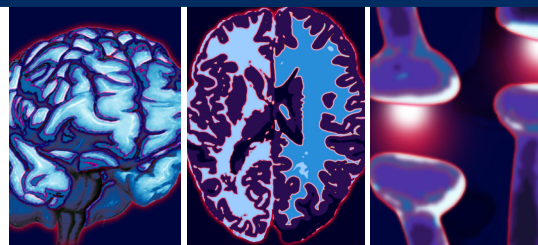


RESEARCH ARTICLE

For reprint orders, please contact: reprints@futuremedicine.com

Psychotropic medication involved in intentional drug overdose: implications for treatment



Paul Corcoran^{1,2}, Breda Heavey³, Eve Griffin¹, Ivan J Perry² & Ella Arensman^{*1,2}

Practice points

- Patients who engage in intentional drug overdose are more likely to be depressed and to have previously engaged in self-harm compared with other self-harm patients who have not engaged in intentional drug overdose.
- While psychotropic drugs have an established efficacy in treating psychiatric conditions, there is evidence of a link between increased prescribing rates and increased use in intentional drug overdose.
- Having a prescription of a minor tranquilizer increases the risk of using prescribed psychotropic drugs in intentional overdoses that are independent of other studied risk factors.
- Among intentional drug overdose patients with a history of previous self-harm, a high proportion were in contact with psychiatric services, which underlines the need for careful monitoring of medication in this setting.
- The risk of taking one's own prescription medication in intentional overdoses increases with age and an increased number of prescription medications, including minor tranquilizers, which implies that minor tranquilizers should be prescribed with caution in older people.
- Consideration should be given to complementary therapies for patients with anxiety disorders, such as cognitive-behavioral therapy.
- Differences between countries with regard to the frequency of psychotropic drugs used in intentional overdoses are likely to reflect differences in prescribing practice and access to these drugs via illegal sources.

SUMMARY **Aims:** Limited information is available on the source of medications taken in intentional drug overdoses (IDOs). The present study aimed to investigate the proportion of patients who engaged in IDOs with current prescriptions and the proportion of those that used their medicines in overdose acts, as well as the factors associated with patients who do so. **Methods:** The registration systems of three hospital emergency departments

¹National Suicide Research Foundation, University College Cork, Cork, Ireland

²Department of Epidemiology & Public Health, University College Cork, Cork, Ireland

³Institute of Technology, Waterford, Ireland

*Author for correspondence: Tel.: +353 21 4205551; earensman@ucc.ie

participating in the Irish National Registry of Deliberate Self Harm were screened over a continuous 6-month period and a consecutive series of 299 IDO presentations were identified. **Results:** Most of the IDO presentations involved female patients (59.9%) and half (50.4%) had a previous history of self-harm. The prescription of psychotropic drugs was associated with the use of these drugs in IDOs, particularly minor tranquilizers. Having a prescription of a minor tranquilizer increased the risk of using prescribed psychotropic drugs in IDOs even when controlling for other factors. **Conclusion:** These findings highlight the importance of considering the risk of IDO among patients who are prescribed minor tranquilizers.

Suicidal behavior is a significant health problem and has a strong association with psychiatric disorders such as mood and anxiety disorders [1,2]. Intentional drug overdose (IDO) is the most common form of hospital-treated deliberate self-harm [3,4]. In general, psychotropic drugs, such as minor and major tranquilizers, selective serotonin reuptake inhibitors (SSRIs) and barbiturates are over-represented in IDOs [5-7], accounting for up to 80% of IDOs involving prescription drugs [8]. In Ireland, approximately 68% of all hospital-treated episodes of deliberate self-harm involve an IDO [3], and, of these, minor tranquilizers (benzodiazepines) are present in approximately 43% of cases [9]. This percentage is three-times that recorded in England [4], suggesting a particularly high risk for self-harm associated with this medication in Ireland and reflecting differences between the countries in terms of prescribing patterns and other sources of access to benzodiazepines.

