



Predicting ICU admissions from attempted suicide presentations at an Emergency Department in Central Queensland

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RESEARCH

Please cite this paper as: Walker X, Lee J, Koval L, Kirkwood A, Taylor J, Gibbs J, Ng S, Steele L, Thompson P, Celi LA. Predicting ICU admissions from attempted suicide presentations at an Emergency Department in Central Queensland, Australia. AMJ 2013, 6, 11, 536-541. <http://doi.org/10.21767/AMJ.2013.1730>

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Abstract

Background

Emergency medicine physicians and psychiatric staff face a challenging job in risk stratifying patients presenting with suicide attempts to predict which patients need intensive care unit admission, hospital admission or can be discharged with psychiatry follow up.

Aims

This study aims to analyse patients who were admitted to the intensive care unit or regular ward for suicide attempt, and the methods they employed in a rural Australian base hospital.

Method

We conducted a retrospective analysis of patients who presented with suicide attempts to the Rockhampton Base

Hospital Emergency Department, Queensland Australia from 1 September 2007 to 31 August 2009. Multivariate logistic regression was undertaken to identify risk factors for ICU and regular ward admission, and predictors of suicide method.

Results

There were 570 patients presenting with suicide attempts, 74 of which were repeat suicide attempts. There was a 10-fold increase in the odds of intensive care unit or ICU admission (CI 1.45-81.9, $p=0.02$) for patients who presented with drug overdose. Increased age (OR=1.02, 95 per cent CI 1.00-1.03, $p=0.05$), drug overdose (OR=2.69, 95 per cent CI 1.37-5.29, $p=0.004$), and previous suicide attempt (OR=1.53, 95 per cent CI 1.03-2.28, $p=0.03$) were significantly correlated with hospital admission. Male patients (OR=2.76, 95 per cent CI 1.43-5.30, $p=0.002$) and Aboriginal patients (OR=3.38, 95 per cent CI 1.42-8.05, $p=0.006$) were more likely to choose hanging as a suicide method.

Conclusion

We identified drug overdose as a strong predictor of ICU admission, while age, drug overdose and history of previous suicide attempts predict hospital admission. We recommend reviewing physician practices, especially safe medication, in suicide risk patients. Our study also highlights the need for continued close collaboration by acute care and community mental health providers for quality improvement.

Key Words

Suicide, Attempted; Drug Overdose; Emergency Care; Intensive Care; Utilisation.



What this study adds:

1. There are few studies looking at risk factors for ICU or regular ward admission after a suicide attempt, especially in rural Australia.
 2. We identified drug overdose as a strong predictor of ICU admission, while age, drug overdose and history of previous suicide attempts predict hospital admission.
 3. We recommend safer medication prescribing for patients at risk for suicide and continued collaborative efforts between acute care and community mental health providers.
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Background

Suicide is a major public health issue in Australia and worldwide.¹⁻³ The World Health Organisation (WHO) has published that every year almost one million people die from suicide. Over the last 45 years, suicide rates have increased by 60 per cent worldwide, especially in men between 15-44 years and those with depression, alcohol and drug use. These figures do not include suicide attempts, which have been reported to be 20 times more common than completed suicide.² The management of suicide attempts is a challenge for emergency departments and hospitals already pressured for resources.³⁻⁵ Studies have shown approximately one-third of patients with suicide attempts are admitted to medical wards and 5-10 per cent to the intensive care unit.^{4,5} There are also major cascade effects on family, relationships, work and society as a whole.⁶ In Australia there are over 2000 suicide deaths a year - 2,361 alone in 2010.⁷ In 2010, the Australian Government announced a \$274 million *Taking Action to Tackle Suicide* package to address this important issue.⁶ There have been particular concerns of the high rates of suicide in the male population under 40 years of age,¹ Aboriginal ethnicity^{3,6-10} and those living in rural areas.¹⁰ It is difficult to estimate the number of non-fatal suicide attempts in Australia, since many people who attempt suicide remain unreported or are recorded as accidents.⁸ In 2005-6, there were 23,778 patients hospitalised in Australia with intentional self-harm; a large majority (82 per cent) of self-harm were poisoning, including drug overdose.¹¹

