

In-Home Medication Reviews: A Novel Approach to Improving Patient Care Through Coordination of Care

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Abstract The use of multiple medications, in persons 65 years and older, has been linked to increased risk for cognitive impairment, falls, hip fractures, hospitalizations, adverse drug reactions, and mortality. The purpose of this study was to determine if trained undergraduate students, in conjunction with pharmacists, could provide in-home medication reviews and demonstrate benefit to the health and welfare of a senior population affiliated with a primary care facility. Students received training in the completion of an in-home medication inventory, assessing a home for fall risk, and performing blood pressures. Once trained and proven proficient students performed the assessments in homes of Decatur Family Medicine Residency patients 65 years and older. Collected medication inventories were reviewed by a hospital pharmacist for fall risk medications, major drug interactions, or duplicate therapy. Changes to patient management were made by the primary care provider as needed. In all, 75 students visited 118 patients in Fall 2010. Findings from the medication review include: 102 (86%) patients were prescribed at least one fall risk medication; 43% were prescribed 3 or more; 14% had the potential for a major drug interaction; and 7% were prescribed duplicate therapies. Fifty-seven patients had a

subsequent change made to their clinical medication list. The results demonstrate that an in-home outreach can be successfully performed by student volunteers and provide data of high clinical relevance and use. This application of the patient-centered medical home can readily and directly improve patient safety.

Keywords Geriatric · Home visit · Medication review · Patient centered medical home · Undergraduate students

Introduction

In the US the population greater than 65 years and older is growing quickly and is estimated to double from 35 million in 2000 to 71 million by 2030 [1]. Already, persons 65 years and older consume 30% of all prescription medications [2]. The use of multiple medications has been linked to increased risk for cognitive impairment, falls, hip fractures, hospitalizations, adverse drug reactions, and mortality [3–7]. In addition, these outcomes play a major role in skyrocketing health care costs as well as strains on personal and family resources [1]. Further complicating matters is fragmentation of care due to higher utilization of specialist care, over the counter (OTC) alternative and supplemental medications in this population, and client use of more than one pharmacy to meet budget goals and insurance restrictions [8–10]. A pilot study exploring emergency department (ED) recidivism rates concluded that high specialty care and absence of coordinated care increased repeat ED visits among an elderly population [11].

Interventions have been devised to address these issues. However, polypharmacy interventions such as “brown bag” reviews are subject to such limitations as patient recall and compliance [12, 13]. Primary care providers may

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be unaware of what medications their patients are taking. In one study, community-residing seniors were told on several occasions to bring in, “all their medications” for a primary care clinic visit. An in-home medication inspection by a physician revealed that half of all patients had omitted at least 1 regular medicine and that one-fifth had omitted a prescribed medicine [14].

The geriatric population is at an increased risk for many chronic diseases, and therefore often requires more medications than other segments of the population. Organic and iatrogenic memory impairment complicates self-management of medications. Within the current primary care setting, managing medications for the senior population is becoming increasingly difficult. A paradigm of care exists which may serve to address such a challenge. The Patient-Centered Medical Home (PCMH) highlights primary care facilities as the nexus of comprehensive, longitudinal primary care [15–18]. Conceptually, coordination and integration of care is emphasized, and services performed inside and outside the primary office by physicians and healthcare professionals of the PCMH are included. Primary care practices that incorporate the seven essential functions of primary care have lower Medicare spending, lower resource inputs, lower utilization rates, and better quality of care [15, 19, 20].

Purpose

The community outreach model presented here was developed to meet the challenges of polypharmacy through coordination of care and utilization of trained undergraduate students working in the context of a PCMH. Use of students to perform basic health assessment techniques and provide a door-to-door outreach was successfully demonstrated in a previous pilot study [21, 22]. The purpose of this study was to determine if trained undergraduate students, in conjunction with pharmacists, could provide in-home medication reviews, and demonstrate benefit to the health and welfare of a senior population affiliated with a PCMH.

Methods

Undergraduate students, primarily pre-health club members, were recruited from the University of Illinois in Champaign. Students received training in the completion of an in-home medication inventory, assessing a home for fall risk, and performing blood pressures. The team of trainers included a pharmacist (PharmD), physicians (MD), a physician assistant (PA-C), and an occupational therapist (OT) who developed the training modules and proficiency

tests. Students were tested in a pre/post test format, and were considered proficient after passing a written exam with a score of 90%. The training materials were developed collaboratively by the PA-C, PharmD, and OT to enable the students to gather information from patients and assess a home environment. These professionals who developed the training materials utilized published techniques designed to teach perceptive listening, careful observation of details, conversation emphasizing dialogue, recognition of non-verbal communication and specific skills for interviewing older patients [23, 24].

