# Implementation of a pharmacist resident medication reconciliation program★

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**Abstract**

*Purpose*: The objectives of this study were to describe opportunities and barriers to establishing a medication reconciliation program operated by a college-based pharmacist resident at a tertiary hospital.

*Methods*: A pharmacist resident rotating on the telemetry floor piloted the medication reconciliation program by providing services 2–3 days per week for 4 weeks for a total of 10 days. The resident participated on medical rounds with the cardiology consult service. All patients were offered the reconciliation program. A list of patients admitted was obtained from the institution's list of admissions; discharge counselling services were initiated by the pharmacy resident, medical team or nursing. The number and type of interventions rendered as well as challenges to the implementation are described.

*Results*: Fifty-six admission histories and 40 discharge counselling sessions were provided. The most frequent opportunity was related to interventions; 56 interventions were made. The most common interventions were improper documentation of allergies or medications ($N = 26$, 46.4%) and not starting a previous medication ($N = 20$, 35.7%). Non-cardiac medications accounted for 67.9% of interventions. The barriers included that the pharmacy resident provided part-time coverage; therefore, not all patients were educated and fewer interventions were made. Another barrier was related to health literacy. Over 80% of patients did not have a medication list and did not know the names of their medications.

*Conclusions*: Pharmacist residents have many opportunities to impact patient care by conducting these services. The demand for such services may increase as pharmacist-provided medication reconciliation has been given increased national attention and since there is a push for increased pharmacist residency training. Given the limited resources, collaborations between college- and hospital-based pharmacy personnel are essential to optimize the services.

**Keywords:** *Pharmacist resident, patient safety, medication reconciliation, admission history, discharge counselling*

## Background

Medication errors, as reported by the Institute of Medicine (IOM) in their report "To Err is Human: Building a Safer Health System" and most recently in "Preventing Medication Errors: Quality Chasm Series", are among the leading causes of adverse events in the US contributing to at least 1.5 million preventable medication injuries per year and an estimated increase in hospital cost of $3.5 billion (IOM, 2000; IOM, 2006). In addition, the IOM has published a number of key documents related to medication safety including the Crossing the Quality Chasm: A New Health System for the 21st century (IOM, 2001) and Patient Safety: Achieving a New Standard for Care (IOM, 2004). In response to the reports, national health care organizations in the US have placed considerable attention on patient safety and have identified national efforts in order to address the reasons for and implement systems to prevent medication errors (IOM, 2003); Institute for Healthcare Improvement (IHI), (IHI, 2006); The Joint Commission, 2006; National Council on Patient Information and Education (NCPIE), (NCPIE, 2006); American Society of Health System Pharmacists

(ASHP, 2006a). In addition, pharmacists training specifically on medication safety has been recognized (ASHP, 2006b).

The number and complexity of medications used in hospitalized patients increase the probability of medication errors. Numerous studies appear in the international pharmacy and medical literature regarding medication errors occurring on both admission to and discharge from the hospital (Lau, Florax, Porsius, & deBoer, 2000; Cornish et al., 2005; Tam et al., 2005; Vira, Colquhoun, & Etchells, 2006). In an analysis of 22 published studies, up to 95% of patients were reported to have at least one variation in their admission medication history when including both prescription and non-prescription medications (Tam et al., 2005).

In addition, patients are often discharged with unnecessary medications, incorrect dosages of medications and duplicate medicines; medication errors made at discharge may result in re-hospitalization of a patient (Coleman, Smith, Raha, & Min, 2005).

There is a preponderance of evidence demonstrating that medication reconciliation performed by pharmacists may reduce the possibility for medication errors in health systems around the globe (Lau et al., 2000; Gleason et al., 2004; IOM, 2004; Vira et al., 2006) medication reconciliation is the process of identifying the most accurate list of all medications a patient is taking including prescription, over-the-counter and herbal products and then comparing this list of medications to the information obtained from a

Table I.   Future goals and roles of pharmacists in medication reconciliation and patient education.

