Knowledge, attitudes and practices of clinician management of adults presenting with acetylcholinesterase inhibitor poisoning

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A Research Report submitted to the Faculty of Health Sciences of the University of the Witwatersrand, Johannesburg, in partial fulfilment of the requirements for the degree of Masters of Medicine in Emergency Medicine

Johannesburg March 2024

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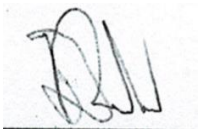
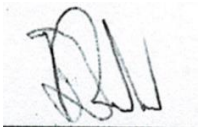
Signature:  Date: 28 March 2024

Declaration

I, Dean Patrick Redant, hereby declare that this research report is my own, unaided work. This research is being submitted for the Degree of Master of Medicine in the Division of Emergency Medicine, University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination at any other university.

Signature of candidate:  .

28 day of March, 2024

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To my amazing wife, Roxann, who supported me through this study and all aspects of my career, I would be unable to achieve what I have without your love and support.

Submission format of this research report

As per the University of the Witwatersrand, Faculty of Health Sciences guidelines, this research report is being submitted in the following format: submission for publication ready format.

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- Abbreviations should be spelt out when first used and thereafter used consistently, e.g. 'intravenous (IV)' or 'Department of Health (DoH)'.
- Include sections on Acknowledgements, Conflict of Interest, Author Contributions and Funding sources. If none is applicable, please state ‘none’.
- Scientific measurements must be expressed in SI units except: blood pressure (mmHg) and haemoglobin (g/dL).
- Litres is denoted with an uppercase L e.g. 'mL' for millilitres).
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- OMIM: Online Mendelian Inheritance in Man (MIM) nomenclature and instructions

- Bennet et al. Standardized human pedigree nomenclature: Update and assessment of the recommendations of the National Society of Genetic Counselors. J Genet Counsel 2008;17:424-433: standard human pedigree nomenclature.

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Research articles describe the background, methods, results and conclusions of an original research study. The article should contain the following sections: introduction, methods, results, discussion and conclusion, and should include a structured abstract (see below). The introduction should be concise – no more than three paragraphs – on the background to the research question, and must include references to other relevant published studies that clearly lay out the rationale for conducting the study. Some common reasons for conducting a study are: to fill a gap in the literature, a logical extension of previous work, or to answer an important clinical question. If other papers related to the same study have been published previously, please make sure to refer to them specifically. Describe the study methods in as much detail as possible so that others would be able to replicate the study should they need to. Results should describe the study sample as well as the findings from the study itself, but all interpretation of findings must be kept in the discussion section, which should consider primary outcomes first before any secondary or tertiary findings or post-hoc analyses. The conclusion should briefly summarise the main message of the paper and provide recommendations for further study.

Select figures and tables for your paper carefully and sparingly. Use only those figures that provided added value to the paper, over and above what is written in the text.

Do not replicate data in tables and in text .

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- This should be 250-400 words, with the following recommended headings:

o **Background:** why the study is being done and how it relates to other published work.

o **Objectives:** what the study intends to find out

o **Methods:** must include study design, number of participants, description of the intervention, primary and secondary outcomes, any specific analyses that were done on the data.

o **Results:** first sentence must be brief population and sample description; outline the results according to the methods described. Primary outcomes must be described first, even if they are not the most significant findings of the study.

o **Conclusion:** must be supported by the data, include recommendations for further study/actions.

- Please ensure that the structured abstract is complete, accurate and clear and has been approved by all authors.
- Do not include any references in the abstracts.

Main article

All articles are to include the following main sections: Introduction/Background, Methods, Results, Discussion, Conclusions.

The following are additional heading or section options that may appear within these:

- Objectives (within Introduction/Background): a clear statement of the main aim of the study and the major hypothesis tested or research question posed
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- Setting (within Methods): level of care, e.g. primary, secondary, number of participating centres.
- Participants (instead of patients or subjects; within Methods): numbers entering and completing the study, sex, age and any other biological, behavioural, social or cultural factors (e.g. smoking status, socioeconomic group, educational attainment, co-existing disease indicators, etc)that may have an impact on the study results. Clearly define how participants were enrolled, and describe selection and exclusion criteria.
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- Contribution to the body of knowledge
- Strengths and weaknesses in relation to other studies
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- Unanswered questions and recommendations for future research

Conclusions

This may be the only section readers look at, therefore write it carefully. Include primary conclusions and their implications, suggesting areas for further research if appropriate. Do not go beyond the data in the article

Manuscript for submission

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ARTICLE FOR SUBMISSION

Knowledge, Attitudes and Practices of Clinician Management of Adults Presenting with Acetylcholinesterase Inhibitor Poisoning

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Abstract

Background: Acetylcholinesterase inhibitor (AChE-I) poisoning is a common cause of deliberate self-harm in South Africa (SA). Whilst there is existing literature on the epidemiology and management of AChE-I poisoning, there is a lack of research on the South African clinician's knowledge, attitudes and clinical practice when managing these patients.
Objectives: To describe the knowledge, attitudes and practices (KAP) of clinicians when managing adult patients with AChE-I poisoning in academic emergency departments (ED) in Southern Johannesburg, Gauteng.
To describe the correlation between the clinician's demographics and experience to their knowledge, attitudes and practices in this setting.
Methods: One hundred and forty-five clinicians completed a structured questionnaire used to gather data on clinicians' knowledge, attitudes and practices (KAP) with regards to their management of patients with AChE-I poisoning.
Descriptive and inferential statistics were used to analyse the data and to infer correlation between clinician's KAP vs clinician's demographics and experience.
Results: One hundred and forty-five questionnaires from 5 EDs were completed and analysed. Of which 86 (59%) of participants were female and 59 (41%) were male. The majority of participants were under the age of 40 (84%) and employed as Grade 1 Medical Officers (39%). Years of experience were divided into <2 years, 2 – 5 years and ≥5 years with each group representing a third of the sampled population. Clinician average knowledge scores on AChE-I poisoning were good (77.9% n= 12.46/16) with scores improving predictably with years of experience (72.5% in <2 years to 83% in ≥5 years). Attitudes towards managing patients with AChE-I poisoning were overall neutral. Clinician practices varied greatly, particularly with adjustment of atropine infusions and adjunctive treatments used.
Conclusion: Clinicians had an overall good knowledge of AChE-I poisoning which improved predictably with greater experience managing these patients. Practices were highly varied across all demographic groups despite access to protocols in most departments studied. Attitudes were generally neutral with no clear impacting factors.
Clinicians agreed unequivocally that the public health system did not provide sufficient primary preventative care in order to address the underlying factors driving patients to self-harm.
This research revealed that the medical and psychosocial management of adult patients with AChE-I poisoning can be improved upon through specific clinician training.

Key words: Acetylcholinesterase inhibitors, poisoning, organophosphate, Emergency Department, Self-harm, Self-poisoning, Knowledge, Attitudes, Practices

1. Introduction

Poison, as defined by the Oxford English Dictionary, is a material that causes illness or death when introduced into or absorbed by a living organism [1]. Pesticide poisoning is the most common form of self-poisoning in the developing world, accounting for approximately one third of the world's suicides [2]. Acetylcholinesterase inhibitor (AChE-I) - a type of pesticide- poisoning globally results in an estimated 200 000 deaths annually [3-4]. AChE-I poisoning accounted for 12.6% of adult poisonous ingestions in South Africa as per the Tygerberg Poisons Information Centre and 18.1% of toxin-related hospital admissions to the Tygerberg Academic Hospital [5-6]. Chris Hani Baragwanath Academic Hospital in Johannesburg recorded 126 cases of AChE-I poisoning over a 6-month period between August 2013 and January 2014 [7].

AChE-I poisoning results in excessive accumulation of the acetylcholine neurotransmitter and cholinergic receptor overstimulation in different parts of the human body. Clinical presentations may vary but commonly include muscarinic parasympathetic, nicotinic sympathetic and neuromuscular signs and symptoms as well as a central nervous system symptoms [8]. Mortality due to AChE-I poisoning is secondary to respiratory failure [9]. Morbidities include delayed polyneuropathies, neuropsychiatric and sleep disorders [9].

