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Home Medication Review among Patients with Chronic Diseases in Rural Villages of Pahang, Malaysia: A Case Report

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Abstract

Introduction: Home Medication Review (HMR) is crucial for optimising medication use and improving patient's outcomes. Despite its potential benefits, HMR implementation in rural areas faces challenges. This study evaluates the impact of HMR programs on patients with chronic diseases in a rural setting, addressing challenges and proposing strategies for improvement. **Case Presentations:** This case report presents two cases involving patients with chronic diseases residing in a rural area of Pahang, Malaysia, who participated in pharmacist-led HMR visits. The first case describes a 62-year-old single Malay female with multiple chronic conditions, including Type 2 diabetes mellitus (T2DM), hypertension, dyslipidemia, and bronchial asthma, managed with eight prescribed medications. The second case involves a 34-year-old married Malay female diagnosed with hypertension and T2DM, receiving nine prescribed medications. Both patients underwent a follow-up HMR visit six months after the initial consultation. During each visit, assessments included blood pressure (BP), pulse rate (PR), and blood glucose tests. HMR activities encompassed medication reconciliation, review, patient interviews, evaluation of medication knowledge and adherence, inspection of medication storage, and patient counseling. Identified drug-related problems (DRPs) were addressed through appropriate interventions. **Results:** The study reveals improved patient understanding post-HMR and emphasising the role of pharmacists in addressing medication-related issues. Challenges like non-adherence, uncontrolled disease conditions, and incorrect insulin storage persist. The discussion explores these challenges, citing the need for patient education, regular follow-ups, multidisciplinary collaboration, and technology integration to enhance patient outcomes. **Summary:** These cases underscore the challenges of managing chronic diseases in resource-limited rural settings and highlight the critical role of pharmacist-led HMR in optimizing medication use and improving patient outcomes. The findings highlight the importance of regular follow-up, tailored interventions to address drug-related problems, and collaborative care approaches. They also advocate for integrating technology, enhancing patient education, and addressing social determinants to improve medication understanding and overall health outcomes in underserved populations.

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Introduction

Home Medication Review (HMR) is a patient-centered approach involving collaboration among clinicians, pharmacists, and patients to optimize the quality use of medicines, improve patients' understanding of their medications, and enhance health outcomes by ensuring continuity of care in community settings (Gudi *et al*., 2019). The primary aim of the HMR program is to reduce drug-related problems (DRPs) resulting from improper medication use, thereby improving patients' compliance with their prescribed regimens (Dhillon *et al.,* 2015). One significant advantage of the HMR model is that assessments occur in the patient's home environment, allowing for a comprehensive evaluation of how medications are managed. While HMR consultations typically occur at home, patients may choose alternate locations based on their preferences, cultural beliefs, and socioeconomic circumstances (Patounas *et al.,* 2021).

The delivery of HMR services in Malaysia is currently limited to public hospitals and health clinics (Sundus *et al.,* 2022; 2024). Appointments for HMR are typically conducted at these facilities; however, the availability of trained staff and resources restricts the frequency of geriatric HMR services to a maximum of one visit per week or four visits per month. HMR services are often provided as a one-time intervention without follow-up visits, with urgent clinic appointments arranged only in cases of emergencies. The lack of dedicated personnel further limits the expansion of HMR services and the provision of consistent follow-up care (Sundus *et al.,* 2024). Moreover, significant disparities exist in the delivery of HMR services, particularly in rural areas, due to insufficient resources and infrastructure (Rahman *et al.,* 2020).

In the current study, HMR was initiated during a community engagement program in rural villages in Pahang by a multidisciplinary team comprising pharmacists, nurses, doctors, and non-medical volunteers under a university flagship initiative. Follow-up HMR visits were integrated into a university core course. The objectives of this program were to reconcile and review patients' medication regimens, assess medication adherence, identify pharmaceutical care issues, and provide education to patients and caregivers on disease management and proper medication storage.

