SSRG International Journal of Electronics and Communication Engineering
ISSN: 2348-8549/ https://doi.org/10.14445/23488549/IJECE-V11I3P119

Volume 11 Issue 3, 209-219, March 2024

Original Article

Leveraging Electronic Health Records to Elevate Home Blood Pressure Monitoring Competence among Patients in Community Pharmacy

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Received: 18 January 2024 Revised: 20 February 2024 Accepted: 18 March 2024 Published: 31 March 2024

Abstract *- The high prevalence of hypertension has increased the use of Home Blood Pressure Monitoring (HBPM) for routine screening. However, it is unclear how well individuals measure their blood pressure according to recommended procedures. Physicians may hesitate to use this data clinically due to potential reporting errors. Electronic Health Records (EHRs) offer a possible solution to improve these barriers. They are now widely used in community pharmacies as a digital health solution. This study aims to identify factors influencing the accuracy of blood pressure readings and explore the potential of EHRs to enhance HBPM using the HOT-fit Framework. Questionnaires and a case study were conducted in a community pharmacy. Findings show the suboptimal quality of HBPM due to low awareness and knowledge among patients and healthcare professionals. Community pharmacists recognize EHRs as a valuable tool for improving HBPM. This research provides a foundation for integrating digital health interventions into healthcare management.*

Keywords *- Hypertension, Home Blood Pressure Monitoring, Community pharmacy, Community pharmacist, Electronic Health Records, HOT-fit Framework.*

1. Introduction

Hypertension, often known as high blood pressure, is a medical condition characterized by persistently elevated Systolic Blood Pressure (SBP) and Diastolic Blood Pressure (DBP) readings at or above 140/90 mmHg. In conjunction with other chronic diseases, such as diabetes mellitus and high cholesterol, they have collectively contributed to about 71% of the premature deaths recorded in Malaysia (NHMS, 2019). The increasing mortality rate among younger individuals due to complications related to hypertension poses a significant public health concern. Advocating for regular blood pressure monitoring, especially among those at risk of developing hypertension, is crucial for early detection and timely intervention.

Traditionally, physicians have heavily relied on Office Blood Pressure Monitoring (OBPM) as the primary method for diagnosing and managing hypertension in patients. However, it is widely recognized that OBPM is susceptible to measurement errors and observer bias, which can lead to inaccurate blood pressure readings (Parati et al., 2021). A well-known example of measurement error is the "white-coat effect," where blood pressure readings tend to be higher in a medical setting than in non-medical environments. Validating appropriate observer blood pressure measurement techniques in a clinical setting can be challenging due to the time constraints during rushed visits. (Hare et al., 2021).

Relying solely on OBPM may result in hypertension misdiagnosis, as it may not detect various hypertension types like masked hypertension and white coat hypertension. Masked hypertension occurs when a patient's blood pressure appears normal during OBPM but is elevated outside the medical setting. This often happens due to variations between Office Blood Pressure (OBP) readings and those taken outside the office. To avoid misdiagnosis, physicians should carefully interpret abnormal blood pressure readings during visits.

To enhance diagnostic accuracy, numerous international hypertension guidelines now advocate the use of out-of-office blood pressure monitoring techniques like Home Blood Pressure Monitoring (HBPM) and Ambulatory Blood Pressure Monitoring (ABPM) alongside OBPM to confirm hypertension diagnoses. (Nerenberg et al., 2018; Umemura et al., 2019; Unger et al., 2020; Whelton et al., 2018; Williams et al., 2018). ABPM and HBPM have a key advantage where

they allow more frequent blood pressure measurements in a person's daily environments, something not possible in a clinical setting where the "white-coat effect" is more like to occur. Moreover, they possess better predictive capabilities for Cardiovascular Disease (CVD) outcomes compared to OBP, thanks to their distinct blood pressure information characteristics.

Practically, when ABPM is either unavailable, poorly tolerated, or not easily accessible, HBPM is the preferred monitoring method. As HBPM is more cost-effective and readily obtainable compared to ABPM, often available over the counter in community pharmacies. Community pharmacists play a pivotal role in hypertension management, especially in advocating and facilitating HBPM. HBPM enables patients to measure their blood pressure in the comfort of their homes, minimizing the likelihood of the "white coat effect." This provides a better picture of a patient's overall blood pressure control.

Digital health, also known as e-health, presents a promising avenue for bolstering the prevention, management, and control of hypertension. A central component of e-health is Electronic Health Records (EHRs), which serve as a comprehensive digital repository of a patient's medical information that is accessible to healthcare providers. Community pharmacists can play a vital role in e-health through the provision of a wide range of services, including medication management, health screenings, and lifestyle education. Through the synergistic use of digital technologies and community-based resources, e-health holds the potential to streamline healthcare delivery and patient outcomes.

Despite the recognized importance of hypertension management, there exists a critical research gap that necessitates further exploration. While traditional Office Blood Pressure Monitoring (OBPM) has been the cornerstone for diagnosing and managing hypertension, its limitations, such as measurement errors and the "white-coat effect," have prompted the need for more effective diagnostic approaches. This research aims to address this gap by delving into alternative monitoring techniques and leveraging digital health solutions to enhance the accuracy and accessibility of hypertension management.

