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## Identification of Medication Related Problems During Medication Reviews in A Community Setting

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### Research Article

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#### ABSTRACT

**Objective:** Medication reconciliation is the process of collecting a list of a patient's medications including name, dosage, frequency, and route of administration. Medication reconciliation is important to reduce the risk of drug-related problems and is a National Patient Safety Goal. The objective of this study was to evaluate a pharmacist-performed medication reconciliation process to identify the pharmacist's contribution in identifying high-risk patients, identifying medication-related problems (MRPs) and potential adverse drug events, and recommending alternative treatments to prevent MRPs.

**Methods:** This study was a cross-sectional analysis in an ambulatory-care clinic. Patients included in the analysis were taking at least 7 medications with at least 2 disease states, and had an appointment with a clinic provider from July to September 2013. The primary outcome was the number and type of MRPs encountered during pharmacist-performed medication reconciliations. We also identified patient factors associated with MRPs and provider acceptance of recommendations.

**Results:** Fifty-three patient visits were analysed. On average, 8 MRPs were found per visit. Patients saw an average of 8 providers in the 15 months preceding their visit. A total of 477 MRPs were addressed by the pharmacist, including 309 medication errors and 22 adverse drug events. The most common MRPs included the patient taking medications not on provider's list (26%), discontinued medication on medication record (21.7%), and no monitoring for disease state or medication (12.8%). A statistically significant increase in the number of MRPs was found in patients taking greater than 10 medications (5 vs 9;  $p = 0.044$ ) and those who saw at least 7 providers (7 vs 10;  $p = 0.02$ ). Providers approved 74% of pharmacist recommendations.

**Conclusions:** Pharmacist-performed medication reconciliations resulted in a significant number of MRPs being identified and resolved.

## INTRODUCTION

The Institute of Medicine cites that medication errors account for more than 2 million serious adverse events and as many as 7,000 deaths annually.<sup>[1]</sup> Medication reconciliation, or the process of collecting an accurate list of all medications that a patient is taking, including name, dosage, frequency, and route of administration, is a key process for identifying potential medication related problems (MRPs), and thereby helping to reduce the risk of medication errors (ME) and adverse drug events (ADEs).<sup>2</sup> The purpose of medication reconciliation is to avoid inadvertent inconsistencies in the patient's complete medication regimen<sup>[2]</sup>.

Although most often discussed in the hospital context, medication reconciliation can be equally important in ambulatory care, as many patients receive prescriptions from more than 1 outpatient provider.<sup>[2]</sup> Medication reconciliation is also important during transitions in care when communication about medication between providers and the patient often break down. Given the potential for medication reconciliation to avoid MRPs, the Joint Commission has made this process a National Patient Safety Goal and a key initiative for improving patient care across all healthcare settings.<sup>[3]</sup>

Although ambulatory care centers have developed and implemented medication reconciliation processes, many ambulatory care environments have not used clinical pharmacists in the process.<sup>[4]</sup> Pharmacists are trained to find interactions and discrepancies with medication regimens. Studies have shown that pharmacists can readily identify inconsistencies and mistakes in patients' self-reported medication histories.<sup>[4-7]</sup> Further, pharmacist-performed medication histories are more accurate, save money, and increase patient safety when compared with nurse-obtained medication histories.<sup>[4,5]</sup> Johnson and colleagues conducted a study evaluating medications reconciliations in a community setting.<sup>[6]</sup> The authors did not, however, involve face-to-face visits and obtained their data through the patient's fill history. As found in this study, the pharmacist is able to discern what medications the patients are taking and how they are taking them rather than the medications they are filling.

Despite substantial review of medication reconciliation, data on pharmacist-performed medication reconciliation in the ambulatory care setting using electronic medical record (EMR) documentation are limited, and a need exists to explore the quantity and types of MRPs that are exposed by pharmacists based on EMR data.<sup>[7]</sup>

## OBJECTIVE

The objective of the study was to evaluate a clinical pharmacist's contribution in identifying high-risk patients, identifying MRPs and potential ADEs, and recommending alternative treatments to prevent MRPs in an ambulatory care setting.

