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Physician Intervention for Medication Reduction in a Nursing Home: The Polypharmacy Outcomes Project

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Abstract

OBJECTIVES—To examine the effects of a medication review project by geriatricians and geriatric medicine fellows on polypharmacy in a teaching nursing home.

DESIGN—Quality Improvement Intervention Study

SETTING—Long-term care facility in Honolulu, HI

PARTICIPANTS—Seventy-four patients with the Minimum Data Set (MDS) quality indicator (QI) criteria of polypharmacy (nine or more medications).

INTERVENTION—Geriatric Medicine Fellows and Faculty reviewed each patient's medication list, consulted the updated Beers Criteria and Epocrates online drug-drug interaction program, and recommended medication changes to the patients' primary care physicians.

MEASUREMENTS—Descriptive statistics, including means, standard deviations, and sums of variables were obtained for the number of medications in the following categories: total number, scheduled, Pro re nata (PRN), high risk, contraindicated, with potential drug-drug interactions, and with no indication.

RESULTS—Out of 160 patients residing in a nursing home, 74 were on nine or more medications. After the intervention, the mean number of medications per patient in the following categories decreased significantly: total number (16.64 to 15.54, $p<.001$), scheduled (11.3 to 10.99, $p<.001$), PRN (5.33 to 4.56, $p<.001$), high risk (0.94 to 0.73, $p<.001$), contraindicated (0.29 to 0.13, $p=.004$), with potential drug-drug interactions (6.1 to 4.83, $p<.001$), and with no indication (3.34 to 3.29, $p=.045$).

CONCLUSION—Polypharmacy in long-term care is prevalent and can lead to increased adverse effects and potentially inappropriate prescriptions. This study demonstrates an effective geriatrician-led intervention that both reduced polypharmacy and provided core competency training for geriatric medicine fellows.

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Keywords

polypharmacy; long-term care; nursing home

INTRODUCTION

Polypharmacy has been identified as a cause of adverse patient outcomes, and is more common among elderly patients. Patients using greater than or equal to nine medications are significantly more likely than patients on less than nine medications to experience adverse drug reactions.[1,2] Patients taking a significantly larger number of medications are more likely to have potentially inappropriate prescriptions.[3] The nursing home population has one of the highest rates of polypharmacy with prevalence's ranging from 14% [4] to 24% [5] depending on the definition of polypharmacy used (≥ 10 medications or ≥ nine medications respectively). The Minimum Data Set (MDS) quality indicator (QI) trigger mandated by CMS defines polypharmacy as the long-term simultaneous use of nine or more medications. [6] The few previous studies on physician intervention [4, 7, 8] to reduce polypharmacy in long-term care settings were based in countries other than the United States using different methodologies and with conflicting results. The objective of this study is to examine the effect of physician intervention on the number of prescribed medications among elderly long-term care patients in Hawaii.

METHODS

Study Design

The Polypharmacy Outcomes Project was a quality improvement intervention study conducted in October, 2007. This project was initiated to partially fulfill the Accreditation Council for Graduate Medical Education (ACGME) requirement for core competency training of geriatric medicine fellows in practice-based learning & improvement and systems-based practice. The Kuakini Medical Center and University of Hawaii Institutional Review Boards approved the analysis of the Quality Improvement project data for research purposes.

Study Population and Setting

Kuakini Geriatric Care (KGC) is a 180-bed nursing facility with Skilled Nursing Facility (SNF) and Intermediate Care Facility (ICF) levels of care located in Honolulu, HI. In October 2007, there were 160 residents in the facility and 74 of the 160 residents had polypharmacy according to the MDS QI criteria of 9 or more different medications. Of these 74 patients, two died and two were discharged prior to the intervention and were not included in the analysis.

Data Collection

Nine first- and second-year geriatric medicine fellows collected data on the medication regimens of the 70 teaching nursing home residents identified as having polypharmacy using the MDS QI criteria. Medication data included start date, dosing frequency and therapeutic indication. Scheduled medications were defined as those given every day. Pro re nata (PRN) medications were defined as those given on an as needed basis. Medications without therapeutic indications were noted. All fellows received training in the use of the standardized data collection tool. Data collection quality and consistency was monitored by the attending geriatrician and two lead geriatric medicine fellows and any discrepancies in data collection were resolved through a second data extraction by the attending geriatrician and lead geriatric medicine fellows.

Key Measures

High risk medications were defined by the updated Beers Criteria, [9] a comprehensive set of explicit criteria for potentially inappropriate medication use in people over 65 years old. Disease-specific high risk medications were not recorded as this was beyond the scope of the project. Contraindications and potential drug-drug interactions were defined by the Epocrates online program, a proprietary database in use by many physicians/pharmacists and used in previous research.[10, 11] Medications were considered to have "no indication" if no diagnosis was listed with the pharmacy medication order sheets.

