

# Clinical overlap between intentional and unintentional drug intoxication in elderly emergency patients: a retrospective study

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## Research Article

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# Abstract

## Background

Drug intoxication is a common cause of emergency admission in older adults. However, distinguishing between intentional (suicidal) and unintentional intoxication is often challenging in clinical practice.

## Methods

We conducted a retrospective observational study of patients aged  $\geq 65$  years presenting with drug intoxication to a tertiary emergency center between 2016 and 2023. Patients were classified into intentional and unintentional groups based on clinical records. Baseline characteristics and patterns of ingested drug categories were compared using appropriate statistical tests.

## Results

A total of 132 patients were included in the study (intentional,  $n = 62$ ; unintentional,  $n = 70$ ). Baseline characteristics were largely similar between the two groups, with no substantial differences in demographic or clinical factors. Hypnotics/anxiolytics were the most frequently ingested drugs in both groups. Psychotropic drugs were significantly more common in the unintentional ingestion group, whereas pesticide ingestion was markedly higher in the intentional ingestion group. The mean number of drugs ingested was slightly higher in the unintentional group (1.53 vs. 1.29). Overall, patterns of ingested drugs were largely similar between groups, except for pesticide-related cases.

## Conclusions

In older adults, intentional and unintentional drug intoxication share similar clinical backgrounds and medication patterns, suggesting the possibility of shared underlying vulnerability. Distinctions based solely on intent may be clinically limited in this population.

## Background

The global population is rapidly aging, and older adults account for an increasing proportion of emergency department (ED) visits. Among the various conditions encountered by this population, drug intoxication is a common and clinically important problem, as evidenced by poisoning center surveillance reports and emergency hospitalization studies of adverse drug events in older adults [1, 2]. Older adults are particularly vulnerable to intoxication owing to age-related pharmacokinetic and pharmacodynamic changes, multimorbidity, cognitive and functional decline, and frequent exposure to multiple medications [2–4].

Recent population-based studies have shown that both suicide and accidental drug poisoning are important preventable causes of morbidity and mortality in older adults [5–7]. Japanese nationwide claims data also indicate that overdose-related admissions show a distinct late-life peak and that benzodiazepine exposure and cardiovascular drug poisoning are particularly relevant in the oldest age groups [8].

In clinical practice, intentional and unintentional intoxication are often conceptualized as distinct entities with different mechanisms, risk factors, and prevention strategies. However, several lines of evidence suggest that this dichotomy may be incomplete for older adults. ED-based comparative studies focusing on actual ingested drug patterns are limited. A national study from Spain emphasized that suicide and accidental drug poisoning deaths should be examined together because determining the intent in fatal overdose is often difficult and prevention strategies may overlap [5]. A Swedish national register-based study showed that both intentional and unintentional poisoning remain clinically important among older adults, although intentional poisoning outnumbered unintentional events in this setting [7].

Distinguishing between intentional and unintentional intoxication in the ED is challenging. Older adults frequently present with impaired consciousness, limited communication, or incomplete information from their families or caregivers. In addition, the widespread use of sedative-hypnotics and other psychotropic medications can produce sedation, cognitive impairment, falls, and other similar manifestations regardless of intent [9]. Thus, the initial classification of intoxication may not accurately reflect the underlying intent, and clinical management based solely on this classification may overlook shared vulnerabilities.

However, most studies have examined intentional and unintentional intoxication separately. A previous Japanese tertiary care study directly compared intentional and unintentional drug poisoning in older adults [10]; however, further ED-based evidence is needed to clarify how clinical backgrounds and actual ingested drug patterns overlap between these two categories.

Given these considerations, it remains unclear whether intentional and unintentional intoxication in older patients in the ED are truly distinct clinical entities or whether overlapping manifestations arise from shared underlying vulnerabilities. This study aimed to compare the clinical characteristics and patterns of ingested medications between intentional and unintentional drug intoxication in older adults presenting to the ED and to explore the extent to which these conditions can be distinguished in real-world clinical practice.

## Methods

### Study design and setting

This retrospective observational study was conducted at the Emergency and Critical Care Center of St. Mary's Hospital, a tertiary care facility in Kurume, Japan.

