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Review Article

The Practice of Home Medication Review (HMR) by Community Pharmacists: a Scoping Review

Mega Silviana[1,2], Okti Ratna Mafruhah[1], Vitarani Dwi Ananda Ningrum[1]*

[1]Master of Pharmacy, Department of Pharmacy, Universitas Islam Indonesia, Yogyakarta, Indonesia
[2]Banjarbaru Utara Primary Health Care, Banjarbaru City, Indonesia
Email: vitarani.ningrum@uii.ac.id

ABSTRAK

Praktik farmasi klinik yang berkolaborasi dengan petugas kesehatan lain di tingkat komunitas masih terbatas. HMR bertujuan untuk meningkatkan kesehatan pasien dan meningkatkan kualitas pengobatan melalui kolaborasi perawatan kesehatan. Home Medication Review (HMR) merupakan pelayanan kesehatan di rumah yang mengoptimalkan pelayanan kesehatan pasien serta penggunaan dan pengelolaan obat setelah tidak adanya pemantauan langsung dari petugas kesehatan. HMR dilakukan secara kolaboratif oleh dokter umum dan apoteker di Puskesmas. Artikel review ini bertujuan untuk memberikan gambaran rinci mengenai praktik HMR oleh apoteker komunitas yang mencakup tujuan, tahapan, durasi, dan manfaat HMR serta karakteristik demografi pasien. Review tersebut meliputi artikel penelitian yang dipublikasikan selama tahun 2013 – 2023. Artikel tersebut didapat melalui PubMed dengan kata kunci "(Home Medication Review) DAN (Home Medicine Review)". Artikel berbahasa Inggris dimasukkan, diekstraksi, dan disajikan dalam sebuah tabel. Empat belas artikel relevan menggambarkan praktik HMR yang melibatkan intervensi apoteker, termasuk rujukan ke dokter umum, untuk mengidentifikasi Masalah Terkait Obat (DRPs), mengoptimalkan pengobatan, meningkatkan kepatuhan pengobatan, dan studi farmakoekonomi. Pasien berusia 18 tahun hingga lanjut usia berasal dari klinik dan fasilitas kesehatan primer atau di panti jompo. HMR juga diberikan kepada pasien dengan satu atau lebih penyakit kronis yang diobati dengan beberapa obat. HMR berlangsung selama 3–18 bulan dengan tahapan persiapan, identifikasi pasien, persetujuan dokter dan pasien, pencatatan data pasien, penilaian awal, kunjungan rumah, identifikasi masalah, intervensi, penilaian akhir, dan laporan HMR. HMR secara signifikan mengurangi kejadian DRP, meningkatkan kepatuhan pengobatan, meningkatkan hasil terapi, meningkatkan pengetahuan, meningkatkan status kesehatan, dan meningkatkan kolaborasi apoteker-dokter. HMR meningkatkan peran apoteker dalam layanan farmasi klinis kolaboratif di masyarakat.

Kata Kunci: Masalah Pengobatan, Apoteker Komunitas, Kolaborasi Interprofesional, Farmasi Klinik, Pelayanan Kesehatan

ABSTRACT

Clinical pharmacy practices in collaboration with other health workers at the community level remain limited. Home Medication Review (HMR) is a home health service that optimizes patient health care and drug use and management after no direct monitoring from health workers. HMR is collaboratively performed by general practitioners and pharmacists of primary health care. HMR aimed to improve patient health and enhance the quality of medication through healthcare collaboration.This review article aims to provide a detailed description of HMR practice by community pharmacists that includes the purpose, stages, duration, and benefits of HMR and patients' demographic characteristics. The review includes the research articles published during 2013 - 2023. The articles were searched via PubMed with the keywords "(Home Medication Review) AND (Home Medicine Review)". English articles were included, extracted, and presented in a table. Fourteen relevant articles described the practice of HMR involving pharmacist intervention, including referrals to general practitioners, for identifying Drug-Related Problems (DRPs), optimizing treatment, improving medication adherence, and pharmacoeconomic studies. Patients aged 18 years to elderly are from clinics and primary health facilities or in nursing homes. HMR is also provided for patients with one or more chronic diseases treated with several drugs. HMR lasts for 3 – 18 months with stages of preparation, patient identification, doctor and patient agreement, patient data recording, initial assessment, home visit, problem identification, intervention, final assessment, and HMR report. HMR significantly reduces DRP incidence, increases medication adherence, improves therapeutic outcomes, increases knowledge, improves health status, and increases pharmacist-doctor collaboration. HMR enhances pharmacists' role in collaborative clinical pharmacy services in the community.

