

Characteristics of Drug Poisonings Presenting to the Emergency Department: An Electronic Medical Record Database Analysis

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1.0 Abstract

Rationale: Drug poisonings are a frequent diagnosis in the Emergency Department (ED), requiring patient management from multiple services. Although there is considerable research detailing the fatal opioid overdose epidemic, little is known about drug poisonings as a whole. Our objective was to describe the drug poisonings seen in the ED at St. Joseph's Hospital Hamilton (SJHH), a large academic urban hospital.

Methods: This study was a retrospective, descriptive study using data abstracted from Dovetale – Epic®, an electronic medical record for calendar years 2018 through 2020. Patients were identified by ICD-10 drug poisoning codes and data were collected on demographics, drugs involved, hospital management and outcomes to the end of the acute admission. Data were stratified by the intent of drug poisoning.

Results: In total, 2983 drug poisoning visits were included, patient mean age 38.3 years (SD 16.2), 54.7% female, yielding an overall incidence rate of 16.0 drug poisonings/1000 ED visits (8.1 intentional, 6.6 non-intentional and 1.3 unknown). The intentional drug poisoning cohort was younger (mean 36.1 +/-15.7 versus 41.0 +/- 16.6 years) with a higher proportion of females (67.1% versus 42.5%) than the non-intentional cohort. The most prevalent drugs for intentional drug poisonings were antidepressants (26.9%), benzodiazepines (24.9%) and acetaminophen (21.9%) compared to opioids (any opioid, 46.9% including fentanyl, 15.9%, heroin, 11.5%, other opioids, 15.0%) for non-intentional. An antidote was ordered for 26.7% of patients; most commonly N-acetylcysteine for intentional (7.9%) and naloxone for non-intentional (17.1%). The rate of return visit to the ED with a subsequent drug poisoning was 25.9% within a mean follow up of 18.4 months. Mental Health Services (Psychiatric Emergency referral or consult) and Addictions Services consults were ordered in 33.5% and 6.5% of patients respectively. Only 716 (24.0%) of patients were admitted for inpatient care from the ED with an accompanying acute in-hospital mortality rate of 1.0%. The mean length of stay for the initial ED stay and acute hospitalization was 2.2 days (SD 5.8).

Conclusion: This study illustrates a high rate of hospital utilization due to drug poisoning associated with several drugs and suggesting a significant rate of poor outcome, resource utilization and recidivism.

2.0 Introduction

2.1 Background

Drug Poisoning Epidemiology

Drug poisonings are a frequent diagnosis in the United States representing 0.4-2% of all ED visits^{1,2}. The term poisoning is frequently associated with an act of malicious intent, however in medical terminology it is an overarching term that can also be used to describe a drug overdose, an accidental ingestion, or intentional self-harm³. According to the Canadian Coding Standards (CCS), a poisoning is defined as a substance taken incorrectly that results in harm. This definition can include both intentional, taking a drug or substance with the purpose of self-harm, or non-intentional, accidentally taking a drug/substance or too much of said drug/substance⁴. These definitions exclude acute intoxications, inebriations, and adverse drug reactions (Appendix A).

Across Canada in 2014, there were 13,438 hospitalizations for a self-inflicted injury, of which 11,564 (86.1%) were a poisoning⁵. In 2012, poisonings accounted for 23.3% of suicides in Canada. Ontario Poison Control (OPC) reported 52,414 calls to the OPC Centre in 2019. Of these, 40% were for a patient in the ED or admitted to a healthcare facility, 1.5% had life threatening symptoms, and 0.1% resulted in death⁶. Locally, the City of Hamilton's Public Health Service provides weekly summary reports on ED visits for drug misuse by incorporating triage data into an epidemiologic surveillance informatics system. At the current rate of ED visits in Hamilton, it is estimated there will be 4732 visits for drug misuse and 1924 visits for overdose in 2021. Hamilton rates non-intentional drug overdose in the top 3 of the most burdensome health outcomes in the city⁷.

Drugs Involved

In the OPC report, 6 of the top 10 classes of medications responsible for consults with them were pain medications (acetaminophen, acetylsalicylic acid, etc.), anxiolytics and sleeping pills, antidepressants, antihistamines, cough and cold and cardiovascular medications⁶. A retrospective chart review completed in the EDs of Montreal characterizing 369 patients who attempted suicide between 2009 and 2010, found similar medications were used in overdose attempts⁸. A retrospective review of hospital discharge abstracts in British Columbia using drug poisoning ICD-10 codes found antiepileptics, sedatives, hypnotics, psychotropics and non-opioid analgesic to be the most common causes of hospitalization from intentional drug poisonings versus narcotics and psychedelics for non-intentional drug poisonings⁹. Opioid poisonings are a particular concern Canada-wide, given their frequency and burden of avoidable accidental death and morbidity. A recent report by the Government of Canada notes an 89% increase in opioid-related deaths in 2020 compared to 2019; of the approximately 17 deaths per day, the majority were non-intentional (96%) and involved fentanyl (82%)¹⁰.

Management of Drug Poisonings

A drug poisoning can be difficult to diagnose, as patients often present with unexplained symptoms complicated by altered mental status and the lack of reliable information. Once diagnosed, and in those who present immediately following a drug poisoning, techniques to decrease the absorption (e.g. decontamination via administration of charcoal) or to counteract the damaging effect of the poison (e.g. antidotes) are utilized. The best practices from the Institute for Safe Medication Practices (ISMP) for targeted medications in acute hospitals recommends that antidotes, reversal agents and rescue agents be readily available along with order sets and protocols to support expeditious emergency administration¹¹. OPC provides guidelines on the recommended antidotes to have stocked in the acute care settings¹². This list contains treatments such as n-acetylcysteine (NAC), which prevents serious hepatotoxicity following acetaminophen overdoses, and naloxone to reverse the respiratory depression of opioid overdose^{13,14}. The NICE self-harm guidelines for the acute management and

prevention of recurrence recommends self-harm patients in the ED receive psychosocial assessments, be considered for gastrointestinal decontamination and/or activated charcoal if they present early, have appropriate samples collected (e.g. blood) for analysis and providing clinicians should have access to a poisoning centre for further contact¹⁵. Following initial presentation, patients should be assessed for their risk of repetition of self-harm and underlying mental health disorder to determine if referral, discharge, or admission is appropriate.

St. Joseph's Healthcare Hamilton (SJHH)'s Charlton campus is a 600-bed teaching hospital in downtown Hamilton with an ED that sees 66,000 visits per year and includes the emergency psychiatry specialty services for the region¹⁶. Beginning in December 2017, SJHH transitioned to the electronic medical record (EMR) system, Dovetale, powered by Epic®.

2.2 Study Purpose and Objectives

A literature review of the MEDLINE database back to 1996 did not reveal any study characterizing drug poisonings presenting to an Ontario hospital. Our objective in this study was to characterize drug poisonings seen initially in the ED at SJHH, a large academic urban hospital.

Primary Objective:

- To describe the incidence of all acute drug poisonings presenting to the ED of St. Joseph's Healthcare Hamilton

Secondary Objectives:

- To characterize the demographics (sex, age, location), comorbidities and intention of patients with a drug poisoning and the drugs involved.
- To describe the management of these drug poisonings e.g., antidotes, psychiatric assessments, and laboratory drug testing, etc.
- To describe the in-hospital outcomes (mortality, intensive care admissions, length of stay and readmission/recidivism)
- To detail the impact of the Covid-19 pandemic on the incidence of drug poisonings

3.0 Methods

3.1 Design

The study was as a descriptive, retrospective case series involving data analysis of the SJHH EMR system, Dovetale - Epic®.

3.2 Inclusion and Exclusion Criteria

Inclusion Criteria

- Patients 18 years or older seen in the SJHH ED or Urgent Care (UC) diagnosed with a poisoning that was the result of a drug, biologic agent, medication, or a combination of such, between January 1st, 2018, and December 31st, 2020.

Exclusion Criteria:

- Poisoning caused by a non-drug substance
- Patients diagnosed with an adverse drug reaction, an acute intoxication/inebriation or drug poisoning was a result of a medical error
- Drug poisoning occurred in hospital

3.3 Data Collection

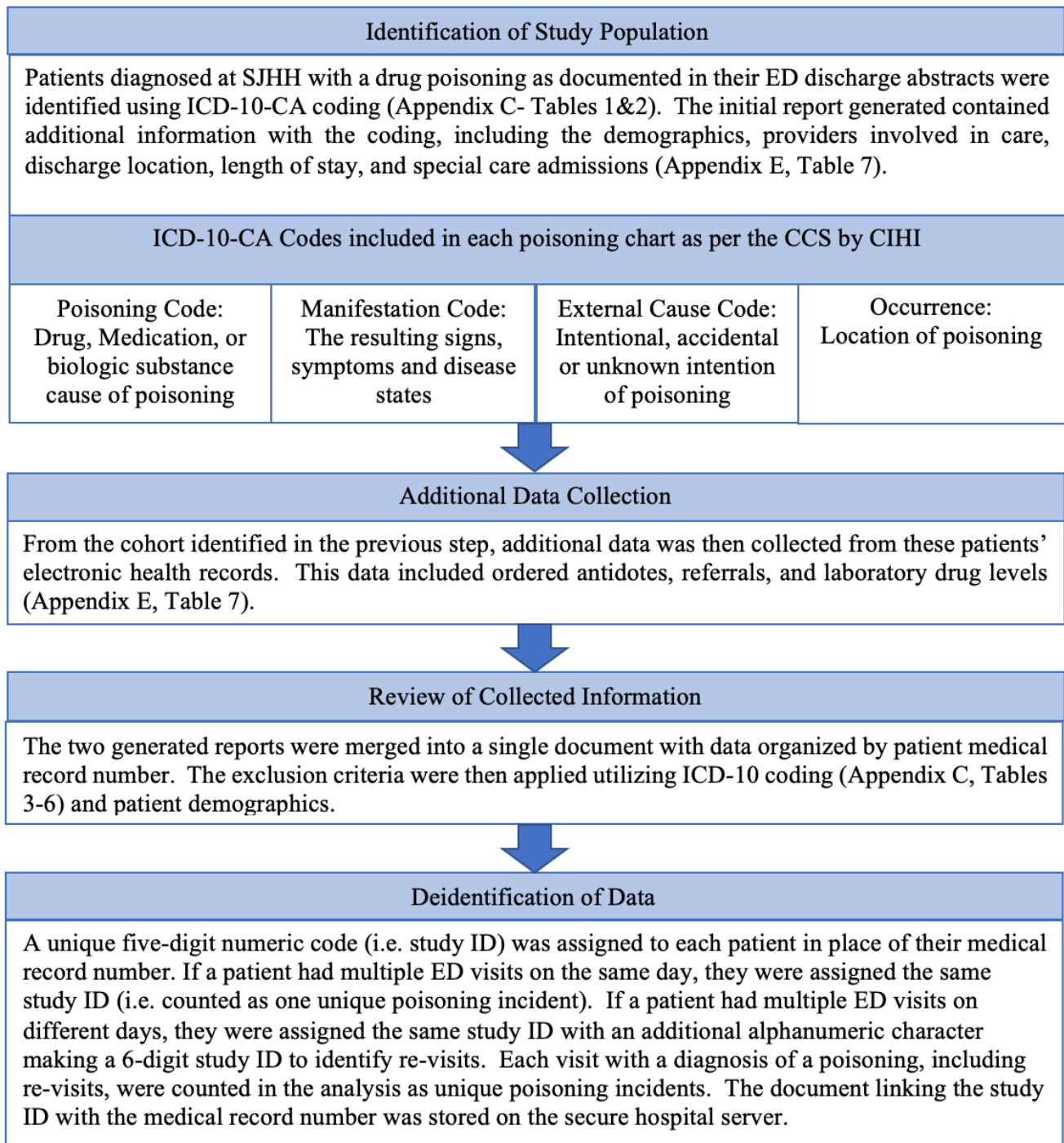
We received ethics approval for this study from the Hamilton Integrated Research Ethics Board (Project #12680-C). The Health Data and Information Team searched Dovetale-Epic® EMRs of patients registered at triage and seen by a physician in our ED or UC centre from January 1st 2018 to December 31st 2020. From this search, all medical records of ED/UC visits for a drug poisoning were identified if they had at least one ICD-10 poisoning and 'external cause' code assigned to their visit (Figure 1). These codes are assigned to a patient's visit by the Health Data and Information Team if a drug poisoning was a current diagnosis and was treated or contributed to the use of hospital resources. External cause codes are assigned to visits where a diagnosis is made during such visit that is the result of an environmental event or circumstance^{3,17}. In relation to drug poisonings, self-harm is the environmental event/circumstance which can then be described and coded as intentional, non-intentional or unknown intent. For drug poisonings, external cause codes are assigned with a drug poisoning code that provides context to the drug involved in the drug poisoning event. Examples of the diagnostic codes included are shown in Table 1.

The ICD-10 drug poisoning codes are grouped into 15 drug classes which describe the individual drugs or families involved in the drug poisoning (Appendix C-Table 2). The external cause codes which describe the intent of the drug poisoning are categorized into 3 classes (Appendix C-Tables 1)¹⁷. The Canadian Coding Standards provides guidance on how to apply the ICD-10 codes to improve reproducibility and accuracy of documenting poisonings (Appendix B-Figure 1)³. A similar search was done by the Health Data and Information Team to identify all medical records of patients admitted to hospital to an acute medical unit through the ED with a drug poisoning diagnosis. An acute medical unit excludes mental health units, therefore patients admitted to an acute mental health unit from the ED will have only their ED data included in this study.

Table 1: Examples of codes utilized to identify the drug poisoning population in the ED

ICD-10 Code Class	Subclass of Codes	Example
External Cause Codes (3 subclasses of codes) ^a	Nonintentional (X40-X44)	X42- Non-intentional poisoning by Narcotics and psychodysleptics
	Intentional (X60-X64)	X62- Intentional Self-Poisoning by Narcotics and psychodysleptics
	Unknown Intent (Y10-Y14)	Y12- Unknown Intent of Poisoning by Narcotics and psychodysleptics
Drug Poisoning Codes (15 different subclasses of codes) ^a	Nonopioid analgesics, antipyretics and antirheumatics (T39)	T39.1- 4-aminophenol derivatives
	Narcotics and psychodysleptics (T40)	T40.4- Fentanyl
	Psychotropic drugs, not classified elsewhere (T43)	T43.0- tricyclic and tetracyclic antidepressants

^a For a full listing of codes refer to Appendix C: Tables 1 and 2.

Figure 1: Data collection process

From the cohort identified by the Health Data and Information Team, additional data were retrieved from two main parts of the EMR: CIHI and non-CIHI data (Appendix E: Data Collection). CIHI data was coded data by the Health Data and Information Team for patients' visits and included the patient demographics, comorbidities, intent of drug poisoning, drugs involved, most responsible physician (MRP) and in-hospital outcomes. We utilized the MRP as a surrogate to understand the services responsible for the care of the patients diagnosed with a drug poisoning during their ED visit and/or admission to an acute medical unit. In all visits where the MRP was a psychiatrist, data collection was limited to the ED. In-hospital outcomes were collected from discharge dispositions and are presented separately for patients discharged from the ED versus an inpatient medical unit.

Non-CIHI data was collected from the patient's medical record during the selected visit; this included mental health, addictions, pharmacy and social work consults, orders for medications on the recommended antidote list, and selected lab orders for drug screens and levels (Appendix D, List 2-4). The collected data were from the National Ambulatory Care Reporting System (NACRS) and Discharge Abstract Database (DAD) which include admissions to ED and acute medical units respectively. Data were not collected from Ontario Mental Health Reporting System (OMHRS), which holds psychiatric unit admissions.

3.4 Data Organization

To prepare the collected data for descriptive analysis, the qualitative data such as the comorbidities, drug poisoning codes and discharge locations were organized into groupings as detailed in Appendix F -Tables 1-8. Drug poisoning codes containing all different possible drug causes were organized into 32 unique groupings based on clinical significance or if the drug was estimated to be involved in greater than 3% of the drug poisonings (Appendix F -Table 2). Using the external cause codes (Appendix F, Table 1), visits identified were organized into non-intentional, intentional, and unknown intent drug poisonings for the analysis and description. If a patient was admitted to an acute medical unit and visits existed for both the ED and inpatient unit, the inpatient codes were given preference over the ED codes. This decision was made with the assumption that there would be more information available to improve the accuracy of the diagnosis and therefore the assigned codes. This applied to all collected data except labs, consults and antidotes, where no preference was given to inpatient versus ED data and both sets of data were used conjointly.

