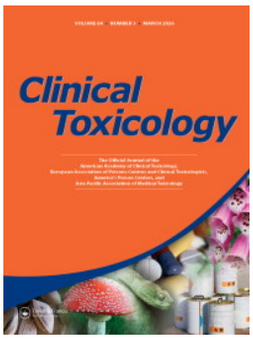

Clinical Toxicology

ISSN: 1556-3650 (Print) 1556-9519 (Online) Journal homepage: www.tandfonline.com/journals/ictx20

Poisoning in the elderly is increasing rapidly and is more severe than younger patients

Geoffrey K. Isbister, Michael A. Downes, Kylie McArdle, Shane Jenkins, Caitlyn Lovett & Ingrid Berling

To cite this article: Geoffrey K. Isbister, Michael A. Downes, Kylie McArdle, Shane Jenkins, Caitlyn Lovett & Ingrid Berling (18 Mar 2026): Poisoning in the elderly is increasing rapidly and is more severe than younger patients, Clinical Toxicology, DOI: 10.1080/15563650.2026.2631131

To link to this article: https://doi.org/10.1080/15563650.2026.2631131

CLINICAL TOXICOLOGY
https://doi.org/10.1080/15563650.2026.2631131

Taylor & Francis
Taylor & Francis Group

CLINICAL RESEARCH

OPEN ACCESS Check for updates

Poisoning in the elderly is increasing rapidly and is more severe than younger patients

Geoffrey K. Isbister, Michael A. Downes, Kylie McArdle, Shane Jenkins, Caitlyn Lovett and Ingrid Berling

Department of Clinical Toxicology, Clinical Toxicology Research Group, University of Newcastle, Waratah, Australia

ABSTRACT

Introduction: An aging population has resulted in an increasing burden on health care services. We investigated the epidemiology and severity of poisoning in the elderly (≥65 y) population.

Methods: Poisoning admissions to a tertiary toxicology service (1990–2024) were extracted. Elderly patients (≥65 y) were compared to non-elderly patients (19–64 y). Data recorded prospectively in a clinical database included demographics, drugs ingested, clinical effects, complications, treatments and outcomes.

Results: There were 1,532 elderly poisoning admissions compared to 24,912 non-elderly admissions. Elderly admissions increased between the first five years (1990–1994) and last five years (2020–2024) from 111 to 449 (5.1–9.8% of all admissions). Elderly patients ingested cardiac medications more often than non-elderly, and fewer psychotropic medications. Median length of stay, intensive care admission, and mortality were higher for elderly patients. All these outcomes improved between the first and last five years: median length of stay decreased from 39 h (interquartile range: 18–77 h) in the first five years to 19 h (interquartile range: 8–39 h) in the last five years; intensive care admission decreased from 29/111 (26%) to 57/449 (13%); and mortality decreased from 5.4% to 1.3%. For the last decade (2015–2024), elderly patients had more cardiac complications (dysrhythmia (4.2% versus 1.3%) and hypotension (8.0% versus 3.4%)) and acute kidney injury (4.2% versus 1.3%), but similar neurological complications (coma and delirium). Morbidity and complications increased with age from 65 to ≥85 y. Elderly patients received more inotropes and dialysis, although less for patients ≥85 y.

Discussion: Elderly patients had longer hospital stays, more intensive care admissions and cardiac complications, consistent with increased age and medications ingested, but this improved over 35 years. Poisoning severity increased with age, but critical care interventions decreased in patients ≥85 years.

Conclusions: Elderly poisoning cases have rapidly increased, and morbidity and mortality were greater than for non-elderly patients.

ARTICLE HISTORY
Received 11 December 2025
Revised 27 January 2026
Accepted 7 February 2026

KEYWORDS
Elderly; epidemiology; overdose; poisoning; severity; treatments

Introduction

The elderly population continues to expand rapidly because of the combination of a growing world population and increasing global life expectancy. Current estimates are that people aged >60 years will approximately double from 1.1 billion to 2.1 billion by 2050 [1], and one in six Australians will be older than 65 years [2]. In addition to increasing numbers of elderly, there has been an increase in global depressive disorders in the >55-year-old population since 2010, with sharp upward trend from 2019 [3]. This increase is possibly related to the increased odds of patients having depressive disorders with chronic medical conditions, in combination with the expanding elderly population. The result of this is that there will be a proportionate increase in elderly patients with deliberate self-harm.

