Deliberate Self-Harm in Young People: Characteristics and Subsequent Mortality in a 20-Year Cohort of Patients Presenting to Hospital

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Received June 22, 2006; accepted Jan. 23, 2007. From the Centre for Suicide Research, University of Oxford, Department of Psychiatry, Warneford Hospital, Headington, Oxford, United Kingdom.

This study was funded by Oxfordshire Health Services Research Committee, the National Health Service (NHS) Executive for England Department of Health, and the Oxfordshire and Buckinghamshire Mental Health Partnership NHS Trust.

The authors thank the members of the psychiatric service in the general hospital in Oxford. We also thank Liz Bale, Anna Shepherd, and Daniel Zahl for assistance with data collection and Sue Simkin for her help with the preparation of the manuscript; none of these individuals report any financial or other relationships relevant to the subject of this article.

In the spirit of full disclosure and in compliance with all ACCME Essential Areas and Policies, the faculty for this CME article were asked to complete a statement regarding all relevant financial relationships between themselves or their spouse/partner and any commercial interest (i.e., any proprietary entity producing health care goods or services consumed by, or used on, patients) occurring within at least 12 months prior to joining this activity. The CME Institute has resolved any conflicts of interest that were identified. The disclosures are as follows: Dr. Hawton and Ms. Harriss have no personal affiliations or financial relationships with any proprietary entity producing health care goods or services consumed by, or used on, patients to disclose relative to the article.

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Objectives: To investigate the characteristics of young deliberate self-harm (DSH) patients and determine outcome in terms of mortality and risk factors for suicide.

Method: Information was collected on consecutive DSH patients aged 15 through 24 years presenting to a general hospital during a 20-year period (1978–1997). Deaths to the end of 2000 were identified through national mortality registers.

Results: Of 5459 patients in the cohort, 62.9% were female and 37.1% male. Overdoses (90.5% of DSH episodes) most frequently involved acetaminophen (44.0%). Acetaminophen and antidepressant overdoses increased during the study period, whereas overdoses of minor tranquilizers decreased. More than one third of patients (36.1%) drank alcohol immediately before DSH. The most frequent problems faced by patients involved family members, partners, employment/studies, and friends. One quarter of patients (26.3%) had a history of prior DSH. Of 4843 patients followed up, 141 (2.9%) died (90 males [5.0%] and 51 females [1.7%]), the risk of death being 4 times greater than expected. More than half (81; 57.4%) of the deaths were from probable suicide, which was approximately 10 times more frequent than expected. Risk factors for suicide included male gender, previous DSH, prior psychiatric history (females), and high suicide intent. There were also more deaths than expected from respiratory disorders, circulatory disorders, and accidents that did not involve poisoning.

Conclusions: The range of characteristics of young DSH patients indicates the multifactional nature of aftercare required following DSH. The very high risk of suicide after DSH in young people highlights the need for preventive initiatives in this population.

(J Clin Psychiatry 2007;68:1574–1583)

Deliberate self-harm and suicide are both major problems in young people. Rates of *deliberate self-harm* (DSH), the term used for intentional self-poisoning or self-injury in many European countries because of the mixed motivation that is often involved,[1,2] are highest in young persons.[3,4] Several descriptive studies of young DSH patients presenting to general hospitals have been published. Most[5–7] have focused on adolescents, with some[8,9] concentrated on young people who have made "serious" suicide attempts. These have usually highlighted the large female-male ratio; much higher frequency of self-poisoning compared with self-injury; high levels of psychiatric disorder, especially depression and anxiety; evidence of social disadvantage; and high levels of interpersonal problems and adverse childhood experiences.[10] These studies have rarely included very large consecutive samples of patients, and the time span covered has not usually permitted examination of trends over time, such as changes in the substances used for self-poisoning.

An episode of DSH is the strongest risk factor for eventual suicide.[11,12] This fact applies as much to adolescents and young adults as to older persons. In an

TAKE-HOME POINTS

- Deliberate self-harm in a young person indicates a considerable risk of future suicide.
- All young people who present with deliberate self-harm should receive a full psychosocial assessment.
- The diversity of characteristics and problems of young people with deliberate self-harm means that a variety of approaches to clinical care should be available.

early follow-up study of Swedish adolescents who attempted suicide, 4.3% had died by suicide in the 10 to 15 years following the attempt.[13] In a group of English 16- to 20-year-old patients who had taken overdoses and were followed up for a mean of 2.8 years, 0.32% had died by suicide.[14] Very little attention has been paid to risks of death from other causes.

Knowledge of risk factors for suicide is a key aspect of prevention of suicide in patients who present with DSH, yet information on such factors in young people is sparse.[13–15] This dearth of information is due to the relatively small size of most studies, limited number of risk factors examined, and, in most cases, relatively short follow-up periods.

We have conducted an investigation of the characteristics of a large consecutive series of 15- through 24-year-olds who presented to general hospital during a 20-year period. We have also followed up these individuals to examine deaths from all causes, including suicide and risk factors associated with this outcome.