Few studies, particularly in recent years, have focused on the source of medications taken in IDO acts. It has been consistently indicated that overdose patients primarily take their own medication in IDOs [5,10,11]. In addition, individuals who engage in IDOs are more likely to be depressed and to have previously engaged in self-harm compared with other self-harm patients who do not engage in IDOs [1,10,12]. While not all studies distinguish between types of prescribed medication in cases of IDO, factors such as single and multiple psychotropic drug use and repeat prescribing are identified as being strongly associated with repeat overdoses [12]. While psychotropic drugs have an established efficacy in treating psychiatric conditions, there is evidence of a link between increased prescribing rates and increased use in IDOs [13].

Restricting access to means has been shown to be one of the most effective strategies in both self-harm and suicide prevention [14]. In Ireland, in 2006, the withdrawal of Distalgesic (a prescription-only compound of paracetamol)

resulted in an 84% reduction in the rate of IDO presentations to hospital emergency departments (EDs) involving Distalgesic compared with the previous 3 years before it was withdrawn [15], without a significant substitution effect. Similar findings were observed in England and Wales in the 6 years following the withdrawal of co-proxamol from the market [16]. Based on a comparative study including data on intentional paracetamol overdoses in the UK and Ireland, an association was found between paracetamol pack sizes and the number of tablets involved in overdoses [17].

Knowing the extent to which patients who present to hospital EDs as a result of IDO have taken their prescribed medications in the act should inform preventive initiatives. If this is rare, then the focus should be placed on the availability of over-the-counter medicines, however, if this is common, then the revision of prescribing practices and other measures aimed at reducing access to relevant prescribed medications should be considered. Within this context, the present study aims to investigate the proportion of IDO patients with current prescriptions and the proportion of those that used their medicines in overdose acts, as well as factors associated with these patients.

Methods

■ Setting

The National Registry of Deliberate Self Harm records deliberate self-harm presentations to all hospital EDs in Ireland with ethical approval granted by the National Research Ethics Committee of the Faculty of Public Health Medicine [3]. For the purposes of this study, additional data to that routinely recorded were obtained from three hospital EDs in the southeast of Ireland. These hospitals were selected following an assessment of the completeness of data available in Irish hospital EDs, which found that the information required for the study was routinely recorded in these hospitals for the vast

majority of IDO presentations. The three study hospitals also had adjacent catchment areas, which together had a catchment population of 383,738 individuals, which is 8.5% of the total Irish population. It was also established that it was rare for study catchment area residents who had an IDO to present to a hospital other than the three selected.

■ Data collection

The registration systems of the three hospital EDs studied were screened over a continuous 6-month period and a consecutive series of 345 presentations were identified as meeting the definition of deliberate self-harm used by the Registry: “an act with a nonfatal outcome in which an individual deliberately initiates nonhabitual behavior, that without intervention from others will cause self-harm, or deliberately ingests a substance in excess of the prescribed or generally recognized therapeutic dosage, and which is aimed at realizing changes that the person desires via the actual or expected physical consequences” [18]. This definition was derived for an earlier European study and it is consistent with that used in the UK multicenter study [4]. This definition includes acts involving varying levels of suicidal intent and various underlying motives, such as loss of control, a cry for help or self-punishment. The definition also explicitly clarifies the definition of an IDO. Of the 345 self-harm presentations, there were 299 IDOs and information as to whether the patient had a prescription for psychotropic medication was available for 288 of these presentations. All data were extracted from charts in the EDs and medical records of the general hospitals.

■ Data analysis

χ^2 tests were used to assess the associations between two categorical variables. χ^2 tests for a trend were reported when one of the categorical variables was ordinal (e.g., age group) and there was evidence of a linear pattern in the association. A series of simple logistic regression models were estimated, including data only from those with current prescriptions (active at the time of presentation). The dichotomous dependent variable was medication taken from current prescription in the IDO act. Factors for which their association with the dependent variable reached ($p < 0.05$) or approached ($p < 0.1$) statistical significance were then entered together into a

multivariate logistic regression model to identify the factors independently associated with taking one’s own currently prescribed medication in IDO. This approach was adopted because the sample size was relatively limited and there was a degree of multicollinearity between some of the independent variables. Odds ratios and their 95% CIs are reported with the associated level of statistical significance. SPSS® Statistics Version (IBM, NY, USA) 20 was used for the statistical analysis.

