Thirteen-year follow-up of deliberate self-harm, using linked data

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Background We describe a national cohort of individuals surviving an episode of deliberate self-harm (DSH). Subsequent admissions for DSH and mortality over the following 13 years were studied.

Method In 1981, 8304 individuals were discharged from Scottish general hospitals with a diagnosis of attempted suicide (E950–959). They were followed-up to the end of 1994 using the Scottish Linked Data Set. Mortality was compared to the Scottish population using person-years analysis.

Results 2624 people (31.6%) were readmitted with further episodes of DSH. The median number of readmissions was 1, range 1–137. The observed:expected ratio for all-cause mortality was 2.26 (95% CI 2.13–2.26). One hundred and sixty-eight people (2%) died from suicide, and 46 (0.6%) from undetermined causes. The observed:expected ratio for suicide plus undetermined deaths was 12.17 (95% CI 10.64–13.91). Accidental deaths in men and homicide deaths in men and women were elevated. The pattern of deaths from other causes suggested that alcohol misuse was a contributory factor.

Conclusions People admitted to general hospitals in Scotland after attempted suicide are at high risk of readmission for further episodes of DSH. Long-term follow-up of such large cohorts is impractical, but services should review the scope for intervention in alcohol misuse following DSH.

The effectiveness of possible interventions to prevent suicide remains controversial (Gunnell & Frankel, 1994). One possible point of intervention is at times of general hospital admission for attempted suicide. Assessing the possible importance of this opportunity for intervention requires accurate epidemiological information. Previous work has been restricted by the difficulties in the long-term follow-up of large numbers of individuals after attempted suicide. It has also been difficult for researchers to examine readmission for attempted suicide in the cohort. The development of a record linkage system in Scotland allowed us to follow general hospital readmission and death in a national Scottish cohort over a 13-year period.

METHOD

The Information and Statistics Division of the National Health Service in Scotland maintains a linked data set which holds all Scottish non-psychiatric, non-maternity/neonatal hospital discharges combined with the Registrar General's death certificate details (Kendrick & Clarke, 1993). The file covers the years 1981–1994 and contains over 13 million records representing in excess of 4 000 000 individuals. Records for each individual are held together allowing follow-up of in-patient health care and subsequent mortality over a 14-year period. The method uses computer probability matching to take account of changes of address and, in women, changes of surname. A person-years analysis of mortality in the cohort compared with expected figures for the Scottish population was carried out using the person-years program (Coleman et al, 1986). This allows age-specific mortality rates and drop-out from the cohort to be taken into account.

The routine hospital discharge form, the Scottish Morbidity Record 1 (SMR1), has a separate option to record deliberate self-harm (DSH). The linked data set was used to identify individuals discharged alive from Scottish general hospitals after in-patient stays following attempted suicide (ICD–9 E950–959) (World Health Organization, 1978) in 1981, the earliest full year on the file. Individuals were included in the cohort if attempted suicide was recorded in any position on the SMR1. The method allows identification of individuals who were transferred to other hospitals (including psychiatric units), but does not allow the identification of people seen in accident and emergency units but not admitted to a general hospital.

We identified 8457 individuals. Records in which the DSH option was not indicated on the SMR1 were excluded, in order to increase the likelihood that a true DSH episode was included. One hundred and fifty-three individuals were excluded, leaving a cohort of 8304. It was not known how many prior suicide attempts, if any, these individuals had made and so this group should not be regarded as an incident cohort.

Mortality experience was examined for all causes; suicide (ICD E950–959); undetermined deaths (ICD E980–989); homicide (E960–969); accidents (E800–949, 970–979, 990–994); external causes (E800–E949, E970–E979, E990–E994); infectious and parasitic diseases (10–139); all neoplasms (140–239); endocrine (240–279); mental disorders (290–292); nervous system (320–326); circulatory system (390–459); respiratory system (460–519); digestive system (520–579) and genito-urinary system (580–629). Individuals aged over 85 years were excluded because multiple causes of death tend to be recorded, making identification of the primary cause less reliable.