This case report highlights the experiences of patients with chronic diseases who participated in the HMR program and examines the impact of HMR on their understanding, medication management, and adherence. The manuscript aims to provide insights into the potential benefits of HMR services in rural areas, the challenges encountered in their implementation, and their role in improving medication management and health outcomes in community settings. The following cases illustrate key findings from the HMR services provided.

Case Presentation

Case 1

History

A 62-year-old Malay female with multiple chronic conditions, including type 2 diabetes mellitus (T2DM), hypertension, dyslipidemia, and bronchial asthma, participated in an HMR program. The patient was single and lived with her mother. The initial HMR visit was conducted at the patient's home by a multidisciplinary team comprising pharmacists, nurses, doctors, and non-medical volunteers. Functional assessments revealed normal vision, hearing, speech, swallowing, cognition, insight, mobility, and no issues with language or literacy. She did not utilize dose administration aids (e.g., pillboxes or alarms) or monitoring devices such as blood pressure and blood glucose monitors.

The patient's prescribed medications included subcutaneous Insulatard 20U ON, metformin 500 mg (2 tablets BD), gliclazide 80 mg (2 tablets BD), perindopril 4 mg (2 tablets OD), amlodipine 10 mg (1 tablet OD), atorvastatin 20 mg (½ tablet ON), Flixotide Evohaler 125 mcg (2 puffs BD), and salbutamol MDI (2 puffs PRN). Health screenings revealed elevated blood pressure (184/101 mmHg) and pulse rate (119 bpm), while random blood glucose (RBG) was 5.6 mmol/L. Her HbA1C from medical records indicated suboptimal glycemic control (7.2%). Although she reported no alarming symptoms related to her elevated blood pressure or heart rate, she exhibited mild shortness of breath, likely attributed to asthma, and denied experiencing medication-related side effects.

Six months later, a follow-up HMR visit was conducted under a university program involving healthcare professionals and students from International Islamic University Malaysia (IIUM) Kuantan. The patient's prescribed medications remained unchanged, but clinical parameters showed persistent poor control. Her blood pressure

(189/113 mmHg) and pulse rate (104 bpm) remained elevated, while RBG increased to 8.4 mmol/L. Additionally, the patient reported a persistent cough.

Intervention and Outcome

During the initial HMR visit, the healthcare team conducted medication reconciliation, reviewed prescribed medications (name, dosage, frequency, and administration route), and assessed for allergies and adverse reactions. The patient's technique for administering medications, including the use of inhalers, was evaluated, and proper techniques were reinforced. The team also examined medication storage practices, including insulin storage, and assessed the patient's understanding of medication use using the Drug's Dose, Frequency, Indication, and Time (DFIT) assessment. The patient scored 100% on the DFIT assessment, indicating good knowledge and competence in self-administering her medications. However, her blood pressure remained uncontrolled (184/101 mmHg), and she reported that her Flixotide Evohaler and salbutamol MDI were ineffective despite correct usage. During the HMR visit, the patients were requested to show how the MDI and Evohaler were used. Any incorrect technique was properly corrected and informed to the patient. We communicated and presented the issue to the doctor for further action.

During the follow-up visit, the patient's medications were reviewed. Flixotide Evohaler was replaced with MDI Fluticasone (2 puffs BD), and atorvastatin 20 mg (½ tablet ON) was switched to simvastatin 20 mg (1 tablet ON). Although the patient retained good knowledge of her medications (100% DFIT score), issues with insulin injection technique and improper insulin storage persisted. The pharmacist provided counseling on proper insulin injection techniques and emphasized correct storage practices. This includes guidance on storing the unopened insulin inside the refrigerator without freezing it, keeping an open insulin pen with a cartridge at room temperature for four to six weeks after the first use (Richter *et al.*, 2023), and emphasising the importance of regularly checking expiration dates. The patient was advised to store other medications in a dry place away from direct sunlight, heat, and humidity.

