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Home-Based Comprehensive Medication Reviews: Pharmacist's Impact on Drug Therapy Problems in Geriatric Patients

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OBJECTIVE: To evaluate the effects of pharmacist-conducted, home-based comprehensive medication reviews (CMRs) on drug therapy problems (DTPs) in geriatric patients.

DESIGN: Pre-/postintervention study.

SETTING: Grocery store chain affiliated with three independent living facilities.

PARTICIPANTS: Twenty-five older adults using pharmacy delivery services for at least three chronic medications.

INTERVENTION: A pharmacist conducted a home-based CMR for each participant. DTPs were identified across 13 categories. Patients received a medication action plan post-CMR. A follow-up patient phone call was completed two weeks following the appointment. Patient profiles were reviewed for three months postintervention for changes in DTPs.

MAIN OUTCOME MEASURES: Changes in DTPs per patient and changes in five Centers for Medicare & Medicaid Services triple-weighted Star Rating performance measures.

RESULTS: The average DTPs identified per patient were reduced from 3.4 ± 2.06 to 1.48 ± 1.68 ($P < 0.05$) DTPs three months postintervention. The most common categories identified—nonadherence and incorrect administration/technique—were significantly reduced ($P = 0.012$ and $P = 0.010$, respectively). One Star Rating performance measure significantly improved: 68% of patients taking hypertension medications were adherent at baseline and 91% were adherent three months post-CMR ($P = 0.016$).

CONCLUSION: Pharmacist-provided, home-based CMRs reduced the average number of DTPs per patient. The most common categories of DTPs identified—nonadherence and incorrect administration/technique—were reduced postintervention.

KEY WORDS: Chronic disease, Comprehensive medication review, Drug therapy problem, Geriatrics, Medication therapy management, Nonadherence, Pharmacist, Star Rating.

ABBREVIATIONS: CMR = Comprehensive medication review, CMS = Centers for Medicare & Medicaid Services, DTP = Drug therapy problem, MAP = Medication action plan, MTM = Medication therapy management, PDC = Proportion of days covered, PMR = Personal medication record.

Introduction

There are currently 43.1 million adults older than 65 years of age in the United States, and that number is expected to more than double by 2050. Among this population, the prevalence of chronic disease greatly surpasses all other age groups. More than 90% of older adults have at least one chronic disease, and more than 75% have two or more. Chronic diseases can place a significant burden on older adults and may cause loss of independence. Additionally, chronic disease constitutes more than 65% of United States health care expenditures. Individuals older than 65 years of age have health costs three to five times that of other age groups.[1]

Members of the aging population consume approximately 14 to 18 prescription medications annually, and almost one-fourth of medications used in older adults are considered unnecessary or inappropriate.[2] Older adults have magnified medication-related risks because of an increased number of medications and age-related physiological changes. Additionally, almost one-third of older-adult hospitalizations are a result of drug therapy problems (DTPs), defined as any adverse event or potential interference to achieving optimal patient outcomes that is or could be medication-related.[2,3]

Patient care services such as medication therapy management (MTM) have been shown to optimize medication use and improve health outcomes. Outcomes affected by MTM services include: decreased high-risk medication use in the geriatric population, decreased hospital readmission rates, and improved quality of life.[4-6] Frequent patient contact, access to medication records, and medication expertise uniquely position community pharmacists to provide effective MTM services. One component of MTM services is the comprehensive medication review (CMR). During a CMR, a health care professional reviews the indication, safety, efficacy, adherence, and cost of a patient's prescriptions, over-the-counter (OTC) medications, and dietary/herbal supplements. The health professional then summarizes the information in the form of a personal medication record (PMR) and medication action plan (MAP) that is given to the patient. All Medicare Part D plans must offer a CMR performed by a qualified health professional

to eligible beneficiaries.[7] Pharmacists are qualified to perform CMRs to identify and address DTPs, including medication use and adherence. Additionally, CMRs can be performed in a variety of settings, including the patient's home.

