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Medical management of deliberate drug overdose: A neglected area for suicide prevention?

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Objectives: Overdoses account for a quarter of all suicides in England. The number of people who survive the immediate effects of their overdose long enough to reach medical attention, but who subsequently die in hospital is unknown. The aim of this study was to determine the proportion of overdose suicides dying in hospital and describe their sociodemographic characteristics.

Method: Cross sectional analysis of routinely collected Hospital Episode Statistics data for England (1997 to 1999) to identify hospital admissions for overdose among people aged 12+ and the outcome of these admissions.

Results: Between 1997 and 1999 there were 233 756 hospital admissions for overdose, 1149 (0.5%) of these ended in the death of the patient such deaths accounted for 29% of all overdose suicides and 7% of total suicides. The median time between admission and death was three days (interquartile range one to nine days). The most commonly identified drugs taken in fatal overdose were paracetamol compounds, benzodiazepines, and tricyclic/tetracyclic antidepressants.

Conclusion: Around a quarter of all overdose suicide deaths occur subsequent to hospital admission. Further more detailed research is required to discover if better pre-admission and inhospital medical management of those taking serious overdoses may prevent some of these deaths.

Suicide is a leading cause of premature mortality and, in recognition of this, recent health improvement strategies in Britain have set targets for its reduction.[1 2] One of the most commonly used methods of suicide is the deliberate ingestion (overdose) of excessive quantities of prescribed or non-prescribed substances. Of the 5292 suicides in England in 2000, around a quarter (n = 1312) were from overdose (personal communication, Office for National Statistics, January 2002).

Unlike the two other commonly used methods of suicide—hanging and carbon monoxide poisoning from car exhaust gases—the lethal effects of drug overdose may not occur for several hours or days after the attempt. For this reason most people who take overdoses reach hospital alive and the medical interventions they receive in hospital are likely to prevent a proportion of deaths. While the need for improved medical management of deliberate self poisoning in developed countries has been highlighted,[2a] little attention has been given in the suicide prevention policies of industrialised countries to the inhospital medical management of people who have taken life threatening overdoses.[3] Indeed, the proportion of overdose suicides who survive the immediate effects of their overdose long enough to reach medical attention, but who subsequently die, is unknown. Using routinely collected national hospital admissions data we have investigated the characteristics of overdose deaths occurring subsequent to hospital admission and assessed the contribution of such deaths to overall suicide rates.

METHOD

We used the Hospital Episode Statistics (HES) from the Department of Health for England to identify all people who died in hospital between 1 January 1997 and 31 December 1999 after admission for drug overdose. All episodes of hospital inpatient care are recorded on the computerised HES record system. Each patient's record includes information on their age, sex, date of admission and discharge, together with the main diagnosis and up to six other diagnoses, coded using the International Classification of Diseases version 10 (ICD-10), for each episode of care. For each admission, a discharge code is also recorded—one such code is death. We identified linked episodes of care occurring during one continuous period of admission using encrypted unique identifiers based on a person's date of birth, sex, and postcode of residence. Such episodes of care might, for example, include an initial general hospital admission for the management of a paracetamol overdose, followed by transfer to another hospital with a specialist liver unit where death occurred.

The following ICD-10 codes were used to identify admissions for drug overdose: X40–49 (accidental poisoning), X60–69 (intentional self poisoning) and Y10–19 (poisoning, intent uncertain). While the accidental poisoning category is likely to include some genuine accidents, it is probable that most overdoses serious enough to result in death, particularly in younger adults, were deliberate rather than accidental. We excluded those episodes where illegal drugs, alcohol or gases (that is, ICD-10 codes: X42, X45–47, X62, X65–67, Y12, Y15–17) were recorded as the principal substances taken because of the probably inaccuracy of using routine HES data to distinguish deliberate from accidental overdose of these substances and because our focus was on drug ingestion. To avoid including accidental overdoses among children we excluded all episodes among individuals aged <12 years.

We examined the seven diagnosis fields to (1) crudely identify the specific drugs most frequently taken in overdose as indexed by ICD-10 T-codes and (2) identify other diagnoses given to fatal overdose cases and therefore an indication of the medical complications that may have resulted in death.

The HES computer records for each death were scrutinised. Where it was probable that the patient had died from causes unrelated to their overdose during subsequent inpatient psychiatric care, their records were excluded. For example, a person aged 80+ years who was transferred to a psychiatric hospital after overdose admission but readmitted to an acute

hospital bed with a diagnosis of heart attack many weeks after the overdose admission was assumed to have died from an unrelated condition. Altogether we extracted HES records for 1590 possible cases of inhospital death after admission for overdose. After inspection of these we excluded 441 cases for one of the following reasons: (1) the patient was transferred to another trust (most commonly a mental health trust) after their overdose and died several days later, the diagnoses listed for their final episode of care appeared to be unrelated to the drugs they had taken in overdose; (2) patients with cancer whose episodes of care after overdose were coded as only relating to cancer; (3) two accidental poisoning deaths (where food poisoning (T codes T61–T62)) identified as the cause of death.