Keywords: Drug-Related Problems, Community Pharmacy, Interprofessional Collaboration, Clinical Pharmacy, Home Medication

I. INTRODUCTION

One of the pharmacist competency areas are related to the aspects of their clinical ability (Kementerian Kesehatan, 2019; Mulyani *et al.,* 2019). Pharmaceutical service standards cover two main aspects, managerial aspects and clinical pharmacy aspects (Bainbridge *et al*., 2024). The clinical pharmacy aspect is related to patient care to improve therapeutic outcomes and minimize the incidence of adverse drug events aimed at patient safety and improving quality of life (Kementerian Kesehatan, 2019). The implementation of clinical pharmacy services at the Pontianak City Health Center was only 60.62% (Robiyanto *et al.*, 2019). Clinical pharmacy services at the Ponorogo District Health Center in clinical consideration, home care, and counseling activities have not been fully carried out (Norcahyanti *et al.,* 2020). The implementation of clinical pharmacy aspects at the Ogan Kemering Ulu District Health Center is in the low category with an achievement of 50.60% (Alfian, 2016;

Kadia & Schroeder, 2015). This shows that the implementation of clinical pharmacy services in the community is still low (Jihadi *et al.*, 2023; Mendez *et al.*, 2022). Medication non-adherence is a condition where the patient does not take the medication prescribed by the doctor, thereby causing a decrease in the quality of life and an increase in patient hospitalization (Alfian, 2016; Kadia & Schroeder, 2015). The level of medication adherence for hypertension patients at the Pekauman Banjarmasin Health Center in the high category only reached 30.09%, while the low category reached 24.75% (Ayuchecaria *et al.*, 2018). Research conducted at the Halmahera Semarang Health Center showed that medication adherence with diabetes mellitus patients in the high category was only 18.6% (Fatiha & Sabiti, 2021; Saibi *et al.*, 2020). The medication adherence level for hypertensive patients at the Samarinda City Lempake Health Center in the low category reached 41.5% (Rasyid *et al.*, 2022). Education is one of the main factors that play a role in medication adherence (Pramana *et al*., 2019). In addition, the level of knowledge and motivation of patients also affect medication adherence (Husnatika *et al.*, 2023; Mamahit *et al.*, 2019). The role of pharmacists should be enhanced in efforts to improve medication adherence (Elnaem *et al*., 2020).

Collaboration between health workers or Interprofessional Collaboration (IC) is something that cannot be avoided in an effort to improve patient recovery (Reeves *et al.*, 2017). Interprofessional Collaboration can improve patient safety, patient satisfaction, and quality of care (Ita *et al.*, 2021). Interprofessional Collaboration required relationship initiation, role specification, and trust between health workers (Gloria *et al.*, 2021). Research conducted at the Neurological Hospital in Surabaya City shows that there is still low collaboration between doctors and pharmacists due to the lack of good communication by pharmacists (Rinda & Atmaja, 2017). Collaboration between pharmacists and doctors at Meuraxa Hospital is still not effective, which is due to the low involvement of pharmacists in collaborative care (Wahyuni *et al.*, 2021). Collaboration between pharmacists and doctors should be built as an effort to increase the role of pharmacists in improving therapeutic success.

Home Medication Review (HMR) is a community-based collaborative service outside of health facilities that involves Doctors and Pharmacists to improve the effectiveness of therapy (Ali et al., 2018). HMR aimed to improve patient health and enhance the quality of medication through healthcare collaboration (Pharmaceutical

Society of Australia, 2020). HMR emphasized the collaboration with doctors or other health workers, while HPC can be carried out by pharmacists themselves or involve doctors if necessary. Based on this, an article review will be conducted with the aimed to know the application of Home Medication Review in pharmacist practice in the community.

II. METHOD

A. Study Type

The study conducted was an article review. The article review included quantitative study research articles with experimental, descriptive, and observational designs. Qualitative study research and systematic reviews are not included in the criteria for research articles to be reviewed. Research articles that will be reviewed are only those published in English and can be accessed in fulltext.

B. Inclusion dan Exclusion Criteria

This article review included research articles involving patients of all ages and various disease states in various health facilities. The inclusion criteria is research articles related to the implementation of Home Medication Review or Home Medication Review conducted in various countries. Exclusion criteria were articles whose fulltext could not be accessed.

