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REVIEW

Pharmacists and medication reconciliation: a review of recent literature

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Background: Adverse drug event (ADE) errors are common and costly in health care systems across the world. Medication reconciliation is a means to decrease these medication-related injuries and increase quality of care. Research has shown that medication reconciliation accuracy and efficiency improved when pharmacists are directly involved in the process.
Objective: We review studies examining how pharmacists impact the medication reconciliation process and we discuss pharmacists' future roles during the medication reconciliation process and then barriers pharmacy staff may face during this critical process.
Methods: A comprehensive literature search from MEDLINE and manual searching of bibliographies was performed for the time period January 2012 through November 2018.
Conclusion: Although the issue of rising costs and injury due to medication errors in our health care system are not solvable via medication reconciliation alone, it is the first and perhaps most critical piece of the medication management puzzle. As such, numerous organizations have called for pharmacists to expand their roles in the medication reconciliation process due to their expertise in medication management.
Keywords: medication reconciliation, pharmacists, adverse drug events

Introduction

Adverse drug events (ADEs) are a leading cause of injury and death in patients around the world.[1,2] In Europe, it was estimated that nearly 5% of all hospital admissions were caused by ADEs, and ADEs were responsible for 197,000 deaths annually.[3] In the US, it was estimated that ADEs caused approximately 1.3 million emergency department (ED) visits and 350,000 hospitalizations each year.[4] According to the 2007 Institute of Medicine (IOM), seminal report on Preventing Medication Errors: Quality Chasm Series, ADEs cost the US health system approximately $3.5 billion dollars per year.[1,5] Previous research has shown that majority of ADEs are preventable and that medication reconciliation is an effective means to decrease these medication-related injuries.[6–9] In fact, numerous organizations around the world including The Joint Commission (TJC) recognize medication reconciliation as a critical component to improve medication safety.[2,5] Pharmacists and pharmacy staff are well positioned to provide patient-centered medication care including reconciling medications; however, the medication reconciliation process has proven to be difficult to implement across the health care continuum.[10]

Medication reconciliation is a robust process intended to identify and resolve medication discrepancies before they lead to costly and devastating outcomes. Definitions of medication reconciliation have varied across the literature,[11] but the

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most basic definition of a medication reconciliation is the process of creating the most accurate list of what the patient is taking. The Joint Commission (TJC) has proposed five main steps to reconcile medications including: 1) develop a list of what the patient is taking; 2) develop a list of medications that were prescribed; 3) compare medications on the two medication lists; 4) make clinical decisions based on the comparison; and 5) communicate the new medication list to the patient, caregivers, and providers.[5] Medication reconciliation is a critical process in both inpatient and outpatient settings and should involve multiple health care members across settings. A medication reconciliation should be performed when patients transition between health care settings or anytime a medication is changed or discontinued. A goal of medication reconciliation is to create an updated list of medications that is maintained and guides therapy for the patient.[10,13–16]

Numerous studies have been published over the past two decades that have examined pharmacists' role during the medication reconciliation process.[12] However, many of these studies were small and poorly designed. We discuss larger, recently published studies and reviews that have reported clinical and economic outcomes of pharmacist impact in the medication reconciliation process, the future roles pharmacists have in the medication reconciliation process, and barriers pharmacy staff may face reconciling medications.

Methods

To perform this review, we targeted articles that were specific to medication reconciliation and inclusion of pharmacy team members in outpatient or inpatient settings. We did not limit studies from the United States. Studies not written in English or published as a conference abstract were excluded from the review.

Two reviewers (EP and KK) conducted a comprehensive literature search from MEDLINE limiting the search January 2012 through November 2018. Search terms included: medication reconciliation OR medication reconciliations OR medication history OR medication histories OR medication discrepancy OR medication discrepancies AND pharmacy OR pharmacist. The two reviewers also manually searched bibliographies of selected studies.

Both reviewers screened the titles and abstracts for potential studies. One reviewer retrieved the full-text articles potentially relevant articles, and then both reviewers agreed before the study was included in the review. If there was a disagreement between the 2 reviewers, a third reviewer (JP) reviewed the article and decided whether the study should be included in the review. One reviewer (EP) abstracted the following information from all potentially relevant articles using a standardized data abstraction form: 1) study objectives, 2) keywords, 3) methods, and 4) outcomes. The 2 reviewers subsequently examined and confirmed the data abstracted within the form.

Review of studies published since 2012

Our search yielded 904 articles in MEDLINE and 14 articles by the manual process. However, the authors selected the studies below to be particularly noteworthy with advancing knowledge of medication reconciliation and utilization of the pharmacy team.