## Study population

Patients aged  $\geq 65$  years who presented with drug intoxication between January 1, 2016, and December 31, 2023, were identified from the electronic medical record system using diagnostic codes related to intoxication. Patients with non-drug intoxication, including alcohol and gas poisoning, were excluded. Among the 1,867 patients initially identified, 220 cases were identified as drug intoxication after excluding non-drug causes. Medical records were reviewed in detail, and cases without confirmed drug intoxication (e.g., triage-only diagnoses, suspected but unconfirmed cases, or duplicate records) were excluded. The final study population comprised 132 patients.

## Classification of intoxication

Patients were classified into two groups based on clinical assessment documented in medical records: intentional intoxication (suicidal) and unintentional intoxication. This classification was based on treating physicians' documentation in the medical records, including patient statements, family reports, and clinical context.

## Data collection

The following variables were extracted from medical records: age, sex, living status (living alone or not), psychiatric history, dementia, diabetes mellitus, mode of arrival, level of consciousness at presentation, and clinical outcomes, including hospital admission and intensive care unit (ICU) admission. The level of consciousness was assessed using the Japan Coma Scale (JCS) and was categorized as alert (JCS 0), I (JCS 1–3), II (JCS 10–30), or III (JCS 100–300).

## Classification of ingested drugs

The ingested drugs were classified into the following predefined categories: hypnotics/anxiolytics, antidepressants, psychotropic drugs, antiepileptics, antiparkinsonian drugs, antidementia drugs, antihypertensive drugs, antidiabetic drugs, antiplatelet agents, anticoagulants, vasodilators, gastrointestinal drugs, antiallergic drugs, analgesics, antibiotics, herbal medicines (Kampo), and pesticides. Psychotropic drugs were defined as antipsychotics and other central nervous system agents, excluding hypnotics/anxiolytics and antidepressants.

## Statistical analysis

Continuous variables are presented as mean  $\pm$  standard deviation (SD), and categorical variables are presented as numbers (percentages). Percentages were calculated within each group. Comparisons between the intentional and unintentional intoxication groups were performed using the unpaired

Student's t-test for continuous variables and the chi-square test or Fisher's exact test for categorical variables, as appropriate. Statistical significance was defined as a two-sided p-value of  $< 0.05$ .

## Ethical considerations

The institutional ethics committee approved this study and waived the requirement for informed consent in view of its retrospective design.

## Results

### Patient characteristics

In total, 132 older adult patients with confirmed drug intoxication were included in the analysis. Of these, 62 were classified as intentional intoxications and 70 as unintentional intoxications (Fig. 1). The baseline characteristics are shown in Table 1. There were no significant differences between the two groups in terms of age, sex, or living status. Similarly, psychiatric history and dementia were not significantly different between the groups, although psychiatric history tended to be more frequent in the intentional group than in the unintentional group. Diabetes mellitus was significantly more common in the unintentional intoxication group (16.7% vs. 9.7%,  $p = 0.04$ ).

Table 1  
Baseline characteristics of patients with intentional and unintentional drug intoxication

