Perceptions of Patients and Health Care Professionals about Factors Contributing to Medication Errors and Potential Areas for Improvement

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ABSTRACT

Background: Significant efforts have been directed to understanding medication errors in recent years, but there has been little work to compare the perceptions of health care professionals and patients regarding such errors.

Objective: To determine the factors contributing to medication errors and related areas for improvement, as perceived by health care professionals and patients, and to compare and contrast these perceptions.

Methods: Medication errors documented at South Shore Health hospitals in Nova Scotia from February 2002 to June 2004 were compiled and analyzed to identify trends. Trends and examples of medication errors were presented to 2 focus groups, the first consisting of health care professionals and the second consisting of patients. Participants were asked to identify factors perceived as contributing to errors using the nominal group technique and to identify possible areas for improvement using an Ishikawa (fishbone) diagram.

Results: Health care professionals and patients identified different factors as contributing to errors. Health care professionals identified factors related to individuals, whereas patients identified both individual and system-wide factors. According to the fishbone diagram, participants felt that "people" and "procedures and management" are the areas where interventions to reduce medication errors should be primarily directed.

Conclusions: A wide range of factors perceived as contributing to medication errors were identified. These results provide valuable information that could be used to improve the medication use system at South Shore Health.

Key words: medication errors, patient safety, nominal group technique, Ishikawa diagram

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ABSTRACT

Historique : Des efforts considérables ont été déployés ces dernières années pour comprendre les erreurs de médication, mais peu pour comparer les perceptions des professionnels de la santé et celles des patients sur ce sujet.

Objectif : Déterminer les facteurs qui contribuent aux erreurs de médication et les éléments connexes à améliorer, d'après les perceptions des professionnels de la santé et des patients, et comparer ces perceptions et en faire ressortir les différences.

Méthodes : Les erreurs de médication documentées dans les hôpitaux de la régie de la santé South Shore Health de Nouvelle-Écosse entre février 2002 et juin 2004 ont été compilées et analysées pour en dégager les tendances. Ces dernières et des exemples d'erreurs de médication ont été présentés à deux groupes de discussion, le premier formé de professionnels de la santé, le second composé de patients. On a demandé aux participants de cerner les facteurs qui à leurs yeux contribuaient à la survenue des erreurs de médication, en utilisant la technique du groupe nominal, et les éléments connexes qui pourraient être améliorés, en utilisant un diagramme d'Ishikawa (causes-effet).

Résultats : Les professionnels de la santé et les patients ont défini différents facteurs qui contribuaient à la survenue des erreurs. Les professionnels de la santé ont cerné des facteurs liés aux personnes, alors que les patients ont relevé des facteurs liés à la fois aux personnes et aux systèmes en place. D'après le diagramme de causes-effet, les participants ont estimé que les interventions visant à réduire les erreurs de médication devaient être principalement dirigées sur deux catégories de causes: « personnes » et « méthodes et gestion ».

Conclusions : Un large éventail de facteurs perçus comme contribuant à la survenue des erreurs de médication a été défini. Les résultats fournissent des renseignements précieux qui pourraient servir à améliorer les systèmes de distribution des médicaments à la régie régionale de la santé South Shore Health.

Mots clés : erreurs de médication, sécurité des patients, technique du groupe nominal, diagramme d'Ishikawa

INTRODUCTION

As defined by the National Coordinating Council for Medication Error Reporting and Prevention, a medication error is "any preventable event that may cause or lead to inappropriate medication use or patient harm while the medication is in the control of the health care professional, patient, or consumer".[1] The Institute of Medicine report entitled *To Err is Human* estimated that approximately 7000 Americans die annually because of medication errors.[2] Although the Canadian Adverse Events Study[3] quantified, for the first time, the problem of adverse events, including adverse drug events, in Canadian hospitals, no studies have yet been published that quantify the magnitude of the problem of medication errors in Canada. Extrapolation from US data suggests that approximately 700 Canadians die each year as a result of medication errors.[4] These numbers may appear small, but the underreporting of adverse events in medicine ranges from 50% to 96%,[5] and it seems safe to assume that the incidence of medication errors, which can lead to adverse drug events, is also severely underreported.