## MEDICATION RECONCILIATION PROCESS DESCRIPTION

The setting for this intervention a community-based pharmacy located in a large health care clinic that provides primary and specialty care which is part of a larger academic health system. Clinical pharmacists currently offer a comprehensive medication reconciliation to all patients with 7 or more medications and 2 listed in and those being on their EMR seen by a clinic provider. Patients can also be referred to the clinical pharmacist for medication reconciliation by their primary care provider.

The service includes a face-to-face visit with a clinical pharmacist. Patients are called to come into the pharmacy and meet with a clinical pharmacist for a medication review. Prior to the appointment the patient's EMR is reviewed for the presence of any MRPs and potential ADEs. The clinical pharmacist will also review labs and verify if monitoring is appropriate and up to date given the medications and disease states a patient has.

Upon meeting with the patient, the clinical pharmacist gathers information regarding over-the-counter (OTC) medications, supplements, and problems the patient is having with their current prescribed medications such as cost, adherence barriers and/or knowledge deficits. Documentation and interventions are made in the patient's medical chart as an office visit encounter. Each encounter includes the following information: 1) reason for review, 2) medications added or deleted in the EMR, including any OTC medications or supplements, 3) an updated list of all current medications, OTCs, herbals, and supplements, 4) presence of any MRPs, 5) recommendations to the provider regarding monitoring or modification of therapy.

Within 2 weeks of the office visit, the clinical pharmacist follows up to determine if the recommendations were accepted. Recommendations could be fully accepted, partially accepted with the MRP resolved, partially accepted with MRP remaining, denied or other. Partially accepted denotes that the pharmacist's recommendation was modified, and the MRP can either be resolved (partially accepted with the MRP resolved) or still remain (partially accepted with MRP remaining). For example, if the high intensity statin, rosuvastatin 40 mg daily was recommended and the provider accepted a change in medication but prescribed atorvastatin 80 mg daily, the recommendation would be classified as partially accepted with the MRP resolved since atorvastatin is also a high intensity statin. However, if the provider prescribed atorvastatin 20 mg, a moderate intensity statin, the recommendation would be partially accepted with the MRP remaining.

## EVALUATION METHODS

A descriptive cross-sectional analysis of the pharmacist-performed medication reconciliation service was conducted based on a review of EMRs. The main outcome was the quantity and category of MRPs encountered during pharmacist-performed

medication reconciliations in the community setting. Other outcomes measured included patient factors that lead to the highest risk of having MRPs and whether or not providers accepted pharmacist recommendations.

Patients were included in the analysis if they were  $\geq 18$  years old, had  $\geq 7$  medications listed in the providers EMR, had  $\geq 2$  chronic disease states listed in the EMR and established care with a primary care provider at the health center from July 1, 2013, to September 30, 2013. Patients currently managed by the clinical pharmacist under a collaborative practice agreement were excluded, because comprehensive medication reconciliation is performed during the initial visit with a clinical pharmacist. The study protocol was submitted to the Institutional Review Board for approval and deemed exempt.

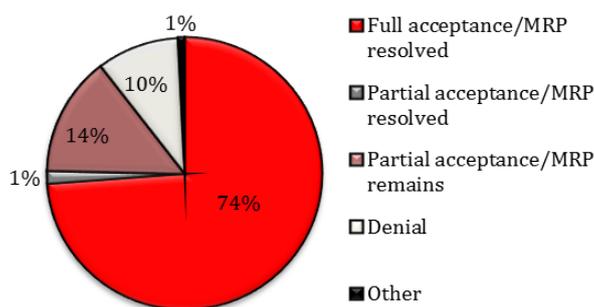
A clinical pharmacist reviewed the electronic medical records to collect documented MRP, as well as demographic and treatment data including gender, number of medications prior to the comprehensive medication reconciliation, number of medications after the comprehensive medication reconciliation, number of herbal supplements, number of over-the-counter medications not prescribed and number of providers seen by the patient within the last 15 months.