C. Search Strategy

The literature study strategy aimed to identify research articles published from 2013 to 2023. The search strategy went through three steps, as follows:

1. Search for research articles through Pubmed by entering keywords, "(Home Medication Review) AND (Home Medicine Review)" so that all articles related to these keywords come out
2. Articles that came out of the search results were then selected. The selected articles contained the word Home Medication Review or Home Medicine Review in the title or abstract as well as in the whole text.
3. Selected articles were screened again to ensure that the full text was accessible and the content met the inclusion criteria.

D. Data Extraction

The selected research articles were then recapitulated in a table. The recap table included the author's name, year of publication, country of origin where the research was conducted, research objectives, research population, research methods, and research conclusions.

III. RESULT AND DISCUSSION

The search results on PUBMED with the keywords "(Home Medication Review) AND (Home Medicine Review)"

obtained 862 articles. The articles were then screened so that 769 were excluded, and 39 were assessed in depth. The assessment results on the full text of the article, 25 articles were excluded because they were included in systematic reviews, case reports, and qualitative research. Finally, 14 articles were obtained that met the criteria for review (figure 1).

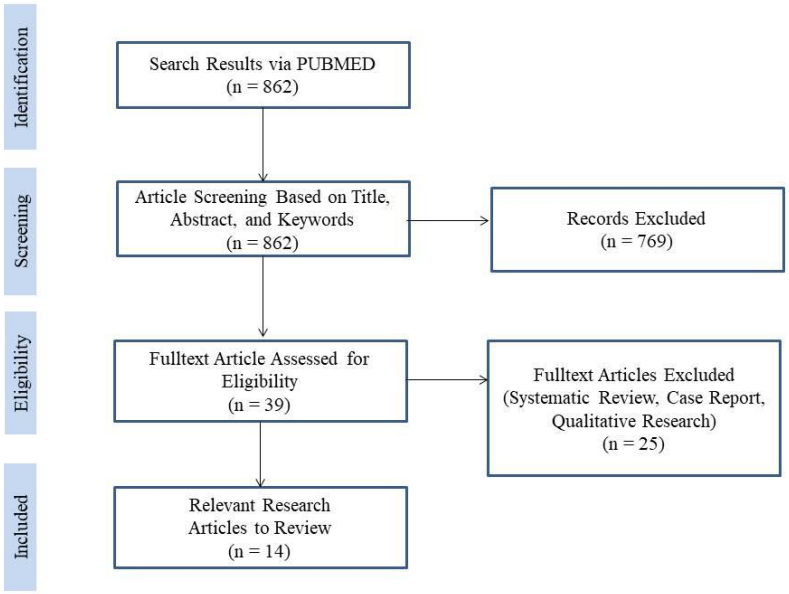

Figure 1. PRISMA research article search flow

The results of the initial search conducted through Pubmed obtained 862 articles. The articles obtained were screened by looking at the suitability of the title and abstract until 39 articles were obtained. Furthermore, articles included in systematic reviews, case reports, and qualitative research were excluded. Articles that met the criteria for review were 14 articles. The articles obtained were recapitulated in the table as presented in Table 1.

The most HMR research was conducted in Australia based on 9 articles obtained. Other countries like Finland, Scotland, Jordan, Taiwan, and Malaysia 1 article each. HMR is an Australian government-funded service that engaged medical personnel and pharmacists in medication review of patients in the community (Pharmaceutical Society of Australia, 2020).