In the past five years, pharmacists have worked to improve MTM efficiency and develop cost-effective service models. In one study in 2013, pharmacists reported patients' lack of interest and patients' declining participation as the greatest barriers to providing CMRs.[8] Patients may decline a CMR for various reasons, including difficulty traveling to the pharmacy. Approximately 36% of adults 65 years of age or older have an impairment that makes travel to the pharmacy more difficult. These impairments include hearing or vision loss and decreased cognition or ambulation.[2] Home-based CMRs may be appealing to patients who have difficulty traveling to a pharmacy or prefer to utilize pharmacy delivery services. CMRs performed in the patient's home have also been shown to be effective for identifying DTPs that may not be detected if the CMR is conducted in other settings.[9-11] Issues such as hoarding medications, inappropriate storage, and multiple storage locations may be more challenging to detect if the CMR is not performed at the patient's home.[9-11] Home-based CMRs may increase patient participation in the service while allowing pharmacists to identify and resolve DTPs in this population.

Several national organizations, such as the Centers for Medicare & Medicaid Services (CMS), have recognized the importance of pharmacist involvement in optimizing medication therapy. Providing MTM services has been shown to correlate with improved health plan CMS Star Ratings.[12] The CMS Star Rating system measures performance of health insurance plans based on predetermined quality measures. The Star Rating system allows patients to compare health plans before making enrollment decisions and CMS rewards plans based on performance. Ratings are determined by patient satisfaction, operational performance, ease of patient access to health care, and designated health outcomes. Health outcomes performance measures are weighted by CMS three times as much as operational measures in

determining a plan's Star Rating. Five out of 10 triple-weighted performance measures are specific to Medicare Part D plans including percentage of:

- Members 65 years of age and older receiving high-risk medications
- Members with diabetes taking appropriate blood pressure medication
- Members highly adherent (more than 80% proportion of days covered) to oral medications for diabetes, hypertension, or dyslipidemia.

Additionally, the completion rate of CMRs has been added as a performance measure for 2016. Pharmacists are well positioned to make significant contributions to these medication and chronic disease-related performance measures, representing an opportunity to collaborate with payers to improve Star Ratings and patient care.[13]

Objectives

This study primarily sought to assess the effect of pharmacist-conducted home-based CMRs on DTPs in older adults. The secondary objective was to evaluate the effect of home-based CMRs on five Medicare Part D CMS triple-weighted Star Rating performance measures.

Methods

Setting

This study was granted exemption from full board review by the University of Kansas Medical Center Human Subjects Committee. Home-based CMRs were completed for patients of Balls Foods Stores, a grocery store chain that operates multiple pharmacies in the Kansas City metropolitan area. Currently, company pharmacists provide in-pharmacy or telephone CMRs to eligible patients based on health insurance coverage.

Participants

Researchers compiled a list of eligible patients from three pharmacies that deliver prescriptions to local independent living facilities. Eligible patients included those 65 years of age or older receiving prescription medications through Balls Food Stores' delivery service and taking three or more chronic disease state medications. Those receiving

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medication administration assistance by a registered nurse or other health care provider were excluded from the study. Data collection occurred between September 2014 and January 2015.

Eligible patients were contacted via telephone and offered a home-based CMR as a voluntary service free of charge. The service would include a pharmacist visit to their home to discuss their medications. The benefits of a CMR were explained as an opportunity to resolve any medication-related issues and answer medication questions. Patients who declined were removed from the list of potential participants. If the patient agreed, an appointment time was scheduled.

Intervention

All home-based CMRs were performed by a single pharmacist. Medication profiles were reviewed prior to the appointment to identify potential DTPs, including: incorrect administration or technique, medication overuse, nonadherence, adverse reaction, high cost, high dose, low dose, drug interaction, additional therapy needed, suboptimal therapy, vaccination needed, unnecessary drug, and high-risk medication. A medication was classified as high-risk based on the Pharmacy Quality Alliance's Use of High-Risk Medications in the Elderly document.[14]

At the start of the CMR appointment, the pharmacist reviewed the patient's medical history and medication allergies. Then, all active prescription medications, OTC products, and dietary/herbal supplements were assessed for indication, efficacy, safety, adherence, and cost. The pharmacist also reviewed the patient's method of medication administration, medication storage, and use of adherence tools such as pillboxes, calendars, or reminder alarms. All DTPs identified before and during the appointment were addressed.