| Initiative | Goal/role of pharmacist |
| --- | --- |
| The American Society of Health-System Pharmacists ASHP; 2015 initiative | Goal 1: increase the extent to which pharmacists help individual hospital inpatients achieve the best use of medications |
| | • Objective 1.1: pharmacists will be involved in managing the acquisition, upon admission, of medication histories for 75% of hospital inpatients with complex and high-risk medication regimens<br>• Objective 1.3: in 90% of hospitals, pharmacists will have organizational authority to manage medication therapy⋆ in collaboration with other members of the health-care team<br>• Objective 1.4: 75% of hospital inpatients discharged with complex and high-risk medication regimens will receive discharge medication counselling managed by a pharmacist<br>• Objective 1.5: 50% of recently hospitalized patients (or their caregivers) will recall speaking with a pharmacist while in the hospital |
| JCAHO; National Patient Safety Goal 8 IHI 1,00,000 Lives Campaign | • Accurately and completely reconcile medications across the continuum of care<br>• Pharmacists are named as a provider for this care<br>• Campaign is an initiative for US hospitals to implement changes in patient care in order to help prevent death and increase patient care. One way to do this is to provide adequate medication reconciliation<br>*3 Step process*<br>1-Verification obtain med history<br>2-Clarification medications/doses<br>3-Documentation changes/recommendations |
| NCPIE | • NCPIE works to advance the safe, appropriate use of medicines through enhanced communication. Pharmacists counsel patients. Counselling should include:<br> - Indications for the use of the medication as well as precautions and warnings<br> - Expected outcome from the medication<br> - Potential adverse reactions and interactions with food or other medications<br> - Actions to take when adverse reactions or interactions occur -Storage requirements of the medication |
| Royal Pharmaceutical Society of Great Britain, Guild of Hospital Pharmacists, Pharmaceutical Services Negotiating Committee, Primary Care Pharmacists' Association | • Pharmacists taking patients' medication histories on admission<br>• Patients encouraged to bring own drugs into hospital<br>• Patients own drugs used and all supplies provided by one-stop original pack dispensing<br>• Prescription written and checked on ward against previously dispensed medication. Only transferred to pharmacy if last minute changes in prescribing |
| CMS, MTMS | • MTMS has been approved to be provided by a pharmacist and is needed to optimize a patient's response to their medicines. It includes face-to-face patient interviews and assessing and coming up with a plan to treat the patient's problems<br>• Review patient history, medication profile (prescription and non-prescription)<br>• Recommendations for improving health outcomes and treatment compliance |

⋆ Managing medication therapy may include: initiating, modifying and monitoring a patient's medication therapy; ordering and performing laboratory and related tests; assessing patient response to therapy; counselling and educating a patient about medications; and administering medications.

ASH= American Society of Health-system Pharmacists; CMS= Center for Medicare and Medicaid Services; IHI=Institute for Healthcare Improvement; JCAHO=Joint commission on Accreditation of Healthcare Organizations; MTMS=Medication Therapy Management Services; NCPIE=National Council on Patient Information and Education.

physician's admission, transfer, or discharge orders; any discrepancies would then be addressed (Pronovost et al., 2003; IHI, 2006). When performing medication reconciliation, information for an accurate list may need to be obtained from the patient's family member, community pharmacist, primary care physician, transfer form, nursing home, or from the medications physically brought with the patient.

The ASHP has put forth the 2015 Objectives which are goals for health-system pharmacists that include their active participation in direct patient care and drug therapy monitoring at both admission and discharge (ASHP, 2006). The 2015 objectives coincide with many policies of the Joint Commission on Accreditation of Healthcare Organizations' (JCAHO) Medication Management, IHI 1,00,000 Lives Campaign, NCPIE and the Center for Medicare and Medicaid Services (CMS) Medication Therapy Management Services (MTMS) (ASHP, 2006). Specifically, JCAHO has included the reconciliation of medication as a National Patient Safety Goal and the IHI 1,00,000 Lives Campaign supports medication reconciliation (IHI, 2006; IOM, 2006). Similarly, in the UK, the Royal Pharmaceutical Society of Great Britain, the Guild of Hospital Pharmacists, the Pharmaceutical Services Negotiating Committee and the Primary Care Pharmacists' Association have published guidelines on discharge and transfer of patients entitled Moving Patients, Moving Medicines, Moving Safely (Royal Pharmaceutical Society of Great Britain, 2006). In addition, recommendations for pharmacist's roles in bridging the gap in patients' safety between national recommendations (National Patient Safety Agency) and practice have been published (Mathews & Bain, 2007). All of these programs illustrate both the need for action by a pharmacist and the development of medication reconciliation programs focusing on patient education (Table I).