There have been numerous studies on elderly poisoning over the last few decades [4–9], which have had varied age cut-offs and included different patient groups (poison centre vs. inpatient toxicology unit) or subgroups of patients (intentional vs. unintentional). The age cut-off differs from 50 to 80 years [4,6,10,11], which includes a large range of people with varying physical, mental and social differences. The World

CONTACT Geoffrey K. Isbister geoff.isbister@gmail.com c/o Calvary Mater Newcastle, Edith St, Waratah, NSW 2298, Australia.
Supplemental data for this article can be accessed online at https://doi.org/10.1080/15563650.2026.2631131.

Health Organisation defines elderly as >60 years of age [1], but Australia and many countries use the more common cut-off of 65 years of age [2]. Even when using the definition of patients over 65 years, it is important to note that there are considerable differences between the age ranges of patients, and thus, subgroups within the elderly should be investigated, such as the very elderly (>80 years) [10]. In addition, the aims of these studies differ, from understanding unintentional poisoning, deliberate self-poisoning and important subgroups of poisoning patients (e.g., dementia patients).

Earlier published data from our unit on older adults' poisoning presentations demonstrated that deliberate self-poisoning still accounted for the majority of poisoning admissions, although unintentional poisonings did increase with age [5]. Managing older adult deliberate self-poisoning presentations, including assessment and decision-making regarding benefits and burdens of critical care interventions, becomes more complicated in an aging population with contrasting views in regard to treatment and end of life decisions. To improve the treatment of elderly patients with poisoning, it is essential to understand the types and severity of poisoning, including the outcomes, compared to younger patients.

In all types of poisoning, deliberate and unintentional, the severity is associated with the type of medication ingested, which is associated with medication availability in poisoned patients [5,12]. Elderly patients are more likely to have one or more chronic medical illnesses, including cardiovascular disease, and thus have access to potentially more toxic medications, such as cardiac medications [5]. The combination of all these factors, increasing aging population with increasing depressive disorders with access to more toxic medications, results in a complex and higher burden of disease from poisoning.

An aging population has resulted in an increasing burden on health care services, particularly critical care resources and the feasibility of use of such resources in an aging population. We investigated the epidemiology and severity of poisoning in the elderly (≥65 y) population for a 35-year period compared to younger adults, focusing on the last decade.

Methods

We undertook a retrospective review of elderly patients (≥65 years) compared to all other adults (19–64 years) with poisoning or envenoming using data from a prospective cohort of consecutive presentations admitted to a tertiary toxicology unit. The toxicology unit is a referral centre for over 500,000 people in a large regional city and from 1992, ambulances diverted all poisoning and envenomation presentations in the Newcastle region to this service. There have been no major changes in the patient group admitted to the toxicology unit over 35 years, which includes deliberate self-poisoning, unintentional ingestions, recreational poisonings, envenomations, iatrogenic poisoning, adverse drug effects, and occupational poisoning or exposure. Alcohol intoxication alone and less severe recreational poisonings are usually managed by the emergency department, so they are not admitted or included in the cohort.

The unit has prospectively collected data on all poisoning and envenoming presentations to the hospital since 1987. Use of a clinical database and review of medical records for research has had a longstanding approval from the Hunter New England Human Research Ethics Committee (HREC/05/03/09/3.11).

All patients admitted to the toxicology unit have a standardised clinical data collection form filled out by the medical staff. In addition, since 2014, all referrals to the service are recorded on a tablet-based electronic database (Filemaker Go 2019, Filemaker®) used clinically for continuity of patient care. Data are taken from the data collection form or from the tablet-based database and entered into a relational database by a trained research assistant and then reviewed weekly by a clinical toxicologist. Any missing data are obtained from the medical record if required. Information on demographics (age, sex, intention), overdose characteristics (drugs, dose and time of ingestion), clinical effects, complications, treatments and outcomes is recorded [12].

In this study, we included all adult patients (>18 years) admitted to the toxicology unit with poisoning and envenoming from 1990 to 2024 and compared adults (19–64 years) to elderly patients (≥65 years). Data were extracted for all admissions meeting this criteria, including gender, intention of poisoning, drugs, length of stay (LOS), intensive care unit (ICU) admission, death, complications (coma (GCS <9), seizure, delirium, dysrhythmias, hypotension (systolic blood pressure <90 mmHg), acute kidney injury (defined as per 2012 Kidney Disease: Improving Global Outcomes (KDIGO) guideline), hepatotoxicity (alanine transaminase >1,000 U/L)), treatment (intubation, charcoal, vasoactive treatment, dialysis, acetylcysteine, naloxone, chemical sedation). In addition, all drugs taken by patients were extracted for each admission and adult patients were compared to elderly patients.