Health care professionals and patients experience medication errors first-hand, and their perceptions may be valuable in efforts to reduce errors. One method that could be used to decrease the incidence of medication errors is to develop an understanding of health care professionals' and patients' perceptions of the causes of errors and their opinions regarding the manner in which the medication use system could be improved to enhance patient safety.

The Canadian College of Health Services Executives believes that the core competencies of all health services executives in Canada should include responsiveness to consumer and community needs, the ability and drive to actively seek out and listen to messages from these stakeholders, and the use of their feedback to continuously improve the delivery of health care services.[6] Obtaining input from health care providers and from patients regarding their perceptions of the causes of medication errors is one way for health services executives to realize these core competencies. Furthermore, before any changes are made to the fundamental basis of the medication use system, recommendations on preventing medication errors should be sought from those at both the giving and the receiving ends of health care. Because health care professionals provide care and patients receive it, the experiences of these 2 groups in the medication use process are different, and their perceptions of the causes of errors may also be quite different.

Although research about medication errors has dramatically increased in recent years, an important void remains in the literature concerning perceptions about errors. The objectives of the study reported here were to determine and compare health care professionals' and patients' perceptions regarding the factors contributing to medication errors and potential areas for improvement.

METHODS

The study protocol was approved by the Health Sciences Ethics Review Board at Dalhousie University and by the Research Review Committee at South Shore Health (SSH), 1 of the 9 health districts in Nova Scotia. The study involved several steps: compilation of medication error data from SSH hospitals; formation of focus groups of health care professionals and of patients, during which the perceived contributing factors to medication errors were identified using the nominal group technique;[7] and identification of areas for improvement using an Ishikawa (fishbone) diagram.[8] The methods employed followed the continuous quality improvement (CQI) philosophy of collecting data about a particular problem or area of interest, presenting the data to front-line health care staff, and offering them the opportunity to suggest methods for improving the system.[9] The use of CQI techniques has become widely accepted in health care and is increasingly being implemented in health care institutions. The final stages of the CQI process for this project, which consist of implementing the proposed solutions and measuring any resultant change, are not reported here because these steps have not yet been completed.

Data Collection

Data about medication incidents were collected from the 3 SSH hospitals. SSH provides community and hospital-based services to more than 60 000 residents of Lunenburg and Queens counties and to residents of neighbouring communities. SSH has 2 acute care community hospitals and 1 primary and secondary care hospital, which together have a total of 155 beds, operating, on average, at an 89% occupancy rate.

SSH implemented a new medication error reporting and tracking system in February 2002. All medication-related incidents documented at SSH from February 2002 to June 2004 were compiled into a database, which was reviewed for trends (using SAS statistical software, version 8.2, SAS Institute, Cary,

NC). Four errors were selected from the database and described to participants in the 2 focus groups. These examples were selected to highlight the diverse types of situations and incidents that are considered to represent medication errors. In one of the examples, the error resulted in patient harm, but the other 3 errors did not result in any harm (Table 1).

Focus Groups

Eligible health care professionals (general medicine practitioners, physician specialists, nurses, and pharmacy personnel actively employed at one of the SSH hospitals) were invited by the director of pharmacy to participate in the focus group, and the first 10 people to express interest were recruited; ultimately, 9 of these health professionals participated. All participants provided informed consent.

Eligible patients were those who had been discharged from one of the study hospitals in August or September 2004 (which indicated recent experience in an SSH hospital) and who were taking 4 or more medications at the time of discharge. The first 10 patients to express interest were invited to take part in the patient focus group; ultimately, 8 of these patients participated. All participants provided informed consent.

The trends in medication errors and descriptions of 4 medication errors from the database were presented to the 2 focus groups; the 4 examples were intended to provide complementary information to the trending data. Medication error trends were classified according to the following characteristics: drug name and American Hospital Formulary Service class; date, time, place, and type of incident; the breakdown point (the point in the medication use process at which the error occurred); the staff member who reported the error (by profession); the severity of the error, as indicated by the level of injury to the patient; and the patient outcome. The same information was presented in both focus group sessions, each of which lasted approximately 2 h. The goal was for participants in both groups to receive an overview of medication incidents at SSH and to ensure comparable baseline knowledge.