| Demographics                                                                                                                                                                                                                                                                                                                     | Intentional<br>intoxication (n = 62) | Unintentional<br>intoxication<br>(n = 70) | p-value |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------|-------------------------------------------|---------|
| Age, years, mean $\pm$ SD                                                                                                                                                                                                                                                                                                        | 76.8 $\pm$ 7.3                       | 77.7 $\pm$ 8.1                            | 0.49    |
| Female sex, n (%)                                                                                                                                                                                                                                                                                                                | 43 (69.4)                            | 38 (54.3)                                 | 0.07    |
| Living alone, n (%)                                                                                                                                                                                                                                                                                                              | 12 (19.4)                            | 16 (22.9)                                 | 0.36    |
| Clinical characteristics                                                                                                                                                                                                                                                                                                         |                                      |                                           |         |
| Psychiatric history, n (%)                                                                                                                                                                                                                                                                                                       | 31(50.0)                             | 25 (35.7)                                 | 0.10    |
| Dementia, n (%)                                                                                                                                                                                                                                                                                                                  | 15 (24.2)                            | 25 (35.7)                                 | 0.15    |
| Diabetes mellitus, n (%)                                                                                                                                                                                                                                                                                                         | 6 (9.7)                              | 16 (16.7)                                 | 0.04    |
| Clinical presentation                                                                                                                                                                                                                                                                                                            |                                      |                                           |         |
| Ambulance transport, n (%)                                                                                                                                                                                                                                                                                                       | 62 (100.0)                           | 66 (94.3)                                 | 0.99    |
| Level of consciousness (JCS), n (%)                                                                                                                                                                                                                                                                                              |                                      |                                           | 0.55    |
| Alert (JCS 0)                                                                                                                                                                                                                                                                                                                    | 10 (16.3)                            | 7 (10.0)                                  |         |
| I (JCS 1–3)                                                                                                                                                                                                                                                                                                                      | 22 (35.5)                            | 32 (45.7)                                 |         |
| II (JCS 10–30)                                                                                                                                                                                                                                                                                                                   | 15 (24.2)                            | 14 (20.0)                                 |         |
| III (JCS 100–300)                                                                                                                                                                                                                                                                                                                | 15 (24.2)                            | 17 (24.3)                                 |         |
| Discharge disposition, n (%)                                                                                                                                                                                                                                                                                                     |                                      |                                           |         |
| Hospital admission                                                                                                                                                                                                                                                                                                               | 57 (91.9)                            | 48 (68.6)                                 | 0.001   |
| ICU admission                                                                                                                                                                                                                                                                                                                    | 47 (75.8)                            | 22 (31.4)                                 | < 0.001 |
| Values are presented as number (percentage). Percentages were calculated within each group. Psychotropic drugs included antipsychotics and other central nervous system agents, excluding hypnotics/anxiolytics and antidepressants. P-values were calculated using the chi-squared test or Fisher's exact test, as appropriate. |                                      |                                           |         |

## Clinical presentation and outcomes

Most patients in both groups were transported via ambulance. The level of consciousness at presentation, as assessed using the Japan Coma Scale, did not differ significantly between the groups ( $p = 0.55$ ). In terms of clinical outcomes, hospital admissions were more frequent in the intentional group

(83.9% vs. 67.1%,  $p = 0.001$ ). The ICU admission rate was also significantly higher in the intentional group (75.8% vs. 30.0%,  $p < 0.001$ ).

## Patterns of ingested drugs

The distribution of ingested drug categories is shown in Fig. 2 and Supplementary Table S1.

Hypnotics/anxiolytics were the most frequently ingested drugs in both intentional and unintentional intoxication groups, demonstrating a substantial overlap in major poisoning patterns. Antidepressant use was also similar between the two groups.

At the category level (Fig. 2A), several statistically significant differences were observed. Psychotropic drugs were significantly more common in the unintentional intoxication group (21.4% vs. 3.2%,  $p = 0.002$ ), whereas pesticide ingestion was markedly higher in the intentional intoxication group (32.3% vs. 7.1%,  $p < 0.001$ ). In addition, antiepileptics, anti-parkinsonian drugs, and antihypertensive drugs were modestly more frequent in the unintentional group.

However, these differences were not uniform across categories, and the overall poisoning patterns remained broadly overlapping between the two groups. When drug categories were regrouped into clinically meaningful clusters (Fig. 2B), the distributions largely converged except for pesticide-related cases. This pattern suggests that intentional and unintentional intoxication in older adults may share partially overlapping medication exposure backgrounds despite localized differences in specific drug categories.

## Number of ingested drug categories

The average number of ingested drug categories was slightly higher in the unintentional group than in the intentional group (1.53 vs. 1.29), although the difference was modest.

## Discussion

This study provides a direct ED-based comparison of poisoning patterns between intentional and unintentional drug intoxication in older adults. Overall, the distribution of poisoning agents was broadly similar between the groups, although important differences were observed for pesticide ingestion and ICU admission. In addition, several category-level differences were identified in specific medication classes; however, these differences were not uniform and were observed within an overall pattern of substantial clinical overlap. These findings suggest that, in real-world emergency settings, distinguishing intentional from unintentional intoxication in older adults may sometimes be clinically challenging. In particular, overlapping medication exposure patterns and similar clinical presentations may contribute to ambiguity in the initial assessment of intoxication. This interpretation is consistent with previous reports showing that older adults with self-poisoning or drug-related acute toxicity often have overlapping vulnerabilities, including psychiatric and physical illnesses, social isolation, medication exposure, and difficulties in medication management [5–7]. Similar overlaps have also been reported in studies of self-harm and prescription drug overdose among older adults [11, 12].

