

Overdose in young people using heroin: associations with mental health, prescription drug use and personal circumstances

Jane M Burns, Raymond F Martyres, Danielle Clode and Jennifer M Boldero

Depression, coupled with substance use, increases vulnerability to adverse life experiences and antisocial and suicidal behaviour in young people.¹ The Epidemiologic Catchment Area studies conducted by the US National Institute of Mental Health in the 1980s found that over half of respondents with a drug-misuse disorder (not including alcohol misuse) also had a psychiatric disorder (most commonly major depression or anxiety).² In Australia, about 12% of patients visiting general practitioners have symptoms of depression and substance-misuse problems.³ Psychiatric disorders may be even more prevalent among patients using methadone and heroin than among other drug users: about 70% of people using heroin in Australia have a psychiatric disorder, compared with 25%–30% of the general population.⁴ Depression, anxiety and antisocial personality have been reported to be the most common comorbidities among people using heroin.⁵

Despite the magnitude of the problem, Australian GPs have difficulty identifying and managing both people who misuse drugs⁶ and those with mental health disorders.^{7,8} These difficulties are compounded when drug users attend GPs to obtain prescription drugs to augment, supplement or substitute for illegal drugs. “Polydrug” misuse is common in Australia,⁹ and prescription drug misuse is a significant problem.¹⁰ GPs write over 15 million prescriptions each year for drugs known to be misused, particularly narcotic analgesics and benzodiazepines — about 8.5% of the total number of prescriptions issued per annum.¹¹ Requests for opioids, without proper indications for the drug, cause significant discomfort for GPs, but are rarely refused.¹²

Despite being more knowledgeable about benzodiazepines than nicotine or alcohol, GPs report being less confident and less effective when dealing with benzodiazepine use than use of these “non-prescription” drugs. GP confidence is even lower for illicit drugs, such as heroin and amphetamines.¹³ Nonetheless, chronic drug addiction brings people using heroin into close contact with GPs and puts GPs in an important position to assess, refer and/or treat drug users.

Our study matched self-report data collected from young people using heroin with Pharmaceutical Benefits Scheme (PBS) prescription drug use as recorded by the Health Insurance Commission. In particular, we tested a model of patterns associated with a history of overdose — personal circumstances (such as age, sex, home

ABSTRACT

Objective: To identify patterns of mental health, prescription drug use and personal circumstances associated with heroin overdose in young people.

Design: Linkage of data on use of Pharmaceutical Benefits Scheme (PBS) prescription drugs with data from a self-report questionnaire.

Setting: Inner metropolitan Melbourne, Australia.

Subjects: 163 young people, 15–30 years, using heroin.

Main outcome measures: Personal circumstances, mental health (as measured by various scales), and PBS-listed prescription drug use.

Results: Young people using heroin reported high rates of feelings of hopelessness, depression, antisocial behaviour, self-harm and diagnosed mental illness. A prior history of overdose was associated with previous mental illness, which in turn was associated with being female, having poor social support, being dissatisfied with relationships, and living alone or in temporary accommodation. While feelings of hopelessness and antisocial behaviour were strongly associated with overdose history, the number of PBS prescription drugs used had a very strong relationship with overdose, particularly benzodiazepines, other opioids, tricyclic antidepressants and tranquillisers.

Conclusions: Further research to explore causal relationships between prescription drugs and heroin overdose is warranted. Improved data linkage to PBS records for general practitioners may facilitate safer prescribing practices.

MJA 2004; 181: S25–S28

stability, family history and employment), mental health (including a history of diagnosed mental illness, and measures of hopelessness, depression, self-harm and antisocial behaviour) and drug use (both illicit and prescription). We sought to identify factors associated with overdose history. These could prove useful for further investigation as risk factors for future overdose.

METHODS

We recruited young people (15–30 years) who used heroin from three inner-metropolitan Melbourne general practices between June and December 2000. A small incentive was offered for participation. Participants were given a copy of the questionnaire, a study description and a guarantee of anonymity. An estimated 30% declined to participate, informally citing lack of benefit of the research or privacy concerns. Questionnaires were self-administered. Consent forms and completed questionnaires were deposited in separate sealed boxes, while signed PBS information release forms were given to their GPs.