METHOD

Study Population

All patients who presented to the general hospital in Oxford, United Kingdom, following acts of DSH during the 20-year period from January 1, 1978, to December 31, 1997, and who were aged from 15 through 24 years at the time of their first presentation (the index episode) were included in the study. DSH was defined as intentional self-injury or self-poisoning, irrespective of motivation.[16] DSH is a term increasingly used in Europe to describe all acts of self-harm, including both suicide attempts and those with nonsuicidal or mixed intentions. It includes self-mutilation but not stereotypical repetitive acts displayed by individuals with developmental disorders and cognitive disabilities.

Patients were identified through the Oxford Monitoring System for Attempted Suicide,[4,16] which collects information on all DSH patients assessed by the general hospital psychiatric service. Nonassessed patients are identified through regular searching of records of presentations to the emergency department. For these patients, more limited information is collected, including gender, age, and method of DSH. This approach ensures identification of all DSH patients presenting to the hospital.[17]

Patient Characteristics

For all patients assessed by the general hospital psychiatric service, a clinician records demographic and clinical information on a standardized form. The following information was collected throughout the study period: age, marital status, employment status, current and previous psychiatric treatment, method of DSH, previous DSH (irrespective of whether or not DSH resulted in a general hospital referral), and *alcohol misuse* (defined as chronic alcoholism with physical symptoms or alcohol dependence prior to June 30, 1988). Since July 1, 1988, some extra items were added: living situation, parental status, violence to others and violence received in the preceding 5 years, criminal record, and a range of problems. A *problem* is defined as a factor that is causing current distress for the patient and/or contributed to the act of DSH. In addition, *alcohol misuse* was redefined to include the category "excessive drinking" (drinking more than nationally recommended maximum weekly limits). From January 1, 1993, until December 31, 1997, the Beck Suicide Intent Scale (SIS)[18] was also completed at the time of assessment whenever possible.

Deaths

Demographic information (name, gender, and date of birth) for all patients who presented between January 1, 1978, and December 31, 1997, was submitted to the Office of National Statistics for England and Wales, the Central Services Agency in Northern Ireland, and the General Register Office for Scotland. Tracing revealed whether a patient was alive or deceased as of December 31, 2000. Patients who could not be traced were excluded from the follow-up analyses. Copies of death certificates were obtained for all subjects who had died. The underlying condition recorded on each death certificate as being the primary cause of death was considered to be the cause of death for the purposes of this study. *International Classification of Diseases, Ninth Revision* (ICD-9)[19] codes were used to categorize cause of death. All codes recorded prior to the introduction of ICD-9 were updated to ICD-9. All deaths that received a coroner's verdict

of "suicide" (ICD-9 codes E950–E959), "undetermined cause" (E980–E989, excluding E988.8), or "accidental poisoning" (E850–E869) were combined to form a "probable suicide" category, as it has been shown that overall mortality from suicide will be underestimated if the verdict of suicide alone is used.[20,21]

Statistical Analysis

Chi-squared analysis, Kaplan-Meier survival analysis, the log-rank test, and Cox regression were used to analyze the data.

For every cause of death of interest, the national death rate was calculated using data for England and Wales provided by the Office for National Statistics by gender, age (5-year age bands), and calendar year. For each cause, total person-years at risk were calculated according to gender, age (5-year age bands), and calendar year. The person-years at risk were multiplied by the national rate for each gender, age, and year subgroup to give an expected number of deaths within the DSH sample. The expected numbers were calculated on the basis of the ages and calendar years at which the individuals died. The total expected number of deaths for each cause over the entire study period was determined by summing across all ages and years. Relative risks for each cause of death were calculated by dividing the observed number of deaths from each cause by the expected number. Confidence intervals for the relative risks were computed using the Poisson distribution. The analyses were conducted using Stata 8.0[22] and SPSS 12.0.[23]

Ethical Approval

The Oxford Monitoring System for Attempted Suicide has the approval of the Oxford Psychiatric Research Ethics Committee.

RESULTS

Study Population

A total of 5459 individuals aged 15 through 24 years, 3432 females (62.9%) and 2027 males (37.1%), presented to the general hospital during the 20-year study period, following 6836 episodes of DSH (2569 by males, 4267 by females). Just over half were aged 15 to 19 years (N = 2839, 52.0%), with more females (N = 1997, 58.2%) than males (N = 842, 41.5%) being in this age group ($\chi^2 = 141.5$, $p < .001$). In all, 4558 patients (83.5%) received a psychosocial assessment while in the general hospital. More female (N = 2956, 86.1%) than male patients (N = 1602, 79.0%) received an assessment ($\chi^2 = 46.6$, $p < .001$).

Nature of the DSH Episodes

The majority of the index DSH episodes involved self-poisoning (Table 1). While the majority of episodes in both genders involved self-poisoning, self-injury was more frequent in males than in females ($\chi^2 = 127.4$, df = 2, $p < .001$).

