Suicide Attempts by Firearms and by Leaping From Heights: A Comparative Study of Survivors

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Objective: The purpose of this study was to compare the clinical and demographic profiles of patients who deliberately harmed themselves, either by jumping from a great height or by using firearms, and survived. **Method:** The study consisted of an 18-year retrospective case history analysis of survivors of jumping and shooting identified from the database of consultation-liaison psychiatry referrals at a hospital in Sydney, Australia. Clinical and demographic information was collated and analyzed. **Results:** Fifty-one patients who had shot themselves and 31 patients who had jumped, all of whom had survived, were assessed by the consultation-liaison psychiatry team. There were clear differences between the two groups. Those who jumped were more likely to be single, unemployed, and psychotic. Those who used firearms were more likely to be male, abuse alcohol, have a forensic history, and have an antisocial or borderline personality disorder. **Conclusions:** In this study, the subjects who attempted suicide by shooting themselves and those who did so by jumping had different profiles of mental state, personality function, and psychiatric diagnosis. The importance of mental state and specific psychiatric diagnosis as determinants of the method used has been neglected in studies of suicide. These factors should be considered along with others such as accessibility and acceptability of means, since these differences may be important when suicide prevention is considered. It is also important for psychiatrists providing consultation-liaison services to be aware of these differences in order to ensure optimal treatment of survivors.

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Studies that focus on the violent methods of self-harm by either shooting or jumping are relatively few. Such studies have included successful suicide attempts (1–4), special populations (e.g., those who were inpatients in psychiatric hospitals) (5–7), preventive aspects such as firearm control legislation (8–11), and forensic studies (12, 13). Very few studies have attempted to characterize the psychopathology of persons using violent means of self-harm, and we are not aware of any studies that have directly compared survivors of different types of violent self-harm.

Providing consultation-liaison psychiatric services in a large general hospital, we gained the impression that survivors of shooting were a different clinical group from those who survived jumping, and that the method of self-harm perhaps delineated clinical subtypes of deliberate self-harm populations. This goes against the intuitive assumption that all methods of violent self-harm may reflect similar psychopathology. Our aim was therefore to compare the clinical profile of these two groups of survivors of violent suicide attempts.

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METHOD

Westmead Hospital is a 750-bed general teaching and tertiary referral center for the University of Sydney. Located in the west of Sydney, its catchment area population of nearly 700,000 is relatively youthful and has a high proportion of immigrants and working-class people. The residential accommodations in this outer suburban area are freestanding, single-story or two-story houses, but there are also semirural areas and a number of centers with high-rise retail, office, and residential buildings.

The consultation-liaison database was used to obtain the files of all patients who had survived self-harm inflicted by shooting or jumping and who had been admitted to Westmead Hospital in the 18

TABLE 1. Univariate Logistic Regression Analysis of Demographic Variables of Persons Who Harmed Themselves With Firearms or by Jumping

Variable	Persons Who Used Firearms (N=51)	Persons Who Jumped (N=31)	Odds Ratio	95% CI	p
Gender					
Male	47	18	1		
Female	4	13	8.5	2.4 to 29.4	0.001
Employment					
Employed[a]	30	9	1		
Unemployed	18	21	3.9	1.5 to 10.3	0.006
Marital status					
Single[b]	25	23	1		
Married/de facto relationship	18	8	0.5	0.2 to 1.3	0.16
Separated/divorced[c]	8	0	0	0 to <1	0.01
Living arrangement					
With parents	19	8	1		
In own home	15	5	0.8	0.2 to 2.9	0.73
Renting	8	10	3.0	0.9 to 10.3	0.09
Hostel/hospital[c]	0	9	>20	1 to >100	0.004
No fixed address	3	1	0.8	0.1 to 8.8	0.85

[a] Student, paid work, or domestic duties.
[b] Never having been in a de facto relationship or married.
[c] It was not possible to accurately estimate the 95% CI because estimated variance of the odds ratio necessitates a division by zero. The p value is from Fisher's exact 2×2 test.

years from 1979 to 1996. From the case notes, demographic and clinical information was abstracted. Further information was obtained from hospitals or clinics where the patients had been assessed in the past or from hospitals and community clinics where the patients had been seen after the episodes of self-harm. All patients had been admitted to Westmead Hospital and assessed by psychiatric trainees and then consultants. Many were discussed at the weekly review meeting of the consultation-liaison department. All patients received DSM diagnoses at the time of admission. The psychiatric care of patients was managed by the consultation-liaison team until discharge. Descriptive data were obtained, and the two clinical groups were compared by means of univariate and multivariate logistic regression or the Mann-Whitney rank sum test.

