Medication Discrepancies During Transitions of Care: A Comparison Study

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Purpose: Concerns surround discontinuity of care and poor communication during transitions of care between inpatient and outpatient settings. This study was designed to examine the differences in medication discrepancies during these transitions between an outpatient clinic with admitting privileges (PCP-AD) and another without admitting privileges (PCP-NOAD).
Methods: Retrospective, chart review of patients admitted to the hospital between January and July 2009, who stated their primary care provider (PCP) was from either one of the outpatient clinics. Charts were evaluated for medication discrepancies on admission and discharge and follow-up with PCP after discharge.
Results: On both admission and discharge, PCP-AD had a rate of unacceptable discrepancies less than that of PCP-NOAD, 63.4% versus 90.3% ($p < .001$) and 44.9% versus 84.1% ($p < .001$) respectively. Patients prescribed more than 10 medications were more likely to have a medication discrepancy compared with those on fewer medications ($p = .003$). Additionally, 85% of patients from PCP-AD followed up after discharge compared with 62.7% from PCP-NOAD ($p < .001$).
Conclusions: The differences between the two groups in medication discrepancies and follow-up are suggestive of increased continuity of care with fewer discrepancies when PCPs are directly involved in inpatient care. A comprehensive and accurate medication history is imperative regardless of practice model.

Purpose

The Society of Hospital Medicine (2012) defines hospitalists as physicians who specialize in the practice of hospital medicine. With almost half of all hospitals in the United States utilizing hospitalist's services, there are approximately 20,000 practicing hospitalists (Terry, 2008). The hospitalist model was initially designed to decrease hospital costs, reduce hospital length of stay, improve patient safety, and allow primary care providers (PCPs) to focus on outpatient care, while hospitalists specialize in inpatient care (Harrison & Curran, 2009). However, with more patients being seen inpatient by a hospitalist rather than their PCP, there is concern about discontinuity of care and lack of communication during the transitions between settings (Kripalani et al., 2007).

Concerns associated with these transitions include an increase in medication discrepancies on admission and discharge and a lack of appropriate follow-up. Studies have identified issues with medication errors on admission related to incomplete medication histories (Dobrzanski, Hammond, & Kahn, 2002; Pippins et al., 2009; Tam et al., 2005). Upon discharge from the hospital, one study found that 49% of patients experienced at least one medical error in medication continuity, diagnostic workup, or test follow-up (Moore, Wisnivesky, Williams, & McGinn, 2002).

To help address concerns with medication discrepancies during the transition of care, the Joint Commission (2011) set a goal to "accurately and completely reconcile medications across the continuum of care." This goal includes transitions to and from the outpatient setting. In response to this issue of poor medication reconciliation, the government, as part of the Healthcare Reform, in 2011 established a Community Care Transition Program to assist Medicare beneficiaries with follow-up care after hospital discharge (Healthcare.gov, 2010). This program focuses on reducing hospital readmission and maintaining or improving quality of care (Centers for Medicare & Medicaid Services, 2011).

Although evidence has highlighted a disconnect during the transition of care between inpatient and outpatient settings, it is not known if there are similar issues in medication discrepancies and follow-up when the PCP is responsible for inpatient care of the patient. This study was

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conducted to determine if there were differences in medication discrepancies during transitions in care between an outpatient physicians' office with admitting privileges, where the PCP or another physician from the same practice was primarily responsible for patient care while in the hospital and another physicians' office without admitting privileges in which hospitalists' services are utilized.

Methods

This was a retrospective analysis of patient medical records conducted through one hospital with patients admitted from two outpatient offices. One of the offices consists of seven internal medicine physicians and one cardiologist, all with admitting privileges to the hospital (PCP-AD). The other office consists of five family medicine physicians and four physician's assistants, none of who have admitting privileges to the hospital (PCP-NOAD). As a result, patients admitted to the hospital whose PCP is PCP-NOAD are exclusively managed by hospitalists employed by the hospital.

