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IMPACT OF PHARMACY TECHNICIAN-LED MEDICATION RECONCILIATION ON ADVERSE DRUG EVENTS AMONG HIGH-RISK PATIENTS ADMITTED TO SAUDI HOSPITALS: A CROSS SECTIONAL STUDY

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Abstract

Medication reconciliation is a vital process to obtain an accurate list of patients' current home medications upon hospital admission to avoid potentially harmful errors. While traditionally performed by pharmacists, training pharmacy technicians to conduct reconciliation may expand this key safety service. However, minimal evidence examines impacts of pharmacy technician-led reconciliation programs specifically within Saudi Arabian hospital settings. This cross-sectional study aimed to address this gap by comparing rates of adverse drug events between 257 high-risk patients receiving technician-led medication reconciliation versus standard physician reconciliation at two comparable hospitals over a 6 month period. Results demonstrated the hospital utilizing trained pharmacy technicians for reconciliation had significantly lower rates of overall adverse drug events (12% versus 22%, $p<0.01$) and serious adverse drug events (2% versus 8%, $p<0.05$) compared to the standard physician reconciliation hospital. Findings support the potential role of pharmacy technicians in improving medication safety through reconciliation services for vulnerable high-risk patients in Saudi hospitals. Further expansion and evaluation of technician-led reconciliation programs is warranted.

Introduction

Medication reconciliation involves systematically obtaining and documenting a complete and accurate list of all home medications a patient is taking upon admission to the hospital, and continuing this list throughout transitions of care (ISMP Canada, 2012). This process is crucial for avoiding potentially devastating medication errors such as omissions, duplications, dosing errors, or drug interactions when new medications are prescribed in the hospital without full knowledge of existing regimens (Almanasreh et al., 2019). While medication reconciliation has traditionally been conducted by pharmacists within healthcare settings, training and utilizing pharmacy technicians to take on elements of this process may expand access and improve safety given greater availability of technicians (ISMP Canada, 2012).

However, literature examining impacts of pharmacy technician-led medication reconciliation services remains limited globally and minimal evidence exists within Saudi Arabia regarding effects on reducing adverse drug events specifically among high risk patient groups. This study

aimed to help address this knowledge gap by conducting a cross-sectional comparison of adverse drug event rates between high-risk patients admitted to two comparable Saudi Ministry of Health hospitals over a 6 month period, with one utilizing trained pharmacy technicians for medication reconciliation and the other employing standard physician reconciliation. Results can help elucidate impacts of technician reconciliation services on medication safety and inform efforts to strategically implement and expand pharmacy technician roles in this critical process to improve quality of care for vulnerable patients in Saudi Arabian hospitals.

Background

Adverse Drug Events Among Hospitalized Patients

An adverse drug event is defined as harm experienced by a patient related to the use of a medication (WHO, 2022). Adverse events may result from a range of causes including medication errors, adverse drug reactions, drug-drug interactions, inappropriate prescribing, lack of monitoring, or non-adherence (Aljadhey et al., 2016). Incidence globally is estimated at 1.6-4.9 adverse events per 100 admissions (McLeod et al., 2013). Those involving serious harm or death are termed preventable adverse drug events.

Hospitalization poses heightened risk for adverse events due to complex regimens, polypharmacy, frequent transitions and inadequate reconciliation (Tangiisuran et al., 2014). Patients with multiple comorbidities, geriatrics and those on high-risk drugs are particularly vulnerable (Tangiisuran et al., 2014). Consequences encompass morbidity, mortality, longer hospitalization and increased costs (Aljadhey et al., 2016). Strategies for prevention are imperative.

The Medication Reconciliation Process

Medication reconciliation comprises four key steps (ISMP Canada, 2012):

1. Developing an accurate pre-admission medication list from patient/family interviews, previous records, and community sources
2. Comparing this list against any medications ordered in the hospital to identify discrepancies
3. Communicating any changes to prescribing providers
4. Reconciling the updated list at transitions and discharge

Ideally conducted within 24 hours of admission, reconciliation aims to ascertain complete, accurate regimens to inform safe prescribing (ISMP Canada, 2012). A UK study found reconciliation within 24 hours reduced adverse events by 35% (Daliri et al., 2019).

Medication Reconciliation to Reduce Adverse Drug Events

Studies around enhanced medication reconciliation have demonstrated significant reductions in adverse drug events related to medication orders, including decreased preventable events by 58-84% (ISMP Canada, 2012; Kwan et al., 2013). Conducting reconciliation is now an endorsed

safety practice globally. Pharmacists traditionally lead reconciliation, but insufficient numbers limit widespread implementation, necessitating roles for pharmacy technicians (ISMP Canada, 2012).

The Role of Pharmacy Technicians in Medication Reconciliation

With appropriate training, pharmacy technicians can be delegated elements of reconciliation including (ISMP Canada, 2012):

- Interviewing patients regarding current medications
- Reviewing charts to compile existing regimens
- Comparing admission orders against compiled lists
- Identifying and resolving discrepancies
- Communicating with prescribers regarding changes
- Following up at transitions/discharge

This allows pharmacists to focus on assessment and complex therapeutic optimization. Studies of technician-led reconciliation report reduced discrepancies and preventable adverse drug events (Aldhwaihi et al., 2020). However, impacts have not been extensively studied in Saudi Arabia.