The hospital discharge records contain the postcode of residence, which can be linked to the small area statistics of the 1981 census. Selected census variables are aggregated to form the Carstairs score (Carstairs & Morris, 1991), a widely used measure of deprivation in Scotland. Postcode sectors at the time of initial DSH were allocated to one of five categories on the basis of their Carstairs score. People for whom the postcode sector was unreliable or could not be assigned to a category were excluded from the analysis by deprivation category. One health board area (Fife) did not record postcodes in 1981 and so this analysis is based on 7454 individuals. Death records also contain postcode at

time of death. The analysis used residence at initial episode in preference to this as it reflects the situation facing hospital services when assessing an individual.

RESULTS

The cohort

In 1981, 8304 individuals were identified as having been discharged from Scottish general hospitals following attempted suicide. There were 3347 males (40.3%) and 4957 females (59.7%), with a median age of 30 years (range 10–96). The most common initial act was deliberate overdose in 94.4% (7839), followed by cutting/piercing (238), jumping (33), drowning (31), hanging (10), domestic gas (8), other gases (11) and firearms (7). In 127 cases, the method was unknown.

Subsequent deliberate self-harm

In the next 13 years 2624 individuals (31.6%) were readmitted for DSH on 7423 occasions. Of the total cohort, 11.8% were readmitted within the first 12 months after the initial episode. Of the individuals who were readmitted for DSH the median number of readmissions was one (range 1–137). Overall, 15% of the cohort had more than one readmission and a smaller group (36 individuals) had ≥20 readmissions over the period. The time until first readmission is illustrated in Fig. 1. Of the 168 people who died by suicide in the 13-year follow-up period, 88 had no further admissions for DSH before their death (range 0–30, median 0).

Mortality

All causes

The observed:expected ratio for males and females under 85 years of age was 2.26 (95% CI 2.13–2.26) (males: 2.42 (95% CI 2.23–2.63); females 2.11 (95% CI 1.94–2.29)).

Deaths by suicide and undetermined causes

One hundred and sixty-eight individuals died by suicide in the period under study (E950–959), and in a further 36 cases the cause of death was recorded as undetermined (E980–989). Table 1 shows observed and expected deaths for these causes, and for the two causes combined. The remainder of the results treat suicide and undetermined deaths together.
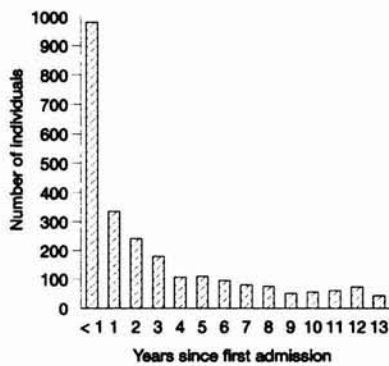

Fig. 1 Time until first readmission for parasuicide.

The greatest number of deaths was in the first five-year period, with an observed: expected ratio of 21.46 (95% CI 17.06–27) for males and 24.91 (95% CI 18.49–32.83) in females. The excess of deaths continued throughout the period and in the third five-year period was 5.33 (95% CI 3.26–8.23) for males and 9.46 (95% CI 5.61–14.95) for females. Mortality from suicide and undetermined cause is shown by deprivation category of residence in 1981 in Table 2.

The observed:expected ratio for deaths in accidents (E800–949, 970–979, 990–994) was 4.78 (95% CI 1.92–9.85) for males and 2.55 (95% CI 0.31–9.19) in females. Observed:expected ratios for homicide (E960–969) were 2.82 (95% CI 2.06–3.78) in males and 4.98 (95% CI 3.57–6.75) in females. Deaths from natural causes are shown in Table 3.

DISCUSSION

Record linkage

Record linkage provides great opportunities for large-scale psychiatric epidemiological studies. There is a trade-off between the ability to examine an entire national cohort and the loss of qualitative detail. Qualitative information, which could be gathered from case notes identified in a registry-based study, cannot be identified in a study of this type.