3.5 Statistical Analysis

The incidence rate of acute drug poisonings leading to ED visits was described per 1000 ED visits. To calculate the incidence rate, the number of ED visits for the specified cohort was divided by the total number of patients to register at triage and see a physician in the ED from January 1st, 2018 to December 31st, 2020 (186673 ED visits) and then multiplied by 1000 to give the incidence rate per 1000 ED visits. This rate was further described in relation to the intent of the drug poisoning, opioids, and the date the Covid-19 pandemic was declared (January 1st, 2018 to March 10th, 2020 and March 11th, 2020 to December 31st, 2020, inclusive). For the rates before and after the pandemic was declared, the denominator was reflective of the number of ED visits during these two time periods (141035 and 45638 ED visits, respectively).

Descriptive analysis was completed to describe the demographics, incidence, drug causes, services involved and resource utilization for non-intentional, intentional, and unknown intent drug poisonings. The quantitative outcome measures (continuous data) were described using mean and a respective standard deviation. The qualitative outcome measures (categorical data), which were grouped together as described above, were presented with incidence and respective percentage. The data were analyzed per number of visits. Patients with multiple visits for a drug poisoning would be represented multiple times in the data analysis. For the demographics, the age, number of female patients, and visits where the patient was diagnosed with a selected comorbidity were summed and then divided by the total number of ED visits within that selective cohort (i.e. total drug poisonings, intentional, non-intentional and unknown intent). This mean value was utilized to present the mean data such as average age in our population. If the value was to be presented as a percentage, such as the percent of population that was female, this value was then multiplied by 100. A similar approach was used in the statistical analysis for admission to special care units, most responsible provider (MRP), selected consults, labs, antidotes, and disposition. This approach was also utilized for the drugs involved in the acute drug poisonings, therefore the percentage calculated reflects how many drug poisoning visits involved such drug class. In doing so, it allowed for a single drug poisoning event to involve multiple contributing drugs.

To calculate the percent of acute drug poisoning visits to the ED that were for a subsequent drug poisoning during our study period (referred to as a re-visit), the number of visits for patients in each cohort that had multiple visits were summed. The number of individual patients with multiple visits was then subtracted from the summed visits before being divided by the total number of visits. To present as a percentage this number was then multiplied by 100. For the mean number of visits per patient, the total ED visits for each cohort were divided by the number of unique patients represented in that respective cohort. Patients may be represented in multiple cohorts: 2211 patients in all drug poisonings, 1120 patients in intentional poisoning, 1038 patients in non-intentional and 227 in the unknown intent poisoning cohort. To determine the average follow up time during our study period, the number of days between the ED visit for an acute drug poisoning and the end of our study period (December 31st, 2020) was calculated for each visit. This value was then summed and divided by the total number of ED visits in the respective cohort to give the mean follow up time for each cohort.

For the length of stay, a visit was assigned a minimum value of 1 day if the patient presented to the ED. For each subsequent day a patient was in the ED or admitted to an acute medical unit, the additional days were then tallied. The length of stay for each visit was then the sum of their days in the ED and on a medical unit. The length of stay of all visits within each cohort was then summed and divided by the total number of respective visits to present the mean length of stay.

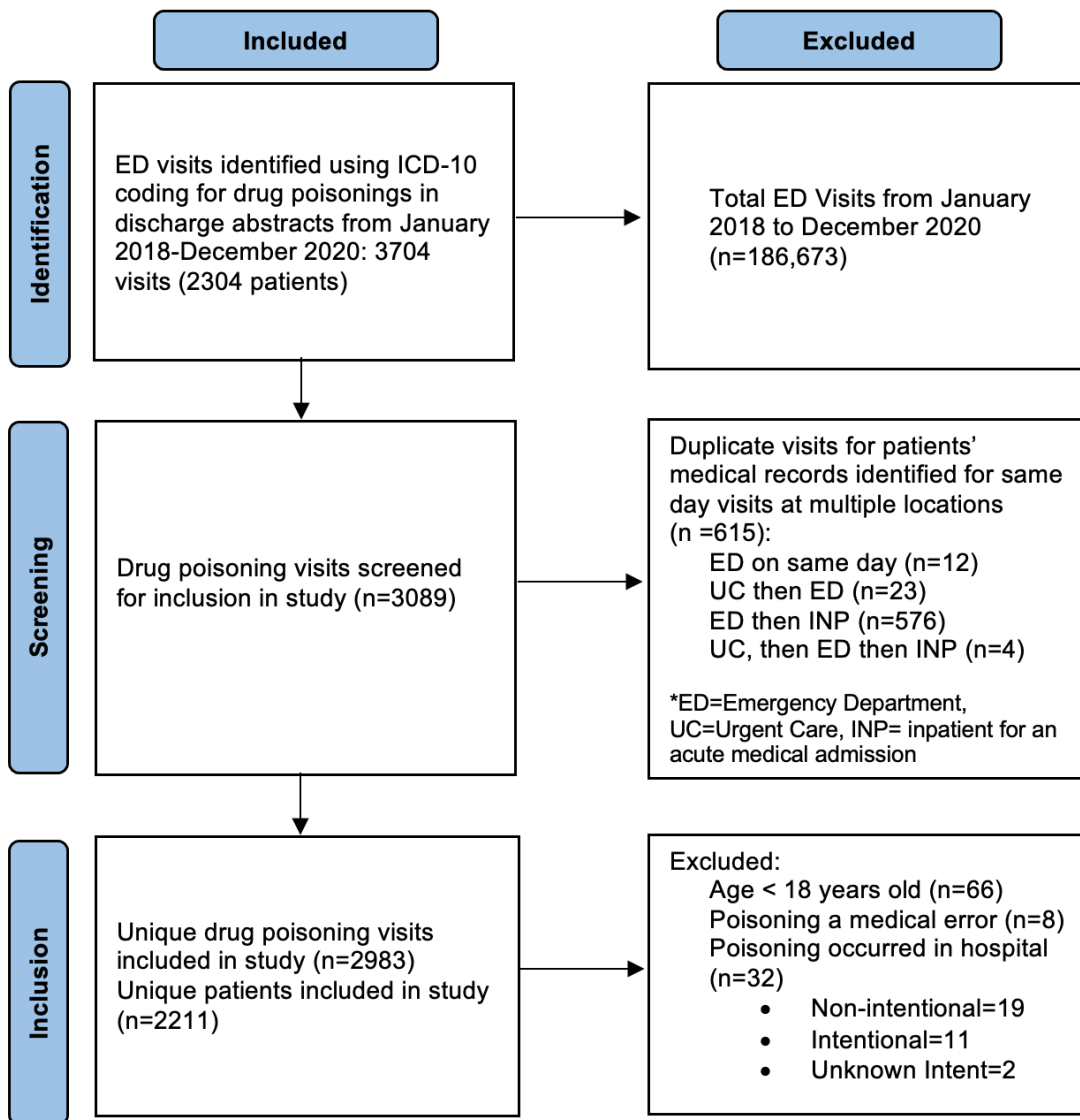
3.6 Geographical Heat Maps

Forward sortation areas (FSAs) are the first three characters of Canadian postal codes; these were collected for each patient visit and used to create geographical heat maps. These heat maps are designed to highlight the relative prevalence of city ward residence or origin of the patients and suggest where further health interventions may be helpful. Once stratified for the intention of the drug poisoning, the number of the drug poisonings occurring in each FSA was entered into Tableau Public® software to create the maps. This data represents the total number of drug poisonings occurring in each FSA for the study period: it does not account for the population of said FSA or rate of drug poisonings. This data was analyzed in two ways: 1) per poisoning visit and 2) per patient. The per patient analysis was completed to account for patients who had multiple drug poisoning visits in the study period, therefore their FSA would be included only for the first drug poisoning visit at our ED. Homeless patients were excluded from the dataset if they did not have an FSA assigned to their visit. Patient's living in a shelter had the FSA of the shelter used in the analysis if assigned to their visit.

4.0 Results

Our study identified 3704 possible drug poisoning visits presenting to SJHH ED (Figure 2). After accounting for duplicate visit entries defined as two visits for the same patient/date/drug, there were 3089 unique drug poisoning visits. A total of 106 visits were excluded; patient's age less than 18 years (66 visits), drug poisoning was a result of a medical error (8 visits), and the drug poisoning occurred in the hospital (32 visits). A total of 2983 unique drug poisoning visits (2211 patients) were included in the analysis.

Figure 2: ED visits identified with a diagnosed drug poisoning from January 1st, 2018 to December 31st, 2020



4.1 Incidence

Between January 1st 2018 and December 31st 2020, 2983 drug poisoning visits occurred where a patient was diagnosed with a drug poisoning at our ED, resulting in a rate of 16.0/1000 ED visits. Most poisonings were determined to be intentional (50.5%) with an incidence rate of 8.1/1000 ED visits followed by non-intentional (41.4%) with an incidence rate of 6.6/1000 ED visits and unknown intent (8.1%) with an incidence rate of 1.3/1000 ED visits. After the Covid-19 pandemic was declared, an increase in the rate of all drug poisonings was observed as compared with the time period prior to the pandemic (16.8 versus 15.7) as seen in Table 2. The rate of opioid poisoning diagnosis/1000 ED visits also increased during this time (5.1 versus 4.3).

Table 2: Rate of Drug Poisonings per 1000 ED Visits from January 1st 2018 to December 31st 2020

	All	Intentional	Non-Intentional	Unknown Intent	All Opioids
Pre-COVID (Jan 2018-March 11 th , 2020)	15.73	7.91	6.25	1.57	4.33
Post-COVID (March 12 th , 2020-December 31 st , 2020)	16.76	8.55	7.78	0.44	5.13
Total Study Period	15.97	8.06	6.62	1.30	4.53

4.2 Demographics

The patients' mean age was 38.3 years (SD 16.2 years) and 1632 (54.7%) were female. The intentional drug poisoning cohort was younger (36.2 versus 41.0 years) with a higher proportion of females (67.1% versus 42.5%) compared to the non-intentional drug poisoning cohort. A higher percentage of patients diagnosed with a non-intentional drug poisoning were homeless (10.8%) and had a chronic health condition (12.5%) compared to the patients with an intentional drug poisoning diagnosis, where more patients had a diagnosed mental health disorder (47.4%). Many patients (25.9%) had multiple ED visits with a drug poisoning diagnosis during the study period with a mean follow up of 18.4 months. During the 3-year study period, a patient with an intentional drug poisoning diagnosis averaged 1.6 poisoning ED visits compared with 1.3 poisoning ED visits for patients with a non-intentional drug poisoning diagnosis. Patient characteristics according to intention of drug poisoning are shown in Table 3.

Table 3: Characteristics of Patients Presenting to the ED with a Drug Poisoning from January 1st 2018 to December 31st 2020

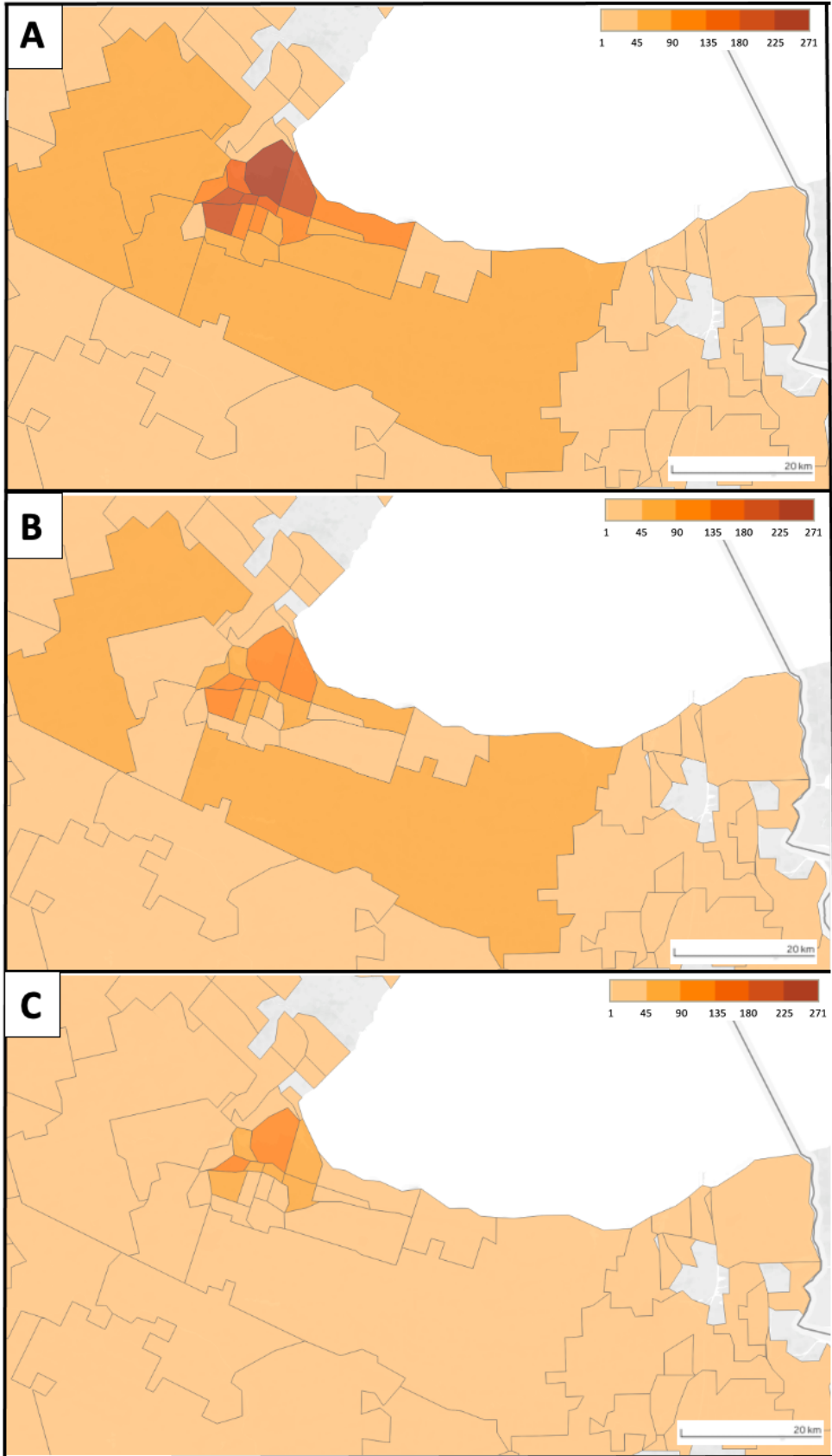
	All Poisonings (N=2983)	Intentional (N= 1505, 50.45%)	Non- Intentional (N=1236, 41.43%)	Unknown Intent (N=242, 8.11%)
Demographics				
Age, years, mean (SD)	38.28 (16.15)	36.15 (15.74)	41.02 (16.57)	37.45 (14.01)
Female (%)	1632 (54.71)	1010 (67.11)	525 (42.48)	97 (40.08)
Mental Health Disorder ^a (%)	866 (29.03)	714 (47.44)	121 (9.79)	31 (12.81)
Addiction Disorder ^a (%)	400 (13.41)	210 (13.95)	164 (13.27)	26 (10.74)
Selective Chronic Health Condition ^a (%)	278 (9.32)	102 (6.78)	154 (12.46)	22 (9.09)
Homeless (%)	211 (7.07)	61 (4.05)	133 (10.76)	17 (7.02)
Recidivism				
# Patients to Revisit the ED ^b (%)	772 (25.88)	440 (29.24)	277 (22.41)	55 (22.73)
Mean Number of ED Visits/ Poisoning Patient ^b (SD)	1.35 (4.29)	1.34 (7.83)	1.19 (3.03)	1.07 (3.01)

^a Disorders defined as addiction, mental health or selected chronic health disorders (Chronic pain, HIV, cancer, CVD, diabetes, COPD, Dementia, Kidney Disease and Liver cirrhosis) are listed in Appendix F; Table 13- Comorbidities

^b This includes only visits to the ED with a Drug poisoning diagnosis

Geographical heat maps were created from the collected FSAs. As seen in Figure 3, the L8L forward sortation area which encapsulates the western industrial area of downtown Hamilton was the most common area for a patient diagnosed with a drug poisoning to reside. Patients with ED visits with a diagnosed non-intentional drug poisoning were highly localized in this FSA (133 visits) and its surroundings: L8P (102 visits), L8N (89 visits) and L8H (77 visits). The intentional drug poisoning cohort was more evenly dispersed across Hamilton led by patients residing in the following FSAs: L9C (120 visits), L8L (117 visits), L8H (103 visits) and L8P (102 visits). When looking at the number of patients without an FSA, indicating possible homelessness, a similar result was seen compared to a formal homelessness diagnosis (Table 3); more patients diagnosed with a non-intentional drug poisoning having no FSA (13.6%) versus patients with an intentional drug poisoning diagnosis (2.7%). Similar results were seen when the data were analyzed per patient (Appendix G Table 5 and Figure 1).

