Medicines Related problems on Admission to Hospital -The Evidence

In this document we review the evidence for adverse drug events (ADEs) leading to patients being admitted to hospital, consider the different causes of ADEs and highlight the difficulties in establishing an accurate estimate of the scale of the problem.

Key points

- Drug related problems or adverse drug events can cause serious harm to patients and can lead to hospitalisation or even death

- Pay attention to terminology used in literature: There are several causes of adverse drug events (ADEs); adverse drug reactions (ADRs) are one cause

- Rates of drug related hospital admissions quoted in literature vary widely (from 0.1% to 45%) due to variation in the study methodology from which they have been derived. A great deal of caution should be applied if extrapolating national hospital admission data or the prevalence identified by pooling international studies

- Clinical coding captures some ADRs, but is generally an underestimate. Coding will not capture ADEs

- Not all ADEs or ADRs are preventable.

- Preventable drug related admission (PDTA) rates reported in literature vary from 1.4%-15.4% (median 3.7%)

- Drugs most commonly associated with PDRAs are anti-platelets, diuretics, NSAIDs and anti-coagulants

- PDRAs are most commonly associated with problems in adherence to, and prescribing and monitoring of, medication

- The main causes of PDRAs are failures in communication and knowledge

- Elderly patients with multiple co-morbidities receiving multiple medicines for long-term illness are prone to ADRs & are likely to be more susceptible to ADEs in general

- Technical solutions and single interventions targeted at one stage of the medication use process, although useful, are unlikely to be sufficient on their own in reducing PDRAs. Interventions which target the human causes such as improving communication methods are also required
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Background

There is general agreement that medicine-related problems or adverse drug events (ADEs), defined as patient injury related to taking a drug, are responsible for an appreciable proportion of hospital admissions and that a substantial proportion of these problems are potentially preventable, however, gaining an understanding of the true size of this problem is problematical due to terminology and methodological differences employed in published studies.

An ADE can arise from:

- adverse drug reactions (ADRs) i.e. unwanted or harmful effect of medication
- failure by the patient to take the medicine as intended,
- medication errors e.g. prescribing, dispensing or administration errors,
- inappropriate or over treatment being prescribed,
- failure to prescribe an indicated treatment
- medication discrepancies i.e. unexplained differences in documented medication regimens, particularly at transfer of care e.g. hospital admission & discharge

What is the overall size of the problem?

Leendertse (2010) reviewed 95 studies which reported a range of medication-related hospitalisations from 0.1% to 54%. A higher prevalence was found in the studies which examined all hospital admissions compared to studies examining only acute hospital admissions, in studies in the elderly population compared to children, and in studies examining ADEs compared to studies examining only ADRs. The method of data collection strongly influenced the findings; medical chart screening resulted in a higher prevalence of medication-related hospitalisation compared to database methodology or spontaneous reporting. Combined studies in Europe showed a lower prevalence of medication-related hospital admissions than those from other continents included in the study.
Admissions related to Adverse Drug Reactions (ADR)

A review of 25 studies (Kongkaew 2008) reported ADR prevalence rates between 0.16% and 15.7%, with an overall median of 5.3%. The authors suggest methodological differences are the main reason for the variance. Overall, higher rates were found in elderly patients who were likely to have been receiving multiple medications for long-term illness.

Using hospital coding to study ADR related admissions

In theory, ADRs are easier to measure than ADEs, because some ADRs can be captured by coding.

Wu (2010) examined data from the Hospital Episode Statistics database for all English hospital admissions (1999-2008) with a primary or secondary diagnosis of an ADR recorded. Between 1999 and 2008, there were 557,978 ADR-associated admissions, representing 0.9% of total hospital admissions. Over this period the annual number of ADRs increased by 76.8% (from 42,453 to 75,076), and in-hospital mortality rate increased by 10% (from 4.3% to 4.7%). However, some of this increase may be due to improved diagnostic coding. In 2008, there were 6,830,067 emergency admissions of which 75,076 (1.1%) were drug-related.

How does this compare to other countries?

A similar Spanish study (Carrasco-Garrido 2010) during the period 2001-6, reported 1.69% hospitalised patients had a diagnostic code that was ADR related. Of these just over 5% died. The medicines most commonly associated with the admission were antineoplastic and immunosuppressive medicines, corticosteroids, anticoagulants and antibiotics.

In the Netherlands, ADR related hospital admissions rates of 0.41% for men and 0.47% for women were reported during the period 2000-2005 (Rodenburg 2011).

