Adverse events in British hospitals: preliminary retrospective record review
Charles Vincent, Graham Neale, Maria Woloshynowych

Abstract

Objectives To examine the feasibility of detecting adverse events through record review in British hospitals and to make preliminary estimates of the incidence and costs of adverse events.

Design Retrospective review of 1014 medical and nursing records.

Setting Two acute hospitals in Greater London area.

Main outcome measure Number of adverse events.

Results 110 (10.8%) patients experienced an adverse event, with an overall rate of adverse events of 11.7% when multiple adverse events were included. About half of these events were judged preventable with ordinary standards of care. A third of adverse events led to moderate or greater disability or death.

Conclusions These results suggest that adverse events are a serious source of harm to patients and a large drain on NHS resources. Some are major events; others are frequent, minor events that go unnoticed in routine clinical care but together have massive economic consequences.

Introduction

Retrospective studies of hospital case records in the United States and Australia have shown a substantial rate of adverse events, defined as unintended injuries caused by medical management rather than the disease process. The Harvard medical practice study found that 3.7% of hospital admissions led to adverse events. In 70% of these patients the adverse event led to slight or short lived disabilities, but in 7% the disabilities were permanent and in 14% they contributed to death. Similar rates were found in a study from Colorado and Utah. The quality in Australian healthcare system $4.7bn a year. The Australian study estimated that adverse events accounted for 8% of hospital bed days and cost the Australian healthcare system $4.7bn a year.

The epidemiology of adverse events has not been studied in Britain. We report preliminary findings from a pilot study that examined the feasibility of applying United States and Australian methods and the potential value of a parallel study in the United Kingdom.

Methods

Design and procedure

The study was carried out at two acute hospitals in the London area. We reviewed 500 randomly drawn records from site 1 between July and September 1999 and 514 records from site 2 between December 1999 and February 2000. In both sites the index admissions occurred in two months in 1998, about a year before the review periods. We reviewed 273 (26.9%) records from general medicine (including geriatrics), 290 (28.6%) from general surgery, 277 (27.3%) from orthopaedic surgery, and 174 (17.2%) from obstetrics. Admissions to the four specialties studied in 1998-9 were 19 397 in site 1 and 18 335 in site 2. The proportions of admissions studied were 2.6% and 2.8% respectively.

Review process

The review team consisted of an experienced nurse who worked as project manager with four part time research nurses. A consultant physician acted as lead medical assessor, working with five part time surgical and obstetric colleagues, each of whom had been qualified for a minimum of 10 years. Each reviewer screened sets of notes under supervision until they were judged to be fully conversant with the review process.

The nurse reviewers used 18 predefined screening criteria to assess the case records. Records that
### Table 1: Number of adverse events by specialty

<table>
<thead>
<tr>
<th>Specialty</th>
<th>No of records reviewed</th>
<th>All (%) of records</th>
<th>Preventable (%) of events</th>
<th>All (%) of records</th>
<th>Preventable (%) of events</th>
</tr>
</thead>
<tbody>
<tr>
<td>General medicine</td>
<td>273 (27)</td>
<td>24 (8.8)</td>
<td>18 (75)</td>
<td>25 (9.2)</td>
<td>19 (76)</td>
</tr>
<tr>
<td>General surgery</td>
<td>290 (29)</td>
<td>41 (14.1)</td>
<td>17 (41)</td>
<td>47 (16.2)</td>
<td>20 (43)</td>
</tr>
<tr>
<td>Obstetrics</td>
<td>174 (17)</td>
<td>7 (4.0)</td>
<td>5 (71)</td>
<td>7 (4.0)</td>
<td>5 (71)</td>
</tr>
<tr>
<td>Orthopaedics</td>
<td>277 (27)</td>
<td>38 (13.7)</td>
<td>12 (32)</td>
<td>40 (14.4)</td>
<td>13 (33)</td>
</tr>
<tr>
<td>Total</td>
<td>1014 (10.8)</td>
<td>52 (47)</td>
<td>119 (11.7)</td>
<td>57 (48)</td>
<td></td>
</tr>
</tbody>
</table>

### Example of adverse event

A 53-year-old man with a history of stroke, multiple resistant *Staphylococcus aureus* infection, leg ulcers, and heart failure was admitted for treatment of venous ulceration and cellulitis of both legs. He sustained two adverse events:

1. Failure to manage the leg ulcers aggressively led to the development of osteomyelitis. He subsequently underwent below knee amputation of both legs.
2. Incorrect management of his urinary catheter resulted in necrosis of the tip of the penis. He had suprapubic catheterisation and developed an infection.