The nominal group technique,[7] which uses both interacting and non-interacting group processes to ensure that quiet participants have a voice and to allow minority ideas to be expressed, was used for the 2 focus groups. After presentation of the trends in medication errors and the descriptions of specific errors, participants were asked to identify the factors contributing to medication errors at SSH. They were given time for quiet brainstorming, during which they were instructed to write down their ideas in silence and following which each was given the opportunity to share his or her ideas in turn. These ideas were recorded on flipcharts and posted on the walls of the room for reference. Participants were then instructed to rank their perceptions of the top 3 contributing factors. After the voting, group discussion was used to organize the ideas in a cause-and-effect diagram (also known as a fishbone or Ishikawa diagram[8]). The purpose of this exercise was to organize the perceived causes of medication errors, as identified by the brainstorming sessions, into the following categories of error causes (which are typically used with the Ishikawa diagram): physical environment; people; patients; provisions, supplies, and equipment; and procedures and management. This process allows assessment of areas for improvement.

Table 1. Description of Medication Errors Presented to Focus Groups

Error	Description	Outcome
The patient received 2 tablets of regular-release verapamil 120 mg, instead of 1 tablet of sustained-release verapamil 240 mg	The order was written after pharmacy hours, and the medication was retrieved from the night cupboard.	The patient did not experience any adverse effects.
An IV "water" flush was prescribed, but the medication nurse actually administered half-strength hydrogen peroxide.	A sterile water container filled with half-strength hydrogen peroxide was not labelled correctly.	The patient experienced severe abdominal pain, nausea, and retching, and appeared grey and clammy. Symptoms subsided within 15–20 min.
Ten extra doses of hydromorphone 8 mg were administered to the patient.	The physician's order to discontinue was written in the patient's medical record, but the medication was not discontinued on the medication administration record.	The patient did not experience any adverse effects.
Staff members wondered whether the patient had received an extra tablet of codeine 30 mg.	The codeine count showed that 2 tablets had been removed overnight; the nurse remembered administering only 1 tablet to a patient.	The patient stated that he "had the best sleep ever".

RESULTS

Trends in Medication Errors

From February 2002 to June 2004, a total of 227 medication errors were reported in the medication incident tracking system at SSH.

Central nervous system agents were responsible for 78 (34%) of the errors reported; 27 (12%) of the errors involved cardiovascular drugs; and 24 (11%) involved electrolyte, caloric, and/or water balance agents. The most commonly reported medication errors involved the administration of the wrong drug (72 errors or 32%), whereby the patient received a drug that had not been prescribed or a drug that had been prescribed inappropriately. Errors of omission and errors involving the wrong dose were the second and third most commonly reported medication errors (42 [19%] and 41 [18%], respectively). A large proportion of the errors (166 [73%]) occurred during the administration phase of the drug use process. Of those, 30 (18%) involved improper interpretation of the order, 22 (13%) involved a missed dose, and 20 (12%) involved improper reading of the label or instructions.

Most of the errors were reported by nurses, 175 (77%) by a registered nurse and 23 (10%) by a licensed practical nurse. Physicians and pharmacists reported 9 (4%) and 4 (2%) of the errors, respectively, and this information was missing for the remaining 16 errors (7%). Fifteen (7%) of the reported errors did not reach the patient; 143 (63%) of the reported errors reached the patient but did not result in any harm; 52 (23%) of the errors reached the patient and did not result in harm, but had the potential to cause moderate or severe harm or even death; 12 (5%) of the reported errors resulted in moderate harm to patients; and 1 (<1%) of the reported errors resulted in serious harmful effects that required immediate interventions (severity was not ranked for 4 of the reports). The errors were roughly equally distributed throughout the day: 118 (52%) occurred between 0700 and 1900, and 109 (48%) occurred overnight, between 1900 and 0700.

Health Care Professional Focus Group

The focus group of health care professionals initially generated 29 potential factors contributing to medication errors at SSH, but after deletion of duplicates and rewording to combine related ideas, 24 factors remained. The top 4 factors perceived to contribute to medication errors at SSH are presented in Table 2.

