Self-poisoning suicides in England: a multicentre study

N. KAPUR¹, P. TURNBULL¹, K. HAWTON², S. SIMKIN², L. SUTTON², K. MACKWAY-JONES³, O. BENNEWITH⁴ and D. GUNNELL⁴

From the ¹Centre for Suicide Prevention, University of Manchester, Manchester, ²Centre for Suicide Research, University of Oxford, Oxford, ³Department of Emergency Medicine, Manchester Royal Infirmary, Manchester, and ⁴Department of Social Medicine, University of Bristol, Bristol, UK

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Summary

Background: Suicide by self-poisoning is an important cause of death worldwide. A substantial proportion of those with a fatal outcome may come into contact with medical services before they die.

Aim: To estimate the proportion of self-poisoning suicides who reached hospital alive; to compare those who reached hospital alive with those who did not; to describe in detail the clinical characteristics and medical management of those dying in hospital.

Design: Retrospective audit.


Results: Of the 214 individuals who completed suicide by self-poisoning during the study period, 49 (23%) reached hospital alive. Those reaching hospital were more likely to be female, more likely to have ingested paracetamol and less likely to have ingested co-proxamol. In the hospital sample, the commonest causes of death were respiratory (n=10), hepatic or hepatorenal (n=8), cardiac (n=5), or a result of hypoxic brain injury (n=5). Only 18% of in-hospital deaths occurred within 24 h of the overdose.

Discussion: Extrapolating to England as a whole, we might expect 300 self-poisoning suicides per year to reach hospital alive (6% of all suicides). Improved medical management might produce a small but significant reduction in the rate of suicide. Such interventions should not be restricted to the emergency care domain. Further research will help to clarify the likely contribution of improved medical management to suicide prevention.

Introduction

The prevention of suicide is a health priority in many countries.¹–⁴ Suicide by self-poisoning is a major cause of death worldwide. In England, it accounts for >1300 deaths per year, or approximately a quarter of all suicides. Self-poisoning by drugs is the commonest method of suicide in women, and the second most common in men.⁵ Analgesics and antidepressants are the substances most frequently ingested in fatal overdose in England,⁶ whereas pesticides are more commonly ingested in developing-world settings.⁷

Self-poisoning may not be immediately lethal, and it is likely that a substantial proportion of self-poisoning suicides will come into contact with medical services before they die. Although this issue has received some attention in developing
countries, comparatively few studies have explicitly investigated fatal self-poisoning presenting to hospital in industrialized settings. Gunnell et al. undertook a cross-sectional analysis of three years of Hospital Episode Statistics data for England. They estimated that almost one third of overdose suicides survived the effects of their poisoning long enough to reach hospital. On this basis, they suggested that improved medical management of life-threatening self-poisoning in hospital might contribute to a reduction in the rate of suicide. Small case series from Australia suggest that fatal outcomes might be prevented in almost a fifth of self-poisoning deaths in the general hospital and a higher proportion of self-poisoning deaths in the intensive care unit. However, a number of questions remain unanswered. For example, what distinguishes self-poisoning suicides who reach hospital alive from those who do not? What treatment do individuals who subsequently die as a result of self-poisoning receive in hospital? Is there any evidence that improved medical management might prevent some of these deaths?

We carried out a multicentre descriptive study of self-poisoning suicides by examining a national sample of coroners’ records. We aimed to investigate the potential contribution of improved hospital management to suicide prevention.

We had three specific objectives: first, to estimate the proportion of self-poisoning suicides who reached hospital alive; second, to compare the general characteristics of self-poisoning suicides who reached hospital with those who did not; and third, to describe in detail the sociodemographic profile, clinical characteristics and hospital management for the group of self-poisoning suicides who reached hospital, with a view to informing prevention strategies.

**Methods**

**Setting and subjects**

The study was carried out in three research centres (Oxford, Bristol and Manchester) as part of a wider programme of research investigating methods of suicide particularly relevant to the National Suicide Prevention Strategy for England. Based on the number of coroners’ districts in England, we estimated that a total of 24 coroners (i.e. eight per centre) would give us coverage of approximately one fifth of the English population, and would lead to the identification of up to 260 self-poisoning suicides per year. One third of these might be expected to reach hospital alive. If the prevalence of a risk factor was 20% in the community suicide group, a one year sample would give us 90% power to detect a two-fold difference in the prevalence of this risk factor between community and hospital samples.