Table I. Recapitulation results of HMR related publications

No.	Publication	Publication Year	Research Country	Research Objectives	Research Population	Research Method	Conclusion
1.	Rosli *et al.*	2021	Malaysia	Evaluating the effectiveness of Home Medication Review by Community Pharmacists to optimize diabetes therapy and reduce medication wastage.	Type 2 diabetes patients at Kelantan Primary Health Care Clinic	Randomized controlled clinical trial	Home Medication Review significantly improves glycemic control, quality of life, medication adherence, knowledge, and reduces the number of DRPs as well as wasted medication costs
2.	Basheti *et al*	2016	Jordan	Conducting RCT testing of Home Medication Management Review to identify patient medication-related problems	Outpatient clinic at Jordan University Hospital	Randomized controlled clinical trial	Home Medication Review in chronic patients reduces medication-related problems and improves patient compliance
3	Sawan *et al.*	2020	Australia	Understanding the use of Computerized Clinical Decision Support System (CCDSS) in the implementation of HMR.	Patients on anticholinergic and sedative medications	Randomized controlled clinical trial	Research shows the CCDSS has a good ability to assist in identifying and assessing anticholinergic and sedative medications
4.	Souter *et al.*	2017	Scotland	Understanding the practicality, acceptability, feasibility of blood pressure monitoring data collection	Patients who have been discharged from acute stroke care	Randomized controlled clinical trial	Patient order needs to be modified in transient ischaemic attack (TIA) patients
5.	Liou	2021	Taiwan	Understanding the effect of pharmacist home medication review on improving quality of life and therapeutic outcomes	Patients living in nursing homes who received more than 5 medications per day and at least 2 chronic diseases from 2013 to 2014	Randomized controlled clinical trial	There was no clear difference between the intervention group and the control group regarding improvements in quality of life, health facility utilization, prescribed medications, but there was a decrease in medication discrepancies
6.	Du *et al.*	2019	Australia	Measuring the association between HMR in older adults with sociodemographic, medication, and health factors	Patients receiving HMR for 5 years in the period 2019 - 2014	Prospective cohort	HMR recipients are increased in older adult patients with polypharmacy, general practitioner referral, low education level, low health level, and high-risk drug prescribing.
7.	Bereznicki	2016	Australia	Identify the effect of HMR by pharmacists on INH control and observe the quality of INH control in Australian veterans	Veterans who used warfarin from 2007 to 2009	Retrospective Cohort	INH use was well controlled in the elderly group, HMR by pharmacists was not directly related to this control
8.	O'Donnell *et al.*	2019	Australia	Understanding the accuracy of the integration between electronic calculations and reports from the Drug Burden Index (DBI) on the implementation of HMRs	Elderly patients who received anticholinergic and sedative therapy in the period 2014 to 2015	Prospective and Retrospective Cohort	Integration of DBI calculation in HMR activities is feasible and beneficial in reducing anticholinergic and sedative use in elderly patients

No.	Publication	Publication Year	Research Country	Research Objectives	Research Population	Research Method	Conclusion
9.	Lee *at al*.	2018	Australia	Understanding the number and types of problems related to medication	Nursing home patients in the period September 2014 to December 2015	Prospective Cross Sectional	Pharmacist integration in nursing home patients is able to identify problems in treatment, suitability of drug selection, and increase medication safety
10.	Buss et al	2018	Australia	Evaluating Pharmacist recommendations regarding laboratory tests in the HMR process	Patients who received HMR in the period 2011 to 2015	Retrospective Cross Sectional	Pharmacists are able to provide useful advice based on pathology data in accordance with national and international guidelines
11	Schmid *et al*	2023	Australia	Reviewing the use of treatment guidelines for the prevention of IHD and identifying the influence of patient characteristics on such treatment in patients receiving HMR	IHD patients who received HMR services from January 2010 to September 2012.	Retrospective Cross Sectional	The use of medication guidelines is suboptimal in IHD patients in the community. Health workers should ensure that patients are compliant in using the prescribed.
12	Carter *et al.*	2015	Australia	Extending the conceptual model to the influence of patient evaluations on interpersonal care and testing the hypothesis of patient perceptions of HMR.	Patients who had undergone HMR in the period November 2008 to May 2009	Exploration and structural equation modeling	The patient's willingness to use the service will be influenced by the patient's perception of the pharmacist's ability to listen during the interview process in HMR
13	Guirguis	2019	Finland	Understanding the extent of therapeutic compliance of heart failure patients referred using HMR based on guidelines	Heart failure patients from 2015 to 2018	Retrospective Cross Sectional	Patients referred using HMR showed suboptimal pharmacotherapy in heart failure patients
14	Sluggett	2021	Australia	Identifying the implementation trends of HMR and RMMR in older people in Australia over the period 2009 to 2019, and the impact of policy changes between 2011 and 2014.	patients record who used HMR or RMMR programs in the period 2009 to 2019	Retrospective Cross Sectional	Changes in policies related to HMR or RMMR cause a decrease in claims and utilization. Policy system changes are useful for addressing gaps in the use of HMR/RMMR programs and improving the quality of treatment

HMR is performed in the outpatient population because monitoring can be carried out during treatment at home. Patients involved in HMR are those with chronic diseases, nervous systems, and blood disorders. Patients feel comfortable undergoing HMR because to get health services, they don't have to go to a health facility, so patients generally really accept the HMR program (Ang *et al.*, 2022). Patients undergoing HMR are also sometimes used as a population for conducting research related to the implementation of health applications.