Results

Most of the 288 IDO presentations involved female patients (59.9%) and half (50.4%) had a previous history of self-harm (Table 1). Other methods of self-harm were rarely involved. Self-cutting had taken place in 16 (5.6%) cases. Approximately two-thirds (68.4%) of the 288 IDO presentations were currently prescribed medication and 58.0% had a current prescription for psychotropic medication. More than half (53.8%) had used alcohol in combination with the overdose.

■ Drugs taken in IDO

The types of drugs taken in the 288 IDO presentations are detailed in Table 2. Almost half (45.8%) involved a minor tranquilizer and one in four (24.7%) involved a paracetamol-only medication.

As can be seen from Figure 1, there were clear differences in the drugs taken in IDOs by patients currently prescribed with psychotropic medication and other patients. Psychotropic medications were far more likely to be involved in patients with prescriptions for these drugs, whereas analgesics, most of which would be available over the counter, were more common in patients without a prescription for psychotropic medication. For all but three drugs (salicylate compound, opiate and tricyclic antidepressants) the level of significance was $p < 0.05$. There was only one gender difference in the drugs involved in IDO. One in five (20.5%) male IDOs involved a major tranquilizer, compared with just 5.8% of female acts ($\chi^2[1]: 14.35; p < 0.001$).

■ Contact with psychiatric services

Overall, one in three IDO patients was known to be in contact with psychiatric services at the time of the act. These patients were generally older (χ^2 for trend[1]: 26.14; $p < 0.001$; 37.9 vs 16.1% over 45 years), more likely to have

Table 1. Characteristics of intentional drug overdose presentations.

Characteristic	Patients; n (%)
Gender	
Male	117 (40.6)
Female	171 (59.4)
Age (years)	
<30	111 (38.5)
30–44	110 (38.2)
≥45	67 (23.3)
Medical card[†]	
Yes	151 (52.6)
No	136 (47.4)
History of self-harm[‡]	
Yes	140 (50.2)
No	139 (49.8)
Currently prescribed medication	
Yes	197 [§] (68.4)
No	91 (31.6)
Currently prescribed psychotropic medication	
Yes	167 (58.0)
No	121 (42.0)
Contact with psychiatric services	
Yes	95 (33.0)
No	193 (67.0)
Presentation day	
Weekday	199 (69.1)
Weekend	89 (30.9)
Presentation time[†]	
8 am–12 pm	17 (5.9)
12 pm–4 pm	45 (15.7)
4 pm–8 pm	51 (17.8)
8 pm–12 am	74 (25.8)
12am–4 am	71 (24.7)
4 am–8 am	29 (10.1)
Brought by ambulance[†]	
Yes	153 (53.7)
No	132 (46.3)
Alcohol taken	
Yes	155 (53.8)
No	133 (46.2)
Admitted to hospital	
Yes	266 (92.4)
No	22 (7.6)

[†]Data not known for one case.
[‡]Data not known for nine cases.
[§]Prescribed drugs unknown for one case.
[¶]Data not known for three cases.

a medical card entitling them to free medical care owing to their economic circumstances ($\chi^2[1]: 16.19; p < 0.001; 69.5$ vs 44.3%) and more likely to have a history of self-harm

($\chi^2[1]: 25.24; p < 0.001; 71.3$ vs 39.5%) than those not in contact with psychiatric services. All patients with psychiatric contact had a current prescription that compared with just over half (52.4%) of the other IDO patients ($\chi^2[1]: 65.48; p < 0.001$) and they were prescribed more medications (χ^2 for trend[1]: $117.56; p < 0.001; 52.6\%$ prescribed four to six medicines vs 5.7%).

■ **Prescription medication**

As can be seen in **Table 3**, the 196 IDO patients with a current prescription for a known medication were generally older (24.0% under 30 years vs 70.3% ; χ^2 for trend[1]: $54.18; p < 0.001$), more likely to have a medical card (64.8 vs 26.7% ; $\chi^2[1]: 35.98; p < 0.001$), to have a history of self-harm (58.6 vs 32.2% ; $\chi^2[1]: 16.73; p < 0.001$) and to be in current contact with psychiatric services (48.5 vs 0% ; $\chi^2[1]: 65.93; p < 0.001$). The vast majority had psychotropic medication on their current prescription (85.2%) and this most often involved a minor tranquilizer.