2. Related Work

In Kumar Devaraj et al. (2018) cross-sectional study, it was noted that many patients in Malaysia possessed automated electronic upper arm devices for HBPM. Surprisingly, most of them did not receive instructions from healthcare professionals on how to conduct blood pressure measurements properly. This absence of guidance may lead to measurement errors that patients might not be aware of while conducting HBPM. Poor HBPM knowledge and measuring skills could affect the reliability and accuracy of blood pressure readings.

Both Asayama et al. (2021) and Gulati et al. (2021) have stressed the significance of blood pressure measurement accuracy in diagnosing and managing hypertension. This is vital because inaccurate readings can lead to either overestimating or underestimating a patient's blood pressure, ultimately influencing the physician's inertia. Physician inertia refers to the reluctance to adjust drug therapy when patients have uncontrolled blood pressure. To ensure the accuracy and reliability of blood pressure measurements, healthcare professionals should provide comprehensive counseling and education on HBPM to patients.

Nonetheless, delivering comprehensive HBPM counseling and education in a clinical setting is seldom feasible due to limitations like time constraints, staffing shortages, and resource scarcity. To overcome these challenges, a collaborative approach involving allied healthcare professionals, such as community pharmacists, could offer a practical solution. Community pharmacists are well-suited to educate patients about the fundamentals of HBPM and its measurement techniques while providing continuous support to patients in their journey of hypertension management. Given that patients often visit community pharmacies to replenish their prescribed hypertension medications and acquire home blood pressure monitors over the counter.

Besides inadequate HBPM knowledge and measurement skills, the traditional method of manually recording HBPM readings in logbooks often results in errors, illegible entries, and incomplete information due to poor handwriting and misreporting (Parati et al., 2021). As a result, physicians often hesitate to rely on these manual logbooks to guide their clinical decisions due to concerns regarding data accuracy. To address this concern, integrating EHRs with HBPM has emerged as a potential solution to enhance doctors' confidence (Liyanage-Don et al. 2019).

Thanks to advancements in Information and Communication Technology (ICT), blood pressure readings can now be transmitted and recorded online. Community pharmacists can actively participate in this ecosystem by establishing a Health Information System (HIS) using EHRs and mobile applications, which can allow them to provide more holistic patient care digitally.

EHRs are digital systems that store an individual's health information electronically, facilitating easy access and analysis of health patterns over time and supporting healthcare professionals in making well-informed decisions regarding patient care and treatment. These EHRs can be utilized in the context of HBPM, allowing patients to take blood pressure measurements at their convenience and digitally upload the data using mobile applications. Community pharmacists can subsequently engage in remote monitoring of patient's blood pressure data, enhancing the efficiency of care provision.

Furthermore, mobile health applications are valuable tools for educating patients about hypertension and the correct methods for HBPM. These applications offer convenient access to educational resources and guidance, aiding patients in understanding the significance of HBPM and the recommended measurement procedures. Patients with a good understanding are more inclined to adopt EHRs for monitoring and recording their blood pressure readings.

Recognizing the value of digital tools like EHRs in managing their health would significantly influence their readiness to embrace this technological advancement. This has the potential to enhance patient adherence to their treatment regimen and encourage them to play an active role in overseeing their health condition.

To date, there has been no assessment conducted to appraise the performance of an HIS implemented in community pharmacy settings. Most assessments of HIS within the healthcare sector have primarily centered on clinical or hospital settings (Hapsari et al., 2021). We have proposed to use the Human, Organization, and Technology-fit (HOT-fit) framework developed by Yusof et al. (2008) to address this gap.

This framework represents an expansion of two prominent models: the Information Systems (IS) Success Model and the IT-Organization Fit Model. Its utility lies in its capacity to assess the effectiveness of HIS implementation within healthcare contexts by considering the alignment of three key dimensions: human, organizational, and technological factors. Unlike frameworks that concentrate on singular aspects, this comprehensive approach ensures that the technological solution aligns not only with the organizational structure but also with the capabilities and needs of human users. Hence, this framework provides valuable insights, highlighting areas for potential improvements across various dimensions, ultimately promoting a successful HIS implementation.

While existing studies by Kumar Devaraj et al. (2018), Asayama et al. (2021), and Gulati et al. (2021) have shed light on the importance of blood pressure measurement accuracy and the role of community pharmacists, there remain gaps in our understanding. These studies highlight the challenges faced in delivering comprehensive counseling and education on Home Blood Pressure Monitoring (HBPM) within clinical settings. However, a thorough investigation into the collaborative approaches involving allied healthcare professionals, particularly community pharmacists, and the evaluation of Health Information Systems (HIS) in community pharmacy settings is yet to be explored.

Recognizing these gaps, this study seeks to show the important role of community pharmacists in improving the current problem of inadequate knowledge and measurement skills among patients with the integration of electronic health records.