Most published research is a randomized controlled trial (RCT), although there are several cohort and cross-sectional design studies. RCTs are common in research conducted on intervention groups compared with control groups (Nguyen *et al.*, 2022). RCT is a research design that has the highest level of confidence because it involves a control group (Khan *et al*., 2023).

Patient criteria, sample, interventions, DRPs, and patient satisfaction are presented in Table II. HMR is a community-based service performed by pharmacists in collaboration with other health workers. HMR is generally performed in elderly patients with multimorbidity and polypharmacy (Lin *et al.,* 2021*)*. Implementation of HMR will overcome problems resulting from polypharmacy and prevent the adverse effects of treatment. HMR has been proven to increase the success of therapy and prevent premature death in patients (Abu Fadaleh *et al.*, 2022). The average time for preparation, writing reports, and communicating with other health workers is 175 min, in the range of 140–235 min. conducting HMR on patient averages 110 min, with a range of 90–140 min. Pharmacists who perform HMR annually treat 51 or more patients (Czarniak *et al.*, 2020).

In implementing HMR, pharmacists can significantly identify DRPs. The most common DRPs are drug interactions, adverse drug reactions, addition of drugs, inappropriate drug use, patient non-compliance, untreated indications, dose discrepancies, and use of expired drugs (Gudi *et al.*, 2019). HMR can be an additional service in the community. HMR can identify DPRs that occur in patients with the highest incidence, namely the need for additional therapy (23.6%), drug non-adherence (23.3%), and adverse drug reactions (17.8%) (Papastergiou *et al.*, 2019). HMR implementation can be carried out for a minimum of 3 months. Pharmacists can intervene in DRPs for patients and doctors. At the end of HMR, the number of DRPs decreased significantly, and the patient's quality of life improved (Zhang *et al*., 2022).

Table II. Patient criteria, sample, interventions, DRPs, and patient satisfaction

No	Writer's name	Patient Criteria	Research Sample	HMR Duration	HMR Intervention	DRPs	HMR Impact	Patient Satisfaction
1.	Rosli *et al.* (2021)	Patients must be at least 18 years old, have a recent HbA1c of more than 6.5%, taking at least 5 medications or more than 12 doses per day, within a 25 km radius of a health facility, and contactable by phone.	A total of 166 patients at the beginning of the study, at the end the sample size was 149 patients	6 months	Pharmacists conduct counseling with patient profile, medication history, clinical data, and anthropometry. Counseling includes medication adherence, lifestyle modification, and blood glucose monitoring. Including identification of DRPs	The most common DPRs are suboptimal drug effects. Other problems include inappropriate use, incorrect storage, and inappropriate dosing times or intervals	Trained pharmacists were found to be fit to run HMR. The HMR program significantly improved glycemic control, quality of life, medication adherence, and patient knowledge. HMR also reduced the number of DRPs and medication costs	The implementation of HMR builds relationships and trust between pharmacists and patients. The relationship will make the patient more open in informing
2.	Basheti *et al.* (2016)	Jordanian citizen, 18 years old and above, has at least 1 chronic disease, takes at least 5 or more medications, takes more than 12 doses of medication per day	112 patients were involved, 97 patients remained at the end	3 months	Patients are visited and counseled regarding medication adherence, pharmacological and non-pharmacological therapy education. DRPs were identified, then recommendations were made to the doctor	A total of 158 DRPs were identified from 97 patients with an average of 1,63 events per patient	Pharmacist-conducted interventions significantly reduce the incidence of DRPs and improve patient medication adherence	-
3.	Sawan *et al.* (2020)	At least 65 years of age, taking anticholinergics and sedatives, having dementia or not	A total of 26 patients	3 months	The Goal-directed Medication review Electronic Decision Support System (G-MEDSS)© is a computerized clinical decision support system that assists clinical decisions to complete individual medication reviews.	-	The results showed that G-MEDSS used in HMR was helpful in identifying and assessing anticholinergic and sedative use	Patients think that pharmacists provide opportunities to discuss treatment goals, possible discontinuation of some drugs, and perceived benefits of HMRs
4.	Sounter *et al.* (2016)	Patients with a diagnosis of stroke who have been discharged	At the beginning of the study there were 40 patients, then at	6 months	Identifying drug use problems, categorizing, and following up on the problem	DRPs detected and need recommendations including indications without drugs, drugs	Doctor acceptance of pharmacist recommendations is high. Home visits may identify problems, but follow-	-

