Characteristics of Drug Poisonings Seen in the Emergency Department of an Urban Hospital

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ABSTRACT

Background: Drug poisoning, either intentional or non-intentional, is a frequent diagnosis in the emergency department (ED), necessitating patient management from multiple services.

Objective: To describe the drug poisonings seen in the ED of a large academic urban hospital.

Methods: This retrospective descriptive study used 3 years of data (2018–2020) abstracted from the hospital's electronic medical record system and linked to validated, coded extracts from the Canadian Institute for Health Information Discharge Abstract Database. Patients with a diagnosis of acute drug poisoning who presented to the ED were identified on the basis of International Statistical Classification of Diseases and Related Health Problems, 10th revision, Canada (ICD-10-CA) codes, and data were collected for demographic characteristics, the drugs involved, in-hospital management, and inpatient outcomes. Patients with diagnosis of an acute drug reaction, inebriation, or nondrug or in-hospital poisoning were excluded. Data were stratified and analyzed in relation to the intent of drug poisoning.

Results: A total of 2983 visits for drug poisoning, involving 2211 unique patients (mean age 38.3 [standard deviation 16.2] years, 54.7% female), were included, yielding an overall incidence rate of 15.7 drug poisonings per 1000 ED visits (8.1 intentional, 6.4 non-intentional, and 1.3 unknown intent). Among the 1505 intentional drug poisonings, the most prevalent drug sources were antidepressants (n = 405, 26.9%), benzodiazepines (n = 375, 24.9%), and acetaminophen (n = 329, 21.9%); in contrast, opioids (n = 594, 48.1%) were most prevalent for the 1236 non-intentional poisonings. For 716 (24.0%) of the poisoning visits, the patient was admitted to acute care services, and the in-hospital mortality rate was 1.0% (n = 31). In addition, 111 patients (9.0%) with non-intentional drug poisoning left against medical advice. Finally, for 772 (25.9%) of the poisoning visits, the patient returned to the ED after discharge with a subsequent drug poisoning.

Conclusions: Drug poisonings are a common cause of visits to urban EDs. They are rarely fatal but are associated with substantial utilization of hospital resources and considerable recidivism.

Keywords: emergency, poisoning, overdose, opioids

RÉSUMÉ

Contexte : L'intoxication médicamenteuse, intentionnelle ou non, est un diagnostic fréquent dans le service des urgences (SU); elle nécessite la prise en charge des patients par plusieurs services.

Objectif : Décrire les intoxications médicamenteuses observées dans le SU d'un grand hôpital universitaire urbain.

Méthodologie : Pour cette étude rétrospective et descriptive, des données contenues dans le système de dossiers médicaux électroniques de l'hôpital et liées à des extraits validés et codés de la base de données sur les congés des patients de l'Institut canadien d'information sur la santé pendant 3 ans (2018-2020) ont été utilisées. Les patients ayant reçu un diagnostic d'intoxication médicamenteuse aiguë qui se sont présentés à l'urgence ont été identifiés sur la base des codes de la Classification statistique internationale des maladies et des problèmes de santé connexes, 10e version, Canada (CIM-10-CA), et des données ont été recueillies pour les caractéristiques démographiques, les médicaments impliqués, la prise en charge à l'hôpital et les résultats pour les patients hospitalisés. Les patients présentant un diagnostic de réaction médicamenteuse aiguë, d'ébriété ou d'intoxication non médicamenteuse ou à l'hôpital ont été exclus. Les données ont été stratifiées et analysées en fonction de l'intention de l'empoisonnement médicamenteux.

Résultats : Au total, 2983 cas mettant en cause 2211 patients (âge moyen 38,3 [écart type 16,2] ans, dont 54,7 % de femmes) ont été inclus; les résultats ont donné un taux d'incidence global de 15,7 intoxications médicamenteuses pour 1000 visites au SU (8,1 intentionnelles; 6,4 non intentionnelles; et 1,3 intention inconnue). Parmi les 1505 intoxications médicamenteuses intentionnelles, les médicaments les plus répandues étaient les antidépresseurs (n = 405, 26,9 %), les benzodiazépines (n = 375, 24,9 %) et l'acétaminophène (n = 329, 21,9 %); les opioïdes (n = 594, 48,1 %) étaient les plus répandus parmi les 1236 intoxications non intentionnelles. Dans 716 des cas (24,0 %), le patient a été admis dans les services de soins aigus. Le taux de mortalité hospitalière était de 1,0 % (n = 31). Par ailleurs, 111 patients (9,0 %) présentant une intoxication médicamenteuse non intentionnelle ont quitté l'hôpital contre avis médical. Enfin, dans 772 des cas d'intoxication (25,9 %), le patient est retourné à l'urgence après sa sortie à cause d'une intoxication médicamenteuse ultérieure.

Conclusions : Les intoxications médicamenteuses sont une cause fréquente de visites dans les SU urbains. Ils sont rarement mortels, mais sont associés à une utilisation importante des ressources hospitalières et à une récidive considérable.

