustainable digital health transformation requires attention to both technological design and the social and institutional conditions surrounding its use (Yao et al., 2022; Torab-Miandoab et al., 2023). These findings provide a basis for strengthening MuPLoMT as a responsive and sustainable component of primary healthcare information management.

CONCLUSION AND RECOMMENDATIONS

This study affirms the potential of the Multi-Programme Local Mapping Tool (MuPLoMT) to strengthen primary healthcare delivery. It can improve workflow efficiency, patient monitoring, care coordination, and equitable access to services. The findings demonstrate that a centralized digital patient registry can reduce administrative burdens. It can also facilitate timely access to patient information for monitoring and risk stratification. However, its implementation was influenced by connectivity and hardware limitations, system-related issues, workload demands, and gaps in user support. These findings indicate that the effectiveness of MuPLoMT depends not only on its technical capabilities but also on the capacity of healthcare workers and the organizational conditions supporting its use.

Although conducted in Pasig City, the study provides relevant insights for other local government health units and comparable primary healthcare settings. The findings suggest that the sustainable adoption of digital health technologies requires alignment among system functionality, workforce capacity,

infrastructure, and institutional support. Transferability to other settings should, however, be considered in relation to differences in local resources, health information systems, and implementation conditions.

Based on the findings, MuPLoMT should be continuously refined in response to frontline users' experiences. Particular attention should be given to system reliability, usability, data completeness, and technical support. Healthcare institutions should likewise ensure appropriate resources and sustained capacity-building to support effective use of the platform. Future implementation should prioritize interoperability with existing health information systems. It should also establish mechanisms for monitoring system performance and user experience. Specific policy and implementation actions are outlined in the accompanying policy brief.

Overall, MuPLoMT demonstrates considerable promise as a digital health platform for strengthening primary healthcare delivery. Its long-term contribution will depend on sustained institutional commitment and responsive system development. It will also require coordinated efforts among health authorities, healthcare workers, system developers, and other stakeholders.

Box 1. Policy Brief: Enhancing Primary Healthcare Delivery through MuPLoMT

Executive Summary

This policy brief presents findings from a qualitative study on the Multi-Programme Local Mapping Tool (MuPLoMT), a digital patient registry implemented in Pasig City for managing non-communicable diseases (NCDs). The study identified themes related to system efficiency, human adaptability, sustainability, and scalability. Based on these findings, the brief offers recommendations to enhance the effectiveness and sustainability of MuPLoMT in primary healthcare delivery.

Introduction

The Philippine healthcare system faces challenges in managing NCDs due to fragmented data and inefficient service delivery models. MuPLoMT addresses these gaps by streamlining processes and improving data accessibility. Understanding healthcare workers' experiences with MuPLoMT provides insights essential for optimizing implementation and scaling impact.

Key Findings

- Streamlining Healthcare Processes through Digital Innovation - MuPLoMT significantly improved the efficiency of healthcare delivery by consolidating patient information into a single digital profile, reducing duplication, and enhancing real-time data retrieval. This integration facilitated better patient tracking and outcome monitoring.
- Human Adaptability in the Face of Systemic Limitations - Despite technological advancements, healthcare workers encountered challenges such as unstable internet connectivity and system glitches. Their adaptability, including using personal mobile data and peer support, was vital in overcoming these barriers.
- Sustainability through Knowledge, Resources, and Training - Sustained investment in infrastructure, such as functional computers and stable internet, alongside structured training programs, was essential for consistent system use and user competence.
- Toward a Future-Ready MuPLoMT: Continuous Improvement and Scalability - Healthcare workers envisioned an expanded MuPLoMT that includes mental health and additional NCD modules, enhanced interoperability, and national integration to promote equitable healthcare delivery.