Pharmacist impact on medication reconciliation during care transitions

Multiple studies have shown the positive impact pharmacists have when integrated into the medication reconciliation process. Pharmacists often served as the medication therapy experts on the health care team and were involved in impacting patient outcomes particularly when a patient transitions from one health care setting to another.[17,18] In a retrospective comparison and quality improvement analysis using integrated health care records from Group Health Cooperative in Washington State, an evaluation was conducted where patients with a higher risk for hospital readmission were eligible for inclusion in the study. Patients either received a multifaceted intervention including a medication reconciliation (n=243) or usual care (n=251). Intervention patients received a phone call from the pharmacist within 3 to 7 days of hospital discharge during which the pharmacist completed a comprehensive medication therapy assessment to identify any medication-related problems and then performed a medication reconciliation. During these phone calls, the pharmacist also addressed patient concerns that arose after their recent hospital discharge. In the usual care group, this pharmacist intervention was not included. The main outcomes measured were readmission rates (7, 14, and 30 days post discharge) and any financial benefit of the intervention. It was found that intervention patients had decreased readmission rates, with statistical significance on 7 days: 0.8% vs 4% (P=0.01) and 14 days: 5% vs 9% (P=0.04). The extrapolated financial impact of the pharmacist-led intervention was calculated to be $1,518,600 in annual net cost savings as a result of preventing hospital readmissions.[19]

Ravn-Nielsen et al[20] reported results on whether a multifaceted pharmacist intervention reduced hospital readmission and ED visits. This randomized controlled trial included 1,467 patients who were randomized to receive either usual care, the basic intervention, or an extended intervention. In addition to medication reconciliation, patients in the basic intervention group received a patient-centered medication review by pharmacists at hospital admission and documented proposed changes in the electronic medical record for physician review when available. A medication review included pharmacists evaluating the patient's medication regimen for any gaps in therapy. Patients in the extended intervention group received a medication review but also a comprehensive medication reconciliation at discharge that included motivational interviewing. Primary care providers, patient's community pharmacy, nursing homes, and caregivers were also contacted with any medication-related issues at discharge. Patients in the extended intervention group were also followed up via telephone postdischarge. It was found that the extended intervention had a statistically significant effect on the number of patients who experienced a readmission within 30 days compared to usual care (HR, 0.62; 95% CI, 0.46–0.84) or within 180 days (HR, 0.75; 95% CI, 0.62–0.90). Further, this effect was also seen in the number of patients who had a composite of readmissions or ED visits within 180 days after inclusion (HR, 0.77; 95% CI, 0.64–0.93). The authors concluded that pharmacists may play an important role in decreasing hospital readmissions.[20]

In a study by The Permanente Medical Group, data from 18 Kaiser Permanente hospitals were collected and 30-day all-cause readmission factors were studied. A total of 537 readmissions were analyzed, in which 250 (47%) readmissions were assessed as potentially preventable with medication management as one of the main focus areas for improvement.[14] The authors suggested that an area where pharmacists can make an impact is in the ED. Pharmacists would have the ability to perform medication reconciliation services on patients who may be admitted or discharged, and subsequently provide medication management services to increase the overall quality of care provided to hospitalized patients.

A study conducted at Northwestern Memorial Hospital reported the impact of a pharmacist-led medication intervention, including medication reconciliation at admission and discharge, on 30-day patient readmission rates and ADEs.[21] Patients were randomly assigned to receive either usual care or the intervention. A total of 278 patients were included in the final analysis. Eligibility consisted of patients who were discharged home on greater than three scheduled prescription medication or were taking at least one high-risk medication. Patients in the usual care received a medication reconciliation performed by the pharmacist and then medication counseling provided by the physician or nursing staff at discharge. The intervention group also receive a personalized medication plan created by pharmacist at discharge, and medication discrepancies were addressed before the patient left the facility. Medication counseling was then performed, and follow-up phone calls were scheduled at days 3, 14, and 30 days post-discharge. Authors reported a total of 380 medication discrepancies (46.2%) in the intervention group, compared to 205 (19.9%) from the usual care group ($P<0.0001$).[26] In terms of hospital readmission, 55 patients (39%) in the usual care group were readmitted or had an ED visit within the 30 days post-discharge period compared to the 34 (24.8%) patients from the intervention arm ($P=0.001$). This study showed that pharmacists were key to rectifying medication discrepancies as well as optimizing the patient's medication regimen postdischarge.[21]

