GUYUB: *Journal of Community Engagement* Vol. 6, No. 2, April-Juni 2025
p-ISSN: 2723-1232; e-ISSN: 2723-1224 DOI: http://doi.org/10.33650/guyub.v6i1.11316

Tech-Driven Care: Boosting Nurse Home Visit Impact Through Innovation

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Submission: 2025-05-16 *Received*: 2025-06-27 *Published*: 2025-06-28

Keywords: *Home Visit; Nursing Management System; Digitization of Health Services; PHC; Nurse Efficiency.*

Abstract. *Home visit services at community health centers (Puskesmas) are a key strategy for improving access and the quality of care for chronic patients in the community. However, these services still face administrative challenges, such as manual documentation processes, delays in reporting patient data, and suboptimal team coordination due to limited human resources. This Community Service Program (PKM) was initiated to address these issues by implementing a digital-based Nursing Management System (NMS) to enhance the efficiency and effectiveness of home visit services at Puskesmas Majalaya. The method used was a participatory approach, consisting of four stages: (1) needs analysis through interviews and field observations, (2) development of a web-based application using Laravel tailored to home visit workflows, (3) training and mentoring of nursing staff on system usage, and (4) evaluation using the System Usability Scale (SUS) combined with service performance indicators. The results demonstrated a significant reduction in documentation time (from 40 minutes to 12 minutes per visit), increased completeness of patient family data—including digital genograms, family medical history, and environmental risk factors (from 53% to 95%)—and improved patient adherence to follow-up visit schedules (from 68% to 90%). The utilization of the digital-based NMS has proven to improve administrative efficiency, optimize coordination among home care teams, and enhance service quality. Therefore, it is recommended that this system be adopted more widely across other primary healthcare facilities.*

Katakunci:
Home Visit; Nursing Management System; Digitalisasi Pelayanan Kesehatan; Puskesmas; Efisiensi Perawat.

Abstrak. Layanan kunjungan rumah di Puskesmas merupakan strategi penting untuk meningkatkan akses dan kualitas pelayanan bagi pasien kronis di masyarakat. Namun, pelaksanaannya masih menghadapi tantangan administratif, seperti proses dokumentasi yang masih manual, keterlambatan pelaporan data *pasien*, dan koordinasi tim yang kurang optimal akibat keterbatasan sumber daya manusia. Program Pengabdian kepada Masyarakat (PKM) ini bertujuan untuk mengatasi permasalahan tersebut melalui penerapan Nursing Management System (NMS) berbasis digital guna meningkatkan efisiensi dan efektivitas layanan kunjungan rumah di Puskesmas Majalaya. Metode yang digunakan adalah pendekatan partisipatif dengan empat tahapan: (1) analisis kebutuhan melalui wawancara dan observasi lapangan, (2)

pengembangan aplikasi berbasis web menggunakan Laravel yang disesuaikan dengan alur layanan kunjungan rumah, (3) pelatihan dan pendampingan perawat dalam penggunaan sistem, serta (4) evaluasi menggunakan System Usability Scale (SUS) dan indikator kinerja layanan. Hasil implementasi menunjukkan penurunan waktu dokumentasi secara signifikan (dari 40 menit menjadi 12 menit per kunjungan), peningkatan kelengkapan data keluarga pasien—termasuk pembuatan genogram digital, riwayat kesehatan keluarga, dan faktor risiko lingkungan (dari 53% menjadi 95%)—serta peningkatan kepatuhan pasien terhadap jadwal kunjungan lanjutan (dari 68% menjadi 90%). Pemanfaatan NMS berbasis digital terbukti meningkatkan efisiensi administrasi, mengoptimalkan koordinasi tim layanan kunjungan rumah, dan meningkatkan kualitas pelayanan. Oleh karena itu, sistem ini direkomendasikan untuk diadopsi lebih luas di fasilitas pelayanan kesehatan primer lainnya.