Table 1. Methods of DSH in Patients Aged 15 Through 24 Years Presenting to Hospital

	Males (N = 2027)		Females (N = 3432)		Both Genders (N = 5459)	
Method	N	%	N	%	N	%
Self-poisoning	1638	80.8	3113	90.7	4751	87.0
Self-injury	308	15.2	210	6.1	518	9.5
Self-poisoning and self-injury	81	4.0	109	3.2	190	3.5

Abbreviation: DSH = deliberate self-harm.

Self-poisoning. Substances involved in the 4941 overdose episodes (including those combined with self-injury) were as follows: acetaminophen (including compounds), 2172 (44.0%); nonopiate analgesics without acetaminophen, 947 (19.2%); minor tranquilizers and sedatives, 641 (13.0%); antidepressants, 527 (10.7%); and other substances (e.g., other prescribed drugs, noningestible poisons), 1436 (29.1%).

Changes in the drugs used for self-poisoning occurred during the study period. Between the first half (1978–1987) and second half (1988–1997) of the study period, acetaminophen overdoses increased from 33.3% (N = 781) to 53.4% (N = 1391) of self-poisonings ($\chi^2 = 205.6$, $p < .001$), whereas overdoses of minor tranquilizers and sedatives decreased from 18.8% (N = 441) to 7.7% (N = 200) ($\chi^2 = 134.5$, $p < .001$). Antidepressant overdoses also increased from 9.3% (N = 219) to 11.9% (N = 308) of self-poisonings ($\chi^2 = 8.25$, $p < .005$).

Self-injury. Of the 708 self-injuries (including those combined with self-poisoning), the following methods were employed: 627 (88.5%) self-cuts (80.9%, wrist/arm; 7.6%, elsewhere on body), 27 (3.8%) jumps from a height, 13 (1.8%) hangings or attempted asphyxiations, 7 (1.0%) attempted drownings, 4 attempted shootings, 4 jumps in front of a moving vehicle, and 26 other methods (e.g., electrocution, ingestion of glass, injection of air into vein). There was an increase in other methods of self-injury between the first and second halves of the study period, from 1.2% (N = 4) to 5.8% (N = 22) ($\chi^2 = 11.5$, $p = .001$) of episodes.

Patient Characteristics

Further analysis of patient characteristics was conducted on the patients who had received a psychosocial assessment following DSH at their initial presentation (N = 4558; Table 2). The majority of these patients were single, and just under one third were students (including those at school). More female than male patients were students. Although male patients were more likely to be unemployed, the employment rate within both genders was higher than in young people in the local general popula-

Table 2. Demographic and Clinical Characteristics of Assessed Patients[a]

Variable	Both Genders[b] N	Both Genders[b] %	Male N	Male %	Female N	Female %	χ^2	p
All assessed patients	4558		1602		2956			
Age group, y								
15–19	2399	52.6	657	41.0	1742	58.9		
20–24	2159	47.4	945	59.0	1214	41.1	133.8	< .001
Marital status								
Single	4036/4539	88.9	1459/1590	91.8	2557/2929	87.4		
Married	326/4539	7.2	78/1590	4.9	248/2929	8.4		
Widowed/divorced/separated	177/4539	3.9	53/1590	3.3	124/2929	4.2	21.9	< .001
Unemployed	981/4522	21.7	507/1589	31.9	474/2933	16.2	150.4	< .001
Student	1430/4522	31.6	350/1589	22.0	1080/2933	36.8	104.4	< .001
Current psychiatric treatment	420/4461	9.4	140/1564	9.0	280/2897	9.7	0.61	.44
Previous psychiatric treatment	960/4331	22.2	369/1513	24.4	591/2819	21.0	6.70	< .01
Previous DSH	1119/4261	26.3	399/1483	26.9	720/2778	25.9	0.49	.49
Alcohol within 6 hours of DSH	1571/4348	36.1	732/1518	48.2	839/2830	29.6	147.7	< .001
Alcohol at time of DSH	772/4300	18.0	363/1494	24.3	409/2806	14.6	62.5	< .001
Misuse of alcohol	124/4230	2.9	75/1445	5.2	49/2785	1.8	39.4	< .001
Drug misuse[c]	305/2068	14.7	190/758	25.1	115/1310	8.8	101.3	< .001
Alcohol dependence[c]								
No	1631/2090	78.0	506/772	65.5	1125/1318	85.4		
Excessive drinking	395/2090	18.9	227/772	29.4	168/1318	12.7		
Alcohol dependence	64/2090	3.1	39/772	5.1	25/1318	1.9	117.8	< .001
Violent to others[c]	189/1830	10.3	126/641	19.7	63/1189	5.3	92.7	< .001
Violence received[c]	290/1774	16.3	87/617	14.1	203/1157	17.5	3.49	.06
Criminal record[c]	259/1810	14.3	202/642	31.5	57/1168	4.9	238.8	< .001

[a]The number of patients with available information differed between factors.
[b]Gender not known for 20 patients.
[c]Data available from July 1988 onward.
Abbreviation: DSH = deliberate self-harm.

tion. Less than 1 in 10 were in treatment from a psychiatric service at the time of DSH. However, more than a fifth had a history of previous psychiatric treatment, which was more common among male patients. Approximately one quarter of patients had a history of at least 1 episode of DSH prior to the one that brought them into the study. This figure included episodes that did not result in hospital presentation.