RESULTS

We identified 51 persons who had shot themselves and 31 who had jumped. The majority of the statistically significant differences between the two groups are shown in tables 1, 2, and 3.

We had comprehensive forensic histories for 30 of the 51 who used firearms, and for 23 (77%) of these, there was a history of criminal conviction; in comparison, we had similar histories for 24 of the persons who jumped, and there was a history of criminal conviction for only eight (33%) (odds ratio=6.6, 95% confidence interval=2–22, p=0.002). The length of stay on the surgical ward for those who jumped (median=27.5 days; interquartile range=19–46) was significantly longer than for those who used firearms (median=13 days; interquartile range=7–25) (p=0.003, Mann-Whitney rank sum test). Many potential risk factors were considered. The results reported in tables 1–3 should be treated as exploratory data analyses. Because of the large number of comparisons, it is possible that statistically significant results occurred by chance alone. The results obtained here need to be confirmed in other studies. There were missing values for a number of the variables under examination; in the multivariate model, the effect of this is compounded.

Seventeen of the 31 persons who jumped were psychotic at the time, compared with only two of the 51 who shot themselves. Of the 17 psychotic persons who jumped, 15 had an axis I diagnosis of schizophrenia; the remaining two had an amphetamine-induced psychotic disorder. Thirty of the persons who used firearms and only two of those who jumped had adjustment disorder as their main axis I diagnosis. The only two patients with bipolar illness were in the group who had jumped, and they were severely depressed. Twenty-eight of the users of firearms and only 10 of those who jumped had a substantial history of substance abuse. The 31 patients diagnosed primarily with personality disorders who shot themselves usually had an antisocial or borderline disorder.

No significant differences between the two groups were found for the following variables: place of birth (Australia versus overseas), age (median=31 years for firearms users and median=33 years for those who jumped), past history of deliberate self-harm, communication of suicidal intent to others before the event, proportion transferred to a psychiatric inpatient unit, continued voicing of suicidal statements after admission, and proportion requiring involuntary admission.

The estimated average height from which subjects jumped was 7.5 m (25 feet). Sixteen of the 31 jumped from private dwellings, usually their own; all of the others jumped from public buildings. Of the group who jumped, 12 had thorax/back injuries, 12 had orthopedic limb injuries, six had head injuries, and one had abdominal injuries. Seven of the subjects who jumped were hospital inpatients at the time of the episode, and four jumped at the hospital—three at a psychiatric hospital and one at a general hospital. Forty of the 51 patients who shot themselves used long arms, either shotguns or 0.22-caliber rifles. Of the 51, 18 had

TABLE 2. Univariate Logistic Regression Analysis of Clinical Variables of Persons Who Harmed Themselves With Firearms or by Jumping

Variable	Persons Who Used Firearms (N=51)	Persons Who Jumped (N=31)	Odds Ratio	95% CI	p
Past psychiatric history[a]					
Yes	21	26	5.7	1.9–17.5	0.002
No	23	5	1		
Past substance abuse					
Yes	28	10	1		
No	13	16	3.4	1.2–9.6	<0.02
Affected by drugs[b] or alcohol at the time					
Yes	23	10	1		
No	8	16	4.6	1.5–14.3	0.008
Current inpatient					
Yes	1	7	22.4	2.7–186	0.004
No	50	24	1		
Current psychiatric outpatient					
Yes	8	16	7.1	2.4–20.9	<0.001
No	39	11	1		
Principal stressor					
Spouse	26	5	0.05	0.01–0.3	<0.001
Physical	8	2	0.07	0.009–0.5	0.009
None	3	11	1		
Other	10	9	0.2	0.5–1.1	<0.06
Psychotic					
Yes	2	17	29.4	6.0–144	<0.001
No	45	13	1		
Personality disorder					
Yes	31	10	1		
No	6	20	10.3	3.2–32.9	<0.001
Treated with psychotropics or ECT[c]					
Yes	8	22	13.2		
No	43	9	1	4.4–38.5	<0.001
Deceitful					
Yes	22	6	1		
No	20	22	4.0	1.4–11.9	0.01

[a] Includes deliberate self-harm, a psychiatric admission, or outpatient care.
[b] Illegal or excessive legal drug use.
[c] Physical treatment for the underlying psychiatric illness.

their main injury in the head and 21 in the thorax. Four patients had peripheral injuries only (i.e., injuries to their limbs). We compared the 18 head-injured subjects who used firearms with the remaining users of firearms on the clinical and demographic variables mentioned above. The only significant difference was the median length of stay on the surgical ward, 25 days (interquartile range=16–79) for the head-injured as against 9 days (interquartile range=4–17) for the remainder ($p<0.001$, Mann-Whitney rank sum test).

