

Impact of Pharmacy-Driven Medication Reconciliation upon Admission to Improve Patient Safety in a Family Medicine Unit

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ARTICLE INFO	ABSTRACT
<p>Article type: Research Paper</p> <hr/> <p>Article History: Received: 12-Mar-2020 Accepted: 27-Mar-2021</p> <hr/> <p>Key words: Medication reconciliation, Medication errors, Medication safety, Pharmacy intern.</p>	<p>Introduction: Medication reconciliation is the process of comparing a patient's ordered medications to what the patient is actually taking. For several years, it has been included as part of The Joint Commission National Patient Safety Goals for improving medication safety. Our study investigated the impact of pharmacy personnel involvement in the medication reconciliation process on a family medicine unit in a large, urban, academic medical center.</p> <p>Materials and Methods: A prospective, non-randomized, cross-sectional study was conducted from November 2017 through March 2018. The number of medication discrepancies identified as well as the characteristics of the patients, types and medication classes most commonly associated with discrepancies were assessed.</p> <p>Results: Approximately 104 out of 134 or 78% of patients had at least one discrepancy at the time of admission. The most common discrepancy type was related to the electronic medical record followed by omissions, patient non-compliance and the drug being held. The medication classes mostly commonly associated with discrepancies were over the counter medications, cardiac medications and analgesics. Of the 104 patients that had at least one discrepancy, 31 (30%) required an intervention by a member of the pharmacy team.</p> <p>Conclusion: Pharmacy interns identified additional prescription and non-prescription medication discrepancies after the medication reconciliation process had already been completed. Involving pharmacy interns in a formal, standardized medication reconciliation process can help maintain and communicate accurate patient information.</p>
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Introduction

According to the 1999 publication "To Err is Human" by the Institute of Medicine, up to 98,000 people die as a result of preventable medical errors in hospitals each year (1).

A more recent study conducted by Makary and Daniel (2016) suggested that medical errors may actually be the third-leading cause of death in the United States following cardiovascular diseases and cancer (2).

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More specifically, it is estimated that approximately one medication error per hospitalized patient occurs per day (3). In hospitals, medication errors can occur during any step of the medication-use process but studies have shown that the admission process is particularly susceptible to medication errors (3-5). A study conducted by Cornish et al (2005) determined that up to 60% of patients will have an error in their medication history upon admission and 6% of those patients will experience a preventable complication as a result of that error (6). Polypharmacy, defined as the concurrent use of multiple medications to treat a condition and/or comorbid conditions, significantly increases the risk of adverse drug events, drug-drug interactions and medication non-adherence (7,8). Additionally, polypharmacy increases the likelihood of a discrepancy occurring during a transition of care moment (8,9). Lubowski et al (2007) found a positive correlation between the number of medications prescribed for a patient and the number of discrepancies identified during medication reconciliation, with the highest number of discrepancies occurring among patients taking six or more medications, including prescription and non-prescription medications as well as herbal supplements (9). While polypharmacy can be medically necessary, its prevalence continues to increase as new drugs are introduced into the market, indications are expanded for existing medications and as the population lives longer (7,8). Hajjar et al (2005) discovered that of 384 patients studied, 41.4% of them were on at least five to eight medications and an overwhelming 37.2% were on nine or more medications. Additionally, 58.6% of the patients were on at least one prescribed medication that was deemed superfluous (10). Medication reconciliation is defined by The Joint Commission as "the process of comparing a patient's medication orders to all the medications that a patient has been taking." (11) It is included as part of the Joint Commission's third National Patient Safety Goal for improving medication safety to encourage organizations to maintain and communicate accurate patient information. With the increasing number of patients receiving complex medication regimens,

medication reconciliation has been identified as a vital component for safe medication use and improved patient outcomes (13).

The medication reconciliation process can be broken down into four steps: obtain and document a comprehensive medication history upon hospital admission, compare the medication history to the patient's active orders, identify and resolve any discrepancies and lastly provide the patient with list of medications at discharge along with patient education (8,12).

Medication reconciliation is completed in an effort to evaluate the therapeutic appropriateness of each medication and to avoid medication errors such as omissions, duplications, dosing errors and drug interactions by identifying discrepancies between a patient's reported and active medications (6,8,11,12).

The Joint Commission notes that an organization should identify a qualified individual to complete the reconciliation. Although many studies have demonstrated that reconciliation completed by pharmacy personnel results in improved outcomes (4,6-12,14-17), there is still a question of with whom the responsibility rests. Lee and colleagues (2015) studied the perceptions of physicians, nurses and pharmacists about their role in completing medication reconciliation. Although an overwhelming majority of providers believed that maintaining an accurate list of a patient's medications would improve patient care, there was a significant difference on who they identified as being responsible for obtaining and documenting the medication history (12).