For each of the three study centres we selected the coroner’s jurisdiction that covered the local geographical area. The remaining seven coroners were selected using a random number method from a list of coroners’ offices within 50 miles or 1 h 30 min travelling time of each centre. Selected coroners were approached by letter and invited to take part in the study. Twenty-one of the 24 coroners originally selected agreed to participate in the study (participation rate 87%). The remaining three were replaced by others randomly selected from the list. Five of the coroners’ jurisdictions were urban, 15 mixed urban/rural and four rural.

Coroners’ lists (both paper and electronic, where available) were searched in order to identify deaths where the main cause of death was self-poisoning. We included deaths from ingestion of drugs (prescribed or non-prescribed) or non-medicinal substances (for example, weed killers or pesticides). These substances account for over 1300 deaths per year in England. We excluded deaths as a result of non-ingestible poisons (for example, gaseous inhalation of motor vehicle exhaust fumes) since this is the approach adopted by the National Suicide Prevention Strategy for England, which considers such deaths separately. We identified all cases during a one-year period (1 January 2001 to 31 December 2001). We selected cases who had received a verdict of either ‘suicide’ or ‘undetermined cause’. Although the majority of undetermined deaths were likely to be suicides, we adopted more stringent inclusion criteria. The undetermined cases were discussed by the investigators and rated as having a high, moderate or low probability of suicide on the basis of the circumstances of the attempt, the antecedents, the past history of the individual and any other available information. Only those with a moderate or high probability were included in the current study. A prior comparison of ratings of a series of 47 cases by researchers in the three centres had demonstrated good reliability, with agreement in 90% of cases.

**Measures**

A proforma was developed in order to extract the relevant information from the coroners’ records. The proforma was piloted in each centre before being finalized, and included items relating to the sociodemographic characteristics of the deceased,
the verdict received, the underlying cause of death and the location of the act. A more detailed proforma was completed on self-poisoning suicides who reached hospital alive. This included clinical details (timing of the act, consumption of alcohol, toxicology), as well as a rating of the objective circumstances of the act from the Suicide Intent Scale (SIS).16 Additional information was collected on psychiatric history, recent contact with health services, and medical management in hospital. Drugs were rated as having contributed to death on the basis of the cause of death stated in the coroners’ files and the toxicology results.

### Analysis

A simple descriptive analysis was done using SPSS 11.5.17 Figures are quoted as numbers and percentages. If an item of information was not known for a case, the case was removed from the analysis for that item; the denominator in all estimates is therefore the number of valid responses for that item unless otherwise stated. To test for differences between groups, we used the $\chi^2$ test for categorical variables and the Mann Whitney U test and the Kruskal Wallis H test for continuous variables.

### Results

We identified 214 self-poisoning suicides during the one-year study period (141 suicide verdicts, 34 open verdicts with a high probability of suicide and 39 open verdicts with a moderate probability of suicide). Of the 214 individuals, 49 (23%) reached hospital alive and these are subsequently referred to as ‘in-hospital overdose deaths’. The proportions of deaths given suicide verdicts, open verdicts (high probability of suicide), or open verdicts (moderate probability of suicide) were 57%, 27% and 16%, respectively, for the hospital sample vs. 68%, 13% and 19% for the community sample, $\chi^2 = 5.4, p = 0.07$.

### In-hospital and community deaths

Table 1 compares in-hospital overdose deaths with deaths occurring in the community. The in-hospital sample was slightly older than the community sample: mean age (SD) 52.4 (21.8) years vs. 47.3 (17.4) years. The age bands in Table 1 were chosen in order to obtain categories of approximately equal size. There were very few people aged <20 years in the sample: 2 (4%) for in-hospital deaths and 5 (3%) for community deaths. Those who died in hospital were more likely to be female. Regarding substances contributing to death, pure paracetamol overdose was implicated in over a quarter of the hospital deaths but just 5% of the community deaths. Co-proxamol overdose contributed to death in a fifth of the hospital deaths and a third of the community deaths. Figure 1 shows the distribution of substances contributing to death in the hospital and community samples. There was a highly significant difference in the distribution of substances ingested between the two groups ($\chi^2 = 43.8$, d.f. 14, $p < 0.001$). More than one drug contributed to death in 5 (10%) of the hospital sample and 29 (18%) of the community sample ($p = 0.21$). Alcohol was recorded as directly contributing to death in 6 (12%)