Additionally, the patient's uncontrolled blood pressure (189/113 mmHg) and persistent cough were discussed with the doctor, who suspected the cough might be a side effect of perindopril. According to Brugts *et al.*, (2014), ACE inhibitors may induce a dry, irritating cough in 4% to 35% of individuals. This cough can commence at any point during ACE inhibitor treatment, either after the initial dose or over several weeks or months. The cough is attributed to the accumulation of bradykinin and substance P in the lungs, causing constriction of smooth muscle and subsequent coughing (Yilmaz, 2019). Factors that potentially elevate the risk include older age, female gender, non-smoking status, and conditions like asthma or chronic obstructive pulmonary disease (COPD) leading to airway hyperreactivity (Nasser *et al.*, 2018). Hence, the concern was noted in the patient's record for the doctor's attention. Educational interventions on asthma and diabetes management were also provided.

Case 1

History

A 34-year-old Malay female living in a rural village in Pahang was included in the HMR program. She lived with her family, was married, and had a history of hypertension and T2DM. Functional assessments indicated that she was independent in activities of daily living (ADL). The patient did not use dose administration aids or home monitoring devices. Her prescribed medications included subcutaneous insulin (Insugen), perindopril 4 mg (2 tablets OD), amlodipine 10 mg (1 tablet OD), bisoprolol (1 tablet OD), hydrochlorothiazide 50 mg (1 tablet OD), metformin 500 mg (2 tablets OD), vildagliptin 50 mg (1 tablet BD), and gliclazide 80 mg (2 tablets BD). During the initial visit, her blood pressure (161/116 mmHg), pulse rate (134 bpm), and RBG (10.5 mmol/L) were elevated. She did not complain any side effects of her prescribed medications.

During the follow-up visit, gliclazide MR 30 mg was newly prescribed. Despite counseling, her clinical parameters remained poorly controlled, with blood pressure at 153/120 mmHg and RBG at 10.5 mmol/L.

Intervention and Outcome

Medication reconciliation, DFIT assessment, and evaluation of medication administration and storage were conducted. The patient scored 95% on the DFIT assessment during the initial visit. It was

found that the patient stored the unopened insulin at room temperature and did not keep it at a cool temperature due to the broken refrigerator. Hence, the improper insulin storage due to a broken refrigerator was addressed by coordinating with health clinic personnel to supply smaller insulin quantities.

Duplication of therapy with gliclazide 80 mg and gliclazide MR 30 mg was identified, and the patient was educated on the risks of overdose, with the discontinued medication retrieved for disposal. Sulfonylurea (gliclazide) overdose might cause severe hypoglycaemia, which may necessitate urgent intravenous glucose administration and close monitoring (Megarbene *et al.,* 2022). Symptoms of hypoglycaemia, such as sweating, shakiness, increased hunger, nervousness, fatigue, and loss of consciousness, were explained to the patient. Unfortunately, her RBG was 10.7 mmol/L indicating that a home blood glucose monitoring device was deemed necessary to enable regular monitoring of her RBG levels.

Despite counselling and educational efforts, the patient's adherence to medications remained poor, as indicated by unused medications, including insulin.

During the follow-up visit, the patient's knowledge of her medications improved to 100% on the DFIT assessment. However, issues with insulin storage and medication non-adherence persisted, contributing to uncontrolled clinical parameters. The pharmacist referred the patient to a doctor for further evaluation and management.

Discussion

This study demonstrated that patients exhibited improved understanding of medication use following HMR visits, as evidenced by the DFIT assessment score. This finding highlights the positive impact of pharmacist-led HMR programs on enhancing patients' comprehension of their treatment regimens. Proper understanding and adherence to prescribed medications are critical for effective disease management (Saqib *et al.,* 2018). Insufficient knowledge about medications can hinder adherence, potentially compromising therapeutic outcomes (Tan *et al.,* 2019). During HMR visits, pharmacists provided essential information on medication indications, dosages, and safe storage practices (Sundus *et al.,* 2022). Notably, these interventions significantly improved patients' understanding of medication indications and appropriate dosages. Enhanced comprehension of drug dosages mitigates the risks of underdosing or overdosing, thereby optimizing therapeutic efficacy and minimizing toxicity (Tan *et al.,* 2019). Similarly, understanding the indications of medications aligns treatment objectives with therapeutic goals, improving effectiveness and patient outcomes.

