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Preventable hospital admissions related to medication (HARM): Cost analysis of the HARM study

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ABSTRACT

Objective: Adverse drug events (ADEs) can cause serious harm to patients and can lead to hospitalization or even death. ADEs are a burden not only to patients and their relatives, but also to society and have the potential to involve high costs. To provide more information on the economic burden of preventable adverse drug events of outpatients, we performed a cost study on the data collected in the Hospital Admissions Related to Medication (HARM) study. In this study we examined the frequency, preventability, and risk factors for hospital admissions related to medication.

Methods: The average costs for a preventable medication-related hospital admission were calculated by summing the direct medical costs and the production losses of all the preventable admissions, taking into account the different types of hospitals (academic and general) and the age of the admitted patients.

Results: The average medical costs for one preventable medication-related hospital admission were €5461. The average production loss costs for one admission were €1712 for a person younger than 65 years of age. Combining the medical costs and the costs of production losses resulted in average costs of €6009 for one, potentially preventable, medication-related hospital admission for all ages.

Conclusions: The costs of potentially preventable hospital admissions related to medication are considerable. Therefore, patient safety interventions to prevent ADEs and hospital admissions may be cost-effective or even cost saving.

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Introduction

Adverse drug events (ADEs) can cause serious harm to patients and can lead to hospitalization or even death [1,2]. Adverse drug events are not only a burden to patients and their relatives but also to society, potentially involving high costs [3–5]. On one hand, improvement of medication safety and patient safety is a major concern to health care workers and policymakers and has the potential to reduce health care costs; however, increasing budgetary constraints often hamper investments in patient safety improvements. Thus, more insight into the costs of preventable hospital admissions may help to prioritize areas to improve patient safety from an economic perspective in addition to the patient and health care perspective.

Some information is already available on costs associated with adverse events and preventable adverse events that occur inside hospitals. A study in the United States estimated the costs attributable to an ADE at $2595 for all ADEs and $4685 for preventable ADEs in 1997. Based on these costs and data about the incidence of ADEs, the authors extrapolated that the annual costs attributable to all ADEs and to preventable ADEs for a 700-bed teaching hospital would be $5.6 million and $2.8 million, respectively [3].The direct medical costs in Dutch hospitals [4] (total number of beds in The Netherlands: 54,353 [6]) were estimated at a total of €355 million for all adverse events (not just events caused by drugs) and €161 million for preventable adverse events in 2004, which is 1.1% of the expenses of the Dutch health care budget [7].

Information on costs of outpatient adverse drug events leading to hospital admissions is still lacking in The Netherlands, but some information is available from studies performed in the United States and the United Kingdom. Estimates of the costs of one medication-related hospital admission vary from US$1507 to US$8300 [8,9]. Exchanging UK£ into US$, a large study in the United Kingdom estimated these costs at the lower range of this interval. Patel et al. [1] also suggested that these admissions cost the NHS up to £466 (US$786; €542) million annually, which is 0.59% of the British health care budget [10]. Unfortunately, only direct medical costs were reported [11], and many of the published studies were either limited to only one [12] or two hospitals, individual units, or patient groups [8,13], or reported no information on preventable costs [14,15].

Given the wide range of costs mentioned in literature and the need for information on the economic burden of preventable adverse drug events of outpatients, we performed a cost analysis on the data we had previously collected in the Hospital Admissions Related to Medications (HARM) study [2]. The previous HARM study was a prospective, multicenter, case-control study in which we collected data on approximately 13,000 unplanned admissions in 21 hospitals in The Netherlands. Results revealed that 5.6% (n = 714) of hospital admissions were thought to be medication related. One-half of these (n = 332) were considered to be potentially preventable. In the current study, we present the total short-term costs associated with preventable medication-related hospital admissions. In addition, we report costs of different subgroups of admissions based on type of hospital, age, preventability, and reason of admission to gain further insight into the potential sizes and areas for cost savings attributable to possible strategies to prevent ADEs.

Method

Setting and study population

Data were collected from the prospective, multicenter, case-control, HARM study on medication-related hospital admissions, which has been described in more detail in a previous publication [2]. Briefly, in this study 12,793 unplanned (acute) admissions from 4 university and 17 general hospitals from all regions in The Netherlands were screened for a potential medication-related cause of hospitalization. An unplanned admission was defined as an admission that was not scheduled by the hospital 24 hours before the actual admission. A case-control design was used to determine risk factors for potentially preventable admissions. Controls were patients admitted for elective surgery. The exclusion criteria were age younger than 18 years and admission for obstetric indications, to a psychiatric ward, or for self-poisoning. The causality assessment of admissions was done by using a three-step approach (trigger list, confirmation by a physician, and central assessment). The central causality assessment was performed by two independent clinical pharmacists according to an adjusted version of the algorithm by Kramer et al. [2,16]. In the adjusted version of the algorithm by Kramer et al., three questions are to be answered (in contrast to six questions in the original algorithm): whether the reason for admission is known to be an adverse event of the suspected medicine, whether alternative causes can explain the relationship between the suspected medicine and the adverse event, and whether a plausible time relationship exists between the adverse event and the start of medication administration (or the occurrence of the medication error). On the basis of the answers, causality is classified as possible, probable, or unlikely. Cases with an assessment of unlikely were excluded. Preventability also was assessed centrally according to a modified version of the algorithm by Schumock et al. [2,17]. In this algorithm, an admission was assessed as potentially preventable when a medication error was made with the medication that caused the hospital admission. If the assessments of the pharmacists were not in agreement, they met and discussed to reach a consensus. This resulted in 714 (5.6%) medication-related hospital admissions, of which 332 (46%) were considered potentially preventable. The median length of hospital stay of the 332 potentially preventable medication-related cases was 8 days, and 24 (7.2%) of these patients were admitted to an intensive care unit (ICU). Lack of a clear indication for the medication, nonadherence to the medication regimen, inadequate monitoring, and drug–drug interactions were the most common medication errors found. Most of the included admitted patients had much comorbidity: 56% had four or more diseases in their medical history. In addition to the number of comorbidities, other risk factors to medication-related

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