More than half ($95; 56.9\%$) of the 167 patients with a prescription for psychotropic medication were in current contact with psychiatric services, although this varied depending on the prescribed drug: major tranquilizer, 90.7% ; barbiturate, 72.4% ; other antidepressant/mood stabilizer, 72.1% ; SSRI, 61.4% ; and minor tranquilizer, 61.4% . It also varied depending on the number of prescribed psychotropic drugs. Respectively, $31.3, 62.9, 89.3$ and 100% of patients prescribed one, two, three or four psychotropic drugs were current psychiatric patients.

■ **Factors associated with taking one’s own prescribed medication in IDOs**

In total, 82.1% of those with a current prescription took medication from their prescription in the IDO act. From the univariate analysis, taking one’s own prescribed medication in IDO was more common in men, although this narrowly failed to reach statistical significance ($p = 0.055$). It was found to be more common with increasing patient age, with increasing number of prescribed medications and if a minor tranquilizer was one of the prescribed drugs (**Table 4**). Multivariate logistic regression indicated that having a prescription for minor tranquilizers was the only factor independently associated with a patient taking an IDO of their own medication (odds ratio: $4.27; p < 0.01; 95\%$ CI: $1.49–12.25$).

Discussion

The present study showed an association between prescription of psychotropic drugs and the use of these drugs in IDOs, in particular minor tranquilizers, SSRIs and major tranquilizers. Although limited research has been conducted in this area, the findings of the current study are consistent with previous studies [5,8,12,19]. However, the present study identified that having a prescription of a minor tranquilizer increases the risk of using prescribed psychotropic drugs in IDOs independent of any other studied risk factor. In their study of IDOs involving psychotropic drugs, Tournier *et al.* found that the proportion of IDOs involving a benzodiazepine was the same whether the patient had taken at least one of his/her own prescribed psychotropic drugs (79.0%) or not (81.6%) [5]. They suggested that their findings were consistent with those of an earlier Spanish study [19], which indicated that benzodiazepine overdose was independent of the individual's prescription [5]. This indicates the existence of differences between countries that may be related to prescribing practices, accessibility and availability of alternative interventions.

In our study, just under two thirds of IDO patients using minor tranquilizers were in contact with the psychiatric services at the time of the IDO. This suggests a high incidence of psychiatric disorders in this group. Given that psychiatric disorders are a significant risk factor for suicidal behavior, the findings highlight the challenge of prescribing medication for the

treatment of the patient's psychiatric disorder while assessing their risk for IDO.

The findings have implications for the prescription of psychotropic medication to patients at risk of suicidal behavior. More care and restraint in prescribing practices, and investigation into illegal sources in order to reduce the incidence of overdose would be recommended. A review by Smith and Tett demonstrated that studies using a multifaceted approach had the largest and most sustained reductions in the use of minor tranquilizers [20]. Elements considered to enhance the success of interventions include advice to patients to reduce or stop the use of minor tranquilizers, encourage an inter-professional approach, such as pharmacists alerting prescribers of potentially inappropriate prescribing of minor tranquilizers, and education of staff about alternative methods to treat insomnia and reduce anxiety [20]. In considering alternative drugs to minor tranquilizers, there is a need to be concerned about prescribing more toxic drugs as these may be used in IDOs, resulting in more severe consequences for the patient. Hawton and Harriss reported a decreasing trend in IDOs involving tranquilizers and sedatives, and an increase in antidepressant overdoses between 1978 and 1997, reflecting changes in prescribing patterns [21].

The significantly higher proportion of IDO patients with a history of previous self-harm among those who were in contact with psychiatric services at the time of the index IDO underlines the need for careful monitoring of

Table 2. Type of drug used in intentional drug overdose by gender.