Mots-clés : urgence, empoisonnement, surdose, opioïdes

INTRODUCTION

Although the term "poisoning" is frequently associated with an act of malicious intent, "drug poisoning" in medical terminology is used to describe a drug overdose, an accidental ingestion, or intentional self-harm and is defined as taking a substance incorrectly with resultant harm to the patient.[1] In the United States, drug poisonings constitute the main diagnosis for 0.4%–2% of all visits to the emergency department (ED).[2,3] In Canada, there were 13 438 hospitalizations for a self-inflicted injury in 2014, of which 11 564 (86.1%) were for a poisoning.[4] The local epidemiologic surveillance informatics system in Hamilton, Ontario, estimated that the city's EDs would see 4732 visits for drug misuse and 1924 visits for overdose annually by 2021, a 10-fold increase over the previous decade.[5] In 2022, the city's paramedics responded to 814 incidents of opioid poisoning alone.[6]

In terms of the causes of drug poisonings, a retrospective review of hospital discharge abstracts in British Columbia showed that antiepileptics, sedatives, hypnotics, psychotropics, and non-opioid analgesics were the most common causes of hospitalization from intentional poisonings, whereas narcotics and psychedelics were most common for non-intentional poisonings.[7] Opioid poisonings are a particular concern across Canada, given their frequency and the burden of avoidable death and morbidity. A recent report by the Government of Canada noted an 89% increase in opioid-related deaths in 2020 compared with 2019, at approximately 17 deaths per day, with the majority being non-intentional (96%) and involving fentanyl (82%).[8] The UK National Institute for Health and Care Excellence self-harm guidelines for acute management and prevention of recurrence recommends that self-harmed patients seen in the ED receive psychosocial assessments, be considered for antidotes, and have appropriate samples collected (e.g., blood).[9] Following initial presentation, these patients should be assessed for their risk of repetition of self-harm and risk of underlying mental health disorders to determine if referral, discharge, or admission is appropriate.

A literature review of the MEDLINE database from 1996 onward did not yield any study characterizing drug poisoning cases seen at a Canadian hospital. We therefore aimed to characterize drug poisonings seen in the ED of a large academic urban hospital in Ontario, Canada, including incidence, patient demographic characteristics, medical management, and in-hospital outcomes.

METHODS

Study Design and Setting

We conducted a descriptive, retrospective case series using data from the electronic medical record (EMR) system (Epic Systems Corporation, https://www.epic.com/about) at St Joseph's Healthcare Hamilton, a large academic urban hospital that also houses the regional mental health facility and emergency psychiatry specialty services for a catchment population of approximately 2.3 million people. Ethics approval was received from the Hamilton Integrated Research Ethics Board (#12680-C). Reporting of this study adhered to the STROBE guidelines for reporting observational cohort studies.[10]

Participants

Eligible participants were those 18 years or older seen in the ED or Urgent Care Centre (UCC) with a diagnosis of drug poisoning between January 1, 2018, and December 31, 2020. Cases were identified on the basis of International Statistical Classification of Diseases and Related Health Problems, 10th revision, Canada (ICD-10-CA) diagnostic codes (details in Appendix 1). We excluded cases of poisoning caused by non-drug substances, an adverse drug reaction, or acute intoxication/inebriation, cases that occurred as the result of a medical error, and cases of drug poisoning that occurred in hospital.

Data Sources

We reviewed data for all patients registered at triage and seen by a physician in the ED or UCC during the study period (n = 330 642 visits) as per the process flow shown in Appendix 2. The data were obtained from the Canadian Institute for Health Information (CIHI), specifically the national Discharge Abstract Database,[11] which covers all hospital inpatient medical and surgery admissions (acute care admissions), and the National Ambulatory Care Reporting System[12] database, which covers all emergency visits, including psychiatric emergency and UCC visits. Mental health unit data are not included in the Discharge Abstract Database; therefore, for patients with a diagnosis of drug poisoning who were eventually transferred to a hospital mental health unit, their data covers the period from triage to arrival on the mental health unit. Details on data collected and their sources are outlined in Appendix 3, with details on coding provided in Bell and others[13] (see tables in Appendix D of that resource).

Variables

Drug poisoning episodes were identified on the basis of relevant CIHI codes, which also provided information on the drugs involved and the intent of the drug poisoning (if known). In-hospital management and outcomes were collected from 2 main sources: data submitted to CIHI for each hospital visit and data abstracted from the patient's EMR for the selected visit. This approach has been validated as a method for obtaining accurate data.[14] The method applied for data collection of CIHI variables uses "gold standard" CIHI coding procedures and diagnostic extraction methodology and has been shown previously to have a high degree of accuracy, relative to coroners' data, in algorithms

that use ICD-10-CA codes for poisoning to identify prescription opioid–related deaths in Canada.[15] CIHI has validated this coding process through comparison with manually abstracted data, showing that nonmedical information, such as demographic characteristics, is 97% accurate, whereas diagnosis codes are 85% accurate.[16,17] The data collected from the EMR system were structured, that is, data were entered in retrievable fields for patient encounters, including ordered consults, laboratory tests, and antidotes. We are finalizing data validation in the EMR system for exposures, outcomes, diagnostics, demographics, and patient flow, with excellent results.[18]

Statistical Analysis

Visits for drug poisoning were organized according to coded non-intentional, intentional, and unknown-intent groupings for the analysis and description (details in Appendix E of Bell and others[13]). The incidence rate of acute drug poisonings leading to ED visits was described per 1000 ED visits. Because this denominator is specific to ED visits, we excluded UCC visits for which the patient did not later present to the ED (a total of 49 visits); for all aspects of the study other than incidence rate, UCC visits were included. We then examined the intent of the drug poisoning and any changes that occurred once the COVID-19 pandemic was declared (March 11, 2020). The continuous and categorical data were organized by groupings (details in Appendix E of Bell and others[13]) and described as means with standard deviations and incidences with percentages, respectively. The data were analyzed on the basis of number of visits; therefore, patients with multiple visits for different drug poisonings are represented multiple times in the data analysis.