The study also revealed that HMR programs enable healthcare professionals to identify and address medication-related issues. Issues resolved during HMR visits included ineffective medications and medication duplication, consistent with findings from prior studies (Newman *et al.,* 2020; Sundus *et al.,* 2022). Addressing such issues during HMR visits enhances adherence, reduces adverse drug reactions, and prevents hospitalizations (Goh *et al.,* 2014; Ravindra & Kaushik, 2022). However, persistent challenges remain, including medication non-adherence, improper insulin storage, incorrect insulin injection techniques, uncontrolled BP, and high blood glucose levels. These findings underscore the need for healthcare teams to implement targeted strategies to address these issues and improve the quality of life for patients with chronic diseases (Gudi *et al.,* 2019).

The World Health Organization (WHO) recognized medication non-compliance as a significant challenge in managing chronic illnesses (Brown *et al*., 2011). Approximately 50% of patients with chronic illnesses do not adhere to their prescribed medication regimens (Sabaté, 2003; Lee *et al.,* 2006). Patients with diabetes mellitus, in particular, face difficulties adhering to complex treatment regimens and managing medication side effects (Sari *et al.,* 2022). Diabetes management involves tasks such as dietary adjustments, regular exercise, and blood glucose monitoring, which can disrupt patients' daily lives. Lack of dose administration aids, such as pillboxes or alarms, further exacerbates adherence issues, impacting health outcomes. A study by Fitria *et al.* (2023) found that the use of pillboxes during HMR visits improved adherence in Indonesian hypertension patients. These aids facilitate timely and accurate medication intake, enhancing therapeutic efficacy and reducing missed doses. Medication non-adherence in diabetes mellitus patients is associated with unfavourable clinical outcomes, increased complications, and reduced quality of life (Tampa'i *et al.,* 2021). Complications include cardiovascular disease, neuropathy, retinopathy, cerebrovascular

disease, nephropathy, and peripheral vascular diseases (Sari *et al.,* 2022). Education, motivation, continuous monitoring, and assessment are pivotal in improving adherence and health outcomes.

Pharmacists play a critical role in patient education during HMR visits, complemented by consistent monitoring and assessment. However, rural areas present unique challenges due to geographical distances from healthcare facilities, leading to prolonged gaps between HMR visits. These delays disrupt continuity of care, limiting opportunities for medication adjustments, monitoring, and preventative measures. This can result in deteriorating health conditions, increased hospitalizations, and higher healthcare costs. Telehealth services or telemedicine including telemonitoring and teleconsultation, offer a viable solution to overcome geographical barriers and ensure continuity of care. Telemedicine effectively addresses logistical, financial, sociocultural, and infrastructural challenges, enhancing healthcare accessibility (Anawade *et al.,* 2024). Transportation barriers in rural areas further limit access to healthcare facilities, compounding these challenges (Cochran *et al.,* 2022).

Effective management of blood glucose and blood pressure (<130/80 mm Hg) significantly reduces cardiovascular complications in individuals with type 2 DM (Hanley *et al.,* 2015). However, this study found no significant changes in BP or random blood glucose levels between baseline and six-month follow-up visits. This may be attributed to prolonged intervals between visits, the absence of interim interventions, and unmonitored lifestyle changes such as diet and stress levels. Additionally, the lack of home monitoring devices, such as blood glucose and BP monitors, limits patients' ability to manage their conditions effectively. Regular monitoring is essential for informed decision-making and proactive healthcare management.

