

Prescribing Errors

What's the Story?

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Although prescribing errors are one of the most common causes of preventable iatrogenic injury, there have been relatively few studies of their incidence and causes. The majority of the studies that have been carried out have been based in secondary care. This paper reviews what is currently known about prescribing errors. It is suggested that prescribing errors occur in at least 1-2% of all medication orders written, cause harm in about 1% of admissions, and have a wide range of causes. Organisation-wide interventions and cultural changes are likely to be required to prevent them. However, useful first steps suggested include reporting prescribing errors identified, formally reviewing pharmacists' interventions and developing increased 'error awareness' amongst all health care professionals.

Introduction

Medical errors and the harm they can cause are receiving increasing attention. In the UK, the Department of Health recently issued two reports highlighting this problem^{1,2} and an entire issue of the British Medical Journal has been devoted to the subject³. In the US, the Institute of Medicine report 'To err is human: building a safer health system'⁴ has received worldwide publicity. It is clear that medical errors are causing concern amongst patients, health care professionals and governments alike.

Medication errors are one of the most common types of medical error⁵. It has been estimated that 1-2% of

patients admitted to US hospitals are harmed as a result of medication errors⁶, and that each error that results in harm costs an additional US\$5000 excluding legal costs⁷. In the UK, it has been recommended that serious errors in the use of prescribed drugs should be reduced by 40% by 2005¹. In a landmark US study, the majority of the preventable adverse drug events (medication errors that result in harm) were specifically attributed to prescribing, rather than dispensing or administration^{8,9}. It is therefore surprising that there have been few studies of prescribing errors and their causes. This paper reviews what we do

know about prescribing errors and suggests some ways forward. It is based on a literature search carried out using Medline and Embase databases to identify studies of prescribing errors published between 1980 and April 2001. Studies of standards of prescription-writing, rather than prescribing errors, are excluded.

Studying prescribing errors

A word of caution - the prescribing error literature can be difficult to interpret! The results of many studies do not distinguish between the different types of medication error such as prescribing, dispensing and administration errors^{5,10-12}. Others do not differentiate between medication errors and adverse drug reactions¹³⁻¹⁵. There are also wide differences in the definitions and data collection methods used⁶, although a standard practitioner-led definition has now been developed¹⁶.

How often do prescribing errors occur?

Studies of the prescribing error frequency generally fall into two groups, those based on pharmacist review of medication orders and those based on the identification of patient harm. Each of these will be considered in turn. Most research into prescribing errors has taken place in US hospitals, although more recently studies have also taken place elsewhere.

Pharmacists' Review of Medication Orders

In the US, pharmacists reviewing medication orders in the course of their prescription monitoring duties have identified (and prevented) prescribing errors in 0.3 to 1.9% of all medication orders written¹⁷⁻²⁰. However, careful examination of these studies reveals some variation in the definitions of an error used and comparisons amongst them should be made with caution.

The most prolific authors in this area are Lesar and colleagues, based in a teaching hospital in New York State. In their first study, an error was identified in 0.3% of all medication orders written¹⁷. The most common category of error was 'wrong dose' errors. When 'problem orders' (errors without toxic potential, errors

concerning doses that were unlikely to be given, and missing information) were excluded, the 'significant' error rate was 0.2%. As a result of these findings, an ongoing prescribing error monitoring programme was initiated. A total of nine years' data were later published²¹, which suggested that the rate of significant errors had increased from 0.2% to 0.4%. However, as the authors point out, these error rates are likely to be an underestimate of the true error rate, as many errors will go undetected by dispensary-based pharmacists.

In a further study, the same authors examined a series of significant errors to explore the most likely contributing factors¹⁸. The contributory factors were assigned by the investigators rather than the prescribers involved. Nevertheless, the results suggest that the most common factors involved knowledge about drugs and knowledge about patient characteristics that affect drug handling. Analyses of data for specific groups of drugs such as antimicrobials have also been published²².

There have been far fewer studies outside of the US. Twenty-five years ago, Tesh and Beeley²³ carried out a retrospective review of 455 patients' drug charts in a UK hospital. These investigators examined errors in drug use and errors in prescription writing such as prescribing by brand name. It was concluded that more than 30% of all medication orders contained an error of prescription writing. The medical notes were also reviewed for 385 patients to identify any contra-indications to the drugs prescribed; it was concluded that overall, 3.6% of all medication orders were associated with an error in drug use.