A German record-based study which analysed patient records of 57,000 hospitalisations between 2006-7 estimated the incidence of hospitalisation due to possible serious outpatient ADRs to be approximately 3.25%. The mean age of patients was 71yrs and the most frequent ADRs were gastrointestinal haemorrhage and drug induced hypoglycaemia (Rottenkolber 2011).

A Canadian study has suggested that a significant proportion of potential ADRs are not attributed to the medicine by doctors in the emergency department, and may be subsequently missed during the coding process (Hohl 2010). Relying on coding to capture ADR related admissions may underestimate the size of the problem.
Preventable drug-related admissions (PDRAs) to hospital

How many ADRs are preventable?

Not all ADRs are preventable. Some, although they may be well documented, are unpredictable and little can be done to prevent them.

A study in two large Merseyside Hospitals (Pirohammed 2004) found that of 18,820 patients admitted to hospital over a six-month period, there were 1,225 admissions judged to be related to an ADR, giving a prevalence of 6.5%. In 80% of cases the ADR was judged to have led directly to the admission. 72% ADR-related admissions were judged to have been avoidable. The median bed stay was eight days, accounting for 4% of the hospital bed capacity. The projected annual cost of such admissions to the NHS was £446 million.

In a cross-sectional, observational study (Rogers 2009), conducted over 3 months on the medical admissions ward of a north London hospital records for 409 patients aged > or =65 years were screened. Of these 14% (95% CI 10.6, 17.4) had medication-related problems, 6.4% (95% CI 4.0, 8.8) were admitted because of medication-related problems and 3.9% (95% CI 2.0, 5.8) were considered to have preventable medication-related problems. Medicines to prevent or treat cardiovascular disease were implicated in 69% (18/26) of the medication-related admissions and 69% (11/16) of preventable medication-related admissions. Amongst hospitalized patients, admission attributed to adverse drug reaction was more likely as the number of medications being taken increased, and admission attributed to under treatment was more likely as the number of pre-existing conditions increased.

A small study in one UK hospital (Davies 2010) reported that approximately one fifth of those patients readmitted to hospital within a year of discharge were re-admitted due to a suspected ADR and that over half of these (n=52/91; 57%) were judged to be definitely or possibly avoidable. In 30% (n=11/37) of patients readmitted within 28 days of discharge the causative drug had been initiated in during the index admission.

A small Canadian study (Sikdar 2010) reported that 29% (n=16 /55) of the ADRs or possible ADRs identified were considered preventable.

In a further small UK study (Hodgson 2014) 56 patients were identified over a 5 month period as having a hospital admission related to an adverse drug reaction. In 35 patients (63%) the hospital admission was thought to be possible preventable.

These studies all used retrospective case review, but differed in their sampling methodology.
Which drugs are associated with PDRAs to hospital?

A systematic review of 13 papers (Howard 2006) reported a median 3.7% rate (Range 1.4 – 15.4%) of PDRAs to hospital. Admissions caused by ADRs, under or over treatment and medication adherence problems were included. From 9 papers, it was found that over 50% of PDRAs involved four groups of drugs; anti-platelets (16%), diuretics (16%), NSAIDs (11%) or anti-coagulants (8%). From five studies the median proportion of PDRAs associated with prescribing problems was 30.6% (range 11.1-41.8), with adherence problems 33.3% (range 20.9-41.7) and with monitoring problems 22.2% (range 0-31.3).

What are the main causes of PDRAs?

A qualitative study of the causes of PDRAs to a hospital in Nottingham from 4 PCTs (Howard 2008) found that they were complex, multi-faceted and associated with problems at multiple stages in the medication use process, including prescribing, dispensing, administration, monitoring and help-seeking. The main causes of the problems were communication failures (between patients and healthcare professionals, and between groups of healthcare professionals) and knowledge gaps (about medicines and patients’ medical and medication history). It was concluded that solutions to the problems would need to take account of this complexity. Technical solutions and single interventions targeted at one stage of the medication use process, although useful, are unlikely to be sufficient on their own. Interventions which target the human causes such as improving communication methods are also required.

Preventable deaths whilst in hospital

Hogan (2012) carried out a retrospective case record review of 1000 adults who died in 10 acute hospitals in England. Death was considered to have a 50% or greater chance of being preventable in 5.2% of cases (95% CI 3.8% to 6.6%). Problems associated with preventable deaths occurred in all phases of hospital care and involved poor clinical monitoring (31%), diagnostic errors (30%) or inadequate drug or fluid management (21%). The majority of preventable deaths occurred in frail, elderly patients with multiple co-morbidities judged to have less than 1 year of life left to live.
References


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