These top 4 contributing factors were organized into a cause-and-effect diagram (Figure 1), and all 4 were placed in the categories "people" and "procedures and management." The participants in the health care professional focus group were given the option of subcategorizing the main categories on the cause-and-effect diagram and chose to do so. These subcategories also appear in Figure 1.

Patient Focus Group

The patients identified 21 causes of medication errors, fewer than the health care professionals. Some of the items were reworded during discussion, but none were combined. The top 4 factors contributing to medication errors as perceived by the patients are also presented in Table 2.

The cause-and-effect diagram for the patient focus group (Figure 2) identified the "people" category as the biggest area for improvement, followed by the "procedures and management" category. The patient participants chose not to subcategorize the main categories on the cause-and-effect diagram. Therefore, Figure 2 shows only the main categories.

DISCUSSION

In this study, the causes of medication errors within a hospital setting, as perceived by focus groups of health professionals and of patients, were identified. Although national organizations have recommended collaboration with patients to improve patient safety, little research has been done regarding the perceived

Table 2. Top 4 Factors Contributing to Medication Errors, as Perceived by Focus Groups of Health Care Professionals and of Patients

Rank of Factor	As Perceived by Health Care Professionals	As Perceived by Patients
1	Multitasking	Human error
2	Handwriting	Patients unwilling or unable to provide pertinent information
3	Transcription errors	Overworked doctors and nurses
4	Failure to follow the "5 Rs" (right drug, right dose, right person, right route, right time)	Improper patient identification or failure of patient identification

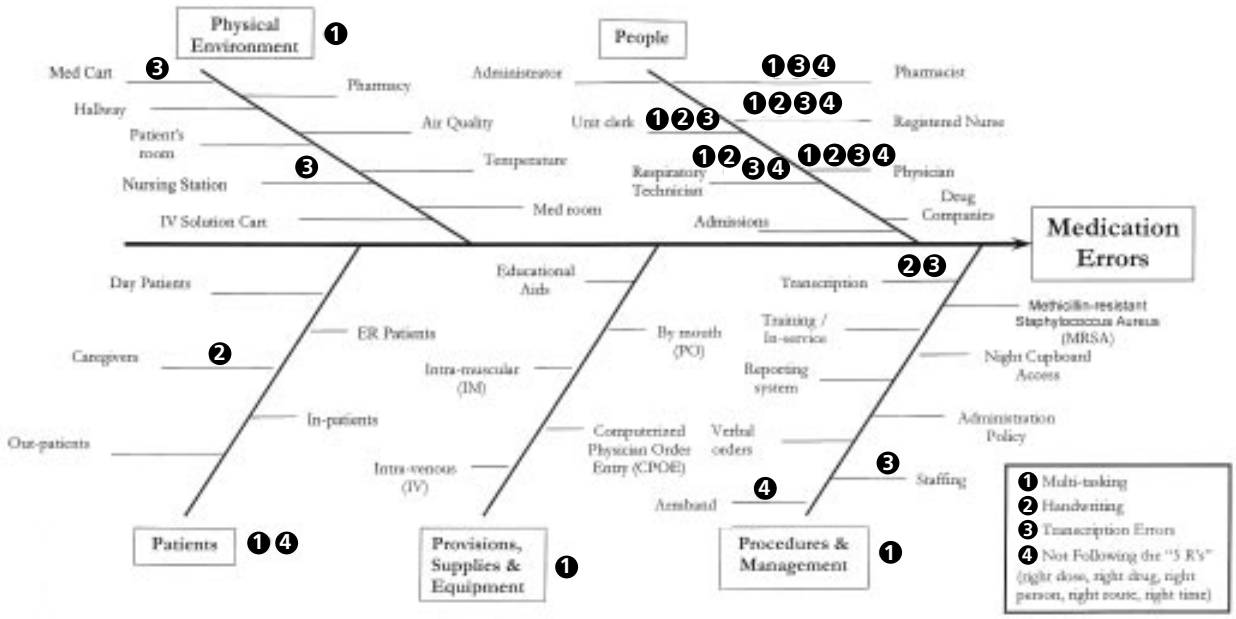

Figure 1. Cause-and-effect diagram for the health care professional focus group. Circled numbers represent the perceived factors leading to errors within each category or subcategory. A number placed next to the heading of a main category rather than one or more subcategories within that main category means that participants felt that every subcategory within the main category could be targeted for improvement.