RESULTS

Participants

Our study identified 3704 ED visits for drug poisoning between January 2018 and December 2020. After removal of duplicate visits for the same poisoning event, there were a total of 2983 visits for drug poisoning by 2211 unique patients (Figure 1), with a mean length of stay after acute-care admission of 2.2 days per visit. Most visits occurred in the ED, with 49 (1.6%) of the visits occurring only at the UCC. The patients' mean age was 38.3 (standard deviation 16.2) years, and 1632 (54.7%) were female (Table 1). The cohort with intentional drug poisoning was younger (mean age 36.2 vs 41.0 years) and had a higher proportion of females (67.1% vs 42.5%) relative to the cohort with non-intentional drug poisoning. Patients with non-intentional drug poisoning were more likely to be homeless (10.8%) or to have a chronic health condition (12.5%), whereas patients with an intentional drug poisoning frequently had an underlying mental health disorder (47.4%).

Drugs Involved

The drugs most frequently involved in drug poisoning visits were opioids, benzodiazepines, antidepressants, acetaminophen, antiepileptics, and antipsychotics (Table 1). Among intentional drug poisonings, antidepressants (26.9%), benzodiazepines (24.9%), and acetaminophen (21.9%) were the most prevalent, whereas non-intentional drug poisonings were predominately due to opioids (48.1%)—primarily fentanyl (15.9%), heroin (11.5%), and other opioids (15.0%)—followed by benzodiazepines (9.1%) and acetaminophen (7.5%). More than 1 drug was involved in 38.9% of the intentional poisonings and 20.0% of the non-intentional poisonings. Overall, each drug poisoning event involved a mean of 1.5 drugs.

Incidence

Between January 1, 2018, and December 31, 2020, visits for drug poisonings overall occurred at a rate of 15.7 per 1000 ED visits, with opioid poisonings observed at a rate of 4.3 per 1000 ED visits. Most of the drug poisonings were intentional (50.5%), followed by non-intentional (41.4%) and unknown intent (8.1%). After the COVID-19 pandemic was declared on March 11, 2020, an increase in the overall rate of drug poisonings was observed, from 15.5 per 1000 ED visits up to March 11 to 16.4 per 1000 after March 11 (Table 2). Many patients (25.9%) had multiple ED visits

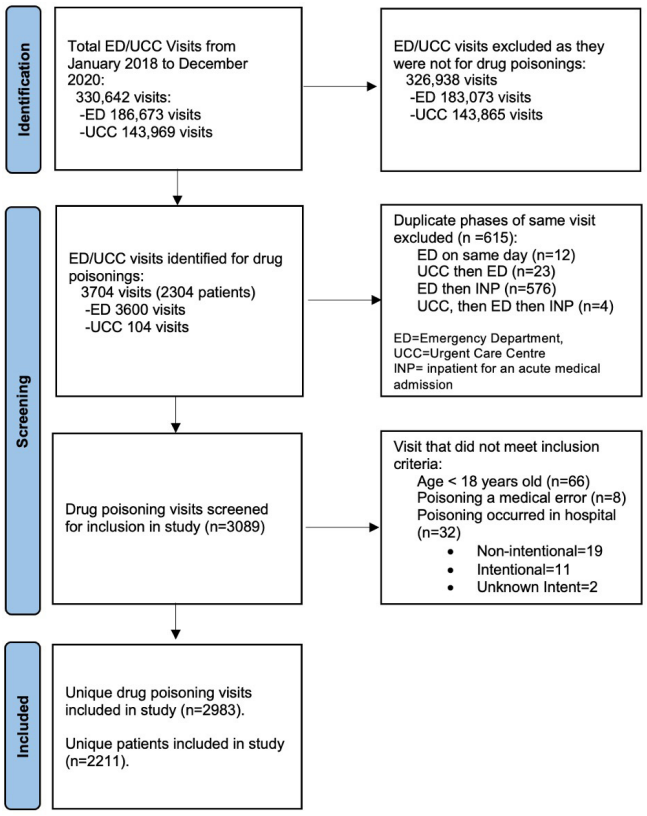

FIGURE 1. Emergency visits for drug poisoning, January 2018 through December 2020.

with a diagnosis of drug poisoning during the study period. Over the 3-year study period, patients with a diagnosis of intentional drug poisoning averaged 1.3 poisoning-related ED visits, compared with 1.2 poisoning-related ED visits for patients with a diagnosis of non-intentional drug poisoning.

Hospital Outcomes and Resources

At the time of discharge or admission to a mental health unit, psychiatry or general internal medicine was the most responsible provider service for the majority of visits involving an intentional drug poisoning (72.7%), whereas for visits involving a non-intentional poisoning, emergency medicine remained the most responsible provider service, indicating non-admission to an acute medical unit (Table 3). Overall, for 24.0% of the poisoning-related ED visits, the patients were admitted and captured in the inpatient Discharge Abstract Database (Table 2). During the initial inpatient non–mental health admission, small percentages of the ED visits led to formal consults from mental health consult services (8.5% of intentional poisonings vs 1.1% of non-intentional poisonings) or addictions services (6.4% of intentional poisonings and 6.3% of non-intentional poisonings), as outlined in Table 3. Antidote use was uncommon, in keeping with the lack of availability of antidotes for many