Documented MRPs were categorized by the reviewing pharmacist using an adaptation of the Patient-Centered Primary Care Collaborative (PCPCC).<sup>[8,9]</sup> MRPs that resulted in a medication error (ME) were identified and categorized per the National Coordinating Council for Medication Error Reporting and Prevention (NCCMERP) Index for Categorizing Medication Errors.<sup>[8]</sup> NCCMERP defines an ME as "any preventable event that may cause or lead to inappropriate medication use or patient harm while the medication is in the control of the healthcare professional, patient, or consumer."<sup>[8]</sup> The reviewing pharmacist also determined if the ME resulted in an adverse drug event (ADE) which is defined by The Institute of Medicine as an injury resulting from medical intervention related to a drug, which can be attributable to preventable and non-preventable causes.<sup>[1]</sup>

Descriptive statistics were used to present patient characteristics, the number of medications, MRPs and types of errors, and the number and types of interventions and intervention acceptance. Patients were stratified into "high" and "low" groups for number of baseline medications ( $\leq 10$  vs.  $>10$ ) and number of providers ( $<7$  vs.  $\geq 7$ ) seen in the baseline period based on the 50<sup>th</sup> percentile. The Wilcoxon-Mann Whitney test was used to compare the count of MRPs in patients by high vs. low number of medications prior to medication reconciliation, high vs. low number of providers, number of medications after the medication reconciliation, number of herbal supplements used, and the number of over-the-counter medications used. Statistical analyses were conducted using STATA version 13.1.

## RESULTS

A total of 53 patients records were analysed for the study; 24 (45%) were male. The median number of medications patients had on their medication profile prior to meeting with pharmacist was 15, and the median number of pharmacist identified MRPs was 8 per appointment. A total of 477 interventions were undertaken by the pharmacist. A majority of the interventions did not warrant a recommendation to the provider and resulted in documenting a current medication in the patient's EMR (117, 26%), deleting a discontinued medication from the patients EMR (97, 22%) or utilization of the therapeutic interchange or refill collaborative practice agreements which include ordering certain labs (57, 13%). A total of 135 (28%) interventions lead to a recommendation to the provider, of these, 100 (74.1%) were fully accepted (**Figure 1**).



**Figure 1.** Provider Approval of MRP Recommendation

**Table 1 and 2** describe the PCPCC type of MRP and interventions or recommendations to the provider, respectively. ME categories, per NCCMERP, included no ME but potential for error (145, 32.9%), ME occurred but it did not reach the patient (105, 23.8%), the ME reached the patient but it did not cause patient harm (160, 36.3%), the ME reached the patient and the patient required monitoring to confirm no harm (23, 5.2%), and an ME occurred resulting in temporary harm requiring intervention (8, 1.8%). Of the 447 pharmacist-performed interventions, 22 (4.9%) resulted in an ADE; none were serious.

Patients with 10 or fewer medications prior to their medication reconciliation had a median of 5 MRPS while those with greater than 10 medications had a median of 8.5 MRPs. Those who had seen 6 or fewer providers over the last 15 months had a median number of 7 MRPS and those seeing 7 or more providers had a median of 10 MRPs. Patients taking greater than 10 medications prior to medication reconciliation had significantly more MRPs than those taking 10 medications or fewer ( $p=0.044$ ).

Patients seeing 7 or more providers had significantly more MRPs than those seeing fewer than 7 providers in the 15 months preceding the pharmacist visit (p=0.02). The number of herbal supplements and OTC medications were not associated with the number of MRPs in this population.

**Table 1.** PCPCC Medication Related Problem Category

| PCPCC Medication Related Problem Category                                    | Frequency  |
|--|------------|
|  | # (%)      |
| Therapeutic duplication  | 20 (4.5)   |
| Medication not on list   | 117 (26.2) |
| Medication no longer taking  | 97 (21.7)  |
| Difference in medication strength  | 3 (0.7)    |
| Difference in medication form  | 3 (0.7)    |
| Difference in medication dosing  | 30 (6.7)   |
| Adherence issue  | 19 (4.3)   |
| Contraindicated drug (due to patient factors. Eg. Lab values or interaction) | 7 (1.6)    |
| Drug-drug interaction  | 4 (0.9)    |
| Drug ineffective   | 11 (2.5)   |
| Untreated medical problem- appropriateness                                   | 39 (8.7)   |
| Treatment not optimal based on current evidence/guidelines                   | 21 (4.7)   |
| Monitoring not being followed  | 57 (12.8)  |
| Drug dose excessive (dose, frequency, duration)                              | 15 (3.3)   |
| Pharmacy/dispensing error  | --         |
| Using expired medications  | 3 (0.7)    |
| Non formulary/ not cost effective drug                                       | 1 (0.2)    |
| Other  | --         |