For the initial analysis, we included all cases from 1990 to 2024 to investigate the frequency of elderly

poisoning over time as well as changes in mortality and morbidity (LOS and ICU admission rate) for the period. For the majority of the analysis, we only included patients admitted in the last 10 years from 2015 to 2024. There were a number of reasons for this separate analysis, including a plateau in the mortality, ICU admission rate and LOS in this last decade, this period being completely separate from a previous study [5], and all the data being recorded using the new tablet-based electronic database. We also compared the elderly for increasing age groups: 65–74 y, 75–84 y and ≥85 y. We compared the number and proportion of elderly poisoning cases to the elderly population in general using census data from the Australian Bureau of Statistics but used the time period from 2011 to 2021 to be consistent with the available census data [13].

We report dichotomous variables with 95% confidence intervals (CIs), calculated by Wilson's procedure with continuity correction, and continuous variables with medians, interquartile ranges (IQRs) and ranges. Statistical analysis and graphical analysis were undertaken in GraphPad Prism, version 10.1.1 for Windows (GraphPad Software, La Jolla, CA; www.graphpad.com).

Results

From January 1990 to June 2024, there were 1,532 elderly poisoning admissions with a median age of 72 years (IQR: 68–79 years; range 65–100 years) and 818 females (54%), compared to 24,912 non-elderly admissions with a median age of 35 years (IQR: 25–44 years) and 14,627 females (59%). Elderly admissions increased from 111 in the first 5 years (1990–1994) to 449 in the last 5 years (2020–2024), a percentage increase from 5.1% to 9.8%, mainly in the last 10 years (Figure 1(A)). Elderly poisoning admissions increased from 192 out of 3,742 poisonings (4.88%; 2009–2013) to 435 out of 4,384 (9.02%; 2019–2023) an 85% increase, compared to the elderly population increasing from 58,695/342,605 (2011 census; 17.1%) to 77,871/390,514 (2021 census; 19.9%), a 16% increase [13]. Younger elderly patients (65–74 y) had the greatest increase in admissions (Supp Figure 1). Within the elderly admissions, there were 1,078 (69%) cases of deliberate self-poisoning, 246 (16%) accidental ingestions, 127 (8%) envenomations, 66 (4%) iatrogenic poisonings, 20 (1.3%) adverse drug effects, 13 (0.8%) recreational poisonings, two occupational poisonings and eight others. The proportion of deliberate self-poisonings did not appear to change over the time period (Figure 1(B)).

The most common ingested medications in the elderly were benzodiazepines (14.9%), then paracetamol (7.8%) and opioids (5.5%), which were also three of