TABLE 1. Description of Patients with ED/UCC Visits for Drug Poisoning

Characteristic	Poisoning Group; No. (%) of Cases[a]			
	All Poisonings (*n* = 2983)	Intentional (*n* = 1505)	Non-intentional (*n* = 1236)	Unknown Intent (*n* = 242)
Demographic				
Age (years) (mean ± SD)	38.3 ± 16.2	36.2 ± 15.7	41.0 ± 16.6	37.5 ± 14.0
Sex, female	1632 (54.7)	1010 (67.1)	525 (42.5)	97 (40.1)
Homeless	211 (7.1)	61 (4.1)	133 (10.8)	17 (7.0)
Past medical history[b]				
Mental health disorder	866 (29.0)	714 (47.4)	121 (9.8)	31 (12.8)
Addiction disorder	400 (13.4)	210 (14.0)	164 (13.3)	26 (10.7)
Chronic health condition	278 (9.3)	102 (6.8)	154 (12.5)	22 (9.1)
Drug involved				
Prescription opioids excluding fentanyl	174 (5.8)	97 (6.4)	70 (5.7)	7 (2.9)
Fentanyl	238 (8.0)	26 (1.7)	197 (15.9)	15 (6.2)
Heroin	182 (6.1)	10 (0.7)	142 (11.5)	30 (12.4)
Other opioids[c]	259 (8.7)	39 (2.6)	185 (15.0)	35 (14.5)
Cocaine	105 (3.5)	30 (2.0)	58 (4.7)	17 (7.0)
Other psychostimulants[d]	163 (5.5)	51 (3.4)	95 (7.7)	17 (7.0)
Cannabis	61 (2.0)	11 (0.7)	43 (3.5)	7 (2.9)
Psychedelics[e]	87 (2.9)	9 (0.6)	57 (4.6)	21 (8.7)
Acetaminophen	436 (14.6)	329 (21.9)	93 (7.5)	14 (5.8)
Salicylates	33 (1.1)	26 (1.7)	7 (0.6)	0 (0)
NSAIDs	149 (5.0)	122 (8.1)	26 (2.1)	1 (0.4)
Tricyclic antidepressants	47 (1.6)	41 (2.7)	5 (0.4)	1 (0.4)
Other antidepressants	449 (15.1)	364 (24.2)	74 (6.0)	11 (4.5)
Benzodiazepines	515 (17.3)	375 (24.9)	112 (9.1)	28 (11.6)
Antiepileptics[f]	337 (11.3)	253 (16.8)	75 (6.1)	9 (3.7)
Antipsychotics	273 (9.2)	210 (14.0)	54 (4.4)	9 (3.7)
Antiallergic medications and antiemetics[g]	152 (5.1)	118 (7.8)	29 (2.3)	5 (2.1)
Poisonings involving > 1 drug	868 (29.1)	585 (38.9)	247 (20.0)	36 (14.9)
No. of drugs involved per poisoning episode (mean ± SD)	1.5 ± 1.0	1.7 ± 1.1	1.3 ± 0.7	1.2 ± 0.5

ED = emergency department, NSAID = nonsteroidal anti-inflammatory drug, SD = standard deviation, UCC = Urgent Care Centre.
[a]Except where indicated otherwise.
[b]Disorders defined as addiction, mental health disorders, and selected chronic health disorders (chronic pain, HIV, cancer, cardiovascular disease, diabetes, chronic obstructive pulmonary disease, dementia, kidney disease, liver cirrhosis) are listed in Appendix C of Bell and others.[13]
[c]Other opioids include drugs such as tramadol, buprenorphine, pentazocine, and Paracodin (dihydrocodeine hydrorhodanide).
[d]Other psychostimulants (with abuse potential) include drugs such as dextroamphetamine, methylphenidate, and caffeine.
[e]Psychedelics include drugs such as lysergic acid diethylamide, mescaline, and psilocin.
[f]Antiepileptics include drugs such as carbamazepine, phenytoin, and valproic acid.
[g]Antiallergic medications and antiemetics include drugs such as diphenhydramine, dimenhydrinate, and cetirizine.

drug poisoning types; however, even for opioid and acetaminophen poisonings, the respective antidotes—naloxone and *N*-acetylcysteine—were used for less than half of the relevant events.

Details on all outcomes and the disposition of each patient are shown in Table 2. During the ED visit or admission to an acute care unit, 31 (1.0%) of the patients died, with a higher mortality rate among patients admitted to an acute care unit than among those seen only in the ED (3.4% vs 0.3%). In 2332 (78.2%) of the poisoning cases, the patient was discharged home from the ED or the acute care unit. Overall, the patient left against medical advice in approximately 6% of cases, including 111 (9.0%) of those involving a non-intentional drug poisoning and 41 (2.7%) of those involving intentional drug poisoning. In 296 (19.7%) of the cases with diagnosis of an intentional drug poisoning, patients were discharged to another acute care facility or service, mainly our own inpatient psychiatric units, compared with 59 (4.8%) of the cases involving a non-intentional drug poisoning.