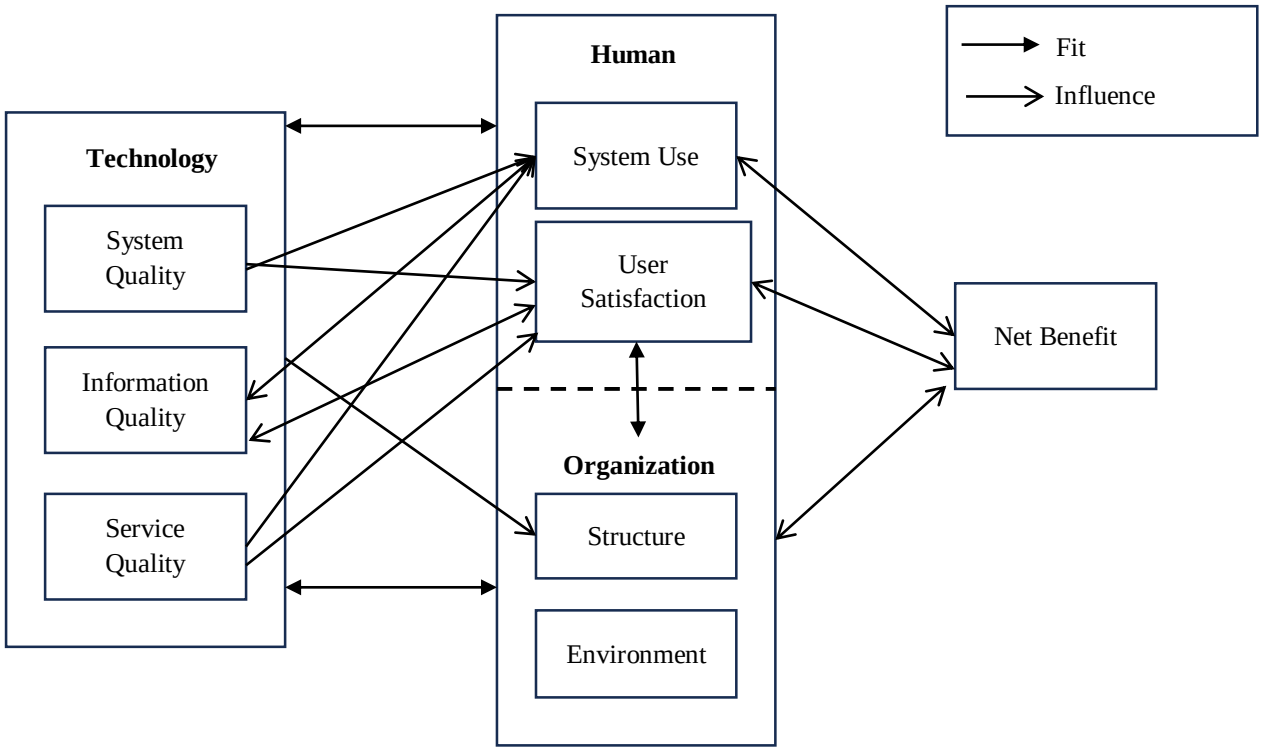

Fig. 1 Proposed HOT-fit framework

3. Research Objectives

Three research objectives guide this study:

- Objective 1: To determine the factors influencing patients' awareness to adopt EHRs for HBPM.
- Objective 2: To evaluate the effectiveness of EHRs in enhancing HBPM in community pharmacies using the HOT-fit Framework.
- Objective 3: To assess the utilization rate of EHRs in community pharmacies for HBPM.

4. Research Methodology

The research methodology for this study employs a blend of quantitative and observational approaches. Initially, the study aim to evaluate patients' understanding and proficiency in HBPM, particularly those who conduct blood pressure measurements at home. The intention is to assess their familiarity with recommended HBPM best practices and identify potential errors made unintentionally.

To achieve this, a questionnaire will be administered to customers visiting various Caring Pharmacy locations in Cheras and Kuala Lumpur. The questions in the first questionnaire are based on a multicentric survey by Flacco et al. (2015), designed to assess adherence to HBPM recommendations according to the 2008 Italian hypertension guideline.

These questions will be further refined by referring to an updated HBPM procedures guide from the AHA Scientific Statement titled "Measurement of Blood Pressure in Humans," commonly used for patient training (Muntner et al. 2019). Additionally, the study will also conduct a practical demonstration to observe and assess patients' competence in accurately performing blood pressure measurements at home.

In the second phase, this study will conduct a case study to evaluate a specific HIS implemented at Caring Pharmacy. The evaluation will employ the HOT-fit framework to identify and elaborate on the factors influencing the adoption of the HIS by community pharmacists, particularly in the context of enhancing HBPM. This framework is valuable for gaining insights into the critical components contributing to the successful implementation and utilization of the HIS within community pharmacy settings.

The second questionnaire is designed based on evaluation measures outlined in studies by Iyzati et al. (2022) and Syahidul Haq et al. (2022), which have previously utilized the HOT-fit framework to evaluate information systems across various sectors. The questionnaire will cover three main domains: Human, Technology, and Net Benefits. Each domain will be further subdivided into specific sub-domains, and the questions will be structured in alignment with the respective evaluation measures. Upon completion and collection of the questionnaires from the respondents and participants, the data will be organized using Microsoft Excel.