Figure 3: Geographical Heat Maps using Forward Sortation Areas of Patients Diagnosed with a(n) (A) Drug Poisonings, (B) Intentional Drug Poisoning and (C) Non-Intentional Drug Poisoning analyzed per visit



4.3 Drugs Involved

Details on the drugs involved in poisonings are shown in Table 4. The most commonly cited drugs were opioids, benzodiazepines, antidepressants, acetaminophen, antiepileptics and antipsychotics. For intentional drug poisonings: antidepressants (26.9%), benzodiazepines (24.9%) and acetaminophen (21.9%) were the most prevalent whereas non-intentional drug poisonings were dominated by opioids (46.9%), primarily fentanyl (15.9%), heroin (11.5%), and other opioids (15.0%). Drug poisonings with more than one drug involved were seen in 38.9% of intentional drug poisonings compared to 20.0% of non-intentional. Overall, there was a mean of 1.5 drugs involved per drug poisoning event.

Table 4: Classes of Drugs Involved in Diagnosed Drug Poisoning ED Visits from January 1st 2018 to December 31st 2020

Drug Class	All Poisonings	Intentional	Non-Intentional	Unknown Intent
Prescription Opioids Excluding Fentanyl	174 (5.83)	97 (6.45)	70 (5.66)	7 (2.89)
Fentanyl	238 (7.98)	26 (1.73)	197 (15.94)	15 (6.20)
Heroin	182 (6.10)	10 (0.66)	142 (11.49)	30 (12.40)
Other Opioids^a	259 (8.68)	39 (2.59)	185 (14.97)	35 (14.46)
Cocaine	105 (3.52)	30 (1.99)	58 (4.69)	17 (7.02)
Other Psychostimulants^b	163 (5.46)	51 (3.39)	95 (7.69)	17 (7.02)
Cannabis	61 (2.04)	11 (0.73)	43 (3.48)	7 (2.89)
Psychedelics^c	87 (2.92)	9 (0.60)	57 (4.61)	21 (8.68)
Acetaminophen	436 (14.62)	329 (21.86)	93 (7.52)	14 (5.79)
Salicylates	33 (1.11)	26 (1.73)	7 (0.57)	0 (0)
NSAIDs	149 (4.09)	122 (8.11)	26 (2.10)	1 (0.41)
Tricyclic Antidepressants	47 (1.58)	41 (2.72)	5 (0.40)	1 (0.41)
Other Antidepressants	449 (15.05)	364 (24.19)	74 (5.99)	11 (4.55)
Benzodiazepines	515 (17.26)	375 (24.92)	112 (9.06)	28 (11.57)
Antiepileptics^d	337 (11.30)	253 (16.81)	75 (6.07)	9 (3.72)
Antipsychotics	273 (9.15)	210 (13.95)	54 (4.37)	9 (3.72)
Antiallergic and antiemetics^e	152 (5.10)	118 (7.84)	29 (2.35)	5 (2.07)
Poisonings with more than 1 drug involved	868 (29.10)	585 (38.87)	247 (19.98)	36 (14.88)
Mean number of Drugs involved per poisoning episode (SD)	1.50 (0.97)	1.71 (1.13)	1.31 (0.73)	1.18 (0.50)

^a Other opioids include drugs such as tramadol, buprenorphine, pentazocine and paracodinc

^b Other Psychostimulants with Abuse Potential include drugs such as dextroamphetamine, methylphenidate and caffeine

^c Psychedelics include drugs such as Lysergic acid diethylamide, mescaline, and psilocine

^d Antiepileptics includes drugs such as carbamazepine, phenytoin and valproic acid

^e Antiallergic and antiemetics include drugs such as diphenhydramine, dimenhydrinate and cetirizine

4.4 Hospital Outcomes and Resource Utilization

In our data set, 716 (24.0%) patients were admitted for inpatient acute care services from the ED. There were up to 375 patients (12.6%) who were transferred to another acute inpatient care location, which may include our own inpatient mental health services that are not reflected in the 24% of patients admitted. More patients with an intentional drug poisoning diagnosis were transferred to another acute care facility or service, 296 (19.7%),

compared to patients with a non-intentional drug poisoning, 59 (4.8%). In all drug poisonings, 251 (8.4%) patients required an intensive level of care: 104 (3.5%) were admitted to the Intensive Care Unit (ICU), 2 (0.1%) were admitted to a Medical Step-Down Unit (MSDU) and 145 (4.9%) received combined care in each of the ICU and MSDU. In patients diagnosed with an intentional drug poisoning, Psychiatry was responsible for 744 (49.4%) patients and General Internal Medicine for 350 (23.3%) patients, whereas in the majority of patients with a non-intentional drug poisoning diagnosis, Emergency Medicine remained the responsible service (864 patients, 69.9%).

During the acute inpatient non-Mental Health admission, a small percentage received formal consults from Mental Health (4.9%), Addictions (6.5%), Social Work (1.7%) and/or Pharmacy (1.6%). An antidote was ordered from OPC's Recommended Antidote List in 797 (26.7%) patients: N-acetylcysteine was the most prominent in intentional drug poisonings, 119 (7.9%) patients versus naloxone in non-intentional, 211 (17.1%) patients, as seen in Table 5.

During a patient's ED visit and/or admission to an acute medical unit, 31 (1.0%) patients died: 19 (1.5%) with a non-intentional drug poisoning, 7 (0.5%) with an intentional drug poisoning and 5 (2.1%) with an unknown intent of drug poisoning. The mortality rate was higher in patients admitted to a medical unit (3.4%) compared to the patients seen only in the ED (0.3%). The majority of patients, 2332 (78.2%), were discharged home from the ED or their acute medical unit. Overall, more patients with a non-intentional drug poisoning left against medical advice, 111 (9.0%), versus the intentional drug poisoning cohort, 41 (2.7%).

Table 5: Drug Poisoning Characteristics –Outcomes and Resources

	All Poisonings	Intentional	Non-Intentional	Unknown
Resource Utilization				
# Admitted to an acute medical unit (%)	716 (24.00)	414 (27.51)	262 (21.20)	40 (16.53)
Mean Length of Stay (SD), Days ^a	2.24 (5.83)	2.18 (5.31)	2.36 (6.31)	2.03 (6.41)
# Admitted to SCU ^b (%)	251 (8.41)	146 (9.70)	90 (7.28)	15 (6.20)
Most Responsible Medical Service (%)				
General Internal Medicine	629 (21.09)	350 (23.26)	243 (19.66)	36 (14.88)
Psychiatry	853 (28.60)	744 (49.44)	82 (6.63)	27 (11.16)
Critical Care	126 (4.22)	73 (4.85)	44 (3.56)	9 (3.72)
Surgery	4 (0.13)	1 (0.07)	3 (0.24)	0 (0)
Emergency	1371 (45.96)	337 (22.39)	864 (69.90)	170 (70.25)
Medical specialties involved in patient's care (SD)	2.57 (1.53)	2.99 (1.43)	2.15 (1.51)	2.17 (1.50)
Selected Consult Ordered^g (%)				
Mental Health ^c	147 (4.93)	128 (8.50)	14 (1.13)	5 (2.07)
Social Work	52 (1.74)	24 (1.59)	22 (1.78)	6 (2.48)
Addictions	193 (6.47)	96 (6.38)	78 (6.31)	19 (7.85)
Pharmacy	47 (1.58)	24 (1.59)	16 (1.29)	7 (2.89)
Selected Antidotes Ordered^d (%)				
Activated Charcoal	67 (2.25)	62 (4.11)	3 (0.24)	2 (0.83)
N-Acetylcysteine	150 (5.03)	119 (7.91)	29 (2.35)	2 (0.83)
Naloxone	342 (11.46)	92 (6.11)	211 (17.07)	39 (16.12)
Selected Blood/Urine Drug Testing^h (%)				
Urine Drug Screen	276 (9.25)	148 (9.83)	99 (8.01)	29 (11.98)
Acetaminophen	1055 (35.37)	629 (41.79)	330 (26.70)	96 (39.67)
Salicylate	1046 (35.07)	629 (41.79)	322 (26.05)	95 (39.26)
Ethanol	1050 (35.20)	628 (41.73)	327 (26.46)	95 (39.26)
Other Drug Blood Concentration	111 (3.72)	66 (4.39)	32 (2.59)	13 (5.37)
Disposition From ED Without Medical Admission (%)				
In Hospital Mortality	7 (0.31)	0	4 (0.41)	3 (1.49)
Left Against Medical Advice	142 (6.26)	30 (2.75)	91 (9.34)	21 (10.40)
Transfer to Another Acute Facility or a Speciality Service ^e	225 (9.93)	175 (16.04)	41 (4.21)	9 (4.46)
Discharged Home	1853 (81.74)	868 (79.56)	819 (84.09)	166 (82.18)
Admission to a non-acute centre ^f	40 (1.76)	18 (1.65)	19 (1.95)	3 (1.49)
Disposition From ED/INP with Medical Admission (%)				
In Hospital Mortality	24 (3.35)	7 (1.69)	15 (5.73)	2 (5.00)
Left Against Medical Advice	40 (5.59)	11 (2.66)	20 (7.63)	9 (22.50)
Transfer to Another Acute Facility or a Speciality Service ^e	150 (20.95)	121 (29.23)	18 (6.86)	11 (27.50)
Discharged Home	479 (66.90)	261 (63.04)	200 (76.34)	18 (45.00)
Admission to a non-acute centre ^f	23 (3.21)	14 (3.38)	9 (3.44)	0

^a Only includes acute inpatient at our centre; does not include if admitted to another facility or admitted to mental health

^b SCU (Special care units); intensive care unit, medical step-down unit and/or surgical step-down unit

^c Not a full representation of mental health services involvement as psychiatry was also the most responsible physician in many cases as described in Table 3.

^d Medications listed on Ontario Poison Control's recommended antidote list for acute care facilities (Appendix D / List 1).

^e This includes Inpatient care, including specialty services that may be within SJHH (inpatient rehab, inpatient psychiatry and inpatient chronic/complex continuing care), military medical facilities and subacute care where this occurs within acute care hospitals.

^f This includes long-term care homes (24-hour nursing), mental health and/or addiction treatment centres and hospice/palliative care facilities.

^g For each drug poisoning encounter a patient may have more than 1 selected consult ordered. If multiple of the same consults were ordered for a patient they were included only once in the analysis.

5.0 Discussion

This is the first study in Ontario describing a large cohort of patients with drug poisonings presenting to an urban academic hospital ED. The number of drug poisonings was larger than expected compared to that estimated by City of Hamilton's Public Health Report⁷. This may be explained by the large number of intentional drug poisonings seen in our cohort that the public health system is not designed to capture. In contrast to a review of Ontario and Alberta discharge abstracts from 2010-2018, which showed that ED visits for non-intentional drug poisonings were nearly twice as common as intentional, we found a higher incidence of intentional versus non-intentional drug poisonings¹⁷. Our results may be biased towards intentional drug poisonings as our centre is the regional mental health facility which includes the emergency psychiatry specialty services for the area. The demographics described in the study aligned with that reported in the other studies completed in British Columbia, United States, and Europe with a younger and predominately female population diagnosed with an intentional drug poisoning and an older, predominately male population diagnosed with a non-intentional drug poisoning^{9,17-20}.

The geographical heat maps identified the western industrial area of downtown as the regions of Hamilton with the highest incidence of drug poisonings. These FSAs do not reflect the highest population density within Hamilton, as those belong to the FSAs immediately southwest of this area²¹. Therefore, our maps indicate these areas with the high incidence of drug poisonings are not only due to the population size but additional factors. Studies have demonstrated that individuals with a lower socioeconomic status are at greater risk of drug poisoning mortality²². Cross-referencing our maps to maps assessing poverty in Hamilton, the areas with a high incidence of acute drug poisoning also have some of the highest poverty rates²³. This is reflected in current Canadian guidance for opioid poisoning patients recommending not only the involvement of medications such as methadone but also non-medical "wrap around" services in an effort to target the social factors that also play a large role in drug poisonings such as housing, education, and employment²⁴.

In the care of the acute drug poisoning patients, our study demonstrated a higher rate of leaving against medical advice, mortality and lower admission rate compared to a similar study conducted in the United States¹⁹. The study completed in the United States, differed from our study as it did not include inpatient admissions and only reported ED data. If comparing only ED mortality rate, then similar rates were seen (0.3 versus 0.1%)¹⁹. The mortality rates reported in the study completed in the United States and ours are much lower (0.3 and 3.4% respectively) than that reported in drug poisonings presenting to EDs in British Columbia (11.6%)⁹. To explain the overall low admission rate in our study (24.0%) compared to that of the United States study (41.2%), it can be hypothesized that either our population was less sick, there is a lower threshold for admission in the United States, or there was a difference in the study populations (e.g. a greater number of intentional poisonings in our study leading to more admissions to psychiatric units which is was not captured/reflected in our data)¹⁹.

The frequent involvement of antidepressants, antipsychotics, and antiepileptics (e.g. valproic acid which is prescribed for various mental health conditions), along with the high incidence of underlying mental health disorders in the intentional poisoning cohort as described in this study and others, points to a need for a larger focus on interventions, both pharmacologic and nonpharmacological, for the prevention of self-harm in this population^{8,9}. In the acute care setting, there is increased urgency as studies suggest 15-25% of patients within this cohort will attempt a subsequent intentional poisoning within one year of their previous attempt²⁵. A Cochrane review found cognitive-behavioural-based psychotherapy (CBT) compared to treatment as usual lead

to fewer patients repeating self-harm incidents²⁶. A meta-analysis found no benefit in repeat self-harm incidents comparing hospital admission to no admission in all self-harm patients, but a benefit was seen in the intentional self-harm cohort²⁷. Our study demonstrated this high recidivism risk in the intentional cohort, with 29% of patients diagnosed with an intentional poisoning re-visiting the ED during our study period with a subsequent drug poisoning diagnosis.

Patients diagnosed with a non-intentional drug poisoning did not demonstrate as high of a recidivism risk as the intentional cohort, however almost 9% did leave against medical advice (AMA). This rate is higher than that reported in the United States ED, with a leaving AMA rate of 1.2%¹⁹. As opioids were the leading drug class resulting in non-intentional poisonings, 46.9%, this high rate may be in part to the undermanaging of patients' withdrawal symptoms and ensuring patients feel comfortable in the hospital setting. This result may be contributed to by the underutilization of addictions consults in the non-intentional poisoning cohort (6.3% of patients received a formal addiction consult). Our results reflect that there was an unexpected small number of consults ordered which likely underestimates allied health involvement in the care of acute drug poisoning patients. This may be attributed to consults not formerly ordered through the EMR system ie. verbal consults to addictions services in the ED or the expectation of a pharmacist to review home medications. Different strategies need to be investigated to prevent patients from leaving AMA, such as managing patient's withdrawal symptoms in the ED, with and without addictions services, to provide the necessary time to implement other harm reduction strategies.

Optimizing the research into harm reduction strategies for the non-intentional cohort is critical given the predominance of opioids in this population, the high incidence of fentanyl involvement, and the known increasing opioid related mortality in Canada^{28,29}. As demonstrated in our study, the incidence of acute drug poisonings and in particular poisonings as the result of opioids, has increased during the pandemic putting an emphasis on the need for interventions to curb opioid epidemic-related harm. In a study in the United States, only 16.6% of patients received follow up treatment for their opioid use disorder within 90 days of a nonfatal opioid poisoning³⁰. Initiation of opioid maintenance treatment in the ED in patients with opioid use disorder increased patients' involvement in addiction treatment at 30 days compared to outpatient referrals and brief interventions alone³¹. Further studies should investigate the impact of initiating opioid maintenance treatment on the risk of patients leaving AMA and repeating opioid poisonings. One harm reduction strategy in the ED is the distribution of naloxone kits. These are provided by the Public Health Unit to distribute to patients in the ED; across Hamilton from 2018-2019 the Public Health unit and associated sites including the SJHH ED distributed over 13,000 naloxone kits which reportedly lead to 1699 opioid overdoses being reversed³².