### Table 1 Sociodemographic characteristics and substances contributing to death, for in-hospital overdose deaths and community overdose deaths (total n = 214)

<table>
<thead>
<tr>
<th></th>
<th>Hospital ($n = 49$)</th>
<th>Community ($n = 165$)</th>
<th>$p$ for difference*</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>34 and under 12</td>
<td>12 (24%)</td>
<td>50 (30%)</td>
<td>–</td>
</tr>
<tr>
<td>35–54</td>
<td>18 (37%)</td>
<td>56 (34%)</td>
<td>0.32</td>
</tr>
<tr>
<td>55 and over</td>
<td>19 (39%)</td>
<td>59 (36%)</td>
<td>–</td>
</tr>
<tr>
<td>Lived in an urban area</td>
<td>41 (84%)</td>
<td>118 (71%)</td>
<td>0.10</td>
</tr>
<tr>
<td><strong>Female</strong></td>
<td>28 (57%)</td>
<td>64 (39%)</td>
<td>0.02</td>
</tr>
<tr>
<td><strong>Marital Status</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Married</td>
<td>14 (29%)</td>
<td>45 (27%)</td>
<td>–</td>
</tr>
<tr>
<td>Single, widowed, separated, divorced</td>
<td>35 (71%)</td>
<td>116 (70%)</td>
<td>0.54</td>
</tr>
<tr>
<td>Unknown</td>
<td>0</td>
<td>4 (2%)</td>
<td>–</td>
</tr>
<tr>
<td><strong>Substances contributing to death</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pure paracetamol</td>
<td>13 (27%)</td>
<td>9 (5%)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Co-proxamol</td>
<td>10 (20%)</td>
<td>55 (33%)</td>
<td>0.08</td>
</tr>
<tr>
<td>Pure salicylates</td>
<td>1 (2%)</td>
<td>2 (1%)</td>
<td>0.67</td>
</tr>
<tr>
<td>Other analgesics</td>
<td>2 (4%)</td>
<td>33 (20%)</td>
<td>0.01</td>
</tr>
<tr>
<td>Tricyclic antidepressants</td>
<td>8 (16%)</td>
<td>42 (25%)</td>
<td>0.18</td>
</tr>
<tr>
<td>SSRIs</td>
<td>0</td>
<td>4 (2%)</td>
<td>0.27</td>
</tr>
<tr>
<td>Mood stabilizers</td>
<td>2 (4%)</td>
<td>2 (1%)</td>
<td>0.19</td>
</tr>
<tr>
<td>Other antidepressants</td>
<td>1 (2%)</td>
<td>8 (5%)</td>
<td>0.39</td>
</tr>
<tr>
<td>Antipsychotics</td>
<td>1 (2%)</td>
<td>5 (3%)</td>
<td>0.71</td>
</tr>
<tr>
<td>Sedatives and hypnotics</td>
<td>4 (8%)</td>
<td>11 (7%)</td>
<td>0.72</td>
</tr>
<tr>
<td>Opiates</td>
<td>1 (2%)</td>
<td>12 (7%)</td>
<td>0.18</td>
</tr>
<tr>
<td>Other prescribed drugs1</td>
<td>11 (22%)</td>
<td>15 (9%)</td>
<td>0.01</td>
</tr>
<tr>
<td>Agrochemicals</td>
<td>1 (2%)</td>
<td>0</td>
<td>0.07</td>
</tr>
<tr>
<td>Other substances2</td>
<td>0</td>
<td>3 (2%)</td>
<td>0.34</td>
</tr>
<tr>
<td>Substance unknown</td>
<td>0</td>
<td>6 (4%)</td>
<td>0.17</td>
</tr>
</tbody>
</table>

* $\chi^2$ test. **Categories not exclusive.
1Included beta blockers, calcium channel blockers, insulin, ACE inhibitors.
2Included cyanide (2 cases), ethylene glycol.
of the hospital sample and 31 (19%) of the community sample \( (p = 0.28) \).

**In-hospital overdose deaths**

(i) **Verdict and sociodemographic characteristics**

Nearly 60% of those who died in hospital were female. Fewer than one third of the sample were married. Twenty-four individuals (49%) were living with family members on the day of suicide, and 19 (39%) were living alone.