Several population-based studies have suggested that intentional and unintentional poisoning in older adults should not always be viewed as completely separate clinical problems [5, 7]. Our findings extend these observations by demonstrating partially overlapping medication patterns and clinical backgrounds in an ED-based cohort.

A notable finding was the predominance of hypnotics/anxiolytics and other psychotropic medications in both groups. This likely reflects the high prevalence of insomnia, anxiety, depression, and behavioral symptoms among older adults, leading to widespread exposure to these agents. Sedative hypnotics have been shown to provide only modest benefits in older adults while increasing the risk of cognitive impairment, psychomotor effects, and falls [9]. Prescription drug overdose studies in older adults also indicate that suicidal behavior is often facilitated by the availability of prescribed medications used for chronic psychiatric or medical conditions [12]. Therefore, intentional and unintentional intoxication in older adults may show partially overlapping medication patterns, particularly when sedatives or psychotropic drugs are widely available at home.

By contrast, pesticide ingestion was significantly associated with intentional intoxication. This finding is consistent with previous evidence showing that pesticide ingestion is a highly lethal and common suicide method in many settings [13]. Although commonly prescribed medications may blur the boundary between suicidal and accidental intoxication, the selection of highly lethal and less routinely prescribed agents may provide important clues regarding the underlying intent.

Interestingly, the number of drugs ingested was slightly higher in the unintentional ingestion group. This pattern may reflect broader medication exposure and medication management complexity rather than deliberate selection. Polypharmacy, dosing errors, and impaired self-management may contribute to diffuse and cumulative toxicity in older adults [3, 4].

Despite having similar levels of consciousness at presentation, patients in the intentional group were more frequently admitted to the ICU. This difference may reflect perceived lethality or medico-psychiatric risk rather than initial physiological severity alone. Even when toxicological severity is limited, suicidal intent and the use of highly lethal agents may influence admission decisions in older adults.

From a clinical perspective, our findings support the importance of integrated assessment and discharge planning for both intentional and unintentional intoxication in older adults. Clinicians should assess not only immediate toxicological severity but also medication management, cognitive function, psychosocial vulnerability, and the home medication environment. Collaboration among emergency physicians, psychiatrists, pharmacists, nurses, social workers, and primary care providers may be important for recurrence prevention and medication safety.

Nursing practice may play an important role in this process, particularly in medication education, discharge coordination, and early post-discharge follow-up. Older adults with either intentional or unintentional intoxication may require structured assessment of medication self-management and caregiver support.

This study had several limitations. First, the retrospective design and reliance on medical records may have led to the misclassification of intent, particularly in cases with impaired consciousness or incomplete information. However, this limitation also reflects the real-world difficulty of intent determination, which is central to the clinical questions addressed in this study. Second, the sample size was relatively small, which limited the statistical power to detect subtle differences. In addition, because this exploratory study involved multiple comparisons across drug categories, some statistically significant findings may have occurred by chance. Third, we analyzed ingested drugs rather than habitual prescriptions; therefore, we could not directly evaluate chronic polypharmacy, medications remaining at home, or medication adherence. Fourth, we did not formally analyze repeated intoxication or post-discharge outcomes.

## Conclusions

In conclusion, intentional and unintentional drug intoxication in older adults showed partially overlapping clinical backgrounds and medication patterns. These findings suggest that distinguishing intent in real-world emergency settings may be clinically challenging in some older patients. Recognizing this overlap may contribute to more appropriate ED assessment, discharge planning, medication safety interventions, and recurrence prevention strategies.

## Abbreviations

ED  
Emergency Department  
ICU  
Intensive Care Unit  
JCS  
Japan Coma Scale  
SD  
Standard Deviation

## Declarations

### **Ethics approval and consent to participate**

This study was conducted in accordance with the Declaration of Helsinki and was approved by the Research Ethics Committee of Our Lady of the Snow Social Medical Corporation (approval number: 26-0410).

The requirement for informed consent, including written informed consent, was waived due to the retrospective nature of the study. Instead, an opt-out approach was adopted, and study information was publicly disclosed to provide participants with the opportunity to decline participation.

## **Consent for publication**

Not applicable.

## **Availability of data and materials**

The datasets used and/or analyzed in the current study are available from the corresponding author upon reasonable request.

## **Competing interests**

The authors declare that they have no competing interests.

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This research received no external funding.

## **Authors' contributions**

HK contributed to data collection, database construction, and clinical data interpretation.