More recent UK studies have focused on pharmacists' clinical interventions. For example, Hawkey *et al.*²⁴ recorded interventions in six hospitals. It was found that pharmacists made interventions in about 2.9% of all prescriptions, and that the majority concerned drug doses. In the former North Thames Region of England, hospital pharmacists record all interventions made during one week each year. These data are then collated and analysed centrally. For example,

Barber *et al.*²⁵ reported that 3501 interventions were made for 10,478 occupied beds during a one-week period, equivalent to 33 interventions per 100 beds per week. However, such studies do not allow firm conclusions to be drawn regarding the frequency of prescribing errors, as pharmacists' interventions also include advice-giving, formulary issues and patient counselling.

In a more recent UK study, pharmacists recorded details of all prescribing errors identified in non-obstetric inpatients during a four-week period²⁶. The number of medication orders written was estimated from a 1 in 5 sample of inpatients. An error was identified in 1.5% of all prescriptions written, of which one quarter were judged to be potentially serious. As in other studies, the majority (59%) were associated with choice of dose.

In studies of this type, the errors reported are those that pharmacists identify and draw to the prescribers' attention. The medication orders concerned are usually corrected before the patient receives the medication. There are therefore no adverse patient outcomes. In contrast, studies based on the identification of harm include only the subset of errors that reach the patient and result in injury.

Identification of harm

Such studies usually include iatrogenic injury of many different kinds, but depending on how the data are presented, the frequency of medication-related events can usually be identified. The US Harvard study⁵ is probably the most well known study of iatrogenic harm and was based on the retrospective review of more than 30,000 medical records. This study suggested that a medication error caused harm in 0.7% of inpatients. A similar study in Australia identified a figure of 1.8%²⁷. However, these figures include both prescribing and administration errors and the results do not allow differentiation between them. The Adverse Drug Event (ADE) Prevention Study Group examined medication-related harm in more detail⁸. This six-month study included all adults admitted to a stratified sample of wards in two large hospitals.

A medication error that resulted in harm ('preventable ADE', in the authors' terminology) was identified in 1.8% of admissions. Prescribing accounted for the majority of these, representing 1.0% of all admissions. The staff involved were also interviewed to obtain details of the circumstances surrounding each error⁹. As in Lesar *et al.*'s study¹⁸, the most common causes were lack of knowledge about the drug and lack of knowledge about the patient. More recently, a similar study was carried out in two paediatric hospitals; a preventable ADE was identified in 0.4% of admissions²⁸.

Why do prescribing errors occur?

Surprisingly, there has been little research into the reasons why prescribing errors occur. While many health care professionals have their own hypotheses about the causes of prescribing errors, there is little evidence on which to base these theories. There is, however, a growing body of research concerning human error in other fields.

Theories of human error have been used for some time to analyse errors in high-risk environments such as aviation and nuclear power, and have more recently been applied to medicine^{29,30}. There are many different approaches to the study of human error³¹, but Reason's accident causation model³² is the most widely used. This model is based on the assumption that 'active failures' on the part of front-line individuals are largely the result of the conditions in which they work, often termed 'error producing conditions'. These in turn are the result of fallible decisions at an organisational level, known as 'latent conditions'. There is therefore less focus on the individual who makes the error and more on pre-existing organisational factors. The advantage of using this approach is that it aids the identification of relevant latent conditions, the primary focus of intervention³³. Reason's model has now been used to investigate and analyse incidents in obstetrics³⁴, mental health³⁵ and other clinical settings²⁹. It has also been used to develop a protocol for the routine investigation of adverse incidents in hospitals³⁶.

However, this approach has only recently been applied to prescribing errors³⁷. In this UK study, forty-four interviews were conducted with prescribers making potentially serious errors. It was found that active failures were usually slips in attention or mistakes such as not applying relevant rules. Doctors identified many error-producing conditions; these included work environment, workload, whether or not they were prescribing for their own patient, communication within their team, physical and mental well-being, and lack of knowledge. Latent conditions included lack of training, low perceived importance of prescribing, a hierarchical medical

team, and a lack of self-awareness of errors. It was concluded that amongst other things, we need to create a culture in which prescription writing is seen as important and to sensitise health care professionals to situations in which errors are most likely to occur.

Conclusions

The literature suggests that prescribing errors are a major source of iatrogenic injury in hospitals. While little is known about the incidence of errors in primary care, there is no reason to suppose that prescribing errors are any less frequent. Careful study of the literature also reveals that there is wide variation in the

definitions of a prescribing error used, and that little is known about their causes or how they can be prevented. Human error theory has been helpful in the investigation of adverse incidents in medicine, and has more recently been applied to prescribing errors. Large-scale studies of interventions to reduce prescribing errors are now required. However, useful first steps suggested include reporting prescribing errors identified, formally reviewing pharmacists' interventions and developing increased 'error awareness' amongst all health care professionals. Any successful intervention to reduce prescribing errors is likely to require the involvement of all health care professionals. ★

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