No	Writer's name	Patient Criteria	Research Sample	HMR Duration	HMR Intervention	DRPs	HMR Impact	Patient Satisfaction
		from inpatient hospitalization	the end of the study 35 patients remained			without indications, too low doses, unexpected drug reactions, drug interactions, non-adherence medication, and there are several other comorbidities	up consultations may be considered over the phone	
5.	Liou *et al.* (2022)	Aged 65 years or older, using at least 5 oral medications daily, having at least 2 chronic diseases	100 patients were involved, 80 patients remained at the end of the study	18 months	Patients received pharmaceutical care services at 1st, 3rd, 7th, and 13th month. Then at 18th month, all information was collected. Pharmacists identified DPRs, and doctors were consulted if necessary	158 DRPs were identified with an average of 1.6 events per patient. The incidence of DRPs were medication errors (27.9%), drug therapy monitoring (13.9%), and improper storage (9.8%)	Decreased number of potentially inappropriate medications and incidence of DPRs, as well as improved knowledge of health status, self-care, and doctor's instructions	Intervention group patients had the highest satisfaction scores and willingness to accept future visits
6.	Du *et al.* (2019)	Using at least 5 drugs, drugs with a narrow therapeutic index, inappropriate prescribing, use of anticholinergics and sedatives	A total of 131,483 patient records	3 months	Patient undergoes HMR in accordance with Australian procedures	-	HMR patients use 5 - 9 drugs at most, increasing with age, smoking, single, obesity, distant residence, diabetes mellitus, and impaired physical function	-
7.	Bereznicki (2016)	Patients who are members of the Department of Veterans Affairs (DVA), these patients received at least two warfarin administrations in the 6 months before HMR	A total of 344 HMR patient records at the beginning of the study, at the end of the study a sample of 321 patient records	6 months	Identify and monitor the effectiveness of warfarin based on the International Normalized Ratio (INR) and range (Time In Therapeutic Range, TTR)	-	HMR had no effect on INR and TTR values in veteran patients taking warfarin	-
8.	O'Donnell *et al.* (2019)	Patients with at least 65 years of age, receiving	A total of 100 patients	3 months	HMR procedure and application of Drug Burden Index (DBI)	-	Integration of DBI calculator in HMR services is feasible and useful in deciding the	Patients find the DBI report information easy

No	Writer's name	Patient Criteria	Research Sample	HMR Duration	HMR Intervention	DRPs	HMR Impact	Patient Satisfaction
		anticholinergics and sedatives			calculator on patients HMR who receiving anticholinergics and sedatives		discontinuation of anticholinergic and sedative prescriptions in elderly patients	to understand and use during the HMR process
9.	Lee *at al*. (2018)	Receive at least 8 medications, have multiple chronic diseases, medications associated with risk of adverse medication events, have recently completed hospitalization, experience adverse events or concerns about adverse events	A total of 84 patients	15 months	Medication reconciliation and comprehensive medication review. Pharmacists identify discrepancies between medications, review administration, use, storage, indications, and patient education	There were 334 medication-related problems detected. The most common were unnecessary prescriptions (17.1%), non-adherence medication (12.9%), and adverse drug events (12.6%)	Patients undergoing HMR are less likely to be re-hospitalized, thereby saving medical costs. Improves cooperation between health workers and increases the safety of drug use	-
10.	Buss *et al*. (2018)	Patients over 20 years old, have chronic diseases	A total of 580 HMR data samples	-	Laboratory testing recommendation by Pharmacist to Doctor	-	Pharmacists recommend laboratory tests on the use of vitamin D and dyslipidemia. In renal impairment, pharmacists use their knowledge in dose adjustment and contraindications	-
11	Schmid *et al* (2015)	HMR patients from January 2010 - September 2012, with a history of Coronary Artery Disease (CAD), Myocardial Infarction (MI) or Ischemic Heart Disease (IHD), age above 18 years	A total of 5396 HMR patient records	-	Conduct a review of the treatment of IHD patients undergoing HMR	-	Only a quarter of patients received antithrombolytics, ACEIs, ARBs, BBs, CCBs, and statins according to Optimal Medical Therapy (OMT) guidelines	-
12	Carter *et al*. (2015)	Patients who underwent HMR in the period November 2008 - May 2009	A total of 595 samples	6 months	Testing how well pharmacists listen to patients during the HMR process	-	The patient's willingness to participate in the HMR program is strongly influenced by the patient's	-