In the final study discussed in this section, the impact of the pharmacist during hospital admission and discharge was measured along with a cost analysis of the intervention.[22] Patients over the age of 18 who received care from either medical or surgical units were included in the study for a 7-week period. The primary outcome measure was the number and severity of medication errors found by the pharmacist per patient per service. Secondary outcome measures were a comparison of the 7-day and 30-day readmission rates to a historical cohort of patients admitted and discharged from the same two units from July and August 2013. During the study, 67 patients were assessed for their admission and discharge medication lists. A total of 84 medication errors were identified with a mean of 1.25±2.04 errors per patient. Six percent of these errors (5/84) were classified as serious; 75% (63/84) and 19% (16/84) were considered to be significant and minor, respectively. The total cost of avoidance was estimated at $42,400, and if the results were extrapolated to the entire adult population in the facility (the study estimated a total of 26,000 adult discharges annually), the cost of avoidance was estimated to be $16,415,000 due to a hypothetical reduction in medical errors.[22]

These studies highlighted the impact of a pharmacist by preventing and reducing medication errors through medication reconciliation and related interventions. As underscored in these studies, medication reconciliation is a patient care service that requires ongoing communication between the

patient, pharmacist, and provider. This allows the team to work together to provide quality care and ensure that preventable errors are avoided and in a way that has potential for reducing costs.

Medication reconciliation is necessary but not sufficient for improving outcomes

Historically, there has been little coordination across health care settings for patients living with chronic conditions.[23] This fragmentation jeopardizes patient safety and increases patient risk of costly rehospitalizations.[23–25] The Chronic Care Model (CCM) addresses the growing needs of the current health care system by offering an evidence-based framework for delivering comprehensive care management.[23–25] The CCM is an organizational approach to providing care to patients living with multiple chronic conditions in the outpatient setting, including the consistency of medications between health care settings. It highlights the importance of a team-based approach in collaboration with the patient with the idea that the decision-maker is not solely the primary care provider. The overarching goal of the CCM is to improve health care quality and accessibility and increase patient awareness of health, thus improving health outcomes. The CCM identifies the necessary components that must be present in order to to promote high-quality chronic disease management: the community; the health system; self-management support; delivery system design; decision support, and clinical information systems. Each component may be modified to facilitate patient-centered chronic disease management. The CCM has been widely used as a guide to redesign the management of many chronic diseases including diabetes and hypertension.[25–27]

Medication reconciliation is part of a process, which is necessary but not sufficient for improving overall outcomes. It is an important component of the patient-centered care process, in which pharmacists have a role to ensure positive outcomes. However, multiple approaches are needed to provide high-quality care. In a study evaluating the effectiveness of a large-scale readmission reduction program funded by the Center for Medicare & Medicaid Services (CMS), the overall Medicare fee-for-service (FFS) readmissions were examined for 10,621 patients.[28] The quasi-experimental evaluation found that the readmission reduction effort including personalized transitional care, including education, medication reconciliation, follow-up telephone calls, and linkage to community resources reduced readmissions by 9.3% among a population targeted by CMS. Patients did not receive all intervention, and patients received a mean of 4.3 interventions (range 0–16), suggesting that decreasing readmissions should be a multifactorial effort among health systems.[28]

Pharmacists have key roles in medication reconciliation

Research has shown that medication reconciliation accuracy and efficiency improved when pharmacists are directly involved in the process. As such, the World Health Organization (WHO) as well as other several key organizations have called for pharmacists to perform the medication reconciliation process due to their expertise in medication management. For example, the American Society of Health-System Pharmacists (ASHP) recommends that pharmacists must have key roles in the medication reconciliation process by:[29,30] 1) designing and managing patient-centered medication reconciliation processes; 2) providing education to patients and their providers about the benefits and limitations of medication reconciliation processes; and 3) advocating for patients when they transition from one healthcare setting to another. Beyond serving in the direct medication reconciliation activities, pharmacists should oversee the development of policies to integrate medication reconciliation practices into the culture and everyday workflow of the health care system. Other activities such as continuous quality improvement, training, ensuring ongoing competency, and therapeutic expertise for information systems development may also be placed under the pharmacy purview.[30]

Health systems are frequently resource constrained, so streamlining and dividing responsibilities during the medication reconciliation process is necessary for sustainment of practices. In many health care settings, pharmacy teams consisting of pharmacists, pharmacy technicians, pharmacy residents, interns (eg, pharmacy students), and clerks may be tasked with the medication reconciliation process. Previous research has shown that pharmacy technicians and pharmacy students have been successfully involved with medication reconciliation activities. Champion et al[31] conducted a review of 32 studies to examine how pharmacy students and technicians have been utilized in medication reconciliation processes in an effort to evaluate expanded roles for pharmacy students and technicians. The authors reported that pharmacy students and technicians with proper training were able to obtain medication histories, identify discrepancies, and take appropriate action to correct these discrepancies. Cost savings to health systems were also reported in select studies when pharmacy technicians or students replaced pharmacists or nurses during part of the medication reconciliation process.[31] In another

