

CLINICAL STUDY

Frequency, types, and direct related costs of medication errors in an academic nephrology ward in Iran

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Medication errors are ongoing problems among hospitalized patients especially those with multiple co-morbidities and polypharmacy such as patients with renal diseases. This study evaluated the frequency, types and direct related cost of medication errors in nephrology ward and the role played by clinical pharmacists. During this study, clinical pharmacists detected, managed, and recorded the medication errors. Prescribing errors including inappropriate drug, dose, or treatment durations were gathered. To assess transcription errors, the equivalence of nursery charts and physician's orders were evaluated. Administration errors were assessed by observing drugs' preparation, storage, and administration by nurses. The changes in medications costs after implementing clinical pharmacists' interventions were compared with the calculated medications costs if the medication errors were continued up to patients' discharge time. More than 85% of patients experienced medication error. The rate of medication errors was 3.5 errors per patient and 0.18 errors per ordered medication. More than 95% of medication errors occurred at prescription nodes. Most common prescribing errors were omission (26.9%) or unauthorized drugs (18.3%) and low drug dosage or frequency (17.3%). Most of the medication errors happened on cardiovascular drugs (24%) followed by vitamins and electrolytes (22.1%) and antimicrobials (18.5%). The number of medication errors was correlated with the number of ordered medications and length of hospital stay. Clinical pharmacists' interventions decreased patients' direct medication costs by 4.3%. About 22% of medication errors led to patients' harm. In conclusion, clinical pharmacists' contributions in nephrology wards were of value to prevent medication errors and to reduce medications cost.

Keywords

Clinical pharmacy services, cost, drug-related problems, medication errors, nephrology

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Medication errors have been defined as “failure in the treatment process that lead to or has the potential to lead to harm to the patient”.^{1,2} Medication errors may occur at each five stages of drug ordering and delivery including prescription, transcription, dispensing, administration, or monitoring.^{1,2} Medication errors occur in 2–14% of hospitalized patients and lead to 44,000 to 98,000 annual deaths in the United States.³ Medication errors, as a subgroup of drug-related problems, are highly prevalent among chronic kidney disease (CKD) and dialysis patients due to altered drugs' pharmacokinetics, presence of multiple complex co-morbidities, polypharmacy, and high susceptibility to drug toxicity.^{4–6} Some reports show that more than 85% of CKD patients experience at least one medication error.⁷ Untreated indications and incorrect dosage are common types

of medication errors among CKD and hemodialysis patients.^{5–9}

Clinical pharmacists play important roles in detection and prevention of medication errors.^{4–8} Clinical pharmacy services started during last two decades in a few teaching hospitals in Iran. There are few reports on medication errors surveillance in hospitalized patients in Iran and clinical pharmacists' interventions to prevent or reduce these errors. The available studies from Iran in infectious diseases and nephrology wards and emergency departments showed that incorrect drug dosage, frequency, or treatment durations, unauthorized drugs, and untreated indications were common types of medication errors in these wards that were prevented by clinical pharmacists.^{10–14} Three of these studies have been performed during different times in the same infectious diseases wards with similar findings. As a result, familiarity of physician and nurses with clinical pharmacists' interventions and subsequently with medication errors, did not prevent happening errors on the same drugs. Taken together, persistent involvement of ward-based clinical pharmacists in the patient care managements is a permanent need for the medical wards. Complexity of pharmacotherapy in patients admitted to nephrology wards and their susceptibility to serious

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