Analysis of information that was available from July 1988 onward showed that substantially more males than females were misusing drugs and alcohol, had a recent history of violence to others, and had a criminal record (Table 2).

Alcohol in Relation to DSH

Over a third of the assessed patients with available information (1571/4348, 36.1%) had drunk alcohol during the 6 hours before DSH, this proportion being considerably greater in males (732/1518, 48.2%) than in females (839/2830, 29.6%) ($\chi^2 = 147.7$, $p < .001$). Alcohol was used as part of the act of DSH in 18.0% of episodes and again more often in males (363/1494, 24.3%) than in females (409/2806, 14.6%) ($\chi^2 = 62.5$, $p < .001$).

Suicide Intent

Suicide intent scores from the SIS were available for the index DSH episodes of 917 assessed patients (76.6% of all the 1197 patients who presented between 1993 and 1997 and were assessed). Of the scores, 37.6% (N = 345) were classified as low (0–6), 33.4% (N = 306) as moderate (7–12), 23.6% (N = 216) as high (13–20), and 5.5% (N = 50) as very high (21–30). Male patients were significantly more likely than female patients to have high or very high SIS scores (33.5% vs. 26.4%, $\chi^2 = 5.22$, $p < .03$).

Problems Preceding DSH

The most common problems facing patients at the time of DSH (assessed from July 1, 1988 onward) were difficulties with family members (50.9%, 1122/2203), problems in the relationship with a partner (45.7%, 1007/2203), problems with employment (including unemployment) or studies (41.9%, 923/2203), problems with friends (22.5%, 496/2202), financial difficulties (19.9%, 438/2202), social isolation (16.4%, 361/2202), problems related to alcohol use (15.1%, 333/2201), and housing problems (15.1%, 333/2202).

Physical illness was present in 13.0% (N = 290) of patients at the time of DSH, the most frequent disorders being respiratory illnesses (5.0%), musculoskeletal disorders (1.8%), and epilepsy (1.3%).

Patients Included in Mortality Follow-Up

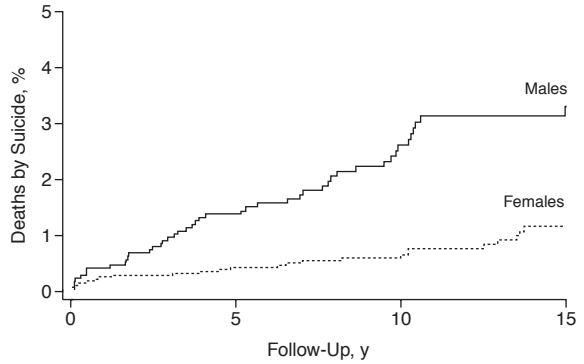
Full follow-up until the year 2000 was possible for 4639 patients (85.0% of the original sample). A further 204 (3.7%) were tracked for part of the follow-up period,