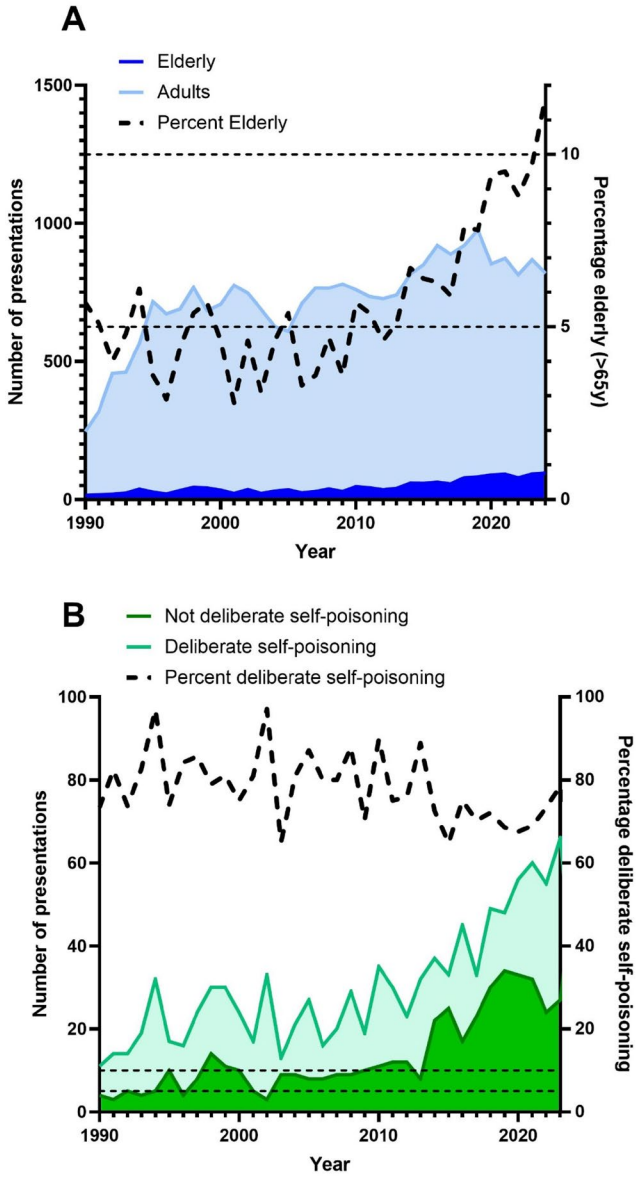

Figure 1. (A) Number of presentations for elderly patients (dark blue) and non-elderly patients (light blue) and proportion (%) of elderly patients from 1990 to 2025. (B) Number of elderly patients with deliberate self-poisoning (light green) and elderly patients that were not deliberate self-poisoning (dark green) and proportion (%) of deliberate self-poisonings from 1990 to 2025.

the four commonly ingested medications in the non-elderly patients, selective serotonin reuptake inhibitors being the fourth (Table 1). Although not the most common medications ingested, the elderly ingested cardiac medications three to nine times more often than the non-elderly – angiotensin converting enzyme inhibitors/angiotensin receptor antagonists (4.1% vs. 0.6%), beta-blockers (3.8% vs. 1.0%) and calcium channel blockers (2.6% vs. 0.3%; Table 1). Younger patients ingested alcohol more often, antidepressants and antipsychotics (Table 1).

The median LOS in elderly patients halved from 39 h (IQR: 18–77 h) in the first five years (1990–1994) to 19 h (IQR: 8–39 h) in the last five years (2019–2024; Figure 2(A)). Similarly, the mortality decreased from 6/111 (5.4%) in the first five years to 6/449 (1.3%) in the last five years (Figure 2(B)). The ICU admission rate decreased from 29/111 (26%) in the first five years to 48/449 (13%) in the final five years and the frequency of intubation decreased from 20/111 (18%) to 19/449 (4.2%; Figure 2(B)). All outcomes and complications, except dysrhythmia were worse for elderly patients with deliberate self-poisoning compared to other causes of poisoning or envenomation (Supp Table 1).

Table 1. List of the drugs (drug or drug class) ingested in order of frequency comparing elderly (≥65 y) to non-elderly (19–64 y).

Drug or drug class	Elderly (≥65 y)	(%)	Non-elderly (19–64 y)	(%)
Benzodiazepines	487	14.9	6,980	12.8
Paracetamol	255	7.8	5,685	10.5
Alcohol	192	5.9	7,217	13.3
Opioids	181	5.5	2,452	4.5
ACE inhibitor/ARB	134	4.1	351	0.6
Beta-blockers	126	3.8	527	1.0
SSRIs	96	2.9	2,604	4.8
Calcium channel blockers	85	2.6	183	0.3
Tricyclic antidepressants	82	2.5	1,426	2.6
Statins	73	2.2	139	0.3
Mirtazapine	55	1.7	801	1.5
SNRIs	52	1.6	1,444	2.7
Aspirin	52	1.6	404	0.7
Quetiapine	51	1.6	2,424	4.5
Lithium	46	1.4	427	0.8
Atypical antipsychotics[a]	43	1.3	1,347	2.5
First generation antipsychotics	39	1.2	1,228	2.3
Digoxin	38	1.2	24	0.04

ACE: angiotensin converting enzyme; ARB: angiotensin receptor blocker; SSRI: selective serotonin reuptake inhibitor; SNRI: serotonin noradrenergic reuptake inhibitor.
[a]Not including quetiapine.

For the last decade of the study (2015–2024), the median LOS, ICU admissions, and mortality were all higher for elderly patients compared to non-elderly patients (Table 2), which was similar to the whole study period (Supp Table 2). Elderly patients had more cardiac complications (dysrhythmia (4.2% vs. 1.3%) and hypotension (8.0% vs. 3.4%)) and were three times more likely to be administered inotropes/vasopressors (Table 2). The frequency of coma was similar between elderly and non-elderly, and similarly the frequency of intubation (Table 2). Although delirium occurred with similar frequency between groups, non-elderly were much more likely to receive parenteral sedation. Elderly patients were less likely to receive decontamination but more elderly patients were administered acetylcysteine (Table 2). Acute kidney injury was far more common in the elderly (4.2% vs. 1.3%), and the elderly were five times more likely to receive dialysis (Table 2).