No	Writer's name	Patient Criteria	Research Sample	HMR Duration	HMR Intervention	DRPs	HMR Impact	Patient Satisfaction
							perception of how well the pharmacist listens during the HMR implementation	
13	Guirguis (2019)	Heart failure patients undergoing HMR, receiving multiple medications (polypharmacy)	A total of 30 patients who met the criteria	-	Identifying the appropriateness of pharmacotherapy in heart failure patients undergoing HMR	There were 13 patients not taking ACEIs and 23 patients not taking ARBs; 7 patients were not taking either ACEIs or ARBs. The pharmacist recommended starting an ACEI in 4 patients and an ARB in 2 patients. Most patients were taking suboptimal doses of heart failure medications	Pharmacotherapy of heart failure in patients referred for HMR has not been optimal. Pharmacists play an important role in optimizing heart failure treatment, and encourage physicians to align pharmacotherapy with treatment guidelines	-
14	Sluggett (2021)	Patients with at least 65 years of age undergoing Home Medici Reviews (HMR) and Residential Medication Management Reviews (RMMR) in the period January 2009 - December 2019	HMR patient data is 900,245 and RMMR is 90,249	-	HMR according to Australian procedures	-	Changes to HMR and RMMR program rules in March 2014 restrict HMR access for patients	-

HMR services have been proven to increase medication adherence and blood glucose control in patients with diabetes mellitus in the intervention group *(*Sari *et al.,* 2023). HMR involves systematic and detailed assessment to identify and prevent treatment problems in patients. HMR can be performed on pediatric patients to minimize errors in dosage and method of drug administration (Shabaraya *et al.,* 2021). Compliance, knowledge, social quality of life, and family components increase in patients with schizophrenia undergoing HMR (Tan *et al.,* 2019).

Implementation of HMR significantly improves therapeutic outcomes, effectiveness, safety, quality of life, drug compliance, patient knowledge, and reduces DRPs (Patounas *et al.,* 2021). Postoperative patients undergoing HMR have improved quality of life. HMR improves compliance and reduces the incidence of falls after surgical procedures (Fritz *et al.,* 2022). Implementation of HMR improves more accurate documentation of treatment histories. This is because other drugs used outside the prescription are detected during HMR (Carson & Kairuz, 2018).

HMR patients experienced significant increases in compliance and knowledge. Cost analysis of wasted medication showed savings of up to $855 during HMR implementation (Chow & Hassali, 2014). HMR provides an opportunity for pharmacists to provide interventions in treatment, resulting in reduced healthcare costs (Monzón-Kenneke *et al.,* 2021). Implementing HMR can reduce the burden on tertiary services, making health financing more efficient (Chandrasekhar *et al.,* 2019).

HMR is carried out through several stages which are presented in Figure 2. The first stage is the HMR module preparation stage which is useful for guiding all HMR activities that must be carried out. The next stage is to identify patients who will be involved in the implementation of HMR. Patients involved in the HMR program can be through recommendations from doctors, pharmacists, nurses, and other health workers (Basheti *et al.,* 2013). The referral document will include the reason for the referral, treatment risk factors, current treatment, and patient contact details. Patients who meet the criteria can also participate on their own. Pharmacists need to seek the consent of the patient's treating physician, so that the collaboration can proceed in the future (Lee *et al.,* 2018; Rosli *et al.,* 2021). Pharmacists also seek the patient's consent through an informed consent form. Patients who have met the criteria and agree to do HMR will be recorded regarding the disease suffered, the treatment being undertaken, and access to the patient's medical record.