Emergency medical services and emergency department personnel are usually the first point of contact with patients post poisoning [10]. According to the South African Triage Scale (SATS), poisoning is classified in the orange category and patients must be seen within 10 minutes of ED arrival [11]. Due to the related mortality and morbidity of AChE-I poisoning, clinician knowledge of the disease pathophysiology, clinical presentation and appropriate patient management is required. Clinicians attending to patients with AChE-I poisoning need to be competent and comfortable treating such patients regardless of whether the intoxication was accidental or due to deliberate self-harm.

Patients recognised to suffer from AChE-I poisoning should be appropriately triaged and managed in a high acuity resuscitation area in the emergency department. Attending clinicians needs to prioritize life-saving interventions, provide atropine therapy, the mainstay of therapy, and supportive care [3-4,8].

In South Africa, clinical practices are guided by hospital protocols or the South African Department of Health's National Guidelines [12]. Treatment algorithms recommend atropine be given initially between 2 to 5mg and the dose doubled every 5 minutes until atropinisation (clearance of secretions, resolution of bradycardia and hypotension) is achieved [3-4,8,12]. This recommendation, based on a randomised controlled trial (RCT), showed decreased mortality with incremental boluses every 5 minutes versus constant dosing of 2-5mg every 10-15 minutes [13]. Post atropinisation the national guideline recommends a weight-based atropine infusion of 0.05mg/kg/h. Multiple other texts recommend a maintenance infusion calculated from 10-20% of the total atropinization dose bolused [3-4,8,13]. The use of adjunctive treatment is not mentioned in the guidelines however a variety of adjuncts have been studied with varied results [3-4,8,13-14]. Patient observation post stabilisation is required to ensure response to therapy as well as to monitor for atropine toxicity [3,8-9]. AChE-I poisoning notification is required by law in South Africa [12].

AChE-I poisoning can be accidental or due to deliberate self-harm [7-9]. Accidental exposures occur both as a result of occupational exposure (13.8%) or ingestion in the community setting (6.2%) [15]. A South African study found that 77% of patients had intentionally ingested AChE-I in an attempt to self-harm [7].
Literature regarding clinician attitudes toward patients who self-harm mainly involved nursing personnel. A few studies involving doctors noted that doctors were neutral or disliked treating patients who self-harm (irrespective of the toxic agent) [16-17]. There are

no studies specifically describing clinician attitudes toward patients with AChE-I self-poisoning. Extrapolation from studies observing doctors and nurses attitudes toward patients who self-harm with other toxins have to be made.

Rayner et al found that a poor understanding of how to manage the psychological aspects of patient self-harming behaviour resulted in negative clinician attitudes which affected the patient's emergency department experience and may influence future help-seeking behaviour [18]. A study by McAllister found no difference in attitudes in nurses of varied years of experience towards patients that self-harm [19]. A systematic review of attitudes and knowledge of clinical staff toward patients who self-harm concluded that hospital staff often have negative attitudes toward this patient population [20]. In this review staff expressed feelings of irritation, anger and helplessness. Seemingly these feelings stem from various beliefs that patients who self-harm deplete hospital resources unnecessarily to staff feeling powerless to effectively help or support these patients. Several studies however noted improved attitudes in nurses who had undergone specific training on approaches to patients who self-harm compared to their colleagues who had not, independent of years of experience [21-22]. The UK NICE guidelines recommend that all staff that encounter patients with self-harming behaviour should receive formal training therein and that all patients with such behaviour be referred to mental health services [18].

A Tanzanian study exploring healthcare providers knowledge and practices in managing patients with acute pesticide poisoning found a significant improvement in knowledge in clinicians with more experience [23]. This implies the benefit of greater experience and post-graduate training in improving knowledge and practices. In South Africa, post-graduate training may include informal teaching, completing the Diploma in Primary Emergency Care and specialisation in emergency medicine by completing a fellowship in the College of Emergency Medicine (FCEM) which cover anticholinergic poisoning as part of their curricula (24-25). Additionally, a 2 day short course in emergency toxicology and venomology is available in Pretoria, Gauteng. The Advanced Cardiac Life Support for Experienced Providers course offers a brief section on poisoning where AChE-I poisoning is specifically taught. Patient psychosocial support is not included in the learning objectives of either course [26-27].

AChE-I poisoning remains a huge healthcare burden in SA [4-7]. ED clinicians continue to manage AChE-I poisoned patients on a regular basis. A search of the literature yielded no studies that specifically looked into the knowledge, attitudes and practices of clinicians towards patients with AChE-I poisoning. The study authors hypothesized that clinician's knowledge and clinical practice regarding AChE-I poisoning will be influenced by their job title and years of employment experience. The authors also hypothesized that clinicians may demonstrate negative attitudes toward this patient population and the processes required in their management. This study therefore aimed to assess the knowledge, attitudes and practices of ED clinicians managing adults presenting with AChE-I poisoning.

2. Methods

This cross-sectional, multi-centre observational study was conducted between November 2021 and May 2022 in the EDs of five academic Johannesburg hospitals. The hospitals were purposely chosen as they represent tertiary and regional hospitals that employ a spectrum of clinicians, from interns through to specialist emergency physicians.

Ethics approval was obtained from the Wits Human Research and Ethics Committee, M210733, prior to commencement of the study. Permission to conduct the study was obtained from the hospital management of the respective hospitals.

The study population comprised of qualified clinicians having worked in the EDs for a minimum of one month. For the purpose of the study "clinician" referenced a medical doctor and AChE-I poisoning referenced both organophosphate and carbamate pesticide poisoning as clinically it is difficult to differentiate one from the other.

Purposive sampling was used to select eligible participants. The clinicians had to have managed patient's presenting with AChE-I poisoning for study inclusion. Other inclusion criteria were registration with the Health Professions Council of South Africa and consent to participate in the study. Visiting foreign or elective clinicians were excluded.

At the time of the study 185 clinicians employed in the respective EDs were determined to be eligible to participate in the study. One hundred and twenty-five participants were required to achieve a sample size that would ensure significance testing set at a confidence interval of 95% with a margin of error of 5% [28].

Study data was collected via a self-administered, hard copy questionnaire handed out during ED academic meetings or at shift handover. Participants were given a study information sheet and consent form (Appendices B and C). The questionnaire was adapted from a questionnaire used by Rutto et al - Knowledge, Attitudes and Practices of nurses on the acute management of adults with acute poisoning in a Kenyan Hospital [29]. This questionnaire was used as a template due to the authors asking a similar clinical question to healthcare workers practicing in a healthcare system with a similar environment and challenges seen in the South African public healthcare system. The questionnaire comprised of five sections. Section A collected demographic data and section B assessed clinician's exposure to patients presenting with AChE-I poisoning. Section C and D collected data regarding clinician's knowledge and practice in the management of AChE-I poisoning. The knowledge and practice sections of the questionnaire were constructed using available literature and guidelines published by experts in the field of AChE-I poisoning [3-4,8,12-13]. Similar to Rutto et al, the clinician's knowledge and clinical practice were analysed using mean scores from the participant's correct responses.

Section E measured clinician attitude mean scores using a 5-point Likert scale. The statements available for participant selection were phrased in both positive and negative statements and randomly ordered. Negative statements were reverse coded so that lower scores reflected a more positive attitude.

Raw data was entered into an Excel Spreadsheet (Microsoft Excel 365) and coded to facilitate analysis. Data was exported to Statistic Package for Social Sciences (IBM SPSS version 28.0.1.0) for analysis. Measures of central tendency were calculated for all data and inferential statistics were performed using independent sample T-tests and ANOVAs for parametric data and independent sample Kruskall-Wallis tests for non-parametric data. Post-hoc analysis was done using Dunnett's T3 tests for ANOVAs revealing statistical difference.