A patient list was generated for patients admitted to a nonprofit, 411 bed, level II trauma center between January and July 2009 that stated their PCP was from either one of the two outpatient offices. Patient charts were obtained from their outpatient office and each chart was then evaluated for demographic information, including patient age, gender, type of insurance, and PCP of record. Patient charts were also evaluated for follow-up time with PCP after hospital discharge. Patient charts were only excluded if no record was found at the primary care site. Each site had a designated reviewer using the same data collection sheet for chart review. Discussion between reviewers and authors occurred regarding definition of discrepancies as needed on a case-by-case basis for scenarios that did not fit prior discussions.

Medication discrepancies were evaluated on admission by comparing the patient's home medication list documented by the hospital on admission and the most recent follow-up with the PCP. Discrepancies on discharge were evaluated by comparing the discharge summary medication list, or if available, the medication list given to the patient at discharge to the first follow-up visit with the PCP. When available, patient notes from other physicians or specialists were evaluated to determine if changes occurred between hospital admission and last PCP follow-up and hospital discharge and first PCP follow-up to possibly account for discrepancies found. If documentation of medication changes was found in other physician or specialist notes, the medication changes were not considered a discrepancy. Medication histories were usually taken in the outpatient setting by office staff that included medical assistants, certified nursing assistants, licensed practical nurses, and registered nurses and in the inpatient setting by registered nurses. Physicians or pharmacists were rarely involved in conducting medication reconciliation. Comparison of individuals conducting the medication reconciliation by training, degree, or procedure used for reconciliation was not evaluated for this study. Medications were evaluated for total number of medications and medication discrepancies at both admission and discharge. An incorrect medication, strength, frequency, dosage form (e.g., immediate release formulation vs. extended release formulation, enteric coated vs. nonenteric coated, dual medication formulations vs. individual medications), additional or omitted medications were all considered a medication discrepancy. Prescription medications and aspirin were evaluated while other over-the-counter medications, herbals, vitamins, antibiotics, and short-term prescriptions (i.e., short-term pain medication) were excluded from the study.

Analyses were conducted with number of medication discrepancies compared to total number of medications at admission and discharge to determine if any type of correlations existed. A discrepancy: total medications ratio of ≤ 0.15, which corresponds to at least an 85% accuracy of a patient's medication list, was considered acceptable. The higher discrepancy: total

medication ratio corresponds to more discrepancies per medication.

Descriptive statistics were evaluated for demographics and continuous variables. Comparisons between the offices for nonnormally distributed continuous variables (i.e., number of medications, age) were analyzed with the Mann–Whitney *U* test. Logistic regression was used to compare medication discrepancies between clinics controlling for factors, such as number of medications on admission and discharge, insurance status, and age categories. For other comparisons between offices, chi-square and *t* tests were used for nominal and continuous variables to determine if differences existed. *p* Values of $<.05$ were determined to be significant. PAWS Statistics Version 17.0, Chicago, IL, was used for statistical analyses. Institutional Review Board approval was obtained through the hospital and university associated with the hospital prior to the commencement of the study.

Results

A total of 263 patients were identified, resulting in a total of 251 patient records evaluated for analysis. Twelve patients were excluded because no medical record existed at the outpatient physician's office. Demographic information is shown in Table 1. The patient groups were similar in gender (51.1% PCP-AD vs. 54.2% PCP-NOAD female) and insurance coverage, with the majority of patients in both groups (66% total, 71.4% in PCP-AD and 60% in PCP-NOAD) having Medicare healthcare coverage. The average patient age was significantly higher in the PCP-AD group compared to the PCP-NOAD group (74.8 ± 13.1 vs. 66.5 ± 18.3, respectively, $p < .001$). The average number of medications on both admission and discharge were also significantly higher in the PCP-AD group (10.1 ± 5.1 vs. 5.9 ± 4, $p < .001$).