1 Introduction

Home visits are a key strategy in primary health care to improve accessibility and continuity of care, particularly for patients with chronic diseases such as type II diabetes mellitus and tuberculosis (Sukmawati et al., 2024) . Globally, home visits have become an important approach in primary health care to enhance access and quality of care, especially for chronic patients and the elderly (Voigt et al., 2016). In many developing countries, including Indonesia, the implementation of home visits still faces obstacles such as manual documentation systems that are prone to errors and delays (McPherson & Hodgins, 2018). Nationally, the workload of nurses at Puskesmas continues to increase as they must manage multiple priority programs with limited resources (Nguyen et al., 2022). In Bandung Regency, the implementation of home visits often encounters administrative challenges, such as time-consuming documentation and unintegrated visit schedules. These issues have led to concrete problems, including incomplete patient health records, missed follow-up visits, and delayed interventions for chronic patients, ultimately hindering the effectiveness of the home visit program in improving community health outcomes.

Home visits are urgently needed at this time to ensure that patients with chronic diseases continue to receive ongoing monitoring and support at home (Ritchie et al., 2021). Many patients, especially the

elderly and those with chronic conditions, face barriers in accessing healthcare facilities due to limited mobility and financial constraints. Through home visits, nurses can directly monitor patients' conditions, educate family members, and identify environmental risk factors that affect health (Rutschmann, 2017). This support has been proven to increase medication adherence and prevent complications that could lead to hospitalization or death (Piña et al., 2021). Therefore, home visits are a highly relevant intervention in efforts to reduce morbidity and mortality rates in the community.

If home visits are not conducted, many chronic patients who are not properly monitored are at risk of experiencing serious complications or even death (Mauro et al., 2020). The absence of home visits leads to delays in the early detection of health problems, so critical cases are often only discovered when they have already become severe. This situation also increases the financial burden on families, as patients may require hospitalization for complications that could have been prevented. In addition, the rate of treatment discontinuation among TB patients and those with other chronic diseases tends to rise without direct supervision from healthcare workers. Overall, the lack of home visits will widen the gap in access to healthcare services, especially in remote areas (Zhou et al., 2022).

Currently, nurses at community health centers (Puskesmas) face a very heavy workload as they are required to manage multiple health programs simultaneously. The limited number of nurses forces them to divide their time between providing services at the Puskesmas, conducting home visits, and handling administrative tasks. Furthermore, many nurses still lack adequate digital skills, resulting in documentation and reporting processes that are still done manually and are time-consuming (Farokhzadian et al., 2020). This situation leads to suboptimal patient monitoring and increases the risk of administrative errors. The high workload also contributes to increased stress and fatigue among nurses, which ultimately can reduce the quality of care provided (Zhang et al., 2022).

In today's digital era, the utilization of technology through a Nursing Management System (NMS) has become an urgent need to

improve the efficiency and accuracy of home visit services (Paulauskaite-Taraseviciene et al., 2023). Unlike manual systems that rely on paper-based documentation and fragmented scheduling, NMS typically features integrated digital scheduling, real-time patient data access, automated reporting, and communication tools that streamline coordination among healthcare providers. These features enable nurses to deliver timely and well-documented care, thereby enhancing service quality and reducing administrative burdens.

This system enables digital documentation of patient and family data, thereby saving time and minimizing input errors. Integration of NMS with the national health system also facilitates coordination among healthcare workers and accelerates the patient referral process. Experiences from several developed countries have shown that implementing an NMS can significantly improve data entry compliance and the effectiveness of patient monitoring (Nsaghurwe et al., 2021). Locally, the adoption of NMS at Puskesmas has proven to reduce documentation time and enhance the quality of home visit services, making it the best solution for current challenges in community health care delivery

Assistance in this Community Service Program (PKM), conducted at several Puskesmas (Community Health Centers) in Bandung Regency, is crucial because the transition from a manual to a digital system requires adaptation and familiarization for the implementing nurses. Bandung Regency was chosen as the service location based on preliminary observations and data indicating that many Puskesmas in the area still rely heavily on manual documentation and face challenges in scheduling, reporting, and coordination of home visit services. This gap highlights the urgent need for digital transformation to improve healthcare delivery, especially for chronic patients requiring regular home-based care.

