British Journal of Psychiatry (1996), **169**, 489–494

Suicide in the 18 Years After Deliberate Self-harm
A Prospective Study

GREGORY M. DE MOORE and ANDREW R. ROBERTSON

Background. Clinical and demographic information on patients seen as a result of deliberate self-harm (DSH) was collected in an attempt to identify factors in the index episode of DSH predictive of subsequent suicide.

Method. Specific data were prospectively collected on all DSH patients who lived in Blacktown Municipality, Sydney, Australia, and seen from October 1975 to September 1976. Follow-up at 18 years was by evaluation of coroners' records and identification of 'probable suicide'.

Results. Two hundred and twenty-three patients harmed themselves on one or more occasions. Follow-up at 18 years showed that 15 of the 223 (6.7%) had completed suicide. The proportion at five and eight years was 4.0% and at 10 years was 4.5%. Identified predictors of suicide were: narcotic overdose; more than one episode of DSH in the year of the study; planned episode; and mental illness. Teenage narcotic-abusing males were at greatest risk, and in females a planned episode was the most powerful predictor.

Conclusions. Suicides continued to occur over 18 years. One of the striking differences between this and other studies is the finding of teenage male DSH, associated with narcotic abuse, as a strong predictor of subsequent suicide. These findings are particularly relevant to the issue of young male suicide, which increased from the 1970s onwards in Australia and elsewhere.

The prediction of eventual suicide in those who harm themselves is notoriously difficult. The sensitivity and specificity of the risk factors are low (Pokorny, 1982; Nordentoft *et al*, 1993). Long-term follow-up studies of deliberate self-harm (DSH) are one method of improving our predictive ability and hence our clinical management.

Follow-up studies in the past few decades have usually been of 5–10 years duration at the most. Two notable earlier studies of much longer duration date from the 1940s and 1950s (Schneider, 1954; Dahlgren, 1977), since when there have been major changes in the epidemiology of both DSH and suicide (Hawton & Catalan, 1987). Australia has experienced a disturbing increase in youth suicide in the past 20 years, and now has one of the world's highest youth suicide rates (Kosky, 1987; Hassan & Carr, 1989).

Method

Background

The first part of this study involved the prospective collection of data on all cases of DSH seen in a defined local government area (Blacktown, New South Wales (NSW), Australia) over 12 months, 1 October 1975 to 30 September 1976. Blacktown lies on the western outskirts of Sydney. The population was almost 160 000 and was rapidly increasing. Over one-third of the population was under 15 years of age. The population was predominantly of the lower socio-economic classes (Australian Bureau of Statistics, 1976 census).

Data came predominantly from patients taken to hospital as a result of DSH. Other sources were patients seen in their homes by community staff, and patients seen in hospital out-patient clinics or psychiatrists' private rooms as a result of DSH which had not led to hospital assessment.

An outcome study was planned to note the incidence, and the epidemiological and clinical features, of completed suicide in this DSH population.

Data collection

One author (ARR) initiated the study. A data-collection sheet was completed by the assessor each time a patient with DSH was assessed. Data obtained include the following.

(a) Demographic information: name, address, sex, age, country of birth, marital and parental status, with whom the subject was living, employment status, and date of DSH episode and of assessment.
(b) Clinical and social details of the episode: method and agent used; lethality and suicidal intent, each scored on a three-point scale as low, intermediate or uncertain, or high; whether significantly affected by alcohol; whether pregnant; presence or absence of environmental precipitants; and previous DSH.
(c) Presence of mental and physical illness: mental illness was defined in a narrow and arbitrary way as presence of schizophrenia, major depression, alcohol or drug dependence, and dementia or clinically significant brain injury. Any current physical illness led to a positive recording.
(d) Sequelae of the episode, for example whether admitted to hospital, whether still suicidal, and proposed management.

Because of an error in the preparation of later data sheets, we had data for the presence and nature of physical and mental illness for only 162 of the 223 patients.

Inclusion criteria

Any action of self-harm which might, however remotely, threaten life, led to inclusion. Patients who lived outside Blacktown were excluded.

Identification of suicides

Through the Office of Births, Deaths, and Marriages we identified those of the 223 patients who had died in NSW. Through coroners' records, those who may have died in unnatural ways were identified. We studied the records, and decided whether to deem a death as suicide, using the criteria of 'probable suicide' (Adelstein & Mardon, 1975).

Statistical analysis

The possible predictors of suicide in the DSH population were those variables recorded at the time of DSH. Data were analysed using the χ^2 test, and by logistic regression analysis using the SPIDA statistical package. Both univariate analysis for each variable and a best-fitting multivariate model were ascertained.