3. Results

3.1 Demographics

A total of 152 doctors participated in the study. Due to extensive missing data, 7 questionnaires were excluded thus 145 questionnaires were analysed. The demographic data is displayed in Table 1.

Table 1 – Demographics of Clinicians working in Emergency Departments (EDs) in Southern Johannesburg

Characteristic	**n**	**%**
Sex		
Female	86	59%
Male	59	41%
Age		
20 - 29	52	36%
30 - 39	69	48%
40 - 49	18	12%
>50	6	4%
Job Title		
Intern	24	17%
Community Service Medical Officer	10	7%
Medical Officer Gr 1	56	39%
Medical Officer Gr 2	4	3%
Medical Officer Gr 3	8	6%
Registrar	28	19%
Specialist Emergency Physician	15	10%
Years of experience		
<2 years	50	34%
2 - 5 years	49	34%
>5 years	46	32%
Experience in other EDs	104	72%
Short Courses		
BLS	132	91%
ACLS	122	84%
ACLS-EP	60	41%
PALS	91	63%
APLS	36	25%
ATLS	91	63%
Other	47	32%
Hospitals		
Hospital 1	22	15%
Hospital 2	56	39%
Hospital 3	39	27%
Hospital 4	10	7%
Hospital 5	18	12%

The majority of participants, 48% (n=69), were in the 30–39-year age group. The 40-49 and >50 age groups were combined for analysis as participants over the age of 50 were limited to 4% (n=6). Fifty-nine percent were female (n=86).

Years of working experience were evenly distributed between <2y, 2-5y and >5y groups (34%, 34% and 32% respectively). A basic life support course (BLS) and advanced cardiac life support course (ACLS) were completed by 132 (91%) and 122 (84%) participants respectively. The advanced cardiac life support for experienced providers (ACLS-EP) was completed by 60 (41%) participants.

The hospitals were de-identified to maintain anonymity.

3.2 Exposure

The number of patients with AChE-I poisoning managed per clinician increased with older age, advancing job title, and increasing years of experience (p value = <0.001 for each respectively). Sixty-three percent of participants (n=91) reported having personally managed more than ten patients in their careers. There was no statistical difference in the number of patients managed by hospital after post-hoc analysis (p=0.08-1.0).

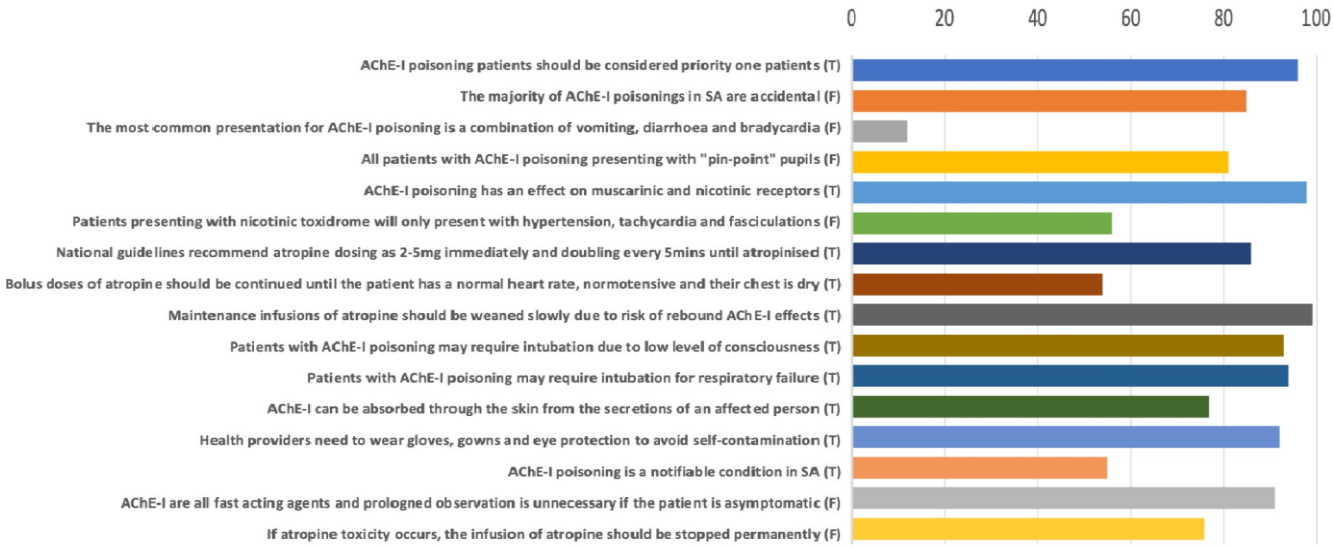
Eighty-four percent (n=42) of clinicians with less than 2 years of working experience recall receiving undergraduate training on AChE-I poisoning management, compared to 59.2% (n=29) and 60.9% (n=28) in the 2-4.9 year and >5-years groups respectively. Postgraduate training, conversely, was received by 34% (n=17) of clinicians with <2 years of experience compared to 85.7% (n=42) and 95,7% (n=44) in the 2-4.9y and >5-year groups respectively.

Only 8.3% (n=12) of clinicians report having received training on the psychosocial management of patients presenting with AChE-I poisoning due to self-harm. This was mainly reported by clinicians with <2 years working experience (n=8, 66,7%).

3.3 Knowledge

The mean knowledge score on AChE-I poisoning across all participants was 12.46/16 (SD 1.55, range 8-16). Knowledge questions relating to the initial management of poisoned patients (Q1, Q7-11) were answered correctly by greater than 80% of clinicians except for question 8 - goals of atropinisation - which was correctly answered by 54% (n=79) of participants. The remaining questions pertained to recognition (Q2-6), clinician safety (Q12-13), notification (Q14), observation (Q15) and complications (Q16). The most poorly answered question was question 3 - the most common presentation of AChE-I poisoning. Twelve percent (n=18) of participants answered this question correctly. Fifty-five percent (n=80) of participants were aware that AChE-I poisoning is a notifiable condition.

Figure 1 –Percentage of correctly answered knowledge questions

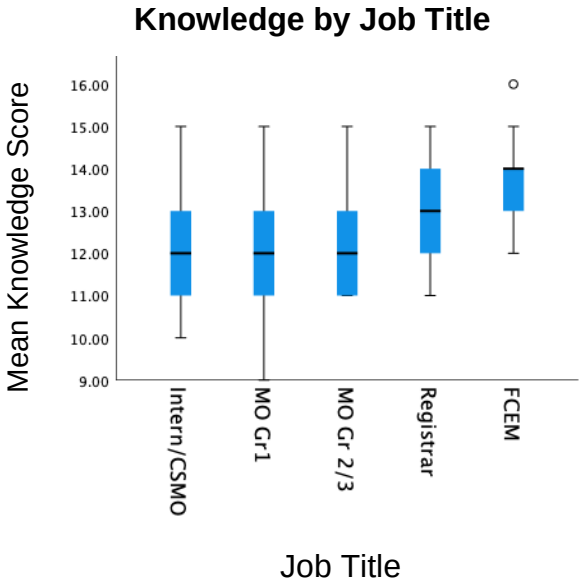


Mean knowledge scores improved with increasing years of working experience and advancing job titles. Mean scores ranged from 11.6/16 in those with <2 years of experience to 13.3 in those with >5 years. A similar linear improvement in mean knowledge scores was seen with increasing numbers of patients personally managed. Clinicians who had managed <5 patients with AChE-I poisoning had a mean knowledge score of 11.5/16 increasing to 13.2 in clinicians who had managed >50 (p=<0.001)

Significant differences in mean scores were found between specialist emergency physicians compared to interns, community service medical officers and Grade 1 medical officers (p-values <0.001 to 0.01) as well as between registrars compared to interns and community service medical officers (p-value 0.016).