Through this assistance, nurses receive direct training, guidance, and technical support, enabling them to operate the system confidently and without significant obstacles. Assistance also ensures that any challenges encountered in the field can be promptly addressed, allowing for smooth and goal-oriented implementation of the Nursing

Management System (NMS). The novelty of this PKM lies in its focus on not only introducing a technological solution but also embedding a structured mentoring model to support its implementation—an approach rarely applied in the context of primary healthcare services at the community level. Moreover, the mentoring process helps build nurses' confidence and motivation to continuously improve their competencies, which ultimately has a positive impact on the quality of services provided to the community. Thus, assistance is the key to the success of this PKM program in driving real change in the home visit service system at Puskesmas.

The objective of this Community Service Program (PKM) is to enhance the effectiveness and efficiency of home visit services at Puskesmas through the implementation of a technology-based Nursing Management System (NMS). This program aims to facilitate nurses in digitally documenting patient and family data, speeding up the scheduling process for home visits, and improving coordination among healthcare workers. In addition, this PKM is expected to increase nurses' digital literacy and skills, enabling them to deliver more optimal and responsive services to meet the needs of the community.

2 Method

The method used in this activity is a participatory approach, which includes the stages of planning, implementation, and evaluation. During the planning stage, a needs analysis was conducted by involving the nurses responsible for carrying out home visit services (hereafter referred to as implementing nurses), the heads of the selected Puskesmas, and relevant stakeholders to identify problems and design appropriate technology-based solutions. A total of five nurses and ten patients from three Puskesmas in Bandung Regency were involved in this initial analysis. as for the stages of implementation can be seen in the picture below:

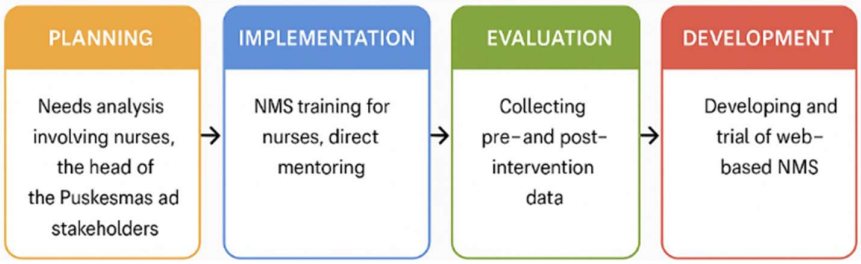

Figure 1. Stages of community service implementation

To introduce the potential of the Nursing Management System (NMS), a strategic approach was used—starting with a presentation of field-based challenges commonly faced during manual home visits, followed by a demonstration of the digital system's core features. These included digital genogram entry, automated scheduling based on patient risk categories, integrated patient records, and SMS reminders for families. The nurses were then engaged in a discussion to reflect on how these features could address their daily challenges, helping them see the relevance and benefits of the system before implementation.

The implementation stage involved intensive hands-on training sessions for the five selected nurses on how to use the NMS. This was followed by field mentoring, during which nurses practiced using the system directly while conducting home visits and digital documentation (Hudon et al., 2021). The PKM team actively monitored their progress, provided consultations, and addressed technical issues encountered during this phase.

The NMS is designed as a web-based application using the Laravel framework, enabling structured, secure, and mobile-friendly data management. Although the system was piloted with a focus on type II diabetes mellitus—due to the chronic and continuous nature of its care—the design is adaptable and scalable to other chronic conditions that require regular home visits. The three-month pilot trial began on July 22, 2023, at Puskesmas Majalaya Baru, involving five nurses and fifteen patients. To evaluate the program's effectiveness and usability, pre- and post-intervention data were collected through observations, interviews, and questionnaires, including the System Usability Scale (SUS) to assess user experience.