The patient's hospital stay was extended by 26 days.

### Discussion

Our pilot study has established the feasibility of conducting a major record review of adverse events in the United Kingdom. We found that 10.8% of patients admitted to hospital experience an adverse event, with an overall 11.7% rate of adverse events when multiple adverse events are included. About half of these events were judged preventable. A third of adverse events led to moderate or greater disability or death. Some adverse events are serious and are traumatic for both staff and patients. Others are frequent, minor events that go unnoticed in routine clinical care and yet together have massive economic consequences.

This study is primarily a pilot and has certain limitations. The study was small and based on only two hospitals. In addition, the case mix does not accurately reflect hospital practice. The specialties included in the review could have higher rates of adverse events than other specialties. Nevertheless, the specialties we chose constitute a large proportion of inpatient care.

Although we cannot extrapolate with any precision, our findings strongly suggest that adverse events are a serious problem in the NHS, as they are in the United States and Australia. We estimate that around 5% of the 8.5 million patients admitted to hospitals in England and Wales each year experience preventable adverse events, leading to an additional three million bed days. The total cost to the NHS of these adverse events in extra bed days alone would be around £1bn a year.

### Table 2: Estimated cost of adverse events (1999 values)

<table>
<thead>
<tr>
<th>Specialty</th>
<th>No of patients with adverse events</th>
<th>Mean (SD) extra bed days for all adverse events</th>
<th>Daily cost of bed (£)</th>
<th>Total cost of additional bed days for study sample (£1000s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>General medicine</td>
<td>25</td>
<td>4.87 (3.67)</td>
<td>171</td>
<td>20.8</td>
</tr>
<tr>
<td>General surgery</td>
<td>47</td>
<td>6.07 (12.52)</td>
<td>282</td>
<td>80.4</td>
</tr>
<tr>
<td>Obstetrics</td>
<td>7</td>
<td>3.57 (2.88)</td>
<td>305</td>
<td>7.6</td>
</tr>
<tr>
<td>Orthopaedics</td>
<td>40</td>
<td>14.58 (17.87)</td>
<td>311</td>
<td>181.4</td>
</tr>
<tr>
<td>Total</td>
<td>119</td>
<td>8.54 (13.55)</td>
<td>—</td>
<td>290.2</td>
</tr>
</tbody>
</table>
In the United States and Australia retrospective case record analysis has provided the foundation and driving force for initiatives to reduce harm to patients and to make more efficient use of expensive hospital resources. Our findings indicate that a full national study would be justified in the United Kingdom, as indicated in the chief medical officer's recent report.1 We believe that the investigation should cover at least 20 general hospitals (of varying size and type) and include 500 representative case records from each hospital. This would yield around 1000 adverse events for detailed analysis. Such a study would provide reliable information on the numbers, types, and costs of adverse events occurring in NHS hospitals. This would allow the principal causes to be explored and specific risk reduction strategies to be identified and costing. The total cost of such a study would probably be equivalent to the money lost through preventable adverse events in less than eight hours in the NHS.

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Contributors: CV designed and wrote the original research proposal. GN was lead clinician for the review. MW managed the project and was responsible for data analysis. All authors contributed equally to the final report. CV and GN are guarantors.

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Involving consumers in designing, conducting, and interpreting randomised controlled trials: questionnaire survey
Bec Hanley, Ann Truesdale, Andy King, Diana Elbourne, Iain Chalmers

Abstract

Objective To assess the extent to which consumers are involved in the work of clinical trial coordinating centres in the United Kingdom and the nature of consumers' involvement in randomised trials coordinated by these centres.

Design National surveys using structured questionnaires with some open ended sections.

Setting 103 clinical trial coordinating centres in the United Kingdom identified through a database assembled in 1997 by the NHS clinical trials adviser.

Participants Named contacts at 62 coordinating centres and investigators in 60 trials that were identified as involving consumers.

Main outcome measures Number of coordinating centres and number of trials in which consumers were involved and the nature of consumers' involvement.

