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Medication Reconciliation in Hospice: A Pilot Study

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Background: The Joint Commission required implementation of medication reconciliation processes by January 2006. Medication reconciliation is the practice of acquiring an accurate medication history at each transitional point of care. Potential for errors increases with inaccurate medication histories. This study determined the extent of medication reconciliation errors in hospice.

Methods: Patients were enrolled from 2 hospices in Maryland (January 2007). An initial medication history was completed by the nurse on hospice admission. The pharmacist did another medication history within 5 days of admission and compared the medication histories. All differences were reported as medication discrepancies.

Results: There were 504 medication discrepancies. Medication omissions occurred most commonly. All patients had at least 1 medication discrepancy (average 8.7 per patient). Overall, 190 drug interactions were identified; most were moderately severe.

Conclusion: Terminal patients often use numerous medications increasing the risk of medication errors. Accurate medication histories reduce errors and potential for harm.

Keywords: medication reconciliation; medication history; Joint Commission National Patient Safety Goal 8; home hospice; medication error potential; medication discrepancies

Introduction

Medication reconciliation (MR) is the practice of obtaining the most accurate list of medications for all patients at each transition of care including admission, transfer between levels of care, and discharge.[1] Medication information should be accurately communicated to the next provider at all transitional points of care. The potential for medical errors increases when there is breakdown of communication during these transitions.[1,2] Inaccurate or incomplete medication histories may lead to patient harm, particularly when they are used as the basis for new medication orders.[2] In essence, MR is a process of safe practices designed to prevent the occurrence of medication-related problems (MRPs).

Medication-related problems occur commonly and can be associated with significant morbidity and mortality. The 1999 Institute of Medicine Report revealed that MRPs are responsible for approximately 7000 hospital-related deaths each year, especially due to prescribing and medication administration processes.[3] Medication-related problems are divided into 8 categories: (1) untreated indication, (2) drug use without indication, (3) improper drug selection, (4) failure to take or receive medications, (5) overdosage or supratherapeutic dose, (6) underdosage or subtherapeutic dose, (7) adverse drug reactions, and (8) drug interactions (DIs).[4] Adverse events are a major concern and a common result of medication errors, contributing to approximately 44 000 to 98 000 deaths annually.[5] Half of hospital-related medication errors and one fifth of hospital-related adverse events are the result of

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breakdown in communication during transitional points of care.[6] Roughly 90% of DIs in the emergency department occur in patients taking at least 3 or more medications concurrently.[6,7]

Certain patient populations have a higher risk for MRPs, particularly the elderly and critically or chronically ill patients using an assortment of medications for comorbid and chronic medical conditions. Hospice patients are a high-risk population, frequently consuming at least 3 or more medications concurrently. Additionally, hospice patients frequently experience physiologic changes due to advanced disease, which potentially alter the pharmacodynamics (drug effects) and pharmacokinetics (drug absorption, drug distribution, protein binding, drug metabolism, and excretion) of medications, increasing the risk for medication misadventures.

In 2005, the Joint Commission created National Patient Safety Goal (NPSG) 8 for reconciling medications.[8] NPSG 8 mandated that all accredited organizations develop and implement effective MR processes by January 1, 2006. Organizations were required to develop processes for the collection and documentation of a complete list of all the patient's current medications upon admission into, transfer within, and discharge from an institution, with the help of the patient. The medication list must be verified for accuracy, and all inconsistencies must be addressed by the prescribing physician and resolved before new medications are prescribed. The reconciled medication list should be consulted for further drug therapy decision making and kept current at all times. Finally, the medication list must be communicated to the patient's next provider of care and the patient must also receive a copy upon discharge from an organization.