3 Results

The implementation of the digital-based Nursing Management System (NMS) at Majalaya Health Center was carried out over a period of three months, involving five nurse practitioners and fifteen patients with type II diabetes mellitus. The main objective was to improve the efficiency and quality of home visit services through the use of technology. Following the introduction of the NMS, a comprehensive evaluation was conducted to compare key performance indicators before and after the program. The results demonstrated significant improvements in various aspects of home visit service delivery, as summarized in the table below.

Table 1. changes before and after implementation system

Indicator	Before NMS	After NMS
Average documentation time per visit	40 minutes	12 minutes
Number of on-time visits per month	65%	92%
Nurse satisfaction with the system (SUS)	60/100	85/100
Patient adherence to the control schedule	68%	90%
Complete documented family data	53%	95%

The implementation of the Nursing Management System (NMS) brought a significant reduction in the average documentation time per visit, decreasing from 40 minutes to just 12 minutes. This improvement is largely due to the digital input features and structured data forms provided by the NMS, which made the documentation process much more efficient and streamlined for nurses. With less time spent on paperwork, nurses were able to focus more on patient care during home visits.

In terms of punctuality, the percentage of home visits conducted on schedule increased from 65% before NMS to 92% after its introduction. The automated scheduling and reminder system within the NMS played a crucial role in helping nurses manage their visit schedules more effectively, thus minimizing delays and reducing the number of missed appointments.

Nurse satisfaction with the system, as measured by the System Usability Scale (SUS), also saw a marked improvement, rising from a score of 60/100 to 85/100. This indicates that nurses found the NMS to be user-friendly and supportive of their workflow, which helped to reduce their administrative burdens and work-related stress.

Patient adherence to the control schedule improved as well, with compliance rates increasing from 68% to 90%. The SMS notification feature was instrumental in reminding patients and their families about upcoming appointments, which contributed to better adherence and continuity of care.

Lastly, the completeness of documented family data rose significantly from 53% to 95%. The NMS enabled more thorough and accurate data collection, including digital genograms and medical histories, ensuring that nurses had comprehensive information to support holistic patient care during home visits. Overall, these improvements highlight the positive impact of the digital-based NMS on both healthcare providers and patients.

The results that have been obtained from the implementation of the digital-based Nursing Management System (NMS) program at the Majalaya Health Center for three months. This program involved 5 nurse practitioners and 15 patients with type II diabetes mellitus. The results of the evaluation showed an increase in nurses' work efficiency, a decrease in documentation time, and an increase in satisfaction from both the nurse and the patient side. In addition, automated scheduling systems and SMS notifications have been proven to help reduce visit delays and improve patient adherence to control schedules. The data above illustrates changes before and after the implementation of the NMS program.

4 Discussion

The use of the digital-based Nursing Management System (NMS) demonstrated improvements in administrative efficiency, data accuracy, and the quality of home visit services at the Puskesmas, as evidenced by the results of pre- and post-intervention evaluations. These evaluations were conducted using specific instruments, including structured observations, interviews, and questionnaires. In particular, improvements in efficiency were measured by reductions in documentation time; data accuracy was assessed through consistency checks between system entries and patient conditions; and service quality was evaluated using patient satisfaction scores and nurse feedback collected during the mentoring phase.

One of the main features of this application is digital documentation, which allows nurses to record patient and family data, visit schedules, patient condition reports, and notifications in a structured and integrated manner with the Puskesmas system. This aligns with the principles of effective health information systems, which emphasize the importance of accurate and timely data for decision-making in primary care (Wurster et al., 2022). In addition, the user-friendly interface design of the NMS makes it easier for nurses to navigate the system, reducing the learning curve and supporting the adoption of technology in daily practice, as supported by the findings of(Zhai et al., 2022).