Table 2. Comparison of complications, outcomes and treatments between elderly patients (≥65 years) and non-elderly patients (19–64 years) from 2015 to 2024.

	Elderly (≥65 years)	Adults (19–64 years)
Length of stay (h; median, IQR)	20 h (IQR: 8–45 h)	15 h (IQR: 5–24 h)
Intensive care unit	98 (12.5%)	660 (7.5%)
Died	11 (1.4%)	13 (0.15%)
Clinical complications		
Dysrhythmia	33 (4.2%)	114 (1.3%)
Hypotension	63 (8.0%)	299 (3.4%)
Coma	68 (8.7%)	775 (8.8%)
Seizure	2 (0.3%)	108 (1.2%)
Delirium	25 (3.2%)	283 (3.2%)
Acute kidney injury	33 (4.2%)	114 (1.3%)
Hepatotoxicity	7 (0.9%)	57 (0.6%)
Treatments		
Intubation	41 (5.2%)	404 (4.6%)
Inotropes	30 (3.8%)	101 (1.2%)
Charcoal	14 (1.8%)	303 (3.5%)
Chemical sedation	21 (2.7%)	684 (7.8%)
Dialysis	8 (1.0%)	17 (0.2%)
Acetylcysteine	71 (9%)	633 (7.2%)
Naloxone	59 (7.5%)	674 (7.7%)

IQR: interquartile range.

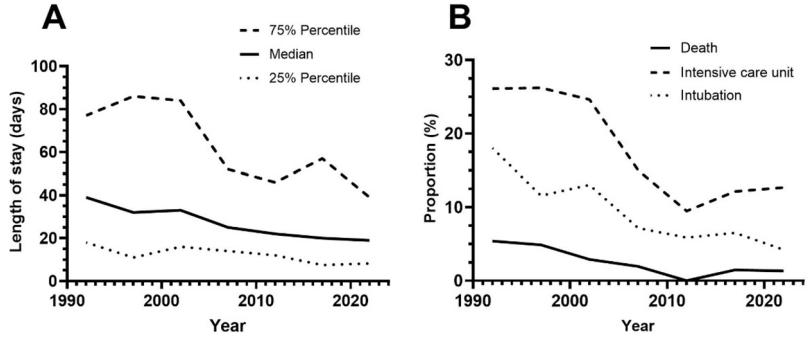

Figure 2. (A) Plot of length of stay for elderly patients versus year with the median (black line), 25% percentile (dotted line) and 75% percentile (dashed line). (B) Proportion (%) of elderly patients who were admitted to intensive care (dashed line), who were intubated (dotted line) and who died (black line) versus year from 1990 to 2025.

Some complications increased progressively with age, notably dysrhythmia, hypotension and acute kidney injury, but for other outcomes the relationship with age is inconsistent across groups (coma and delirium), or similar (ICU; Figure 3). There was a marked decrease in the proportion of patients ≥85 years receiving critical care interventions, such as inotropes/vasopressors and dialysis, despite this group having the greatest proportion with cardiac complications and acute kidney injury (Figure 3).