Questionnaire responses selected as uncertain were calculated as incorrect for reporting purposes. Uncertainty ranged from 0% in questions 5 and 10, to 26.2% (n=38) in question 14. Uncertainty was below 10% in all questions except questions 6, 12 and 14, which pertain to the nicotinic toxidrome, skin absorption and notification status respectively.

Figure 2 - Box plot of mean knowledge scores according to job title



A difference was noted with clinicians having completed only BLS or ACLS and BLS courses versus those without courses, however the finding was not statistically significant (p=1.0 & p=0.629). However, when one compared clinicians who completed ACLS-EP to those who had not, a mean difference of 0.84 (5,2%) on the knowledge questionnaire was observed (p <0.001).

3.4 Practices

Despite 81% (n=117) of clinicians stating that they use an evidence-based protocol for the management of AChE-I poisoning, practices of individual clinicians were highly variable. The clinical practices observed in this study related to the calculation of atropine starting and maintenance doses, markers of atropinisation, response to atropine toxicity and patient observation times in the emergency department.

Mean starting doses for atropine boluses ranged from 1 to 15mg with a mean initial dose of 3,3mg. Twenty-eight percent (n=41) of clinicians used a weight-based starting dose. Participants reported a weight-based calculation starting dose between 0.01 – 0.75mg/kg. Almost all clinicians (98% n=142) doubled their initial starting bolus every 5 minutes in accordance with national guidelines and 84% (n=122) stated that there is no maximum atropine dose if the patient had not achieved atropinisation.

Clearance of respiratory secretions was stated as the marker of atropinisation by 97% (n=141) of clinicians whilst 27% (n=39) and 28% (n=41) also considered a heart rate >80bpm and systolic blood pressure >90mmHg respectively. The development of mydriasis was used as a goal of atropinisation by 19% (n=28) of clinicians.

Maintenance atropine infusions varied however, 88,5% of clinicians started the infusion at either 10% or 20% of the total atropinisation dose (45% (n=65) and 43% (n=63) respectively).

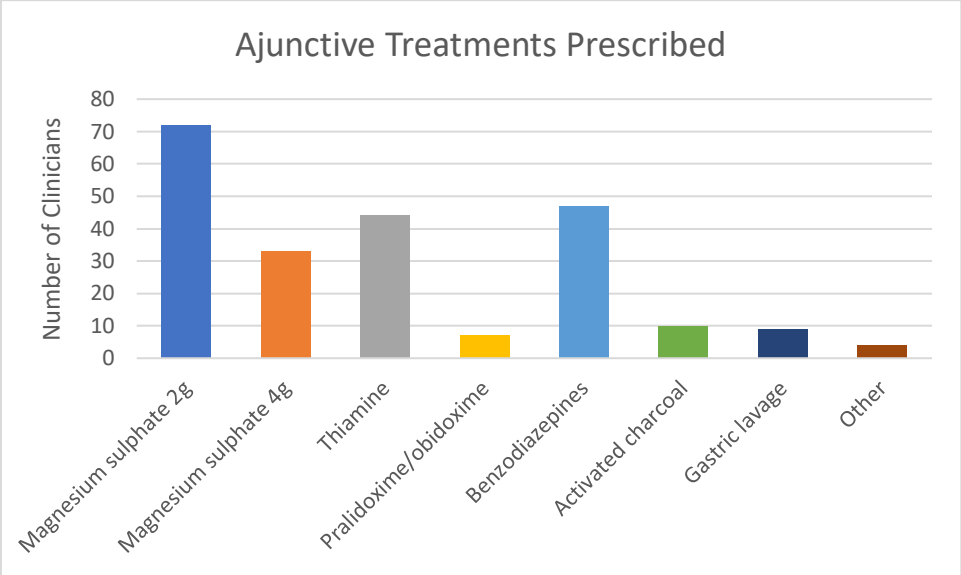
In instances where rebound cholinergic toxicity occurred, 92% (n=134) of clinicians would re-atropinise the patient as performed initially. The maintenance infusion dose was recalculated with the addition of both the total initial and re-atropinisation bolus doses by 46% (n=66) of clinicians. A smaller group (13%, n=19) added only the final reatropinisation bolus dose instead of the total reatropinisation bolus doses when recalculating the maintenance infusion dose. Other clinicians did not recalculate the

maintenance infusion dosage but rather increased the rate of infusion by 10-20% (17% n=24 and 5% n=7 respectively). Twelve percent (n=18) of clinicians would reatropinise the patient but not change the maintenance infusion rate at all. The remaining 8% (n=11) clinicians were either unsure of how to manage this complication or used another, unspecified, method.

Twenty percent (n=29) of clinicians stopped atropine administration altogether when they recognised atropine toxicity. Twenty-seven percent (n=39) of clinicians switched to a glycopyrrolate infusion. The remaining clinicians reported pausing the atropine infusion for 30 minutes and then decreasing the infusion rate by 10%, 20% or 50% (n= 36, 8, 23, percentages 25%, 6%, 16% respectively).

The most prescribed adjunctive treatment was intravenous magnesium sulphate with 73% (n=105) of clinicians prescribing between 2g (50% n=72) to 4g (23%, n=33) to patients. Thiamine and benzodiazepines were regularly prescribed by 30% (n=44) and 32% (n=47) of clinicians respectively.

Figure 3 – Adjunctive treatments prescribed



Patient observation periods in the ED varied from no observation (14%, n=21) to >12 hours (15%, n=22). More than half of clinicians, 54% (n=79), choose to monitor patients with AChE-I poisoning for 6-12h before determining disposition.

3.5 Attitudes

Each item was answered on a scale of 1 to 5 on the Likert scale, with lower scores (after reverse coding for negative statements) representing more positive attitudes. Complete neutrality, by answering neutral (3 on the Likert scale) on every item, would result in a score of 54. The mean attitude score of all clinicians in our study was 49.2 (SD of 6.75) with a range of 32 to 74, representing slightly positive attitudes.

Comparison of mean attitude scores based on clinician's sex, job title, years of experience, number of cases personally managed and psychosocial training are presented in table 2.

Table 2 – Mean Attitude Scores of Subgroups

	Number (n)	Mean (SD)	Range	p-value
Sex				
Female	86	48.2 (6.3)	32 – 63	0.03
Male	59	50.7 (7.2)	38 - 74	
Job Title				
Intern/CSMO	34	47.4 (7.5)	32 – 67	0.28
MO Gr 1	56	49.9 (7.2)	35 – 74	
MO Gr 2/MO Gr 3	12	48.0 (4.1)	40 - 55	
Registrar	28	49.3 (6.1)	38 – 63	
Specialist EP	15	51.4 (5.7)	43 - 66	
Years of Experience				
<2	50	47.9 (7.3)	32 – 67	0.23
2-4.9	49	50.2 (7.0)	36 – 74	
>5	46	49.6 (5.6)	38 - 66	
Psychosocial Training				
	Number (n)	Mean (SD)	Range	p-value
Received	12	50.3 (4.8)	38-55	0.78
Not Received	113	49.0 (7.2)	32 – 74	
Uncertain	20	49.7 (5.1)	44 - 64	
Completion of ACLS-EP				
Yes	60	50.0 (7.0)		0.26
No	85	48.7 (6.6)		
Cases Personally Managed				
<5	33	46.5 (7.4)	32 – 67	0.12
5 – 10	21	50.4 (6.3)	39 – 64	
11 – 24	31	50.0 (6.8)	36 – 64	
24 – 50	25	50.2 (6.5)	39 – 66	
>50	35	49.7 (6.2)	38 - 74	

There was a statistically significant difference in mean attitudes between male and female clinicians (p-value 0.03) with females having a slightly lower mean attitude score representing more positive attitudes toward patients. Comparison of job title, years of experience, cases managed, ACLS-EP and psychosocial training showed no significant differences.