General hospital records are reasonably accurate. In 1992, main diagnosis on SMR1 data was 88.4% accurate (Harley & Jones, 1996). Our decision to exclude discharge forms which did not identify attempted

Table 1 Deaths by suicide (E950–959) and deaths undetermined whether purposely or accidentally inflicted (E980–989)

	Group	Observed	Expected	O/E ratio (95% CI)
Suicide (E950–959)	Male	93	8.69	10.71 (8.74–13.12)
	Female	75	4.34	17.14 (13.67–21.49)
Undetermined (E980–989)	Male	30	2.8	10.72 (7.24–15.31)
	Female	16	1.73	9.27 (5.30–15.05)
Suicide and undetermined	Male	123	11.48	10.71 (8.98–12.78)
	Female	91	6.10	14.91 (12.14–18.31)

O/E, observed:expected.

Table 2 Deaths by suicide and undetermined cause (ICD E950–959, E980–989) by deprivation category of postcode (Depcat) 1981–1994

	Depcat	Observed	Expected	O/E ratio (95% CI)
Male	1	25	0.94	26.61 (17.22–39.27)
	2	12	1.37	8.74 (4.51–15.26)
	3	12	1.65	7.25 (3.75–12.67)
	4	14	2.28	6.15 (3.36–10.32)
	5	44	4.01	10.96 (7.97–14.71)
Female	1	22	0.69	32.05 (20.08–48.52)
	2	10	0.72	13.95 (6.69–25.66)
	3	7	0.88	7.93 (3.19–16.34)
	4	20	1.35	14.85 (9.07–22.93)
	5	25	1.88	13.29 (8.60–19.62)

O/E, observed:expected.

Table 3 Deaths from natural causes 1981–1994

	Group	Observed	Expected	O/E ratio (95% CI)
Infectious and parasitic (10–139)	Male	3	1.09	2.75 (0.57–8.04)
	Female	2	1.47	1.36 (0.17–4.92)
All neoplasms (140–239)	Male	81	59.61	1.36 (1.09–1.69)
	Female	102	87.83	1.16 (0.96–1.41)
Endocrine (240–279)	Male	13	3.28	3.96 (2.11–6.78)
	Female	5	3.8	1.32 (0.43–3.07)
Mental disorders (290–319)	Male	27	3.18	8.5 (5.6–12.36)
	Female	23	3.31	6.94 (4.4–10.41)
Nervous system (320–389)	Male	19	3.88	4.89 (3.95–7.64)
	Female	13	4.92	2.64 (1.41–4.52)
Circulatory system (390–459)	Male	163	97.06	1.68 (1.44–1.96)
	Female	159	104.22	1.53 (1.31–1.78)
Respiratory system (460–519)	Male	43	17.01	2.53 (1.83–3.40)
	Female	53	21.29	2.49 (1.90–3.26)
Digestive system (520–579)	Male	25	8.31	3.01 (1.95–4.44)
	Female	41	10.85	3.78 (2.71–5.13)
Genito-urinary system (580–629)	Male	6	1.55	3.88 (1.42–8.44)
	Female	3	2.90	1.03 (0.21–3.02)

O/E, observed:expected.

suicide in both the diagnostic categories and the separate self-harm field should have increased the reliability of our cohort definition further. Other studies have reported DSH classification to be acceptably accurate, for example Sellar et al (1990) found classification of adolescent attempted suicide in Oxford to be 95% accurate.

Individuals who moved outside Scotland and were readmitted to hospital in England or Wales would not be identified. Deaths in other parts of the UK would be identified in Scottish records only if the person continued to be resident in Scotland. Around 50 000 people a year migrate from Scotland to other parts of the UK (Central Statistical Office, 1992). These figures may, therefore, underestimate the risk of repeated DSH and of death.

Repetition of attempted suicide

In the whole cohort, 68% had no further hospital admission for DSH in the period studied. Gunnell et al (1996) found that 10.1% were readmitted in the first year, similar to the 11.8% readmitted from the cohort described in the present study. Bluglass & Horton (1974) reported on readmission for DSH in the year after the initial episode in Edinburgh. Readmission in three one-year cohorts was between 14 and 17%.

Our results indicate that the risk of first readmission was highest in the first 12 months but continued over time. Over half of those who died by suicide had no further readmissions for attempted suicide before their death, suggesting that this may have been the only opportunity to intervene.

