An international taxonomy for errors in general practice: a pilot study

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ABSTRACT

Objectives: To develop an international taxonomy describing errors reported by general practitioners in Australia and five other countries.

Design and setting: GPs in Australia, Canada, the Netherlands, New Zealand, the United Kingdom and the United States reported errors in an observational pilot study. Anonymous reports were electronically transferred to a central database. Data were analysed by Australian and international investigators.

Participants: Non-randomly selected GPs: 23 in Australia, and between 8 and 20 in the other participating countries.

Main outcome measures: Error categories, and consequences.

Results: In Australia, 17 doctors reported 134 errors, compared with 301 reports by 63 doctors in the other five countries. The final taxonomy was a five-level system encompassing 171 error types. The first-level classification was "process errors" and "knowledge and skills errors". The proportion of errors in each of these primary groups was similar in Australia (79% process; 21% knowledge and skills) and the other countries (80% process; 20% knowledge and skills). Patient harm was reported in 32% of reports from Australia and 30% from other countries. Participants considered the harm "very serious" in 9% of Australian reports and 3% of other countries' reports.

Conclusions: This pilot study indicates that errors are likely to affect primary care patients in similar ways in countries with similar primary healthcare systems. Further comparative studies are required to improve our understanding of general practice error differences between Australia and other countries.

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DESCRIPTIONS OF MEDICAL ERRORS are essential to understanding the types of mistakes occurring in general practice and to develop strategies to improve patient safety. There is no reason to suppose that a taxonomy peculiar to errors in one country can be applied in another. Indeed, an international taxonomy is needed if direct comparisons are to be made between countries.

In this article, we describe the Australian results of the 2001 international pilot study, the *Primary Care International Study of Medical Errors* (*PCISME*), drawing comparisons and contrasts with findings from all other participating countries combined.

PCISME is the first international study of medical errors in general practice, and involved six countries with similar primary healthcare standards. It aimed to classify the types of errors recognised by primary medical care providers, and develop a taxonomy of the errors reported. It also tested an electronic method of data collection in general practice that could be applied to the six participating countries.

METHODS

The Robert Graham Center of the American Academy of Family Physicians invited investigators from Australia, Canada, the Netherlands, New Zealand, the United Kingdom and the United States to participate in *PCISME*. Countries were chosen because they had a similar concept of primary healthcare and their healthcare systems all delivered a First World style of medicine.

In essence, *PCISME* was a survey of the errors noted by a non-random sample of GPs in the six participating countries. All participants were allowed a minimum of three months to contribute reports. Data collection occurred from June to October 2001 in Australia, and in other countries between June and December 2001.

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The protocol was approved by the University of Sydney Human Research Ethics Committee.

Participants

In each country, selection of GPs was conducted through invitation by local investigators using established GP research networks. Each country aimed to include about 20 doctors. Eligibility criteria included working in clinical general practice for at least 20 hours per week (excluding a main work activity of teaching or research), with an absence from work during the study period not exceeding two weeks. Participants had to be computer literate and have access to a personal computer with a CD-ROM drive, running Windows 95 or higher, and connected to the Internet.

The protocol regarding payments varied among participating countries. Aus-

1: Questionnaire used in *PCISME* 2001

Question	Answer format
a) Is the problem related to a specific patient?	YES/NO
b) If yes, how well do you know the patient?	5 point Likert scale
c) Patient age	Free text
d) Patient sex	Male/Female
e) Is the patient a member of a group designated an ethnic minority by your country?	YES/NO
f) Does patient have a complex health problem?	YES/NO
g) Does patient have a chronic health problem?	YES/NO
h) What happened? Please consider what, where and who was involved.	Free text
i) What was the result? Please think about actual and potential consequences.	Free text
j) What may have contributed to this error? Please consider any special circumstances.	Free text
k) What could have prevented it? Please consider what should change to prevent recurrence.	Free text
l) Where did the error happen? Choose all that apply from *Office or surgery, Nursing home, Hospital, Patient's home, Telephone contact, Emergency Room, Laboratory, Pharmacy, Radiology*	Check a box or boxes: 9 choices
m) To your knowledge, was any patient harmed by this error?	YES/NO
n) If yes, how would you rate the seriousness of this harm?	5 point Likert scale
o) How often does this error occur in your practice? *First time, Seldom 1–2 per year, Sometimes 3–11 per year, Frequently > 1/month*	Check a box: 4 choices
p) Other comments?	Free text

tralian doctors were invited to claim an honorarium: if they reported at least 10 errors, they could claim the equivalent of the general practice fee recommended by the Australian Medical Association for 10 standard consultations. They were also eligible for Quality Assurance Audit points from the Royal Australian College of General Practitioners (RACGP). It was not possible to pay doctors per report, as this would have impinged upon the anonymity of the participants.