Descriptive analysis will be conducted utilizing Excel formulas to compute fundamental parameters including frequency, percentage, mean, and Standard Deviation (SD) from the collected data. Subsequently, for further statistical analysis, IBM SPSS Statistics Version 29.0.1.0 (171) will be used to perform relevant analyses based on the responses gathered from the questionnaires.

4.1. Participants

The study conducts participant recruitment for both phases of the research study of a retail community pharmacy chain with multiple outlets across Malaysia. In the first phase, a random selection method is employed to identify customers visiting the pharmacy for various reasons, such as medication refills, blood pressure checks, or general shopping. These customers are approached and inquired whether they practice regular HBPM at home. The participants may include individuals both with and without hypertension.

Patients diagnosed with hypertension are often required to monitor their blood pressure regularly to ensure its control and assess the effectiveness of their medications. Similarly, individuals without hypertension may engage in regular blood pressure measurements as part of their health-conscious lifestyle to gain better insight into their cardiovascular health and risk for heart disease and stroke. The goal is to recruit a minimum of 40 participants for the first phase, as this sample size is considered suitable for generating meaningful results in usability studies (Raluca Budiu & Kate Moran, 2021).

For the second phase, the focus is on recruiting employees of the pharmacy, specifically, community pharmacists who are at the forefront of patient care. They will be the primary subjects of investigation as they were early adopters of an HIS that has been implemented in Caring Pharmacy and received training during its initial implementation phase.

The HIS has now become an integral part of the community pharmacists' daily routine, assisting them with various tasks through its comprehensive features. By involving these pharmacists, the aim is to gain insights into their experiences, perspectives, and perceptions of the HIS in the context of enhancing HBPM practices. The existing HIS implemented at Caring Pharmacy will be discussed in detail in the Case Study section.

4.2. Data Collection

Two separate sets of questionnaires will be utilized in both phases of the research study to gather the necessary data for analysis and interpretation. The initial set of questions for the first questionnaire is adapted from a multicentric survey conducted by Flacco et al. (2015). This survey aimed to assess the level of adherence to HBPM recommendations based on

the 2008 Italian hypertension guidelines for HBPM. These questions are then further modified by referencing an updated HBPM procedures guide, which serves as a resource for patient training by healthcare professionals. The AHA Scientific Statement titled "Measurement of Blood Pressure in Humans" provides a comprehensive overview of HBPM procedures used for patient training (Muntner et al. 2019). Consequently, the adopted questionnaire is refined to consist of three main parts.

Part 1 comprises 7 questions that capture participant demographics. Part 2 consists of 13 questions, including a mixture of binary, multiple-choice, and Likert scale responses, to assess general knowledge of HBPM. Lastly, Part 3 involves an observational study where participants will be requested to perform their routine HBPM procedures. Any noteworthy observations during the demonstrations will be recorded in the comments section for discussion.

4.3. Data Analysis

Once the questionnaires are completed and collected from the respondents and participants, the data will be entered and organized in Microsoft Excel. Descriptive analysis will be performed using Excel formulas to calculate key parameters such as frequency, percentage, mean, and Standard Deviation (SD) of the data.

The results will be presented in tables and charts to visually depict trends and facilitate a better understanding of the data. Noteworthy findings will be carefully noted and discussed in the Results and Discussion section.

For further statistical analysis, IBM SPSS Statistics Version 29.0.1.0 (171) will be utilized to conduct relevant analyses based on the collected questionnaire responses. This may include conducting reliability tests to assess the internal consistency of the questions and using the Pearson correlation coefficient to explore any significant relationships between variables. Any interesting observations or feedback received from the questionnaires will also be discussed to provide additional insights into the results obtained from the data analysis.

4.3.1. Case Study of Patient Medication Record (PMR) System

The main HIS implemented in Caring Pharmacy is the Patient Medication Record (PMR) System, which was introduced in July 2019. Community pharmacists primarily utilize this EHRs system to document patients' existing medications, oversee their compliance with prescribed treatments, and track any allergies. It also includes additional features like medication alarms and reminders that can be customized to enhance patients' treatment adherence, but these features are not the focus of this study.

Within the PMR System, there exists a Health Summary feature that is not being used as frequently compared to the aforementioned features. This feature permits both community pharmacists and patients to input and update health-related metrics such as blood pressure readings at their convenience following measurements.

All the data collected will be securely stored in the cloud, facilitating easy access and retrieval by community pharmacists for reviewing purposes. Conventionally, blood pressure readings obtained from in-pharmacy measurements or HBPM are often manually documented in logbooks or on paper. However, given the availability of the PMR System, it is important to evaluate community pharmacists' perceptions and utilization of the EHRs system in the context of monitoring and recording patients' blood pressure.

The main focus of this study is to assess the performance of the PMR System in the context of recording, monitoring, and sharing health records, specifically blood pressure data, in enhancing HBPM for hypertension management. The HOT-fit framework will be employed to evaluate the PMR System's effectiveness by examining the alignment between human and technological factors.