Study Intervention: Phase I

After data collection was completed, the geriatric medicine fellows reviewed each patient's medication list and consulted the updated Beers Criteria. Fellows then made recommendations to continue, stop or taper each medication. Medications were recommended to be continued if they were not on the updated Beers criteria and there were valid indications for their use. Medications were recommended to be tapered if the medications appeared in the updated Beers criteria and could not safely be discontinued abruptly. Medications were recommended to be discontinued if the medications appeared on the updated Beers criteria and could be safely discontinued. Medications without indications were recommended to be discontinued. A list of recommendations was generated for each study patient's medication list.

Phase II

The extracted data were reviewed and any discrepancies were resolved by consensus between lead fellows and attending geriatrician. Using the Epocrates online drug-drug interaction program, the medication regimens were reviewed for contraindications and potentially serious drug-drug interactions. The lead fellows and attending geriatrician generated a second set of recommendations based on this review. The attending geriatrician consolidated and finalized all recommendations.

Phase III

The two lead geriatric medicine fellows or the attending geriatrician met in person or called the patients' nursing home primary care physicians (PCP's) with recommendations from the review process. The nursing home PCP made the final decision of continuing, discontinuing or attempting to taper individual medications. To maximize good relations and long-term viability of the project, there were no attempts to coerce the PCP's into following any recommendations. Any medication order changes were entered into the patients' charts by the lead geriatric medicine fellows or attending geriatrician with the PCP's permission.

Phase IV

A final chart review was conducted to confirm whether recommended medication changes were ordered, in order to determine outcomes.

Statistical Analysis

Medications that were discontinued due to the intervention were assigned a category based on the usual primary use of the medication. Medications were sorted into categories according to the most common nursing home medication indication. Descriptive statistics were used to calculate means, standard deviations, and sums of variables. Mean numbers of various categories of medications pre- and post-intervention (PRN medications, scheduled medications, and total PRN plus scheduled medications) were compared using t-tests. Pre- and post-intervention numbers of high risk medications (those that appeared on the updated Beers criteria), medications with potential contraindications and drug-drug interactions

(based on Epocrates drug-drug interaction program), and medications without indications were compared using t-tests. All p values presented are two tailed; $p < 0.05$ was considered statistically significant. Data were analyzed using SAS (version 9.1; SAS Institute, Cary, NC).

RESULTS

Of the 160 patients residing in the nursing home in October 2007, 70/160 (46.2%) were on nine or more medications. Average patient age was 82.7 years; 27.1% were male and 72.9% were female. These 70 polypharmacy patients were prescribed a total of 1165 medications: 68.0% were scheduled medications and 32.0% were PRN medications. The majority of patients with polypharmacy (50/70, 71.4%) were given a recommendation for a change in their medication regimen.

The medication outcomes of the intervention are shown in Table 1. There were significant reductions in all key medication measures. Table 2 lists the categories of discontinued medications. The category most frequently discontinued was gastrointestinal agents. Antimicrobials were the most frequently discontinued scheduled medications, while gastrointestinal agents were the most frequently discontinued PRN medications.

DISCUSSION

To the authors' knowledge, this is the first study in the United States of a physician intervention for polypharmacy in nursing homes. In this nursing home population, 46.2% of the patients were on nine or more medications. After the physician intervention, there were statistically significant decreases in all medication key measures. There were reductions in the mean number of total medications, scheduled medications, PRN medications, high risk medications, contraindicated medications, medications with potential drug-drug interactions and medications with no indication. This study demonstrated that systemic application of medication guidelines and tools significantly reduced polypharmacy. This effective practical intervention could be replicated at other nursing homes as the guidelines and tools are readily accessible and familiar to nursing home physicians. Further, this intervention demonstrated utility for teaching ACGME core competencies in a geriatric medicine training program.

The previous literature on interventions for polypharmacy has demonstrated mixed results. A Swedish study performed an intervention using a team with a physician, pharmacist, selected nurses and nursing assistants to decrease non-recommended medications.[7] After the intervention, the intervention group had no significant change. An Australian nursing homes study examined the number of medications after interdisciplinary case-conferences.[8] After the conferences, there was a non-significant trend towards reductions in total number of medications and total administered medications. In a Dutch nursing homes study, teams consisting of a hospital pharmacist and a nursing home physician performed medication reviews with a follow-up meeting six weeks later.[4] After physician intervention, there was a significant decrease in the number of medications. One United States pharmacist-intervention study showed a significant decrease in the mean number of prescriptions filled.[12] Physicians were not included in the study intervention. Another United States pharmacist-intervention study showed a non-significant decrease in the cumulative drug use in the intervention nursing homes compared with the control nursing homes.[13] Physicians were not included in the study intervention, and contact with the physicians was indirect, through written reports placed in charts for the residents' physicians to read. No previous studies have examined the effects of a physician-led intervention to reduce polypharmacy in a U.S. nursing home.

