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A Scale For Predicting Subsequent Suicidal Behaviour

By DOROTHY BUGLASS and JOHN HORTON

Between 1962 and 1970, the male parasuicide (attempted suicide) rate in Edinburgh has doubled, and the rate for women shows a 70 per cent increase (Kreitman, 1972). Of those who are admitted following a parasuicidal act a substantial proportion are readmitted—approximately 15 per cent within 12 months and 25 per cent within three years. Parasuicide is a sign of severe distress, and repetition indicates that the distress has not been adequately alleviated. A means of early identification of the potential repeaters would be valuable.

An earlier study (Buglass and McCulloch, 1970) described an attempt to construct a scale predictive of a recurrence of suicidal behaviour within a three-year period. In that instance, the scale for women was successfully validated, but the scale for men was not predictive at a later date. In this paper we present a new predictive instrument developed and validated on more recent data. The follow-up period has been shortened to one year, in the belief that a measure which can select people at short-term risk of further suicidal behaviour will be of greater clinical relevance than longer-term prediction.

Method

The material for this study was provided by the Regional Poisoning Treatment Centre at the Royal Infirmary, Edinburgh. The work of this centre has been described elsewhere (Matthew *et al.*, 1969). It receives 98 per cent of all adults admitted to a city hospital with a diagnosis of poisoning. Anyone who has taken drugs in excess of the prescribed therapeutic dose is admitted regardless of the degree of life endangerment. Self-injurers are also transferred to the R.P.T.C. when they present at the hospital. Standard information, including demographic, clinical and social data, on admission to the R.P.T.C. is recorded by the medical and clerical staff and subsequently coded on punched cards. Patients recorded as having an admission for parasuicide during 1968, 1969 and 1970 were selected. Each calendar year was treated as a separate cohort. A person's first appearance at the R.P.T.C. for parasuicide during the year was termed his 'key' admission and determined his inclusion in the cohort for that year. Although a person could appear only once in a single cohort, it was possible for him to reappear in a subsequent cohort, as about 10 per cent of patients have a prior admission in the preceding calendar year. This degree of overlap was considered small enough to warrant the treatment of the cohorts as independent. Persons in each cohort were followed up for evidence of further suicidal behaviour within twelve months of their key admission. Information about further acts of parasuicide was obtained from the R.P.T.C. records, while evidence of suicide was obtained from lists of violent deaths prepared by Edinburgh public health department. A person who either was readmitted to the R.P.T.C. or committed suicide within 12 months of the key admission was termed a repeater. The 1968 cohort was used for scale construction. Twenty-four items referring to the patient at the time of his admission and describing his social situation, clinical diagnosis and past history were selected.

The method of scale construction consisted of identifying items which discriminated repeaters from non-repeaters and combining these items into a predictive scale.*

Results

Table I shows that the proportion of repeaters in the construction and validation cohorts remained fairly constant—16 per cent in 1968, 14 per cent in 1969 and 17 per cent in 1970. The results of the comparison between repeaters and non-repeaters in 1968 are shown in Table II.

* An alternative method—predictive attribute analysis—was used to construct a scale on 1968 data. As this scale failed to validate when applied to 1969 data no further details are presented here.

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TABLE I

Repetition of suicidal behaviour within 12 months

	Year of cohort admission								
	1968			1969			1970		
	M (N = 337)	F (N = 510)	M+F (N = 847)	M (N = 352)	F (N'= 558)	M+F (N = 910)	M (N = 386)	F (N = 666)	M+F (N = 1,052)
Repeaters ..	19%	14%	16%	17%	12%	14%	19%	16%	17%
Non-repeaters ..	81%	86%	84%	83%	88%	86%	81%	84%	83%

More items distinguish female than male repeaters, perhaps in part because significance is more easily achieved with the larger numbers available in the female group. Of the nine items which distinguished male repeaters, 8 were also shared by female repeaters. Thus male and female repeaters showed a greater degree of similarity than in the earlier study (Buglass and McCulloch, 1970), and it was no longer considered necessary to construct a separate scale for each sex.

Having identified items discriminating repeaters and non-repeaters, the next stage was to combine these in a manner capable of predicting repetition prospectively. Since the data were derived from material recorded routinely on all persons admitted to the R.P.T.C., information on a particular patient was sometimes incomplete. Whereas his past psychiatric history and current clinical state were usually noted, detailed questions about his social circumstances and living conditions were not always asked or recorded. This factor was taken into account in selecting items for inclusion in the scale.