Many studies support pharmacists' role in decreasing prescribing errors, obtaining complete medication histories and providing discharge counseling (Dobrzanski, Hammond, Khan, & Holdsworth, 2002; Anderson, Pedersen, & Bach, 2003; Bobb et al., 2004; Gleason et al., 2004; Tam et al., 2005; Schnipper et al., 2006). Pharmacist-acquired admission medication histories yield more information than both physician- and nurse-acquired medication histories (La Verde, 1973; Barger & Barger, 1976; Montpetit & Roy, 1988). In addition, pharmacist discharge counselling results in cost-effect patient care, causes less preventable adverse drug events after hospitalization and pleases both patients and other healthcare professionals (Saunders, Tierney, Forde, Onorato, & Abramson, 2003; Schnipper et al., 2006).

Therefore, one possible method to performing medication reconciliation is including a pharmacist who would carry out such services for patients; however, pharmacists do not always have the time to provide medication reconciliation due to their other clinical or staffing responsibilities. One way to combat this is to hire additional pharmacists who will solely provide medication reconciliation and achieve patient safety goals (Katchum, Grass, & Padwojski, 2005). Another option to overcome this barrier is to have a pharmacist resident perform medication reconciliation as part of the residency experience. Pharmacy residents have been documented to make clinical interventions to positively influence patient care (Taylor, Church, & Byrd, 2000). Consequently, the purpose of this study was to describe opportunities and barriers to establishing a new pharmacist resident medication reconciliation program including the collaboration between an academic institution and a tertiary hospital.

## Methods

A college-based primary care pharmacist resident rotating on the cardiology telemetry floor at a tertiary institution piloted this medication reconciliation program. The pharmacist resident provided services at the hospital 2–3 days per week during the month of March 2005. While at the hospital, the pharmacist resident concurrently participated on medical rounds with the cardiology consult service.

The medication reconciliation program was offered to all patients. The patient medication histories were initiated by the pharmacy resident from the institution's list of admissions. Each morning the pharmacist would obtain the admission list for the unit and conduct the service on all patients admitted that day and the previous day. The pharmacist resident would not conduct the service on patients admitted prior to the previous day. For example, on Mondays the resident would conduct the service on patients admitted on Sunday and Monday and therefore no services would be provided to patients admitted on Saturday.

During the admission interview, the pharmacist resident would conduct a detailed history of the patient's prescription medications, over-the-counter and herbal products and allergies and reactions. If the patient was unable to provide an accurate medication history, the pharmacist would contact a family member, community pharmacist, or primary care physician's office. After the pharmacist resident conducted the interview with the patient, if a discrepancy was noted from the pharmacist resident's information and the physician's admission information, the pharmacist resident would notify the medical resident or the attending physician who would then help to resolve the issue, usually prior to or during rounds.

Pharmacist's interventions were classified based on the following: (1) improper documentation of allergy

or medication, (2) not starting a prior to admission medication, (3) wrong dose, and (4) deletion or addition of a medication. Improper documentation of allergy or medication includes if a reaction to a medication was not listed or if the reaction listed was incorrect. It also included if a patient was taking the medication, but there was no mention of it in the history. Not starting a previous medication was recorded if a prior to admission medication was listed by the physician but an order was never made for it. Oftentimes, this was when the physician had the name of the medication but never verified the strength or frequency. This section did not include intentional medications left off such as blood pressure medications changed for patients who were experiencing hypotension. Wrong dose included anytime the medication dose or frequency was different between the pharmacist resident and physician history. Finally, deletion or addition medication was documented for patients who came in on therapeutic duplications or patients who needed a medication added at the time of the medication history such as being on two calcium channel blockers.

Discharge counselling services were initiated by the pharmacist resident, the medical team, or nursing personnel. The discharge of a patient was determined during rounds. If the patient was to be discharged and the pharmacist resident was at the hospital, the pharmacist resident would provide educational materials and a list of discharge medications to the patient.

Opportunities related to the pharmacist resident's patient interventions, collaboration between the university and the health-system and the pharmacist resident experience was recorded. Barriers linked to interventions and collaboration were recorded. The results were analyzed using descriptive statistics.

## Results

At the end of the 4 weeks, the pharmacist provided a total of 10 days of coverage. Fifty-six medication admission histories were conducted from the 150 patients who were admitted during the 4 weeks (28 days). The average time spent with each patient was approximately 15 min for an admission interview. The admission histories would take longer for those patients whose community pharmacist or primary care physician needed to be contacted. An admission history form was developed by the pharmacist resident which recorded the patient's information related to admission.