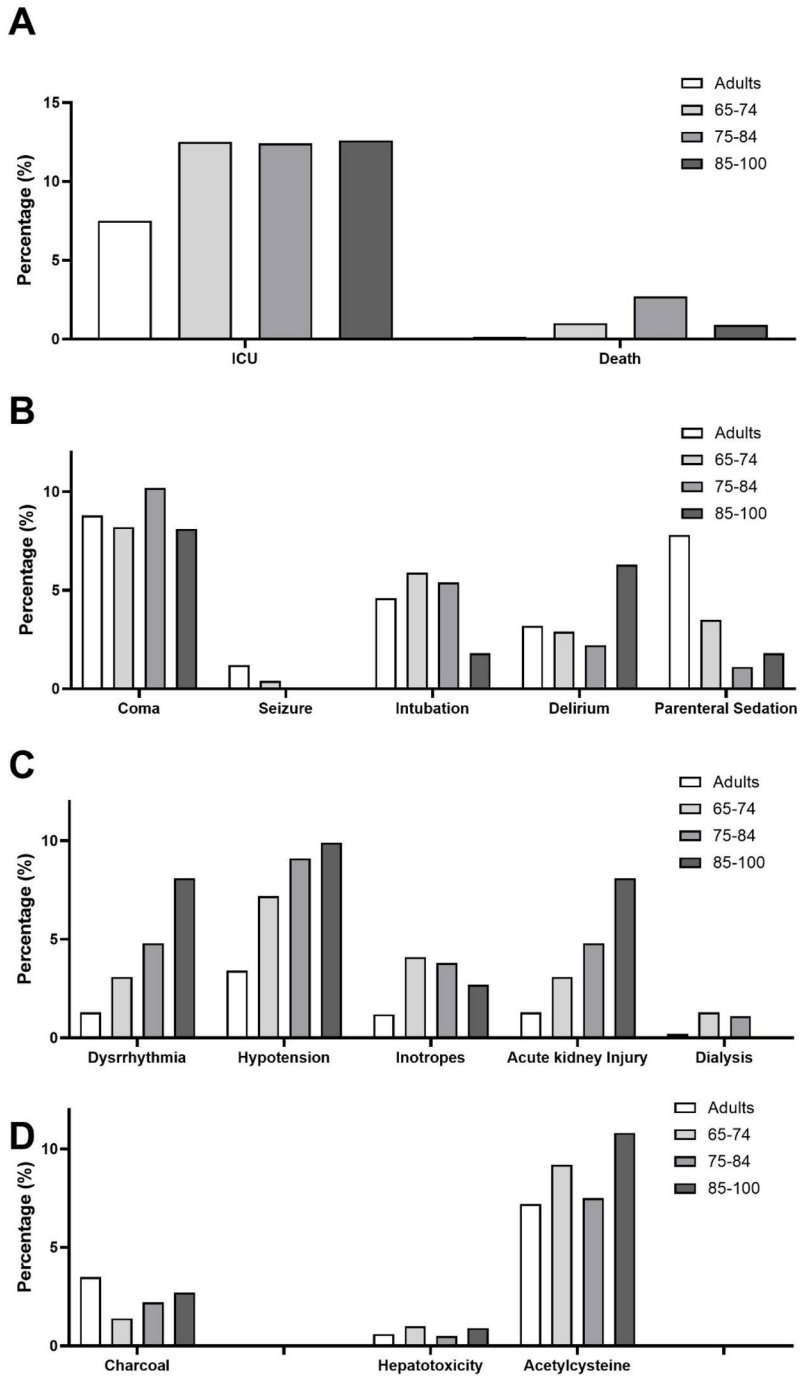

Figure 3. Proportion (%) of non-elderly patients (white bars), elderly patients (65–74 years; pale grey bars), elderly patients (75–84 years; grey bars) and elderly patients (≥85 years; dark grey). (A) Admitted to intensive care and who died; (B) with coma and seizures, who were intubated, developed delirium and were administered parenteral sedation; (C) developed dysrhythmias, hypotension, were given inotropes, developed an acute kidney injury and were given dialysis; (D) were given charcoal, developed hepatotoxicity and were administered acetylcysteine.

Discussion

We have shown that poisoning in elderly patients has almost doubled in the last decade after being relatively constant in the two decades prior. This is despite an overall increase in the elderly population of only 16% during this time period. Elderly patients had greater morbidity, with a longer LOS, increased ICU admissions, more cardiac complications, and a sevenfold higher inpatient mortality than non-elderly adult patients (Table 2). Although these outcomes and complications decreased over the 35 years, there was a similar decrease in non-elderly patient outcomes, maintaining the difference in outcomes between the two groups (Figure 2; Table 2 and Supp Table 2). The severity of poisoning increased with age within the elderly population, but critical care interventions decreased despite this in the ≥85 y age group (Figure 3). Severity of poisoning was also greater in elderly patients with deliberate self-poisoning compared to other causes of poisoning or envenomation (Supp Table 1).

The increase in rates of deliberate self-poisoning and unintentional poisoning has been reflected in other studies. In one Spanish study, there were increases in mortality in elderly patients from both deliberate self-poisoning and unintentional poisoning, although they found a much more rapid rise in the latter [14]. Another study of calls to the poison centre in our state investigated unintentional poisoning in patients ≥75 y, which found the same types of drugs ingested but did not report on clinical complications or outcomes, only hospital referral [6]. Other studies of elderly patients with deliberate self-poisoning also found an increased morbidity and mortality [15,16]. A Dutch poison centre study of elderly poisoning found that elderly poisoning was increasing, similar to our study [9]. However, they found that the majority was unintentional poisoning, including medication errors, suggesting that calls to poison centres underestimate the number of deliberate self-poisoning cases.