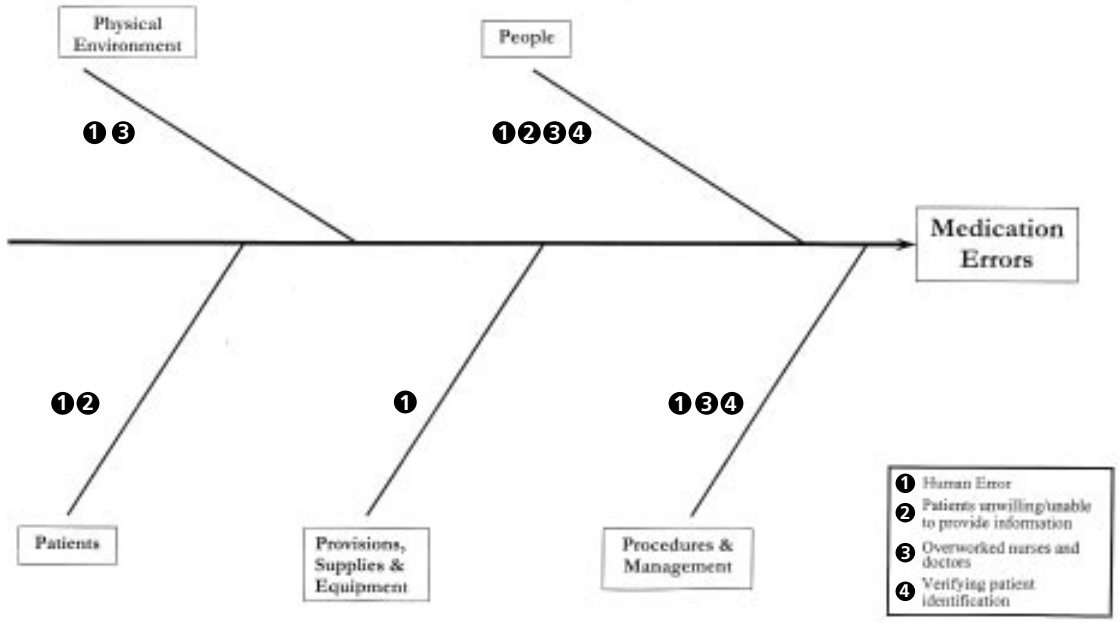

Figure 2. Cause-and-effect diagram for patient focus group. Circled numbers represent the perceived factors leading to errors within each category or subcategory.

causes of medical errors and areas for improvement to prevent such errors, particularly medication errors.

The perceived causes of errors identified here, which were similar to those reported by others,[10-13] differed between the 2 focus groups. Health care professionals, who identified multitasking, handwriting, transcription errors, and not following the "5Rs" as the top 4 causes of medication errors, seemed to place more emphasis on individual-level issues as causes of medication errors. In contrast, patients seemed to place equal emphasis on individual and system causes of errors. Although the top 4 perceived causes seemed to differ between the 2 groups (Table 2), the cause-and-effect diagrams revealed that "people" and "procedures and management" were the primary categories of causes of errors, which suggests that both groups perceived medication errors as representing individual and systems problems and that interventions designed to reduce the incidence of medication errors should be directed at both these areas.

A particularly interesting finding was that patients seemed to recognize the concept of human error and how it contributes to the incidence of error in medicine. During the patient focus group, participants engaged in conversation about human error, noting that not all errors result from poor care, that some errors result from the fact that health care professionals are human, and that human error is not necessarily due to negligence, lack of knowledge, or poor care.[14] In addition, the health care professionals tended to place responsibility for medication errors on themselves or their colleagues, and the patients recognized their own contributions to error by identifying patients' unwillingness or inability to provide health care professionals with appropriate information about their health history, previous treatment, and past and current medication use.