The two statements with the highest rate of agreement were:

- Patients with AChE-I poisoning due to multiple self-harm attempts were more likely to have poor or fatal outcomes in future (91% n=132) and;
- The healthcare system does not provide enough support to address the underlying factors leading to AChE-I poisoning (93% n=135)

The statement with the highest rate of disagreement was:

- Treating patients with AChE-I poisoning made the clinician feel uncomfortable (79%, n= 114)

Table 3 shows the study results related to clinician mean attitudes scores.

Table 3 – 5-point Likert Scale for Attitudes (percentages)

Key – SD – Strongly Disagree, D – Disagree, N – Neutral, A – Agree, SA – Strongly Agree	SD %	D %	N %	A %	SA %
I believe that patients presenting with AChE-I poisoning have intentionally ingested the substance	6.9	11.0	35.2	34.5	12.4
I consider that patients presenting with AChE-I poisoning may be victims of an attempted homicide	2.8	9.0	33.1	44.8	10.3
Treating patients with AChE-I poisoning is exhausting as treatment is labour intensive	6.2	16.6	23.4	35.9	17.9
It takes time to break open all the atropine ampoules and hence I do not worry about the timing of my boluses	15.2	39.3	15.2	17.9	12.4
I believe that patients presenting with intentional AChE-I poisoning lack constructive coping skills	5.5	22.8	27.6	31.0	13.1
Caring for a patient with AChE-I poisoning makes me feel uncomfortable, particularly if they present due to an intentional poisoning	33.8	44.8	12.4	3.4	5.5
I believe that patients presenting with AChE-I poisoning are victims of their environments and are not responsible for their actions	12.4	34.5	35.2	14.5	3.4
I believe that regardless of how supportive healthcare providers are, it will not change whether a patient will re-attempt intentional AChE-I poisoning or not	7.6	38.6	15.9	29.0	9.0
I believe that any patient who has attempted suicide multiple times is at high risk of succeeding in future	2.1	1.4	5.5	40.7	50.3
I believe that patients with AChE-I poisoning may have a mental health disorder and require formal evaluation	2.1	8.3	15.9	51.0	22.8
I am comfortable caring for a patient with AChE-I poisoning and I show them the same empathy as any other patient in the emergency department	0.7	6.9	15.2	49.7	27.9
I think that the high numbers of patients presenting with AChE-I poisoning occupy too much staff time and resources	4.8	24.1	26.9	29.0	15.2
Sometimes I believe patients with AChE-I poisoning are seeking attention	4.1	36.6	20.7	35.9	2.8
I get frustrated with caring for patients who have a intentionally attempted suicide by ingesting an AChE-I	9.0	35.9	25.5	25.5	4.1
I feel that patients with intentional AChE-I poisoning abuse hospital resources	10.3	45.5	22.8	17.9	3.4
Managing patients with AChE-I poisoning makes me consider my own mental health well-being	8.3	33.8	28.3	26.2	3.4
I would like to have a clinical team debrief after treating a patient with AChE-I poisoning	9.7	25.5	31.0	28.3	5.5

I believe that our public healthcare system does not address the underlying factors leading to AChE-I poisoning	1.4	1.4	4.1	46.9	46.2

Most clinicians believed that other interventions, such as those listed in table 4 below, would benefit this particular patient population. The belief that patients post self-ingestion of AChE-I should be offered psychiatric evaluation and social worker consultation was held by 96% (n=139) and 97% (n=140) of clinicians respectively.

Table 4 – Interventions that clinicians believe should be offered to patients with AChE-I poisoning.

Intervention	**Number of Clinicians (%)**
Psychiatric Assessment and Risk Evaluation	139 (96%)
Social Worker Consultation	140 (97%)
Psychotherapy	111 (77%)
Specific Ward designated for patients with attempted suicide	37 (26%)
Specifically trained nurses to observe and treat suicidal patients whilst in general medical wards	88 (61%)
General support groups for all patients	89 (61%)
Stressor specific support groups	87 (60%)
Family therapy	102 (70%)
Cognitive behavioural therapy	80 (55%)
Antidepressant/anxiolytic therapy	46 (32%)

4. Discussion

AChE-I poisoning poses a significant health threat to the South African population due to its widespread availability and toxicity [30-31]. Authorised use of AChE-I is seen mainly in the agricultural sectors. Unfortunately, AChE-I products have found an illegal market in urban southern Johannesburg communities [7,31].

Clinical presentations vary from asymptomatic to severe intoxication. Oral ingestion is the main route of poisoning in our setting [7]. Pesticide poisoning presents secondary to accidental exposure or due to self-harm [32]. Clinicians working in emergency departments need to have a holistic approach to managing these patients as they are usually the patients' first point of medical contact [32]. Patients with self-harming behaviors (inclusive of suicide attempts) are 10 times more likely to have a diagnosed psychiatric disorder [33] and 18 times more likely to die by suicide compared to the general population [19].

Demographics

This study observed the knowledge, attitudes and practices of clinicians managing adult patients with AChE-I poisoning in 5 hospitals in central and southern Johannesburg.
A total of 145 clinicians participated in this study. The clinicians were stratified according to sex, age, job title, years of working experience and emergency medicine short course qualifications. The authors hypothesized that older clinicians with more years of experience would have more knowledge and sound clinical practices in managing patients with AChE-I poisoning. The authors, based on generic studies of patients presenting to emergency departments due to poisoning and self-poisoning, also hypothesized that

female clinicians would display more positive attitudes towards patients presenting with AChE-I poisoning [19-20].

Experience and Knowledge

A Tanzanian study observed the knowledge and experience of healthcare professionals (HCPs) in diagnosing and managing patients with pesticide poisoning [23]. Similar to our study a questionnaire was used to collect self-reported data from the HCPs. Majority of study participants were male clinical officers (medical officer equivalent) with less than or equal to five years of working experience. Fifteen percent of clinical officers reported having managed more that 6 patients with pesticide poisoning in their careers. The Tanzanian study found that overall their HCPs had poor knowledge of pesticide poisoning and incorrect management practices. The only statistically significant variables related to knowledge were higher levels of education and employment in a private hospital. In their discussion the Tanzanian study authors speculate whether the overall poor knowledge finding was related to the HCPs undergraduate curriculum training.

Our study found that older clinicians, clinicians with more senior job titles and clinicians with increased years of experience had more exposure and opportunities to manage patients with AChE-I poisoning (p value = <0.001). Training received in the management of this patient population dichotomized clinicians into those with less working experience (< 2years) having likely received undergraduate training on the clinical topic (84% vs 60% respectively) and clinicians with more experience (>2 years) having likely received training in their postgraduate training years (34% vs 90.5% respectively). Unlike the Tanzanian study, our study was undertaken in urban academic EDs. Our findings cannot predict whether similar findings would be observed in South African non-academic rural settings.

Psychosocial training was shown to improve attitudes in nurses and physicians towards patients with self-harming behaviour [17], in our study however only 8.3% of doctor's recall ever receiving training on how to manage the psychosocial aspects of patients with AChE-I poisoning. When divided into job titles, it becomes apparent that senior doctors lacked such training with no emergency physicians having ever received such training.

The knowledge section of the study questionnaire evaluated participant's knowledge on PPE requirements, patient triage, recognition of the cholinergic toxidrome, treatment guidelines and notification processes. The mean knowledge score across all participants in our study was 12.46/16 (SD 1.55) range (8-16). Mean knowledge scores improved with increasing years of clinician experience, job title and number of cases personally managed in a linear fashion (ranges 11.6-13.3, 11.7-13.7, 11.5-13.2 respectively, p=<0.001 for each comparison). Completion of short courses did not show a significant difference in mean knowledge scores except for completion of ACLS-EP which specifically addresses management of the poisoned patient showing a mean difference of 5.3% (p value = <0.001). Notably clinicians in emergency medicine specialist training posts and qualified specialist emergency physicians scored higher than interns and medical officers. This is likely due to the teaching in the registrar training program.

Practices

The management practice of clinicians was evaluated by asking focused questions on their atropine prescription orders. The authors sought to determine how much atropine was prescribed as a starting bolus dose, timing to atropine boluses, maximum dosing, determination of maintenance infusions, end targets/markers of atropinisation and response to atropine toxicity. These observations were deemed to be important since atropine is the mainstay of treatment in this condition [3,7-9].