A number of reports have shown that programs involving pharmacy personnel in the medication reconciliation process identify more discrepancies when compared to their physician or nurse counterparts. In a study conducted by Buckley et al (2013), patients were screened upon admission and received medication reconciliation by a member of the pharmacy team. Out of 5,006 medications reviewed by a member of the pharmacy team, 467 admission medication errors, equivalent to an average of 3.5 errors per patient, were identified and resolved and almost half of those were considered significant (38.1%) or serious (7.5%)(3).

Cornish et al (2005) found that in patients taking four or more medications upon admission, 53.6% had at least one unintended discrepancy after the initial medication reconciliation had been conducted by either a physician or nurse. Pharmacists identified a total of 141 additional unintended medication discrepancies in the 81 study patients (6). In a similar study, Reeder et al (2008) concluded that the lowest number of medication discrepancies were found in services with a pharmacist present (15). Furthermore, Nester et al (2002) found that not only did pharmacists and pharmacy students identify more discrepancies compared to physician or nurse-led medication reconciliation programs, but they also implemented more interventions, confirmed the use of non-prescription medications and supplements and contacted more outpatient pharmacies when compared to the same group (16). While many studies focus on the outcomes of pharmacist-led medication reconciliation, a review of the literature also demonstrates the positive impact of pharmacy intern involvement in the medication reconciliation process. Lancaster et al (2014) demonstrated that student pharmacists discovered significantly more medication discrepancies per patient when compared to physicians and nurses.

Specifically, students identified a total of 532 prescription and non-prescription medication discrepancies throughout the medication process compared to only 355 identified by nurses and 368 identified by physicians (17). Likewise, Lubowski et al (2007) found that pharmacy students identified 922 medication discrepancies during the medication reconciliation process, the majority of which involved prescription medications (64%) but also involved non-prescription medications (32%) and herbal supplements (4%)(9). Involving Advanced Pharmacy Practice Experience (APPE) students in the medication reconciliation process helps identify medication discrepancies and is in accordance with the elements listed in standard 13 of the APPE curriculum of the 2016 Accreditation Council for Pharmacy Education (ACPE) accreditation standards and key elements for the professional program in pharmacy leading to

the doctor of pharmacy degree (19).

The medication reconciliation process provides the students with the opportunity to improve their patient interviewing skills (key element 13.1 patient care emphasis), critical evaluation of medication lists and to work as a member of a multidisciplinary team (key element 13.3 interprofessional experiences). Despite the numerous studies demonstrating the benefits of detailed medication reconciliation, currently at our health care system, there are no formalized medication reconciliation processes in place involving the pharmacy department neither upon admission nor at discharge.

Prior to the initiation of this study, a need's assessment was administered to the family medicine unit medical residents, which demonstrated an overwhelming desire for pharmacy assistance with the medication reconciliation process within our institution. The purpose of this study was to evaluate the impact of pharmacy-led medication reconciliation at the time of hospital admission in a family medicine unit by 1) determining the number of intentional and unintentional discrepancies identified by pharmacy students 2) identifying the most common types of discrepancies and 3) describing which medication classes are most commonly associated with medication discrepancies.

Materials and Methods

Setting

This study, which took place in a large, academic medical center, was approved by the hospital's Institutional Review Board.

Study Design

This is a prospective, non-randomized, cross-sectional study that took place within our institution from November 2017 through March 2018.

Participants

Patients admitted to the Family Medicine Team in the unit of interest were assessed for inclusion criteria Monday through Friday excluding holidays during the study period. Patients 18 years or older who were admitted were included in this study unless the admission was anticipated to be less than 24 hours, it was predicted that there would

be a limitation of care or death within 24 hours of admission or the patient was unresponsive and/or non-communicative.

Medication Reconciliation

Pharmacy interns completing 6-week long APPE rotations at our institution received formal training from their preceptor and/or pharmacy resident. Training included how to conduct a patient interview using a formal script and how to obtain a detailed medication history from the patient using a standardized medication reconciliation form. Patients were assessed for inclusion and exclusion criteria within 24 hours of admission. Patients admitted over the weekend or on holidays were assessed on the next work day.

All patients received the standard of care, which includes medication reconciliation by a medical resident or nurse regardless of inclusion in this study.

Interns completed a chart review of the patient's profile for home medications entered into four locations with the electronic health record. Interns contacted the patient's pharmacy or pharmacies to confirm the medication lists and the last date of fill as well as conducted patient interviews when necessary.

Discrepancies

Discrepancies were classified as either intentional or unintentional.

Intentional discrepancies are ones that the provider made to treat the patient's current condition and is documented in the clinical record. Whereas unintentional discrepancies are discrepancies that happened either by accident and/or without clear documentation.