Table 3. Death by Cause: Observed and Expected Numbers, by Gender

		Males				Females				Both Genders			
Cause	ICD-9 Code	Observed	Expected	Observed/ Expected	95% CI	Observed	Expected	Observed/ Expected	95% CI	Observed	Expected	Observed/ Expected	95% CI
Infectious and parasitic diseases	001–139	1	0.5	1.9	0 to 10.7	0	0.5	0.0	…	1	1.0	1.0	0 to 5.6
Neoplasms	140–239	3	2.3	1.3	0.3 to 3.8	1	4.3	0.2	0 to 1.3	4	6.6	0.6	0.2 to 1.6
Endocrine, nutritional, and metabolic diseases and immunity disorders	240–279	1	0.4	2.3	0.1 to 13.1	1	0.5	2.2	0.1 to 12.2	2	0.9	2.3	0.3 to 8.2
Diseases of blood and blood-forming organs	280–289	0	0.1	0.0	…	0	0.1	0.0	…	0	0.2	0.0	…
Mental disorders	290–319	7	0.9	7.9	3.2 to 16.3	3	0.4	8.4	1.7 to 24.5	10	1.2	8.1	3.9 to 14.8
Diseases of the nervous system and the sense organs	320–389	0	0.9	0.0	…	1	0.9	1.1	0 to 6	1	1.8	0.6	0 to 3.1
Diseases of the circulatory system	390–459	6	1.9	3.2	1.2 to 7.0	3	1.7	1.8	0.4 to 5.2	9	3.6	2.5	1.1 to 4.8
Diseases of the respiratory system	460–519	0	0.7	0.0	0 to 3.5	5	0.8	6.2	2 to 14.5	5	1.6	3.2	1.0 to 7.5
Diseases of the digestive system	520–579	4	0.6	6.3	1.7 to 16.3	0	0.7	0.0	0 to 4.5	4	1.3	3.1	0.8 to 7.9
Diseases of the genitourinary system	580–629	0	0.1	0.0	…	1	0.1	6.8	0.2 to 38.0	1	0.2	4.4	0.1 to 24.5
Diseases of the skin and subcutaneous tissue	680–709	0	0.0	0.0	…	0	0.0	0.0	…	0	0.0	0.0	…
Diseases of the musculoskeletal system and connective tissue	710–739	0	0.0	0.0	…	1	0.1	7.5	0.2 to 41.5	1	0.2	5.7	0.1 to 32.0
Symptoms, signs, and ill-defined conditions	780–799	2	0.2	8.4	1 to 30.4	3	0.1	23.5	4.8 to 68.6	5	0.4	13.7	4.1 to 32.0
Accidents and adverse effects other than poisoning	E800–844	12	4.9	2.4	1.3 to 4.3	4	2.0	2.0	0.6 to 5.2	16	6.9	2.3	1.3 to 3.8
Accidental poisoning	E850–869	13	0.9	14.8	7.9 to 25.2	1	0.4	2.5	0.1 to 13.9	14	1.3	10.9	6.0 to 18.3
Suicide and self-inflicted injury	E950–959	28	3.0	9.3	6.2 to 13.4	15	1.1	13.7	7.7 to 22.6	43	4.1	10.4	7.6 to 14.1
Homicide and injury purposely inflicted by other persons	E960–969	0	0.2	0.0	…	0	0.2	0.0	…	0	0.5	0.0	…
Injury undetermined whether accidentally or purposely inflicted[a]	E980–989	13	1.5	8.8	4.7 to 15.1	11	0.9	12.8	6.4 to 23.0	24	2.3	10.3	6.6 to 15.3
Overall		90	19.2	4.7	3.8 to 5.8	50[b]	14.7	3.4	2.5 to 4.5	140	34.0	4.1	3.5 to 4.9

[a]E988.8 was excluded.
[b]Cause of death not known for 1 female patient.
Abbreviation: ICD-9 = *International Classification of Diseases, Ninth Revision*.

Figure 1. Cumulative Percentage of Suicides, Male and Female DSH Patients Aged 15 Through 24 Years (truncated at 15 years follow-up)



Abbreviation: DSH = deliberate self-harm.

yielding a total of 4843 individuals (88.7%) (3043 females and 1800 males) with full or partial follow-up. Patients for whom no follow-up information was available (N = 616, 11.3%) (usually because of incorrect identifier information) did not differ in gender distribution from those with information. Those with follow-up information were, however, significantly more likely to be less than 20-years old (53.1% vs. 46.9%, $\chi^2 = 21.7$, $p < .001$), to have received a psychosocial assessment following DSH (84.4% vs. 76.3%, $\chi^2 = 26.1$, $p < .001$), to have been admitted to a bed in the general hospital following DSH (85.7% vs. 76.0%, $\chi^2 = 39.4$, $p < .001$), and to have used self-poisoning for DSH (91.0% vs. 86.7%, $\chi^2 = 11.8$, $p < .001$). The length of follow-up ranged from 1 day to 23 years, with a median follow-up time of 11 years.

Deaths by All Causes

By the end of the follow-up period a total of 141 individuals (2.9%) had died, 90 males (5.0%) and 51 females (1.7%) (relative risk = 3.09, 95% CI = 2.2 to 4.4). The overall number of deaths was 4.1 times greater than would have been expected on the basis of general population mortality figures (Table 3). This was mainly due to the excess number of deaths within the categories that comprised the "probable suicide" group: suicide (10.4 times more frequent than expected), undetermined cause (10.3 times), and accidental poisoning (10.9 times). However, there was also an excess number of deaths from causes other than probable suicide (both sexes, relative risk = 2.3, 95% CI = 1.7 to 2.9; males, relative risk = 2.6, 95% CI = 1.8 to 3.6; females, relative risk = 1.9, 95% CI = 1.2 to 2.8).

There were excess numbers of deaths due to circulatory and respiratory disorders and ill-defined conditions (although the 95% confidence intervals for the risk ratios for these disorders were wide), and there was an excess in deaths due to accidents that did not involve poisoning. In males, there was also an excess number of deaths due to gastrointestinal disorders. There was also an excess of deaths in the "mental disorders" category; all of these deaths (N = 10) were classified as being due to drug dependence or nondependent drug abuse. The drugs involved in these cases were morphine (N = 7), alcohol (N = 1), and "other" (N = 2).