Drug type	Male (n = 117); %	Female (n = 171); %	Total (n = 288); %
Salicylate	5.1	5.3	5.2
Salicylate compound	6.0	2.9	4.2
Paracetamol	18.8	28.7	24.7
Paracetamol compound	13.7	10.5	11.8
Opiate	4.3	6.4	5.6
Opiate compound	12.8	10.5	11.5
Minor tranquilizer	47.0	45.0	45.8
NSAIDs/other analgesic	13.7	16.4	15.3
Major tranquilizer	20.5	5.8	11.8
SSRI	12.8	16.4	14.9
TCAD	0.0	2.3	1.4
Other antidepressant/mood stabilizers	6.0	7.6	6.9
Antiepileptic/barbiturate	7.7	7.0	7.3
Other	20.5	18.7	19.4
Street drug	5.1	8.2	6.9

SSRI: Selective serotonin reuptake inhibitor; TCAD: Tricyclic antidepressant.

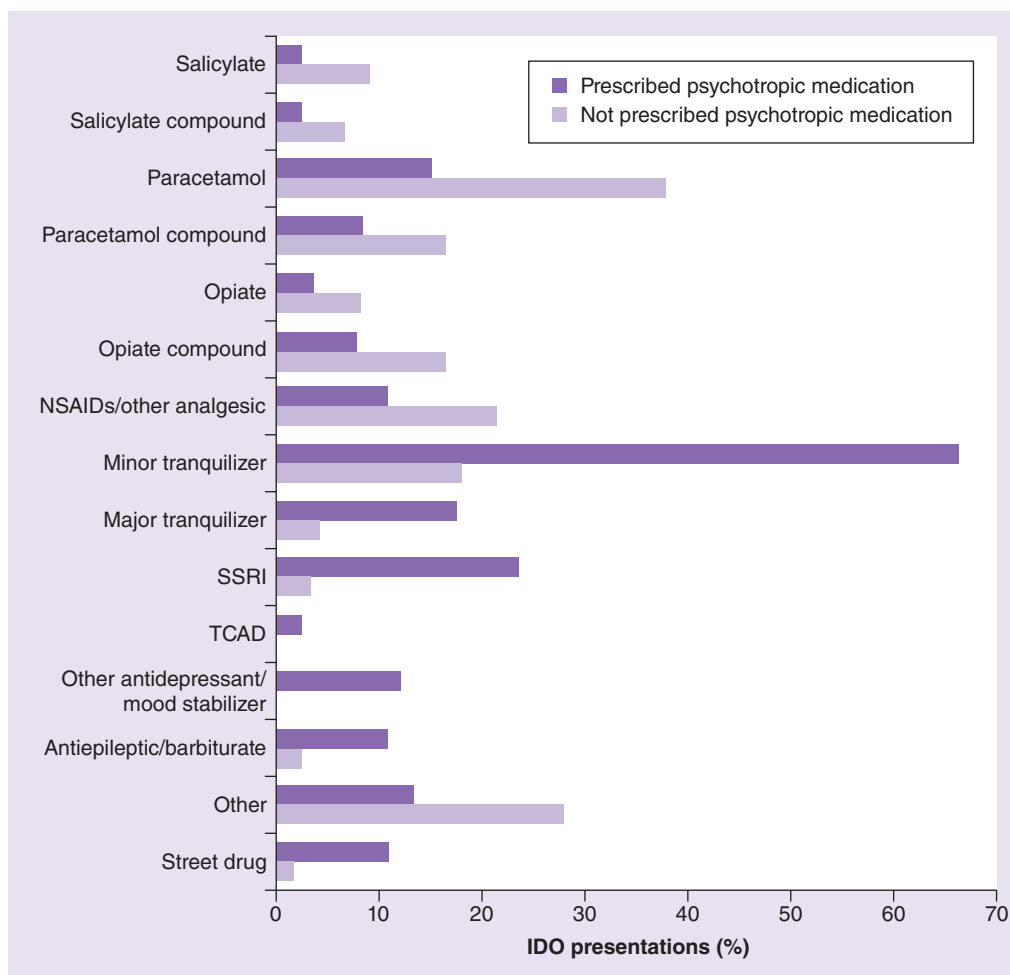


Figure 1. Type of drug used in intentional drug overdose for those prescribed and not prescribed psychotropic medication.