The clinician practice of AChE-I poisoning was found to be highly variable in the 5 EDs despite the availability of protocols in most of the EDs. Whilst there is considerable variation in atropine dosing in the literature [3], the SA National guidelines state patients should receive 2-5mg of atropine as a starting bolus dose[12]. Fixed starting atropine doses observed in this study ranged from 1-15mg (mean 3.2mg). The National guidelines recommend atropine (like other medications) be administered in a weight-based fashion. Observed clinician atropinisation target end points varied considerably. Nineteen percent of clinicians considered the development of mydriasis as a target endpoint. Mydriasis is a delayed effect of atropinisation and if used as an endpoint, increases the risk of atropine toxicity [3].

Atropine maintenance infusion dosages and adjustments reflected the lack of guidance seen in the literature [3,8,13]. The most common infusion dose in our study was calculated at 10-20% of the total atropinisation bolus dose. The 10% recommendation was studied in a randomised control trial (RCT) by Abedin et al and showed a 14.5% reduction in mortality when used in conjunction with rapid incremental atropinization as performed by most clinicians in our study [13]. There is no high-quality evidence to guide adjustment of the infusion rate over time and is largely left to the treating clinicians' judgement [8,13].

Management of rebound AChE-I toxicity or atropine toxicity showed no standard clinician management response. Many clinicians in our study stop the atropine infusion for 30 minutes when rebound AChE-I toxicity occurs (47%) however the adjustment of the infusion rate varied from no change to a 50% decrease. Some clinicians stopped the infusion altogether (20%) and others changed the atropine to glycopyrrolate at an equivalent dosage (27%). Switching from atropine to glycopyrrolate has not been shown to improve patient outcomes despite a decrease in centrally mediated anticholinergic effects such as agitation and tachycardia [4].

The variability in clinician practice reflects the lack of RCTs to an provide optimal, safe treatment regime [3-4, 13] and highlights the need for further research to define best practice. RCTs however are difficult to conduct in clinical toxicology.

Adjunctive treatments

The literature on adjunctive therapy in AChE-I poisoning is littered with various medications trialed in small studies without definitive patient-related outcomes [4,8,14]. The majority (73%) of clinicians reported prescribing magnesium sulphate as adjunctive therapy in addition to atropine. The most prescribed dose of magnesium sulphate in our study was 2g (n=72, 50%) which contrasts with the literature where most studies have used 4g over 24 hours as the chosen dose [14]. The role of magnesium in decreasing further release of acetylcholine is postulated as the reason for its use in AChE-I poisoning. There is no high level research to support giving magnesium. The practice is generally endorsed by the lack of permanent adverse effects related to its administration.

Observation

Patients with AChE-I poisoning require high care or intensive care unit admission to monitor for signs and symptoms in asymptomatic patients; to monitor patient response to treatment and to observe for atropine toxicity as well as to provide supportive care [7]. Despite the risk of delayed onset of life-threatening symptoms even beyond 24h post-exposure, many of these patients are destined to be admitted to a general ward if they do not require an atropine infusion or organ support [8]. Thirty percent of clinicians in this study choose to admit patients immediately post ED assessment or within 6 hours of ED stay. Fifteen percent choose to observe these patients for more than 12 hours before determining disposition. Delayed disposition of any patient in the ED often results in ED overcrowding and access block [32]. ED clinicians observing AChE-I poisoned patients for more than 6 hours will significantly contribute to the access block.

Attitudes

Overall attitudes of clinicians managing patients with AChE-I poisoning was neutral with a mean score of 49.2 with complete neutrality equating to 54. There was, however, a very wide range of attitude scores from very positive to very negative (32-74) and may suggest a variety of unmeasured variables affecting clinicians' attitudes. Female clinicians had slightly more positive attitudes compared to their male counterparts ($p = 0.03$). No other comparisons showed any statistical significance even though there was a trend to more negative attitudes in clinicians who had more patient exposure, more years of experience and higher job titles in the ED.
Treating patients with acute poisoning elicited specific self-reported emotions in nursing staff in the Rutto et al study [29]. Some emotions reflected the nurses' perceptions of their own competencies and other emotions were directed toward the patients being treated. Hostile attitudes toward patients have been described particularly in clinicians managing poisoned patients with self-harming behaviour [20]. In our study the labour intensive nature of treating patients with AChE-I poisoning (breaking many atropine ampoules) played a role in influencing clinician attitudes.

There is evidence that hospital staff attitudes affect patients' hospital experience and future health-seeking behaviours [18,20]. It is therefore imperative that clinicians recognise the influence of their attitudes toward patients and where necessary seek out training to empower themselves to treat patients with the least presentation of bias or prejudice.

Additional patient interventions

Internationally there are a variety of additional interventions offered to patients with self-poisoning, such as psychiatric assessment, admission to mental health care wards and care by specialised nursing. [36-37]. Whilst the South African healthcare system has significant resource constraints, clinicians were asked which interventions they believed should be offered to patients with self-ingested AChE-I poisoning. Ninety percent of clinicians reported that all patients should receive a psychiatric assessment and 97% a social worker consult before hospital discharge. Psychotherapy was suggested by 77% participants whilst other forms of therapy such as family therapy and cognitive behavioural therapy were suggested by 60% and 55% respectively.

Limitations

This study may have been affected by several possible biases:
Selection Bias

Our study was limited to a clinician population in urban academic emergency departments. Further research in non-academic, more rural settings would be required to gain a broader understanding of clinician's knowledge, attitudes, and practice in managing AChE-I poisoning.

Social Desirability
Participants may have been more likely to answer the attitude questions (Section E) in a more positive way than they would feel with a real AChE-I poisoned patient. Maintaining anonymity may have mitigated this bias.

Measurement Bias
Knowledge questions responded as uncertain were calculated as incorrect but may represent clinicians who would discuss patients with a senior colleague and not necessarily make an incorrect assessment.
The practices section included an "other" option on management which was not fully explored.

5. Conclusion

This study aimed to describe clinician knowledge, attitudes and practices towards managing adult patients with AChE-I poisoning. Mean knowledge scores amongst clinicians were generally good however some deficiencies related to patient clinical presentation, atropinisation target end points and legal notification processes were observed.

Despite four of the five hospitals EDs having established protocols, clinical practices in patient management varied widely with disagreement in how to achieve atropinisation, maintenance infusion dosing and management of atropine toxicity. An observed lack of clinician psychosocial training in managing patients with deliberate ingestion of AChE-I poisoning translates into a purely biological model of patient management and not a holistic biopsychosocial approach.

Clinician attitudes varied but mostly having a neutral attitude towards this particular subset of patients.

Clinicians beliefs were unequivocal in that the healthcare system did not provide sufficient primary preventative care in order to address the underlying factors driving patients to self-harm. The clinicians in this study also provided insights into potential public health interventions which could improve both clinician experiences and patient outcomes.

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Appendix A: Questionnaire on Knowledge, Practices and Attitudes regarding Acetylcholinesterase Inhibitor Poisoning in Adults

Section A - Demographics

Please indicate your choice with a cross or tick in the appropriate box. All responses are anonymous and strictly confidential.