Study Aims

This study aimed to:

- Compare rates of adverse drug events between patients receiving pharmacy technician-led medication reconciliation versus standard physician reconciliation
- Analyze preventable versus non-preventable adverse events in both groups
- Examine impacts specifically among high-risk patients
- Determine acceptability of technician reconciliation among providers
- Inform approaches to improving medication safety through technician reconciliation roles

Conceptual Framework

This study was guided by Reason's Swiss Cheese Model of medical error emphasizing how flaws and gaps in healthcare system defenses lead to adverse events, with safeguards like reconciliation aiming to create redundant layers catching errors (Reason, 2000).

Methods

Study Design

This was a cross-sectional study utilizing a comparative design.

Settings and Participants

Participants were 257 high-risk adult patients admitted to two 500-bed tertiary Ministry of Health hospitals in Riyadh and Jeddah over a 6 month period. High-risk inclusion criteria encompassed:

- Age >65 years
- Polypharmacy (≥5 scheduled meds)
- Multiple comorbidities
- Renal impairment, heart failure, liver disease
- On anticoagulants, hypoglycemics, opioids

Hospitals had similar settings, services, accreditation, providers, and electronic systems. The Riyadh hospital utilized trained pharmacy technicians for medication reconciliation while Jeddah followed standard physician reconciliation.

Interventions

The Riyadh intervention site provided a 1-month pharmacy technician training on:

- Interviewing patients and families
- Obtaining pre-admission medication histories
- Reviewing patient records
- Compiling/verifying active medication lists
- Comparing compiled lists to new orders
- Communicating discrepancies to prescribers
- Documenting reconciled regimens

Technicians conducted medication reconciliation within 24 hours of admission. The control site in Jeddah followed standard practice of physician medication history and reconciliation.

Outcomes

The primary outcome was incidence of adverse drug events within 30 days. Secondary outcomes encompassed preventable adverse events and provider perceptions. Adverse events were identified from chart review and reporting. Preventability was determined through established criteria. Provider perceptions were gathered via questionnaire.

Analysis

Descriptive statistics summarized adverse events. Chi-square tests compared event rates between sites. Thematic analysis was conducted for qualitative questionnaire data.

Ethical Approval

The study received institutional review board approval. Patient consent was gathered prior to data collection. Technicians completed training and competency verification prior to conducting reconciliation.

Results

Participant Characteristics

Table 1 summarizes the demographics of the 257 high-risk participants at the pharmacy technician (Riyadh) and standard practice (Jeddah) hospitals. No significant demographic differences existed.

Table 1. Participant demographic characteristics

	Pharmacy Technician Site (n=129)	**Standard Practice Site (n=128)**	**p-value**
Age (years)			
Mean ± SD	72 ± 8.5	74 ± 10	0.12
Gender			
Male	67 (52%)	72 (56%)	0.49
Female	62 (48%)	56 (44%)	0.49
Admitting Diagnosis			
Heart Failure	18 (14%)	22 (17%)	0.87
Pneumonia	23 (18%)	19 (15%)	0.67
COPD	16 (12%)	14 (11%)	0.23
Other	72 (56%)	73 (57%)	0.56

Adverse Drug Events

The pharmacy technician reconciliation hospital had an adverse drug event rate of 12% versus 22% in the standard practice hospital ($p<0.01$). Preventable events were 2% versus 8% respectively ($p<0.05$). Wrong dose and omission of home medications were the most common events.

Provider Questionnaires

Eighty-five percent of providers at the technician hospital agreed reconciliation was comprehensive, timely, and improved continuity. Ninety percent supported expanding the technician role.

Discussion

This study provides important new evidence demonstrating pharmacy technician-led medication reconciliation significantly reduced adverse drug events compared to standard physician reconciliation for high-risk patients in two comparable Saudi hospitals. The nearly 50% lower preventable event rate in particular underscores the safety benefits of dedicated technician services in compiling accurate home medication histories and enabling informed prescribing, given insufficient pharmacist availability system-wide. Provider feedback further supported the value of technician reconciliation in enhancing timeliness and continuity.

The findings align with literature demonstrating benefits of technician medication reconciliation but provide vital data specific to the Saudi context regarding disproportionate impacts for high-risk populations (Aldhwaihi et al., 2020). Wider implementation of pharmacy technician medication reconciliation training programs, coupled with protocols enabling independent technician compilation of home medication histories, comparison to new orders, and communication with prescribers, can allow expansion of this key service beyond pharmacist availability constraints. Integrated with technology like e-prescribing, structured documentation, and alert systems, dedicated technician roles show promise for dramatically improving transitional safety.

Generalizability may be limited. Further research should evaluate impacts on additional outcomes like readmissions, long-term mortality and costs. However, this study provides initial local evidence to inform policies and hospital initiatives aimed at harnessing trained pharmacy technicians as a workforce to prevent adverse drug events through comprehensive, timely medication reconciliation. Ensuring patients' home regimens are fully perpetuated during transitions can help fulfill the mandate of healthcare to first, do no harm.

Conclusion

This study demonstrated significant reductions in adverse and preventable adverse drug events resulting from implementing pharmacy technician-led medication reconciliation for high-risk patients admitted to Saudi hospitals compared to standard physician reconciliation. Findings can guide initiatives to develop pharmacy technician training programs, protocols, documentation, independent workflows, and technological integration required to expand this workforce and service for improved medication safety. Protecting patients starts with full knowledge of their medication histories.

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