DISCUSSION

To the authors' knowledge, this is the first Canadian study to describe a large cohort of patients with drug poisonings presenting to the ED of an urban academic hospital. The

TABLE 2. Outcomes of ED/UCC Visits with Diagnosis of Drug Poisoning

Outcome	Poisoning Group; No. (%) of Cases[a]			
	All Poisonings (*n* = 2983)	Intentional (*n* = 1505)	Non-intentional (*n* = 1236)	Unknown Intent (*n* = 242)
Incidence per 1000 ED visits[b]				
Pre-COVID (January 2018 to March 11, 2020)	15.5	7.9	6.1	1.5
Post-COVID (March 12 to December 31, 2020)	16.4	8.6	7.5	0.4
Total study period	15.7	8.1	6.4	1.3
Admission and stay				
Admission to an acute care unit	716 (24.0)	414 (27.5)	262 (21.2)	40 (16.5)
Length of stay (days) (mean ± SD)[c]	2.2 ± .8	2.2 ± 5.3	2.4 ± 6.3	2.0 ± 6.4
Admitted to SCU[d]	251 (8.4)	146 (9.7)	90 (7.3)	15 (6.2)
Recidivism[e]				
Revisit to the ED	772 (25.9)	440 (29.2)	277 (22.4)	55 (22.7)
No. of ED visits per patient with drug poisoning (mean ± SD)	1.3 ± 4.3	1.3 ± 7.8	1.2 ± 3.0	1.1 ± 3.0
Disposition from ED without acute care admission[f]				
No. of patients	2267	1091	974	202
In-hospital mortality	7 (0.3)	0	4 (0.4)	3 (1.5)
Left against medical advice	142 (6.3)	30 (2.7)	91 (9.3)	21 (10.4)
Transfer to another acute care facility or speciality service[g]	225 (9.9)	175 (16.0)	41 (4.2)	9 (4.5)
Discharged home	1853 (81.7)	868 (79.6)	819 (84.1)	166 (82.2)
Admission to a non-acute care centre[h]	40 (1.8)	18 (1.6)	19 (2.0)	3 (1.5)
Disposition from ED with acute care admission[f]				
No. of patients	716	414	262	40
In-hospital mortality	24 (3.4)	7 (1.7)	15 (5.7)	2 (5.0)
Left against medical advice	40 (5.6)	11 (2.7)	20 (7.6)	9 (22.5)
Transfer to another acute facility or speciality service[g]	150 (20.9)	121 (29.2)	18 (6.9)	11 (27.5)
Discharged home	479 (66.9)	261 (63.0)	200 (76.3)	18 (45.0)
Admission to a non-acute care centre[h]	23 (3.2)	14 (3.4)	9 (3.4)	0

ED = emergency department, SCU = special care unit, SD = standard deviation, UCC = Urgent Care Centre.
[a]Except where indicated otherwise.
[b]Excluding cases seen only at the UCC (49 cases total: 42 non-intentional and 7 unknown intent).
[c]Based solely on acute care inpatients at authors' centre; does not include patients admitted to another facility or admitted to a mental health unit.
[d]SCU = intensive care unit, medical step-down unit, and/or surgical step-down unit.
[e]Includes only visits to the ED with a diagnosis of drug poisoning.
[f]The proportion of poisoning visits where the patient left the ED without an acute care admission was 76.0% (*n* = 2267); the proportion where the patient left with an acute care admission was 24.0% (*n* = 716).
[g]Includes inpatient non-acute care, including specialty services that may be within St Joseph's Healthcare Hamilton (inpatient rehabilitation, inpatient psychiatry, and inpatient chronic/complex continuing care), military medical facilities, and subacute care where such care is provided within acute care hospitals.
[h]Includes long-term care homes (24-hour nursing), mental health and/or addiction treatment centres, and hospice/palliative care facilities.

patient numbers in this study were not as high as predicted for the area; however, our institution's ED is only 1 of 3 EDs in the area that regularly see local patients. In addition, street outreach teams that focus on opioid and other substance use disorders frequently treat patients in the community, who subsequently decline to come to hospital. In contrast to a review of Ontario and Alberta discharge abstracts for the period 2010–2018, which showed that ED visits for non-intentional drug poisonings were nearly twice as common as those for intentional poisonings,[19] we found a higher incidence of intentional poisonings. This may be partly related to the inclusion of children in the Ontario–Alberta study, the inclusion of substances other than drugs in the definition of poisoning (e.g., chemicals, foods), and the fact that our hospital is the regional facility for psychiatric emergency, inpatient psychiatry, and forensic psychiatry. Both studies showed an increasing rate of poisonings over time. The demographic characteristics of patients in our study aligned with those reported in previous studies completed in British Columbia, the United States, and Europe, with a younger and predominately female population having diagnosis of intentional drug poisoning and an older, predominately male population having diagnosis of non-intentional poisoning.[7,20-22] Our study has added large numbers to this general information about patients with drug poisoning, but has also demonstrated high rates of recidivism and patients leaving against medical advice where they were allowed to do so (i.e., not subject to involuntary admission for psychiatric assessment).

The high recidivism rate in the cohort with intentional poisoning, whereby patients in 29.2% of the cases involving a diagnosis of intentional poisoning revisited the ED during the study period with a subsequent diagnosis of drug poisoning, points to an ongoing need for more effective interventions, both pharmacologic and nonpharmacologic, to prevent repetitive self-harm. Given the frequent