Questionnaire

The self-report questionnaire was developed by an advisory committee of GPs, researchers in adolescent health and drug use,

beyondblue: the national depression initiative, Hawthorn West, VIC.

Jane M Burns, BA (Hons), PhD, Senior Program Manager.

Melbourne Division of General Practice, Parkville, VIC.

Raymond F Martyres, MB BS, MMed, FRACGP, Program Co-ordinator.

Department of Zoology, University of Melbourne, Parkville, VIC.

Danielle Clode, BA(Hons), DPhil(Oxon), Research Associate,

Department of Zoology.

Department of Psychology, University of Melbourne, Parkville, VIC.

Jennifer M Boldero, MA, PhD, Senior Lecturer, Department of Psychology.

Correspondence: Dr Raymond F Martyres, 841 Rathdowne Street, North Carlton, VIC 3054. raymond.martyres@mdgp.com.au

1 Glossary of mental health scales

BHS: Beck Hopelessness Scale¹⁴

SMFQ: Short Mood and Feeling Questionnaire¹⁶

BRASH: Brief Scale of Adolescent Self-Harm (in the past 6 months)

Anti-social behaviour scale¹⁷

and mental-health and drug-use counsellors. It comprised questions about personal circumstances, mental health and drug use.

Personal circumstances included categorical and open-ended questions on living arrangements, educational and employment status, and the level of social support from and emotional relationships with family and friends. Responses were aggregated into brief scales indicating levels of social support and quality of emotional relationships.

Scales used to measure mental health included the Beck Hopelessness Scale (BHS),¹⁴ which has predicted deliberate non-fatal overdose in adolescents;¹⁵ the Short Mood and Feeling Questionnaire (SMFQ)¹⁶ for assessing depression; a brief scale measuring self-harm in the past 6 months (BRASH); and antisocial behaviour (for the past 6 months) (Box 1).¹⁷ Participants were also asked if they had ever been diagnosed with mental illness (eg, major depression, schizophrenia or psychosis). The questionnaire also measured participants' duration of heroin use and their patterns of use, and enquired about history of overdose.

PBS data

Completed questionnaires and PBS information release forms were forwarded to the Health Insurance Commission, which provided data on PBS drugs used by each participant over the past 5 years. Data were matched to de-identified questionnaire data. Drugs were grouped into benzodiazepines, other opioids, stimulants, major tranquilisers, antidepressants, anti-infection agents, non-opioid analgesics, and other prescriptions, and counted by frequency of prescription.

Statistical analysis

Data for number of PBS prescriptions, as well as level of perceived social support, dissatisfaction with relationships, self-harm in the past 6 months and hopelessness, were transformed to normal distributions, using appropriate mathematical transformations, to comply with statistical assumptions of normality.

We used logistic regression to determine which factors predicted a history of heroin overdose. The high potential for interrelationship between variables renders simple correlational analyses inappropriate. By entering clusters of variables in clinically meaningful steps in the logistic regression analysis, we were able to control variation due to initial factors before examining variation due to subsequent factors. This tool can reveal significant associations which may be hidden by extraneous variation.

Ethical approval

Ethics approval for this research was granted by the Ethics Committee of the Department of Human Services (Victoria). Anonymity was strictly preserved. Participants could withdraw at any time without prejudice to medical or other treatment, and GPs offered to discuss issues raised by the study with participants.

RESULTS

Participants

Eighteen participants reported not using heroin and were excluded from the study. The remaining 163 who reported having "ever used heroin" (88 men, 74 women and one unspecified) were aged 15–30 years (median, 21 years). When asked if they had ever overdosed (requiring an ambulance or naloxone), 42% agreed (69/163), and 56% disagreed (92/163). Most respondents (64%; 105/161) lived permanently with other people; 30% (49/161) lived alone or in temporary accommodation. Two respondents did not respond to these items. Few participants were employed (23%; 37/163) or studying (12%; 20/163), mostly part-time.