IDO: Intentional drug overdose; SSRI: Selective serotonin reuptake inhibitor; TCAD: Tricyclic antidepressant.

the use of medication among this subgroup of IDO patients. Consideration should also be given to the provision of complementary therapies, such as cognitive-behavioral therapy [14,22]. Based on a review by Otte, cognitive-behavioral therapy demonstrates both efficacy in randomized controlled trials and effectiveness in naturalistic settings in the treatment of adult anxiety disorders [23].

The risk of taking one's own prescribed medication in IDOs increased with age, an increasing number of prescription medications and if a minor tranquilizer was one of the medications prescribed. These findings are in line with a Swedish study, in which the use of minor tranquilizers was common in drug poisoning suicides among older people in which the terminal cause of death was often drowning [24]. This implies

that minor tranquilizers should be prescribed with caution for this age group.

■ **Strengths & limitations**

The study sample size was limited, although it had the merit of being drawn from a consecutive series of presentations to three hospital EDs operating in a geographically defined catchment area, thereby minimizing a range of potential biases. The data were extracted from hospital records and notes by Heavey who operated according to standard operating procedures and showed very high levels of agreement ($\kappa > 0.9$) with colleagues in case ascertainment. The study was constrained by the availability of information in hospital records and the reliability of the information obtained could not be established. Specifically, information was lacking regarding psychiatric

diagnosis, and the nature and duration of contact with psychiatric services and, in a minority of cases, generic drug names or drug types were specified instead of proprietary drug names.

The present study obtained data from the hospital ED setting on a consecutive series of IDO

patients, which meant that it was not possible to examine the risk of taking an IDO among patients with current prescriptions for a range of psychotropic medications. There is a need for studies to address this, and such studies will need to be based on patients in the primary care

Table 3. Characteristics of intentional drug overdose presentations by individuals with and without current prescriptions.

Characteristic	Current prescription	
	Yes (n = 196) [†] ; n (%)	No (n = 91); n (%)
Gender		
Male	85 (43.4)	31 (34.1)
Female	111 (56.6)	60 (65.9)
Age (years)		
30	47 (24.0)	64 (70.3)
30–44	88 (44.9)	22 (24.2)
≥45	61 (31.1)	5 (5.5)
Medical card[‡]		
Yes	127 (64.8)	24 (26.7)
No	69 (35.2)	66 (73.3)
History of self-harm[§]		
Yes	112 (58.6)	28 (32.2)
No	79 (41.4)	59 (67.8)
Alcohol taken		
Yes	111 (56.6)	44 (48.4)
No	85 (43.4)	47 (51.6)
Contact with psychiatric services		
Yes	95 (48.5)	0 (0)
No	101 (51.5)	91 (100)
Prescribed medications (n)		
1	50 (25.5)	–
2	55 (28.1)	–
3	30 (15.3)	–
4–6	61 (31.1)	–
Psychotropic medication prescribed		
Yes	167 (85.2)	–
No	29 (14.8)	–
Type of psychotropic medication prescribed		
Minor tranquilizer	127 (64.8)	–
Major tranquilizer	43 (21.9)	–
SSRI	70 (35.7)	–
Tricyclic AD	3 (1.5)	–
Other AD/mood stabilizer	43 (21.9)	–
Barbiturate	29 (14.8)	–
Took own prescribed medication in IDO		
Yes	161 (82.1)	–
No	35 (17.9)	–

[†]Excludes one patient whose prescribed medication was unknown.
[‡]Not know for one case.
[§]Not know for nine cases.
AD: Antidepressant; IDO: Intentional drug overdose; SSRI: Selective serotonin reuptake inhibitor.

Table 4. Factors associated with taking own prescribed medication in intentional drug overdose.