A total of 56 interventions were made by the pharmacist resident. Table II describes the most frequent interventions the pharmacist resident performed. The most common intervention was improper documentation of allergies or medications ($N = 26$, 46.4%). Not starting a previous medication that the patient was taking prior to admission

Table II.   Admission interventions.

|  | N (%) |
| --- | --- |
| Type of medication | |
|   Cardiac | 18 (32) |
|   Non-cardiac | 38 (68) |
| Intervention | |
|   Improper documentation of allergy or medication | 26 (46.4) |
|   Not starting a previous medication | 20 (35.7) |
|   Wrong dose | 6 (10.7) |
|   Deletion or addition of medication | 4 (7.1) |
| Number of interventions per patient | |
|   1 intervention | 1 (1.8) |
|   2 interventions | 3 (5.4) |
|   3 interventions | 3 (5.4) |
|   4 interventions | 2 (7.1) |
|   5 + interventions | 5 (8.9) |

($N = 20$, 35.7%) was the second most common intervention. All of the discrepancies for previous medications the pharmacist resident found were discussed with the attending physician or medical resident, and all were accepted ($N = 20$, 100%). Since the study took place on a cardiac unit, cardiac medication errors versus non-cardiac medication errors were recorded. It was found that 67.9% of the interventions were made on non-cardiac medications. The most common of the non-cardiac medication interventions were made on over-the-counter and herbal products including aspirin ($N = 22$, 39.3%) and on diabetes medications ($N = 7$, 12.5%). Fourteen patients needed interventions, and as it was more common for multiple interventions to be made on each patient than only one intervention on multiple patients.

Upon admission, approximately 80% of patients did not know the name(s) of their medication(s). Thirteen percent of patients knew the names of their medication but did not have a medication list, while 7% had an updated medication list.

Forty discharge counselling sessions were provided during the study period. A discharge counselling form was developed by the pharmacist resident which helped record the patient's information related to discharge. The pharmacist resident spent approximately 10 min with a patient for a discharge counseling session. Two patients were discharged and re-admitted to the unit. The pharmacist resident provided the patient with education on their medications and a discharge medications list to all patients; all were accepted by the patients ($N = 40$, 100%).

## Discussion

The above results demonstrate the impact a pharmacist resident can have when providing medication reconciliation. This pilot program helped to demonstrate the establishment of a pharmacy resident

provided medication reconciliation program and the many opportunities and barriers that may occur. Based on the results, a pharmacist resident can help make interventions and decrease possible medication errors while simultaneously participating on rounds. As pharmacist residents, they are qualified to make interventions on their own without supervision from a preceptor. In addition, international research demonstrates that having a pharmacist on the floor with patients versus in the pharmacies will increase the number of medication errors detected.

*Limitations*

A major limitation to this study was that it was a 10-day pilot study with a small patient population. The results may differ once expanded throughout the health-system. Since the pharmacist resident spent limited time at the site due to obligations from the university, continuity of care was lacking in this study which could have limited the number of interventions made. However, despite the limited amount of time, the pharmacist resident was still able to make many interventions. A possible way to overcome the obstacle of continuity of care is to use clinical or staff pharmacists to conduct the medication reconciliation service on the days the pharmacist resident is not available. Accordingly, the long-term impact of this study on patient outcomes, including medication errors, is lacking due to it being a pilot.

*Barriers.* The pharmacist resident had an increased morning workload, which required proficient time management skills, in order to prepare not only for rounds but also to interview patients prior to rounds. Another obstacle to the program included the fact that approximately 80% of patients did not bring in a medication list upon admission and did not know the names of their medications. This limited the amount of time the pharmacy resident could spend with the patient since the community pharmacist or primary care physician would need to be contacted. Since most of the patients were not aware of their medications and what they were used for, many patients showed no interest in discussing their medications with the pharmacist resident. However, lack of education may have been the reason for this and this is supported by the fact that once patients were aware of what the program entailed they showed more interest, and also by the fact that the two patients who were readmitted to the unit during this time brought their previous discharge medication lists provided by the pharmacist resident.

*Opportunities.* Upon implementation of the pilot study, many patients were unaware of pharmacists participating in direct patient care, despite the fact that is has been documented that pharmacists can help to prevent errors when they obtain a detailed drug history on admission (Dutton, Hedger, Wills, & Davies, 2003). Although this may have initially been a barrier, in the end, it proved to be an opportunity for the practice of clinical pharmacy and patient support. Patients' comfort and trust in the pharmacist increased as they were able to have more exposure to this clinician. This study demonstrated numerous interventions the pharmacist resident made to increase patient education. Pharmacists were able to increase patient understanding of their medication, and this is especially beneficial for those patients who have low health literacy and little knowledge of their medications and for patients who use multiple physicians since these types of patients are at risk for duplicate therapy and drug interactions. The pharmacist resident was able to recommend the discontinuation of medications upon admission for patients who were on duplicate therapy and drugs that could interact and cause harm. This demonstrates the need for and implementation of similar types of patient education programs in order to improve patient care. Other opportunities upon admission were that many of the patients did not have medication lists or know the names of their medications, and the pharmacist resident was able to educate these patients and provide them an accurate medication list at the time of discharge.