Improper insulin storage and injection techniques were also identified as barriers to effective diabetes management. Poor storage conditions, such as exposure to extreme temperatures, can compromise insulin efficacy (DDRC, n.d). Incorrect injection techniques can lead to complications, including hypo- and hyperglycemia, glycemic fluctuations, and diabetic ketoacidosis (Trief *et al.,* 2016). Disease management programs tailored for cardiovascular conditions, including diabetes, have demonstrated improved clinical outcomes (Ofman *et al.,* 2004). Frequent HMR visits, coupled with telehealth interventions, can enhance medication adherence, patient engagement, and clinical outcomes (Rothwell & Hogan, 2015; Rosli *et al.,* 2021).

This study underscores the importance of adherence to medication regimens, lifestyle modifications, and patient education on proper insulin storage and injection techniques. Shorter follow-up intervals, such as monthly home visits and weekly telephonic updates, could further enhance outcomes. Telehealth solutions offer a promising avenue for improving long-term disease management by fostering patient engagement and reducing hospital admissions (Hanley *et al.,* 2015).

Strategies to address issues and to improve patient's outcomes

Tailored assessments, multidisciplinary collaboration and effective communication with patients

Implementing individualized home medication reviews that consider each patient's medical history, obtaining patient's details, challenges, preferences, and lifestyle can effectively identify and address drug-related issues, optimize medication use, and enhance overall patient outcomes. Collaboration between pharmacists, physicians, and other healthcare providers during HMR sessions ensures comprehensive medication management. For instance, drug-related problems identified during HMR visits can be discussed with physicians, allowing for the development of a tailored management plan. This plan is subsequently shared with the patient and caregiver, ensuring its effective implementation with necessary modifications (Chandrasekhar *et al.,* 2019).

Gudi *et al.* (2019) demonstrated that collaborative efforts between general practitioners and pharmacists during HMR visits resolved approximately 85% of drug-related problems. Effective communication is equally essential in improving patient outcomes. The Agency for Healthcare Research and Quality (2018) recommends communication strategies such as teach-back, warm handoffs, and medication reviews, which involve discussing the patient's complete medication regimen. Additionally, engaging with patients outside their homes,

including follow-up calls, can enhance patient satisfaction and adherence to treatment plans.

Frequent and comprehensive HMR visits

More frequent and comprehensive HMR visits are crucial for addressing medication-related challenges and improving outcomes for patients with chronic diseases. Regular reviews facilitate early identification of drug-related problems and support personalized care for optimized disease management. Scheduling HMR visits every 2–3 months can ensure consistent follow-up, particularly for patients in remote locations. Rosli *et al.* (2021) suggested shorter follow-up intervals to enhance the interaction between pharmacists and patients.

Monthly HMR visits supplemented with weekly telephonic updates on drug-related problems (DRPs) and clinical progress may significantly improve medication adherence and patient quality of life. Sundus *et al.* (2022) found that participants valued follow-up HMR visits to monitor progress and resolve medication-related issues, providing reassurance during the waiting period for the next clinic appointment. Personalized and in-depth discussions during HMR sessions improve patient understanding of medication indications and administration techniques, fostering adherence and better health outcomes.

Enhancing patient education on medications and storage

Healthcare professionals should prioritize educating patients about their medications, including proper administration, potential adverse effects, and the importance of adherence. Proper medication storage, particularly for insulin, is critical. According to the Diabetes Disaster Response Coalition (n.d), insulin should be stored in a refrigerator at 2–6°C (36–43°F) and never frozen. Patients should be informed about the expiration date of insulin and advised to store it in a cool, dry place away from direct heat and sunlight when refrigeration is unavailable. Ice packs and insulated containers may also be utilized for storage (Jacob *et al.*, 2023).

Richter *et al.* (2023) highlighted that opened insulin can be stored safely at room temperature for 4–6 weeks. Patients should also be educated on proper injection techniques, including site selection, needle length, and injection angle, to ensure effective absorption and avoid complications. Visual materials, such as pamphlets or posters, and mobile applications can provide instructional content and reminders on proper insulin administration. Collaborating with local health clinics for hands-on demonstrations and utilizing telehealth services for real-time guidance can further support patients, particularly in rural settings.