The Institute for Healthcare Improvement (IHI)[6] and the Massachusetts Coalition for the Prevention of Medical Errors[9] have provided instructional examples to aid in the development of MR processes, through a series of steps. Step 1, obtain a medication history from the patient for all medications taken at home, (prescription, nonprescription, herbals, vitamins, and dietary supplements). All medications should have a dose, dosage form, route of administration, and frequency of use listed; if possible the date and time of the last dose should also be recorded. For patients unable to provide accurate details any and all accessible resources of medication information should be exhausted (home medication lists, family members/caregivers, community pharmacies, and primary care physicians). Drug and food allergies with reactions should also be described and documented. Step 2, develop a list of admission medications. Step 3, compare the home medication history with the list of admission medications, identify any discrepancies between the 2 lists of medications (eg, omitted or duplicate medication orders, and potential MRPs). Step 4, resolve all detected discrepancies and document in the patient's medical record. Step 5, provide a copy of the medication history to the next provider of care as well as to the patient on discharge from the organization.

Numerous institutions and outpatient facilities have successfully implemented MR processes.[6,9] However, there is a paucity of information about MR practices in the hospice setting. The objectives of this study are (1) to determine whether MR errors occur during hospice admission and (2) if present, to describe the type and frequency of medication discrepancies observed in hospice.

Methods

This pilot study was conducted during January 2007 and enrolled patients from 2 hospice programs in Maryland; both programs are certified by Medicare and the Joint Commission (formerly JCAHO). Each of the hospice programs primarily provide home-based assistance, in addition to institutional support for patients in facilities (assisted living facilities [ALF], hospitals, long-term care [LTC], skilled nursing facilities [SNF], and rehabilitation centers [rehab]). An assortment of services are provided by the hospice including physician and nursing assessment and management, spiritual counseling, and volunteer services, as well as grief and bereavement for patients, family members, and other loved ones. Both hospices are also affiliated with consultant pharmacists who (1) perform continual medication regimen review for all patients, (2) are a resource for pharmaceutical information on pain and other symptoms, and (3) evaluate hospice medication formulary to ensure cost-effective use of medications. Hospice A had an average daily census of 190 patients during January 2007 and for hospice B the average daily census was 87 patients.

The study protocol was approved by the University of Maryland, School of Medicine Institutional Review Board in Baltimore, Maryland. Study participants and/or their caregivers were required to provide consent prior to study participation.

Study participants were selected by convenience sampling and were included if (1) they were a newly admitted hospice patient >18 years of age, (2) they or their caregivers were able to speak and understand English, and (3) they or their caregivers were responsive and able to answer questions about medications and medical history. Patients with impaired cognition without a competent caregiver were excluded.

Each week day (Monday to Friday) during January 2007, the pharmacist collected a patient admission list and discussed patient eligibility with the nurse case manager. Eligible patients were contacted by the pharmacist and appointments were made to visit the place of residence (home, ALF, SNF, LTC, or rehab) within 5 days of hospice admission. During the visit the pharmacist collected a second medication history from the patient, caregivers, and/or the family .The pharmacist-collected medication history included information on prescription, nonprescription, herbals, dietary supplements, vitamins, drug, and food allergies (with descriptions if possible). To avoid information bias, the pharmacist was blinded to the initial medication history prior to patient interview.

Following the pharmacist's interview, the new medication history was compared with the initial admission medication history. Any medication disagreements or inconsistencies between the admission medication list and the second medication list were resolved and the medical record was updated to reflect the most accurate medication history.

Medication discrepancies were defined as errors of omission (EOM, medications not included on the admission medication list), errors of commission (medications listed on the admission medication list but which were not being used by the patient), incomplete or inaccurate medication information (eg, wrong dose, route, or frequency of use or indication of use), and inconsistent allergy information (absent or incorrect medication or food allergies and their descriptions). All new medications that were started between the day of admission and the pharmacist interview were not counted as discrepancies to avoid overestimation of errors.

Bivariable analyses (chi-square or Fisher exact tests for categorical variables and *t* tests for continuous variables) were used to compare characteristics and medication discrepancies between the 2 hospices and to explore variations in discrepancies by patient characteristics. An alpha level of statistical significance was a priori set at .05.