Characteristic	Took own medication; n (%)	Crude OR	95% CI	Adjusted OR	95% CI
Gender					
Male	75 (88.2)	2.18	0.98–4.83	2.30	0.97–5.46
Female	86 (77.5)	1.00	Ref	1.00	Ref
Age (years)					
<30	32 (68.1)	1.00	Ref	1.00	Ref
30–44	75 (85.2)	2.70*	1.16–6.33	1.53	0.58–4.07
≥45	54 (88.5)	3.62*	1.33–9.81	1.58	0.49–5.04
Medical card					
Yes	107 (84.3)	1.49	0.71–3.13	–	–
No	54 (78.3)	1.00	Ref	–	–
History of self-harm					
Yes	93 (83.0)	1.15	0.54–2.42	–	–
No	64 (81.0)	1.00	Ref	–	–
Alcohol taken					
Yes	93 (83.8)	1.29	0.62–2.69	–	–
No	68 (80.0)	1.00	Ref	–	–
Contact with psychiatric services					
Yes	82 (86.3)	1.76	0.83–3.73	–	–
No	79 (78.2)	1.00	Ref	–	–
Prescribed medications (n)					
1	34 (68.0)	1.00	Ref	1.00	Ref
2	44 (80.0)	1.88	0.77–4.58	0.91	0.32–2.56
3	26 (86.7)	3.06	0.91–10.25	1.21	0.30–4.91
4–6	57 (93.4)	6.71**	2.07–21.72	2.40	0.59–9.71
Minor tranquilizer prescribed					
Yes	117 (92.1)	6.65***	2.95–14.96	4.27**	1.49–12.25
No	44 (63.8)	1.00	Ref	1.00	Ref
Major tranquilizer prescribed					
Yes	38 (88.4)	1.85	0.67–5.11	–	–
No	123 (80.4)	1.00	Ref	–	–
SSRI prescribed					
Yes	61 (87.1)	1.76	0.77–4.01	–	–
No	100 (79.4)	1.00	Ref	–	–
Other AD/mood stabilizer prescribed					
Yes	34 (79.1)	0.77	0.33–1.80	–	–
No	127 (83.0)	1.00	Ref	–	–
Barbiturate prescribed					
Yes	27 (93.1)	3.33	0.75–14.69	–	–
No	134 (80.2)	1.00	Ref	–	–

*p < 0.05; **p < 0.01; ***p < 0.001.
AD: Antidepressant; OR: Odds ratio; Ref: Reference group; SSRI: Selective serotonin reuptake inhibitor.

setting or psychiatric outpatients. Longitudinal studies from these settings would make it possible to disentangle the links between depression, prescription of antidepressants and engaging in suicidal behavior.

Conclusion

Prescription of psychotropic drugs was associated with the use of these drugs in IDOs, in particular minor tranquilizers. Having a prescription of a minor tranquilizer increased the risk of using

prescribed psychotropic drugs in IDOs independent of any other factor. The risk of taking one's own prescribed medication in IDOs increased with age, an increasing number of prescription medications and if a minor tranquilizer was one of the medications. The findings underline the need for more care and restraint in prescribing practice, as well as addressing illegal sources in order to reduce the incidence of IDOs.

Financial & competing interests disclosure

The Irish National Registry of Deliberate Self Harm is funded by the Health Service Executive's National Office for Suicide Prevention. The authors have no other relevant

affiliations or financial involvement with any organization or entity with a financial interest in or financial conflict with the subject matter or materials discussed in the manuscript apart from those disclosed.

No writing assistance was utilized in the production of this manuscript.

Ethical conduct of research

The authors state that they have obtained appropriate institutional review board approval or have followed the principles outlined in the Declaration of Helsinki for all human or animal experimental investigations. In addition, for investigations involving human subjects, informed consent has been obtained from the participants involved.