In broad terms, the patients who survived shooting were young, male, blue-collar workers embroiled in domestic disputes, fueled by alcohol abuse against a background of often long-standing social, forensic, and personality problems. The shooting was commonly preceded by a crescendo of disputes, despair, and tension over days or weeks. Even for the two psychotic subjects who shot themselves, factors such as alcohol and interpersonal conflict were important. Common disputes centered on use of court orders prohibiting men from approaching their partners as a result of domestic violence and conflict over custody of children. For the firearms users, this expressed itself as an escalating series of arguments and threats; often they sought vengeance on a spouse by carrying out a threat of shooting. Sometimes spouses were threatened with guns. The final precipitant was most commonly an argument with a sexual partner.

TABLE 3. Multivariate Logistic Regression Analysis of Variables of Persons Who Harmed Themselves With Firearms or by Jumping

Variable	Odds Ratio[a]	95% CI	p
Drug and alcohol use	0.05	0.004 to 6.3	0.02
Deceitful	0.19	0.02 to 1.1	0.05
Psychotic	77.2	2.9 to >100	0.009
Psychiatric history	26.7	2.0 to >100	0.01
Rental accommodation	24.7	1.7 to >100	<0.02

[a] Adjusted for all other variables in the fitted model.

An identifiable stressor was less apparent in many of the patients who jumped. While some of them had scenarios similar to those of the patients who shot themselves, the act of jumping was usually a more isolated and disorganized act by an individual with severe axis I psychopathology. Many were under psychiatric treatment, and at the time of jumping, those who were psychotic often responded to hallucinatory commands or persecutory, grandiose, or nihilistic delusions. Notably, several persons going to a building to jump were put off by relatively trivial barriers. Their immediate reaction was not to find another method or even another

site, but when some days or weeks later, an easier opportunity for jumping presented itself, this led to their injury and hospital admission.

The hospital course of the two groups showed distinct trajectories. The level of deceit in the group who used firearms was noteworthy. They commonly claimed to have shot themselves accidentally while cleaning a gun, despite overwhelming evidence to the contrary. They often became clinging or demanding and used spouses or threats of suicide as bargaining chips while hospitalized. The subjects who jumped, because of thought disorder or ambivalence associated with their psychoses, tended to change their stories (e.g., initially admitting to command hallucinations and then denying them). The paranoid nature of their illnesses led them to be evasive and to change the story to one of falling rather than jumping after initially giving a clear history of jumping.

The nature of the psychiatric treatment given the patients while they were recovering on the surgical ward also reflects the different underlying mental states. Twenty-two of the 31 who jumped received physical treatments for their psychiatric disorders (excluding treatment for postinjury delirium). The treatment was usually antipsychotics, mood stabilizers, or antidepressants, although one patient received ECT. Only eight of the 51 subjects who shot themselves received such treatments.

DISCUSSION

For most of the study period, use of firearms was the most common method of suicide for males in Australia. Jumping has been a relatively uncommon method of suicide in Australia throughout the century, generally accounting for less than 5% of suicides. Throughout the period, ingestion of toxic substances was the most common method of suicide for females. Access to firearms in Australia is through a licensing system, applied for through the police, with access to handguns severely restricted. Recent legislation has put tighter restrictions on access to all firearms.

By their nature, violent suicide attempts result in few survivors; thus, information about this group is limited and is a likely reason for the paucity of studies in the literature. With this low base rate of survivors, prospective studies can be difficult to achieve. Two clinical studies from the United States of firearms users who survived (14, 15) had findings broadly similar to ours, apart from the higher number of female firearms users in the United States. Studies of persons who jumped and survived include community samples, psychiatric inpatients, and general hospital inpatients. The psychiatric inpatient studies, not unexpectedly, have found a preponderance of psychotic patients (5, 6). Kontaxakis et al. (16), in a community sample of persons who jumped compared with persons who overdosed, found more severe psychopathology in those who jumped. Prasad and Lloyd (17) studied survivors of jumping in a community sample admitted to a general hospital. They found patients with major psychopathology, in particular severe depressive illness, schizophrenia, and alcohol abuse. Cantor et al. (18) found high rates of severe psychopathology, particularly schizophrenia, among those who completed and those who failed suicide attempts in their study group of persons who jumped from bridges. Thus, there is evidence to suggest that persons who survive jumping may have particularly severe axis I psychopathology, notably psychosis.