Policy Recommendations

1. **Invest in MuPLoMT-Specific Infrastructure** – Allocate dedicated funding through the Pasig City local government budget (e.g., City Health Office and ICT Office allocations) to ensure stable internet connectivity and provision of functional devices (computers, tablets, and secure servers) across all MuPLoMT-integrated health centers, with priority support for facilities experiencing. high patient demand
2. **Institutionalize MuPLoMT Training Programs** – Assign the City Health Office, in collaboration with the ICT Office and selected academic or technical partners, to design and implement standardized and continuous training programs. These should include structured onboarding for new users, periodic refresher courses, and peer-led mentoring within each facility to strengthen digital literacy and system proficiency.
3. **Enhance and Localize System Functionality** – Establish a formal feedback and technical support mechanism between healthcare workers and the MuPLoMT development team, with designated focal persons per facility. Regular coordination with IT specialists should be conducted to promptly address system glitches, optimize user interface design based on end-user feedback, and ensure responsiveness to clinical workflows.
4. **Operationalize Interoperability with Existing Systems** – Develop and implement technical integration protocols, including the use of standardized health data formats (e.g., HL7 FHIR), APIs, and secure data exchange frameworks, in coordination with national agencies such as the Department of Health and PhilHealth. This will allow MuPLoMT to interface with existing health information systems for seamless and unified patient data management.
5. **Strengthen Local Implementation and Sustainability in Pasig City** – Develop a structured enhancement and sustainability plan for MuPLoMT within Pasig City led by the local government in collaboration with health center administrators and frontline healthcare workers. This may include periodic resource mapping, targeted infrastructure upgrades (e.g., internet connectivity, devices, and technical support), refresher training for users, and routine monitoring of system performance and user experiences. Prioritizing these local improvements can help optimize MuPLoMT's effectiveness, address identified operational barriers, and support continuous quality improvement in primary healthcare delivery within the city.
6. **Strengthen Data Protection and Privacy Governance in MuPLoMT** – Based on findings related to system use, data handling, and user access, the Pasig City Health Office should reinforce role-based access controls, standardize data sharing agreements, and establish clear data processing protocols consistent with applicable data privacy requirements. Regular privacy and security training, periodic privacy risk assessments, and formal incident response and breach management procedures should

also be institutionalized. Designating a Data Protection Officer or privacy compliance focal person will further strengthen oversight, accountability, and user trust in the system.

Conclusion

MuPLoMT has demonstrated potential in enhancing primary healthcare delivery in Pasig City. By addressing infrastructure challenges, investing in human resources, and planning for scalability, the system can be optimized and expanded to improve healthcare outcomes nationwide.

Policy Implications

The findings indicate that MuPLoMT has the potential to strengthen primary healthcare delivery by improving the use of patient information, care coordination, and equitable access to services. For policymakers and health-system leaders, these findings underscore the importance of treating digital health transformation as a broader health-system priority rather than solely a technological initiative. This requires supportive governance, coordinated implementation, sustained institutional commitment, and policies that enable digital innovations to be effectively adopted, maintained, and scaled according to the needs of healthcare providers and the communities they serve. Within the Philippine Universal Health Care context, these considerations can guide future decisions on digital health governance, resource allocation, system development, and scale-up, while promoting a more robust, responsive, and equitable primary healthcare system.

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CONFLICT OF INTEREST

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CONTRIBUTIONS OF INDIVIDUAL AUTHORS

The study was conceptualized and analyzed, critically reviewed, and approved by all authors Data Curation: Lara Faith L. Martin, Ma. Andrea Nicole T. Macaraeg, Ma. Eureka R. Mangsat, Jose Robert V. Mari, Grace Ann E. Matias, and Paula Mikaela B. Mendoza. Formal analysis: Lara Faith L. Martin, Ma. Andrea Nicole T. Macaraeg, Daisy Ann O. Magundayao, Ma. Eureka R. Mangsat, Jose Robert V. Mari, Grace Ann E. Matias, Paula Mikaela B. Mendoza, Khayla Marie Montjoy, and Tristan Jourdan C. Dela Cruz. Methodology: Ma. Andrea Nicole T. Macaraeg and Ma. Eureka R. Mangsat. Policy Brief Formulation: Tristan Jourdan C. Dela Cruz. Supervision: Tristan Jourdan C. Dela Cruz. Review and editing: Lara Faith L. Martin and Tristan Jourdan C. Dela Cruz.

DECLARATION OF GENERATIVE AI AND AI-ASSISTED TECHNOLOGIES

During the preparation of this work, the authors used ChatGPT 4.0 in order to compress and refine the original manuscript to fit the technical requirements of the journal. After using this tool, the authors reviewed and edited the content as needed and take full responsibility for the content of the publication.

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