TABLE 3. Resource Utilization for ED/UCC Visits with Diagnosis of Drug Poisoning

Resource	Poisoning Group; No. (%) of Cases[a]			
	All Poisonings (*n* = 2983)	Intentional (*n* = 1505)	Non-intentional (*n* = 1236)	Unknown Intent (*n* = 242)
Most responsible physician service				
General internal medicine	629 (21.1)	350 (23.3)	243 (19.7)	36 (14.9)
Psychiatry	853 (28.6)	744 (49.4)	82 (6.6)	27 (11.2)
Critical care	126 (4.2)	73 (4.9)	44 (3.6)	9 (3.7)
Surgery	4 (0.1)	1 (0.1)	3 (0.2)	0 (0)
Emergency	1371 (46.0)	337 (22.4)	864 (69.9)	170 (70.2)
No. of medical specialties involved in patient's care (mean ± SD)	2.6 ± 1.5	300 ± 1.4	2.2 ± 1.5	2.2 ± 1.5
Selected consults ordered[b]				
Mental health[c]	147 (4.9)	128 (8.5)	14 (1.1)	5 (2.1)
Social work	52 (1.7)	24 (1.6)	22 (1.8)	6 (2.5)
Addictions	193 (6.5)	96 (6.4)	78 (6.3)	19 (7.9)
Pharmacy	47 (1.6)	24 (1.6)	16 (1.3)	7 (2.9)
Selected antidotes ordered[d]				
Activated charcoal	67 (2.2)	62 (4.1)	3 (0.2)	2 (0.8)
N-Acetylcysteine	150 (5.0)	119 (7.9)	29 (2.3)	2 (0.8)
Naloxone	342 (11.5)	92 (6.1)	211 (17.1)	39 (16.1)
Fomepizole	5 (0.2)	3 (0.2)	2 (0.2)	0 (0)
Intralipid	3 (0.1)	3 (0.2)	0 (0)	0 (0)
Selected blood/urine drug testing				
Urine drug screening	276 (9.3)	148 (9.8)	99 (8.0)	29 (12.0)
Acetaminophen	1055 (35.4)	629 (41.8)	330 (26.7)	96 (39.7)
Salicylate	1046 (35.1)	629 (41.8)	322 (26.1)	95 (39.3)
Ethanol	1050 (35.2)	628 (41.7)	327 (26.5)	95 (39.3)
Blood testing for other drug(s)	111 (3.7)	66 (4.4)	32 (2.6)	13 (5.4)

ED = emergency department, SD = standard deviation, UCC = Urgent Care Centre.
[a]Except where indicated otherwise.
[b]For each drug poisoning encounter, more than 1 selected consult might be ordered for the same patient. However, if there were multiple orders for the same type of consult for an individual patient, that patient was included only once in the analysis.
[c]Not a full representation of involvement of mental health services, because psychiatry was the most responsible physician service in many cases.
[d]Antidotes stocked are listed in Appendix C of Bell and others.[13]

involvement of psychiatric medications in these poisonings, such as antidepressants, antipsychotics, and antiepileptics, these interventions alone may not be effective. Some of these pharmacologic therapies, such as gabapentin and benzodiazepines, may be problematic because they can be used to treat underlying mental health disorders but are often also used as a source of intentional poisoning. In our study, many of the ED visits for intentional poisoning involved more than 1 drug (38.9%), and these combinations are known to be associated with increased risk.[22,23] This elevated risk is particularly important given that our study and others have suggested that 15%–25% of patients will attempt a subsequent intentional poisoning within 1 year of a previous attempt.[24] Several systematic reviews of hospital-based interventions to reduce self-harm have shown weak evidence supporting inpatient care over discharge from ED and staff training, whereas consults obtained, psychosocial work-up, and length of intervention in hospital did not modify the risk of repeated self-harm.[25,26] Conversely, a Cochrane systematic review of adults with any type of recent self-harm events, including poisoning and/or self-injury, that resulted in presentation to hospital found low- to moderate-quality evidence that relative to usual care, cognitive–behavioural psychotherapy may lead to fewer repetitive self-harm incidents.[27] In our study, patients with diagnosis of a non-intentional drug poisoning had a relatively high rate of leaving against medical advice (9.0%) compared with that reported from EDs in the United States in 2007 (1.2%); however, the US study included children, who would not be allowed to leave against medical advice.[21] In addition, opioids are now the predominant drug cause of non-intentional poisoning, and long waits for care combined with patient concern about withdrawal drives high rates of leaving against medical advice. At St Joseph's Healthcare Hamilton, the Addictions/Substance Disorder service, which provides transitional and follow-up care for patients with opioid addiction, was not fully organized at the start of our study. Increasing involvement of addictions services is an important area to address, given evidence showing that patients who leave against medical advice have nearly a 2-fold risk of death or readmission within 30 days.[28]

One strength of this study was the large sample size from a single large urban public hospital with comprehensive services for poisonings, including regional mental health services. Another strength was the comprehensive collection of variables, including validated data. In addition, this study provides recent data that seem to be missing from the literature. The availability of current data is important to gauge the success of mental health and addiction programs, as well as the flow and types of illicit substances causing harm.

The study also had several limitations. First, we did not review primary records in patients' EMRs to validate the accuracy of data extracted from the EMR system, such as consults, laboratory data, and antidotes.[29] However, as outlined above, the key diagnosis, demographics, and disposition data were based on extraction and coding by CIHI coding experts, who represent the "gold standard" for coding of hospital data across Canada. Second, the determination of the intent of a drug poisoning was based on CIHI coding, which itself is based on the patient's report to their provider team. This detail may not always be accurate and was missing for 242 (8.1%) of drug poisoning events. Finally, our study dealt only with the pre–mental health admission component of visits and admissions for drug poisonings, so our data underestimate overall use of hospital resources and mental health services workload.