The strengths of this study include the practical applicability and complete follow-up of the intervention. The direct communication of recommendations and follow-through may have been more powerful than the indirect communication used in other studies. The geriatric medicine fellows benefited from participating in this quality improvement project, indicating improved understanding of polypharmacy in nursing homes as a result of this project. This project helped the geriatric medicine fellowship program fulfill its ACGME requirements for training fellows in practice-based learning and improvement and systems-based practice.

The study results may not be applicable to a nonacademic nursing home setting. This study involved only one nursing home, with 160 residents. A large number of patients were on the faculty teaching nursing home service, an academic setting with a faculty geriatrician as the attending physician.

The MDS QI definition of polypharmacy (nine or more medications) has been used as standardized criteria in the literature.[5] This criterion may miss patients with drug-related problems who are taking fewer medications. Drug-disease interactions were not taken into consideration. This study did not follow morbidity or mortality outcomes of medication interventions, a potential area of future research.

This study used the updated Beers criteria to detect potentially high risk medications and Epocrates to detect medications with potential drug-drug interactions and contraindications. Other measurement tools including Medication Appropriateness Index (MAI),[14] the Assessing Care of Vulnerable Elders-3 Quality Indicators (ACOVE),[15, 16] Healthcare Effectiveness Data and Information Set (HEDIS) Measures,[17] Computer-assisted decision support [18] and Centers for Medicare and Medicaid Services Regulations [19] are available and have been used in the literature.[20] While the tools used in this study are used by many physicians and organizations, they may be less comprehensive than other measures. However both the Updated Beers Criteria and Epocrates are easily accessible, practical and applicable for busy physicians, enhancing reproducibility of this intervention.

Future Directions

The feasibility of implementing this intervention in different types of nursing homes is an important area of future research. Future studies should also compare validated instruments to identify patients at risk for adverse effects from medications. More research is needed to develop innovative strategies for preventing polypharmacy in the long-term care setting. Long-term outcomes and sustainability of this project are future directions for research.

CONCLUSION

Polypharmacy in long-term care is prevalent and can lead to increased adverse effects and potentially inappropriate prescriptions. This study demonstrated an effective geriatrician-led intervention that both reduced polypharmacy and provided core competency training for geriatric medicine fellows.

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Table 1

Medication Outcomes of Intervention: Mean Numbers per Patient

Key Medication Measures	Pre-Intervention Medications (N=1165)	Discontinued Medications (N=77)	Post-Intervention Medications (N=1088)	P value, pre-post
Overall medications	16.64 (±4.46) range 10–38	1.10 (±1.24) range 0–5	15.54 (±3.91) range 10–34	<.001
Scheduled medications	11.30 (±3.22) range 6–25	0.33 (±0.56) range 0–3	10.99 (±3.17) range 6–24	<.001
PRN medications	5.33 (±1.94) range 1–13	0.77 (±1.09) range 0–4	4.56 (±1.42) range 1–10	<.001
High risk medications	0.94 (±1.39) range 0–9	0.21 (±0.48) range 0–2	0.73 (±1.25) range 0–8	<.001
Medications with contraindications	0.29 (±0.74) range 0–4	0.16 (±0.44) range 0–2	0.13 (±0.48) range 0–3	0.004
Medications with potential drug-drug interactions	6.10 (±5.71) range 0–34	1.27 (±2.67) range 0–16	4.83 (±4.19) range 0–21	<.001
Medications with no indications	3.34 (±3.36) range 0–12	0.06 (±0.23) range 0–1	3.29 (±3.36) range 0–12	0.045

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Table 2

Categories of Discontinued Medications

Medication Categories	Total (%) (n=77)	Scheduled (%) (n=23)	PRN (%) (n=54)
Gastrointestinal	23 (29.9)	4 (17.4)	19 (35.2)
Antimicrobials	12 (15.6)	12 (52.2)	0 (0.0)
Analgesics	11 (14.3)	1 (4.3)	10 (18.5)
Respiratory	8 (10.4)	0 (0.0)	8 (14.8)
Central Nervous System	7 (9.1)	1 (4.3)	6 (11.1)
Anticholinergic	7 (9.1)	1 (4.3)	6 (11.1)
Topical Steroids	3 (3.9)	2 (8.7)	1 (1.9)
Ocular	3 (3.9)	1 (4.3)	2 (3.7)
Cardiovascular	2 (2.6)	0 (0.0)	2 (3.7)
Diabetic	1 (1.3)	1 (4.3)	0 (0.0)

* Numbers do not add up exactly to 100 due to rounding