PBS data

PBS data were available for 96 of the participants who, over 5 years (1 August 1996 – 31 July 2001), obtained 6381 prescriptions, averaging 13.5 per person per year (95% CI, 10.6–16.0) — substantially higher than the Australian average of 7.6 per person per year.¹⁸ Most prescriptions were for benzodiazepines (56%; 3573/6381), with a further 5% (319/6381) for opioids. There were no differences for any of the variables measured in the study between participants with or without PBS data.

Mental health measures

Guttman's reliability coefficient lambda was 0.88 for the BHS, 0.95 for the BRASH (indicating high internal consistency), but low (0.62) for the SMFQ. Mean mental health scores (BHS: 5.83 [95% CI, 5.2–6.5]; and SMFQ: 11.75 [95% CI, 10.2–12.8]) were higher than normal population scores. Of the participants, 37.4% (61/163; 95% CI, 18.4%–57.4%) reported self-harm (BRASH) and 85% (138/163; 95% CI, 71.95%–98.05%) reported at least one antisocial incident in the last 6 months. These mental health measures were poorer than in normal populations, but not comparable with those in clinical subpopulations, such as patients with major depression.

Logistic regression analysis

To develop a predictive model discriminating between participants who had overdosed and those who had not, we entered variables for personal circumstances in Step 1 of a logistic regression analysis, mental health variables in Step 2, PBS prescription data in Step 3, and prior mental illness in Step 4 (Box 2). Steps 3 and 4 only used data from the 96 participants for whom PBS data were available. Steps 1 and 2 included all participants.

The variables entered in the first three steps of the model correctly classified 74% of participants (119/161; two participants were excluded from the analysis due to missing data). The last two steps of the analysis resulted in 77% of participants (74/96) being correctly classified. PBS prescription data emerged as the strongest predictor of overdose history, particularly the number of prescriptions for benzodiazepines, antidepressants, opioids and tranquilisers (Box 2). Reanalysis revealed that the effect of antidepressants was due to the influence of tricyclic antidepressants rather than selective serotonin reuptake inhibitors (SSRIs). Tricyclic antidepressants were prescribed for 39/96 (41%) participants (median number [range] of prescriptions, 2 [1–21]), while SSRIs were prescribed for 31/96 (32%) participants (median number [range] of prescriptions, 3 [1–19]). In addition, hopelessness, antisocial

2 Logistic regression analysis of the predictive value (Wald's statistic) of variables measuring personal circumstances, mental health and PBS data for a history of overdosing

Variable	Step 1	Step 2	Step 3	Step 4
Sex	0.19	0.22	0.70	0.19
Age	0.29	0.45	2.32	3.25*
Employment status	0.78	0.69	1.73	1.61
Relationship dissatisfaction	3.49*	4.11*	3.98*	4.05*
Perceived social support	1.06	1.17	0.91	1.62
Living alone/temporary accommodation	3.99*	0.14	0.07	0.01
Hopelessness (BHS) ¹⁴	—	4.31*	6.38†	6.12†
Reported self-harm (BRASH) ¹⁷	—	0.95	1.74	1.39
Depression (SMFQ) ¹⁶	—	0.09	1.43	-1.01
At least one episode of antisocial behaviour	—	3.86*	6.52†	8.21†
Prescriptions				
Benzodiazepines	—	—	9.04‡	9.25†
Opioids	—	—	4.09*	3.84*
Antidepressants	—	—	5.44*	3.99*
Selective serotonin reuptake inhibitor	—	—	0.98	1.23
Tricyclic antidepressants	—	—	0.64	4.28†
Tranquillisers	—	—	4.03*	4.05*
Prior mental illness	—	—	—	4.15*

A dash signifies that the variable was not entered on that step of the equation.
 * $P < 0.05$; † $P < 0.01$; ‡ $P < 0.001$. PBS = Pharmaceutical Benefits Scheme.
 See Box 1 for glossary of mental health scales.

behaviour, prior mental illness, young age and dissatisfaction with relationships all predicted overdose history.