1) Hospital where currently working	Charlotte Maxeke Johannesburg Academic Hospital	☐
	Chris Hani Baragwanath Academic Hospital	☐
	Helen Joseph Hospital	☐
	Tambo Memorial Hospital	☐
	Thelle Mogoerane Regional Hospital	☐

2) Age	20 - 29	☐
	30 - 39	☐
	40 - 49	☐
	≥ 50	☐

3) Sex	Female	☐
	Male	☐
	LGBQT	☐
	Other	☐

4) Job title	Medical Intern	☐
	Community service medical officer	☐
	Medical Officer Gr 1	☐
	Medical Officer Gr 2	☐
	Medical Officer Gr 3	☐
	Emergency Medicine Registrar	☐
	Specialist Emergency Physician	☐
	Specialist Family Physician	☐

5) Short courses	Basic Life Support	☐

Please tick all applicable	Advanced Cardiac Life Support (ACLS)	☐
	Advanced Cardiac Life Support for Experienced Providers (ACLS-EP)	☐
	Advanced Paediatric Life Support (APLS)	☐
	Advanced Trauma Life Support (ATLS)	☐
	Emergency Management of Acute Poisonings (EMAP)	☐
	Paediatric Advanced Life Support (PALS)	☐
	Other (please specify)	☐

6) Years of Experience in Emergency Medicine (years)	

7) Have you worked in another Emergency Department before?	Yes ☐	No ☐

Section B - Exposure to Acetylcholinesterase inhibitor (AChE-I) poisoning

Please indicate your choice with a cross or tick in the appropriate box. All responses are anonymous and strictly confidential

1) How many patients with AChE-I poisoning have you personally managed?	0	☐
	< 5	☐
	5 - 10	☐
	11-25	☐
	25 - 50	☐
	> 50	☐

2) How many patients with AChE-I poisoning present to your hospital per month?	0	☐
	< 5	☐
	5 - 10	☐
	11-15	☐
	16 - 20	☐
	21 - 30	☐
	31 - 40	☐
	> 40	☐

	Statement Question	True	False	Uncertain
3	I have received formal lectures or tutorials on how to manage AChE-I poisoning during my medical studies			
4	I have received formal lectures or tutorials on how to manage AChE-I poisoning as a working professional			
5	I have received training on how to provide psycho-social support to patients after presenting with AChE-I poisoning			

Section C - Knowledge regarding AChE-I poisoning

Please indicate your choice with a cross or tick in the appropriate box. All responses are anonymous and strictly confidential
Please indicate whether the following statements are true or false or if you are uncertain.

	Question Statement	True	False	Uncertain
1	AChE-I poisoning patients should be considered priority one patients			
2	The majority of acetylcholinesterase inhibitor pesticide poisonings in South Africa are accidental			
3	The most common presentation for acetylcholinesterase inhibitor poisoning is a combination of vomiting, diarrhoea and bradycardia			
4	All patients with acetylcholinesterase inhibitor poisoning present with “pin-point” pupils			
5	AChE-I poisoning has an effect on muscarinic and nicotinic receptors			
6	Patients presenting with nicotinic toxidrome will only present with hypertension, tachycardia and fasciculations			
7	National guidelines recommend Atropine dosing as follows: starting at 2-5mg immediately and doubling every 5 minutes until atropinization occurs			
8	Bolus doses of Atropine should be continued until the patient has a normal heart rate, normotensive and their chest is dry.			
9	Maintenance infusions of atropine should be weaned slowly due to the risk of rebound acetylcholinesterase inhibitior effects			
10	Patients with acetylcholinesterase inhibitor poisoning may require intubation due to a low level of consciousness			
11	Patients with ACHe-I poisoning may require intubation for respiratory failure			
12	AChE inhibitors can be absorbed through the skin from the secretions of an affected person			
13	Health providers need to wear gloves, gowns and eye protection to avoid self-contamination			
14	Acetylcholinesterase inhibitor poisoning is a notifiable condition in South Africa			

15	Acetylcholinesterase inhibitors are all fast-acting agents and prolonged observation is unnecessary if the patient is asymptomatic			
16	If atropine toxicity occurs, the infusion of atropine should be stopped permanently			

Section D – Clinical Practices regarding management of patients with AChE-I poisoning

Please answer the following questions by placing a tick or a cross in the applicable box. The questions relate to your **OWN** practices (not those of your department as a collective)

1) I take all patients suspected of having AChE-I poisoning directly to the resuscitation area	Yes	☐
	No	☐

2) I use a timer or clock when treating patients AChE-I poisoning to ensure adequate intervals of atropine boluses	Yes	☐
	No	☐

3)	**Please indicate your starting dose for atropine boluses** (Please choose one)	
3.1	I use a fixed dose for all patients	…….mg
	I calculate the dose per patient body weight (mg/kg)	……..mg/kg

4)	**Please indicate your practices regarding bolus doses of atropine**	**True**	**False**
4.2	a. Bolus doses of atropine are doubled every 5 minutes, until the patient is atropinised.	☐	☐
	b. Bolus doses of atropine are given every 5 minutes, without incremental increases, until the patient is atropinised.	☐	☐
4.3	There is no maximum dose for atropine boluses as long as the patient is not yet deemed to be atropinised	☐	☐
4.4	The maximum atropine bolus dose is reached when the patient's pupils are no longer pinpoint.	☐	☐

5) Which of the following factors are required to determine that a patient is atropinised? (please tick all applicable)	
a. Respiratory secretions are cleared	☐
b. Systolic blood pressure is over 90mmHg	☐
c. Tachycardia develops	☐
d. Heart Rate > 80	☐
e. Mydriasis (dilated pupils) occurs	☐
f. Other (Please specify)	

6) At what rate do you start your maintenance atropine infusion? Please select ONE of the following.	
a. Atropine maintenance is started at a baseline of 20mg in 200ml at 20ml/h	☐
b. Atropine maintenance is started at 10% of the **total** of all atropine bolus doses	☐
c. Atropine maintenance is started at 20% of the **total** of all atropine bolus doses	☐
d. Atropine maintenance is started at 30% of the **total** of all atropine bolus doses	☐
e. Atropine maintenance is started at 10% of the **final** atropine bolus given	☐
f. Atropine maintenance is started at 20% of the **final** atropine bolus given	☐
g. Atropine maintenance is started at 30% of the **final** atropine bolus given	☐
h. Other:	

7) If atropine toxicity develops, which one of the following is the way you adjust the maintenance infusion?	
a. Atropine infusion is stopped	☐
b. Atropine is stopped and replaced with a glycopyrrolate infusion	☐
c. Atropine infusion is stopped for 30 minutes and is then restarted at a 10% lower dose	☐
d. Atropine infusion is stopped for 30 minutes and is then restarted at a 20% lower dose	☐
e. Atropine infusion is stopped for 30 minutes and is then restarted at a 50% lower dose	☐
f. Other (Please specify)	

8) If rebound AChE-I toxicity develops, which one of the following is the way you adjust the maintenance infusion?	
a. The patient is re-atropinised as previously and the maintenance infusion remains unchanged	☐
b. The patient is re-atropinised as previously and the maintenance infusion is recalculated with the addition of the new **total** bolus doses	☐
c. The patient is re-atropinised as previously and the maintenance infusion is recalculated with the addition of the new **final** bolus dose	☐
d. The patient is re-atropinised as previously and the maintenance infusion is increased by 10%	☐
e. The patient is re-atropinised as previously and the maintenance infusion is increased by 20%	☐
f. Other (Please specify)	

9) in addition to atropine, please select other treatment that you normally prescribe (you may select more than one option)	
a. Magnesium sulphate 2g	☐
b. Magnesium sulphate 4g	☐
c. Thiamine	☐
d. Pralidoxime/Obidoxime	☐
e. Benzodiazepines	☐
f. Activated Charcoal	☐
g. Gastric Lavage	☐
h. Other (Please specify)	☐

10) How long do you observe asymptomatic patients with suspected AChE-I poisoning in your Emergency Department prior to admission?	Admitted immediately	☐
	< 6 hours	☐
	6 - 12 hours	☐
	> 12 hours	☐

11) I use an evidence-based treatment protocol when treating patients with AChE-I poisoning	Yes	☐
	No	☐

12) How often do you fill out the forms to notify patients with AChE-I poisoning?	Always	☐
	More than half the time	☐
	Less than half	☐
	Never	☐