KF conceived the study, supervised the project, performed data interpretation, and drafted and critically revised the manuscript.

SI contributed to clinical nursing perspectives and interpretation of the findings.

SS and SJ contributed to clinical data interpretation and emergency care perspectives.

CT and YI contributed to methodological and statistical consultation.

MT contributed to overall supervision and critical review of the manuscript.

All authors read and approved the final manuscript.

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## **Authors' information**

Not applicable.

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## Figures

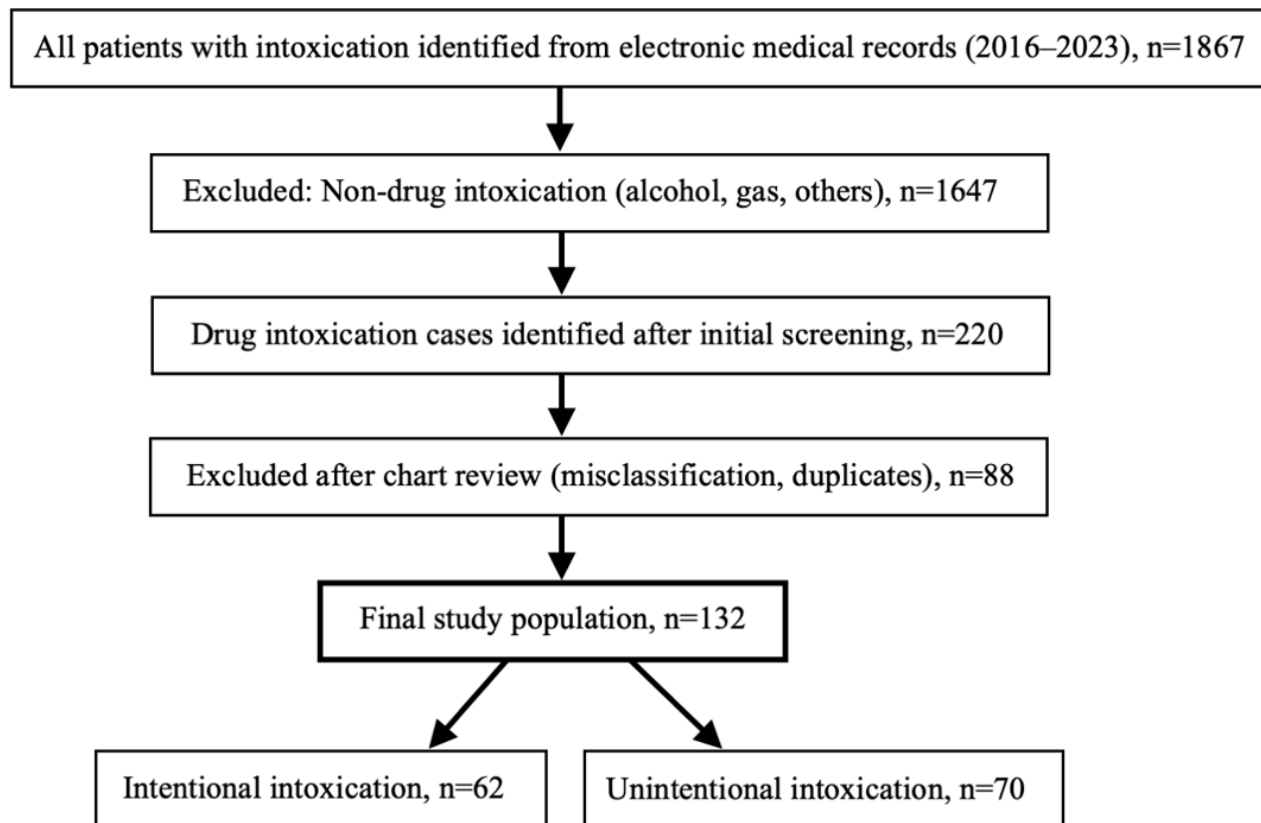


**Figure 1**

Flow diagram of patient selection and classification into intentional and unintentional intoxication groups.