Table 1. Characteristics of Hospice Patients—January 2007

Characteristic	Hospice A, n = 32	Hospice B, n = 26	*P* Value
Mean ± SD age, years	80 ± 12	81 ± 12	.66[a]
No (%) females	21 (66)	17 (65)	.88[b]
Diagnosis on admission, no (%)			
Cancer	8 (25)	14 (54)	<.001[b]
Noncancer	24 (75)	12 (46)	
Place of residence, no (%)			
Home	11 (34)	16 (62)	<.001[b]
Assisted living facility (ALF)	11 (34)	3 (12)	
Nursing home (NH)	6 (19)	6 (23)	
Rehabilitation center (rehab)	4 (13)	1 (4)	
Mean no medications/ patient	19.8 ± 6.5	18.4 ± 5.1	.38[a]

[a]2-tailed Student *t* test.
[b]Chi-square test.

Results

The study enrolled a total of 58 patients; 32 patients from hospice A and 26 patients from hospice B (Table 1). Average patient age was similar between groups (80 years at hospice A and 81 years at Hospice B, $P = .66$). Most patients (52%) were between 65 and 85 years of age; and there were more female patients (66% at hospice A and 65% at hospice B, $P = .88$) in both groups.

The primary diagnosis on hospice admission was categorized as either cancer or noncancer and was significantly different between hospices. Compared to hospice B, hospice A had a higher proportion of noncancer diagnoses (75% vs. 46% $P < .001$). The most common noncancer diagnosis at hospice A was debility or failure to thrive and the most common noncancer diagnosis at hospice B was dementia. Lung cancer was the most prevalent cancer diagnosis at both hospices. Approximately one third of patients at hospice A and two third of patients at hospice B lived at home. The mean medications per patient were similar (hospice A, 19.8 ± 6.5; hospice B, 18.4 ± 5.1, $P = .38$).

Overall, 504 medication discrepancies were identified among the 2 hospices. Eighty-two percent of the medication discrepancies identified were EOM (Table 2). "Other" medication discrepancies discovered were incorrect frequency of use, incorrect dose, incorrect medication, missing or incorrect

Table 2. Medication Discrepancies Identified at Hospices A and B—January 2007[a]

Types of Discrepancies	Hospice A, No (%); n = 279	Hospice B, No (%); n = 225	Total, No (%); n = 504
EOM			
Prescription medications	117 (41.9)	79 (35.1)	196 (38.9)
Nonprescription medications	110 (39.4)	67 (29.8)	177 (35.1)
Vitamins/minerals/ supplements	11 (3.9)	14 (6.2)	25 (5.0)
Herbals	4 (1.4)	6 (2.7)	10 (2.0)
Others			
Incorrect frequency of use	16 (5.7)	30 (13.3)	46 (9.1)
Incorrect dose	15 (5.4)	20 (8.9)	35 (6.9)
Incorrect medication listed	1 (0.4)	5 (2.2)	6 (1.2)
Incorrect allergy information	4 (1.4)	3 (1.3)	7 (1.4)
Incorrect medication formulation	0 (0.0)	1 (0.4)	1 (0.2)
Incorrect route of administration	1 (0.4)	0 (0.0)	1 (0.2)

Abbreviations: EOM, errors of omission.
[a]$P < .003$ Fisher exact test, comparing hospice A to hospice B.

allergy information, incorrect medication formulation, and incorrect route of administration. No errors of commission were identified. Overall, distributions of discrepancy types were different between the 2 hospices (Table 2, $P < .003$). Among the 279 medication discrepancies found in hospice A, 242 (87%) were EOM and 37 (13%) were "other" medication discrepancies. Hospice B had 225 medication discrepancies; 166 (74%) were EOM and 59 (26%) were "other" medication discrepancies (Table 2).

Prescription medication EOMs accounted for more than one third of all discrepancies (Table 2). Nonprescription medication EOMs were the second most common type of discrepancy (177; 35%). Incorrect frequency of use (9.1%) and incorrect dose (6.9%) were the most commonly occurring non-EOM types of discrepancies (Table 2). At hospice A, 97% (272/279) discrepancies were identified from the initial medication history taken by the admission nurse and 3% (7/279) discrepancies were identified on the second medication history (taken by the pharmacist). At hospice B, 87% (195/225) discrepancies were detected on the admission medication history and 13% (30/225) of discrepancies came from the second medication history.