RESULTS

Between 1 January 1997 and 31 December 1999, 1149 people—569 (49.5%) females, 577 (50.2%) males, and three (0.3%) where sex was unrecorded—died in hospital after admission for overdose: a rate of about 380 deaths/year. Eight hundred and seventeen (71.1%) of the episodes were coded as intentional overdoses, in 49 cases (4.3%) the person's intention was undetermined and for 283 (24.6%) the overdose was coded accidental. In the same three year period, there were a total of 233 756 hospital admissions for overdose; the estimated case fatality for hospital admitted overdose was therefore 0.49%. Over the same period there were 15 560 suicides, including 4003 overdose suicides in England (personal communication Office for National Statistics). The 1149 inhospital deaths therefore account for 29% of all overdose suicides and 7% of all suicides.

Figure 1 shows the age/sex distribution of inhospital overdose deaths. The mean age of male deaths was 56.5 years (range 15 to 94) and for females it was 58.2 years (range 12 to 99). The greatest number of deaths (n = 342) occurred among those aged 75+, otherwise the deaths were fairly evenly distributed over the six age groups, with similar numbers of male and female deaths. Among those aged 75+, 114 (33.3%) of the deaths were coded accidental, this figure for all other age groups combined was 20.9%, indicating that the excess of deaths in this age group may be at least partially attributable to a higher proportion of genuine accidents (χ^2 (2df) 19.9 $p<0.001$).

The main category of drug taken was coded for only 926 (80.6%) of the deaths. Two drug groups accounted for most of these cases: analgesics and antipyretics (n = 488 (52.7%)) and psychotropic drugs (n = 362 (39.1%)). Nineteen deaths (2.0%) were associated with pesticide ingestion. Table 1 gives the main specific drugs taken in overdose. The figures here are likely to be underestimates of the use of these drugs as for many records no specific drugs were listed. Fifty two deaths were caused by overdoses of anticoagulants, insulin and oral hypoglycaemics, cardiac glycosides or thyroxin; 26 (50%) of these were coded as accidental.

The median time between admission and death was three days (interquartile range one to nine days). Figure 2 shows the time (in days) between admission and death for subjects dying within the first 21 days of admission. Four hundred and thirteen people (35.9%) died within one day of their admission and 821 (71.5%) died within seven days. The median time between admission and death was two days for overdoses involving non-opioid analgesics/antipyretics and three days for overdoses involving psychotropic drugs.

Examination of the six additional diagnosis fields included in the HES data enabled us to identify a number of conditions likely to have contributed to death. The most frequently recorded diagnoses (proportion of all deaths) were: hepatic failure: 197 (17.1%); cardiac arrest: 135 (11.7%); pneumonia: 104 (9.1%); cerebral anoxia: 49 (4.3%), and septicaemia: 37 (3.2%). Sixty three (5.5%) of the deaths had a diagnosis of malignant neoplasia recorded in one of their diagnosis fields.

DISCUSSION

Using HES data for England we have estimated that there are about 380 inhospital deaths a year after admission for drug overdose. These deaths account for around 29% of overdose suicides and 7% of all suicides. Thus while most people who commit suicide by drug overdose are already dead when they are discovered, we have identified that a sizeable proportion reach hospital alive, but die subsequently as a consequence of their overdose.

Paracetamol containing analgesics, benzodiazepines, and tricyclic/tetracyclic antidepressants were the commonest single drug groups involved. These drugs were also the most commonly taken medicines, except those associated with drug misuse, mentioned on death certificates for all (inhospital and community) poisoning deaths in England and Wales between 1994 and 1998.[4]

There are three main limitations to our analysis. Firstly, because the data were derived from anonymised HES records, we were unable to obtain more detailed information on individual cases. Fuller information on each patient's condition at the time of admission, subsequent management, and their cause of death would permit a better assessment of the potential for preventing some of these deaths. Secondly, HES are collected for administrative rather than research

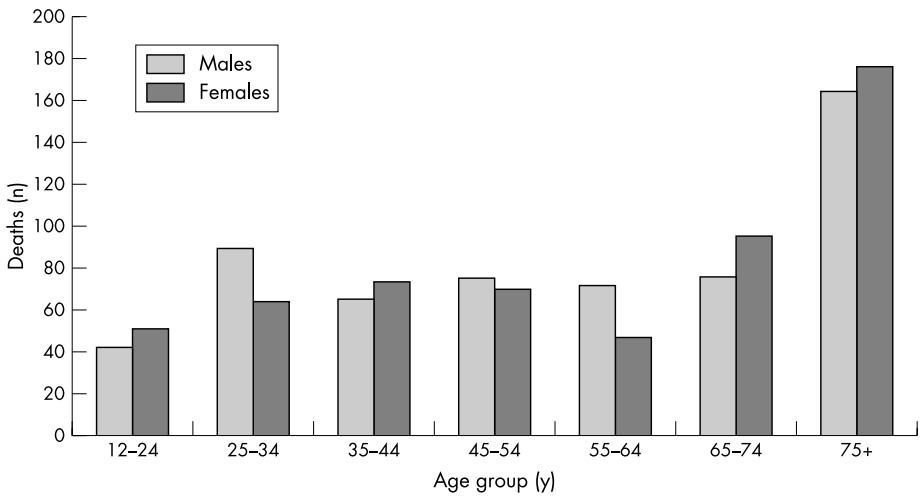

Figure 1 Age distribution of inhospital overdose deaths in England 1997–1999.