If you answered “always” to the above question, please skip the next question

13) Reasons for failure to notify (tick all appropriate)	I was unaware that AChE-I poisoning is a notifiable condition in South Africa.	☐
	I am unsure of the notification procedure.	☐
	I am unable to confirm the diagnosis or identify the specific poison ingested.	☐
	Lack of staff or time due to a busy emergency department.	☐
	The notification forms should be completed by the admitting doctors in the ward.	☐
	The notification forms should be done by administrative staff.	☐
	Notifying AChE-I to the relevant authorities is a waste of time.	☐

Section E - Attitudes towards patients presenting with AChE-I poisoning

Please indicate to what extent you agree or disagree with the following statements using the five-point Likert scale below and placing a cross / tick in the appropriate box. All responses are anonymous and strictly confidential

SA - Strongly agree
A - Agree
N - Neutral
D - Disagree
SD - Strongly disagree

	Question Statement	SD	D	N	A	SA
1	I believe that patients presenting with AChE-I poisoning have intentionally ingested the substance					
2	I consider that patients presenting with AChE-I poisoning may be victims of an attempted homicide					
3	Treating patients with AChE-I poisoning is exhausting as treatment is labour intensive					
4	It takes time to break open all the atropine ampoules and hence I do not worry about the timing of my boluses					
5	I believe that patients presenting with intentional AChE-I poisoning lack constructive coping skills					
6	Caring for a patient with AChE-I poisoning makes me feel uncomfortable, particularly if they present due to an intentional poisoning					
7	I believe that patients presenting with AChE-I poisoning are victims of their environments and are not responsible for their actions					
8	I believe that regardless of how supportive healthcare providers are, it will not change whether a patient will re-attempt intentional AChE-I poisoning or not					
9	I believe that any patient who has attempted suicide multiple times is at high risk of succeeding in future					
10	I believe that patients with AChE-I poisoning may have a mental health disorder and require formal evaluation					

11	I am comfortable caring for a patient with AChE-I poisoning and I show them the same empathy as any other patient in the emergency department					
12	I think that the high numbers of patients presenting with AChE-I poisoning occupy too much staff time and resources					
13	Sometimes I believe patients with AChE-I poisoning are seeking attention					
14	I get frustrated with caring for patients who have a intentionally attempted suicide by ingesting an AChE-I					
15	I feel that patients with intentional AChE-I poisoning abuse hospital resources					
16	Managing patients with AChE-I poisoning makes me consider my own mental health well-being					
17	I would like to have a clinical team debrief after treating a patient with AChE-I poisoning					
18	I believe that our public healthcare system does not address the underlying factors leading to AChE-I poisoning					

Please indicate, with a cross or a tick, which intervention you believe our hospitals should offer patients with intentional AChE-I poisoning to decrease the risk of repeated attempts and provide more holistic care. You may select more than one option

19) Intervention (select one or all relevant options)	
Psychiatric Evaluation and Risk Assessment	☐
Social Worker to address patient stressors	☐
Psychotherapy	☐
A separate ward specifically designated for parasuicidal patients	☐
Trained nursing staff to observe suicidal patients whilst in other wards	☐
General Support Group for all patients	☐
Stressor Specific Support Groups	☐
Family Therapy	☐
Cognitive Behavioural Therapy	☐

Antidepressant/Anxiolytic Medication	☐

Should there be any intervention not listed above that you believe should be offered, please indicate it below.

_____
_____
_____
_____
_____

Thank you for completing this survey. Your participation is highly appreciated

Dr Dean Redant (Principal Investigator)
072 892 3405
deanredant@gmail.com

Appendix B - **Information letter for participants**

Dear Participant

I am Dean Redant, a registrar in Emergency Medicine. As part of the course requirement, I intend to conduct a study titled “Knowledge, attitudes and practices of clinician management of adults presenting with Acetylcholinesterase inhibitor poisoning”.

This is a multicenter study looking at all medical doctors, from medical interns to specialist emergency physicians, and how their knowledge, attitudes and practices have been impacted by their experience and exposure to patients presenting with organophosphate or carbamate poisoning (collectively referred to as acetylcholinesterase inhibitor poisoning). There are no financial benefits to this study.

Participation is completely voluntary and you may withdraw at any point during the study. There is no risk to participants as data collection is in the form of a five-section questionnaire which should take about 20 minutes of your time. All questionnaires are completely anonymous and responses will be only be accessible to the investigator and supervisor.

Your participation is highly appreciated. Any questions or clarification can be referred to the principal investigator on 072 892 3405.

Thank you
Dr Dean Redant

Appendix C - **Consent form for Participants**

I have read through the information letter provided by the principal investigator for participation in the study "Knowledge, attitudes and practices of clinician management of adults presenting with Acetylcholinesterase inhibitor poisoning".

I have been able to clarify any concerns with the principal investigator. I hereby give consent to participate in the above-mentioned study.

Signature of participant Date: DD/MM/YYYY

Signature of investigator Date: DD/MM/YYYY

Contact Details

Dr Dean Redant
072 892 3405
deanredant@gmail.com

Appendix D – Ethics Clearance Certificate (HREC)

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG	HUMAN RESEARCH ETHICS COMMITTEE (MEDICAL)

Office of the Deputy Vice-Chancellor (Research and Innovation)

TO:	Dr DP Redant School of Clinical Medicine Department of Medicine Division of Emergency Medicine Medical School University E-mail: deanredant@gmail.com
CC:	Supervisor: Dr K Molokoane-Mokgoro <Keamogetswe.Molokoane@wits.ac.za> and <HREC-Medical Research Office@wits.ac.za>
FROM:	Mr Iain Burns Human Research Ethics Committee (Medical) Tel: 011 717 1252 E-mail: Iain.Burns@wits.ac.za
DATE:	2021/11/05
REF:	R14/49
PROTOCOL NO:	**M210733** (This is your ethics application reference number. Please quote it in all enquiries, oral or written, relating to this study.)
PROJECT TITLE:	*Knowledge, attitudes and practices of clinician management of adults presenting with acetylcholinesterase inhibitor poisoning*

Please find attached the Clearance Certificate for the above project. I hope it goes well and that an article in a recognized publication comes out of it. This will reflect well on your professional standing and contribute to Government funding of the University.

MSWorks2000/Iain0007/Clearscan.wps

UNIVERSITY OF THE
WITWATERSRAND
JOHANNESBURG

R49 Dr DP Redant

HUMAN RESEARCH ETHICS COMMITTEE (MEDICAL)
CLEARANCE CERTIFICATE NO. M210733

NAME: **(Principal Investigator)**	Dr DP Redant
DEPARTMENT:	School of Clinical Medicine Department of Medicine Division of Emergency Medicine Medical School University
PROJECT TITLE:	*Knowledge, attitudes and practices of clinician management of adults presenting with acetylcholinesterase inhibitor poisoning*
DATE CONSIDERED:	2021/07/30
DECISION:	Approved unconditionally
CONDITIONS:	
NOTE:	If contact information regarding student study participants is required, please contact the Registrar's office - <Nicoleen.Potgieter@wits.ac.za>
SUPERVISOR:	Dr K Molokoane-Mokgoro
APPROVED BY:	CB Penny Dr CB Penny, Chairperson, HREC (Medical)
DATE OF APPROVAL:	2021/11/05

This Clearance Certificate is valid for 5 years from the date of approval. An extension may be applied for.

DECLARATION OF INVESTIGATORS

To be completed in duplicate and **ONE COPY** returned to the Research Office secretariat on the 3rd floor, Phillip Tobias Building, Parktown, University of the Witwatersrand, Johannesburg.

I/we fully understand the conditions under which I am/we are authorized to carry out the above-mentioned research and I/we undertake to ensure compliance with these conditions. Should any departure be contemplated from the research protocol as approved, I/we undertake to submit details to the Committee. **I agree to submit a yearly progress report**. When a funder requires annual re-certification, the application date will be one year after the date when the study was initially reviewed. In this case, the study was initially reviewed in July and therefore reports and re-certification will be due in the month of **July** each year. Unreported changes to the study may invalidate the clearance given by the HREC (Medical).

Signature of Principal Investigator _____ Date _____