The high number of acute drug poisonings, combined with the relatively low mortality rate, suggests that current practices for the acute management of these cases are reasonable. However, the high recidivism rate and the number of patients leaving against medical advice suggest areas where improvement is required in coordination of postdischarge care and management of mental health and addictions in the community. Expansion of this study to include data from multiple hospitals, both large and small, may provide further evidence to indicate if this is a macroscopic or microscopic issue. Policies and funding should aim to investigate implementation of more effective and safer treatments for common mental health and addictions diagnoses while patients are present in the ED or are receiving inpatient care. Order sets can be designed for optimal management of patients' withdrawal symptoms to prevent departure before patients have received their full spectrum of care. Implementation of strategies in the ED to rapidly triage patients to services such as cognitive–behavioural psychotherapy after their acute crisis may be an initial step in reducing the high rate of recidivism in this population. Optimizing research into harm reduction strategies for the cohort with non-intentional poisoning is critical, given the predominance of opioid poisonings in this population, the high incidence of fentanyl involvement, and the known and increasing opioid-related mortality in Canada.[30,31]

CONCLUSION

Our analysis of a large cohort of patients presenting with drug poisoning at an urban Ontario hospital with comprehensive services suggests that drug poisonings are common, involve a variety of drugs, and are associated with high rates of recidivism but few in-hospital deaths. Initiatives and policies to better promote and implement supports, treatments, and referrals for common mental health and addictions diagnoses are urgently needed.

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APPENDIX 1: Coding algorithm.

This study utilized ICD-10-CA (International Statistical Classification of Diseases and Related Health Problems, 10th Revision, Canada) coding for population identification and parts of the data collection.

- At St Joseph's Healthcare Hamilton, like other Canadian hospitals, ICD-10-CA codes for each admission are applied to patients' discharge summaries in accordance with the Canadian Coding Standards and the Canadian Institute for Health Information's standard procedures.
- Each drug poisoning is coded with the drug(s) involved (see Bell et al.,[1] Appendix D, Table 5), the manifestation of the drug poisoning, the intent of the drug poisoning (see Bell et al.,[1] Appendix D, Table 4), and the location where it occurred as shown in Figure A1.

The full appendix material for this article is available in Bell et al.[1]

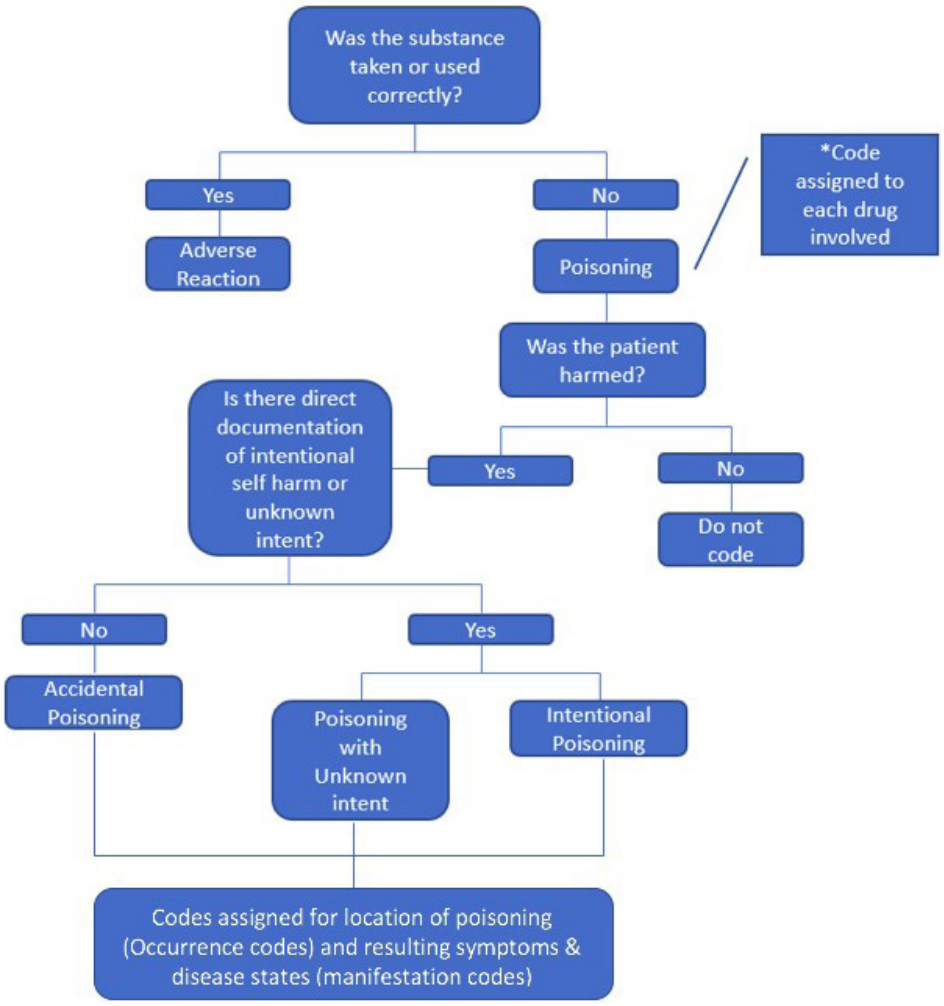

FIGURE A1. Drug poisoning coding pathway as per Canadian Coding Standards.[2-4] *Each drug involved in the poisoning event was assigned a code from the International Statistical Classification of Diseases and Related Health Problems, 10th Revision, Canada (ICD-10-CA).