These results were somewhat surprising, in that health care professionals might be expected to attribute medication errors to system factors, hence removing a degree of responsibility from themselves, whereas patients might be expected to attribute medication errors to health care providers, since these are the people from whom patients receive care. In fact, health care professionals and patients both identified a personal responsibility in relation to the causes of medication errors. Both groups appeared to appreciate that medication errors are caused by both individual and system factors. As stated by other researchers in this area, "the first step in improving medication error rates could well be reaching an acceptable level of consensus among hospital staff [and, arguably, patients] on why they occur in the first place."[13]

Even though the 2 focus groups each identified various perceived causes for medication errors, they both identified "people" and "procedures and management" as top areas for improvement. As a result of this study, the following specific recommendations were made to the SSH Board of Directors with the aim of improving the medication use system and potentially reducing the incidence of medication errors: creation of a clinical pharmacist position to support bedside decision-making, implementation of a unit-dose drug distribution system, implementation of pharmacy-generated medication administration records, implementation of computerized physician order entry, and creation of a home medication reconciliation program. In response, SSH has committed support for a part-time clinical pharmacist, made a substantial monetary investment in the implementation of a unit-dose drug distribution system (specifically, the purchase of equipment and renovations to existing space to house the equipment), initiated a pilot program in the inpatient mental health unit to determine the feasibility and effectiveness of pharmacy-generated medication administration records, and committed funding to support a dedicated home medication reconciliation pharmacist.

CONCLUSIONS

A wide range of factors perceived as contributing to medication errors were identified by a focus group of health care professionals and a focus group of patients. Health care professionals identified individual factors as causes of errors, whereas patients identified both individual and system-wide factors. Overall, participants felt that "people" and "procedures and management" are the areas in which interventions to reduce medication errors should be primarily directed. This study has provided valuable information that is being used to improve the medication use system at SSH, and many recommendations resulting from this study have already been implemented.

This study has identified the perceived causes of medication errors at SSH; an important next step is to use the results of this and other studies to correlate these perceived causes of errors with the actual causes of errors as identified by root cause analysis. If the perceived causes of medication errors are correlated with the actual causes, organizations can use the perceived causes of errors to effect positive change and facilitate error prevention.

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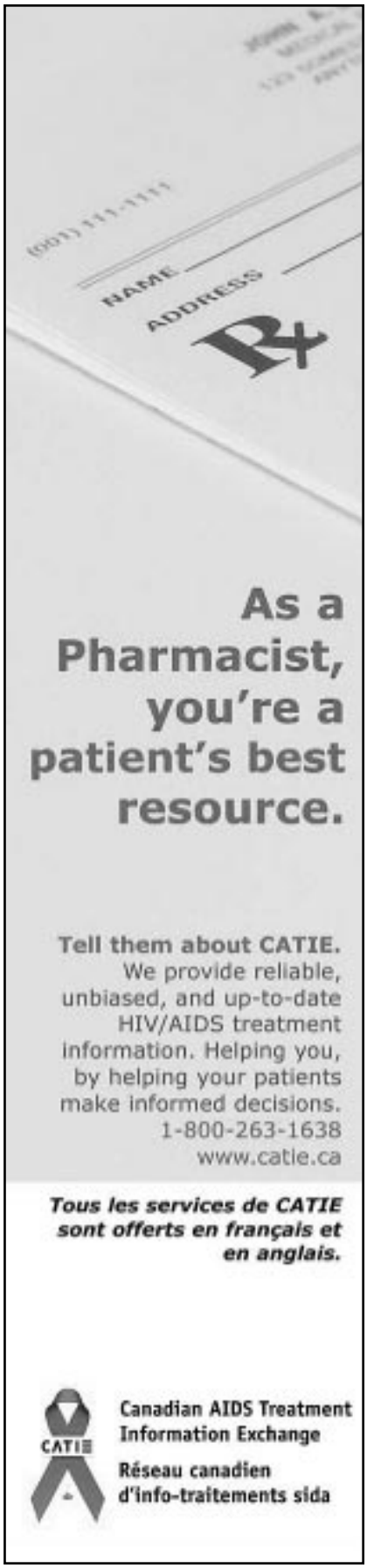
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