The Outcomes MTM™ CMR worksheet was used for information collection and DTP documentation.[15] Adherence was evaluated and resolution plans were developed using the Drug Adherence Work-up (DRAW©) tool during patient appointments.[16] The DRAW tool has demonstrated effectiveness in addressing medication nonadherence.[17]

After the appointment, the CMR was summarized with a PMR and MAP using the Medicare Part D Medication Therapy Management Program Standardized Format.[18] The patient's physician(s) was contacted via fax or telephone with recommendations related to high-risk medication use, suboptimal therapy, therapy needed, or unnecessary therapy using a standardized form requesting a medication change, adjustment, initiation, or discontinuation. The patient received a follow-up phone call two weeks after the appointment to ensure receipt of the MAP, to discuss progress toward resolution of DTPs, and to allow the patient time to ask follow-up questions.

Changes in identified DTPs were evaluated through monthly patient profile review for three months after the home-based CMR. If a DTP could not be evaluated based on the pharmacy medication profile, information regarding DTP resolution was obtained from the patient during the two-week follow-up phone call.

Analysis

Patient demographics were assessed using descriptive statistics. Chronic medication adherence was measured using the Proportion of Days Covered (PDC) calculation. This calculation is based on a day's supply of a medication provided to the patient divided by the number of days covered by the prescription fill.[19] High adherence was defined as more than 80% of days covered.[13] Changes in DTPs and CMS triple-weighted Star Rating performance measures over time were identified using repeated measures ANOVA. Statistical analyses were conducted with SPSS v.22 at the 0.05 significance level.

Results

A potential 49 participants were initially identified. Of these, 13 patients did not meet the inclusion criteria (10 patients received medication assistance and three were taking fewer than three chronic disease state medications). Of the remaining 36 eligible patients, researchers could not reach 3 by telephone, 8 declined the service, and 25 (69.4%) completed a home-based CMR. Patient demographics are summarized in Table 1. The participants were predominantly white females with a median age of 88 years. An average of 3.44 ± 2.06 (mean

± standard deviation [SD]) DTPs were identified per patient at baseline (Table 2). The most common categories of DTPs identified were nonadherence (20% of DTPs), incorrect administration or technique (14.3% of DTPs), vaccination needed (11.9% of DTPs), and unnecessary drug (11.9% of DTPs). Three months after the home-based CMR, the average number of DTPs per patient was reduced to 1.48 ± 1.68 ($P < 0.001$). Prevalence of nonadherence and incorrect administration/technique were significantly reduced ($P = 0.012$ and $P = 0.010$, respectively) (Table 2).

Prior to the home-based CMR, three patients were taking at least one high-risk medication. High-risk medications included nonbenzodiazepine hypnotics (two patients), oral estrogen (one patient), and a skeletal muscle relaxant (one patient). All high-risk medications were discontinued post-CMR.

The proportion of patients taking medications for diabetes, hypertension, and dyslipidemia at baseline are displayed in Table 3. Eight patients (32%) had both diabetes and hypertension. Of these eight patients, one patient was not taking a renin-angiotensin inhibitor at baseline. Despite the pharmacist's recommendation, this medication was not initiated post-CMR.

Adherence to oral diabetes, hypertension, and dyslipidemia medications increased throughout the follow-up period, but the increase was not always statistically significant (Figure 1). The proportion of

Table 1. Demographics of Study Participants

	n (%)
Gender	
Female	18 (72)
Ethnicity	
White	25 (100)
Age (years)	
Age Median (IQR)	88 (76-92)

Abbreviation: IQR = Interquartile range.

Table 2. DTPs Identified Before or During Home-Based CMR

Categories of DTP	Frequency of DTPs (N = 85) n (%)	DTPs after 3 months (N = 37) n (%)	Overall *P*-values
Medication underuse	17 (20)	7	0.012*
Incorrect administration/ technique	12 (14.3)	3	0.01*
Vaccination needed	10 (11.9)	8	0.216
Unnecessary drug therapy	10 (11.9)	8	0.161
High dose	6 (7.1)	3	0.104
Suboptimal therapy	6 (7.1)	2	0.049*
Drug interaction	5 (6.0)	2	0.104
Needs treatment	4 (4.8)	1	0.134
High-risk medication	4 (4.8)	0	0.103
Cost too high	3 (3.6)	0	0.083
Low dose	3 (3.6)	2	0.327
Medication overuse	2 (2.4)	1	0.327
Adverse reaction	2 (2.4)	0	0.161

Abbreviations: CMRs = Comprehensive medication reviews, DTPs = Drug therapy problems.