The study will center on the community pharmacists at Caring Pharmacy, who serves as the main users of the PMR System and have undergone training for its utilization. Therefore, the organizational factor will not be considered in this evaluation as these users were not engaged in higher-level organizational decision-making processes during the planning and development stages of the information system.

5. Results

Table 1 shows the source which the respondents commonly got their instructions for HBPM from. 75% of respondents stated that they had received instructions before through various means like physical demonstration, written materials, or verbal explanations.

In contrast, the remaining 25% of participants stated they had not received prior guidance but relied on the instruction manual that came with their blood pressure monitors for guidance. This implies that some respondents may have obtained their HBPM devices from sources other than community pharmacies, the typical channel for such devices.

When it comes to the instruction providers, around 52.50% of respondents mentioned that community pharmacists provided them with HBPM guidance, 12.50% of respondents cited doctors, and the remaining respondents sought advice from families or friends. This highlights the crucial role of community pharmacists as the primary source of support for individuals interested in purchasing HBPM devices and understanding how to use them effectively. Consequently, community pharmacists can make a significant contribution to promoting the adoption and awareness of HBPM.

Table 1. Source of guidance

Respondents	Total (n = 40)	Percentage (%)
Receive Guidance Before		
No	10	25
Yes	30	75
Provider of Instructions		
Friends	1	2.50
Families	3	7.50
Doctor	5	12.50
Instruction Manual	10	25
Community Pharmacist	21	52.50

Figure 1 shows the respondents' routines and preparations regarding the adherence to HBPM best practices. A notable observation is that most respondents exhibit a consistent approach by measuring their blood pressure on the same arm, demonstrating their awareness of consistency to ensure accurate readings.

Additionally, a substantial 73% of respondents are aware of the importance of avoiding factors that can influence blood pressure readings, such as exercising, smoking, or consuming caffeine and alcohol, before conducting blood pressure measurements. However, some areas need improvement. Notably, 65% of respondents do not maintain a consistent schedule for blood pressure measurements, potentially affecting the accuracy and reliability of the readings. Approximately 33% of respondents do not take breaks between consecutive measurements, possibly due to the relatively low number of daily measurements. Surprisingly, around 51% of respondents do not void their bladder before measuring their blood pressure. This indicates that half of the respondents underestimated the significance of being in a relaxed state during measurements, as a full bladder could conceivably influence blood pressure results.

Lastly, an important observation is that around 55% of respondents do not keep a record of their blood pressure readings or share this information with healthcare professionals for periodic evaluation.

Maintaining such records and sharing them with healthcare professionals is essential for tracking how well the prescribed treatment is working and monitoring one's hypertension control. These findings highlight the necessity for a continuous effort to educate and enhance people's awareness of HBPM best practices.

Figure 2 presents the results of an observational study assessing the technical skills of respondents in terms of cuff placement and body positioning during HBPM. Several insights can be derived from the data. Firstly, it is commendable that all respondents successfully selected cuffs that comfortably fit their arms, avoiding issues associated with overly tight or loose cuffs that could affect the accuracy of blood pressure readings.

However, around 20% of respondents positioned the cuff over their clothing rather than directly on their bare arms. This phenomenon is quite common among respondents, likely due to challenges posed by their attire, which restricts them from rolling up their sleeves to enable direct cuff placement on their bare arms.