Another major opportunity to the program was that it offered a unique perspective on providing medication reconciliation since the service was provided by a pharmacist resident employed by an academic institution. Medication reconciliation programs are time and labour intensive. This study demonstrated that health systems can join efforts with academic institutions and utilize pharmacist residents to sustain such services at a lower cost than a staff or clinical pharmacist. This is especially important as the recent ACCP Position published indicates a push for pharmacist post-graduate training and also states the recommendation that by 2020, residency training should be a pre-requisite prior to practicing as a pharmacist. Our study exemplifies a "win–win" scenario for both academic institutions and health-systems; colleges and schools of pharmacy may be able to expand their practice sites, and thus expand opportunities for early and advanced practice experiences for pharmacy student as well as increase the number of pharmacy residents.

Health-systems may be able to further enhance patient care and compliance with national goals and accreditation standards at a decreased cost by utilizing pharmacist residents whose entire or partial salaries are paid for by the academic institutions. The ASHP 2015 Objectives, JCAHO National Patient Safety

Goal, the IHI 1,00,000 Lives Campaign and the NCPIE, Royal Pharmaceutical Society of Great Britain, the Guild of Hospital Pharmacists, the Pharmaceutical Services Negotiating Committee and the Primary Care Pharmacists' Association goals may all by reached by utilizing a pharmacist residents. In addition, clinical pharmacists have been actively providing patient care and medication therapy services for a long time and may now soon become reimbursed for such services due to MTMS. The CMS showed many examples of successful pharmacist-delivered MTMS positively impacting patient care. Therefore, it is important for pharmacists to be proactive in order to provide MTMS and by participating in medication histories and discharge counselling, patients can do so (Table I).

Alternatively, health-systems can start and/or expand their own residency programs and utilize their own residents to provide these services. Program consistency is essential when providing such services. Thus, collaborations among institution-employed pharmacists and colleges or schools of pharmacy-employed residents is vital to ensure continuity of care. Also, due to the current shortage of in pharmacy practice, utilizing pharmacy residents is one way to overcome this burden. Currently, there are 8000 pharmacy graduates/year in the US and there are approximately 1700 residency positions available in the US (Murphy et al., 2006). As expansion of pharmacy graduates occurs, there will be a need for more pharmacy residency positions and one role for the pharmacy residents can be to participate in medication reconciliation. In addition, as pharmacy residency and student graduates expand, the need for qualified preceptors will increase and by collaborating with health-systems, academic institutions can expand their residency programs.

Finally, a call for interdisciplinary efforts to reduce harm to patients including medications errors was made in the Crossing the Quality Chasm: A New Health System for the 21st century report. Considering the changing needs in heath care and roles of pharmacists, an emphasis is placed on preparing future pharmacists to provide patient-centred care (Accreditation Council for Pharmacy Education, 2006; Murphy et al., 2006). ASHP currently has Accreditation Standards related to specialized residency programs in Medication-Use Safety (ASHP, 2006). Also, the National patient Safety Agency in the UK has published the Seven Steps to Patient Safety: A guide for NHS staff (National Patient Safety Agency, 2004). These specialized programs will help to prepare pharmacists to provide medication reconciliation. Additionally, specific focus on medication safety and medication errors is included in preparing future pharmacy graduates during educational training (ASHP, 2006).

## Conclusion

Pharmacist residents have many opportunities to make clinical interventions by providing medication reconciliation. Collaboration between health-systems and pharmacist residents may result in improved achievement of national patient safety goals, increased number of practice sites for residents or students and decreased costs for health-systems. Given the limited resources, collaborations between college- and hospital-based pharmacy personnel may be able to optimize the rendered services. In order to effectively impact health literacy, pharmacists educating patients in the hospital setting should conduct a thorough evaluation of patients' level of education, knowledge of their diseases and medications, and involvement in self-care. Providing admission and discharge counselling to patients may lead to a stronger patient–pharmacist rapport and enhance the learning experience. The demand for such services may increase as pharmacist-provided medication reconciliation has been given strong national attention and the push for pharmacist residency training continues to grow.

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