Our study investigated the risk factors for ICU admission after a suicide attempt in a community teaching hospital. ICU beds are a limited and costly resource. Australia has approximately 7.5 ICU beds per 100,000¹² and the average ICU day cost is AU\$2670.¹³ Rural and remote Australia represents further challenges for scarce ICU resources.¹² More importantly the tragic human cost to families, friends and the greater Australian community is difficult to fully quantify. There are currently few studies on patients who

present with suicide attempts in rural Australia. Our study used chart audited data, which is more accurate than medical coded hospitalised self-harm data that is currently being used.⁸

Method

Rockhampton Hospital, Queensland, Australia is a 230-bed community teaching hospital, which serves a population of 74,530 and serves as a major referral centre for the wider Central Queensland population of 187,916 people and covering an area of 122,971.5 km².¹⁶ We conducted a retrospective analysis of patients who presented with suicide attempts to the Rockhampton Base Hospital Emergency Department from 1 September 2007 to 31 August 2009. Over this study period, there were 81,196 total patient presentations with 16,246 hospital admissions.¹⁷

To collect data we used a preformatted standardised form. Data collected included demographic variables (age, marriage status, religion and employment), suicide method, disposition (admission or discharge status), diagnosed psychiatric illness, history of alcohol or substance use and previous suicide attempt. A head researcher supervised and reviewed data collected to improve inter-rater reliability of data extraction. A summary of the data collected is found in Table 1. The inclusion criterion for the study was presentation with a suicide attempt. Patients were screened by retrospectively reviewing all emergency patient visits during this two-year period using electronic (Emergency Department Information System) and paper chart records. We also cross-referenced with psychiatry data records, psychiatry suicide attempt database and hospital admission data. At the time of data extraction, we excluded patients with self-harm but no intent of completing suicide as assessed by emergency and psychiatric evaluation. This included accidental poisoning or incidents, intentional alcohol or drug abuse and superficial cutting with no intent of suicide. We excluded patients who were deceased before arrival to the Emergency Department and those who were referred directly to the psychiatric service.

Our primary outcome was admission to the intensive care unit. The secondary outcome was hospital admission. We also identified factors associated with the suicide method. We used a coding system during data collection; no protected health information was stored. For statistical significance, $p < 0.05$ was employed. All statistical analyses were conducted in MATLAB version R2010b (MathWorks, Natick, MA, USA). For each multivariate regression model, patients with missing data were excluded.



Results

During the study period, September 1 2007 to August 31 2009, there were 570 patients who presented with suicide attempt. Of these, 74 patients were repeat suicide attempt presentations.

Table 1: Basic statistics of the patient cohort

Gender (male)	247 (43.3%)
Age (yrs), median [Q1,Q3]	27 ^{19,40}
Marital Status	
Never	362 (64.3%)
Married or de facto	132 (23.4%)
Divorced	59 (10.5%)
Widowed	10 (1.8%)
Ethnicity	
Non-Aborigine	513 (90.5%)
Aborigine	47 (8.3%)
Aborigine and Torres Strait Islander	7 (1.2%)
Religion (any religion)	272 (49.3%)
Employment Status	
Unemployed	124 (21.1%)
Employed	184 (32.9%)
Student	91 (16.2%)
Home duties	66 (11.8%)
Retired	49 (8.8%)
Others	46 (8.2%)
Suicide method	
Drug overdose	378 (66.3%)
Hanging	53 (9.3%)
Laceration	87 (15.3%)
Others	52 (9.1%)
Disposition	
Discharged	296 (51.9%)
Mental Health Inpatient Ward	86 (15.1%)
Medical or Surgical Ward	82 (14.4%)
ICU	73 (12.8%)
Others	33 (5.8%)
Psychological diagnosis	
None	67 (12.1%)
Depression	397 (71.4%)
Others	92 (16.5%)
Previous suicide attempt	318 (56.6%)
History of alcohol or substance abuse	327 (62.4%)

Table 1 describes the patient cohort. There were more females than males, and the median age was 27 years; 8.3 per cent were of Aboriginal origin. Roughly a third of the patients (32.9 per cent) were employed while 21.1 per cent were unemployed. The most common method of suicide attempt was drug overdose (66.3 per cent), followed by laceration (15.3 per cent). Roughly half of the patients were discharged after psychiatric evaluation (51.9 per cent); the

rest were admitted to the in-patient psychiatric ward (15.1 per cent), medical ward (14.4 per cent), or intensive care unit (12.8 per cent). The majority of the patients also had a previous suicide attempt (56.6 per cent) and a history of alcohol or substance abuse (62.4 per cent).