study, Gortney et al[32] reported on outcomes of medication histories collected by trained student pharmacists measured by the accuracy and completeness of the subsequent discharge medication list compared to patients in the control group. A total of 215 patient medication histories were obtained by 17 pharmacy student interns over a 12-month period. The student pharmacists made a total of 76 interventions to inpatient medication regimens, which affected a total of 25% of patients. Pevnick et al[33] reported the results of their three-arm randomized controlled trial of 306 hospitalized patients. The first arm was usual care; the second and third arm included the pharmacist or pharmacy technician (respectively) obtaining and reconciling medication information from multiple sources prior to patient admission. Errors in the admission medication history were reduced by over 80% when a pharmacist or technician was involved during the medication reconciliation process at hospital admission.[33]

The role of student pharmacist in the institutional setting is to work along with and learn from the pharmacist. An excellent hands-on experience a student pharmacist can receive is through the medication history process where students are presented with the opportunity to learn and develop skills such as assessing the ADE for risk and then appropriately triaging the medication-related issue to the appropriate provider. The medication history process allows for student pharmacists to enhance their communication skills and build confidence in their ability to translate their didactic knowledge into practice. The process allows a student to reinforce professional curriculum, potentially decrease ADEs due to inaccurate medication histories, and allows the student to grow under the supervision of a trained clinical pharmacist.

Challenges (or barriers) to medication reconciliation

Some hospitals have limited resources and may find difficulty with the implementation of the medication reconciliation process.[34] This is pronounced in smaller institutions, critical access hospitals, and those serving safety net populations. These institutions may frequently lack pharmacy team members to conduct medication reconciliation or perhaps in some countries pharmacists are not authorized to perform this process. As such, the medication reconciliation process may be designated to another team member (eg, physicians, nurses, and nursing assistants). Previous studies have reported the differences in outcomes when medication reconciliation was performed by a pharmacist or pharmacy technician compared to other health care team members.[35–38] For example, Kramer et al reported that nurses had significantly higher discrepancy rates per medication (0.59) compared with pharmacy technicians (0.36) and pharmacists (0.16) ($P<0.001$). Pharmacists, on the other hand, corrected significantly more discrepancies per participant than nurses (6.39 vs 0.48; $P<0.001$).[37]

Issues arise when team members who perform the medication reconciliation process may not have a working knowledge of different medications and how the medications translate to different disease states. Thus, it is important for team members to receive appropriate training on performing a medication reconciliation, particularly when taking a medication history. The use of standardized tools to standardize the medication reconciliation process has produced positive results in admission medication lists obtained by nursing students in a community hospital.[39] One study showed the accuracy of medication lists during the medication reconciliation process improved significantly with student nurses who used the standardized tool and received appropriate training versus those who did not (87% versus 74%, $P=0.010$).[39] Fortunately, there are publicly available resources to assist health care professionals with implementing medication reconciliation practices. For example, the MARQUIS Implementation Manual: A Guide for Medication Reconciliation Quality Improvement outlines best practices around medication reconciliation practices and provides enough detail so health systems can adapt these processes based on their environment.[40] The WHO's The High5s Project – Standard Operating Protocol for Medication Reconciliation was released to help provide standardization of medication reconciliation procedures and guiding principles for implementing processes in health care settings.[41]

The ability to transmit health records from one facility to another is a current challenge among health systems face. When a patient is admitted or discharged from the hospital, it is essential to receive and transmit timely information to outside providers. Despite the potential for health information technology (IT) to increase the quality of care and promote continuity of care when patients transition from one health care setting to another, cost related to the infrastructure needed to share medical records is a major barrier. One study estimated that the costs for an average five-physician outpatient practice to implement an electronic health record system would be $162,000 with $85,500 in maintenance expenses during the first year alone.[42] Community pharmacies often do not have access to medical records from outside health systems despite the fact that patients often fill their prescription medications at community pharmacies while residing in the outpatient

setting.[43] Assistance with the implementation of electronic health records and the subsequent promotion of health information exchange is needed to allow pharmacists and providers to improve the consistency of health care information across multiple electronic platforms.[44]

Conclusion

In this review, we highlighted several exemplar studies examining the potential that pharmacists and pharmacy staff have to positively impact the medication reconciliation process, and how this translates to the overall care process including decreasing overall system costs. These studies demonstrate that the medication reconciliation process should be a team-based effort requiring the expertise and time of multiple health care professionals. With ongoing collaboration from all members of the health care team, preventable medication errors can be decreased. Although the issue of rising costs and injury due to medication errors in our healthcare system are not solvable via medication reconciliation alone, it is the first and perhaps most critical piece of the medication management puzzle.

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