It is of some importance to decide to what degree the survivors of the two methods of suicide in our study resemble those whose suicide attempts were successful. Studies comparing survivors of self-harm with those who do commit suicide have consistently found substantial differences between the large group of survivors and the small group who committed suicide. One might expect to find fewer differences between survivors and suicide victims when violent self-harm is studied. The essential similarity of our head-injured subjects who used firearms—who may be assumed to be the subgroup with the greatest lethality and intent and are likely to have survived by chance—to the remainder of the surviving users of firearms suggests the likelihood that at least a substantial proportion of survivors will be similar to those who succeed in committing suicide. One hypothesis is that those who survive do so because of factors beyond their control but who in essence are no different from those who die. For example, the patients in our study would have jumped from a higher building if they had had more immediate access to one. The alternative hypothesis is that although the method was the same, the intent and perhaps the psychiatric diagnosis were in fact different. We do not yet have a comparison group from our catchment area of persons who succeeded in committing suicide by shooting and by jumping, but such a further study would be important and is planned.

Selway (12), in a forensic study in Victoria, Australia, of suicide by shooting found that the deceased typically were male, shot themselves in the head, abused alcohol, were in the midst of interpersonal conflicts, had forensic histories, and worked in an unskilled or semiskilled occupation. The main differences compared to our group were the overwhelming number who shot themselves in the head and the slightly older median age; otherwise, the similarities are striking.

With respect to persons who attempt suicide by jumping, the subjects considered in various studies have come from very different populations. Psychiatric hospital inpatients who have committed suicide by jumping are inherently likely to have major mental illnesses such as schizophrenia (7). Pounder (1) in Adelaide, South Australia, noted that the group who committed suicide by jumping contained a higher proportion of persons suffering from psychotic illness than the state average for other methods of suicide. Cantor et al. (18) in Queensland, Australia, in a study of persons who jumped from bridges, also found a

high rate of severe psychopathology, notably schizophrenia, among those whose suicide attempts were successful. Fischer et al. (3) in New York found that suicide by jumping was significantly more common in the boroughs with the greatest concentration of tall residential buildings. Comparing the characteristics of those who jumped with those who shot themselves, hanged themselves, or ingested toxic substances, Fischer et al. commented that persons with a psychiatric history, especially schizophrenia, were more likely to have jumped, although they did not provide details. Cheng et al. (19) in Hong Kong found that of 74 outpatients suffering from chronic schizophrenia who committed suicide from 1981 to 1985, 52 did so by jumping; however, they did not provide information on nonpsychotic subjects who jumped. While the studies mentioned above suggest that persons who jump suffer from severe psychopathology, and probably more so than those who use other methods of suicide grouped together, a recent study by Nowers and Gunnell (4) in the United Kingdom found no difference in psychiatric history between persons who committed suicide by jumping and those who used all other methods grouped together. A review by the same authors (20) suggested that there are insufficient data to conclude that those who jump are a psychiatrically distinct group; however, we would argue that a study that lumps all other methods together may obscure important differences between persons choosing particular methods. The majority finding in the research literature is that survivors of suicide attempts made by jumping are likely to be similar in most respects to those whose suicide attempts are successful, and especially so in having severe axis I psychopathology.

Suicide and attempted suicide by violent means are commonly assumed to be a clinically homogeneous entity, and there has been little consideration of differences between persons who use different methods. There is perhaps also an intuitive assumption of a strong association between violent self-harm of all kinds and psychosis. Our study demonstrates major differences between those who jump and those who use firearms and an association with psychosis only in those who jump.

While it is commonly accepted that factors of culture and accessibility of means are important determinants of the method chosen for a suicide attempt, our study indicates that mental state is an additional and important variable in the choice of method. A particular mental state may both reveal information about the immediate reasons for the choice of a certain method and reflect a developmental history that may also influence the method chosen. First, it could be that psychotic patients, without immediate access to loaded firearms, are simply too chaotic in their thinking to obtain a gun, and this disorganization lends itself to accessible methods such as jumping. It may also be that certain methods feed into psychotic processes, such as grandiose thinking that one can fly. In contrast, if one examines the group in our study who shot themselves, although they were disturbed in terms of personality function, alcohol abuse, and the law, most were still engaged in interpersonal relationships, were employed, and organized themselves to obtain a license for firearms. That capacity for organization was missing from many of the psychotic patients who jumped. Thus, mental state, by affecting the degree of coherence of thought and organization, will influence the way self-harm is inflicted. Second, a given psychiatric diagnosis may reflect the developmental course of a given patient group and in turn reflect factors often established many years beforehand that led to a given method of self-harm. Thus, persons with a background of antisocial or borderline personality disorder who shot themselves were often raised in violent, poorly educated environments where the use of aggression and acquisition of firearms within a family were common. Their exposure to their ultimate weapon of self-harm had been shaped by family and subcultural factors well before the acute depression and conflict that led to the shooting. Although shooting is often described as impulsive, this should not imply that most of the persons who used firearms were well-adjusted individuals who, briefly and against the flow of their lives, suddenly shot themselves. While some patients fitted this picture, most in fact had longstanding personality difficulties, with lives that were turbulent and for whom the shooting was typically one violent incident of many. The use of a gun often had symbolic and aggressive components, which was appealing to many of the men.