Results

Episodes of DSH

There were 237 episodes of DSH, involving 223 patients (150 females and 73 males). Nine females and three males harmed themselves twice and one female did so three times.

Demographic details

The age range for females was 14–73 years, mean 28.5, and for males 13–64 years, mean 32.2. Of all patients, 42% were married, 35% were single, 9% were living in a *de facto* (common law) marriage, 10% were separated, 3% were widowed, and 1% were divorced; male–female differences were not statistically significant. Three per cent of both males and females lived alone. Thirteen per cent of the females and 19% of the males classed themselves as unemployed.

Clinical details

A medication overdose was taken by 93% of females and 82% of males. 'Cutting' was used by 6% of females and 7% of males. There were nine narcotic overdoses (eight males and one female). Most episodes were impulsive (86% in females, 85% in males). The majority of episodes were of low lethality (69% of females, 61% of males). With regard to intent, the numbers were fairly evenly divided between the three categories in both females and males. Of the episodes of both high lethality and high intent, 4 (2%) occurred in females and 8 (11%) in males ($\chi^2=6.6$, $P=0.01$).

Twenty-eight of the females (17%) and 34 of the males (45%) were considered to have been significantly affected by alcohol at the time of the episode ($\chi^2=19.1$, $P<0.001$).

A social precipitant, usually interpersonal conflict, was present in 90% of females and 82% of males.

There was a history of DSH in 27% of females and 28% of males.

Nine women (6%) were pregnant, or believed they were pregnant, at the time of the episode.

Physical and mental illness

Eleven per cent of the females and 22% of the males were physically ill, and 11% of the females and 26% of the males were mentally ill, as narrowly defined. The excess of physical and mental illness in the males appeared to be due to higher rates of

alcohol and drug dependency, and their physical complications.

Suicides

Fifteen suicides (nine females and six males) were identified. Nine of these were unquestionable suicides. In five others, death was from overdose where evidence of clear and unambivalent suicidal intent was lacking. The remaining one case was included after considerable discussion; accidental death was recorded by the coroner, but review of the circumstances suggested that suicide was more likely.

The interval from the index episode to suicide ranged from 12 days to 16.9 years (mean interval 6.5 years) (Fig. 1). Four of the 15 suicides occurred within a year of the index episode.

The method of suicide was drug overdose in nine, shooting in two, hanging in two, and jumping or falling in two.

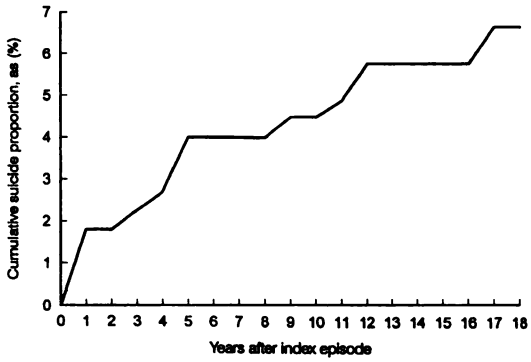

Fig. 1 Cumulative proportion of suicide, as a percentage of the DSH population, with time.

A striking finding was that four of the six male suicides had been aged 16–17 years at the index episode, and three of these four episodes had been narcotic overdoses.

Based on the suicide rate for Sydney in 1975–76, the annual suicide risk for the population as a whole was 1 per 10 000. For the DSH group, the annual suicide risk was 36 per 10 000. (Note, however, that this compares definite suicide in the general population with 'probable suicide' in the DSH group.)

Statistical analysis of variables

Clinical and demographic variables at the time of the index episode of DSH were analysed, using univariate and multivariate logistic regression methods, to determine a best-fit picture for those who completed suicide. Statistical analysis was carried out for the DSH group as a whole, and for males and females separately. Results are presented in Table 1.

In view of the trend to significance for age of males in the univariate analysis, the data were re-examined by dividing age into two groups, teenagers and those aged 20 years and older. For males only, univariate analysis showed that being a teenager was a highly significant predictor of suicide ($P=0.01$). It did not, however, alter the best-fit multivariate model for the males. However, narcotic overdose and being a teenaged male were highly confounded, and if the sample had been larger, both may have become independent predictors. There was no trend for being a female teenager predicting suicide; the trend if anything was for older females to complete suicide.