In the first instance a scale was constructed by giving an individual a score of one point for every unfavourable item which (a) discriminated repeaters from non-repeaters at above the ·001 level of probability, and (b) on which information was available in at least 95 per cent of all cases. This resulted in the selection of six items. Two alternative scales were constructed by reducing the level of probability to ·01 and, secondly, by scoring all items significant at the ·001 level, regardless of the proportion of people on whom no information was available. These latter two scales had no greater predictive

TABLE II

Comparison of repeaters and non-repeaters 1968

* Indicates items associated with repetition at the ·05 level; ** at the ·01 level; and *** at the ·001 level of significance (χ^2 test).

Personal attributes	Male	Female	M+F
Male sex	( )	( )	*
Separated or divorced ..	—	*	*
Social class V	**	—	***
Diagnosis of depression ..	—	—	—
†Diagnosis of sociopathy ..	**	***	***
†Problem in use of alcohol	***	*	***
Alcohol taken at time of act	—	—	—
Drug dependent	—	*	*
Previous in-patient psychiatric treatment	***	***	***
Previous out-patient psychiatric treatment	**	***	***
Previous parasuicide resulting in hospital admission	***	***	***
Previous parasuicide NOT admitted to hospital ..	**	***	***
†Separated from mother when under 10 years ..	—	—	*
†Separated from father when under 10 years ..	—	—	—
Not living with relatives ..	*	*	***
†Violence used	**	***	***
†Violence received ..	—	**	*
4 or more dwelling changes in past 5 years	—	—	**
Less than 1 year at present address	—	—	—
†Overcrowded	—	**	—
Unemployed	—	***	***
†In debt	—	*	—
Criminal record	—	***	***
Aged 25–44 years ..	—	**	**

† Definitions given in Appendix A.

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power than the first (six-point) scale and resulted in the exclusion of more people because of missing information. The six-point scale was therefore preferred. The items included in this scale were: sociopathy, problems in the use of alcohol, previous in-patient psychiatric treatment, previous out-patient psychiatric treatment, previous parasuicide (resulting in hospital admission) and not living with a relative. The distribution of scores by repetition is shown in Table III. People who scored 0 had only a 5 per cent chance of repetition compared with those scoring 5 or 6, of whom 48 per cent were repeaters.

Slightly less than 10 per cent of all cases were excluded from the scale because of missing information on one or more items. These 81 excluded cases were compared with the remainder (766) on whom the scale was constructed. In general, the excluded cases were less well documented than the others—information lacking on one item was associated with the absence of information on other items. For items where missing data was negligible—sex, age, and civil state—the distribution of the excluded cases was indistinguishable from the remainder. A comparison of the two groups on available information for other items produced only two significant differences. The excluded patients were more often categorized as drug-dependent (30 per cent compared with 13 per cent of the remainder) and they were much more likely to be referred to in-patient psychiatric care on discharge from the R.P.T.C. Thirty-seven per cent of the excluded, compared with 17 per cent of the remainder, were transferred to hospital. The excess of drug dependents may be explained by the tendency of some of these patients not to co-operate with the ward regime and to take their own discharge before full information has been collected on them. The latter finding is most probably due to clinicians being less concerned to collect complete information on patients whom they know are to be more fully investigated by their psychiatric colleagues in hospital. With regard to repetition, there was a slightly higher, but non-significant, percentage of repeaters among the excluded cases: 18·5 per cent compared with 15·4 per cent in the remainder. In general, therefore, it was concluded that the population on whom the scale was constructed was not materially different from the total group of R.P.T.C. admissions.

Validation

Table IV shows the results of validating the six-item scale on the 1969 and 1970 data. The range of predictive ability was similar in 1969, though some shrinkage occurred in score groups 3 and 4. In 1970 the main discrepancy was in the reduced effectiveness of the highest risk groups (5 and 6). The predictive power of the scale before and after validation was tested by the Mean Cost Rating (M.C.R.).* The M.C.R. of the scale constructed on 1968 data was ·52; when the scale was applied to the validation cohorts, the M.C.R. was ·38 on 1969 data and ·41 on 1970 data. Thus, although some shrinkage occurs on validation, the predictive power of the scale remains reasonably stable when tested on the two subsequent cohorts.

A further analysis was made for each sex

* The Mean Cost Rating is a measure of predictive power developed by Duncan, Ohlin, Reiss and Stanton (1953) and discussed by Simon (1971) in the Home Office study of young men on probation. The M.C.R. varies between 0, where there is no differentiation in the 'failure' (in this study 'repetition') rates between groups, to 1. where all groups comprise only repeaters or non-repeaters, It is sensitive to the ordering of groups and is highest when the groups are ordered according to decreasing (or increasing) rates. This property of the M.C.R. is useful in comparing results from one cohort with a validation cohort.