A recent study in the Christchurch area of New Zealand (21) examined all suicides and "serious suicide attempts" and found that of the persons having access to a firearm in the home, 22 of 65 chose shooting as their method, while of the 387 who did not have such firearm access, only two chose shooting. Allowing for the importance of the availability of means, one has to ask, when looking at this study, why about two-thirds of those with access to a firearm in the home chose methods other than shooting. The nature of individual psychopathology, reflected by clinical and diagnostic differences, is another factor that determines a given method of self-harm.

Limitations and Generalizability of the Study

This study has the inherent limitations of retrospective case-file studies. The accuracy of the clinical and demographic findings should be high, because from the outset of the study period, one or both of us had personal involvement with most of the cases, through direct assessment, supervision of an assessment by a trainee, or participation in the weekly consultation-liaison review meeting.

Missing data in our study were partly a result of the retrospective design, were partly due to the severity of injury in some patients (which led to limited interviews) but, significantly, were also partly due to the reluctance of some patients, particularly those who shot

themselves, to divulge information. Those who used firearms not uncommonly left the hospital precipitously and were lost to follow-up.

It is important to know whether our results can be generalized to other countries and cultures. There are quite strong indications that our results are concordant with those from other centers in Australia (1, 7, 12, 18). There are reasonable indications that our results are broadly concordant with those from other countries, including the United States (3, 14, 15), the United Kingdom (5, 17), Greece (16), and Hong Kong (19). Certainly, it is too early to make an assumption that the clinical data presented here could simply be transferred to another culture. However some cultures, particularly those of Western countries with a lifestyle not too dissimilar to that of a large Australian city such as Sydney, may be more likely to have similar findings. Our study is representative of an urban landscape that, while having high buildings, is not dominated by such buildings. Other settings may have distinctive characteristics that could alter the findings reported above. For example, in a city of predominantly high-rise buildings, the issue of easier accessibility may lessen the impact of mental state. Although the research to date seems more consistent with our findings, we will not know with any certainty until replication studies are done elsewhere.

Implications of the Study

A general hospital psychiatrist, by appreciating the different clinical profiles of survivors of self-harm, can anticipate problems on surgical wards and provide improved quality of clinical care. Specifically, understanding these patterns allows a clinician to seek more carefully a psychosis in someone who jumps; to not simply accept at face value the history given by someone who uses a firearm, given the high rate of deceit; to be particularly mindful of the role of alcohol abuse among those who shoot themselves; and to advise the trauma team on behavior patterns they may expect to encounter with these patient subgroups. Issues such as medical and nursing staff attitudes of anger (at self-inflicted injury) and fear (of violence or a successful suicide attempt), which can lead to treatment behavior such as avoidance and neglect or otherwise be countertherapeutic, can be dealt with more confidently and effectively.

This study raises issues of suicide prevention. We found that barriers that were less than robust would deter some patients when they were making their way to a position to jump, and that when thwarted they did not simply find an immediate alternative. This is consistent with findings in Australia and elsewhere that barriers around favored jumping locations—for example, the Sydney Harbour Bridge (22) and the Ellington Bridge in Washington, D.C. (23)—will reduce suicidal jumps from these structures. Studies have demonstrated that firearm control legislation (8–11) and reduction of gun ownership are associated with a reduction of suicide by shooting. There is some evidence (24) that restriction of availability of a given method of suicide, as far as this is possible, may reduce overall suicide rates.

This study also highlights the concept that prevention needs to be considered at one of a number of points in a causal chain. The group of subjects who shot themselves highlights the social and developmental context, where community attitudes, firearm legislation, and availability and quality of treatment for substance abuse may have an impact on rates of suicide and attempted suicide. The group of subjects who jumped highlights the importance of good inpatient care—and especially of watchful and thorough after-hospital and outpatient treatment—of persons with psychotic illnesses.

Our knowledge of suicide will be advanced by a closer examination of persons who may select certain methods. This examination should include both survivors of different methods and a comparison with those whose suicide attempts are successful. Such research may help bridge the gulf that exists between primarily clinically based studies and epidemiological findings.

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