Medication discrepancies were categorized by type of discrepancy as detailed in Table 2. Values in this table represent the percentage of patients from each group that was found to have the specified discrepancy when medication lists were compared on both admission and discharge. The most common types of discrepancies that occurred on both admission and discharge were omission or addition of medications. On admission, the PCP-AD group had significantly fewer discrepancies classified as wrong medication and wrong dosage form when compared to PCP-NOAD. On discharge, the PCP-AD group had significantly less discrepancies for all categories compared to

Table 1. Demographic Information

	PCP-NOAD	PCP-AD
Number of patients	120	131
Gender		
Male, *n* (%)	55 (45.8)	64 (48.9)
Female, *n* (%)	65 (54.2)	67 (51.1)
Insurance		
Medicare, *n* (%)	72 (60)	94 (71.8)
Medicaid, *n* (%)	4 (3)	0 (0)
Private, *n* (%)	37 (31)	22 (16.8)
No insurance, *n* (%)	6 (5)	3 (2.2)
Unknown, *n* (%)	1 (1)	12 (9.2)
Age (mean, SD)*	66.5 ± 18.3	74.8 ± 13.1
Medications on admit (mean ± SD)*	5.9 ± 4.0	10.1 ± 5.1
Medications on discharge (mean ± SD)*	7.0 ± 4.0	10.9 ± 5.1

*p-Value $< .001$.

Table 2. Medication Discrepancies between Outpatient and Hospital Records

	Admission			Discharge		
	PCP-NOAD	PCP-AD	*p*-Value	PCP-NOAD	PCP-AD	*p*-Value
Wrong medications (%)	26.4	14.1	.027	46.4	18.0	<.001
Wrong strength (%)	48.2	35.9	.075	59.1	39.8	.005
Wrong frequency (%)	31.8	22.7	.149	49.1	26.6	.001
Wrong dosage form (%)	20.0	7.8	.011	51.8	7.8	<.001
Omitted medications (%)	60.0	50.0	.157	62.7	39.1	<.001
Additional medications (%)	48.2	35.2	.057	68.2	41.4	<.001
Rate of unacceptable discrepancies* (%)	90.3	63.4	<.001	84.1	44.9	<.001
Discrepancies per patient (mean ± SD)	3.78 ± 3.17	2.52 ± 2.17	.001	2.75 ± 2.25	1.92 ± 2.0	.012
Total number of discrepancies	424	375		293	229	
Rate of no discrepancies* (%)	8.7	12.9		14.3	19.5	

*Discrepancy: total medications ratio of ≤0.15, which corresponds to at least 85% accuracy of a patients' medication list, was considered acceptable. The higher discrepancy: total medication ratio corresponds to more discrepancies per medication.

the PCP-NOAD group (Table 2). The rate of unacceptable discrepancies on admission was significantly lower in the PCP-AD group with 63.4% of patient's having an unacceptable discrepancy rate: total medication ratio compared to 90.3% in the PCP-NOAD group ($p < .001$). Similar results were observed at discharge where the PCP-AD group had a rate of unacceptable discrepancies of 44.9% compared to 84.1% occurrence in the PCP-NOAD group ($p < .001$). Additionally, the PCP-NOAD group had a higher average number of discrepancies on both admission and discharge (Table 2).

Overall, patients prescribed more than 10 medications were more likely to have a medication discrepancy compared with those on fewer medications ($p = .003$). Factors, such as age, gender, healthcare coverage, and outpatient follow-up time, were not found to be associated with the occurrence of discrepancies. The practice model was the most significant factor influencing the risk for discrepancies on both admission and discharge ($p < .001$). Additionally, 85% of patients in the PCP-AD group returned for follow-up within the specified time frame stated in the discharge note compared with only 62.7% of patients in the PCP-NOAD group ($p < .001$). For those patients who returned for a follow-up appointment at the outpatient physician's office, the average number of days to follow-up after hospital discharge was not significant at 5.7 ± 7.6 and 4.4 ± 6.1 in the PCP-AD group and PCP-NOAD group, respectively ($p = .2$).