Table 1
Univariate and multivariate analysis of risk factors in index DSH episode associated with subsequent suicide

Risk factor	All patients		Females only		Males only	
	Univariate *P* value	Best-fitting multivariate model *P* value	Univariate *P* value	Best-fitting multivariate model *P* value	Univariate *P* value	Best-fitting multivariate model *P* value
Sex	0.05	–	–	–	–	–
Age	0.8	–	0.2	–	0.1	–
Any past DSH	0.3	–	0.08	–	0.5	–
More than one episode of DSH in year of study	**0.02**	**0.02**	0.08	–	0.08	**0.03**
High lethality	0.2	–	0.1	–	0.8	–
High intent	0.8	–	0.5	–	0.9	–
Planned attempt	**0.04**	**0.02**	**0.02**	**0.02**	0.8	–
Affected by alcohol	0.9	–	0.8	–	0.5	–
Narcotic overdose	**0.009**	**0.001**	0.9	–	**0.01**	**0.007**
Any drug overdose	0.8	–	0.3	–	–	–

https://doi.org/10.1192/bjp.169.4.489 Published online by Cambridge University Press

We had data on mental and physical illness for 162 DSH patients, and for 11 of the 15 suicides. We included mental and physical illness with the other variables and reanalysed the data. For this group of 162 patients, the best-fit multivariate model was planned attempt ($P=0.007$) and being mentally ill ($P=0.03$). For males, the best-fit multivariate model was being a teenage male ($P=0.01$). For females, the best-fit multivariate model was planned attempt ($P=0.02$) and being mentally ill ($P=0.02$).

Clinical findings

Clinical evaluation of the case histories of the 15 suicides was undertaken. For the majority, there was considerable information for the period between DSH and suicide. For 13 of the 15, information was available regarding DSH in the year before suicide, and this was positive in nine.

Three clinical subgroups, accounting for 13 of the 15 suicides, could be identified. (a) Four patients were suffering severe unresolved grief following a major interpersonal loss. These four were among the seven suicides in the first four years after the index episode. (This is the only apparent clinical difference between the early and late suicides.) (b) In seven patients, substance abuse appeared to be a way of life, or a means of dealing with or avoiding conflict. This group overlaps with (c), four females who repeatedly took overdoses as a result of chronic or episodic depression or as a habitual response to conflict.

Discussion

Duration of suicide risk

There was a progressive increase in the cumulative proportion of suicide over the 18 years. Most recent studies have been of 8–10 years. The two earlier long-term studies of Schneider (1954) and Dahlgren (1977) gave somewhat similar results to ours, although Dahlgren's was an atypical sample, having an excess of males and of alcoholism. Our findings, like theirs, suggest that the risk of suicide after DSH, although diminishing over time, is probably a lifetime risk. The cumulative proportion of suicide with time in our study is compared with that in other studies in Table 2.

Four of the 15 suicides (27%) occurred in the first year after the index episode. This increased risk for early suicide is in accord with the findings of most other studies in recent times (Hawton & Fagg, 1988; Nielsen *et al*, 1990; Ekeberg *et al*, 1991; Suokas & Lonnqvist, 1991; Nordentoft *et al*, 1993).

Table 2
Cumulative proportion of suicide, as a percentage of the DSH population, with time, in various studies

Study	Years of follow-up						
	5	8	10	12	18	28	35
de Moore & Robertson	4.0	4.0	4.5	5.8	6.7		
Nordentoft *et al* (1993)			10.6				
Suokas & Lonnqvist (1991)	3.2						
Ekeberg *et al* (1991)	4.0						
Nielsen *et al* (1990)	11.0						
Beck & Steer (1989)			4.8				
Hawton & Fagg (1988)		2.8					
Cullberg *et al* (1988)			6.1				
Dahlgren (1977)				6.0			11.0
Schneider (1954)			10.0		11.8	13.0	

Hawton & Fagg (1988) noted a low rate of suicide at eight years, 2.8%. Their data were collected in the early to mid-1970s, as was ours, and this period saw a large increase in self-poisoning. They speculated that their low rate of suicide may represent fewer 'genuine' suicide attempts, and hence fewer completed suicides. Our data showed a higher suicide rate, but whether this is significantly higher is not clear.

Statistical risk factors and prevention

Table 3 presents the risk factors identified in the present study together with those from six other studies published in recent years. It is somewhat surprising that only two of the seven studies have shown that male sex is statistically significantly associated with completed suicide, in view of the much higher rate of male suicide in the general population, usually about double that of females. It may be that males tend to use more lethal methods, and so the DSH populations studied are skewed towards 'survivors' and females. If this is so, then preventive measures for males may need to be directed to risk factors additional to survival from DSH, such as gun law reform and alteration of social attitudes to teenage male alcohol excess (Cantor, 1994; Kosky & Goldney, 1994).