5.1 Study Strengths

Our study is the first to report on drug poisoning characteristics presenting to an Ontario ED. This study was completed at a large academic urban hospital that contains the regional psychiatric emergency services allowing for a substantial collection of data on patients diagnosed with intentional and non-intentional drug poisonings. Compared to previous studies that looked at drug poisonings using ICD-10 codes, this study also utilized additional data from the EMR to report on recidivism and the in-patient management of drug poisonings^{8,9}. This data represents the most recent drug poisoning trends in Hamilton and may translate to other urban areas across Ontario. By capturing multiple years of drug poisonings up until December 2020, this study incorporates drug poisoning data both before and after the Covid-19 pandemic.

5.2 Study Limitations

In this study, primary record review of patient EMRs was not completed to verify the accuracy of the assigned ICD-10 drug poisoning codes and other data. However, the method applied uses 'gold standard' CIHI coding procedures and diagnostic extraction methodology and has been shown to have a high degree of accuracy in

algorithms that utilize poisoning ICD-10 codes to identify prescription opioid–related deaths in Canada when compared to coroners' data³³. Also, determining the intent of a drug poisoning can be difficult as demonstrated by the 242 drug poisoning events with an unknown intent. This may limit the validity of these designations. Finally, our results on in hospital outcomes and resource utilization is a truncated data set due to capturing data from only ED visits and admissions to acute care units for drug poisoning and therefore missing data from admissions to acute mental health and other psychiatric units. This led to an underrepresentation on the number of admissions, involvement of psychiatric services and the overall resource utilization involved with acute drug poisonings.

5.3 Implications

Suggested by the high number of acute drug poisonings and relatively low mortality rate, our current practices are effective for the acute management of drug poisonings. Although, not uncommon to our facility, the high recidivism rate and number of patients leaving against medical advice in the intentional and non-intentional cohort respectively suggests an area of improvement in the time after the acute management. Policies and funding should look to target increasing the psychiatric and addictions teams' presence in the ED. Order sets can be designed for the optimal management of patient's withdrawal symptoms to prevent patients leaving before receiving their full spectrum of care. Little is known on what can be done to prevent self-harm events from reoccurring. Questions remain such as what is the optimal way to initiate opioid maintenance treatment in the ED in patients following an opioid poisoning or do intentional self-harm patients benefit from prolonged admissions to psychiatric units? These questions need to be answered before more firm policies can be implemented to improve our care of this large, vulnerable population.

6.0 Conclusion

Our analysis of a large cohort of patients presenting with drug poisoning at an urban ED with emergency Psychiatry services, suggests that drug poisoning is common, caused by multiple drugs, associated with a significant rate of poor outcomes, high resource utilization and has a high rate of recidivism. These results will be useful to inform healthcare provider education, hospital policy, and planning. In addition, research is needed to decrease drug poisoning rates and find cost-effective management strategies to optimize patient outcomes.

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Appendices

Appendix A: Definitions

Definitions as per CIHI and WHO^{3,34,35}:

Drug Poisoning- When a substance (drug, medicament, or biological agent) is taken incorrectly and results in harm. A poisoning can be described as a drug overdose, accidental ingestion, or intentional self-harm.

Incorrect use- Wrong drug or dosage given or taken, self-prescribed drug taken in combination with a prescribed drug or taken not as recommended or taking any drug with alcohol.

Intentional poisoning- Purposely self-inflicted or a suicide attempt.

Non-Intentional poisoning- A drug was taken accidentally, too much of a drug was accidentally taken, or the wrong drug was given or taken.

Adverse drug reaction- A substance (drug, medicament, or biological agent) taken correctly as prescribed (correct dose, for therapeutic or prophylactic use) that results in a reaction. This includes allergic reactions, drug interactions or an accumulative effect leading to toxicity.

Acute intoxication or inebriation- Alteration in a person's level of consciousness, cognition, perception, affect or behaviour that resolves with time due to a psychoactive substance.

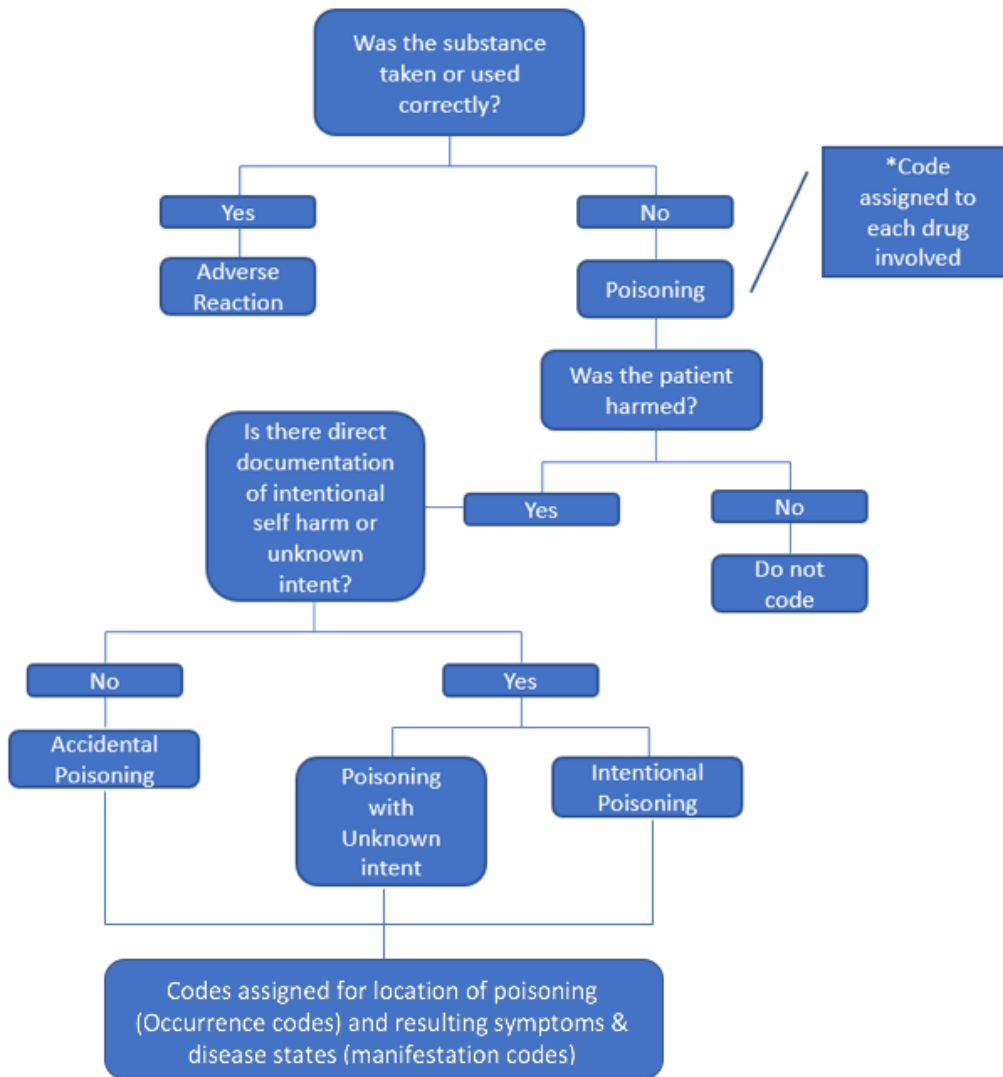
Acute Medical Unit- Medical units with acute care services where abstracts are created upon discharge for the DAD database. In particular these exclude admissions to mental health units as they are reported to the Ontario Mental Health Reporting System (OMHRS).

Appendix B: Coding Algorithm

This study utilized ICD-10-CA coding for its population identification and parts of the data collection.

- At SJHH, like all other hospitals, ICD-10-CA codes are applied for each admission to patients' discharge summaries in accordance with the Canadian Coding Standards and CIHI standard procedures (Figure 1)³.
- Each drug poisoning is coded with the drug(s) (Appendix C- Table 2), the manifestation of the drug poisoning, the intent of the drug poisoning (Appendix C- Table 1) and the location it occurred.

Figure 1: Drug Poisoning Coding Pathway as per CCS^{3,34}



Appendix C: ICD-10-CA Codes

The following tables define the ICD-10-CA codes with their corresponding descriptions³⁴.

Table 1: ICD-10 Drug Poisoning Codes for external causes of morbidity and mortality by drug or substance (Accidental=X40-44, Intentional=X60-X64, and unknown intent=Y10-Y14)

Accidental Poisoning by and exposure to noxious substances		
Medication Class	Code	Examples
Nonopioid analgesics, antipyretics and antirheumatics	X40	4-aminophenol derivatives
		Nonsteroidal anti-inflammatory drugs [NSAID]
		Pyrazolone derivatives
		Salicylate
Antiepileptic, sedative-hypnotic, antiparkinsonism and psychotropic drugs, not elsewhere classified	X41	Antidepressants
		Barbiturates
		Hydantoin derivatives
		Iminostilbenes
		Methaqualone compounds
		Neuroleptics
		Psychostimulants
		Succinimides and oxazolidinediones
Narcotics and psychodysleptics [hallucinogens], not elsewhere classified	X42	Cannabis (derivatives)
		Cocaine
		Codeine
		Heroin
		Lysergide [LSD]
		Mescaline
		Methadone
		Morphine
		Opium (alkaloids)
Drugs acting on the autonomic nervous system	X43	Parasympatholytics [anticholinergics and antimuscarinics] and spasmolytics
		Parasympathomimetics [cholinergics]
		Sympatholytics [antiadrenergics]
		Sympathomimetics [adrenergics]
Other and unspecified drugs, medicaments and biological substance	X44	Agents primarily acting on smooth and skeletal muscles and the respiratory system
		Anaesthetics (general)(local)
		Drugs affecting the: -cardiovascular system - gastrointestinal system
		Hormones and synthetic substitutes
		Systemic and haematological agents
		Systemic antibiotics and other anti-infectives
		Therapeutic gases
Topical preparations		

		Vaccines
		Water-balance agents and drugs affecting mineral and uric acid metabolism
Intentional Self-Poisoning by and exposure to noxious substances		
Nonopioid analgesics, antipyretics and antirheumatics	X60	4-aminophenol derivatives
		Nonsteroidal anti-inflammatory drugs [NSAID]
		Pyrazolines derivatives
		Salicylate
Antiepileptic, sedative-hypnotic, antiparkinsonism and psychotropic drugs, not elsewhere classified	X61	Antidepressants
		Barbiturates
		Hydantoin derivatives
		Iminostilbenes
		Methaqualone compounds
		Neuroleptics
		Psychostimulants
		Succinimides and oxazolidinediones
Narcotics and psychodysleptics [hallucinogens], not elsewhere classified	X62	Cannabis (derivatives)
		Cocaine
		Codeine
		Heroin
		Lysergide [LSD]
		Mescaline
		Methadone
		Morphine
		Opium (alkaloids)
Drugs acting on the autonomic nervous system	X63	Parasympatholytics [anticholinergics and antimuscarinics] and spasmolytics
		Parasympathomimetics [cholinergics]
		Sympatholytics [antiadrenergics]
		Sympathomimetics [adrenergics]
Other and unspecified drugs, medicaments and biological substance	X64	Agents primarily acting on smooth and skeletal muscles and the respiratory system
		Anaesthetics (general)(local)
		Drugs affecting the: -cardiovascular system - gastrointestinal system
		Hormones and synthetic substitutes
		Systemic and haematological agents
		Systemic antibiotics and other anti-infectives
		Therapeutic gases
		Topical preparations
		Vaccines
		Water-balance agents and drugs affecting mineral and uric acid metabolism
Unknown Intent of Poisoning by and exposure to noxious substances		
	Y10	4-aminophenol derivatives

Nonopioid analgesics, antipyretics and antirheumatics		Nonsteroidal anti-inflammatory drugs [NSAID]
		Pyrazolines derivatives
		Salicylate
Antiepileptic, sedative-hypnotic, antiparkinsonism and psychotropic drugs, not elsewhere classified	Y11	Antidepressants
		Barbiturates
		Hydantoin derivatives
		Iminostilbenes
		Methaqualone compounds
		Neuroleptics
		Psychostimulants
		Succinimides and oxazolidinediones
Narcotics and psychodysleptics [hallucinogens], not elsewhere classified	Y12	Tranquillizer
		Cannabis (derivatives)
		Cocaine
		Codeine
		Heroin
		Lysergide [LSD]
		Mescaline
		Methadone
		Morphine
Opium (alkaloids)		
Drugs acting on the autonomic nervous system	Y13	Parasympatholytics [anticholinergics and antimuscarinics] and spasmolytics
		Parasympathomimetics [cholinergics]
		Sympatholytics [antiadrenergics]
		Sympathomimetics [adrenergics]
Other and unspecified drugs, medicaments and biological substance	Y14	Agents primarily acting on smooth and skeletal muscles and the respiratory system
		Anaesthetics (general)(local)
		Drugs affecting the: -cardiovascular system - gastrointestinal system
		Hormones and synthetic substitutes
		Systemic and haematological agents
		Systemic antibiotics and other anti-infectives
		Therapeutic gases
		Topical preparations
		Vaccines
Water-balance agents and drugs affecting mineral and uric acid metabolism		

Table 2: ICD-10 Poisoning Codes by drugs, medicaments, and biological Substances (T36-T50)

Drug Class (code)	Code	Family Medication Class
Systemic Antibiotics (T36)	T36.0	Penicillins
	T36.1	Cephalosporins and other beta-lactam antibiotics
	T36.2	Chloramphenicol group
	T36.3	Macrolides
	T36.4	Tetracyclines
	T36.5	Aminoglycosides
	T36.6	Rifamycins
	T36.7	Antifungal antibiotics, systemically used
	T36.8	Other systemic antibiotics
	T36.9	Systemic antibiotic, unspecified
Other systemic anti-infectives and anti-parasitics (T37)	T37.0	Sulfonamides
	T37.1	Antimycobacterial drugs
	T37.2	Antimalarials and drugs acting on other blood protozoa
	T37.3	Other antiprotozoal drugs
	T37.4	Anthelmintics
	T37.5	Antiviral drugs
	T37.8	Other specified systemic anti-infectives and antiparasitics
	T37.9	Systemic anti-infectives and antiparasitics, unspecified
Hormones and their synthetic substitutes and antagonists, not elsewhere classified (T38)	T38.0	Glucocorticoids and synthetic analogues
	T38.1	Thyroid hormones and substitutes
	T38.2	Thyroid hormones and substitutes
	T38.3	Thyroid hormones and substitutes
	T38.4	Oral contraceptives
	T38.5	Other estrogens and progestogens
	T38.6	Antigonadotropins, antiestrogens and antiandrogens not elsewhere classified
	T38.7	Androgens and anabolic congeners
	T38.8	Other and unspecified hormones and their synthetic substitutes
	T38.9	Other and unspecified hormone antagonists
Nonopioid analgesics, antipyretics and antirheumatics (T39)	T39.0	Salicylates
	T39.1	4-Aminophenol derivatives
	T39.2	Pyrazoline derivatives
	T39.3	Other Non-steroidal anti-inflammatory drugs (NSAIDs)
	T39.4	Antirheumatics, not elsewhere classified
	T39.8	Other nonopioid analgesics and antipyretics not elsewhere classified
	T39.9	Nonopioid analgesics, antipyretics and antirheumatics, unspecified
Narcotics and psychodysleptics (T40)	T40.0	Opium
	T40.1	Heroin