Logistic regression analysis was also used to examine the predictors of prior mental illness. Personal circumstances were entered on the first step of this analysis and mental health factors on the second. These factors correctly classified 87% (140/161) of participants. Prior mental illness was associated with being female (Wald's statistic, 8.56; $P < 0.001$), greater relationship dissatisfaction (Wald's statistic, 6.43; $P < 0.01$), greater lack of social support (Wald's statistic, 4.65; $P < 0.05$), self-harm (Wald's statistic, 4.19; $P < 0.05$), and living alone or in temporary accommodation (Wald's statistic, 4.96; $P < 0.01$).

DISCUSSION

The young people using heroin in our study are a high-risk population. They were highly likely to have had an overdose in the past, they reported misuse of prescription and other drugs, and they may suffer from mental health problems. Self-reported levels of depression, hopelessness, antisocial behaviour and self-harm were considerably higher in our participants than in normative data for the general population. Inclusion of people who declined to participate in our study would only exacerbate this trend, as they seemed to have a less positive attitude towards the benefits of our research than those who participated. In previous studies, prescription drug misuse, poor mental health and chaotic life

circumstances (such as unemployment and homelessness) have all been implicated as contributing to heroin overdose risk. Our study attempted to identify which of these factors was most strongly associated.

Somewhat surprisingly, data on PBS prescriptions used (rather than mental health or personal circumstances) emerged as having the strongest association with overdose history, particularly prescriptions for drugs prone to misuse. Large numbers of benzodiazepine, opioid, antidepressant and tranquilliser drugs, all of which may be used to substitute for or enhance the effects of heroin, were associated with overdose history. Although our study excludes victims of fatal overdose (potentially introducing a survivor bias), an associated study of fatal heroin overdose also found a pattern of escalating "doctor shopping" for prescription drugs, particularly for benzodiazepines, opioids and antidepressants.¹⁹

While opioids and benzodiazepines have a relatively well-known association with both heroin use and overdose risk,⁹ the relationship between overdose and antidepressants is less obvious. It is possible that depression is associated with both overdose and the use of antidepressants, and there may not be any direct causal connection between overdose and antidepressants. The effect we found was entirely related to tricyclic antidepressants. These antidepressants are more commonly used by people using heroin;²⁰ they are cardiotoxic and have contributed to fatal overdose.²¹ The association between overdose history and tricyclic antidepressants (but not SSRIs) suggests a causal link between the use or misuse of tricyclic antidepressants and heroin-related overdose. Further investigation of direct causal links between prescription drugs and overdose, however, would require either a detailed analysis of prescription drugs used at the time of overdose, or a prospective study into factors leading to future overdose risk. Such studies would also have the advantage of removing recall errors inherent in self-report studies.

Our study sought to identify which of the factors previously identified as being risk factors for heroin-related overdose (specifically factors related to mental health, personal circumstances and prescription drug use) are most strongly associated with overdose history. There may be other factors (or different mental health scales, for example) not assessed in our study that are also associated with overdose history. Nonetheless, the fact that of all the factors investigated the association with prescription drugs emerged so strongly reinforces the value of using PBS data to examine risk factors associated with heroin use. There were, however, considerable administrative barriers to the use of PBS data in our study, and, for the full clinical benefits of data linkage studies like this one to be realised, more streamlined research procedures need to be put in place. Until such research is undertaken, GPs faced with possible doctor-shoppers can only be supported in their efforts to avoid prescribing drugs known to be misused, not simply because of the economic costs to the PBS, but because of their potential association with overdose and death.

ACKNOWLEDGEMENTS

We would like to acknowledge the Australian Divisions of General Practice and *beyondblue: the national depression initiative* for funding this research. In addition, we would like to thank the Health Insurance Commission, study participants and general practice staff for providing the data. The following individuals also made significant contributions to the study: Dr Yvonne Bonomo; Ms Fleur Champion de Crespigny; Dr Andrew Chanen; Dr Malcolm

Dobbin; Dr David Jacka; Dr John Jagoda; Mr Hal Roseburg; Ms Lara Watson; Ms Mardie Whitla; and Mr Kim Wyman.