Although the studies in Table 3 vary considerably in design, some risk factors seem to be consistent, including the importance of multiple DSH episodes, psychiatric illness, abuse of alcohol and other sedatives, and planned attempts.

Other studies have noted the importance of increasing age as a risk factor, especially in males (Hawton & Fagg, 1988; Suokas & Lonnqvist, 1991; Nordentoft *et al*, 1993). Our study, in complete contrast to these, found male youth, associated with

Table 3
Risk factors in the index episode of DSH, statistically significant or showing a strong trend, associated with subsequent suicide, in various studies

Risk factor	de Moore & Robertson	Nordentoft *et al* (1993)	Suokas & Lonnqvist (1991)	Nielsen *et al* (1990)	Beck & Steer (1989)	Hawton & Fagg (1988)	Cullberg *et al* (1988)
Male sex	No	No	Yes	No	No	Yes	No
Past or repeated DSH	Yes	Yes	Yes	No	No	Yes	Yes
Psychiatric illness	Yes	Yes	Yes	Yes	Yes[1]	Yes	Yes
Physical illness	No	–	–	Yes	–	Yes	–
Planned episode	Yes (F)	–	Yes	–	Yes	–	–
High lethality	No	–	Yes	–	–	–	–
High intent	No	–	Yes	–	Yes	–	–
Drug/alcohol abuse	Yes (M)	No	–	Yes	Yes	Yes	Yes
Increasing age	No (M)[2] Yes (F)	Yes	Yes	No	No	Yes (F)	No
Narcotic overdose	Yes (M)	–	–	–	–	–	–
Country of study	Australia	Denmark	Finland	Denmark	USA	England	Sweden

1. Alcoholism.
2. Opposite finding.
(F) females only, (M) males only.

narcotic abuse, a major risk factor. We may have picked up the beginnings of the rise in youth suicide from the 1970s. Other studies, using different methods, have emphasised the high suicide risk of young male substance abusers (Tunving, 1988; Hawton *et al*, 1993). Most clinicians find such patients hard to engage in treatment (Kotila & Lonnqvist, 1988; Graham & Burvill, 1992) and so the preventive value of this finding may not be as useful as might be hoped (Kosky & Goldney, 1994). Like Hawton & Fagg (1988), we found that older female survivors of DSH are more likely to complete suicide, although this did not reach statistical significance in our study. We found that a planned episode was an important predictor of suicide in females, but not in males. We also found that mental illness, narrowly defined, was a significant predictor for females, although the smaller numbers and methodological difficulties must give rise to caution in interpreting this finding. We did not find that physical illness was a statistically significant predictor; this may reflect the relative youth of the population, the small number of patients who were physically ill, or the incompleteness of this part of the data collection. Certainly, other studies have found physical illness to be a significant predictor (Hawton & Fagg, 1988; Nielsen *et al*, 1993).

The risk factor of repeated episodes of DSH has been demonstrated in this study, as in many others.

Like Hawton & Fagg (1988), we found marital and employment status at the index episode to be non-predictive of subsequent suicide.

Clinical findings and prevention

Hawton & Fagg (1988) found that suicide rarely followed a major row with, or separation from, a partner. This was not so in our study, as five of the first eight suicides fell into this category. Patients with unresolved grief are a potentially treatable group.

Clinical evaluation of the case histories of the suicides identified a group of women who

Clinical implications

- Teenage males who overdose on narcotics are at relatively high risk of subsequent suicide.
- Suicide risk after DSH gradually declines with time, but may be a lifetime risk.
- Planned or frequently-repeated episodes of DSH, especially associated with substance abuse; chronic unresolved grief; and mental illness are relatively high-risk factors.

Limitations

- Suicides which may have occurred outside NSW will not have been included.
- Incomplete data on physical and mental illness limits conclusions on the predictive importance of these factors.
- Patient numbers are too small to determine whether the highly confounded variables of teenage male and narcotic overdose are independent risk factors for suicide.

https://doi.org/10.1192/bjp.169.4.489 Published online by Cambridge University Press

habitually overdosed in response to conflict or crisis, and in whom substance abuse may also have been a problem. This is probably the same group identified by Cullberg *et al* (1988) as "depressed women with long-standing suicidal processes". In this group it is generally personality disorder and substance abuse, rather than depressive illness, which are the key issues in treatment and in prevention of eventual suicide.