Student trainings consisted of two required sessions. Training session one, mainly didactic, focused student’s attention on how to properly perform an in-home medication review assess a home for fall risk, and perform a blood pressure (BP). Students were given specific training on naming of drugs, and collecting specific information about each drug—name, strength or dose, frequency of administration, PRN (as needed) directions, indicated use for drug and prescribed duration of therapy. Prescription medication bottles were examined for patient and drug information. Sample patient medication lists containing mistakes and discrepancies were reviewed and discussed. Training session two involved simulated in-home interactions in which students had the opportunity to do medication reviews with “mock” patients. All training was completed in September and October 2010.

In-home visits were performed by groups of three students with a medically trained chaperone. Potential recipients of student visits were patients 65 years or older registered with the Southern Illinois University (SIU) Decatur Family Medicine Residency clinical practice (certified as a Level I PCMH by the National Center for Quality Assurance). Approximately 750 valid mailing addresses received a detailed letter, brochure, and consent form approved by the SIU School of Medicine (SIU-SOM) institutional review board. Patients could either call the clinic or mail back a confirmation of their willingness to participate with a written consent to be signed at the beginning of the in-home visit. In addition the homes of patients 65 and older were called along with face-to-face invitations to participate during clinic visits with their PCP. During in-home visits students performed medication reviews. In addition to an up to date list of medications, each visit produced a fall risk assessment, and a BP measurement. All visits were completed on weekends from October through early December 2010.

The medication lists obtained were reviewed by a pharmacist for major drug interactions, duplicate therapy, or medications associated with increased risk of falling. These assessments were then returned to the patient’s physician through the electronic medical record (EMR) as well as hard copy for review and appropriate action.

Additionally, the patient's primary care provider (PCP) was asked to compare the patient's clinical medication list (generated by office visits) to the in-home med list (student list) for any discrepancies, or potential problems.

Results

185 students completed both training sessions and tested proficient. Approximately 75 students participated in the in-home portion of the project. Time constraints kept some students from participating in the outreach portion, however, a great many more asked to participate but were unable to due to limited transportation from Champaign to Decatur (45 miles) and less than expected need for visits (3 students per house, spots filled quickly). Unfortunately, only 118 (16%) patients consented to a home visit. Reasons for poor participation are unknown, but may include being uncomfortable with strangers in the home or prior travel commitments.

Review of the medication lists by a pharmacist revealed that 102 (86%) were on at least one fall risk medication, 51 (43%) patients were on 3 or more, and 12 (10%) were on five or more. Top most common fall risk medications included: Hydrochlorothiazide, Lisinopril, Disphenhydramine, Furosemide, and Amytriptyline. Sixteen (14%) patients had the potential for a major drug interaction (MDI) as determined through review by a hospital pharmacist. Nine (8%) of these patients had a medication change made by their primary care provider correcting the MDI. Table 1 shows the noted MDI and resultant actions. Finally, eight patients were on duplicate therapy (DT) as determined by review of a hospital pharmacist. Duplicate therapies included: Enalapril/Lisinopril, Diltiazem/Nifedipine, Spironolactone/Furosemide, Triamterene/HCTZ. Seven of the patients had a change made to their medication, while one patient was considered stable on their duplicate medications (Furosemide/Spironolactone).

An example of an SIU provider's (EMR) response to a patient on DT is demonstrated in the following comment:

Called patient. Not home today. Spoke to wife and requested her to have patient call SIU. In regards to his meds, as per my records, he is only on Lisinopril 5 mg daily. I don't know who is giving him Coumadin and why he is on it. He has never been on enalapril as per our records.

Finally, 57 (48%) patients had a medication change made to their clinical medication list (generated in office) based upon the in-home medication review. Specifically, the medication change made was a result of discrepancy noted between student observations and the EMR medication list. Medication changes that were frequently necessary

included: removal of antibiotics, use of OTC/supplemental medications, or medications added from other providers. In addition there were several other salient findings noted from comparison of the medication lists. As demonstrated below from an EMR phone note:

Based on In-Home Medication Review, Patient Jane Doe currently taking Metformin 500 mg once a day. However, she was taken off this medication in July 2010 (diet/exercise, sugars had improved). I called this patient about apparent discrepancy, and she has put herself back on Metformin one month after being taken off it, "I should have told Dr. XX, but I was starting to have tingling feelings." In addition she had stopped exercising and her weight had increased. She has felt better since restarting medication as originally prescribed. I will add Metformin back to her med. list and I advised her to call us in future if she is considering any medication changes.

Discussion

In a growing population of elderly patients, there is an increasing need for primary care providers to efficiently and effectively assess myriad medications for fall risk, major drug interactions, duplicate therapy, and other adverse polypharmacy events. In this study, a PCMH provided in-home outreach by using the talents of trained pre-health professional students to provide initial data gathering for these potential risks. Training for the students was evidence-based and student proficiency determined by test. We found the students to be enthusiastic about the opportunity to both learn a new skill and provide a community outreach. We therefore reason that this mode of outreach could be readily adopted in other communities.