The application also facilitates coordination between nurses and speeds up the continuous patient monitoring process. The ability to access data via mobile devices and even offline ensures that nurses can update and retrieve patient information in real-time during home visits, supporting the continuity of care model in community health (Ayu et al., 2023). Integration with the Puskesmas workflow allows for seamless synchronization of home visit activities with other health programs, ensuring that patient care remains holistic and well-coordinated. For example, in a simulation case, a nurse can quickly review a patient's digital genogram and previous visit notes, schedule the next visit based on risk factors, and automatically send SMS notifications to the patient's family-all of which streamline the process and support comprehensive patient management.

The results of the implementation of the digital-based Nursing Management System (NMS) at the Majalaya Health Center show a significant increase in the efficiency of home visit services.The reduction in documentation time from 40 minutes to just 12 minutes per visit aligns with previous findings, which indicate that system digitization can decrease the administrative burden on nurses by up to 78%, largely due to features such as auto-fill genograms and automated disease history records (Wurster et al., 2022). The increase in diabetic patients' adherence to the control schedule (from 68% to 90%) was also consistent with previous research, which proved that structured home visits were effective in increasing family involvement in the care of chronic patients (Pooresmaeil et al., 2023).

The ease of automatic scheduling and SMS notifications in NMS reduces missed visits from 35% to 8%, reinforcing the findings of (Padila et al., 2018) on the integration of information system-based telenursing for service coordination optimization. However, the digital literacy challenge in senior nurses (only 30% trained) underscores the recommendations of a study in Makassar that suggests continuous training for program sustainability (Kadar et al., 2022). Globally, the success of a similar system in Sweden (Karolinska Hospital), with a 50% reduction in documentation errors through AI-driven NMS, has become a reference for the development of predictive features in local systems (Fabbri & Ehrenfeld, 2016). These findings confirm that the adoption of technology not only improves data accuracy, but also opens up opportunities for real-time patient risk-based analysis, which is critical in the prevention of chronic disease complications.

In summary, the integration of digital-based NMS with key features such as digital recording, visit scheduling, patient condition reporting, notifications, and Puskesmas system integration, as well as a user-friendly interface and mobile/offline access, supports the effectiveness and sustainability of home visit services. These technological advancements are consistent with health informatics theory, which emphasizes the role of accessible, accurate, and timely information in improving health outcomes and supporting the workflow of healthcare professionals in primary care settings (Young & Nesbitt, 2017).

5 Conclusion

The implementation of a digital-based Nursing Management System (NMS) at Puskesmas Majalaya has proven effective in improving the efficiency and quality of home visit services. This system significantly reduces documentation time, enhances the completeness of patient and family data, and increases patient adherence to scheduled visits through features such as automatic scheduling and SMS notifications. Additionally, the use of NMS has improved nurse satisfaction in performing administrative tasks and coordinating services. These results demonstrate that leveraging digital technology is an innovative and relevant solution to address the challenges of limited resources and the heavy workload faced by nurses in modern healthcare delivery. Moving forward, continuous development and training are highly recommended to enable wider and sustainable adoption of this system across various Puskesmas

6 Acknowledgment

We would like to express our sincere appreciation to the Head of Majalaya Baru Community Health Center (Puskesmas) for providing full support, facilitating field coordination, and assisting in the smooth implementation of this program from start to finish. Our gratitude also goes to the Rector of Universitas Aisyiyah Bandung, through the Institute for Research and Community Service (LPPM) of Universitas Aisyiyah Bandung, for their policy support, facilitation of permits, and the provision of funding, all of which were essential for the successful execution of this community service activity. The collaboration and synergy between educational institutions, research bodies, and the Puskesmas have been the key to the success of this program, ensuring that its benefits are directly felt by the community. We also extend our appreciation to all parties who have contributed, both directly and indirectly, to supporting the implementation and completion of this activity. We hope that the established cooperation will continue to advance and contribute to improving the quality of health services in the future.

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