	T40.2	Other opioids -codeine -morphine
	T40.3	Methadone
	T40.4	Other synthetic narcotics
	T40.5	Cocaine
	T40.6	Other and unspecified narcotics
	T40.7	Cannabis (derivatives)
	T40.8	Lysergide (LSD)
	T40.9	Other and unspecified psychodysleptics (hallucinogens) (-Mescaline -Psilocin -Psilocybin
Anaesthetics and therapeutic gases (T41)	T41.0	Inhaled anesthetics
	T41.1	Intravenous anesthetics
	T41.2	Other and unspecified general anesthetics
	T41.3	Local anesthetics
	T41.4	Anesthetics, unspecified
	T41.5	Therapeutic gases -carbon dioxide -oxygen
Antiepileptic, sedative-hypnotic and antiparkinsonism drugs	T42.0	Hydantoin derivatives
	T42.1	Iminostilbenes -carbamazepine
	T42.2	Succinimides and oxazolidinediones
	T42.3	Barbiturates
	T42.4	Benzodiazepines
	T42.5	Mixed antiepileptics not classified elsewhere
	T42.6	Other antiepileptic and sedative-hypnotic drugs -valproic acid -methaqualone
	T42.7	Antiepileptic and sedative hypnotic drugs, unspecified
	T42.8	Antiparkinsonism drugs and other central muscle tone depressants -amantadine
Psychotropic drugs, not classified elsewhere (T43)	T43.0	Tricyclic and tetracyclic antidepressants
	T43.1	Monoamine-oxidase inhibitor antidepressants
	T43.2	Other and unspecified antidepressants
	T43.3	Phenothiazine antipsychotics and neuroleptics
	T43.4	Butyrophenone and thioxanthene neuroleptics
	T43.5	Other and unspecified antipsychotics and neuroleptics
	T43.6	Psychostimulants with abuse potential
	T43.8	Other psychotropic drugs, not elsewhere classified
	43.9	Psychotropic drug, unspecified
	T44.0	Anticholinesterase agents

Drugs primarily affecting the autonomic nervous system (T44)	T44.1	Other parasympathomimetics (cholinergics)
	T44.2	Ganglionic blocking drugs, not elsewhere classified
	T44.3	Other parasympatholytics and spasmolytics not elsewhere classified -Papaverine
	T44.4	Predominately alpha-adrenoreceptor agonists, not elsewhere classified
	T44.5	Predominately beta-adrenoreceptor agonists, not elsewhere classified
	T44.6	Alpha-adrenoreceptor antagonists, not elsewhere classified -ergot alkaloids
	T44.7	Beta-adrenoreceptor antagonists, not elsewhere classified
	T44.8	Centrally acting and adrenergic-neuron-blocking agents, not elsewhere classified
	T44.9	Other and unspecified drugs primarily affecting the autonomic nervous system -drug stimulating both alpha and beta adrenoreceptors
Primarily systemic and hematological agents, not elsewhere classified (T45)	T45.0	Antiallergic and antiemetic drugs
	T45.1	Antineoplastic and immunosuppressive drugs -antineoplastic antibiotics -Cytarabine
	T45.2	Vitamins not elsewhere classified
	T45.3	Enzymes, not elsewhere classified
	T45.4	Iron and its compounds
	T45.5	Anticoagulants
	T45.6	Fibrinolysis-affecting drugs
	T45.7	Anticoagulant antagonists, vitamin k and other coagulants
	T45.8	Other primarily systemic and haematological agents -liver preparations and other antianaemic agents -Natural blood products -Plasma substitute
T45.9	Primarily systemic and haematological agents, unspecified	
Agents affecting the cardiovascular system (T46)	T46.0	Cardiac stimulant glycosides and drugs of similar action
	T46.1	Calcium channel blockers
	46.2	Other antidysrhythmic drugs not elsewhere classified
	T46.3	Coronary vasodilators, not elsewhere classified -dipyridamole
	T46.4	Angiotensin converting enzyme inhibitors

	T46.5	Other antihypertensive drugs, not classified elsewhere -clonidine
	T46.6	Antihyperlipidaemic and antiarteriosclerotic drugs
	T46.7	Peripheral vasodilators
	T46.8	Antivaricose drugs, including sclerosing agents
	T46.9	Other and unspecified agents primarily affecting the cardiovascular system
Primarily affecting the gastrointestinal system (T47)	T47.0	Histamine H ₂ Receptor Antagonists
	T47.1	Other antacids and anti-gastric secretion drugs
	T47.2	Stimulant laxatives
	T47.3	Saline and osmotic laxatives
	T47.4	Other laxatives
	T47.5	Digestants
	T47.6	Antidiarrheal drugs
	T47.7	Emetics
	T47.8	Other agents primarily affecting the gastrointestinal system
	T47.9	Agent primarily affecting the gastrointestinal systemic, unspecified
Primarily acting on smooth and skeletal muscles and the respiratory system (T48)	T48.0	Oxytocic drugs
	T48.1	Skeletal muscle relaxants [neuromuscular blocking agents]
	T48.2	Other and unspecified agents primarily acting on muscles
	T48.3	Antitussives
	T48.4	Expectorants
	T48.5	Anti-common cold drugs
	T48.6	Antiasthmatics, not elsewhere classified -Salbutamol
	T48.7	Other and unspecified agents primarily acting on the respiratory system
Topical agents primarily affecting skin and mucous membranes and by Ophthalmological, otorhinolaryngological and dental drugs (T49)	T49.0	Local antifungal, anti-infective and anti-inflammatory drugs, not elsewhere classified
	T49.1	Antipruritics
	T49.2	Local astringents and local detergents
	T49.3	Emollients, demulcents and protectants
	T49.4	Keratolytics, keratoplasties and other hair treatment drugs and preparations
	T49.5	Ophthalmological drugs and preparations -eye anti-infectives
	T49.6	Otorhinolaryngological drugs and preparations -ear, nose and throat anti-infectives
	T49.7	Dental drugs, topically applied
	T49.8	Other topical agents -spermicides
	T49.9	Topical agent, unspecified
	T50.0	Mineralocorticoids and their antagonists

Diuretics and other unspecified drugs, medicaments and biological substances (T50)	T50.1	Loop diuretics
	T50.2	Carbonic-anhydrase inhibitors, benzothiadiazides and other diuretics -acetazolamide
	T50.3	Electrolytic, caloric and water balance agents -oral rehydration salts
	T50.4	Drugs affecting uric acid metabolism
	T50.5	Appetite depressants
	T50.6	Antidotes and chelating agents, not classified elsewhere -Alcohol deterrents
	T50.7	Analeptics and opioid receptor antagonists
	T50.8	Diagnostic agents
	T50.9	Other unspecified drugs, medicaments and biological substances -acidifying agents -alkalizing agents -immunoglobulins -immunologicals -lipotropic drugs -parathyroid hormones and derivatives

Table 3: ICD-10 Codes for toxic effects of non-medical substances (T51-T65)

Drug Class (code)	Code	Family Medication Class
Alcohol (T51)	T51.0	Ethanol
	T51.1	Methanol
	T51.2	2-Propanol
	T51.3	Fuse Oil
	T51.8	Other alcohols
	T51.9	Alcohol, unspecified
Organic Solvents (T52)	T52.0	Petroleum products
	T52.1	Benzene
	T52.2	Homologues of benzene
	T52.3	Glycols
	T52.4	Ketones
	T52.8	Other organic solvents
	T52.9	Organic solvent, unspecified
Halogen Derivatives (T53)	T53.0	Carbon tetrachloride
	T53.1	Chloroform
	T53.2	Trichloroethylene
	T53.3	Tetrachloroethylene
	T53.4	Dichloromethane
	T53.5	Chlorofluorocarbons
	T53.6	Other halogen derivatives of aliphatic hydrocarbons
	T53.7	Other halogen derivatives of aromatic hydrocarbons
	T53.9	Halogen derivatives of aliphatic and aromatic hydrocarbons, unspecified
Corrosive Substances (T54)	T54.0	Phenol
	T54.1	Other corrosive organic compounds
	T54.2	Corrosive acids
	T54.3	Corrosive alkalis
	T54.9	Corrosive substances, unspecified
Toxic Effect of soaps and detergents (T55)	T55	
Toxic effect of Metals (T56)	T56.0	Lead
	T56.1	Mercury
	T56.2	Chromium
	T56.3	Cadmium
	T56.4	Copper
	T56.5	Zinc
	T56.6	Tin
	T56.7	Beryllium
	T56.8	Other metals
	T56.9	Metals, unspecified
Inorganic Substances (T57)	T57.0	Arsenic
	T57.1	Phosphorous
	T57.2	Manganese
	T57.3	Hydrogen cyanide

	T57.8	Other specified inorganic substances
	T57.9	Inorganic substances, unspecified
Carbon Monoxide (T58)		
Other gases, fumes and vapours (T59)	T59.0	Nitrogen oxides
	T59.1	Sulfur dioxide
	T59.2	Formaldehyde
	T59.3	Lacrimogenic gas
	T59.4	Chlorine gas
	T59.5	Fluorine gas and hydrogen fluoride
	T59.6	Hydrogen sulfide
	T59.7	Carbon dioxide
	T59.8	Other specified gases, fumes and vapours
	T59.9	Gases, fumes and vapours, unspecified
Pesticides (T60)	T60.0	Organophosphates
	T60.1	Halogenated insecticides
	T60.2	Other and unspecified insecticides
	T60.3	Herbicides and fungicides
	T60.4	Rodenticides
	T60.8	Other pesticides
	T60.9	Pesticide, unspecified
Noxious substances eaten as seafood (T61)	T61.0	Ciguatera poisoning
	T61.1	Scombroid poisoning
	T61.2	Other fish and shellfish poisoning
	T61.8	Toxic effects of other seafoods
	T61.9	Toxic effects of unspecified seafoods
Noxious substances eaten as food (T62)	T62.0	Mushrooms
	T62.1	Berries
	T62.2	Other ingested parts of plants
	T62.8	Other specified noxious substances eaten as food
	T62.9	Noxious substances eaten as food, unspecified
Contact with Venomous animals (T63)	T63.0	Snake venom
	T63.1	Venom of other reptiles
	T63.2	Venom of scorpions
	T63.3	Venom of spiders
	T63.4	Venom of other arthropods
	T63.5	Toxic effect of contact with fish
	T63.6	Toxic effect of contact with other marine animals
	T63.8	Toxic effect of contact with other venomous animals
	T63.9	Toxic effect of contact with unspecified venomous animals
Aflatoxin and other mycotoxin food contaminants (T64)		
Other and unspecified substances (T65)	T65.0	Cyanides
	T65.1	Strychnine
	T65.2	Tobacco and nicotine

	T65.3	Nitroderivatives of benzene
	T65.4	Carbon disulfide
	T65.5	Nitroglycerin and other nitric acids
	T65.6	Paints and dyes
	T65.8	Toxic effect of other specified substances
	T65.9	Toxic effect of unspecified substance

Table 4: ICD-10 codes for adverse effects caused by drugs

Drug Class (code)	Code	Family Medication Class
Systemic Antibiotics (Y40)	Y40.0	Penicillins
	Y40.1	Cephalosporins and other beta-lactam antibiotics
	Y40.2	Chloramphenicol group
	Y40.3	Macrolides
	Y40.4	Tetracyclines
	Y40.5	Aminoglycosides
	Y40.6	Rifamycins
	Y40.7	Antifungal antibiotics, systemically used
	Y40.8	Other systemic antibiotics
	Y40.9	Systemic antibiotic, unspecified
Other systemic anti-infectives and anti-parasitics (Y41)	Y41.0	Sulfonamides
	Y41.1	Antimycobacterial drugs
	Y41.2	Antimalarials and drugs acting on other blood protozoa
	Y41.3	Other antiprotozoal drugs
	Y41.4	Anthelmintics
	Y41.5	Antiviral drugs
	Y41.8	Other specified systemic anti-infectives and antiparasitics
	Y41.9	Systemic anti-infectives and antiparasitics, unspecified
Hormones and their synthetic substitutes and antagonists, not elsewhere classified (Y42)	Y42.0	Glucocorticoids and synthetic analogues
	Y42.1	Thyroid hormones and substitutes
	Y42.2	Thyroid hormones and substitutes
	Y42.3	Thyroid hormones and substitutes
	Y42.4	Oral contraceptives
	Y42.5	Other estrogens and progestogens
	Y42.6	Antigonadotropins, antiestrogens and antiandrogens not elsewhere classified
	Y42.7	Androgens and anabolic congeners
	Y42.8	Other and unspecified hormones and their synthetic substitutes
	Y42.9	Other and unspecified hormone antagonists

Primary Systemic Agents (Y43)	Y43.0	Antiallergic and antiemetic drugs
	Y43.1	Antineoplastic antimetabolites
	Y43.2	Antineoplastic natural drug
	Y43.3	Other antineoplastic drugs
	Y43.4	Immunosuppressive agents
	Y43.5	Acidifying and alkalizing agents
	Y43.6	Enzymes, not elsewhere classified
	Y43.8	Other primarily systemic agents not elsewhere classified
	Y43.9	Primarily systemic agent, unspecified
Agents primarily affecting blood constituents (Y44)	Y44.0	Iron preparations and other anti-hypochromic-anemic preparations
	Y44.1	Vitamin B12, folic acid and other anti-megaloblastic anemia preparations
	Y44.2	Anticoagulants
	Y44.3	Anticoagulant antagonists, vitamin K and other coagulants
	Y44.4	Antithrombotic drugs
	Y44.5	Thrombolytic drugs
	Y44.6	Natural blood and blood products
	Y44.7	Plasma substitutes
	Y44.9	Other and unspecified agents affecting blood constituents
Analgesics, antipyretics and anti-inflammatory drugs (Y45)	Y45.0	Opioids and related analgesics
	Y45.1	Salicylates
	Y45.2	Propionic acid derivatives
	Y45.3	Other NSAIDs
	Y45.4	Antirheumatics
	Y45.5	4-aminophenol derivatives
	Y45.8	Other analgesics and antipyretics
	Y45.9	Analgesic, antipyretics and anti-inflammatory drugs, unspecified
Antiepileptics and antiparkinsonism drugs	Y46.0	Succinimides
	Y46.1	Oxazolidinediones
	Y46.2	Hydantoin derivatives
	Y46.3	Deoxybarbiturates
	Y46.4	Iminostilbenes
	Y46.5	Valproic Acid
	Y46.6	Other and unspecified antiepileptics
	Y46.7	Antiparkinsonism drugs
	Y46.8	Antispasticity drugs

Sedatives, hypnotics and antianxiety drugs (Y47)	Y47.0	Barbiturates, not elsewhere classified
	Y47.1	Benzodiazepines
	Y47.2	Cloral derivatives
	Y47.3	Paraldehyde
	Y47.4	Bromine compounds
	Y47.5	Mixed sedatives and hypnotics, not elsewhere classified
	Y47.8	Other sedatives, hypnotics and antianxiety drugs
	Y47.9	Sedative, hypnotic and antianxiety drug, unspecified
Anaesthetics and therapeutic gases (Y48)	Y48.0	Inhaled anaesthetics
	Y48.1	Parenteral anesthetics
	Y48.2	Other and unspecified general anaesthetics
	Y48.3	Local anaesthetic
	Y48.4	Anaesthetic, unspecified
	Y48.5	Therapeutic gases
Psychotropic drugs not elsewhere classified (Y49)	Y49.0	TCA
	Y49.1	MAOi antidepressants
	Y49.2	Other and unspecified antidepressants
	Y49.3	Phenothiazine antipsychotics and neuroleptics
	Y49.4	Butyrophenone and thioxanthene neuroleptics
	Y49.5	Other antipsychotics and neuroleptics
	Y49.6	Psychodysleptics
	Y49.7	Psychostimulants with abuse potential
	Y49.8	Other psychotropics drugs
Y49.9	Psychotropic drug, unspecified	
Central nervous stimulants (Y50)	Y50.0	Analeptics
	Y50.1	Opioid receptor antagonists
	Y50.2	Methylxanthines
	Y50.8	Other CNS stimulants
	Y50.9	CNS, unspecified
Autonomic nervous system drugs (Y51)	Y51.0	Anticholinesterase agents
	Y51.1	Other parasympathomimetics
	Y51.2	Ganglionic blocking drugs
	Y51.3	Other parasympatholytics and spasmolytics
	Y51.4	Predominately alpha-adrenoreceptor agonists
Y51.5	Predominately beta-adrenoreceptor agonists	