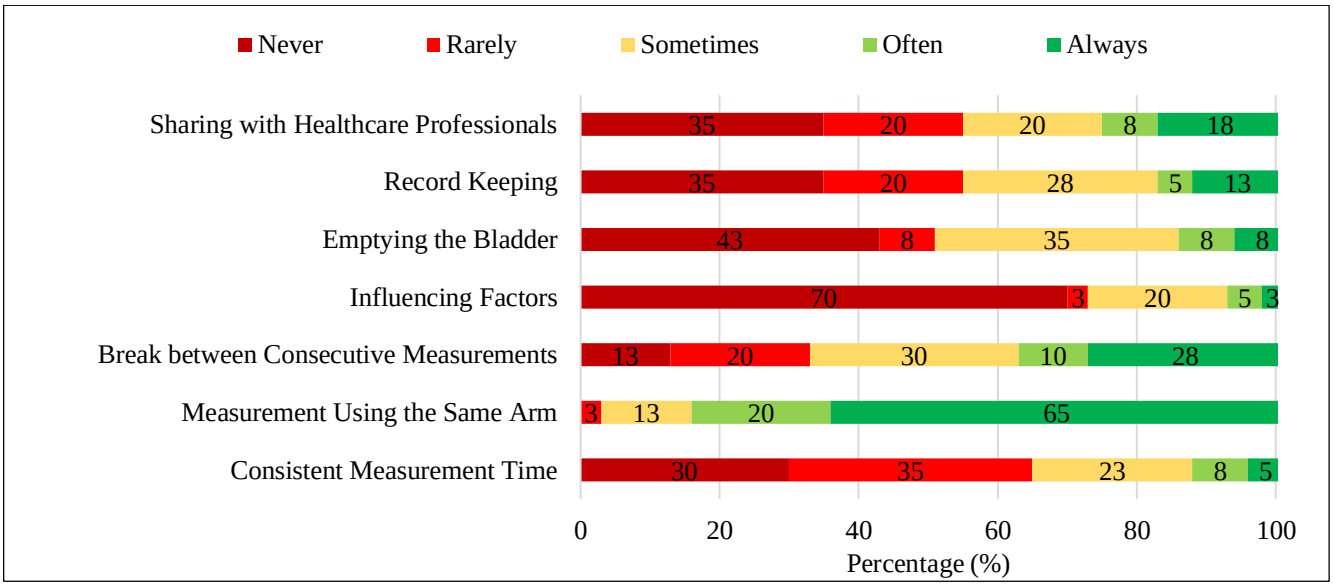

Fig. 2 Best practices for HBPM

For cuff placement, the most common mistake made by 33% of respondents is not tightening the cuff adequately. They tend to wrap it hastily without ensuring a snug fit, often resulting in loose or poorly attached cuffs. Furthermore, some respondents began measurements without verifying the cuff's correct alignment or making necessary adjustments, potentially resulting in less accurate blood pressure readings. Additionally, around 13% of respondents made a minor mistake by placing the cuff slightly below the elbow instead of over the upper arm where the pulse is strongest.

For body positioning, the most common mistake made was the absence of back support. Around 40% of respondents did not lean their backs against the chair while measuring their blood pressure. 13% of respondents did not maintain both feet flat on the ground and instead crossed their legs. Another noteworthy finding is that 23% of respondents did not maintain silence during the measurement, often engaging in conversations on the phone or with companions.

On a positive note, only 8% of respondents showed a lack of awareness regarding the importance of adequately supporting their arm during measurements. However, roughly 23% of respondents did not position their arms at heart level, suggesting a potential lack of awareness regarding proper arm placement. These observations related to cuff placement and body positioning have the potential to affect the accuracy of blood pressure readings. Overall, respondents displayed better technical skills in conducting measurements than their general knowledge of best practices for HBPM.

Table 2 displays the overall performance scores of the PMR System across three key domains: Technology, Human, and Net Benefit. These performance scores are classified into three levels: low, neutral, and high by dividing the range between the lowest and highest possible mean scores by three, establishing an interval range of 1.33 (Low = 1.00-2.33, Neutral = 2.34-3.67, High = 3.68-5.00).

From the table, it is evident that most of the sub-domains have attained a high-performance score of greater than 3.68, signifying their effectiveness in achieving the overall anticipated advantages from the utilization of the PMR System. However, the User Satisfaction aspect attained a neutral performance score of 3.63 ± 1.09. This implies that a portion of the participants expressed lower satisfaction with the PMR System, even though it managed to achieve the overall net benefits. These findings suggest a need for further investigation to enhance the User Satisfaction aspect within the PMR System.