(ii) **Clinical characteristics**

Table 1 shows the substances which contributed to death. Prescribed drugs contributed to death in 38 individuals. It was possible to establish who the medication had been prescribed for in 31 cases. In 26 of these cases (84%), the drug had been prescribed for the deceased. The proportion of drugs prescribed for the deceased increased with age (57% in those aged 34 years and under, 80% in those aged 35–54, and 100% in those aged >55, \( \chi^2 = 6.5, p = 0.04 \)). In 41 cases (84%), the overdose occurred in the individual’s home.

Of the 28 individuals (57% of the sample) for whom information on alcohol consumption shortly before the act was available, there was evidence that alcohol had been consumed in 14 cases (50%). Blood ethanol levels taken after death indicated that levels were still above the legal limit for driving in six cases (21%).

In 22 cases (45%), the person who discovered the subject was a family member. Other subjects were discovered by friends or neighbours (4 cases), and the police (4 cases). In seven cases (14%) the individual was not discovered by anyone, but presented to hospital of their own accord.

(iii) **Suicidal Intent scores**

Table 2 shows Suicidal Intent Scale scores for the hospital sample. Almost three-quarters of cases occurred with no-one nearby. In 78% of cases, some precautions had been taken against discovery. In half the cases, a suicide note was left. In over a third there had been some communication of intent prior to the act. However, a quarter of individuals actually notified someone after the act.

Males and females had similar total SIS scores (7.0 vs. 8.0, \( p = 0.54 \), Mann Whitney U test). SIS scores were highest in the older subjects (median 6.0 in those aged 34 and under, 5.5 in those aged 35–54, and 9.0 in those aged 55 and over, \( p < 0.01 \),
Kruskal-Wallis H test). The older age group were more likely to be isolated when carrying out the act (proportion where no-one was nearby: 42% in those aged 34 and under, 44% in those aged 35–54, and 90% in those aged over 55, \( \chi^2 = 13.9, p = 0.03 \)). There were no other marked differences in the individual items of the SIS by age group.

(iv) Psychiatric history and contact with services

Psychiatric diagnoses were based on all the information contained in the coroners’ records. Almost three-quarters of the sample had evidence of a psychiatric disorder at the time of death (Table 3). The most common primary diagnosis was affective disorder. Almost half the sample had a history of previous deliberate self-harm. Information on contact with psychiatric services was available in 38 cases (78%). Over 40% of these subjects were in contact with psychiatric services at the time of death. Information on the most recent contact with the general practitioner was available for only 27 cases (55%). Of these, eight (30%) had consulted in the week before their suicide, and a further eight within the last month. Three-quarters had seen their general practitioner in the previous 6 months.

(v) Medical management

In only five cases (10%) was there clear evidence of a delay of >6 h between taking the overdose and seeking medical treatment (one case of diltiazem overdose, one case of opioid overdose and three cases of paracetamol overdose). Data on response times (the time elapsed between assistance being requested in the community and assistance arriving) was available in 18 cases (37% of the sample). The median response time was 8 min, range 2–36 min. Five cases had a response time of >15 min. These cases involved overdoses of: (1) opiates; (2) ibuprofen; (3) an ACE inhibitor and paracetamol; (4) insulin; (5) co-proxamol. In no cases was the delay judged to have contributed significantly to death, either by the coroner or by members of the research team (NK, KMJ).

Table 4 summarizes the medical management received by cases who died in hospital. Only nine
(18%) died within 24 h of the overdose. Assistance was initially given by ambulance personnel in the majority of cases.

The level of detail in the coroners’ records regarding in-hospital management meant that in some cases it was difficult to determine with certainty whether an individual had not received a specific treatment, or whether this had simply not been recorded. The denominators in the ‘prehospital care’ and ‘hospital care’ sections of Table 4 therefore represent all cases treated in hospital, and as a result the proportions quoted may be underestimates. Eighty percent of the sample were transported to the hospital by ambulance. In a third of subjects, resuscitation was carried out prior to arrival at hospital. There was evidence of conscious level being recorded on admission in one fifth of cases. A third of the sample had cardiac monitoring, almost half were ventilated, and >40% were treated on the intensive care unit. Seven individuals were ventilated, but there was no record of them being transferred to the intensive care unit. In the majority of these cases, subjects died before transfer could be arranged.

(vi) Individual classes of drug

We examined the hospital management for the main classes of drugs contributing to death separately.