Suicides

Eighty-one deaths (1.7% of the follow-up sample) were categorized as probable suicides: 43 received a verdict of suicide, 24 received an open verdict, and 14 received a verdict of accidental poisoning. This category represented 57.4% of the overall number of deaths. At the time of the index DSH episode, 39 of the patients who eventually died by suicide were aged from 15 through 19 years, and 42 were 20- through 24-years old. There were 54 suicides among the males (3.0% of the followed up sample of males) and 27 (0.9%) among the female patients. Males were more than 3 times as likely to die by suicide than females (hazard ratio [HR] = 3.51, 95% CI = 2.2 to 5.6, $p < .001$). Survival analyses (Figure 1) clearly show the excess risk of suicide in the males (log-rank test, $\chi^2 = 32.28$, $p < .0001$). This pattern was observed within both of the 15- to 19- and 20- to 24-year age groups. However, the survival curves also show that many suicides occurred several years following the initial DSH episodes. Fifteen (18.5%) of the suicides occurred within the first 12 months of the index episode (males, 8/54, 14.8%; females, 7/27, 25.9%).

The methods of suicide were as follows: poisoning, 42 (28 males, 14 females); hanging or asphyxiation, 20 (13 males, 7 females); jumping, 5 (4 males, 1 female); firearm, 2 (males); drowning, 1 (female); cutting, 1 (male); and miscellaneous methods, 10 (6 males, 4 females).

The patients who died by suicide were compared with the remainder of the followed up patients (Table 4). With the exception of gender, age, and method of DSH, these comparisons were restricted to those patients who had received a psychosocial assessment following DSH, as were all multivariate analyses of risk factors for suicide. It should also be noted that female patients who died by suicide were less likely to have received a psychosocial assessment at the time of presentation for DSH (N = 19, 70.4%) than the remainder of the followed up female patients (N = 2631, 87.2%, $\chi^2 = 6.80$, $p < .01$).

Among male patients, previous DSH was the single significant risk factor for suicide (Table 4). The individual risk factors for suicide among females included previous DSH, psychiatric treatment at the time of DSH, and previous psychiatric treatment (Table 4). Self-poisoning as the method of DSH was associated with reduced risk of suicide. Multivariate Cox regression analysis using all of these significant factors showed that the factors in-

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Table 4. Risk Factors for Suicide Among Male and Female DSH Assessed and Nonassessed Patients, 1978 Onward

	Males						Females					
Risk Factor	Total, N	Suicides, N	%	Hazard Ratio	95% CI	p	Total, N	Suicides, N	%	Hazard Ratio	95% CI	p
All patients	1800	54	3.0				3042	27	0.9			
Age group, y												
15–19	768	25	3.3	1			1805	14	0.8	1		
20–24	1032	29	2.8	0.95	0.6 to 1.6	.9	1237	13	1.1	1.39	0.7 to 3.0	.9
Method												
Self-poisoning												
No	264	9	3.4	1			172	5	2.9	1		
Yes	1536	45	2.9	0.87	0.4 to 1.8	.7	2870	22	0.8	0.27	0.1 to 0.7	< .01
Self-injury												
No	1466	44	3.0	1			2769	22	0.8	1		
Yes	334	10	3.0	1.02	0.5 to 2.0	1.0	273	5	1.8	2.34	0.9 to 6.2	.09
Assessed patients only	1437	43	3.0				2650	19	0.7			
Marital status												
Married	67	3	4.5	1			204	1	0.5	1		
Single	1311	39	3.0	0.77	0.2 to 2.5	.7	2338	18	0.8	1.95	0.3 to 14.6	.7
Other	48	0	0.0	…	…	…	103	0	0.0	…	…	…
Employment status												
Employed	604	15	2.5	1			1021	3	0.3	1		
Unemployed	467	16	3.4	1.46	0.7 to 3.0	.3	437	5	1.1	4.03	0.96 to 16.9	.06
Student	303	10	3.3	1.43	0.6 to 3.2	.4	964	8	0.8	3.17	0.8 to 11.9	.09
Other	52	0	0.0	…	…	…	209	3	1.4	4.62	0.9 to 22.9	.06
Current psychiatric treatment												
No	1276	37	2.9	1			2350	13	0.6	1		
Yes	127	4	3.1	1.16	0.4 to 3.2	.8	253	6	2.4	4.94	1.9 to 13.0	< .001
Previous psychiatric treatment												
No	1023	25	2.4	1			1995	6	0.3	1		
Yes	335	13	3.9	1.64	0.8 to 3.2	.1	538	12	2.2	8.12	3.0 to 21.7	< .001
Previous DSH episodes												
No	976	21	2.2	1			1842	5	0.3	1		
Yes	361	19	5.3	2.87	1.5 to 5.4	< .001	659	13	2.0	8.70	3.1 to 24.5	< .001
Alcohol within 6 hours of DSH												
No	708	26	3.7	1			1785	15	0.8	1		
Yes	651	15	2.3	0.61	0.3 to 1.2	.1	761	2	0.3	0.33	0.1 to 1.4	.1
Alcohol at time of DSH												
No	1014	32	3.2	1			2153	16	0.7	1		
Yes	324	8	2.5	0.78	0.4 to 1.7	.5	366	2	0.5	0.69	0.2 to 3.0	.6
Alcohol misuse												
No	1233	37	3.0	1			2457	17	0.7	1		
Yes	64	0	0.0	…	…	…	44	1	2.3	3.61	0.8 to 27.2	.2

Abbreviation: DSH = deliberate self-harm.

dependently associated with eventual suicide were previous DSH (HR = 4.36, 95% CI = 1.5 to 12.4, p < .01) and previous psychiatric treatment (HR = 4.29, 95% CI = 1.6 to 11.8, p < .005).