Table 3. Average Number of Discrepancies According to Hospice Patient Characteristics—January 2007

Characteristic	Mean Number of Discrepancies/Patient	*P* Value[a]
Hospice A (n = 32)	8.7 ± 4.5	.95
Hospice B (n = 26)	8.7 ± 4.2	
Sex		
Males (n = 20)	8.9 ± 4.3	.84
Females (n = 38)	8.6 ± 4.4	
Age (years)		
≤74 (n = 15)	10.4 ± 4.2	.07
≥75 (n = 43)	8.1 ± 4.3	
Diagnosis		
Cancer (n = 22)	9.4 ± 4.2	.35
Noncancer (n = 36)	8.3 ± 4.4	
Residence		
Home (n = 27)	10.2 ± 4.1	.01
Other (n = 31)	7.4 ± 4.1	

[a]2-tailed Student *t* test.

All patients (n = 58) in the study had at least 1 medication discrepancy. On average there were 8.7 discrepancies per patient. Fifteen of the 32 patients (47%) from hospice A and 3 of the 26 patients (12%) at hospice B had medications altered (initiated or discontinued) between admission and the pharmacist's interview had medications altered between admission and the pharmacist's interview; these were not counted as MR errors. Certain patient characteristics including hospice site, sex, age, diagnosis, and location were evaluated to determine the impact on the number of medication discrepancies observed (Table 3). The average number of discrepancies per patient (Table 3) did not differ significantly by hospice site, sex, age or primary diagnosis. However, more discrepancies were discovered in patients residing at home as compared to other places of residence ($P \leq .01$; Table 3).

Inaccurate or incomplete medication histories increase the potential for drug-drug interactions. Therefore, the medication discrepancies identified in this study were scrutinized for potential drug-drug interactions with the Medscape Drug Interaction Checker (MDIC).[10] Table 4 displays the number and severity of the DIs captured on the medication histories for both hospices and are categorized according to severity (contraindicated [CI], severe, moderate, and mild). A total of 135 moderate, severe, or contraindicated DIs were detected from the hospice

Table 4. Number of and severity of drug interactions—January 2007[a]

	Hospice A			Hospice B		
Severity of Interaction	First Med Hx	Second Med Hx	Difference in Identified DIs	First Med Hx	Firnd Med Hx	Difference in Identified DIs
Contraindicated	4	6	2	2	2	0
Severe	5	6	1	2	5	3
Moderate	57	93	36	65	78	13
Mild	0	0	0	0	0	0

Abbreviations: DIs, drug interactions; Med Hx, medication history.
[a] Detailed description of the drug-drug interactions are available upon request.

admission medication history; this number rose to 190 on the pharmacist-collected medication history.

Discussion

Most medication discrepancies identified in this study were EOM. Prescription medications frequently missed included analgesics, antiemetics, antispasmodics, anxiolytics, laxatives, and oxygen; these medications are used often to ameliorate symptoms of hospice patients. Nonprescription medications commonly missed were wound care products and laxatives. Omissions of vitamins, minerals, dietary supplements, and herbal products were not as high as anticipated, given use of these products in the general US population.[11]

Patient characteristics, hospice site, sex, age, and diagnosis did not correlate with increased occurrence of medication discrepancies per patient (Table 3). Only place of residence had a statistically significant increase in the average number of discrepancies per patient. Home-based patients had more discrepancies compared to patients living within facilities. This may be a reflection of the fact that patients living at home are generally able to hoard more medications compared to patients in facilities; facilities must be accountable for all medications for each of their residents and are therefore more restrictive about patient access to medications.