Discrepancy type was defined as one of the following: electronic medical record discrepancy, not documented in the electronic medical record, omission, drug held, drug missing, patient not taking, duplication, wrong dose, wrong formulation, wrong frequency, or formulary switch.

The supervising medical resident was contacted as necessary if the identified discrepancy required an intervention. All identified discrepancies were documented and discussed with the preceptor and/or pharmacy resident.

Statistical Analysis

Patient characteristics and the primary outcome, number of unintended medication discrepancies, were summarized using descriptive statistics. Characteristics of patients with at least one discrepancy were compared to patients without any discrepancies using either a T-test or Mann-Whitney U test. Secondary outcomes including, number of patients requiring an intervention, discrepancy types as well as medication classes most commonly associated with discrepancies were reported using descriptive statistics.

Discrepancies

Pharmacy interns identified a total of 496 discrepancies, which is equivalent to an average of 3.7 discrepancies per patient. Of the 496 discrepancies, 108 (22%) were intended whereas 388 (78%) were unintended. The majority of the discrepancies, 372 (75%), were related to the electronic medical record and 124 (25%) were human errors. The most common types of human discrepancies overall were omissions, patient refusing the medication and the drug being held (Figure 1 and Table 1).

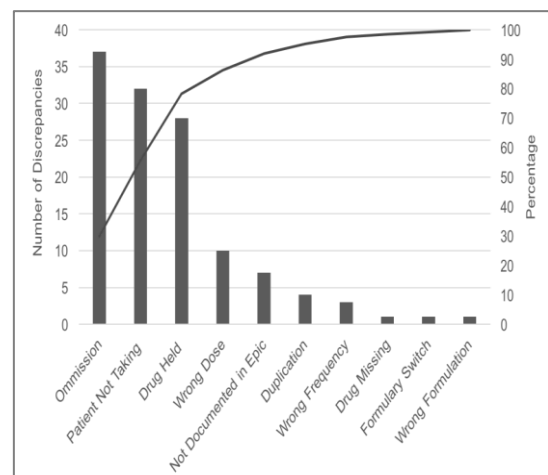


Figure 1: Types of Human Discrepancies (n=124)

The most common unintended discrepancies were also omissions, patient not refusing and the wrong dose whereas the most common intended discrepancies were the drug being held, formulary switches and omissions (Figure 2).

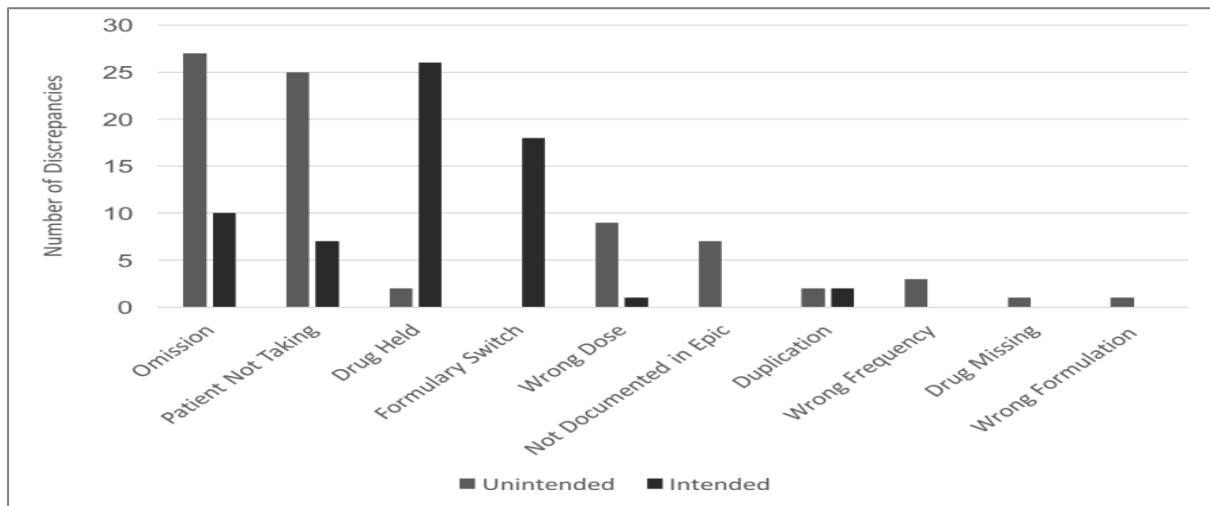


Figure 2: Intended Versus Unintended Discrepancy Types

Table 1: Risk Factors for Medication Discrepancies Data presented as mean (standard deviation); *Statistical significance defined as p<0.05; †Two Sample T-test; ‡Wilcoxon Rank Sum Test.