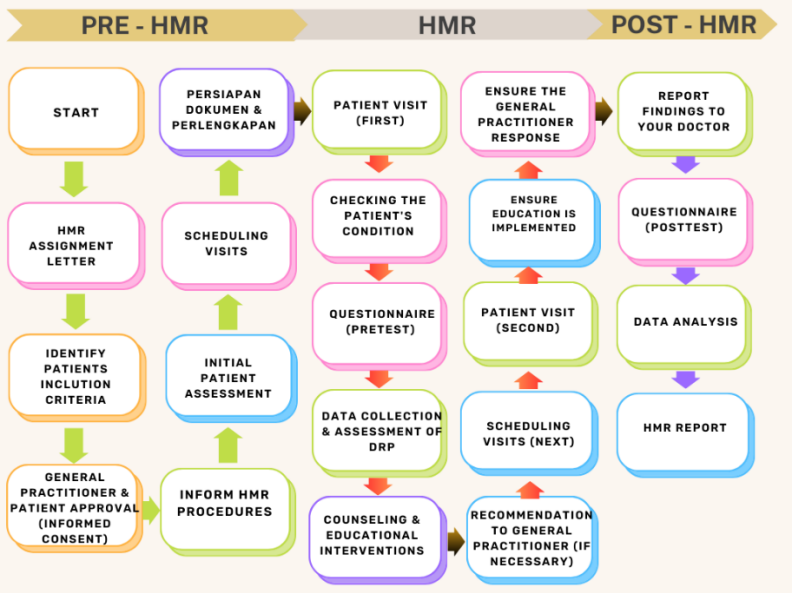

Figure 2. Stages of HMR implementation

Pharmacist-led interventions are usually conducted at the patient's home (Lee *et al.*, 2018). Pharmacists conduct home visits to identify drug-related problems in the form of patient interviews. The identified problems are then examined to determine the cause, a plan for resolution is made, and documented. Patient-related problems such as medication adherence or poor understanding of medication use are addressed by providing counseling and education to the patient. Problems related to the patient's medication are resolved through discussions by the pharmacist and the prescribing doctor (Basheti *et al.*, 2013). Interventions may include a review of medication, drugs taken, lifestyle, drug-related issues, and patient education (Souter *et al.*, 2016). Pharmacists in Australia may recommend HMR patients to undergo laboratory tests for medication monitoring. Recommended laboratory tests include checking for cholecalciferol (vitamin D), blood lipids, kidney function tests, blood sugar level tests, hepatic function tests, hydroxycobalamin tests, complete blood tests, and thyroid function tests (Buss *et al.*, 2018).

Home visite is something that must be done with some consideration. Home visite must adjust to the patient's comfort and adjust the time according to each patient's free time. Another alternative is to contact the patient by phone or video call. Home visits can take a long time, so visits should be carried out effectively and efficiently. Home visits carried out in the implementation of HMR for stoke patients

are carried out in the first, third and sixth months (Souter *et al.*, 2016). Visits also add to the complexity and cost of implementation. Scheduling time for visits is a problem, sometimes patients are too busy to be seen (Basheti *et al.*, 2013). The thing that has to be done when the pharmacist visits the patient's home is a review of the drug and consultation regarding the patient's condition (Liou *et al.*, 2021*)*.

The article review only included research articles published between 2013-2023, so research prior to 2013 was not included. This causes the implementation of HMR discussed in this study to be limited to the last 10 years. The authors did not conduct statistical analysis of the results of Randomized Controlled Clinical Trial (RCT) research obtained. The authors only categorized similar results to see the similarities and differences in the results obtained in each research article. The author involved studies outside RCTs such as Cohort and Cross Sectional studies, so the data presented varied. Nevertheless, this study involved 14 research articles indexed on Pubmed which is a trusted indexation. The diversity of methods in each study also provides a lot of information that may not be obtained if only using articles with RCT methods. This diversity can capture various types of HMR activities in various countries, thus expanding the variety of information. This article review can be one part of determining HMR policy in a region or country.

IV. CONCLUTION

Search results for research articles found 14 relevant articles. The results of the article review showed that HMR is used to identify Drug Related Problems (DRPs), optimize treatment, study pharmacoeconomics, increase medication adherence, and provide recommendations to doctors. Patients involved in HMR are at least 18 years old to elderly and outpatients from clinics, primary health centers, and nursing homes. HMR patients can have one or more chronic diseases that are treated with multiple medications. The duration of HMR ranges from 3-18 months with stages called preparation, patient identification, doctor and patient agreement, recording patient data, initial assessment, follow up (home visit), problem identification, intervention, final assessment, and making an HMR report. The impact of HMR is significantly reduce the incidence of DRPs, increase medication adherence, improve therapeutic outcomes, increase knowledge, improve health status, optimize treatment, and increase collaboration between pharmacists and doctors and other health workers. The conclusion obtained is that HMR can be applied and increase the role

of pharmacists in pharmacy services in the community.

CONFLICT OF INTEREST

All authors declare that there is no conflict of interest in this research.

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