The data used in this report were collected during the "Help Understanding Drug Use (1999–2001) Program" conducted by the Melbourne Division of General Practice, with a grant from the Australian Divisions of General Practice in Canberra. Secondary analysis was funded by *beyondblue: the national depression initiative* (Melbourne, 2002).

COMPETING INTERESTS

None identified.

REFERENCES

- 1 Andrews G, Hall W, Teesson M, Henderson S. The mental health of Australians. Canberra: Mental Health Branch, Australian Department of Health and Aged Care, 1999.
- 2 Regier DA, Farmer ME, Rae DS, et al. Comorbidity of mental disorders with alcohol and other drug abuse: results from the Epidemiologic Catchment Area (ECA) study. *JAMA* 1990; 264: 2511-2518.
- 3 Hickie IB, Koschera A, Davenport TA, et al. Comorbidity of common mental disorders and alcohol or other substance misuse in Australian general practice. *Med J Aust* 2001; 175 (2 Suppl): S31-S36.
- 4 Darke S, Wodak A, Hall W, et al. Prevalence and predictors of psychopathology among opioid users. *Br J Addict* 1992; 87: 771-776.
- 5 Hendriks VM, Steer RA, Platt JJ, Metzger DS. Psychopathology in Dutch and American heroin addicts. *Int J Addict* 1990; 25: 1051-1063.
- 6 Roche AM, Guray C, Saunders JB. General practitioners' experiences of patients with drug and alcohol problems. *Br J Addict* 1991; 86: 263-275.
- 7 Veit FC, Sancu LA, Young DY, Bowes G. Adolescent health care: perspectives of Victorian general practitioners. *Med J Aust* 1995; 163: 16-18.
- 8 Phongsavan P, Ward JE, Oldenburg BF, Gordon JJ. Mental health care: practices and educational needs of general practitioners. *Med J Aust* 1995; 162: 139-142.
- 9 Ross J, Darke S, Hall W. Benzodiazepine use among heroin users in Sydney: patterns of use, availability and procurement. *Drug Alcohol Rev* 1996; 15: 237-243.
- 10 Dobbin M. Prescription drug abuse. Report prepared for the Victorian Department of Human Services. Melbourne: DHS, 1998.
- 11 Australian Bureau of Criminal Intelligence. Illicit drug report 1996-1997. Canberra: ABCI, 1997.
- 12 Bendtsen P, Hensing G, Ebeling C, Schedin A. What are the qualities of dilemmas experienced when prescribing opioids in general practice? *Pain* 1999; 82: 89-96.
- 13 Jacka D, Clode D, Patterson S, Wyman K. Attitudes and practices of general practitioners training to work with drug-using patients. *Drug Alcohol Rev* 1999; 18: 287-291.
- 14 Beck AT, Steer RA. Beck Hopelessness Scale Manual. San Antonio, Tex: Harcourt Brace, 1993.
- 15 McLaughlin J, Miller P, Warwick H. Deliberate self-harm in adolescents: hopelessness, depression, problems and problem-solving. *J Adolesc* 1996; 19: 523-532.
- 16 Angold A, Costello EJ, Messer SC, Pickles A. Development of a short questionnaire for use in epidemiological studies of depression in children and adolescents. *Int J Methods Psychiatr Res* 1995; 5: 237-249.
- 17 Patton GC, Harris R, Carlin JB, et al. Adolescent suicidal behaviours: a population-based study of risk. *Psychol Med* 1997; 27: 715-724.
- 18 Health Insurance Commission, Annual Report 1999-2000, Canberra: HIC, 2000.
- 19 Martyres RF, Clode D, Burns J. Seeking drugs or seeking help? Escalating "doctor-shopping" by young heroin-users before fatal overdose. *Med J Aust* 2004; 211-214.
- 20 Australian Bureau of Criminal Intelligence, Illicit Drug Report 2000-1, Canberra: ABCI, 2001.
- 21 Henry JA, Alexander CA, Sener EK. Relative mortality from overdose of antidepressants. *BMJ* 1995; 310: 221-224.

(Received 8 Jan 2004, accepted 6 May 2004)

□