There was an important trend with increasing age in the elderly population with the oldest group (≥85 years) being more likely to develop complications such as cardiac toxicity, coma and delirium (Figure 3). However, despite the increased severity of poisoning, there were decreased critical care interventions in this group, such as inotropes and dialysis. The rationale for this may be related to clinician assessments regarding futility of advanced treatments in this cohort, who have increased frailty, chronic comorbidities, and decreased reserve to survive or recover from critical illness. However, there is evidence emerging that prediction of outcomes for patients with critical illness secondary to severe poisoning is not comparable with the non-poisoned ICU population. A recent retrospective study of over one hundred thousand patients admitted to ICU units in Germany demonstrated a significantly lower mortality and disease severity scores in the poisoned patient cohort than in the non-poisoned cohort [17]. These findings should prompt consideration that treatment limitations are being applied in elderly patients with deliberate self-poisoning, despite significantly improved prognosis in poisoning patients compared to other presentations of critical illness.

Alternatively, decisions to withhold critical care interventions may have been related to clinicians supporting patient's advanced care directives and end of life preferences. A study from Korea found that elderly people attempting suicide were more likely to be sober, planned their suicide and had a higher underlying prevalence of medical illnesses [18]. This is a challenging legal and ethical area, as cognitive impairment and mental health disorders, particularly major depression, are prevalent in the elderly population and may impair decision-making capacity [3]. Our understanding of aetiology and outcomes in elderly patients with poisoning may be improved by better follow-up of patients after deliberate self-poisoning.

Another important consideration is that the comparison between elderly as a whole and the non-elderly may miss important differences within the elderly group based on age. Overall, the frequency of coma and intubation was similar for elderly compared to non-elderly, but younger elderly were more likely to be intubated if comatose. With the increasing age of patients being admitted to hospital and requiring critical services, health carers will need to re-examine their approach to decision-making regarding active treatments, resuscitation planning, and end of life decisions in elderly patients.

Elderly patients with deliberate self-poisoning had worse outcomes than those with other causes of poisoning, consistent with the much larger doses in the former. However, dysrhythmias were less common in deliberate self-poisoning (Supp Table 1), and hypotension and acute kidney injury were as common in other poisonings. This is a concerning finding because it is often assumed that unintentional poisoning is unlikely to cause severe effects. With the increased access to cardiac medications, elderly patients are likely to require closer observation and potentially more intervention for both deliberate and unintentional poisoning.

There are a number of limitations to the study, including the extended time period of the study in which both standard and critical care interventions changed substantially. Although this is clearly seen by

the improved trends over time, it remains unclear if this was simply improved treatment or related to changes in medication prescriptions, use and availability, or patient behaviour in terms of access to more lethal toxins or more lethal intent. In addition, the data collection changed over the 35 years of the study, and some data elements were prospectively recorded differently earlier in the study period. However, many of the complications and outcomes are objective measures and unlikely to have changed. The types of drugs ingested were based on patient history, and this may not always be accurate. Previous studies have demonstrated overall that patient history is reliable [19] and in a large dataset like this, it is unlikely to change the proportion of different drugs ingested. The increase in elderly patients presenting to hospital with poisoning may be a result of increased referrals via poison centres or increased recognition of poisoning in the elderly, but ultimately this is still an increase in poisoning admissions to hospital.

Conclusions

Our data suggest that there is a rapidly increasing population of poisoned elderly patients who have greater morbidity and mortality compared to non-elderly patients, thus placing an increasing burden on emergency services and toxicology units. This is exacerbated by this group's potentially greater access to cardioactive and other significantly toxic medications, based on the medications they ingested in the study. Both medical toxicology and mental health services may require increased resources to help deal with this increased burden. Additionally, clinicians may need to review their approach to active treatment and end-of-life decisions in elderly patients.

Acknowledgments

We thank Kylie Tape for data entry.

Disclosure statement

No potential conflict of interest was reported by the authors.

Funding

This work is supported by the National Health and Medical Research Council – Australia under Grant No. 1154503.

ORCID

Geoffrey K. Isbister http://orcid.org/0000-0003-1519-7419
Ingrid Berling http://orcid.org/0000-0002-8993-2693

Data availability statement

Data are available by contacting the authors.