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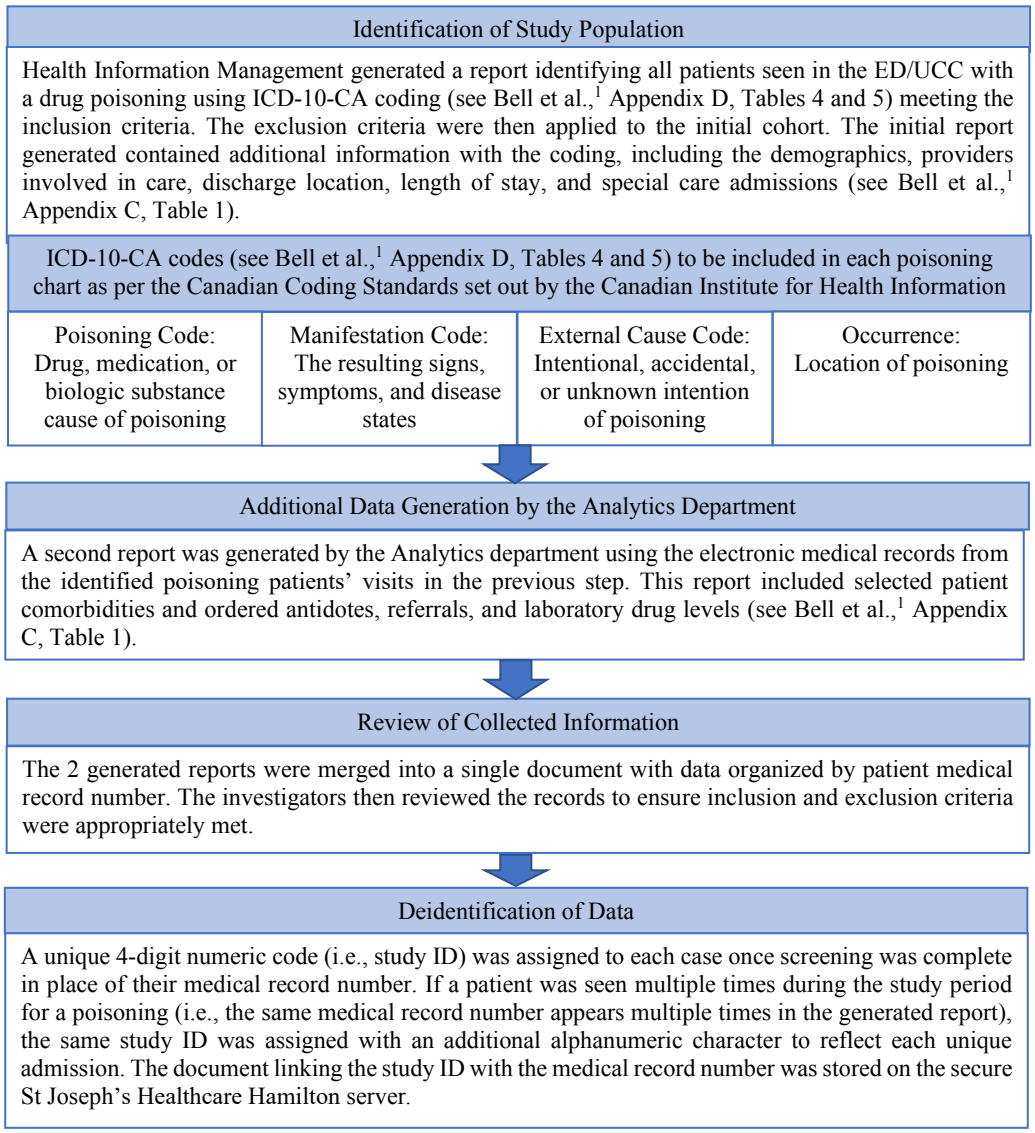
APPENDIX 2: Data collection process.

The full appendix material for this article is available in Bell et al.[1]



ICD-10-CA = International Statistical Classification of Diseases and Related Health Problems, 10th Revision, Canada.

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APPENDIX 3: Details about data collection.

Variable	Description	Location of Data
Poisoning		
Intention	ICD-10-CA coding (see Bell et al.,[1] Appendix D, Table 4)	CIHI
Drug involved	ICD-10-CA Coding (see Bell et al.,[1] Appendix D, Table 5)	CIHI
In-hospital management		
Antidotes ordered	Ontario Poison Control recommended antidotes and activated charcoal (see Bell et al.,[1] Appendix C, Table 2)	EMR
Team referrals ordered	Teams referred to assist in care (see Bell et al.,[1] Appendix C, Table 3)	EMR
Urine and blood drug levels	Toxicology levels ordered during admission (see Bell et al.,[1] Appendix C, Table 3)	EMR
Providers specialities involved in care	Medical specialities/disciplines of providers	EMR
In-hospital outcomes		
Length of stay	Time from presentation at ED to discharge from acute medical unit (days)	CIHI
Admission to special care units	Admission to an intensive care unit, medical step-down unit, or combination of such (see Bell et al.,[1] Appendix E)	CIHI
Discharge location	Discharge location from ED or acute medical unit (see Bell et al.,[1] Appendix E, Tables 8 and 9)[1]	CIHI
Demographic		
Age	Years	CIHI
Gender	Female, male, nonbinary	CIHI
Forward Sortation Area	First 3 characters of postal code	CIHI
Comorbidities	Medical conditions of interest (see Bell et al.,[1] Appendix C, Table 3)	EMR

CIHI = Canadian Institute for Health Information; ED = emergency department; EMR = electronic medical record; ICD-10-CA = International Statistical Classification of Diseases and Related Health Problems, 10th Revision, Canada.

The full appendix material for this article is available in Bell et al.[1]

Reference

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