Adverse drug reactions in patients admitted to hospital identified by discharge ICD-10 codes and by spontaneous reports

A. R. Cox,[1] C. Anton,[1] C. H. F. Goh,[1] M. Easter,[1] N. J. Langford[1,2] & R. E. Ferner[1,2]

[1] *West Midlands Centre for Adverse Drug Reaction Reporting, City Hospital NHS Trust Birmingham, B18 7QH and* [2] *Department of Therapeutics, Queen Elizabeth Hospital, Birmingham, B15 2TH, UK*

Aims We studied the international classification of disease (ICD) hospital discharge codes to find unreported adverse drug reactions (ADRs), and asked doctors about their attitudes to reporting some of these cases.

Methods We examined the ICD codes assigned on discharge to identify ADRs and compared these with spontaneous reports made to the Committee on Safety of Medicines (CSM). Doctors involved were sent brief résumés of cases and asked if they would report them.

Results 49 of 21 365 patient episodes were coded on discharge as ADRs, of which 33 were 'reportable'. Fourteen spontaneous reports were received by the CSM during the same period. The two groups did not overlap. 25 of 60 doctors responded to our questionnaire, and would have reported only 8 of 75 cases outlined.

Conclusions The ICD coding allowed us to identify important ADRs which most doctors would not report spontaneously.

Keywords: adverse drug reactions, ICD10, pharmacovigilance

Introduction

Adverse drug reactions (ADRs) may account for up to 5% of all hospital admissions [1]. However, few suspected reactions are reported to regulatory authorities [2]. Yellow card spontaneous reports were sent to the Committee on Safety of Medicines for only 6.3% of 'reportable' reactions in one hospital study [3].

International classification of disease (ICD) codes are used for coding admissions to NHS hospitals. Each ICD-10 code consists of a letter followed by between 2 and 4 numbers. The main condition treated or investigated during the admission would be given the primary diagnosis code. However, up to seven diagnosis codes may be recorded by the hospital. The second code is known as the subsidiary diagnosis, and the remaining five as secondary diagnoses. Adverse reactions to therapeutic agents have specific codes (Y400–Y590) within the ICD-10 system. At our site, each patient episode is coded by coding clerks from a diagnosis given by the medical staff. If the diagnosis is not present the coding clerks will examine the notes to establish the diagnosis.

We have examined the relationship between 'reportable' ADRs submitted to the CSM through the Regional ADR monitoring centre and those identified by the discharge ICD coded in our teaching hospital with 649 inpatient beds. We also examined the attitude to reporting of the doctors whose patients suffered ADRs.

Methods

All patients admitted to our hospital in the West Midlands who were discharged or who died during a period of 4 months in 1998 were considered. Discharge codes were examined for codes Y400–Y590. A medical registrar and an experienced drug information pharmacist independently verified the coding by examining the patient records, and reached a consensus on whether any suspected ADRs had occurred which fell within the criteria for reporting to the Yellow Card scheme. Causality was not assessed. Spontaneous reports from the CSM Yellow Card scheme were obtained from the same period.

An event was considered 'reportable' if it involved any suspected reaction to a newly marketed (black triangle)

Correspondence: Mr Cox, West Midlands Centre for Adverse Drug Reaction Reporting, City Hospital NHS Trust, Birmingham B18 7QH, UK.

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Table 1 ADRs detected from ICD codes and Yellow Card reports during the period of study

ICD coded ADRs	*Yellow cards*
Anticoagulants	*Cardiovascular drugs*
warfarin haemorrhage (9 cases)	**digoxin and trimethoprim** digoxin toxicity (serious)
Cardiovascular drugs	*Central nervous system drugs*
β-adrenoreceptor antagonists bradycardia (3 cases)	**paroxetine** haemolytic anaemia (fatal)
frusemide dehydration (2 cases)	**thioridazine** ventricular fibrillation associated with long QT interval (serious)
indapamide hyponatraemia	**sulpiride** abnormal liver function (serious)
bendrofluazide hyponatraemia	**amisulpiride** fitting (serious)
digoxin confusion	**paroxetine** bruxism
Central nervous system drugs	*Anti-fungals*
paroxetine hyponatraemia	**clotrimazole** cream blistering of skin
chlorpromazine extrapyramidal reaction	**terbinafine** pityriasis rosea
clonazepam extrapyramidal symptoms	*NSAIDS*
clozapine neutropenia	**diclofenac** gastro-intestinal bleeding (serious)
lamotrigine carbamazepine toxicity	**aspirin** gastro-intestinal bleeding (serious)
diazepam acute confusional state	*Other drugs*
NSAIDS	**Premarin®** (conjugated oestrogens) pulmonary embolus (serious)
aspirin eye socket, lip swelling, and urticarial rash	**prochlorperazine** extrapyramidal reaction (serious)
aspirin and diclofenac gastric erosion	**latanoprost** cystoid macular oedema (serious)
aspirin duodenitis	**iopamidol** cerebral artery vasospasm (serious)
Antibacterials	
penicillin anaphylaxis (3 cases)	
penicillin rash	
amoxicillin bloody diarrhoea	
Vaccines	
diptheria tetanus pertussis vaccine eyes rolling and shaking	
Endocrine drugs	
insulin hypoglycaemia	