References

[1] Measuring the progress and impact of the UN Decade of Healthy Ageing (2021–2030): framework and indicators recommended by WHO Technical Advisory Group. Geneva; 2024.
[2] AIHW (Australian Institute of Health and Welfare). Older Australians Canberra; 2024 [updated 2025 Aug 18; accessed 2025 Aug 18]. Available from: https://www.aihw.gov.au/reports/older-people/older-australians/contents/demographic-profile#Age
[3] Liu Y, Li G, Zhong J, et al. Global, regional, and national burden for major depressive disorders and dysthymia in adults aged 55 years and older, 1990–2021. Acta Psychol. 2025;261:105985. doi:10.1016/j.actpsy.2025.105985.
[4] Klein-Schwartz W, Oderda GM, Booze L. Poisoning in the elderly. J Am Geriatr Soc. 1983;31(4):195–199. doi:10.1111/j.1532-5415.1983.tb05093.x.
[5] Pillans PI, Page CB, Ilango S, et al. Self-poisoning by older Australians: a cohort study. Med J Aust. 2017;206(4):164–169. doi:10.5694/mja16.00484.
[6] Koh QX, Wise S, Raubenheimer JE, et al. Unintentional poisoning in older Australians: a retrospective audit of New South Wales Poisons Information Centre data. Clin Toxicol. 2024;62(10):625–635. doi:10.1080/15563650.2024.2398766.
[7] Ghazi-Khansari M, Oreizi S, Abohosein G. A survey of poisoning on older people in Tehran. J Am Geriatr Soc. 1996;44(5):615–616. doi:10.1111/j.1532-5415.1996.tb01463.x.
[8] Kroner BA, Scott RB, Waring ER, et al. Poisoning in the elderly: characterization of exposures reported to a poison control center. J Am Geriatr Soc. 1993;41(8):842–846. doi:10.1111/j.1532-5415.1993.tb06181.x.
[9] Rietjens SJ, van der Heijden JEM, de Lange DW. Poisoning in older adults: characterization of exposures reported to the Dutch Poisons Information Center. Clin Toxicol. 2022;60(11):1240–1247. doi:10.1080/15563650.2022.2116339.
[10] Rai S, Brace C, Ross P, et al. Characteristics and outcomes of very elderly patients admitted to intensive care: a retrospective multicenter cohort analysis. Crit Care Med. 2023;51(10):1328–1338. doi:10.1097/CCM.0000000000005943.
[11] Laflamme L, Lindholm E, Möller J. Repeated hospital admission for intentional poisonings among older adults – a Swedish national register-based study. BMC Geriatr. 2024;24(1):157. doi:10.1186/s12877-024-04717-8.
[12] Buckley NA, Whyte IM, Dawson AH, et al. A prospective cohort study of trends in self-poisoning, Newcastle, Australia, 1987–2012: plus ca change, plus c'est la meme chose. Med J Aust. 2015;202(8):438–442.
[13] Australian Bureau of Statistics. Census Data (2011 to 2021); 2025. Available from: https://abs.gov.au/census/find-census-data/
[14] Hernández-Calle D, Martínez-Alés G, López-Cuadrado T. Suicidal and accidental drug poisoning mortality among older adults and working-age individuals in Spain between 2000 and 2018. BMC Geriatr. 2022;22(1):114. doi:10.1186/s12877-022-02806-0.

[15] Hong S, Lee WJ, Kim DH, et al. Elderly patients visiting the emergency department for deliberate self-poisoning: do they present a more severe poisoning severity score than the nonelderly patients in the initial 24 h? Aging Clin Exp Res. 2019;31(8):1139–1146. doi:10.1007/s40520-018-1053-3.

[16] Song SJ, Park GJ, Lee JH, et al. The characteristics of elderly individuals who attempted suicide by poisoning: a nationwide cross-sectional study in Korea. J Korean Med Sci. 2020;35(35):e286. doi:10.3346/jkms.2020.35.e286.

[17] Rezar R, Jung C, Mamandipoor B, et al. Management of intoxicated patients – a descriptive outcome analysis of 4,267 ICU patients. BMC Emerg Med. 2022;22(1):38. doi:10.1186/s12873-022-00602-y.

[18] Jang JS, Seo WS, Koo BH, et al. The characteristics of elderly suicidal attempters in the emergency department in Korea: a retrospective study. J Yeungnam Med Sci. 2024;41(1):30–38. doi:10.12701/jyms.2023.01004.

[19] Isbister GK, Friberg LE, Stokes B, et al. Activated charcoal decreases the risk of QT prolongation after citalopram overdose. Ann Emerg Med. 2007;50(5):593–600, 600.e1–46. doi:10.1016/j.annemergmed.2007.03.009.