Characteristics of the participating Australian doctors were collected during enrolment to compare the sample with the population of Australian GPs.

Definition of error

The definition of "medical error" used was tested in a pilot study at the American Academy of Family Physicians in 2000:[1]

> "Errors are events in your practice that make you conclude: '*that was a threat to patient well-being and should not happen. I don't want it to happen again*'. Such an event affects or could affect the quality of the care you give your patients. Errors may be large or small, administrative or clinical, or actions taken or not taken. Errors may or may not have discernable effects. Errors in this study are anything that you identify as something wrong, to be avoided in the future."

This definition attempts to incorporate the broadest possible range of problems. It allows reports not only on events attributable to the reporter's actions, but also on unwanted occurrences noted concerning patient care.

Reporting process

Error reports could be completed on any computer with an Internet connection. The World Health Network's medical information software "Healix" was used to access the study's electronic reporting form and to transmit data. Each report was identified with a self-chosen personal identification number (PIN). Doctors indicated their country, and then proceeded through the questionnaire (Box 1). They were asked not to use any identifying information in their reports.

High-level encryption was used when transmitting the data to the server in London, UK. Doctors were advised not to disclose their PIN, and not to retain paper copies of their error reports. The PINs were not known by the researchers, and were used solely to identify how many reports a participant had contributed. Access to the database was limited to the chief investigators in each country.

Analysis

As the reports were submitted, the Australian investigators, in consultation with the International Principal Investigator, categorised them. Error reports from the other participating countries were simultaneously categorised in this manner. The taxonomy was initially based on an earlier US pilot study.[1] It was further developed and refined during the trial in order to capture the full extent of error types reported from all countries.

The proportion of reports attributable to each category was calculated for Australia and for all other countries combined.

RESULTS

Participants

Australian participants were drawn from the 400 GPs listed on the research databases of the Department of General Practice, University of Sydney, and the NSW Projects, Research and Development Unit of the RACGP. In total, 101 doctors received telephone invitations and 23 were enrolled. Doctors outside the Sydney metropolitan area were excluded because of cost constraints. Of those declining, 32 were too busy and 23 offered no reason. Reasons for non-participation given by the remaining 23 doctors were uncomfortable with an electronic study (6), no Internet connection (4), wished not to participate in further research (4), concerned with potential bad press from the study (3), incompatible operating system (2), on holidays (2), and concerned about the accuracy of the results (2).

The total number of doctors invited to participate in the study in the other countries is unknown.

2: Characteristics of *PCISME* Australian participants compared with recent Australian general practice statistics

Characteristic	*PCISME* participants (23 GPs, 22 practices)	Australian general practice	*P**
Male	18/23 (78%)	13 929/20 852 (66.8%)[2]	0.24
Doctor works in metropolitan area	23/23 (100%)	16 186/20 852 (77.6%)[2†]	0.01
Computers used in practice	21/22 (95%)	1070/1202 (89%)[3]	0.34
Computer used by practice for prescribing	19/22 (86%)	4113/5273 (78%)[4]	0.34

* *P*-value by χ^2 test. † Derived from Australian Medical Workforce Advisory Committee total GP population of 20 852, with 75.6% of men, and 81.7% of women practising in metropolitan areas. *PCISME = Primary Care International Study of Medical Errors.*

The 23 participating Australian doctors were similar to Australian GPs with respect to sex and computer use (Box 2).

Australian doctors on average contributed the highest number of reports (Box 3). Although more participants were enrolled in the study in Australia than in other countries, the US had the highest number of different PINs submitted, implying more individuals contributed reports.

Taxonomy of errors

The final taxonomy was a five-level system encompassing 171 error types. Errors were classed primarily as due to a problem with processes involved in carrying out general practice, or associated with a problem with the knowledge and skills involved in general practice.

Two reports from Australia and four from other countries were excluded as non-errors. In all countries, more reports were of "process" than "knowledge and skills" errors. Box 4 shows the taxonomy, to the first three levels.

Consequences of errors

Patient harm was reported in 32% of Australian errors, compared with 31% in other countries. This harm was considered "very serious" or "extremely serious" (4 or 5 on the Likert scale) in 9% of Australian cases, compared with 3% in other countries. Consequences included hospital admission in 4.5% of the Australian cases, and 3.7% of others, and death in one (0.8%) Australian case, compared with four (1.3%) in other countries.

Errors that were classified with the same code could have different levels of seriousness. Examples of such errors are the two Australian reports classified as 1.1.3, a "process error", due to office administration, concerning patient flow through the healthcare system. In one of these reports, patients were incorrectly called into another doctor's room in a group practice, and the doctor who was supposed to see them could not provide the intended follow-up. The other report described a situation in which an elderly patient was triaged in a local emergency department as low priority. During a long, unattended wait, a fall during a bathroom visit resulted in a broken hip.