drug, and any serious suspected reaction to any other drug. A serious reaction is any adverse reaction which causes death, is life-threatening, results in or prolongs hospitalization, results in persistent or significant disability/incapacity, or causes congenital anomalies/birth defects.

Sixty doctors, involved in the verified cases, were sent résumés of three verified cases other than their own and asked if they would report the described reactions to the CSM. All case résumés used in the questionnaire were 'reportable'. Medical staff were also asked if they had reported an ADR in the past 3 years.

Results

There were 21 635 episodes coded at discharge in the 4 months of the study; 35% (7474) of these episodes related to day case surgery. Forty-nine were coded as ADRs. Five sets of case notes were unobtainable for review. The 44 sets of notes available were reviewed and 33 were verified as having a 'reportable' reaction. None of these reportable reactions had a fatal outcome. All these reactions led to admission of the patient but none had occurred during the hospital stay.

Fourteen reactions were reported to the CSM during the same period. Eleven of these reactions were serious, of which one was fatal. None of the reactions was found in both spontaneous reporting records and ICD coding. ICD coding did not detect any nonserious reactions.

Of the 60 questionnaires posted, 25 were returned (42%). Ten doctors had reported an ADR in the past 3 years. Of the 75 cases reviewed, the medical staff said they would report 8 (11%) to the CSM. Only one of 12 doctors said they would have reported warfarin-induced haemorrhage.

Discussion

We found over twice as many reportable reactions by screening ICD codes as were reported spontaneously in the same period. There was, surprisingly, no overlap between reactions detected by the two methods.

A previous study by Wodtke *et al.* [4] compared ICD coded ADRs with spontaneous reports in an American hospital. Over a 6 month period, 125 ICD codes related to an ADR were discovered and 25 voluntary spontaneous reports filed. Only four reports were found by both

methods. Differences were seen in the type of ADR found by each method. Paediatric reactions, in particular, were not reported spontaneously in their hospital. In our study all episodes were related to admission and we found no recorded episodes of ADRs occurring after admission.

In a review of the case summaries of 2490 patients admitted to a department of infectious diseases, 48 cases with an ICD code related to an ADR were found [5]. Of these, only 10 had resulted in a spontaneous report to the Swedish ADR Advisory Committee. During the same period, the committee received 3 reports relating to an uncoded ADR. We found a smaller proportion of patients experiencing reactions. This may be because the agents used to treat infectious diseases are more likely to lead to ADRs, or may indicate differences between Sweden and England in the coding process.

There are limitations to the use of ICD codes for identifying ADRs. Diagnoses may be inaccurate, and since physicians may consider they are used only for administrative purposes, they may be less concerned with accurate recording of ICD codes [5]. ICD codes also under-report the incidence of ADRs. A study of narcotic toxicity at two acute hospitals found that none of the 21 cases discovered included an ICD code appropriate to the diagnosis [6].

As none of the ADRs discovered by use of the ICD codes led to a Yellow Card, ICD codes do appear to identify ADRs not reported by spontaneous reporting systems. ICD codes easily identify cases of ADRs, but a review of the medical notes to confirm the coding is time consuming.

From our questionnaire it appears that medical staff and the CSM/MCA differ in their attitudes towards reportable reactions. We suppose that those who failed to complete the questionnaire were no more likely to report than those who did. Medical staff did not report well established reactions to older drugs, such as bradycardia due to β-adrenoceptor blockers, or haemorrhage with warfarin leading to hospital admission, which were disclosed by discharge codes. Furthermore, only 1 of 12 medical staff indicated in the questionnaire survey that they would have reported a case of haemorrhage with warfarin.

In summary, ICD coding identifies important ADRs which most doctors would not report spontaneously. Future integration of computer systems within hospitals and the expansion of electronic prescribing and electronic health records may make ICD codes a useful practical tool for drug regulatory authorities.

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