Table 1 Specific drugs/drug groups most frequently recorded as having been taken alone or in combination in fatal overdoses (% of all 1149 overdoses)

	Number (%) where the drug taken was the only one listed as having been taken	Number (%) where drug taken alone or in combination with other drugs
Paracetamol and compounds (including co-proxamol)	284 (24.7)	401 (34.9)
Benzodiazepines	110 (9.6)	206 (17.9)
Tricyclic and tetracyclic antidepressants	63 (5.5)	110 (9.6)
Salicylates	28 (2.4)	60 (5.2)

purposes and so there are likely to be some inaccuracies in the coding of both overdoses and deaths. The specific drugs taken in overdose were not coded for around a quarter of cases. Some reassurance concerning data quality was obtained from the observation that 145 (73.6%) of the 197 patients with diagnoses of hepatic failure had taken overdoses that included paracetamol containing compounds either alone or in combination with other drugs. Lastly, we used comparatively inclusive criteria to define suicidal overdose and so will have slightly overestimated inhospital mortality related to deliberate overdose. We thought it probable that few of the deaths in 12–74 year olds were truly accidental, however in older subjects accidental overdose/drug toxicity is more probable, possibly resulting from the effects of cognitive impairment and poly-pharmacy. While such deaths may not have been suicides, they nevertheless contribute to the overall burden of morbidity and mortality arising from drug overdose. Because of comorbidities, those aged 75+ are likely to be at greater risk from the adverse effects of overdose. This highlights the particular need for careful prescribing in this age group.

A number of studies have reported inhospital morbidity and mortality related to overdose of particular drugs.[6–9] The most commonly reported complications are arrhythmias, seizures, hypoxic brain damage, aspiration pneumonia, and hepatoxicity. In some cases these complications may be preventable[10 11] by following appropriate management guidelines and by use of sources of expert advice on poisoning.[12] There is evidence, however, of variation in adherence to guidelines promoting best practice.[11 13]

There are several approaches to reducing morbidity and mortality associated with drug overdose. These include: (1) population strategies aimed at improving population mental health[1]; (2) encouraging general practitioners to prescribe drugs that are safer if taken in overdose[14]; (3) minimising the amount of drug taken in overdose by restricting the quantity prescribed or sold over the counter[15 16]; (4) disseminating hospital management guidelines on the treatment of overdose involving particular drugs[17]; and (5) ensuring all those involved in the acute management of overdose are made aware of and use where appropriate, authoritative management advice from National Poisons Information Services.

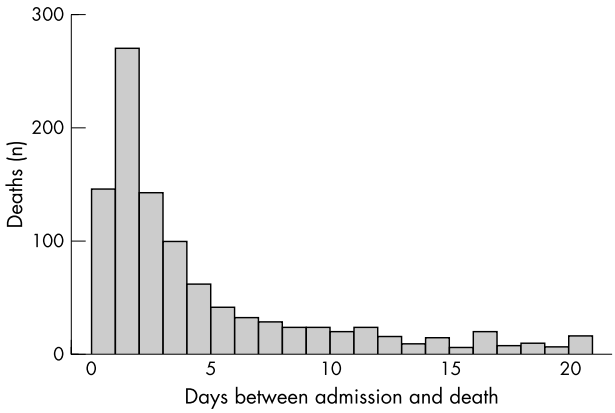

Figure 2 Time between hospital admission and death (days) for overdose deaths within three weeks of admission.

Most suicide attempts occur within the context of acute psychological distress. With appropriate management, most episodes of depression improve and only 5% to 10% of people who survive deliberate drug overdose go on to commit suicide.[18] It is therefore possible that improvements in the pre-admission and inhospital management of acute drug overdose may reduce long term sequelae among survivors, prevent a proportion of suicide deaths, and contribute to suicide reduction targets.[2] It is acknowledged, however, that many inhospital deaths may not be preventable because the person has suffered profound cerebral anoxia or developed aspiration pneumonia before admission. Furthermore, overall mortality among hospital admitted overdoses is low (0.5%) and the costs of interventions to improve upon this low rate should be balanced against other approaches to prevention.

More detailed information, perhaps derived from a national confidential inquiry into inhospital deaths from drug overdose, is required to determine whether there are any aspects of management that could reduce mortality from this cause. Potentially important interventions might include protocols for ambulance crews concerning initial management/antidote administration[19] and adherence to National Poison's Information Services Guidelines for the management of all cases.

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