TABLE III

Six item scale constructed on 1968 data

(Items scored: (a) sociopathy; (b) problem in the use of alcohol; (c) previous psychiatric in-patient care; (d) previous psychiatric out-patient care; (e) previous parasuicide admission; (f) not living with a relative.)

	Score							
	0	1	2	3	4	5	6	Total
Repeaters	14	15	15	30	22	18	4	118
	5%	9%	16%	27%	37%	48%		
Not repeaters	283	144	79	81	37	16	8	648
	95%	91%	84%	73%	63%	52%		
Total=100%	297	159	94	111	59	34	12	766

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TABLE IV
Validation of the 6 item scale in 1969, 1970

Score	% repeaters predicted	% repeaters observed in validation cohorts: 1969 Total N in score group	1969 % rep.	1970 Total N in score group	1970 % rep.
0	5%	299	6%	347	6%
1	9%	205	12%	175	14%
2	16%	120	17%	156	24%
3	27%	114	18%	126	31%
4	37%	63	25%	62	39%
5, 6	48%	37	46%	41	29%

separately (Table V). In each year the scale validated for females very satisfactorily. Males showed somewhat more fluctuation, and in particular the decline in the predictive ability of the high risk group in 1970 is entirely accounted for by the men. In 1970, 48 per cent of the men with a score of 4 repeated within the year, but only 21 per cent of those with a score of 5 or 6. It is difficult to establish the importance of this finding. The high risk group is small—the number of males in 1970 scoring 5 or 6 was only 28—and is inevitably subject to some fluctuation.

Completed suicides

Table VI shows the scale scores for the completed suicide in the construction and validation cohorts: there were 8 in 1968, 7 in 1969 and 8 in 1970. The suicides in the 1968 cohort scored rather low; in the validation cohorts they

TABLE V
Validation of the 6 item scale by sex

Score	% Repeaters in each score group: Males 1968	Males 1969	Males 1970	Females 1968	Females 1969	Females 1970
0	3%	11%	4%	5%	4%	7%
1	8%	8%	16%	10%	15%	12%
2	16%	16%	24%	16%	17%	24%
3	26%	18%	28%	28%	19%	33%
4	34%	29%	48%	26%	21%	29%
5, 6	49%	46%	21%	45%	44%	46%

TABLE VI
Scale score of completed suicides

	Score 0	1	2	3	4	5	6	N/K
1968 cohort	1	4	1	1	—	—	—	1
1969+1970 cohorts	—	2	2	8	1	1	—	1
Total ..	1	6	3	9	1	1	—	2

scored predominantly in the middle of the scale. The numbers are, however, too small for any conclusion to be drawn about the short-term prediction of suicide.

DISCUSSION

We are aware that in using material derived from routinely collected (though standardized) records the data obtained are likely to be less complete and contain more inaccuracies than would be found in specifically collected research material. The identification of repeaters is also less complete than if a personal follow-up study had been carried out. Although we know that few parasuicides are admitted to other hospitals in the City, we do not have information on those who have moved out of the district or who have committed suicide in other areas. Nevertheless, we consider that these evident disadvantages are counterbalanced by the accumulation of sufficiently large numbers for analytic purposes.

The simple 6-item points scale described here is a satisfactory instrument in terms of its easy application and its validation. For the construction cohort (1968), the probability of repetition ranged from 5 per cent for people who scored 0 to 48 per cent of those who scored 5 or 6. On validation on the 1969 cohort the proportion of repeaters varied from 6 per cent in the lowest risk group to 46 per cent in the highest. Using the same scale on the 1970 data, the predictive power of the highest risk group declined, although the other score groups had much the same predictive ability as in the two previous years. Analysis by sex showed that this decline was entirely accounted for by the men. Nevertheless, the fact that the range of predictability is stable in three out of four validation samples—for both sexes in 1969 and for women in 1970—is

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encouraging. Using the M.C.R. as a measure of predictive power, the results obtained here compare satisfactorily with the findings of the Home Office Research Unit (Simon, 1971) study of the prediction of success and failure among young men on probation.