DISCUSSION

The principal findings of the *PCISME* pilot study support the theory that general practice in Australia shares many of the types of problems encountered by GPs in other, similar developed countries. This is demonstrated by the taxonomic descriptions at the second order of classification: all categories of errors that occurred in Australia occurred in one or more of the other countries. We have also been able to demonstrate a successful method of electronically reporting mistakes in an Australian general practice setting.

Our aim has been to try to capture the breadth of different mistakes occurring. The design of the study did not allow quantification of the prevalence of different error types. The limitation with all research of this nature is that a doctor must be aware that an error has occurred, and then must be willing to report the error.

It is possible that the payment of the Australian doctors contributed to the greater numbers of reports from this group. Previous primary care research has suggested that recruitment and quality might be improved through payments,[5] and that, for research that is otherwise ethically permissible, it is also ethically permissible for researchers to pay participants for their out-of-pocket expenses, participation, inconvenience and risk-taking.[6] Primary care funding varies significantly among the participating countries, and other countries chose not to offer an honorarium.

A high level of computer literacy was required to participate in *PCISME*, and this might have affected the types of errors that were described. All error reports were submitted electronically from participating countries, except for Canada, where software problems resulted in their doctors mainly reverting to paper reports. In Australia, there is a high level of computer use in general practice, with around 89% of practices now using computers.[3]

3: *PCISME* results from participating countries

	Australia	Canada	United Kingdom	Netherlands	New Zealand	United States
Number of doctors enrolled	23	15	20	8	20	18
Number of PINs submitted	17	15	14	4	11	18
Number of reports received in total	134	84	63	14	66	74
Median number of reports per PIN (range)	9 (1–17)	5 (1–10)	2 (1–18)	3 (1–7)	5 (1–26)	2 (1–27)

PIN = personal identification number (self-chosen by participants). *PCISME = Primary Care International Study of Medical Errors.*

In relation to other studies, *PCISME* built upon earlier patient safety research conducted in Australia, and extended it into an international context. Australia has been a leader in carrying patient safety research into primary care settings. In 1993, the Commonwealth Government provided funding to test incident monitoring in six specialties, including general practice. A pilot incident-monitoring study was conducted by the RACGP and the Family Medicine Research Unit of the University of Sydney. An analysis of the first 805 incidents reported by GPs between October 1993 and June 1995 demonstrated that incident monitoring can be successfully applied in general practice,[7,8] and is useful for identifying sources of misdiagnosis and for implementation and assessment of quality improvement strategies.[9]

PCISME differs from previous Australian work with respect to the methodology of error reporting and the classification system used to describe these errors. As the two studies used non-random samples of Australian GPs taken from different study populations, there is limited comparability between the results of *PCISME* and the earlier incident-monitoring study.[7,8,10] Furthermore, *PCISME* used a different definition of error from previous Australian studies, which defined an incident as "an unintended event, no matter how seemingly trivial or commonplace, that could have harmed or did harm a patient".[7] The definition of error used in our study was broader, being concerned with mistakes rather than patient harm, and so could have encouraged more reports that posed less threat to patient safety, such as administrative problems. The definition we used was generally well understood by *PCISME* participants, with only six reports from all countries (1.4%) assessed as not involving an error.

Doctors and other healthcare professionals have been reluctant to admit and address the problem of errors, both because of feelings of guilt and from the desire to avoid colleagues' disapproval or punishment.[11,12] Studies of this nature might increase the acceptability of discussing mistakes in general practice.

4: The first three levels of the five-level taxonomy of errors, with number (%) of reports in the first two levels