Table 2: Multivariate logistic regression results for ICU admission (N=509, AUC=0.727, Hosmer-Lemeshow p=0.68)

	OR	95% CI	p-value
Male gender	1.29	0.72-2.32	0.40
Age (yrs)	1.02	1.00-1.04	0.08
Aborigine	0.49	0.11-2.17	0.34
Depression	0.82	0.43-1.55	0.53
Suicide method ¹			
Drug overdose	10.89*	1.45-81.90	0.02
Hanging	5.44	0.57-51.64	0.14
Laceration ²	N/A	N/A	N/A
Others	1	N/A	N/A
History of alcohol or substance abuse	1.79	0.95-3.38	0.07

N/A: not applicable

* statistically significant (p<0.05)

¹ with "others" as reference

² no patient with laceration in the model was admitted to ICU Note: only six covariates were included because only 58 patients in the cohort were admitted to ICU

Table 2 shows the multivariate logistic regression results for ICU admission. There was a 10-fold increase in the odds of intensive care unit or ICU admission (CI 1.45-81.9, p=0.02) for patients who presented with drug overdose than those who used other methods, specifically hanging or laceration.

Table 3 shows the risk factors for hospital admission. Older patients (OR=1.02, 95 per cent CI 1.00-1.03, p=0.05), drug overdose (OR=2.69, 95 per cent CI 1.37-5.29, p=0.004), and previous suicide attempt (OR=1.53, 95 per cent CI 1.03-2.28, p=0.03) were significant predictors of hospital admission.

Finally, Table 4 shows the variables associated with hanging. Male patients (OR=2.76, 95 per cent CI 1.43-5.30, p=0.002) and Aboriginal patients (OR=3.38, 95 per cent CI 1.42-8.05, p=0.006) were more likely to present with hanging.



Table 3: Multivariate logistic regression results for hospital admission (N=486, AUC=0.649, Hosmer-Lemeshow p=0.69)

	OR	95% CI	p-value
Male gender	1.08	0.72-1.62	0.70
Age (yrs)	1.02*	1.00-1.03	0.05
Married	1.37	0.86-2.20	0.19
Aborigine	1.01	0.49-2.06	0.99
Religious	0.86	0.59-1.26	0.45
Unemployed	0.97	0.60-1.56	0.89
Suicide method ¹			
Drug overdose	2.69*	1.37-5.29	0.004
Hanging	1.74	0.73-4.16	0.21
Laceration	1.11	0.49-2.51	0.81
Others	1	N/A	N/A
Depression	1.23	0.80-1.88	0.34
Previous suicide attempt	1.53*	1.03-2.28	0.03
History of alcohol or substance abuse	1.02	0.67-1.54	0.94

N/A: not applicable

* statistically significant (p<0.05)

¹ with "others" as reference

Table 4: Multivariate logistic regression results for hanging as method of suicide attempt (N=510, AUC=0.705, Hosmer-Lemeshow p=0.29)

	OR	95% CI	p-value
Male gender	2.76*	1.43-5.30	0.002
Age (yrs)	0.97	0.95-1.00	0.05
Aborigine	3.38*	1.42-8.05	0.006
Depression	1.59	0.79-3.21	0.19
History of alcohol or substance abuse	1.27	0.63-2.58	0.50

* statistically significant (p<0.05)

Note: only five covariates were included because only 48 patients in the model hung themselves

Discussion

Suicide attempts in Australia are a major public health issue. The main findings of our study were that patients who attempted suicide with a drug overdose had a 10-fold increase in the odds of ICU admission. Increased age, drug overdose and previous suicide attempt were significantly correlated with hospital admission; notably over half of the patients who presented had previous suicide attempts. Finally, male gender patients and Aboriginal patients were more likely to choose hanging as a suicide method.