	Y51.6	Alpha-adrenoreceptor antagonists
	Y51.7	Beta-adrenoreceptor antagonists
	Y51.8	Centrally acting and adrenergic-neuron-blocking agents
	Y51.9	Other and unspecified drugs affecting the ANS
Cardiovascular agents (Y52)	Y52.0	Cardiac stimulant glycosides and drugs of similar action
	Y52.1	Calcium channel blockers
	Y52.2	Other antidysrhythmic drugs not elsewhere classified
	Y52.3	Coronary vasodilators, not elsewhere classified -dipyridamole
	Y52.4	Angiotensin converting enzyme inhibitors
	Y52.5	Other antihypertensive drugs, not classified elsewhere -clonidine
	Y52.6	Antihyperlipidaemic and antiarteriosclerotic drugs
	Y52.7	Peripheral vasodilators
	Y52.8	Antivaricose drugs, including sclerosing agents
	Y52.9	Other and unspecified agents primarily affecting the cardiovascular system
Gastrointestinal System (Y53)	Y53.0	Histamine H ₂ Receptor Antagonists
	Y53.1	Other antacids and anti-gastric secretion drugs
	Y53.2	Stimulant laxatives
	Y53.3	Saline and osmotic laxatives
	Y53.4	Other laxatives
	Y53.5	Digestants
	Y53.6	Antidiarrheal drugs
	Y53.7	Emetics
	Y53.8	Other agents primarily affecting the gastrointestinal system
	Y53.9	Agent primarily affecting the gastrointestinal systemic, unspecified
Water-balance and mineral and uric acid metabolism	Y54.0	Mineralocorticoids
	Y54.1	Mineralocorticoids antagonists
	Y54.2	Carbonic anhydrase inhibitors
	Y54.3	Benzothiadiazide derivatives
	Y54.4	Loop diuretics

	Y54.5	Other diuretics
	Y54.6	Electrolytic, caloric and water balance agents
	Y54.7	Agents affecting calcification
	Y54.8	Agents affecting uric acid metabolism
	Y54.9	Mineral salts
Smooth and Skeletal muscles and the respiratory system	Y55.0	Oxytocic drugs
	Y55.1	Skeletal muscle relaxants [neuromuscular blocking agents]
	Y55.2	Other and unspecified agents primarily acting on muscles
	Y55.3	Antitussives
	Y55.4	Expectorants
	Y55.5	Anti-common cold drugs
	Y55.6	Antiasthmatics, not elsewhere classified -Salbutamol
	Y55.7	Other and unspecified agents primarily acting on the respiratory system
Topical agents primarily affecting skin and mucous membranes and by Ophthalmological, otorhinolaryngological and dental drugs (Y56)	Y56.0	Local antifungal, anti-infective and anti-inflammatory drugs, not elsewhere classified
	Y56.1	Antipruritics
	Y56.2	Local astringents and local detergents
	Y56.3	Emollients, demulcents and protectants
	Y56.4	Keratolytics, keratoplasties and other hair treatment drugs and preparations
	Y56.5	Ophthalmological drugs and preparations -eye anti-infectives
	Y56.6	Otorhinolaryngological drugs and preparations -ear, nose and throat anti-infectives
	Y56.7	Dental drugs, topically applied
	Y56.8	Other topical agents -spermicides
	Y56.9	Topical agent, unspecified
Unspecified drugs (Y57)	Y57.0	Appetite depressants
	Y57.1	Lipotropic drugs
	Y57.2	Antidotes and chelating agents
	Y57.3	Alcohol deterrents
	Y57.4	Pharmaceutical excipients

	Y57.5	X-ray contrast media
	Y57.6	Other diagnostic agents
	Y57.7	Vitamins
	Y57.8	Other drugs
	Y57.9	Drugs, unspecified
Bacterial Vaccines (Y58)	Y58.0	BCG Vaccine
	Y58.1	Typhoid and paratyphoid vaccine
	Y58.2	Cholera vaccine
	Y58.3	Plague vaccine
	Y58.4	Tetanus Vaccine
	Y58.5	Diphtheria vaccine
	Y58.6	Pertussis vaccine
	Y58.8	Mixed bacterial vaccines
	Y58.9	Other and unspecified vaccines
Other and unspecified vaccines and biological substances (Y59)	Y59.0	Viral vaccines
	Y59.1	Rickettsia vaccines
	Y59.2	Protozoal vaccines
	Y59.3	Immunoglobulins
	Y59.8	Other specified vaccines and biological substances
	Y59.9	Vaccines or biological substances, unspecified

Table 5: ICD-10 Codes for mental and behavioral disorders due to psychoactive substance use

Category	Code	Specifics
Alcohol (F10)	F10.0	Acute Intoxication
	F10.1	Harmful Use
	F10.2	Dependence
	F10.3	Withdrawal
	F10.4	Withdrawal with delirium
	F10.5	Psychotic Disorder
	F10.6	Amnesia Syndrome
	F10.7	Residual, late onset, psychotic disorder
	F10.8	Other mental health and behavioral disorders
F10.9	Unspecified mental health and behavior disorders	
Opioids (F11)	F11.0	Acute Intoxication
	F11.1	Harmful Use
	F11.2	Dependence
	F11.3	Withdrawal
	F11.4	Withdrawal with delirium
	F11.5	Psychotic Disorder
	F11.6	Amnesia Syndrome
	F11.7	Residual, late onset, psychotic disorder
	F11.8	Other mental health and behavioral disorders
F11.9	Unspecified mental health and behavior disorders	
Cannabinoids (F12)	F12.0	Acute Intoxication
	F12.1	Harmful Use
	F12.2	Dependence
	F12.3	Withdrawal
	F12.4	Withdrawal with delirium
	F12.5	Psychotic Disorder
	F12.6	Amnesia Syndrome
	F12.7	Residual, late onset, psychotic disorder
	F12.8	Other mental health and behavioral disorders
F12.9	Unspecified mental health and behavior disorders	
Sedatives and Hypnotics (F13)	F13.0	Acute Intoxication
	F13.1	Harmful Use
	F13.2	Dependence
	F13.3	Withdrawal
	F13.4	Withdrawal with delirium
	F13.5	Psychotic Disorder
F13.6	Amnesia Syndrome	

	F13.7	Residual, late onset, psychotic disorder
	F13.8	Other mental health and behavioral disorders
	F13.9	Unspecified mental health and behavior disorders
Cocaine (F14)	F14.0	Acute Intoxication
	F14.1	Harmful Use
	F14.2	Dependence
	F14.3	Withdrawal
	F14.4	Withdrawal with delirium
	F14.5	Psychotic Disorder
	F14.6	Amnesia Syndrome
	F14.7	Residual, late onset, psychotic disorder
	F14.8	Other mental health and behavioral disorders
	F14.9	Unspecified mental health and behavior disorders
Stimulants including cocaine (F15)	F15.0	Acute Intoxication
	F15.1	Harmful Use
	F15.2	Dependence
	F15.3	Withdrawal
	F15.4	Withdrawal with delirium
	F15.5	Psychotic Disorder
	F15.6	Amnesia Syndrome
	F15.7	Residual, late onset, psychotic disorder
	F15.8	Other mental health and behavioral disorders
	F15.9	Unspecified mental health and behavior disorders
Hallucinogens (F16)	F16.0	Acute Intoxication
	F16.1	Harmful Use
	F16.2	Dependence
	F16.3	Withdrawal
	F16.4	Withdrawal with delirium
	F16.5	Psychotic Disorder
	F16.6	Amnesia Syndrome
	F16.7	Residual, late onset, psychotic disorder
	F16.8	Other mental health and behavioral disorders
	F16.9	Unspecified mental health and behavior disorders
Tobacco (F17)	F17.0	Acute Intoxication
	F17.1	Harmful Use
	F17.2	Dependence
	F17.3	Withdrawal

	F17.4	Withdrawal with delirium
	F17.5	Psychotic Disorder
	F17.6	Amnesia Syndrome
	F17.7	Residual, late onset, psychotic disorder
	F17.8	Other mental health and behavioral disorders
	F17.9	Unspecified mental health and behavior disorders
Volatile substances (F18)	F18.0	Acute Intoxication
	F18.1	Harmful Use
	F18.2	Dependence
	F18.3	Withdrawal
	F18.4	Withdrawal with delirium
	F18.5	Psychotic Disorder
	F18.6	Amnesia Syndrome
	F18.7	Residual, late onset, psychotic disorder
	F18.8	Other mental health and behavioral disorders
	F18.9	Unspecified mental health and behavior disorders
Multiple drug use and other psychoactive substances (F19)	F19.0	Acute Intoxication
	F19.1	Harmful Use
	F19.2	Dependence
	F19.3	Withdrawal
	F19.4	Withdrawal with delirium
	F19.5	Psychotic Disorder
	F19.6	Amnesia Syndrome
	F19.7	Residual, late onset, psychotic disorder
	F19.8	Other mental health and behavioral disorders
	F19.9	Unspecified mental health and behavior disorders

Table 6: ICD-10 Codes for Misadventures to patients during surgical and medical care relate to medication poisonings

Category	Code	Specifics
Failure in dosage during surgical or medical care (Y63)	Y63.0	Excessive amount of blood or other body fluid given
	Y63.1	Incorrect dilution of fluid used during infusion
	Y63.4	Failure in dosage in electroshock or insulin-shock therapy
	Y63.6	Nonadministration of necessary drug, medicament or biological substance
	Y63.8	Failure in dosage during other surgical and medical care
	Y63.9	Failure in dosage during unspecified

Appendix D: Variables

List 1: Antidotes Stocked at SJHH as per OPC Guidance¹²

Antidote	Strength	Route	Indication
Acetylcysteine (Mucomyst)	200 mg/mL	IV	Acetaminophen and other hepatotoxins
Atropine sulfate	0.6 mg/mL	IV/IM	Carbamate and organophosphate insecticides
Botulism A-G Heptavalent Antitoxin	18 mL	IV	Botulism Toxin
Bromocriptine	2.5 mg	Oral	Neuroleptic malignant syndrome
Calcium chloride	1g/10 mL Syringe	IV	Calcium channel blockers, hydrofluoric acid burns
Calcium gluconate	1g/10mL (10%)	IV	Calcium channel blockers, hydrofluoric acid burns
Calcium gluconate	2.5% gel	Topical	
Cyproheptadine (Periactin)	4 mg	Oral	Serotonin Syndrome
Dantrolene	20 mg injection	IV	Malignant hyperthermia, neuroleptic malignant syndrome
Deferoxamine mesylate (Desferal)	2 g injection	IV/IM	Iron
Dextrose	25 g/ 50 mL	IV	Insulin, sulfonylureas, with insulin for BB, CCB
Digoxin immune fab (Digifab/Digibind)	40 mg vial	IV	Digoxin and other cardiac glycosides
Dimercaprol (BAL)	100 mg/mL (3 mL)	IM	Acute arsenic, inorganic mercury, lead
Esmolol	10 mg/mL	IV	
Ethyl alcohol	100 % (dehydrated)	IV	Methanol, ethylene glycol, or diethylene glycol
Flumazenil	0.1 mg/mL injection (5mL)	IV	Benzodiazepines
Folic acid	5 mg/mL injection	IV	Formaldehyde, methanol, methotrexate, trimethoprim
Fomepizole	1 mg/mL injection (1.5 mL)	IV	Methanol, ethylene glycol
Glucagon	1 mg vial	IM/IV	Beta-blockers
Hydroxocobalamin (Cyanokit)	5 g/vial	IV	Cyanide
Idarucizumab (Praxbind)	2.5 g/50 mL injection	IV	Dabigatran
Insulin (regular)	100 units/mL	IV	Beta-blockers, calcium channel blockers
Labetalol	5 mg/mL injection	IV	

L-Carnitine	200 mg/mL injection	IV	Hyperammonemia or valproic acid
Leucovorin	50 mg/mL injection	IV	Formaldehyde, methanol, methotrexate, trimethoprim
Lipid 20% (Intralipid)	1 L	IV	Lipid soluble toxin
Methylene Blue	10 mg/mL	IV	Methemoglobinemia
Midazolam	1 mg/mL injection 5 mg/mL injection	IM/IV	
Naloxone (Narcan)	0.4 mg/mL injection	IM/IV	Opioids
Octreotide (Sandostatin)	500 mcg/mL injection	IV	Sulfonylureas, repaglinide and related drugs
Phentolamine	5 mg/mL	IV	Dopamine, epinephrine, norepinephrine and phenylephrine
Physostigmine salicylate	1 mg/mL injection	IM/IV	Anticholinergic syndrome
Phytonadione (Vitamin K)	10 mg/mL injection	IV	Warfarin
Pralidoxime (2PAM)	1 g injection	IV/IM	Organophosphate insecticides
Prothrombin Complex Concentrate (Octaplex)		IV	Warfarin
Pyridoxine (Vit B6)	100 mg/mL injection	IM/IV	Isoniazid (INH), ethylene glycol (cofactor)
Sodium Bicarbonate	1 mEq/mL injection	IV	Tricyclic antidepressants (bolus), cocaine (bolus), salicylates (infusion)
Sodium thiosulfate	25% injection	IV	Cyanide
Thiamine (Vitamin B1)	100 mg/mL injection	IM/IV	Ethanol, ethylene glycol
Tranexamic Acid	100 mg/mL injection	IV	
Additional Agent Used in Poisonings not on the Recommended OPC Antidote List			
Activated Charcoal	50g /225 mL	PO	Adsorbent

*Protamine is not listed on antidote list but carried in pharmacy

**Dimoval to replace Dimercaprol on formulary due to drug shortages, but for the study period, Dimercaprol was available.

List 2: Selected consults that can be ordered/documentated in EPIC® relating to acute drug poisonings and mental health

- Concurrent capacity building team inpatient consult
- Psychiatric emergency services (PES) consult
- Psychologist consult
- Consultation liaison psychiatry services inpatient consult
- Behavioral therapy consult
- Consult to mood disorders tertiary mental health
- Consult to Schizophrenia tertiary mental health
- Social Work inpatient consult
- Inpatient consult to clinical pharmacology and toxicology
- Integrated Comprehensive care (ICC) inpatient consult

List 3: Selected laboratory tests that can be ordered/documentated in EPIC® relating to drug poisonings

- Drug Screen Panel (emergency)
 - Includes; methamphetamines, cocaine, cannabis, benzodiazepines, tricyclic antidepressants, barbiturates, oxycodone, MDMA (ecstasy), amphetamines, opiates, and methadone
 - Urine
- Drug Screen Faeces
- Drug Screen, hair
- Drug Screen, Urine
 - Includes EDDP-methadone metabolite, amphetamines/MDMA, oxycodone, opiates, benzodiazepines, cocaine, THC metabolite (Cannabis)
- POCT rapid urine drug panel
- Barbiturate Screen
- Phenothiazine Screen, urine
 - Drug Levels available:
 - Acetaminophen level
 - Alcohols and ethylene glycol
 - Amiodarone level
 - Amitriptyline level
 - Benzodiazepine, urine, quantitative
 - Carbamazepine level, total
 - Clonazepam level
 - Cocaine, urine, qualitative
 - Cyclosporine level
 - Dabigatran level
 - Digoxin level
 - Doxepin level
 - Ethanol
 - Ethanol, urine
 - Fentanyl, urine
 - Gabapentin level
 - Haloperidol level
 - Imipramine level
 - Factor 10 activity
 - Lamotrigine level
 - Lidocaine level
 - Lithium level
 - Methotrexate level
 - Nortriptyline level
 - Opiate, urine, qualitative
 - Phenobarbital level
 - Phencyclidine (PCP), urine
 - Phenytoin level
 - Primidone level
 - Salicylate level
 - Sirolimus level
 - Tacrolimus level
 - Theophylline level
 - Topiramate level
 - Valproic acid level
- Protime-INR
- XA Heparin standard

List 4: Selected comorbidities in patients relating to drug poisonings³⁶⁻³⁸

- Mental Health Illness
 - Major Depressive Disorder
 - Generalized Anxiety Disorder
 - Agoraphobia
 - Obsessive-compulsive disorder
 - Post-traumatic Stress Disorder
 - Schizophrenia
 - Schizoaffective Disorder
 - Bipolar Disorder Type 1
 - Bipolar Disorder Type 2
 - Borderline Personality Disorder
 - Antisocial personality disorder
 - Attention Deficit Hyperactivity Disorder
 - Eating Disorder
- Addiction Disorders
 - Opioid Use Disorder
 - Cannabis Use Disorder
 - Alcohol Use Disorder
 - Substance Use Disorder
- Miscellaneous disorders previously linked to higher rates of poisonings
 - Chronic Pain
 - Human Immunodeficiency Virus
 - Cancer
 - Cardiovascular Disease (HF, MI, Stroke, PVD)
 - Diabetes (T1DM and T2DM)
 - COPD
 - Dementia