The findings of the medication review generally corroborate the literature and our professional expectations: patients were on multiple medications, some in duplicate, and many with attendant fall risks. In all, 102 (86%) were on at least one fall risk medication and 12 (10%) were on five or more. Important to this study were two specific factors, the review of medication in the patient's home and the subsequent updating and review of known prescribed medications by the patient's PCP. The in-home review should minimize many of the weaknesses of other published "brown bag" reviews where patients had to either recall all their medications or bring them somewhere. Furthermore, the direct link of the medication review by a pharmacist and subsequent update of the patient's EMR (or a call directly to the patient's PCP) allows for immediate medication changes to be made as needed. We found that of the 118 patient's reviewed, 57 (48%) had prescription

Table 1 Listing of potential major drug interactions discovered during the Decatur community outreach and subsequent response actions, Fall 2010

Patient	Prescribed drugs	Potential interactions	Actions taken
#1	Simvastatin + Verapamil	Increased risk of myopathy and rhabdomyolysis	PCP removed Simvastatin
#2	Digoxin + Spironolactone	May increase Digoxin levels, risk of toxicity	PCP removed Spironolactone
#3	Cyclobenzaprine + Tramadol	Increased risk of CNS depression, psychomotor impairment	PCP removed Cyclobenzaprine
#4	Clopidogrel + Omeprazole	Decreased efficacy of plavix and increased risk for thrombosis	PCP changed Omeprazole to Protonix
#5	Amiodarone + Carvedilol	May increase beta blocker levels, risk of hypotension, bradycardia, sinus arrest, AV block	Cardiologist prescribes meds. PCP aware of interaction, and in agreement w/treatment
#6	Verapamil + Digoxin	Verapamil and Digoxin have lead to increased Digoxin Concentration	PCP made aware and no change made
#7	Clopidogrel + Omeprazole	Decreased efficacy of plavix and increased risk for thrombosis	PCP changed Omeprazole to Protonix
#8	Atorvastatin + Verapamil	Increased risk of rhabdomyolysis	PCP made aware and no change made
#9	Gemfibrozil + Lovastatin	Increased risk of rhabdomyolysis	PCP made aware and no change made
#10	Warfarin + Simvastatin	Increased risk of rhabdomyolysis and bleeding	PCP made aware and no change made
#11	Clopidogrel + Omeprazole	May result in reduction of clinical efficacy of Clopidogrel and increased risk for thrombosis	PCP changed patient from Omeprazole to Zantac
#12	Amiodarone + Carvedilol Amiodarone + Simvastatin	May increase beta blocker levels, risk of hypotension, bradycardia, sinus arrest, AV block/ Increased risk if myopathy or rhabdomyolysis	PCP asked patient to come in and be seen.
#13	Dicyclomine + Potassium Chloride	Risk of gastrointestinal lesions, and delay of potassium chloride passage through G.I. tract	PCP stopped Dicyclomine.
#14	Simvastatin + Verapamil	Increased risk of myopathy or rhabdomyolysis	PCP made aware and no change made
#15	Clopidogrel + Naproxen	Increased risk of bleeding	PCP told patient to d/c naproxen and prescribed Tramadol for pain relief
#16	Clopidogrel + Omeprazole	May result in reduction of clinical efficacy of Clopidogrel and increased risk for thrombosis	PCP changed patient from Omeprazole to Protonix

MDI major drug interaction; *PCP* primary care provider

changes made, including 9 who had the potential for a MDI. These results indicate that this method of team care has promise to improve outcomes and overall health care for elderly patients.

There are several limitations to this study. One is the assumption that a patient actually brought out all their current medications for review during the home visit. While every attempt was made to encourage patients to do so, it is possible that not all medications in the home were recorded by the students. Another limitation is the assumption of compliance common to other medication

reviews. If the patient indicated they were taking a specific medication, in a specific way, we have no method to determine if that is indeed accurate. Finally, while it may be quite reasonable to think that reducing the use of medications associated with increased fall risk, and finding and eliminating major drug interactions and duplicate therapy, may reduce the incidence of falls and other adverse health effects, we do not have long-term health outcome data for this population.

We fully expect that this program can be successfully duplicated in other locations. Many students are

enthusiastic and eager to participate in community outreach projects and provide a willing workforce. For the practice side, the costs associated with the program were minimal and were centered around travel reimbursements and food during training sessions. This is also an excellent opportunity for a practice to perform a community outreach which yields useful data. And while no one can predict exactly when a fall or adverse medication reaction will occur, lowering such risks through increased preventative measures is the ultimate goal. By demonstrating that students are an enthusiastic and effective resource, patients were appreciative of the time and effort, and that physicians used data to make significant changes in care, it is sincerely hoped projects like this are a step in that direction.

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