Our study undertaken in a rural community teaching hospital found 570 patients who presented with suicide attempt over the two-year study period. This number is

consistent with a previous study in a larger size rural Australian hospital, which had identified 335 patients with suicide attempt presentations and 46 patients with repeat suicide attempt over a one-year study period.⁵ Our cohort had a disproportionately higher proportion of Aboriginal patients (8.4 per cent) compared with the Aboriginal Queensland state population (3.6 per cent).¹⁸ The most common method was drug overdose (66.3 per cent). Similar percentages of suicide attempts from overdose have been found from retrospective studies in Australia (63.8 per cent),⁵ and the United States (68 per cent).⁴ We were particularly interested in ICU admissions from suicide attempts because these patients have poorer outcome. 12.8 per cent of the patients that presented with a suicide attempt were admitted to the ICU, which is consistent with previous studies.^{4,5} Of these patients, six died in the ICU. In comparing to other recorded deaths from suicide not presenting to Rockhampton hospital, we contacted the coroner for the City of Rockhampton. There were three other patients who died from suicide that were confirmed by autopsies during this period.¹⁹ Patients with drug overdose had a more than 10-fold increased odds of being admitted to the ICU.

We also analysed hanging, as it is the most frequently used method of suicide in Australia, compared with drug overdose, which is the most common method of suicide attempt.^{7,11} We found that men and Aborigines are more likely to present with hanging. In a study of 28 community suicides in Australia over a five-year period, all Aboriginal suicide deaths were from hanging.¹⁵ In addition, alcohol and cannabis were present in 40 per cent of toxicology analysis. An analysis of all suicides in the Northern Territory state from 1981 to 2002 found 49 per cent of all patients had mental illness diagnosis and 72 per cent were associated with alcohol and substance use.²⁰ There is a paucity of studies looking at suicide attempts among the rural and Aboriginal populations.⁵ None had analysed risk factors for ICU admissions, which has implications on health care planning given the scarcity of critical care resources in rural Australia.

A major limitation of this study is its retrospective design. It is also a single centre study; its findings need to be validated in other rural base hospitals. However, due to the high expense of cohort and multi-centre studies in this research area, we believe that our study is an important addition to the literature particularly in light of the prevailing government priority in suicide prevention.

We believe our findings will help inform suicide prevention health policy and assist emergency departments with risk



stratification of patients who present with suicide attempt. We have identified drug overdose, particularly multiple drug overdose, as a strong predictor for ICU admission. We recommend reviewing physician practices, especially safe medication prescribing among at risk patients. Means restriction has been successful in reducing suicide rates with firearms, barbiturates, domestic gas detoxification and vehicle emissions.²¹ Focusing on reducing alcohol and drug abuse, and preventing and treating depression are paramount. The WHO recognises that in Western populations, it is important to focus on adequate prevention and treatment of depression and alcohol and substance use disorders. In improving effective suicide prevention strategies, the WHO also recommends restriction of common methods of suicide, such as firearms or toxic substances like pesticides, which have been effective in reducing suicide rates.² However, given the complexity of studying the risk for suicide, there is limited evidence to guide primary care physicians in the assessment and management of suicide risk.^{23,24}

Our study highlights the need for a better interface between the hospital and community resources, and for new strategies developed collaboratively by acute care and community mental health providers. Analysis of hospital records provides useful information that can help community health providers in developing quality improvement projects to reduce acute care utilisation. Such a collaborative approach has been implemented in Norway, where a multi-disciplinary chain-of-care network provides follow up after suicide attempts leading to lower treatment drop out and repeat suicide attempts.²⁵

Conclusion

Suicide attempts are a major public health issue in Australia. For emergency physicians and acute psychiatric providers risk assessment of these patients has been difficult. We identified drug overdose as a strong predictor of ICU admission. For hospital admission we identified age, drug overdose and history of previous suicide attempts as predictors. Safer medication prescription practice must be implemented especially by those caring for at risk patients. Our study also highlights the need for a closer collaboration between acute care and community mental health providers in regularly reviewing data for quality improvement.

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