Leveraging technology for telehealth and telemedicine

The adoption of telehealth technologies has expanded significantly, particularly during the COVID-19 pandemic, providing a means to deliver HMR services to patients in rural and remote areas. Telehealth platforms enable patients to access healthcare services and records through smartphones, facilitating communication with healthcare teams and improving care navigation (Hanjani *et al.*, 2020).

Telemedicine allows remote consultations and periodic follow-ups via communication tools like SMS, WhatsApp, or phone calls (Ang *et al.*, 2022). These technologies can monitor vital signs at home, reducing hospital readmissions and improving the quality of life for chronically ill patients (Guideway care, 2023). For example, hospitals in Australia have utilized video conferencing to conduct medication reviews, benefiting patients in rural and remote regions (Hanjani *et al.*, 2020).

Medication adherence can be supported through smartphone apps, smart pill dispensers, and electronic packaging, which remind patients to take their medications and alert healthcare providers of adherence issues. In areas with limited internet access, alternative strategies like phone-based consultations, SMS reminders, or local telehealth hubs equipped with internet access can bridge connectivity gaps. These hubs, located in community centers or clinics, provide patients with a centralized location to access telehealth services. Evidence suggests that telehealth-delivered medication reviews improve clinical outcomes, reduce costs, and are well-accepted by patients,

offering a sustainable solution for chronic disease management (Hanjani *et al.*, 2020).

Conclusion

This study highlights the significance of HMR programs in rural areas, emphasizing their impact on patients' understanding, medication management, and adherence. The findings demonstrate the positive influence of HMRs in improving patients' knowledge of their medications, particularly regarding indications and proper dosage. However, challenges such as medication non-adherence, uncontrolled blood pressure, and elevated blood glucose levels persist, underscoring the complexity of chronic disease management in these settings.

The study identifies several critical issues, including the use of ineffective medications, inappropriate insulin storage, and incorrect injection techniques, which highlight the vital role of pharmacists in resolving medication-related problems during HMR visits. To address these challenges, the research emphasizes the need for personalized assessments, multidisciplinary collaboration, and enhanced communication among healthcare providers to optimize patient care.

Furthermore, the study underscores the importance of regular follow-ups, community-based educational initiatives, and the integration of technological interventions, such as telehealth, to improve patient outcomes. Patient education is particularly crucial, with a focus on proper medication storage especially for insulin and correct administration techniques. Recognizing the influence of social determinants, such as education levels, on medication understanding, the study advocates for a comprehensive approach that combines enhancing patients' knowledge with addressing broader systemic factors.

In conclusion, this research demonstrates the positive impact of HMR programs in rural areas while emphasizing the need for ongoing efforts to address persistent challenges. Collaborative care models, regular follow-ups, and the integration of technology are essential to improving the overall health outcomes of patients with chronic diseases in rural settings.

Authors contributions

Conceptualization, NSAR & NIMN; methodology, NSAR, NIMN, AA.; software, AA.; validation, NSAR and NIMN.; formal analysis, AA.; investigation, NSAR and NIMN.; resources, NSAR and NIMN; data curation, AA; writing—original draft preparation, AA; writing—review and editing, NSAR; supervision, NSAR. All authors have read and agreed to the published version of the manuscript.

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Ethical approval statement

This study protocol was approved by the IIUM Research Ethics Committee (IREC) of International Islamic University Malaysia (ID No: IREC 2023-171 on 24th October 2023).

Informed consent statement

Informed consent was obtained from all subjects involved in the study.

Conflict of interest

The authors declare that there is no conflict of interest.

Declaration of generative AI and AI-assisted technologies in the writing process

During the preparation of this work ChatGPT was used to improve readability and language. The author reviewed and edited the content as needed and take full responsibility for the content of the publication.

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