*Statistically significant; *P* < 0.05.

patients adherent to oral diabetes medications increased from 88% at baseline to 100% three months post-CMR ($P = 0.351$). Of the 22 patients taking hypertension medications, 68% were adherent at baseline, and 91% were adherent three months post-CMR ($P = 0.016$). Among patients on statin therapy, 60% were adherent at baseline and 80% were adherent three months post-CMR ($P = 0.128$).

Discussion

The average number of DTPs identified per patient (3.4) was consistent with several other studies utilizing MTM to identify DTPs, ranging from 2.6 to 4.4 DTPs per patient.[12,20-22] Previous studies have evaluated the advantages of home-based CMRs and suggest that visiting the home can provide more insight into the patient's medication regimen, allowing for the identification of DTPs that may not be evident in another setting.[9,10] In this study, the average number of DTPs per patient was reduced after a home-based CMR conducted by a pharmacist. To the authors' knowledge, this is the first study assessing the effects of home-based CMRs on DTPs, including an analysis of the CMS triple-weighted Star Rating performance measures.

The most common DTP identified among patients in the study was medication nonadherence (44% of patients). This finding is comparable to other studies related to pharmacist interventions in the older adult population,

| Table 3. Study Participants with Medications Included in CMS Triple-Weighted Performance Measures at Baseline	
Medication Class	**Number of Patients (%)**
Oral diabetes medication	8 (32)
Hypertension medication	22 (85)
Statin	15 (60)
Abbreviation: CMS = Centers for Medicare & Medicaid Services.	

identifying up to 50% of patients as nonadherent.[10,23,24] In this study, a home-based CMR was an effective avenue for making interventions and recommendations that resulted in improved overall adherence. Examples of direct interventions made in this study that would not have normally occurred in the community pharmacy setting include: helping a patient set a medication dosing alarm, providing visible reminder notes (e.g., placing a note on the patient's refrigerator), and moving a patient's medications to an area that better suited the patient's daily routine.

Another common DTP identified in approximately one-third of patients in this study was unnecessary drug therapy. Previous studies have noted that unnecessary drug

Figure 1. Medication Adherence Pre-/Post- Home-Based CMR
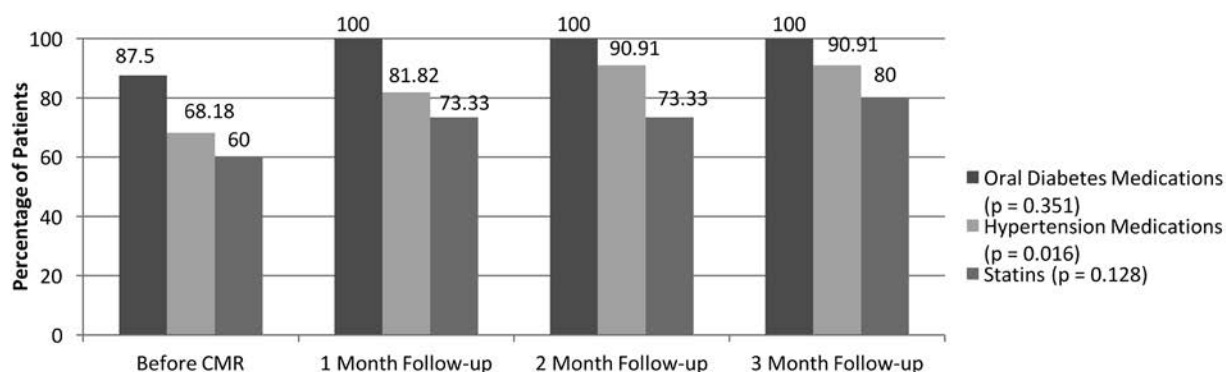
Abbreviations: CMR = Comprehensive medication review.

therapy is a commonly identified DTP and is often related to patients having expired or discontinued medications in the home, practicing unorganized medication administration routines, and receiving care from multiple providers and pharmacies.[9,10,24,25] During three of the home-based CMRs, the pharmacist identified expired OTC medications. CMRs performed in community pharmacies rely on the patient to bring all current medications. OTC medications, herbal/dietary supplements, samples received from the doctor's office, and medications filled by other pharmacies are often not brought by patients to in-pharmacy CMRs. In this study, the pharmacist recognized that a patient was taking two medications in the same drug class, utilizing mail order for one medication and a community pharmacy for the other.