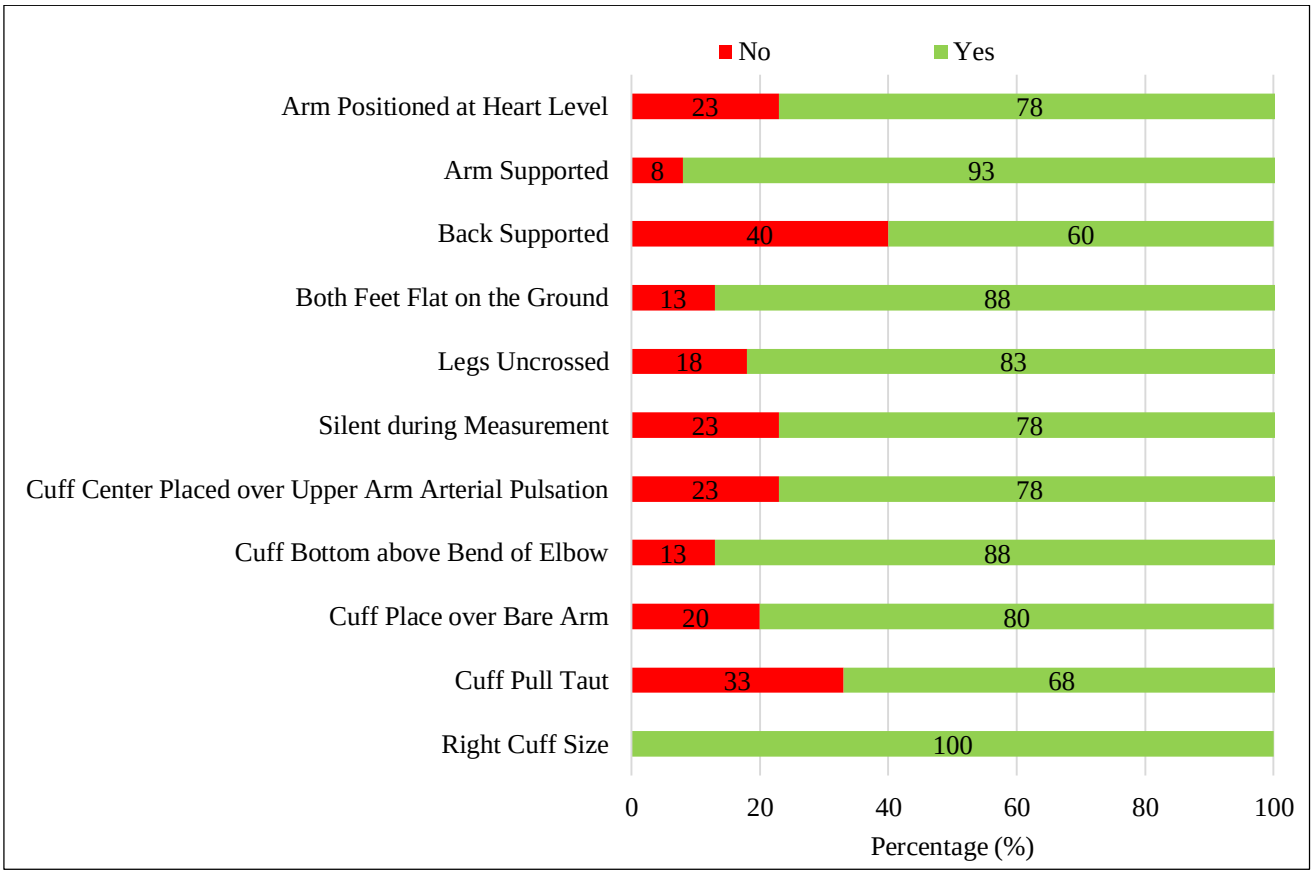

Fig. 3 HBPM technical skills

Table 2. PMR system domain mean performance scores

Domain	Mean ± SD
Technology	
Service Quality	3.85 ± 0.91
System Quality	4.29 ± 0.75
Information Quality	4.35 ± 0.76
Human	
User Satisfaction	3.63 ± 1.09
System Use	3.74 ± 0.85
Net Benefit	4.23 ± 0.86

Considering the previously noted neutral User Satisfaction performance score, further investigation is conducted to pinpoint the specific sub-domain contributing to this result. Table 3 presents the questions within the User Satisfaction aspect that fall within the neutral performance score classification (ranging from 2.34 to 3.67).

Participants expressed disagreement with certain aspects of the PMR System, indicating areas of concern. Specifically, they were skeptical about the PMR System's ability to reduce their daily workloads (3.00 ± 1.15) and enhance their work productivity (3.31 ± 1.25). Additionally, participants did not find using the PMR System for recording (3.54 ± 1.20) and monitoring patients' blood pressure data (3.38 ± 1.19) enjoyable.

Upon reviewing other questions within the Technology and Human domains, several potential factors have been identified that contribute to these dissatisfactions and suggest areas for improvement.

These areas primarily pertain to the System Quality and System Use of the PMR System. Regarding System Quality, it is evident that the PMR System encounters occasional operational issues, as indicated by a performance score of 3.38 ± 1.19.

These issues may manifest as noticeable lags, which have the potential to affect User Satisfaction adversely. These lags might be attributed to suboptimal or outdated hardware, impeding the system's overall performance and responsiveness. Making it potentially challenging to keep up with regular system updates.

Moreover, these delays can inconvenience users when utilizing the PMR System for tasks such as recording and monitoring patient blood pressure data (3.31 ± 0.85) and sharing health records with other healthcare professionals (3.38 ± 0.87).

Table 3. Sub-domain impacting user satisfaction

Sub-Domain	Mean ± SD
System Quality	
Functions seamlessly without noticeable delays	3.38 ± 1.19
System Use	
Digitally record patient blood pressure	3.31 ± 0.85
Track patient blood pressure management	3.31 ± 0.85
Share health records with healthcare providers	3.38 ± 0.87
User Satisfaction	
Reduce daily workloads	3.00 ± 1.15
Improve productivity at work	3.31 ± 1.25
Liked using the PMR System for monitoring blood pressure readings	3.38 ± 1.19
Liked using the PMR System for recording blood pressure readings	3.54 1.20

6. Discussion

The research is centered around assessing individuals' proficiency in accurately measuring their blood pressure at home, regardless of whether they have hypertension or not. Given the high prevalence of hypertension, HBPM has become increasingly important. To investigate this, a survey was administered to customers visiting community pharmacies, aiming to measure their familiarity with HBPM best practices and their proficiency in measurement techniques. The results highlighted a significant lack of awareness and adherence among customers when it comes to recommended HBPM routines. Many reported irregular measurement schedules, which can affect the reliability of blood pressure control assessment.

Regarding measurement skills, the three most common errors identified were inadequate back support during measurement, improper cuff tightening, and incorrect cuff placement on the upper arm where the pulse is strongest. All these errors can compromise the accuracy of blood pressure readings. These findings emphasize the need for better counseling and education to improve the quality of HBPM. Additionally, raising awareness about the benefits of utilizing EHRs tools can motivate individuals to adopt these technologies for more efficient health management. When individuals are confident in measuring their blood pressure, they tend to find digital tools like EHRs valuable for storing and managing their health data effectively.