	All Patients (N = 134)	Patients with Discrepancies (n = 104)	Patients without Discrepancies (n = 30)	P-value
Average age (years)†	62.15 ± 17.46	60.12 ± 17.5	68.84 ± 15.77	0.007*
Average number of comorbidities	4.87 ± 3.16	4.86 ± 3.31	4.9 ± 2.68	0.778
Average number of medications prior to admission‡	8.89 ± 6.16	8.82 ± 6.05	9.13 ± 6.6	0.827

The medication classes that were mostly commonly associated with discrepancies were over the counter medications, cardiac medications and analgesics (Figure 3). Of the

104 patients that had at least one discrepancy, 31 (30%) required an intervention by a member of the pharmacy team.

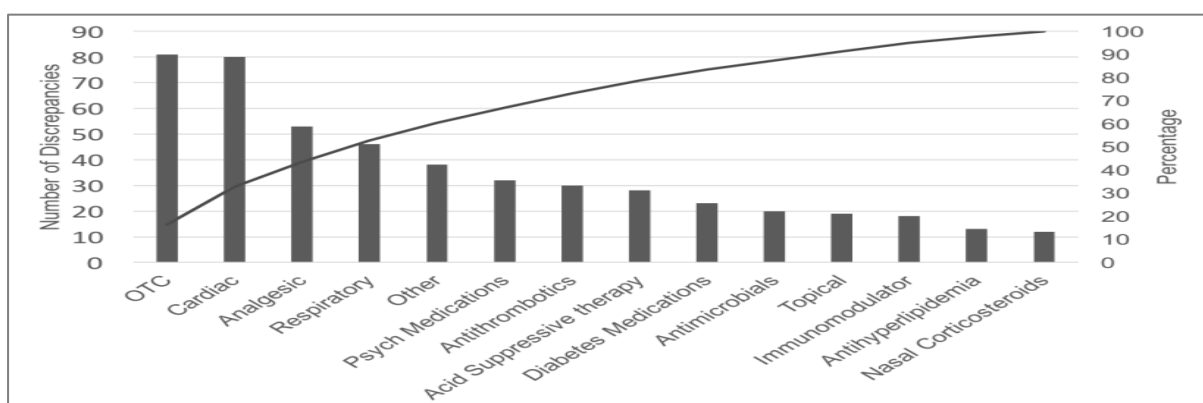


Figure 3: Medications Associated with Discrepancies

Discussion

Medication reconciliation should occur during all transitions of care by a trained healthcare provider (12). While the positive role of pharmacist involvement in the

medication reconciliation process is well documented (3,6), the question remains on how to accurately and efficiently complete medication reconciliation while optimizing pharmacy resources. Our study sought to

describe the impact of pharmacy interns on the medication reconciliation process at the time of admission in a large, urban, academic medical center. Furthermore, this study sought to determine the percentage of discrepancies that existed as a result of our electronic health record system in addition to human discrepancies, which is the first study to do so to our knowledge. We found that despite all patients receiving the standard of care, which included a nurse and/or physician completing medication reconciliation at the time of admission, most patients (78%) still had at least one medication discrepancy upon Pharmacy review. This was equivalent to pharmacy interns identifying an average of 3.7 additional medication discrepancies per patient, which is only slightly higher than the 3.5 discrepancies per patient described by Buckley *et al* (2013)(3).

The most common medication class involved in a discrepancy was over-the-counter medications. This finding is comparable to the findings by Lubowski *et al* (2007) that over a third of the medication discrepancies identified by pharmacy students involved non-prescription medications or herbal supplements (9). This study has limitations. The first limitation was that our research was limited to only one internal medicine unit team within our 1,490-bed institution. While our findings are only limited to the one teaching team, the electronic medical record is used universally within our institution and there is no formalized standard medication reconciliation process in place, which allows us to extrapolate our findings to the institution. Secondly, the family medicine team of interest has a clinical pharmacist who rounds and provides education on medication-related issues such as medication reconciliation regularly. It is unclear whether the clinical pharmacist is a confounder on this unit and whether their presence led us to underestimate the number of discrepancies present after medication reconciliation is performed at the time of admission. However, many units do have clinical pharmacy managers rounding as part of the inter-disciplinary team model within our institution, increasing our confidence that our findings are consistent with our

institution's practice. To our knowledge this study is the first to assess the burden of electronic medical record discrepancies on the medication reconciliation process.

The majority, 75%, of the identified medication discrepancies were related to our electronic medical record indicating a significant latent error within our system. This study is further evidence in support of pharmacy personnel involvement in the medication reconciliation process but also demonstrates the need for standardized processes for medication documentation throughout our healthcare system.

Conclusions

This study is further evidence in support of pharmacy personnel involvement in the medication reconciliation process but also demonstrates the need for standardized processes for medication documentation and reconciliation throughout our healthcare system.

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