	Australia	Other countries
1. Process Errors	104 (79%)	236 (79%)
1.1. Errors in office administration	26 (20%)	55 (19%)
1.1.1. Filing system errors		
1.1.2. Chart completeness errors		
1.1.3. Patient flow (through the healthcare system)		
1.1.4. Message handling errors		
1.1.5. Appointments errors		
1.1.6. Errors in maintenance of a safe physical environment		
1.2. Investigation errors	17 (13%)	55 (19%)
1.2.1. Laboratory errors		
1.2.2. Diagnostic imaging errors		
1.2.3. Errors in the processes of other investigations		
1.3. Treatment errors	38 (29%)	72 (24%)
1.3.1. Medication errors		
1.3.2. Errors in other treatments		
1.4. Communication errors	20 (15%)	42 (14%)
1.4.1. Errors in communication with patients		
1.4.2. Errors in communication with other healthcare providers (non-medical)		
1.4.3. Errors in communication with other doctors		
1.4.4. Errors in communication amongst the whole healthcare team		
1.5. Payment errors	1 (1%)	4 (1%)
1.5.1. Errors in processing insurance claims		
1.5.2. Errors in electronic payments		
1.5.3. Wrongly charged for care not received		
1.6. Errors in healthcare workforce management	2 (2%)	8 (3%)
1.6.1. Absent staff not covered		
1.6.2. Dysfunctional referral procedures		
1.6.3. Errors in appointing after-hours workforce		
2. Knowledge and Skills Errors	28 (21%)	61 (21%)
2.1. Errors in the execution of a clinical task	7 (5%)	7 (2%)
2.1.1. Non-clinical staff made the wrong clinical decision		
2.1.2. Failed to follow standard practice		
2.1.3. Lacked needed experience or expertise in a clinical task		
2.2. Errors in diagnosis	18 (14%)	36 (12%)
2.2.1. Error in diagnosis by a nurse		
2.2.2. Delay in diagnosis		
2.2.3. Wrong or delayed diagnosis attributable to misinterpretation of investigations		
2.2.4. Wrong or delayed diagnosis attributable to misinterpretation of examination		
2.2.5. Wrong diagnosis by a pharmacist		
2.2.6. Wrong diagnosis by a hospital-based doctor		
2.3. Wrong treatment decision with right diagnosis	3 (2%)	18 (6%)
2.3.1. Wrong treatment decision, influenced by patient preferences		
2.3.2. Wrong treatment decision by doctor		

Our study has commenced the development of an international taxonomy of errors in primary care which can be used to plan future studies examining the prevalence of mistakes in general practice. The strength of an international collaboration will become apparent when meaningful differences between countries are defined in the prevalence of different error types. This information can then be used to design interventions or alter existing systems to reduce errors in primary care.

COMPETING INTERESTS

None identified.

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time capsule

General practice research

GENERAL PRACTICE provides a vantage point for gathering data and observing the natural history of disease. . . . Problems of a family, a social, or emotional nature can be studied directly in cross-sections of the community, and study of some epidemiological problems is facilitated by the long, continuing contact between doctor and patient.

There are certain areas which are special features of general practice, and which present exceptional opportunities for research. These are the promotion of health and the prevention of disease (by advising on methods such as weight control, adequate diet, and the rational use of drugs and alcohol); the recognition of the early manifestations of diseases (such as hypertension, anaemia, and diabetes mellitus); and the management of patients with chronic illnesses such as arthritis, diabetes mellitus and hypertension. . . .

Many features of illness seen in the community are different from those seen in hospitals and by specialists, so that the findings of institutional research are often not directly applicable to general practice. General practice questions need to be solved in the setting of primary care, and caution should be exercised in applying answers derived from other sources. . . .

Despite considerable enthusiasm and effort, progress in general practice research is very slow. Now is the time to define the needs, priorities and goals of such research, and to consider the difficulties that prevent us from reaching these goals. The output of research from general practice has been low by comparison with that from hospital and specialist practice, although larger numbers of doctors and patient contacts are involved. Among the many reasons for this are three main obstacles — lack of training, lack of sufficient power base in hospitals and universities, and lack of funding. These three are interrelated, and reflect the history of general practice in Australia. . . .

Today, as it was when the College of General Practitioners commenced its activities in 1954, doctors entering general practice are seldom trained to conduct or be critical of research, and few perceive their practice as a place in which organized curiosity can exist alongside patient care. When such doctors participate in research projects, it is usually in a passive role to assist a pharmaceutical company, a university department, a hospital or a health authority. Usually, the essential contribution is to provide patients for study, or as controls, in the testing of a newly marketed drug or other new treatment. . . .

The other common request to general practitioners is to fill in a questionnaire. This generally arrives by mail with a host of material of varying relevance. The questions may be about his patients, himself, or his use of drugs, and will often be couched in a way that makes an accurate response difficult. For example "What percentage of your patients . . . ?", "How many . . . do you see in an average week?" or "What percentage of your time is spent doing . . . ?". Faced with such questionnaires, many doctors demonstrate passive non-cooperation by way of the waste-paper basket. They have, one imagines, scant regard for imprecise information, have insufficient time to spare, and their records, being designed for other purposes, cannot provide accurate answers to such questions. No wonder general practice research gets a bad name! . . .

The need for resources to promote general practice research and the education of general practitioners in research is urgent — perhaps more urgent now that when it was recommended by the Australian Medical Association Study Group on Medical Planning in 1971.

Alan Chancellor
Chairman, Research Committee
The Royal Australian College of General Practitioners, Sydney
MJA 1984; I: 6-7 [editorial]