Appendix E: Data Collection

Table 1: Variables Collected

	Variable	CIHI Coded Data	Description	Location
Poisoning	Drug(s) Involved	Yes	ICD-10-CA Coding (Appendix C, Table 2)	Discharge Abstracts (DAD/NACR)
	Intention	Yes	ICD-10-CA Coding (Appendix C, Table 1)	
In-hospital Management	Antidotes Administered	No	Ontario Poison Control recommended antidotes and activated charcoal (Appendix D, List 1)	Electronic health record system
	Consults	No	Teams referred to assist in care (Appendix D, List 2)	
	Providers Specialities Involved in Care	Yes	Medical specialities/disciplines of Providers	Discharge Abstracts (DAD/NACR)
In-hospital Outcomes	Length of Stay	Yes	Time from admission to discharge (days)	Discharge Abstracts (DAD/NACR)
	Admission to Special Care Units	Yes	Admission to intensive care unit, medical step-down unit, general internal medicine, or acute mental health, etc.	
	Discharge Location	Yes	Home, another hospital, long term care, community shelter, or no discharge location (death)	
Laboratory Data	Urine Drug Levels	No	Toxicology levels measured during admission (Appendix D, List 3)	Electronic health record system
	Blood Drug Levels	No		
Demographics	Age	Yes	Years	Discharge Abstracts (DAD/NACR)
	Gender	Yes	Female, Male, Non-binary	
	Forward Sortation Area	Yes	First 3 characters of a postal code	
	Comorbidities	Yes	Medical Conditions of Interest (Appendix D, List 4)	

Appendix F: Data Organization

Table 1: Grouping of Intention Codes

ICD-10 Code	Details	Study Grouping
X40	Non-Intentional: Nonopioid analgesics, antipyretics and antirheumatics (NSAIDs, acetaminophen, salicylate, etc.)	Non-intentional Poisoning
X41	Non-Intentional: Antiepileptic, sedative, hypnotic, antiparkinsonism and psychotropic drugs, not elsewhere classified (antidepressants, neuroepileptics, tranquilizers, stimulants, etc.)	
X42	Non-Intentional: Narcotics and psychodysleptics (Cannabis, opioids', cocaine, heroin, LSD, methadone, etc.) [hallucinogens], not elsewhere classified	
X43	Non-Intentional: Drugs acting on the autonomic nervous system (Parasympathomimetics, Sympatholytics, etc.)	
X44	Non-Intentional: Other and unspecified drugs, medicaments and biological substance (Cardio, hormones, anaesthetics, GI, etc.)	
X60	Intentional: Nonopioid analgesics, antipyretics and antirheumatics (NSAIDs, acetaminophen, salicylate, etc.)	Intentional Poisoning
X61	Intentional: Antiepileptic, sedative hypnotic antiparkinsonism and psychotropic drugs, not elsewhere classified (antidepressants, neuroepileptics, tranquilizers, stimulants, etc.)	
X62	Intentional: Narcotics and psychodysleptics (Cannabis, opioids, cocaine, heroin, LSD, methadone, etc.) [hallucinogens], not elsewhere classified	
X63	Intentional: Drugs acting on the autonomic nervous system (Parasympathomimetics, Sympatholytics, etc.)	
X64	Intentional: Other and unspecified drugs, medicaments and biological substance (Cardio, hormones, anaesthetics, GI, etc.)	
Y10	Unknown: Nonopioid analgesics, antipyretics and antirheumatics (NSAIDs, acetaminophen, salicylate, etc.)	Unknown Intent of Poisoning
Y11	Unknown: Antiepileptic, sedative hypnotic antiparkinsonism and psychotropic drugs, not elsewhere classified (antidepressants, neuroepileptics, tranquilizers, stimulants, etc.)	
Y12	Unknown: Narcotics and psychodysleptics (Cannabis, opioids, cocaine, heroin, LSD, methadone, etc.) [hallucinogens], not elsewhere classified	
Y13	Unknown: Drugs acting on the autonomic nervous system (Parasympathomimetics, Sympatholytics, etc.)	
Y14	Unknown: Other and unspecified drugs, medicaments and biological substance (Cardio, hormones, anaesthetics, GI, etc.)	

Table 2: Grouping of Poison Codes

ICD-10 Code	Details	Grouping
36,0	Penicillins	Antimicrobials
36.1	Cephalosporins	
36.3	Macrolides	
36.4	Tetracyclines	
36.9	Systemic antibiotic, unspecified	
37.2	Antimalarials and drugs acting on other blood protozoa	
37.5	Antiviral drugs	
37.8	Other specified systemic anti-infectives and antiparasitics	
38,0	Glucocorticoids and synthetic analogues	Hormones
38.1	Thyroid hormones and substitutes	
38.3	Insulin and oral hypoglycemic [antidiabetic] drugs	
38.4	Oral contraceptives	
38.5	Other estrogens and progestogens	
38.8	Other and unspecified hormones and their synthetic substitutes	
39,0	Salicylates	Salicylates
39.1	4-Aminophenol derivatives	Acetaminophen
39.2	Pyrazoline derivatives	NSAIDs
39.3	Other Non-steroidal anti-inflammatory drugs (NSAIDs)	
39.4	Antirheumatics, not elsewhere classified	Other analgesics
39.8	Other nonopioid analgesics and antipyretics not elsewhere classified	
39.9	Nonopioid analgesics, antipyretics and antirheumatics, unspecified	
40,0	Opium	Other Opioids
40.2	Other opioids not specified elsewhere	
40.28	Other opioid	
40.41	Tramadol	
40.48	Other synthetic opioid	
40.1	Heroin	Heroin
40.,20	Codeine	Prescription Opioids Excluding Fentanyl + Methadone
40.21	Morphine	
40.22	Hydromorphone	
40.23	Oxycodone	
40.3	Methadone	Methadone
40,40	fentanyl	Fentanyl
40.5	Cocaine	Cocaine
40.7	Cannabis (derivatives)	Cannabis

40.6	Other and unspecified narcotics	Psychedelics
40.8	Lysergide (LSD)	
40.9	Other and unspecified psychedelics (hallucinogens) (Mescaline, psilocin)	
41.2	Other and unspecified general anesthetics	Anesthetics
41.3	Local anesthetics	
42.0	Hydantoin derivatives	Antiepileptics
42.1	Iminostilbenes (carbamazepine)	
42.2	Succinimides and oxazolinediones	
42.3	Barbiturates	
42.5	Mixed antiepileptics not classified elsewhere	
42.6	Other antiepileptic and sedative-hypnotic drugs (valproic acid)	
42.7	Antiepileptic and sedative hypnotic drugs, unspecified	
42.4	Benzodiazepines	Benzodiazepines
42.8	Antiparkinsonism drugs and other central muscle tone depressants (amantadine)	Antiparkinsonisms
43.0	Tricyclic and tetracyclic antidepressants	Tricyclic Antidepressants
43.1	Monoamine-oxidase inhibitor antidepressants	Other Antidepressants
43.2	Other and unspecified antidepressants	
43.3	Phenothiazine antipsychotics and neuroleptics	
43.4	Butyrophenone and thioxanthene neuroleptics	Antipsychotics
43.5	Other and unspecified antipsychotics and neuroleptics	
43.6	Psychostimulants with abuse potential	Other Psychostimulants
43.8	Other psychotropic drugs, not elsewhere classified	Other Psychotropics
43.9	Psychotropic drug, unspecified	
44.0	Anticholinesterase agents	Drugs Acting on Autonomic Nervous System
44.1	Other parasympathomimetics (cholinergics)	
44.2	Ganglionic blocking drugs, not elsewhere classified	
44.3	Other parasympatholytics and spasmolytics not elsewhere classified (papaverine)	
44.4	Predominately alpha-adrenoreceptor agonists, not elsewhere classified	
44.5	Predominately beta-adrenoreceptor agonists, not elsewhere classified	
44.6	Alpha-adrenoreceptor antagonists, not elsewhere classified (ergots)	
44.7	Beta-adrenoreceptor antagonists, not elsewhere classified	
44.8	Centrally acting and adrenergic-neuron-blocking agents, not elsewhere classified	
44.9	Other and unspecified drugs primarily affecting the autonomic nervous system (stimulate both alpha and beta)	

T45.0	Antiallergic and antiemetic drugs	Antiemetics and Antiallergics
T45.1	Antineoplastic and immunosuppressive drugs (antineoplastic, cytarabine)	Hematological Agents
T45.2	Vitamins not elsewhere classified	
T45.3	Enzymes, not elsewhere classified	
T45.4	Iron and its compounds	
T45.5	Anticoagulants	
T45.6	Fibrinolysis-affecting drugs	
T45.7	Anticoagulant antagonists, vitamin k and other coagulants	
T45.8	Other primarily systemic and haematological agents (natural blood products, plasma substitute, liver preparations)	
T45.9	Primarily systemic and haematological agents, unspecified	
46,0	Cardiac stimulant glycosides and drugs of similar action	Cardiovascular Drugs
46.1	Calcium channel blockers	
46.2	Other antidysrhythmic drugs not elsewhere classified	
46.3	Coronary vasodilators, not elsewhere classified (dipyridamole)	
46.4	Angiotensin converting enzyme inhibitors	
46.5	Other antihypertensive drugs, not classified elsewhere (clonidine)	
46.6	Antihyperlipidemics and antiarteriosclerotic drugs	
46.7	Peripheral vasodilators	
46.8	Antivaricose drugs, including sclerosing agents	
46.9	Other and unspecified agents primarily affecting the cardiovascular system	
47,0	Histamine H2 Receptor Antagonists	Gastrointestinal Drugs
47.1	Other antacids and anti-gastric secretion drugs	
47.2	Stimulant laxatives	
47.4	Other laxatives	
47.5	Digestants	
47.6	Antidiarrheal drugs	
47.7	Emetics	
47.8	Other agents primarily affecting the gastrointestinal system	
48,0	Oxytocic drugs	Drugs affecting Smooth Muscle
48.1	Skeletal muscle relaxants [neuromuscular blocking agents]	
48.2	Other and unspecified agents primarily acting on muscles	
48.3	Antitussives	
48.4	Expectorants	
48.5	Anti-common cold drugs	
48.6	Antiasthmatics, not elsewhere classified (Salbutamol)	

48.7	Other and unspecified agents primarily acting on the respiratory system	
49.0	Local antifungal, anti-infective and anti-inflammatory drugs, not elsewhere classified	Topical Drugs
49.2	Local astringents and local detergents	
49.4	Keratolytics, keratoplasties and other hair treatment drugs and preparations	
49.6	Otorhinolaryngological drugs and preparations -ear, nose and throat anti-infectives	
49.7	Dental drugs, topically applied	
T50.0	Mineralocorticoids and their antagonists	
T50.1	Loop diuretics	
T50.2	Carbonic-anhydrase inhibitors, benzothiadiazides and other diuretics	
T50.3	Electrolytic, caloric and water balance agents	Other Agents
T50.4	Drugs affecting uric acid metabolism	
T50.5	Appetite depressants	
T50.6	Antidotes and chelating agents, not classified elsewhere	
T50.7	Analeptics and opioid receptor antagonists	
T50.8	Diagnostic agents	
T50.9	Other unspecified drugs, medicaments and biological substances (acidifying agents, immunoglobulins, immunologicals, lipotropic, PTH)	

Table 3: Grouping of Discharge Locations from ER

NACR		
ICD-10 Code	Description	Grouping
10	Death after arrival	Died
72	Died in facility - Excludes MAID and in facility suicide	
3	Left AMA after triage & registration	Left Against Medical Advice
4	Left AMA after triage & registration & assessment	
5	Left AMA after triage & registration & assessment & treatment	
62	Leave post initial treatment - patient left following registration, further assessment by a service provider and initiation of treatment	
63	Left after triage- patient left the ED at his/her own risk following registration and triage	
64	Left after initial assessment- patient left after registration, triage and further assessment (initial treatment did not occur)	
1	Discharged home, no support services(private dwelling)	Home (with or without support, correctional facility, transitional home, etc.)
15	Discharged to place of residence	
16	Home WITH Support/Referral- Discharged to private home with supports from the community at home or referred services	
17	Home WITHOUT Support/Referral- Discharged to private home without supports from the community at home or referred services	
40	Group/Supportive Living- Transfer to assisted living/supportive housing or transitional housing, including shelters, do not have 24-hour nursing care	
90	Correctional Facility- Transfer to jail or halfway house	
6	Admit to reporting facility as inpatient to SCU or Ambulatory care visit functional centre	Transfer to another acute care locations within hospital or between hospitals (can include Mental Health)
7	Admit to reporting facility as INP to another unit of the reporting facility from the ambulatory care visit functional centre	
8	Transfer to another acute care facility directly from ambulatory care visit functional centre (includes transfer to another acute care facility with entry through the ED)	
12	Transfer to surgery	
9	Transfer to another non-acute care facility directly from ambulatory care functional centre (stand-alone rehab, mental health)	Transfer to non-acute care facilities; LTC, Mental health or Addiction Facilities
30	Residential Care- Transfer to long term care home (24-hour nursing, mental health, or addiction treatment centre)	

Table 4: Grouping of Discharge Location from Inpatient Admissions

DAD		
ICD-10 Code	Description	Study Grouping
7	Died	Died
72	Died in facility	
6	Left AMA	Left Against Medical Advice
61	Absent without leave (AWOL)	
62	Left against medical advice (LAMA)	
65	Did not return from leave	
4	Discharge home with support	Home (with or without support, correctional facility, transitional home, etc.)
5	Discharge home without support	
40	Transfer to group/supportive living	
90	Transfer to correctional	
3	Transfer to OTHER care (ambulatory, palliative, etc.).	Transfer to another acute care locations within hospital or between hospitals (can include Mental Health)
10	Transfer to reporting or another facility for inpatient	
2	Transfer to Continuing Care	Transfer to non-acute care facilities; LTC, Mental health or Addiction Facilities
30	Transfer to residential care	

Table 5: Groupings of Comorbidities

Disease State	Grouping
Major Depressive Disorder, single episode	Mental Health Disorder
Major Depressive Disorder, recurrent episode	
Anxiety Disorders (GAD, mixed, panic)	
Agoraphobia	
Obsessive-compulsive disorder	
Post-traumatic stress disorder (+ reaction to severe stress)	
Schizophrenia	
Schizoaffective	
Persistent mood [affective] disorders	
Unspecified mood [affective] disorder	
Bipolar Disorder Type 1 and 2	
Manic Disorder	
Personality disorders	
Attention Deficit Hyperactivity Disorder	
Eating Disorder	Homelessness
Homelessness	Addiction Disorder
Alcohol Related Disorders	
Opioid Related Disorders	
Cannabis Related Disorders	
Sedative, hypnotic or anxiolytic related disorder	
Cocaine related disorder	
Other stimulant related disorder	
Hallucinagen related disorder	
Other psychoactive substance related disorder	Chronic Health Disorder
Chronic Pain	
Human Immunodeficiency Virus (any related)	
Active Cancer	
Cardiovascular Disease (HF, MI, Stroke, PVD)	
Diabetes	
COPD	
Dementia	
Kidney Disease (Acute kidney + chronic kidney disease)	
Liver cirrhosis	

Table 6: Grouping of Consults

Epic® Procedure Order Display Name	Grouping
NA	No Consult
Psychiatric Emergency Services (PES) consult	Mental Health Consult
Psychologist consult	
Neuropsychology consult	
Consultation Liaison Psychiatry Services inpatient consult	
Behavioral Therapy Consult	
Behavioral Supports Ontario inpatient consult	
Cognitive Behavioral Therapy inpatient consult	
Consult To Mood Disorders tertiary mental health	
Consult To Schizophrenia tertiary mental health	
Social Work inpatient consult	
PES Social Work Consult	
Integrated Comprehensive Care (ICC) inpatient consult	
Concurrent Capacity Building Team inpatient consult	Concurrent Capacity and Addiction Consult
Inpatient Consult to Clinical Pharmacology and Toxicology	CPICs Consult
Pharmacy general consult	Pharmacy Consult

Table 7: Grouping of Admissions to Special Care Units

ICD-10 Code	Description	Grouping
99	No Special Care Unit	No admission to a special care unit
45	Coronary Intensive Care Nursing Unit (medical)	Admission to the Intensive Care Unit
95	Step-down Surgical Unit	Admission to the Medical or Surgical Step-Down Unit
30	Combined Medical, Surgical Care Nursing Unit	Admission to both the Intensive Care and Medical/Surgical Step-Down units

Table 8: Grouping of Admitting Physician Services

Service	Groupings
Psychiatry	Psychiatry
Internal Medicine, Cardiology, Nephrology, Gastroenterology, Respiriology, Neurology and Urology	Internal Medicine
Critical Care	Critical Care
General, orthopaedic, thoracic and otolaryngology surgery	Surgery
Emergency	No admitting Service