In patients who presented from July 1988 onward, comparisons were made between those who died by suicide and those who did not for the extra factors for which data were available during this period (Table 5). Among males, suicide risk was associated with drug misuse and having problems with drugs, psychiatric disorder, and self-mutilation. Some other factors that showed a trend toward an association with suicide in males but did not reach statistical significance were the following: problems with alcohol (HR = 2.29, 95% CI = 0.9 to 6.0, p = .09), violence to others (HR = 2.38, 95% CI = 0.7 to 8.1, p = .17), and having a criminal record (HR = 1.82, 95% CI = 0.6 to 5.6, p = .3). For all of these factors, the association with suicide reached significance when both male and female patients were considered together, even though there was no association observed with suicide among female patients alone. Risk factors for females presenting from July 1988 onward included alcohol dependence and problems with psychiatric disorder. However, for both factors there were very wide confidence intervals around the hazard ratios.

Additionally, suicide intent (recorded from 1993 onward) was associated with suicide. Thus, patients with SIS scores categorized as high or very high (13+) were more likely to die by suicide than patients with moderate or low SIS scores (0–12) (HR = 6.22, 95% CI = 1.2 to

Table 5. Risk Factors for Suicide Among Male and Female DSH Assessed Patients, 1988 Onward

	Males						Females					
Risk Factor	Total, N	Suicides, N	%	Hazard Ratio	95% CI	p	Total, N	Suicides, N	%	Hazard Ratio	95% CI	p
All patients	961	21	2.2				1325	5	0.4			
Drug misuse												
No	527	9	1.7	1			1120	3	0.3	1		
Yes	185	8	4.3	2.82	1.1 to 7.3	< .04	109	1	0.9	3.47	0.4 to 33.4	.3
Alcohol dependent												
No	476	9	1.9	1			1058	3	0.3	1		
Excessive	213	8	3.8	1.96	0.8 to 5.1	.2	156	0	0.0	…	…	…
Dependent	33	0	0.0	…	…	…	23	1	4.3	15.5	1.6 to 149.5	< .02
Problems with drugs												
No	657	10	1.5	1			1252	4	0.3	1		
Yes	102	7	6.9	4.90	1.9 to 12.9	< .001	56	1	1.8	5.64	0.6 to 50.4	.1
Problems with psychiatric disorder												
No	679	12	1.8	1			1187	2	0.2	1		
Yes	79	5	6.3	3.89	1.4 to 11.1	< .02	121	3	2.5	14.9	2.5 to 89.0	< .01
Problems with self-mutilation												
No	469	7	1.5	1			785	2	0.3	1		
Yes	15	2	13.3	8.97	1.9 to 43.2	< .01	52	1	1.9	7.73	0.7 to 85.2	.1

Abbreviation: DSH = deliberate self-harm.

32.1, $p < .03$), although this association did not reach significance when each gender was considered separately (probably due to small numbers of cases in the suicide group).

DISCUSSION

We have investigated a large consecutive series of individuals aged 15 to 24 years who presented to a single general hospital following DSH during a 20-year period. The data were collected prospectively, and there was a lengthy follow-up. The sample was typical of young DSH patients in the United Kingdom, with more females than males and with self-poisoning being the predominant method of DSH. However, they would have represented individuals with more severe DSH acts compared with the overall population engaging in DSH since they had presented to hospital and many young people who carry out acts of DSH do not.[24] The data were collected in routine clinical practice. Information on most risk factors was only available for the patients who had received a psychosocial assessment. However, this group was the majority (83.5%), although a slightly greater proportion of females than males were assessed.

There were major changes in the drugs used for self-poisoning during the study period. The most important was a rise in the use of acetaminophen, which reflected the general increase in use of this drug for overdose in the United Kingdom.[25] Legislation introduced in 1998 to reduce pack sizes of analgesics sold over the counter in the United Kingdom appears to have had marked benefits in terms of reducing deaths and liver damage due to this type of self-poisoning.[26] Other notable changes during the study period were a decrease in overdoses of tranquilizers and sedatives and an increase in antidepressant overdoses, both of which reflected changes in prescribing practices.

Fewer than 1 in 10 patients were in contact with psychiatric services at the time of DSH. However, 20% had received previous psychiatric care. Alcohol had a major role in DSH, especially in the males, as reflected in the large proportions recorded as having problems related to alcohol abuse, the fact that alcohol had often been consumed during the few hours before DSH, and that the act of DSH included alcohol in a substantial proportion of cases. Initiatives targeting alcohol abuse in young people are clearly important in prevention of self-harm.

The problems that lead to DSH in young people are often complex.[10,27] The most frequent problems in our study concerned family members, partners, employment or studies, friends, finances, social isolation, alcohol use, and housing. Physical disorders were present in a sizeable proportion.