Besides the challenges stemming from limited knowledge and measuring skills in HBPM, the traditional manual recording methods may also introduce inaccuracies, potentially compromising the reliability of blood pressure readings. To address this challenge, the integration of digital health solutions, like EHRs, presents an opportunity to mitigate errors and enhance confidence among healthcare providers in utilizing the blood pressure data recorded. To assess the impact of EHRs on improving HBPM, a case study is conducted within Caring Pharmacy, an establishment utilizing the PMR System as its EHRs platform for digital health record-keeping, including blood pressure readings.

The community pharmacists are engaged as the main users of this system to gain insights into how the PMR System contributes to enhancing HBPM using the HOT-fit framework. Based on this framework, achieving the desired net benefits will depend on how well the alignment between technology and human factors in the PMR System is. While the PMR System generally performs satisfactorily, several minor issues are identified related to system quality, including operational delays, a less user-friendly interface, and a cumbersome registration process. These issues could potentially impede user adoption and limit its usage for blood pressure recording. Furthermore, the successful adoption of the PMR System relies on its seamless integration into the daily workflow of community pharmacists.

This method of incorporating digital health solutions, including the utilization of EHRs like the PMR System, shows a substantial advancement above previous research on HBPM and traditional manual recording methods. Few studies have examined the precise deployment of digital tools in community pharmacies and their effect on HBPM, despite the fact that prior research has emphasized the significance of these technologies in enhancing healthcare management. By conducting a thorough case study in a real-world environment, our work closes this gap. It offers insightful information about the opportunities and constraints of implementing EHRs for blood pressure recording. This approach's applicability and relevance to modern healthcare procedures are among its strong points. We address the need for workable solutions to improve HBPM by concentrating on community pharmacies, which are accessible healthcare providers for a large number of people.

Furthermore, by applying the HOT-fit methodology, we are able to assess the alignment of technology and human aspects in an organized manner, which will be helpful in guiding future deployments. Our method's discovery of small problems with the PMR System, like operational lags and a less intuitive interface, is a significant flaw. Although these problems do not negate EHRs' overall ability to enhance HBPM, they do emphasize how crucial it is for technology development to improve and incorporate user feedback continuously.

This research adds to the body of knowledge on digital health solutions in the context of HBPM and offers useful tools for improving healthcare delivery in neighborhood pharmacies. Our study educates healthcare professionals and policymakers about the potential advantages and difficulties of integrating EHRs, as well as the opportunity for improving blood pressure control practices. These results also highlight the significance of taking human elements into account in addition to technology capabilities when designing and implementing digital health solutions, opening the door to more efficient and user-centered healthcare interventions.

7. Conclusion

In summary, our findings highlight two potential factors contributing to the suboptimal quality of HBPM. Firstly, there is a deficiency in adequate HBPM knowledge and measuring skills, both among patients and healthcare professionals, leading to errors in HBPM. This emphasizes the need for continuous education and training to enhance HBPM proficiency for both patients and healthcare professionals. Secondly, the absence of a specific local HBPM guideline has made it challenging to establish consistent HBPM best practices among healthcare professionals when instructing patients.

Given that healthcare professionals play a pivotal role in educating patients, this gap may ultimately affect patients' competence in HBPM. As a solution, we suggest conducting further research on HBPM in our local context to create a comprehensive guideline that can be easily shared with the public and healthcare professionals.

Establishing a strong foundation of understanding and measuring skills in HBPM creates a conducive environment wherein individuals can appreciate the advantages of using EHRs to track and record their blood pressure measurements. This understanding would increase the likelihood of individuals embracing EHRs as a valuable tool in managing their health journey. The incorporation of EHRs has displayed significant promise in improving HBPM practices within community pharmacy settings. It facilitates better

communication between healthcare professionals and patients, which in turn helps in monitoring and managing hypertension more effectively. Moreover, underlining the importance of seamlessly integrating technological solutions into users' daily routines is critical.

Regardless of a system's effectiveness, if it does not align well with users' existing workflows, it is less likely to be embraced and utilized. This emphasizes the need for technology to complement and enhance established routines to ensure optimal uptake and utilization. By effectively embracing digital tools, the potential to provide an extensive array of digital health services expands significantly.

This strategic utilization of digital solutions can empower community pharmacists to elevate their current healthcare offerings and introduce innovative approaches that go beyond conventional practices. This study offers practical suggestions for enhancing HBPM procedures in addition to illuminating the difficulties and possibilities related to EHR integration in community pharmacies. We set the path for future research efforts targeted at creating thorough recommendations appropriate to our local environment by identifying the gaps in HBPM knowledge and assessing skills as well as the lack of particular local standards. In addition, our results highlight the significance of ongoing education and training for patients and healthcare providers in order to improve HBPM competency and encourage the uptake of digital health solutions.

Acknowledgement

The research is funded by an FTM1 research grant and conducted under the Research Centre for Software Technology and Management (SOFTAM), www.ftsm.ukm.my/softam, Faculty of Information Science and Technology.

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