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Original Research

Incidence and treatment costs attributable to medication errors in hospitalized patients

Insun Choi, Ph.D.[a,d], Seung-Mi Lee, Ph.D.[a,d], Linda Flynn, Ph.D.[b], Chul-min Kim, M.D., Ph.D.[c], Saerom Lee, B.S.[a], Na-Kyung Kim, B.S.[a], Dong-Churl Suh, Ph.D. M.B.A.[a,*]

[a]*Chung-Ang University, College of Pharmacy, 84 Heukseok-ro, Dongjak-gu, Seoul, South Korea*
[b]*University of Colorado College of Nursing, Aurora, CO, USA*
[c]*Catholic University, School of Medicine, Seoul, South Korea*

Abstract

Background: A significant financial burden arises from medication errors that cause direct injury and those without patient harm that represent waste and inefficiency.
Objective: To estimate the incidence, types, and causes of medication errors as well as their attributable costs in a hospital setting.
Methods: For a retrospective case-control study, data were collected for 57,554 patients admitted to two New Jersey (U.S. State) hospitals during 2005–2006 as well as hospital-specific voluntary error reports from these two hospitals for the same period. Medication errors were classified into categories of stage, error type, and proximal cause, and the incidence was estimated. The costs attributable to medication errors were calculated using both the recycled prediction method, and the Blinder–Oaxaca decomposition method after propensity score matching.
Results: Medication errors occurred at a rate of 0.8 per 100 admissions, or 1.6 per 1000 patient days. Most errors occurred at the administration stage of the medication use process. The most frequent types of errors were wrong time, wrong medication, wrong dose, and omission errors. Treatment costs attributable to medication errors were in the range of $8,439 using the Blinder–Oaxaca decomposition method and $8,898 using the recycled prediction method.
Conclusions: Medication errors are associated with significant additional costs, even without patient harm. Considering the substantial costs associated with adverse drug events, the elimination of medication errors should be further emphasized and promoted, and guidelines should be developed to facilitate this goal.

Keywords: Incidence; Attributable cost; Medication error

Introduction

Medication errors are responsible for significant human and financial costs. More than 7000 deaths per year are attributable to medication errors, which are responsible for an estimated $3.5 billion in annual health care spending in the US.[1] Current estimates of the costs of medication errors are based

[d] Drs Choi and Lee contributed equally to this article.

* Corresponding author. Tel.: +82 2 820 5600; fax: +82 2 813 0650.
E-mail address: dongsuh75@gmail.com (D-C. Suh).

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on preventable adverse drug events and consider only treatment-related costs. However, less than 10% of reported medication errors have resulted in patient harm in several previous studies.[2–4] By not considering the costs of medication errors with less severe outcomes or potential errors, the vast majority of errors are not captured, leading to underestimation of the total burden.

Compared to the costs of actual patient harm, there is little information about the estimated costs of the medication errors that represent waste and inefficiency within the hospital system.[5] One method used to identify medication errors is a review of voluntary error reports, which tends to reflect events without acute patient injury.[6] Errors reported voluntarily are more likely to be latent errors, near misses, or unsafe practices that all had the potential to cause patient harm but were caught before the error reached the patient. The cost to hospital resources includes lost work time spent fixing the problem and additional laboratory measurements.

The frequency of medication errors is, in part, a function of the complexity of care. Hospitals' medication use process consists of multiple steps involving many different personnel, each of which presents an opportunity for error. The rate of medication errors can be quite high because of the systems in place. However, there is significant variation in the rates of medication errors reported because of differing definitions of medication errors and methods of observation.[1,2,7,8] Although costs related to medication errors should include the costs of preventable adverse drug events potential adverse drug events, and errors with no potential for harm, most previous studies have not assessed the costs of medication errors not resulting in harm.

Information on the incidence of medication errors and comprehensive costs related to medication error are important to gauge the scope of the problem, set priorities for prevention, and inform decision makers. Thus, this study was conducted to (a) calculate the incidence of medication errors during hospitalization; (b) examine types and causes of medication errors; and (c) estimate excess hospital costs attributable to medication errors.

Methods

Study design

The study employed a case-control design to estimate the incidence of medication errors and the treatment costs attributable to medication errors. The sample comprised all patients admitted to two hospitals in New Jersey (U.S. State) over 1/1/2005–12/31/2006, excluding the emergency room or intensive care unit. Case patients were those who experienced at least 1 medication error during hospitalization. Control patients without medication errors were those admitted to the same hospitals during the study period. Prior to the initiation of data collection, this study was approved by the Rutgers Institutional Review Board and the Institutional Review Board of each participating hospital.

Study sites and data collection

Hospital A is a nonprofit community hospital with 176 beds and Hospital B is an academic hospital with 417 beds. At hospital A, initial orders are first written by prescribers and scanned into a computerized administrative system in the pharmacy. System alerts may be triggered by potential drug interactions, which would require further investigation. Medications are delivered hourly or through a pneumatic tube system. Drugs are administered and documented by licensed nurses.

Hospital B utilizes a computerized physician order entry (CPOE) system. Initial orders are entered electronically and transmitted to the pharmacy, where they are transcribed and dispensed. All orders are subject to double checking by the CPOE and transcribing pharmacists. Medications are delivered by technicians or a tubing system and are administered by nurses.

Data were collected from hospital-specific voluntary error reports completed by physicians, pharmacists, and nurses and from UB-92 claim forms from each study center. The reports included information on patient age, gender, event date, medications, involved staff, stage of the medication use process at which the error occurred, probable cause, description and patient outcome.

The UB-92 database was used for each center to identify the number of patients admitted to the medical/surgical units at the study sites and to access the charge information for each patient. This database included information on each patient's age, gender, length of stay (LOS), initial department of admission, diagnosis-related group, disease classification based on the International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM), and hospital