Discussion

Overall, this study found a greater number of medication discrepancies both on admission and discharge in hospitalized patients treated by hospitalists for the PCP-NOAD group when compared to PCP-AD group. This difference occurred despite patients in the PCP-AD group having on average more medications on both admission and discharge. Patients were also more likely to follow-up in the PCP-AD group when compared to the PCP-NOAD group.

Consistent with this study, the most common discrepancy during the transition of care is the omission of a medication, accounting for 10–61% of medication errors on admission (Tam et al., 2005). A medication omission may also interfere with appropriate diagnosis of medication-related problems considering that adverse drug events contribute to

5–8% admissions (Winterstein, Sauer, Helper, & Poole, 2002). One prospective study evaluating medication discrepancies on admission found the most common discrepancy was the omission of a medication (46.4%) and reported 38.6% of these discrepancies could possibly contribute to the patient's disease state decline or discomfort (Cornish et al., 2005). A potential consequence of medication omission on discharge is the assumption by the PCP that the medication was intentionally stopped during hospitalization and therefore may result in failure of the PCP to restart the medication in the outpatient setting. One study found a 20–25% rate of unintentional discontinuation of medications in ICU patients at discharge (Bell, Rahimi-Darabad, & Orner, 2006). Conversely, the omission of a medication on both admission and discharge may result in a similar medication being prescribed during hospitalization or at discharge resulting in a therapeutic duplication.

This study also found additional medications to be a common problem both on admission and discharge. This type of discrepancy on admission could be due to the patient taking medications, such as from specialists, which have not been communicated to their PCP. The discrepancy of additional medications on discharge may be the result of patients restarting medications upon return to home.

On admission, the PCP-AD group had statistically fewer discrepancies when compared to the PCP-NOAD group in only two classifications, wrong medication and wrong dosage form. Upon discharge, the PCP-AD group had statistically less discrepancies in all categories. Although patient demographic factors were not indicative of predicting medication discrepancies, the number of medications and the practice model were predictive. Patients on more than 10 medications were more likely to have medication discrepancies which can be expected as the rate of discrepancies is likely to increase with the number of medications. An increased number of medications on admission has been found to be an independent risk factor for increased errors in previous research (Gleason et al., 2010). Our results are surprising, however, considering patients in the PCP-AD group were on a greater average number of medications when compared to the PCP-NOAD group, yet had less discrepancies.

Additional differences between groups were seen in regard to follow-up after hospitalization. The PCP-AD group had greater follow-up rates when compared to the PCP-NOAD group. Follow-up after discharge is critical as patients can have pending laboratory work, which may require reassessment and monitoring. One study of 2,644 hospitalized patients reported 41% had pending laboratory results of which 43% (877) were later found to be abnormal values (Roy et al., 2005). Another study found that 27.6% (191) had outpatient workups recommended by their hospital physician (Moore, McGinn, & Halm, 2007). Both of these studies emphasize the necessity for outpatient follow-up after hospitalization. There is increasing pressure for hospitalized patients to be discharged faster necessitating the need for timely communication and follow-up appointments. Additionally, a study evaluating the effects of timing of postdischarge follow-up found patients who did not follow-up within 30 days of discharge were 10 times more likely to be readmitted to the hospital (Misky, Wald, & Coleman, 2010). This is especially important for almost 40% of patients in the PCP-NOAD group who did not follow-up as recommended on discharge. The variance in postdischarge follow-up between the groups is concerning given that in our study the same discharge process was utilized for both groups.

Study Implications

The results of this study highlight the growing problem associated with disjointed care for patients. Although the outcomes associated with a high number of medications discrepancies were not assessed in this study, others have detailed the increase in readmission rates for patients lacking timely follow-up with their primary care physician, discrepancy in medications on admission and discharge potentially leading

to adverse outcomes, and lack of communication with the primary care physician at key points in transitions of care (Arora et al., 2010; Gleason et al., 2010; Misky et al., 2010). Given the increasing complexity of medicine, it is difficult for PCPs to manage both an outpatient and inpatient practice. For this reason, the hospitalist model will continue to be an essential part of inpatient care, yet may potentially exacerbate the disconnect during transitions of care. The impact of the increased number of medication discrepancies and lack of follow-up associated with patients not seen by their PCP during hospitalization that was found in our study may not be fully realized with this model of patient care.