Results Of the 62 eligible centres, 23 reported that consumers had already been involved in their work, and most respondents were positive about this involvement. 17 centres planned to involve consumers. 15 centres had no plans to involve consumers, but only four of these considered such involvement irrelevant. Responses from investigators about the 48 individual trials were mostly positive, with respondents commenting that input from consumers had helped refine research questions, improve the quality of patient information, and make the trial more relevant to the needs of patients.

Conclusions Consumer involvement in the design and conduct of controlled trials seems to be growing and seems to be welcomed by most researchers. Such involvement seems likely to improve the relevance to consumers of the questions addressed and the results obtained in controlled trials.

Introduction

There is substantial evidence that there are mismatches between the research that gets done and the research that patients would like to see done.1-3 This has led some to call for greater involvement of patients in the research process.4-5 Research designed to assess the effects of treatments and randomised controlled trials in particular seem especially likely to benefit from the involvement of consumers.

Both consumers and researchers are interested in involving consumers in clinical trials, but there has been little formal advocacy of such involvement in the United Kingdom. The 1998 guidelines on clinical trials from the Medical Research Council referred to the involvement of consumers only in an appendix,6 and the guidelines of the Association of the British Pharmaceutical Industry made no mention of consumer involvement.7 Most reports of trials do not make

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continued over

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### Exercise testing and angiography in 10 hospital catchment areas in two Danish counties, one rural and one urban

<table>
<thead>
<tr>
<th>Hospital catchment area</th>
<th>No of exercise tests per million inhabitants</th>
<th>Angiography per million inhabitants</th>
<th>Percentage of exercise tests suggesting disease</th>
<th>Percentage of exercise tests suggesting disease that led to referral for angiography</th>
<th>Distance (km) from hospital to angiography centre</th>
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</thead>
<tbody>
<tr>
<td>Rural (Ringeby):</td>
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<td></td>
<td></td>
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<tr>
<td>1</td>
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<td>58</td>
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<tr>
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<tr>
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<td>3634</td>
<td>2683</td>
<td>26</td>
<td>63</td>
<td>2</td>
</tr>
</tbody>
</table>

*Two different units with bicycle exercise testing in Aarhus University Hospital, but serving the same hospital area population.

### Comments

Referral for coronary angiography in patients with a bicycle exercise test suggesting disease varied strongly with the distance from the angiography centre, showing that triage by medical consultants may constitute a barrier to referral for coronary angiography.

The two Danish counties in this study did not differ in their rates of exercise testing, and the doctors gave similar interpretations of the test results. No economic restrictions affected referral of patients from any of the local hospitals to the angiography centre, and both counties had similar policies on the management of healthcare problems.

The clear association between the distance to the coronary angiography service and the doctor's decision to refer the patient for coronary angiography presumably reflects different local medical cultures rather than problems with the transport of patients. Our data show that the medical specialist is a major barrier to referral for coronary angiography. The observed differences in practice between centres have implications for the organization of the coronary angiography service, the diffusion of new technology, the use of guidelines, and continuing performance development. It is not known whether the observed differences in 1996 reflect appropriate or inappropriate use of medical resources; this issue deserves further investigation.

We thank Professor Henrik Toft Sørensen for epidemiological support.

Contributors: TN and NT had the original idea, and TTN and JL helped to design the study. TN collected and analysed data and drafted the paper. TTN, NT, and JL helped to interpret the data and revise the paper. TN is guarantor for the study.

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Competing interests: None declared.


### Corrections and clarifications

**Adverse events in British hospitals: preliminary retrospective record review**

Two errors persisted to publication in this article by Charles Vincent and colleagues (3 March, pp 517-8). The first column heading in table 2 should read “No of adverse events” [not “No of patients with adverse events”], and the penultimate sentence in the second paragraph of the results section should read: “Overall, 57 [not 53] (48%) adverse events were judged preventable.” It should also have been made clear that some of the authors’ results had already been published earlier in the BMJ (1999;319:1091); in Organisation With a Memory (a report by an expert group, chaired by the chief medical officer for England, Liam Donaldson, on learning from adverse events in the NHS); and in Clinical Governance Bulletin.

**Minerva**

The caption to the photograph submitted by I Grant and colleagues (28 April, p 1672) correctly referred to the left side of the man’s face being affected, but unfortunately we published the photograph the wrong way round.

**Too many medical schools to open**

In the final paragraph of the website version of this news article by Lynn Eaton (7 April, p 816) Newcastle University was inadvertently omitted from the list of new medical schools and places. Newcastle University has been in collaboration with Durham University—the venture has therefore been a joint one.