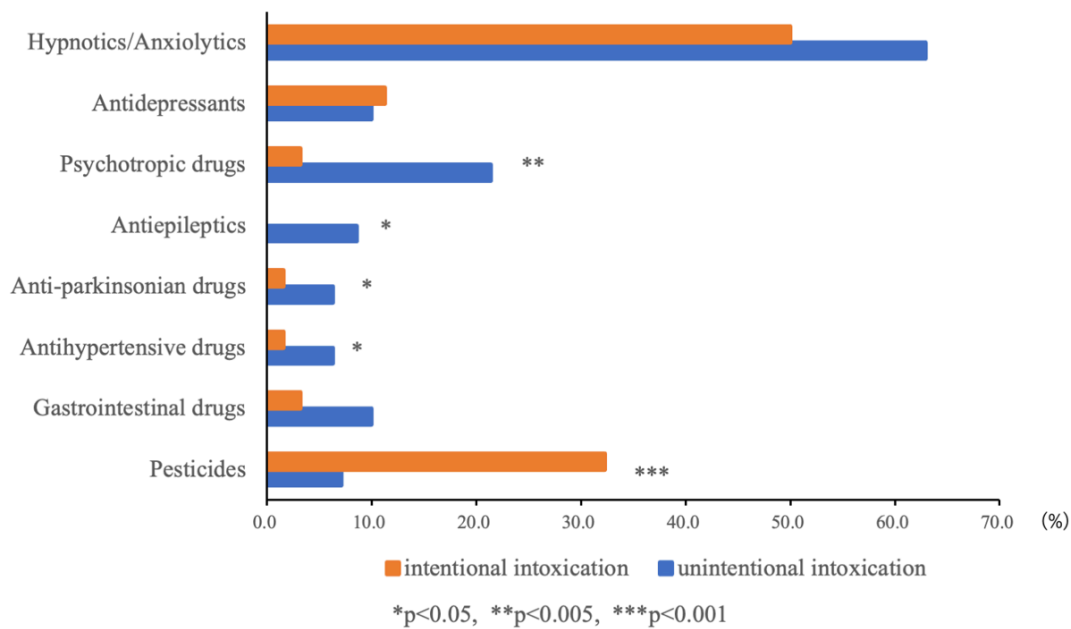


Figure 2A

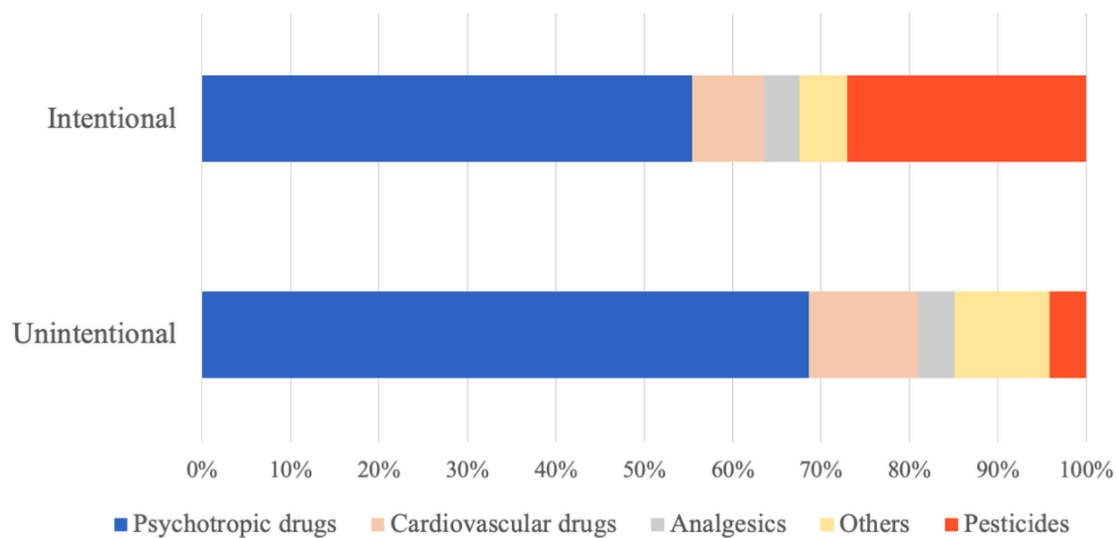


Figure 2B

## Figure 2

(A) Distribution of ingested drug categories in patients with intentional and unintentional intoxication.

(B) Distribution of poisoning agents regrouped into clinically meaningful categories, demonstrating substantial overlap between intentional and unintentional intoxication patterns.

## Supplementary Files

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