In addition to the humanistic outcomes described above, the pharmacist's ability to positively impact a health plan's CMS Star Ratings is in congruence with DTP improvement related to the triple-weighted performance measures found in this study.[12,13] The 2014 adherence thresholds for a Medicare Part D plan Five Star ratings for diabetes, hypertension, and dyslipidemia medications were 82%, 81%, and 76%, respectively.[26] The proportion of study participants adherent to hypertension medications and statins were below the threshold pre-CMR (68% and 60%, respectively) and above the threshold three months post-CMR (91% and 80%, respectively). The proportion of patients adherent to oral diabetes medications in this study met the CMS threshold pre-CMR. Improved medication adherence results in decreased health care costs and improved patient outcomes.[27] Roebuck et al. reported that for every dollar spent on medication for hypertension, diabetes, and dyslipidemia, health care costs decreased by an estimated $10.10, $6.70, and $3.10, respectively.[28] A pharmacy's ability to show improvement in CMS Star Rating measures related to adherence through a home-based MTM service is an avenue to obtain preferred-pharmacy status or develop a pay-for-performance model with a Part D plan.

The addition of CMR completion rates as a performance measure for plan year 2016 should encourage pharmacists to develop methods to increase patient interest and CMR acceptance rates. Doucette et al. found that fewer than one-third of Medicare Part D beneficiaries reported CMR participation.[8] Even lower CMR acceptance rates have been demonstrated in other MTM programs.[22,29] In 2011, CMS reported only 10% of eligible beneficiaries completed a CMR.[13] However, Doucette et al. also reported that providing a CMR at a convenient location performed by their regular pharmacy largely contributes to whether or not the patient participates in a CMR.[8] The high incidence of CMR acceptance (69%) in this study suggests that the convenience of home-based CMRs can increase patient acceptance. This is in congruence with a study by Moultry and Poon that found that patients were highly satisfied with a home-based MTM program and would recommend the service to others.[30] Pharmacists performing home-based CMRs provides an avenue to increase CMR completion rates, improve patient medication adherence, and provide collaborative opportunities between payers and pharmacists. This type of collaboration could conceivably improve patient outcomes, contribute to improved performance on CMS Star Ratings, and allow for the creation of a sustainable home-based MTM service.

Future research should assess the effects of home-based CMRs on DTPs for extended follow-up periods and should evaluate the effects of multiple home visits. Physician collaboration should be considered for future programs involving home-based MTM to provide better continuity of care.[8] In regard to the CMS Star Ratings, future research focusing on performance measures that are not specific to Medicare Part D, but that may be impacted by a pharmacist would be beneficial. For example, measures specific to Medicare Advantage plan ratings include: vaccination rates, management of chronic disease states (e.g., blood glucose and blood pressure control), and completion rates of preventive screenings.[13]

Limitations

Data were collected from a single pharmacy chain in a limited geographic region. The study sample was small and had minimal ethnic and gender diversity. Not all DTPs identified could be monitored via monthly profile review, and as a result, some monitoring was based on patient information at the two-week follow-up phone

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call. Further, data collection was limited to a single home-based CMR per patient and a three-month post-CMR follow-up period. Conducting multiple home visits with patients and a longer follow-up period may provide different results.

Conclusions

By offering home-based CMRs, community pharmacists can increase patient acceptance rates, provide care for patients who are unable to travel to the pharmacy, and make an impact on medication problems that are more likely to be identified during home-based CMRs. Pharmacist-provided home-based CMRs decreased the average number of DTPs per patient (3.44 preintervention vs. 1.48 three months postintervention; $P < 0.001$). Notably, chronic medication adherence was improved as a result of the CMR ($P = 0.012$). The findings from this study warrant future studies utilizing home-based MTM services with longer follow-up periods and multiple CMR interventions.

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