PCPCC= Patient- Centered Primary Care Collaborative

**Table 2.** Interventions

| Interventions                           | Recommendation to Provider | Total Interventions |
|---|----------------------------|---------------------|
|   | # (%)                      |                     |
| Delete/discontinue medication from list | 10 (7.4)                   | 126 (28.2)          |
| Add medication to list                  | 7 (5.19)                   | 132 (29.5)          |
| Dose change                             | 10 (7.4)                   | 31 (6.9)            |
| Change in directions                    | 6 (4.4)                    | 33 (7.4)            |
| Change to a different medication        | 11 (8.2)                   | 16 (3.6)            |
| Obtain lab/Diagnostic test              | 53 (39.2)                  | 55 (12.3)           |
| Office visit                            | 2 (1.5)                    | 2 (0.45)            |
| Referral                                | 9 (6.7)                    | 9 (2)               |
| New prescription                        | 25 (18.52)                 | 27 (6)              |
| Restart medication                      | 2 (1.5)                    | 11 (2.5)            |
| Other                                   | --                         | 5 (1.1)             |

## DISCUSSION

This study of MRPs in a community clinic setting identified the number and type of drug-related problems encountered during pharmacist-performed medication reconciliations. It also aided in identifying patient factors associated with medication related problems. The most common MRPs identified included: patient taking medications not on provider's list, deleting medication on medication record, or no monitoring for disease state or medication. Significant MRP differences were found between the number of providers patients see and the number of medications on the EMR prior to the medication reconciliation.

This study contributes to the literature on MRPs on several levels. First, most studies regarding pharmacist-performed medication reconciliations involve a hospital admission and many collected information on ADEs. This current study was conducted in an ambulatory clinic. In addition, we collected data on all MRPs and our analysis was not limited to identified ADEs. Unlike ADEs, which cause patient harm and are not necessarily preventable, MEs and MRPs involve any mistake in the medication use process, regardless of patient outcome. Not all MEs lead to serious consequences; however, preventing errors at any point in the medication-use process has the potential to reduce harm.<sup>[8,9]</sup> Unlike previous studies, a unique factor with this study is the face-to-face pharmacist-performed medication reconciliation. This provided the opportunity to view the medications the patient was taking and to ascertain when the patient last filled the medication. Johnson and colleagues was conducted in the community setting, but the medication reconciliations did not include patient pharmacist interaction and only looked at discrepancies in the EMR compared to the fill records.<sup>[6]</sup> In this study, the pharmacist conversed with the patient to verify what they were taking and

examined the EMR medication list, recent labs, and progress notes. Based on all the information gathered, the pharmacist would then make a clinical recommendation to the provider.

Contributing factors to the success of our study include the setting in a community clinic with access to the patient's EMR and immediate contact with the providers. The clinical pharmacist also had established collaborative practice agreements with the providers in the clinic, which enhances the pharmacist-provider relationships and facilitates correction of MRPs. With the results of the study, the medical director over the clinic has questioned ways to expand the medication reconciliation service to the other clinics within the academic health system.

## LIMITATIONS

While this study contributes new data on MRPs identified and addressed as a result of pharmacist-performed medication reconciliations, there are several limitations that should be noted. One limitation is the risk of misclassification of recommendation acceptance due to a difference in the timing between recommendation acceptance and follow-up review of the recommendation status. Providers stated that if the patient had an upcoming appointment, he/she would make a note in the patient's EMR to address the MRP at the appointment. The Clinical pharmacist would check the outcome of the recommendations for up to 2 weeks after the pharmacy visit. Any recommendations without acceptance or denial after 2 weeks were categorized as, thus, a denial. In addition, generalizability may be limited given the healthcare center setting and use of therapeutic interchange and collaborative practice agreements. The ability of the pharmacist to make therapeutic interchanges allows for direct changes instead of making recommendations. Refill collaborative practice agreements present within the healthcare center also allow pharmacists to monitor for medications and order certain labs. While we did not have access to claims data, compliance was assessed using the date on the prescription bottle and pill counts.

## CONCLUSION

Overall, results from this study advocate that pharmacist-performed medication reconciliations are effective in identifying MRPs in a community setting. This is particularly true in patients taking more than 10 medications and seeing 7 or more providers. The high acceptance rate for recommendations suggests that providers also see value in the pharmacist's role.

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