Although there is good reason to differentiate completed and attempted suicides (Stengel, 1964) we have chosen to include completed suicides in our definition of a repeater. Ovenstone (1973) has shown marked differences between completed suicides with and without a history of previous suicidal behaviour, the former sharing many of the characteristics of the surviving repeaters. Some acts of parasuicide end in death through 'misadventure' rather than through 'intent', and a distinction of the two is very difficult. Whilst a means of identifying prospective completed suicides is highly desirable, the prediction of an event as infrequent as suicide is fraught with difficulty (Rosen, 1954). The long-term prediction of suicide is a question of a different order and one which cannot be treated here.

We have so far considered the scale in terms of its ability to distinguish which people are most likely to repeat their suicidal behaviour. A second function of a predictive scale is to provide a basis for decisions about the allocation of resources. If resources are limited, it may be desirable to concentrate special attention on the group at greatest risk of relapse. Information from predictive scales gives some measure of the degree of misclassification which occurs in this process. Two types of misclassification must be considered: firstly, incorrectly classifying a repeater as a non-repeater; and secondly, incorrectly classifying a non-repeater as a repeater. In the first type of error, we will fail to give adequate attention to people who will go on to repeat; in the second, we will use our resources on those who would not, in fact, have relapsed anyway. The present study may be used to illustrate this approach. The largest group of parasuicides consists of those scoring 0, who have a low probability of repetition. If intensive treatment is focused on those scoring 1 or above (i.e. assuming these to be potential repeaters) the number requiring attention would be reduced by about 40 per cent. Eighty-eight per cent of the repeaters would be correctly identified and 12 per cent missed. The proportion of the non-repeaters included in the group (i.e. falsely classified as potential repeaters) would be 56 per cent, and because the non-repeaters greatly outnumber repeaters, the treatment group would contain $3\frac{1}{2}$ times as many non-repeaters as repeaters. The degree of misclassification in both directions can, of course, be varied according to the score selected as the dividing line. As a basis for planning, it is important to have information about both types of misclassification. Bagley and Greer (1971) present findings not unlike the example given above: the presence of one or more of five variables selected from a multiple regression analysis identifies 80 per cent of their repeaters. They do not, however, give the proportion of non-repeaters who would also be identified by these items, so a full comparison is not possible.

For simplicity, the discussion has treated repetition as the focus of clinical concern. We are well aware that many patients will require psychiatric treatment regardless of their scores on predictive indices and that clinical assessment is a complex matter. Nevertheless, if it is accepted that repetition is something the clinician wishes to prevent, a predictive scale may well be a useful adjunct to his normal interview practice. A further application of the scale is in designing studies to evaluate treatment innovations. Since the scale enables patients to be classified according to their level of risk, groups can be structured so that adequate numbers in each risk category are included in the study. The description of intensive follow-up of parasuicides by Chowdhury *et al.* (1973) provides an example of the use of an earlier instrument.

Summary

Information on patients admitted to the Regional Poisoning Treatment Centre in Edinburgh after an act of parasuicide (attempted suicide) in three successive years was documented. Patients who were readmitted to the R.P.T.C. for further parasuicidal behaviour within twelve months of their key admission or who committed suicide within the same period were termed 'repeaters' and compared with non-repeaters.

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A scale predicting subsequent suicidal behaviour was constructed on 1968 data by allocating one point for each of the following items: sociopathy, problem in the use of alcohol, previous psychiatric in-patient or out-patient treatment, previous parasuicide (resulting in hospital admission), and not living with a relative. This scale gave a range of probability of repetition of 5 per cent at a score of 0 up to 48 per cent at a score of 5 or 6. The M.C.R. was ·52. The scale was validated on 1969 and 1970 cohorts, giving M.C.R.s of ·38 and ·41 respectively. It is concluded that the scale validates reasonably well, and its applications, especially in evaluative studies, are discussed.

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APPENDIX

Definitions of items used in the analysis

Sociopathy:	Predominant distress of the patient's situation falls on society.
Problem in use of alcohol:	Includes 'excessive drinking' as well as alcohol addiction.
Separation from mother/father:	A permanent situation in which parent has ceased to live with patient and includes parental deaths.
Violence used:	(1968) Patient known to have used physical force to spouse or other relatives; (1969, 1970) Patient known to have used excessive physical force in past 5 years.
Violence received:	(1968) Patient known to have been subjected to physical force from spouse or other relatives (after 1969: 'in past 5 years' added).
Overcrowded:	Over 1·5 persons per room.
In debt:	Arrears of payment.
Criminal record:	Previous court conviction and/or police action currently threatened or in progress.
Family member:	Father, mother, sibling, spouse or child.

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