On average, patients in this study used approximately 18 medications concurrently. Table 3 displays the mean number of discrepancies per patient as 8.7 (for both hospices). Alarmingly nearly half of the medications being taken by each patient had a discrepancy. This dramatically increases the risk for potential adverse events, medication errors, and DIs. Data from Table 4 demonstrate that a more comprehensive medication history allows identification of more potential DIs that may increase the patient's risk of adverse events and harm. However, this study was not originally designed to examine outcomes of an improved MR therefore the true effect of the potential DIs and adverse events that may occur during the hospice admissions process is as yet unknown.

Our findings are consistent with other studies of MR in various settings. Nester and colleague, compared a pharmacist-collected medication history to a nurse-collected medication history in a tertiary care hospital and found that the pharmacist-collected medication histories identified more inconsistencies between the home medications and new medication orders (34% vs 16% in the control group, $P < .001$).[12] Compared to nurses, pharmacists also identified more nonprescription and herbal medications taken by patients, 98% versus 70% ($P < .001$). Compared to nurses, the pharmacists made more attempts to contact the community pharmacy for clarification of medications, 24% versus 4% ($P < .001$); and pharmacists were also able to update patient's allergy information more quickly than nurses, 68 $\pm$ 30 minutes versus 156 $\pm$ 123 minutes ($P < .005$).

Gleason et al[13] sought to identify the type, frequency, and severity of medication errors on admission for newly hospitalized patients and to determine whether a pharmacist-collected medication history was capable of reducing the rate of medication errors in new admission patients. Pharmacists made 97 interventions in 55 of the patients. The most common discrepancies requiring interventions were complete omission of a medication taken at home (42.3%). The second most frequent discrepancy was wrong dose, route, or frequency of a medication previously taken at home (35.1%); and the most frequent class of medications involved in the discrepancies were vitamins and electrolytes. The authors concluded that 22% of the discrepancies detected would have resulted in harm to the patient during

hospitalization; while 59% of the discrepancies would have resulted in continued harm after discharge if they were not detected.

Limitations of this study included patient recall bias, given that patients were interviewed by the pharmacist 3 to 5 days following admission, potentially altering (eg, enhancing) recall of medical/medication information. The hospice admission process can be a disconcerting and tiring experience that can affect the patient's concentration and subsequently the reliability of information obtained and may have contributed to some variability in the medication histories. It is not uncommon for medication changes to occur within the initial days of hospice admission, particularly if symptoms were not optimally controlled. Forty-seven percent of patients from hospice A and 12% patients from Hospice B had new medications started between admission and the pharmacist's interview. Medication changes (additions or discontinuations) between admission and the pharmacist's interview were not evaluated as discrepancies to prevent overestimation of the results. Caregiver recall bias was another limitation encountered as some patients were unable or incapable of providing information about their medications, particularly if they were not the primary caregiver of the patient, potentially providing inaccurate information and inflating the number of medication discrepancies. For this study, patients were enrolled by convenience sampling and these results may not necessarily be representative of other hospice populations. In addition, the pharmacist was the primary person responsible for completing the analysis for the study.

This pilot study was designed to examine the current process of medication documentation at hospice admission and to explore the potential benefit of a more vigorous medication history collection following admission. It did not seek to demonstrate the superiority of one health care profession over the other (nurse-collected history ves. pharmacist-collected history). Study results indicate that the current practice of medication documentation during hospice admission is inadequate. For the purposes of this study, the second medication history was considered more robust and inclusive than the initial (admission) medication history. However, the second medication history was not always 100% effective and there were several occasions in which vital medications or medical history was missed. Therefore, it can be surmised that a more robust medication history form and continual review and update of the patient's medication profile would be valuable practices for reducing medication misadventures and enhancing patient safety.

Conclusion

To date, this is the first study to examine the type and frequency of medication discrepancies that can occur during the transition into hospice care. There were a total of 504 discrepancies identified from a population of 58 patients, with at least 1 discrepancy per patient, and an average of 8.7 discrepancies per patient. The results of this study undeniably demonstrate a need for improved processes to ensure that all medications are accurately captured as patients are transitioned into hospice care.

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