Repetition of DSH was frequent. A quarter of individuals had a history of DSH prior to their first presentation in the study period, which was a similar proportion to that found in other studies of young DSH patients,[28] although it was lower than the proportions with previous DSH found in studies of suicide in young people.[29,30] Repetition of DSH, apart from indicating resurgence or persistence of distress and a further burden on clinical services, enhances risk of subsequent suicide (see below).

In assessing relative risks of death from different causes during the follow-up period, we have used national mortality data to calculate reference figures. The use of local data would have reduced the reliability of comparisons due to much smaller numbers and variability in rates.

It should be noted that the standardized mortality ratios for some natural causes of death (but not suicide) are lower in Oxfordshire than they are nationally so that differences in risk may have been underestimated. The patients in this study were clearly at greatly increased risk of dying, with an overall 4-fold excess death rate compared with the expected rate. The main reason for this increased risk was suicide, with 1.7% dying due to suicide or probable suicide. Perhaps the most surprising result was that more than half (57.4%) of all deaths were due to suicide. We included open verdicts and accidental poisonings in our suicide group. This policy is supported by the fact that the numbers of deaths in each of these verdict categories represented approximately a 10-fold excess over expected numbers. Other studies of young people have demonstrated the need to include deaths receiving verdicts in addition to suicide in order to get a more accurate estimate of true suicide rates.[31] Half of the suicides in the present study involved self-poisoning, which usually represented re-use of the same general method as in the index DSH episode. The excess risk of suicide in this young population is striking and clearly a major public health issue.

There was also an excess of deaths in the ICD-9 category "mental disorder," which, on closer examination, were nearly all due to substance misuse, especially of drugs. While some of these deaths could also have been suicides, this finding also highlights the extent and danger of drug-related problems in this patient population.[32]

The main independent risk factor for suicide was previous (i.e., repeated) DSH. For male patients presenting in the second part of the study period, additional factors were drug misuse and problems and difficulties related to psychiatric disorder. Self-mutilation was also a factor, but that method characterized only 2 individuals. In females, the independent risk factors were previous DSH and a history of psychiatric treatment before the index DSH episode. This latter factor may appear counterintuitive. However, it reflects the fact that patients with more severe problems and disorders would have been more likely to receive earlier treatment. Additional risk factors in female patients presenting in the second part of the study period were alcohol dependence and problems related to psychiatric disorder, although the numbers of deaths in this group of patients was small.

The importance of repetition of DSH as a risk factor for suicide is well established.[11] The finding that substance misuse and previous psychiatric treatment were independent risk factors for suicide confirms the findings of a previous case control study[15] of ours of young people who died by suicide following DSH in Edinburgh. It is also consistent with findings from a study[33] of teenagers who died by suicide in New York. Strategies for prevention of suicide in young people must not only include alcohol and drug policies but also have measures in place for detecting and treating substance misuse when the patients present to clinicians following DSH—such presentations will often be the first time substance misuse is detected and can provide a special opportunity for intervention.[34]

We have primarily focused on risk factors in the 2 genders considered separately. However, in the 2 genders combined, financial problems, violence to others, and criminal record were also risk factors at the univariate level. While data were only available on levels of suicidal intent at the time of DSH for a subgroup of patients who presented toward the end of the study period, risk of suicide was greater in those with higher intent. This is in keeping with findings in adult samples.[35,36] Measurement of suicidal intent should be part of the clinical assessment of DSH patients.

Finally, there were excess numbers of deaths due to causes other than suicide. These included respiratory disorders, which were also quite common at the time of presentation for DSH; circulatory disorders; and, in males, gastrointestinal disorders, which were in keeping with the high rates of alcohol abuse. There were also an excess number of nonpoisoning accidents, which may reflect risk taking and alcohol abuse but might also include some further hidden suicides.

Clinical Implications

The substantial risk of suicide following DSH demonstrated by this study, with over half of all the deaths during the follow-up period being due to suicide, emphasizes the need to focus on young people who present to hospital following DSH in terms of suicide prevention initiatives. Screening for risk factors as identified through this study may assist this process, although overall care for DSH patients irrespective of immediate risk is also important.[37] Assessment of young DSH patients must include close attention to interpersonal problems, previous self-harm, previous and current psychiatric problems, alcohol and drug misuse, history of violence and criminality, and suicidal intent. Treatment interventions for young DSH patients should especially focus on improving interpersonal difficulties by employing strategies such as problem-solving therapy[38] and treatment for substance misuse and psychiatric disorders.[39] The long-term risk of suicide in some individuals suggests that treatments may need to be sustained, although detection of those most at need of this will not necessarily be easy. Prevention of DSH can clearly not be effectively managed through just focusing on young people in psychiatric care, since few are in such care at the time of DSH. Therefore, population-based strategies should also be considered, including attention to availability of methods used for DSH.[26]

Disclosure of off-label usage: The authors have determined that, to the best of their knowledge, no investigational information about pharmaceutical agents that is outside U.S. Food and Drug Administration–approved labeling has been presented in this article.

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