Newer models of patient care created by the Affordable Care Act may provide options to improve continuity of care and therefore reduce the likelihood medication discrepancies and poor communication. This includes the development of the Medicare Community-Based Care Transitions Program (CCTP) that provides funding to support these efforts in continuity of care in the Medicare population (Centers for Medicare & Medicaid Services, 2011). Additionally, the Affordable Care Act has also proposed Accountable Care Organizations (ACO) that consists of a network of physicians and hospitals to allow for information exchange and continuity of care within the organization and improve patient care while reducing costs (Devers & Berenson, 2009). The Medical Home model, centering on the coordination of services between multiple providers and settings, is designed to promote adherence and effective use of medications while avoiding medication errors and adverse drug reactions (Patient-Centered Primary Care Collaborative, 2013). Because the patient's PCP is at the center of the interdisciplinary team, medications discrepancies should be reduced with greater coordination of care.

The number of medication discrepancies found in this study emphasizes the importance of medication reconciliation and a thorough medication history on hospital admission and discharge follow-up. An accurate medication history is crucial to patient care; however, it can be challenging to accurately obtain. Pharmacists can play a vital role in current and newer models of patient care to perform and assist in medication reconciliation and the facilitation of care transitions. Currently pharmacists are underutilized in the medication reconciliation process (Clay, Halasyamani, Stucky, Greenwald, & Williams, 2008). When pharmacists were involved they were able to identify significantly more preadmission medications compared with physicians (Steurbaut et al., 2010). Involving pharmacists in the discharge process has also been successful in identifying and resolving medication discrepancies before discharge (Walker et al., 2009). Another study found patients, aged 18–65 years with a minimum of three prescription medications, who followed up with a pharmacist at their primary care physician's office within 60 days of hospital discharge were less likely to be readmitted when compared to patients who did not follow-up with a pharmacist despite being on less medications and having fewer disease states (Bellone, Barner, & Lopez, 2012). Additionally, a recent systematic review of medication reconciliation in hospitals revealed that incorporating pharmacy staff was a critical element to medication reconciliation (Mueller, Sponsler, Kripalani, & Schnipper, 2012). Pharmacists, as the medication experts, would be an ideal addition to decrease medication discrepancies.

Limitations

As with any study there are limitations. This was a retrospective analysis, as such, all information was limited to documentation in the medical records. The patient list for this project was generated from patient reporting of their PCP and documented in medical record. If patients did not specify PCP from the practice, the chart would not be evaluated. The outpatient practices may not have received all chart notes from other providers. As a result, medication changes may have occurred but were unable to be evaluated. The practice sites compared in this study were internal medicine and family

practice. The difference in the specialty of the site may have affected the results. The person taking the medication history was not evaluated and may have had an impact on the medication list. Additionally, medications lists were obtained from the patient or caregiver. Recall bias or decreased health literacy, which were not evaluated, could be accountable for inaccuracy in medication lists. The home medication list on the admission summary was used for comparison, which may not account for medication changes or corrections during hospitalizations. A greater proportion of the PCP-NOAD group did not follow-up within the specified discharge time frame. This may have contributed to more discrepancies found in the PCP-NOAD group. This study evaluated specific patient demographic characteristics that may not have included all potential factors affecting medication discrepancies.

Conclusion

The transition in patient care between inpatient and outpatient settings is a critical point where medication discrepancies are likely to occur. The differences between the two groups related to medication discrepancies and follow-up are suggestive of an increased continuity of care with fewer discrepancies when PCP is directly involved in inpatient care. The fact remains, however, that medication discrepancies still occurred. Regardless of the practice model, improvements are necessary in the process of obtaining a comprehensive and accurate medication history.

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