References

- Haw C, Hawton K, Houston K, Townsend E. Psychiatric and personality disorders in deliberate self-harm patients. *Br. J. Psychiatry* 178, 48–54 (2001).
- Skegg K. Self-harm. *Lancet* 366, 1471–1483 (2005).
- Perry IJ, Corcoran P, Fitzgerald AP, Keeley HS, Reulbach U, Arensman E. The incidence and repetition of hospital-treated deliberate self-harm: findings from the world's first registry. *PLoS One* 7(2), e31663 (2012).
- Hawton K, Bergen H, Casey D *et al.* Self-harm in England: a tale of three cities. Multi-centre study of self-harm. *Soc. Psychiatry Psychiatr. Epidemiol.* 42(7), 513–521 (2007).
- Tournier M, Grolleau A, Cougnard A, Molimard M, Verdoux H. Factors associated with choice of psychotropic drugs used for intentional drug overdose. *Eur. Arch. Psychiatry Clin. Neurosci.* 259, 86–91 (2009).
- Szkolnicka B. Prescription and over-the-counter medication in deliberate self-poisoning and accidental overdosing – preliminary study. *Przegl. Lek.* 62(6), 568–571 (2005).
- Bernardes SS, Turini C, Matsuo T. Profile of suicide attempts using intentional overdose with medicines, treated by a poison control center in Paraná State, Brazil. *Cad. Saude Publica* 26(7), 1366–1372 (2010).
- Buckley NA, Dawson AH, Whyte IM, Hazell P, Meza A, Britt H. An analysis of age and gender influences on the relative risk for suicide and psychotropic drug self-poisoning. *Acta Psychiatr. Scand.* 93(3), 168–71 (1996).
- National Suicide Research Foundation. *National Registry of Deliberate Self Harm Annual Report 2011*. National Suicide Research Foundation, Cork, Ireland (2012).
- Large RG, Epston A, Kirker JM, Kydd RR. Self-poisoning: who supplies the drugs? *NZ Med. J.* 91(656), 218–221 (1980).
- Alsen M, Ekedahl A, Lowenheim P, Nimeus A, Regnell G, Traksman-Bendz L. Medicine self-poisoning and the sources of the drugs in Lund, Sweden. *Acta Psychiatr. Scand.* 89(4), 255–261 (1994).
- Prescott LF, Highley MS. Drugs prescribed for self-poisoners. *BMJ* 290(6482), 1633–1636 (1985).
- Forster DP, Frost CE. Medicinal self-poisoning and prescription frequency. *Acta Psychiatr. Scand.* 71(6), 657–674 (1985).
- Mann JJ, Apter A, Bertolote J *et al.* Suicide prevention strategies: a systematic review. *JAMA* 294(16), 2064–2074 (2005).
- Corcoran P, Reulbach U, Keeley HS, Perry IJ, Hawton K, Arensman E. Use of analgesics in intentional drug overdose presentations to hospital before and after the withdrawal of Distalgesic from the Irish market. *BMC Clin. Pharmacol.* 10(6), 1–8 (2010).
- Hawton K, Bergen H, Simkin S, Wells C, Kapur N, Gunnell D. Six-year follow-up of impact of co-proxamol withdrawal in England and Wales on prescribing and deaths: time-series study. *PLoS Med.* 9(5), e1001213 (2012).
- Hawton K, Bergen H, Simkin S *et al.* Impact of different pack sizes of paracetamol in the United Kingdom on intentional overdoses: a comparative study. *BMC Public Health.* 11, 460 (2011).
- Schmidtke A, Bille-Brahe U, DeLeo D *et al.* Attempted suicide in Europe: rates, trends and sociodemographic characteristics of suicide attempters during the period 1989–1992. Results of the WHO/ EURO Multicentre Study on Parasuicide. *Acta Psychiatr. Scand.* 93(5), 327–38 (1996).
- Baca-García E, Diaz-Sastre C, Saiz-Ruiz J, de Leon J. How safe are psychiatric medications after a voluntary overdose? *Eur. Psychiatry* 17, 466–470 (2002).
- Smith AJ, Tett SE. Improving the use of benzodiazepines – is it possible? A non-systematic review of interventions tried in the last 20 years. *BMC Health Serv. Res.* 10, 321 (2010).
- Hawton K, Harriss L. Deliberate self-harm in young people: characteristics and subsequent mortality in a 20-year cohort of patients presenting to hospital. *J. Clin. Psychiatry* 68(10), 1574–1583 (2007).
- National Institute for Health and Clinical Excellence (NICE). *Self-Harm: The Short-Term Physical and Psychological Management and Secondary Prevention of Self-Harm in Primary and Secondary Care*. British Psychological Society, Leicester, UK (2004).
- Otte C. Cognitive behavioural therapy in anxiety disorders: current state of the evidence. *Dial. Clin. Neurosci.* 13(4), 413–421 (2011).
- Carlsten A, Waern M, Holmgren P, Allebeck P. The role of benzodiazepines in elderly suicides. *Scand. J. Public Health* 31, 224–228 (2003).