Completed suicide

Several previous studies have demonstrated elevated risk of death by suicide in the years after DSH. Dahlgren (1977) and Schneider (1954) demonstrated that, in individuals in whom the index episode was in the 1940s and 1950s, the risk of suicide was elevated over many years. De Moore & Robertson (1996) provide a recent 18-year follow-up on 223 people in Australia whose index episode was in 1975 or 1976, and found that suicides continued to occur long after the index episode.

In this cohort 2.58% died by suicide or undetermined cause of death in the subsequent 13 years. This is lower than the 4.3% of adolescents who died by suicide in the 10–15 years after DSH in a Swedish study (Otto, 1972) and the 3.2% who died during the five-year follow-up of Suokas & Lonnqvist (1991). In the UK, Hawton & Fagg (1988) found that about 1% of adults died by suicide in the year after DSH (similar to the figure reported by Kessel & McCulloch in 1966), and 2.8% in the

following eight years. Although Hawton & Fagg (1988) reported results on a cohort of 1959 people, the proportion completing suicide was calculated from the 1501 people with full follow-up. It is possible that individuals who die are more likely to have their outcome identified, increasing the observed suicide rate. Other studies have produced higher long-term estimates, with Dahlgren (1977) reporting 6% mortality at 12 years and De Moore & Robertson (1996) 5.8% at 12 years.

Individuals who lived in affluent areas, while a small proportion of the cohort, showed a markedly elevated risk of subsequent death by suicide. Gunnell et al (1996) found that attempted suicide admissions in the south-east of England tended to be higher in less affluent areas. If attempted suicide is a relatively unusual behaviour in affluent areas, then it may be a particular indicator of risk. Examination of this in clinical studies will help to clarify this relationship.

Other mortality

All-cause mortality was significantly elevated. Hawton & Fagg (1988) also noted an elevated risk of death from other causes, with increases in deaths from endocrine, circulatory and respiratory causes, as well as accidents. They hypothesised that deaths from diseases of the digestive system would be increased because of links to alcohol misuse, and our results support this. Half of those who died by natural causes had the disease which lead to their death before their suicide attempt (Hawton & Catalan, 1987). Our findings support the recommendation that assessment of physical ill-health should be an integral part of assessment after DSH (Hawton & Fagg, 1988). Pederson et al (1975) also noted an increase in circulatory, neurological and respiratory causes of death.

Undetermined deaths were elevated, as in a Danish cohort described by Nordentoft et al (1993), and a UK study (Hawton & Fagg, 1988). Deaths by homicides and accidents were also elevated in these studies, although the homicide numbers were not statistically significant. This may have been related to use of a smaller cohort.

Clinical implications

The pattern of hospital readmission indicates that there may be no other opportunity to intervene with these individuals. Total numbers are small, however, and

prediction and effective intervention remains a substantial challenge. The observed:expected ratio was high, but the absolute risk of death by suicide and undetermined causes was only 2.6%. Also, 91 of these deaths occurred more than five years after the initial episode. In the absence of better evidence, it would be unreasonable to propose long-term clinical follow-up in cohorts of this size when the resources may be better invested elsewhere.

Our findings suggest that long-term mortality may be associated with physical ill-health and possibly with alcohol misuse. The importance of this in clinical situations, and the merit of brief interventions for alcohol misuse with these individuals are worthy of further consideration. The high observed:expected ratio in people from affluent areas is also a worthwhile area for further research. The small number of people with very large numbers of repeated admissions constitutes a group which may be difficult to examine clinically as they will be spread across the country. They do, however, have obvious on-going problems and must be suitable for further review.

CLINICAL IMPLICATIONS

■ Half of the people who subsequently commit suicide are never readmitted for attempted suicide before their death.

■ The risk of suicide, compared with the general population, is higher in all age groups.

■ People from affluent areas are at high risk of subsequent death.

LIMITATIONS

■ The study contains no information on psychiatric hospital admissions.

■ The use of routine data allows the use of a large cohort, but prevents the gathering of qualitative information.

■ Suicides occurring among people resident outside Scotland would not be identified by this method.

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