Table 9: Grouping of Selected Lab Values Ordered

Epic® Lab Value Order Name	Grouping
Drug Screen Panel (emergency)	Drug Screen
Drug Screen Faeces	
Drug Screen, hair	
Drug Screen, Urine	
POCT rapid urine drug panel	
Barbiturate Screen	
Phenothiazine Screen, urine	
Acetaminophen level	Acetaminophen
Salicylate level	Salicylate
Alcohols and ethylene glycol	Ethanol
Ethanol	
Ethanol, urine	
Opiate, urine, qualitative	Elicit Substances
Phencyclidine (PCP), urine	
Fentanyl, urine	
Cocaine, urine, qualitative	
Amiodarone level	Therapeutic Drug
Amitriptyline level	
Carbamazepine level, total	
Clonazepam level	
Cyclosporine level	
Dabigatran level	
Digoxin level	
Doxepin level	
Gabapentin level	
Haloperidol level	
Imipramine level	
Lamotrigine level	
Lidocaine level	
Lithium level	
Methotrexate level	
Nortriptyline level	
Phenobarbital level	
Phenytoin level	
Primidone level	
Sirolimus level	
Tacrolimus level	
Theophylline level	

Topiramate level	
Valproic acid level	
Protine-INR	Coagulation
XA Heparin standard	
Factor 10 activity	

Appendix G: Tabulation of All Results

Table 1: Classes of Drugs Involved in Diagnosed Drug Poisonings (% per visit)

	All Drug Poisonings	Intentional Drug Poisonings	Unintentional Drug Poisonings	Unknown Intent of Drug Poisoning
Antimicrobials	27 (0.91)	15 (0.10)	12 (0.97)	0 (0)
Hormones	111 (3.72)	62 (4.12)	45 (3.64)	4 (1.65)
Salicylates	33 (1.11)	26 (1.73)	7 (0.57)	0 (0)
Acetaminophen	436 (14.62)	329 (21.86)	93 (7.52)	14 (5.79)
NSAIDs	149 (4.09)	122 (8.11)	26 (2.10)	1 (0.41)
Other non-opioid analgesics	5 (0.17)	3 (0.20)	2 (0.16)	0 (0)
Fentanyl	238 (7.98)	26 (1.73)	197 (15.94)	15 (6.20)
Heroin	182 (6.10)	10 (0.66)	142 (11.49)	30 (12.40)
Methadone	21 (0.70)	5 (0.33)	15 (1.21)	1 (0.41)
Prescription Narcotics excluding fentanyl and methadone	174 (5.83)	97 (6.45)	70 (5.66)	7 (2.89)
Other opioids	259 (8.68)	39 (2.59)	185 (14.97)	35 (14.46)
Cocaine	105 (3.52)	30 (1.99)	58 (4.69)	17 (7.02)
Cannabis	61 (2.04)	11 (0.73)	43 (3.48)	7 (2.89)
Psychedelics	87 (2.92)	9 (0.60)	57 (4.61)	21 (8.68)
Anaesthetics	6 (0.20)	2 (0.13)	3 (0.24)	1 (0.41)
Benzodiazepines	515 (17.26)	375 (24.92)	112 (9.06)	28 (11.57)
Antiparkinsonisms	52 (1.74)	28 (1.86)	19 (1.54)	5 (2.07)
Antiepileptics	337 (11.30)	253 (16.81)	75 (6.07)	9 (3.72)
Other Psychostimulants	163 (5.46)	51 (3.39)	95 (7.69)	17 (7.02)
Tricyclic antidepressants	47 (1.58)	41 (2.72)	5 (0.40)	1 (0.41)
Other antidepressants	449 (15.05)	364 (24.19)	74 (5.99)	11 (4.55)
Antipsychotics	273 (9.15)	210 (13.95)	54 (4.37)	9 (3.72)
Other Psychotropics	25 (0.84)	9 (0.60)	14 (1.13)	2 (0.83)
Drugs primarily affecting the autonomic nervous system	102 (3.42)	63 (4.19)	33 (2.67)	6 (2.48)
Antiallergic and antiemetic	152 (5.10)	118 (7.84)	29 (2.35)	5 (2.07)
Hematologic Agents	38 (1.27)	24 (1.59)	13 (1.05)	1 (0.41)
Cardiovascular Drugs	85 (2.88)	54 (3.59)	28 (2.26)	3 (1.24)
Gastrointestinal Drugs	35 (1.17)	24 (1.59)	9 (0.73)	2 (0.83)

Drugs affecting smooth muscles	39 (1.30)	30 (1.99)	8 (0.65)	1 (0.41)
Topical Drugs	16 (0.54)	7 (0.47)	9 (0.73)	0 (0)
Diuretics	15 (0.50)	8 (0.53)	7 (0.57)	0 (0)
Other drugs	147 (4.93)	58 (3.86)	60 (4.85)	29 (11.98)

Table 2: Selected Lab Tests Ordered in Diagnosed Drug Poisonings (% per visit)

	All Drug Poisonings	Intentional Drug Poisonings	Unintentional Drug Poisonings	Unknown Intent of Drug Poisoning
Drug Screen	276 (9.25)	148 (9.83)	99 (8.01)	29 (11.98)
Acetaminophen	1055 (35.37)	629 (41.79)	330 (26.70)	96 (39.67)
Salicylate	1046 (35.07)	629 (41.79)	322 (26.05)	95 (39.26)
Ethanol	1050 (35.20)	628 (41.73)	327 (26.46)	95 (39.26)
Illicit Drug	9 (0.30)	0	5 (0.40)	4 (1.65)
Therapeutic Drug	111 (3.72)	66 (4.39)	32 (2.59)	13 (5.37)
Coagulation	214 (7.17)	113 (7.51)	80 (6.47)	21 (8.68)

Table 3: Selected Antidotes Ordered in Diagnosed Drug Poisonings (% per visit)

	All Drug Poisonings	Intentional Drug Poisonings	Unintentional Drug Poisonings	Unknown Intent of Drug Poisoning
Acetylcysteine (Mucomyst)	150 (5.03)	119 (7.91)	29 (2.35)	2 (0.83)
Activated Charcoal	67 (2.25)	62 (4.12)	3 (0.24)	2 (0.83)
Atropine sulfate	3 (0.10)	2 (0.13)	1 (0.08)	0
Botulism A-G Heptavalent Antitoxin	0	0	0	0
Bromocriptine	1 (0.03)	1 (0.07)	0	0
Calcium chloride or gluconate	83 (2.78)	37 (2.46)	40 (3.24)	6 (2.48)
Cyproheptadine (Periactin)	2 (0.07)	2 (0.13)	0	0
Dantrolene	0	0	0	0
Deferoxamine mesylate (Desferal)	0	0	0	0
Dextrose	137 (4.59)	66 (4.38)	63 (5.10)	8 (3.31)
Digoxin immune fab (Digifab/Digibind)	2 (0.07)	1 (0.07)	1 (0.08)	0
Dimercaprol (BAL)	0	0	0	0
Esmolol	1 (0.03)	0	1 (0.8)	0
Ethyl alcohol	0	0	0	0
Flumazenil	2 (0.07)	0	2 (0.16)	0
Folic acid	12 (0.40)	4 (0.27)	6 (0.49)	2 (0.83)
Fomepizole	5 (0.17)	3 (0.20)	2 (0.16)	0
Glucagon	17 (0.57)	12 (0.80)	5 (0.40)	0
Hydroxocobalamin (Cyanokit)	0	0	0	0
Idarucizumab (Praxbind)	0	0	0	0
Insulin (regular)	30 (1.00)	12 (0.80)	15 (1.21)	3 (1.24)
Labetalol	14 (0.47)	3 (0.20)	9 (0.73)	2 (0.83)
L-Carnitine	1 (0.03)	1 (0.07)	0	0
Leucovorin	2 (0.07)	1 (0.07)	1 (0.08)	0
Lipid 20% (Intralipid)	3 (0.10)	3 (0.20)	0	0
Methylene Blue	0	0	0	0
Midazolam	0	0	0	0
Naloxone (Narcan)	342 (11.46)	92 (6.11)	211 (17.07)	39 (16.12)
Octreotide (Sandostatin)	7 (0.23)	2 (0.13)	4 (0.32)	1 (0.41)
Phentolamine	0	0	0	0
Physostigmine salicylate	0	0	0	0

Phytonadione (Vitamin K)	34 (1.14)	14 (0.93)	19 (1.54)	1 (0.41)
Pralidoxime (2PAM)	0	0	0	0
Prothrombin Complex Concentrate (Octaplex)	0	0	0	0
Pyridoxine (Vit B6)	2 (0.07)	1 (0.07)	1 (0.08)	0
Sodium Bicarbonate	0	0	0	0
Sodium thiosulfate	0	0	0	0
Thiamine (Vitamin B1)	235 (7.88)	141 (0.37)	81 (6.55)	13 (5.37)
Tranexamic Acid	7 (0.23)	5 (0.33)	2 (0.16)	0

Table 4: Forward Sortation Area as described Per Drug Poisoning Visit

Forward Sortation Area	All Drug Poisonings	Intentional Drug Poisonings	Unintentional Drug Poisonings	Unknown Intent of Drug Poisoning
B1K	1	1	0	0
H2E	1	1	0	0
L0C	1	1	0	0
L0G	1	0	1	0
L0P	1	0	1	0
L0R	88	52	33	3
L0S	1	1	0	0
L1N	1	1	0	0
L2E	2	2	0	0
L2H	1	0	1	0
L2M	1	1	0	0
L2N	1	1	0	0
L2R	1	0	1	0
L2S	2	1	0	1
L3B	3	2	1	0
L3C	2	2	0	0
L3M	17	12	4	1
L3W	1	1	0	0
L3Y	1	0	0	1
L4L	1	1	0	0
L4S	2	0	2	0
L5A	1	1	0	0
L5E	1	1	0	0
L5H	1	0	0	1
L5J	0	0	0	0
L5K	1	1	0	0
L5N	1	1	0	0
L6A	2	2	0	0
L6H	3	2	1	0
L6J	3	0	3	0
L7A	1	1	0	0
L7G	1	0	1	0
L7H	1	0	0	1
L7L	3	3	0	0
L7M	6	2	2	2
L7N	2	1	1	0
L7P	6	4	2	0
L7S	2	1	1	0

L7T	3	1	2	0
L8B	14	10	3	1
L8E	105	56	40	9
L8G	70	34	29	7
L8H	198	103	77	18
L8J	59	34	20	5
L8K	127	65	56	6
L8L	271	117	133	21
L8M	138	63	61	14
L8N	197	98	89	10
L8P	223	102	102	19
L8Q	0	0	0	0
L8R	153	73	60	20
L8S	100	59	33	8
L8T	65	37	21	7
L8U	0	0	0	0
L8V	99	56	38	5
L8W	72	38	27	7
L9A	107	74	24	9
L9B	60	37	20	3
L9C	199	120	64	15
L9G	58	42	14	2
L9H	79	44	32	3
L9K	37	25	12	0
L9N	2	1	1	0
L9P	1	1	0	0
L9T	4	2	2	0
L9W	3	1	2	0
L9Y	1	1	0	0
M1B	3	2	1	0
M1J	1	0	0	1
M1V	2	2	0	0
M2J	1	0	1	0
M2R	1	1	0	0
M4E	1	1	0	0
M4M	0	0	0	0
M5A	2	2	0	0
M5B	1	0	1	0
M5J	1	0	1	0
M5Z	0	0	0	0
M8W	2	2	0	0

M9C	1	1	0	0
M9R	2	0	2	0
N0A	29	14	10	5
N0B	7	5	2	0
N0C	1	0	1	0
N0E	6	3	2	1
N0G	1	0	1	0
N0J	2	2	0	0
N0K	1	1	0	0
N1A	6	3	2	1
N1G	1	1	0	0
N1H	1	1	0	0
N1K	1	1	0	0
N1L	1	1	0	0
N1R	2	2	0	0
N2L	2	1	1	0
N2R	1	1	0	0
N2S	1	0	1	0
N3L	1	1	0	0
N3P	2	0	2	0
N3R	8	2	5	1
N3S	7	6	0	1
N3T	4	3	1	0
N3V	1	1	0	0
N3W	18	8	10	0
N3Y	1	0	0	1
N4B	1	0	1	0
N4N	1	0	0	1
N5A	1	0	1	0
N5Y	2	0	1	1
N6A	1	1	0	0
N9G	1	1	0	0
P9N	1	0	1	0
S4R	1	0	0	1
T1K	1	0	1	0
T5G	1	0	0	1
V2N	1	0	1	0
N5Z	1	0	1	0
BLANK	237	41	168	28
Total	2983	1505	1236	242

Table 5: Forward Sortation Area as described Per Patient

Forward Sortation Area	All Drug Poisonings	Intentional Drug Poisonings	Unintentional Drug Poisonings	Unknown Intent of Drug Poisoning
B1K	1	0	1	0
H2E	1	0	1	0
L0C	1	0	1	0
L0G	1	1	0	0
L0P	1	1	0	0
L0R	79	31	45	3
L0S	1	0	1	0
L1N	1	0	1	0
L2E	2	0	2	0
L2H	1	1	0	0
L2M	1	0	1	0
L2N	1	0	1	0
L2R	1	1	0	0
L2S	2	0	1	1
L3B	3	1	2	0
L3C	2	0	2	0
L3M	13	4	9	0
L3W	1	0	1	0
L3Y	1	0	0	1
L4L	1	0	1	0
L4S	2	2	0	0
L5A	1	0	1	0
L5E	1	0	1	0
L5H	1	0	0	1
L5J	0	0	0	0
L5K	1	0	1	0
L5N	1	0	1	0
L6A	2	0	2	0
L6H	2	1	1	0
L6J	2	2	0	0
L7A	1	0	1	0
L7G	1	1	0	0
L7H	1	0	0	1
L7L	3	0	3	0
L7M	5	2	2	1
L7N	2	1	1	0
L7P	4	2	2	0
L7S	1	1	0	0

L7T	3	2	1	0
L8B	13	3	10	0
L8E	95	40	49	6
L8G	56	26	25	5
L8H	147	69	68	10
L8J	55	19	32	4
L8K	99	47	49	3
L8L	211	118	77	16
L8M	91	44	41	6
L8N	132	79	47	6
L8P	164	82	71	11
L8Q	0	0	0	0
L8R	79	45	24	10
L8S	71	28	37	6
L8T	51	16	29	6
L8U	0	0	0	0
L8V	73	35	34	4
L8W	61	25	32	4
L9A	77	21	50	6
L9B	50	18	30	2
L9C	138	56	74	8
L9G	42	13	27	2
L9H	63	31	30	2
L9K	30	10	20	0
L9N	2	1	1	0
L9P	1	0	1	0
L9T	4	2	2	0
L9W	3	2	1	0
L9Y	1	0	1	0
M1B	1	1	0	0
M1J	1	0	0	1
M1V	1	0	1	0
M2J	1	1	0	0
M2R	1	0	1	0
M4E	1	0	1	0
M4M	0	0	0	0
M5A	1	0	1	0
M5B	1	1	0	0
M5J	1	1	0	0
M5Z	0	0	0	0
M8W	1	0	1	0

M9C	1	0	1	0
M9R	2	2	0	0
N0A	25	10	12	3
N0B	6	2	4	0
N0C	1	1	0	0
N0E	6	2	3	1
N0G	1	1	0	0
N0J	2	0	2	0
N0K	1	0	1	0
N1A	6	2	3	1
N1G	1	0	1	0
N1H	1	0	1	0
N1K	1	0	1	0
N1L	1	0	1	0
N1R	2	0	2	0
N2L	2	1	1	0
N2R	1	0	1	0
N2S	1	1	0	0
N3L	1	0	1	0
N3P	2	2	0	0
N3R	7	5	1	1
N3S	7	0	6	1
N3T	4	1	3	0
N3V	1	0	1	0
N3W	16	9	7	0
N3Y	1	0	0	1
N4B	1	1	0	0
N4N	1	0	0	1
N5A	1	1	0	0
N5Y	2	1	0	1
N6A	0	0	0	0
N9G	1	0	1	0
P9N	1	1	0	0
S4R	1	0	0	1
T1K	1	1	0	0
T5G	1	0	0	1
V2N	1	1	0	0
N5Z	1	1	0	0
BLANK	131	104	13	14
Total	2211	1038	1021	152

Figure 1: Geographical Heat Map for All Drug Poisonings Analyzed Per Patient