Acknowledgements

Thanks are due to Dr John Westerink, Ms Rosemary Pearson, Mr Colin Everingham, and Ms Kath Fyfe for helping to set up the original study, and Dr Willem Blignault for subsequent help and advice; Dr Karen Byth for statistical advice; Professor Russell Meares for helpful comments; and Ms Lena Melville for secretarial work.

References

ADELSTEIN, A. & MARDON, C. (1975) Suicides 1961–74. *Population Trends*, **2**, 13–18.

BECK, A. T. & STEER, R. A. (1989) Clinical predictors of eventual suicide: a 5- to 10-year prospective study of suicide attempters. *Journal of Affective Disorders*, **17**, 203–209.

CANTOR, C. H. (1994) Clinical management of parasuicides: critical issues in the 1990s. *Australian and New Zealand Journal of Psychiatry*, **28**, 212–221.

CULLBERG, J., WASSERMAN, D. & STEFANSSON, C.-G. (1988) Who commits suicide after a suicide attempt? *Acta Psychiatrica Scandinavica*, **77**, 598–603.

DAHLGREN, K. G. (1977) Attempted suicides – 35 years afterwards. *Suicide and Life Threatening Behaviour*, **7**, 75–79.

EKEBERG, O., ELLINGSEN, O. & JACOBSEN, D. (1991) Suicide and other causes of death in a five-year follow-up of patients treated for self-poisoning in Oslo. *Acta Psychiatrica Scandinavica*, **83**, 432–437.

GRAHAM, C. & BURVILL, P. W. (1992) A study of coroners' records of suicide in young people, 1986–1988, in Western Australia. *Australian and New Zealand Journal of Psychiatry*, **26**, 30–39.

HASSAN, R. & CARR, J. (1989) Changing patterns of suicide in Australia. *Australian and New Zealand Journal of Psychiatry*, **23**, 225–234.

HAWTON, K. & CATALAN, J. (1987) *Attempted Suicide: A Practical Guide to its Nature and Management* (2nd edn). Oxford: Oxford University Press.

——— & FAGG, J. (1988) Suicide, and other causes of death, following attempted suicide. *British Journal of Psychiatry*, **152**, 359–366.

———, ———, PLATT, S., *et al* (1993) Factors associated with suicide after parasuicide in young people. *British Medical Journal*, **306**, 1641–1644.

KOSKY, R. (1987) Is suicidal behaviour increasing among Australian youth? *Medical Journal of Australia*, **147**, 164–166.

——— & GOLDNEY, R. D. (1994) Youth suicide: a public health problem? *Australian and New Zealand Journal of Psychiatry*, **28**, 186–187.

KOTILA, L. & LONNQVIST, J. (1988) Adolescent suicide attempts: sex differences predicting suicide. *Acta Psychiatrica Scandinavica*, **77**, 264–270.

NIELSEN, B., WANG, A. G. & BILLE-BRAHE, U. (1990) Attempted suicide in Denmark. IV. A five-year follow-up. *Acta Psychiatrica Scandinavica*, **81**, 250–254.

NORDENTOFT, M., BREUM, L., MUNCK, L. K., *et al* (1993) High mortality by natural and unnatural causes: a 10 year follow up study of patients admitted to a poisoning treatment centre after suicide attempts. *British Medical Journal*, **306**, 1637–1641.

POKORNY, A. D. (1982) Prediction of suicide in psychiatric patients. *Archives of General Psychiatry*, **30**, 1089–1095.

SCHNEIDER, P. B. (1954) *La tentative de suicide. Etude statistique, clinique psychologique et catamnestique*. Neuchâtel, Paris: Delachauz et Niestle SA.

SUOKAS, J. & LONNQVIST, J. (1991) Outcome of attempted suicide and psychiatric consultation: risk factors and suicide mortality during a five-year follow-up. *Acta Psychiatrica Scandinavica*, **84**, 545–549.

TUNVING, K. (1988) Fatal outcome in drug addiction. *Acta Psychiatrica Scandinavica*, **77**, 551–566.

Gregory M. de Moore, FRANZCP, Department of Consultation-Liaison Psychiatry, The New York Hospital–Cornell University Medical Center, New York, USA; **Andrew R. Robertson**, FRANZCP, Department of Psychiatry, Westmead Hospital, Westmead, Australia

Correspondence: Dr Andrew R. Robertson, Senior Visiting Specialist, Department of Psychiatry, Westmead Hospital, Westmead, NSW 2145, Australia

(First received 8 January 1996, final revision 8 May 1996, accepted 17 May 1996)