There were 13 cases (26% of all in-hospital deaths) where pure paracetamol ingestion had contributed to death. Nine subjects (70%) had a specific antidote (acetylcysteine) administered, but the timing of administration was not available in the majority of cases. Six (46%) were ventilated and six were admitted to the intensive care unit. Three (23%) were referred to a liver unit.

In 10 cases (20% of all in-hospital deaths), co-proxamol contributed to death. Two of these cases (20%) died within 6 h of the act. Five (50%) received pre-hospital resuscitation; four (40%) received naloxone. Two (20%) patients were ventilated and two were admitted to the intensive care unit.

In the eight cases where tricyclic antidepressants contributed to death, two subjects (25%) died within 6 h of the act. Four (50%) received pre-hospital resuscitation. Five (62%) had cardiac monitoring in hospital, six (75%) were ventilated, and four (50%) were admitted to the intensive care unit.

(vii) Cause of death

In 30 cases, specific causes of death in addition to drug overdose were listed. In these subjects, the most frequently recorded causes of death were: respiratory causes (10 cases, 33%, including 3 cases of aspiration pneumonia); hepatic or hepatorenal failure (8 cases, 27%); multiple organ failure (5 cases, 17%); cardiac causes (5 cases, 17%); hypoxic brain damage (5 cases, 17%); gastrointestinal haemorrhage (2 cases, 7%). Eight subjects had more than one additional cause of death listed.

In only one case was there clear evidence in the coroners’ files that improved medical care might have led to a different outcome for the patient. Early intubation and transfer to an intensive care unit may have prevented a death from aspiration pneumonia and respiratory arrest following an overdose of alcohol, benzodiazepines and tricyclic antidepressants.
Discussion

We found that just under a quarter of all those who died after deliberate self-poisoning reached hospital alive. Those who reached hospital were more likely to be female, more likely to have ingested paracetamol and less likely to have ingested co-proxamol than pre-hospital overdose deaths.

With respect to the in-hospital overdose deaths, when a prescribed drug had contributed to death that drug had been prescribed for the deceased in the majority of cases. Alcohol consumption shortly before the act was common, but our data on post-mortem blood ethanol levels needs to be interpreted cautiously because of redistribution and potential synthesis of ethanol after death.\textsuperscript{18} There was evidence of significant suicidal intent in the majority of cases, but a quarter of individuals told someone about the attempt afterwards. At least three-quarters of subjects had evidence of a psychiatric disorder at the time of death and half had a history of deliberate self-harm. There were high rates of contact with both primary and secondary care services. Most subjects were transported to hospital by ambulance and the median response time was 8 min. Assistance was first given by ambulance personnel in the majority of cases. Only nine subjects died within 24 h of the overdose. Hospital management appeared to be relatively intensive. At least one third of patients received cardiac monitoring, 47% were ventilated, and 40% were admitted to the intensive care unit.

Comparison with previous studies

Compared with a previous study of self-poisoning suicides who died in hospital,\textsuperscript{9} our sample was similar in terms of age and sex profile and substances ingested. In both studies the majority of patients died within the first week of admission.

Despite legislation restricting paracetamol pack sizes in 1998 and a decline in the number of deaths involving this drug in England and Wales in the immediate post-legislation period,\textsuperscript{19} paracetamol was still the drug most commonly causing in-hospital death in this study. Paracetamol (in pure form) contributed to death in a fifth of the hospital sample. Pure paracetamol deaths were more likely to occur in hospital than in the community, whereas co-proxamol deaths occurred largely in the community. This probably reflects differences in the relative lethality and speed of action of the two drugs,\textsuperscript{5} but could also reflect underlying differences in the characteristics of individuals who choose to ingest these substances. Females were somewhat over-represented in the hospital sample. This may be because of general differences in help-seeking behaviour between men and women.\textsuperscript{20} Alternatively it could be related specifically to gender differences in suicidal behaviour—men may make attempts of greater immediate lethality.\textsuperscript{21}

Rates of contact with primary care services were comparable with previous studies.\textsuperscript{22} The rate of contact with psychiatric services was higher than that reported in general population samples,\textsuperscript{5} but this finding may be confounded by gender.

Methodological issues

Although the current study used systematic methods and recruited a reasonably representative sample of self-poisoning suicides from a mixture of rural and urban settings, the findings need to be interpreted in the context of its methodological limitations. First, it was a retrospective study using coroners’ records. The level of detail recorded in the files meant we were unable to comment definitively on the quality of care received, and for some treatment variables, the data set was not complete. Second, we lacked a comparison group for the in-hospital sample and so we are unable to draw any firm aetiological conclusions. However, descriptive studies can inform service planning,\textsuperscript{23} and the findings of this study do show the groups in whom suicide must be reduced if prevention is to be achieved. Third, no formal check of the reliability of the data extracted from the coroners’ files was made. However, the data forms were fully structured and had been piloted, and the researchers had previous experience of extracting data from case notes. Fourth, although we included suicide and open verdicts, we did not include accidental deaths, a proportion of which are likely to be suicides.\textsuperscript{24} However, the number of cases that were missed is likely to be small.\textsuperscript{25} Fifth, our study was carried out in a sample of coroners’ districts in England. We found slightly fewer suicides than might have been expected from our power calculation, and this probably reflects the fact that not all coroners’ districts are the same size. Our sample was similar in terms of gender and age profile to all suicide deaths by self-poisoning which occurred in the general population during the study period. For self-poisoning deaths (suicide and undetermined death) in England and Wales in 2001, 42% were female, 29% were aged 34 and under, 41% were aged 35–54, and 30% were aged over 55 (National
Confidential Inquiry into Suicide and Homicide, personal communication). However, we cannot be certain about the extent to which our findings can be generalized to other countries.

Implications for practice and future research

We found that 23% of self-poisoning suicides in this study reached hospital alive. If we extrapolate these figures to England as a whole, we would expect 300 self-poisoning suicides per year to reach hospital alive, representing 6% of all suicides. Improved hospital management might therefore have the potential to effect a small but significant reduction in the rate of suicide. Although we found only one instance where this was definitely the case in the current study (2% of the hospital sample, 95% CI 0–6%), previous studies from Australia based on detailed toxicological records on small numbers of subjects suggest that a higher proportion of hospital deaths (perhaps as many as one fifth) may be preventable.10,11

What aspects of management might have the greatest impact on outcome? Ambulance staff gave initial assistance in the majority of cases in this study, and pre-hospital care might be one area to explore further. However, there are conflicting opinions as to whether such approaches can ever be worthwhile.26,27 Improved assessment and management of the airway might help to reduce poor outcomes.28,29 Prompt administration of specific antidotes such as acetylcysteine for paracetamol poisoning may also be of benefit.30 Interventions should not be restricted to the emergency care domain. We did not obtain comprehensive data on the delay between taking the overdose and seeking emergency care in the current study, but the timing of presentation is likely to have important implications for outcome.30 It is much less clear what interventions might encourage individuals who have poisoned themselves to seek medical help at an earlier stage.

Supportive care is still the mainstay of treatment for self-poisoning,31 and it is unlikely that any single intervention on its own will significantly affect mortality rates. The National Institute of Clinical Excellence in England has recently published guidelines on the management of self-harm, and these include guidance on the medical management of overdose.32

However, an estimated 140,000 patients attend hospital following self-poisoning in England and Wales every year.33 This means the case fatality rate for self-poisoning is only 0.2%. It is likely to be difficult and expensive to intervene in order to reduce this already low rate further.9 If we consider a broader range of outcomes (such as the serious toxic effects of overdose),31 then it may be feasible to demonstrate the effectiveness of interventions in controlled studies. In developing-world settings, where the case fatality rates for self-poisoning are much higher, it may be easier for improved medical management to have an impact on suicide rates.8

In developed-world settings, additional strategies are probably required to reduce deaths, and might include further restriction of pack sizes for over the counter medication,19 safer prescribing of toxic medication such as tricyclic antidepressants,4 or perhaps even withdrawal from the market of analgesics such as co-proxamol,13,34 as has recently been agreed in England. Half of our sample had a history of previous suicidal behaviour, and so psychosocial interventions following self-harm could also have a role.35

Further research will give us a better indication of the likely contribution of improved medical management of self-poisoning to suicide prevention. Case control studies concentrating on the specific sub-groups of patients who account for the greatest number of hospital deaths (namely those ingesting paracetamol, co-proxamol and tricyclic antidepressants) might be helpful. Detailed information on management from hospital records as well as coroners’ files would allow clinicians to rate the adequacy of hospital care using a ‘confidential inquiry’ methodology.29 Studies carried out in a variety of health care settings would improve the generalizability of findings. Ultimately these approaches may help to identify improvements in treatment that could reduce mortality.

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