Advances in Toxicology and Toxic Effects

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Dates: **Received:** 03 June, 2016; **Accepted:** 17 June, 2016; **Published:** 21 June, 2016

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Keywords: Survey; Education; Poisoning; Toxicology; Cardiotoxins; Calcium channel blocker; Emergency medicine; Antidotes

Research Article

Impact of Training and Practice Setting on the Physician's Opinion Regarding the Treatment of Calcium Channel Blocker Poisoning: A Survey of Emergency Physicians

Abstract

Background: A study published by St-Onge at al. (2012), identified an important variation in practice in regards to the management of calcium channel blocker (CCB) poisoning. The objectives of this study was to evaluate if the opinions of emergency physicians regarding the treatment of CCB poisonings varied and are influenced by their training and practice setting.

Methods: A survey was conducted among emergency physicians working in a Canadian province (September 2008 to 2011). A weight-based group sampling method was used to identify the emergency departments where clinicians were invited to participate. During one of the emergency department meetings, clinicians were asked to select their management for six diltiazem poisoning scenarios, and identified which resources were available at their hospital.

Results: A total of 19 emergency departments (140 emergency physicians) participated in the study. A greater proportion of clinicians with a 5 year FRCPC(EM) certificate compared to family physicians considered the administration of high-dose insulin (Case 3: OR 9.40 95%CI 2.26 to 45.68 p=0.0047; Case 4: OR 5.97 95%CI 1.48 to 28.17 p=0.0301). There was also a trend for a greater use of calcium for one of two cases for which it was applicable (Case 4: OR 7.62 95%CI 1.15 to 153.91 p=0.0543). Only internal pacemaker, extracorporeal life support and levosimendan were significantly reported as being unavailable in community/primary centers (p0.05).

Conclusion: The emergency physicians' opinion regarding the management of CCB poisoning varies and is influenced by their training. Access to resources varied mainly depending on the practice setting.

Abbreviations

CCB: Calcium Channel Blocker; CCFP(EM): Canadian College of Family Physicians - Emergency Medicine Certificate; FRCPC(EM): Fellow of the Royal College of Physicians of Canada; OR: Odds Ratio; CI: Confidence Interval; ACLS: Advance Cardiac Life-Support;

Background

A recent study performed in two Canadian cities showed that as many as 58% of calcium channel blocker (CCB) poisoning cases are not treated according to the poison control center's recommendations [1]. This finding was confirmed by an American study underlying that high-dose insulin was administered in only 42% of the cases when the poison control center was recommending it [2]. From these results, it was hypothesized that previous toxicology training could impact the treatment strategy proposed by the physician for care of poisoned patients. The limited availability of resources in some rural regions may also influence the patients' care. No study thus far has assessed at the impact of training or practice setting on the physician's opinion regarding the management strategy of poisonings. Those factors may explain in part variation in practice.

In Canada, many of the clinicians providing care in emergency departments are family physicians practicing without a one year certificate of special competency in emergency medicine (CCFP(EM)) [3]. In 2005, a survey mailed to 32 community emergency departments in southwestern Ontario revealed that 70.1% of the clinicians had no formal emergency medicine training [4,5]. In the Province of Quebec, unpublished data collected for the purpose of this study showed that approximately 1552 physicians work in the 104 emergency departments, and of these, only 129 completed a 5 year Emergency Physicians Board Certificate (FRCPC(EM)) with the Royal College of Physicians and Surgeons of Canada which includes at least a one month toxicology rotation in most of the programs. Very little training in toxicology is included in the family medicine program and the exposition to toxicology during the CCFP(EM) program is variable depending on the university and the candidate. Moreover, most of them work in secondary or community/primary centers where fewer resources are available [3].

The objective of this study was to evaluate if the emergency physicians' opinion regarding the treatment of poisonings (more specifically CCB poisoning) is influenced by their training (family physician, one year CCFP(EM) certification or 5 year FRCPC(EM) certification) and their practice setting.

Methods

As stated by the "Association québécoise d'établissements de santé et de services sociaux" and the Province of Quebec Health ministry, a primary or community centre is defined as an emergency department with less than 10 000 patients on stretcher/year and 24h access to a general medicine physician, an anesthesiologist and a general surgeon. A secondary centre is defined as an emergency department with 10 000 to 20 000 patients on stretcher/year and 24h access to an internal medicine physician, a radiologist and an orthopedist. Finally, a tertiary or academic centre is defined as an emergency department with more than 20 000 patients on stretcher/year and 24h access to some subspecialties such as nephrology, neurosurgery, cardiac or thoracic surgery.

Survey data collection

The survey (anonymous written questionnaire, multi-option variables and unstructured response format) was conducted between September 2008 and 2011 among emergency physicians working in the Province of Quebec. Only physicians who were aware of the study details were excluded. To ensure a proportional participation of physicians from community/primary, secondary and academic/tertiary centers, a weight-based group sampling method was used to identify the emergency departments where the emergency physicians were invited to participate. The weight of each emergency department was established based on the number of emergency physicians working in that department and the estimated proportion of attendance to their emergency department meeting where the survey would be administered. A targeted sample size of 34 emergency departments (13 community/primary centers, 11 secondary centers, 10 academic/tertiary centers) were randomly selected by SAS software (version 9.3, University of Toronto, Ontario) among the 104 hospitals in the Province to detect a 10% absolute difference with 80% power at a level of significance of 0.05.

The chiefs of the 34 emergency departments were contacted to obtain authorization to administer a 30-minute written questionnaire during one of the department meetings. A minimum of three emails and/or phone calls was made before the absence of response was considered as a refusal. The subject of the survey was revealed only at the meeting where the physicians' participation was solicited by the study investigators who attended the 30-minute period of survey administration. After consenting to participate, the emergency physicians were asked to select their management for each of the following six diltiazem (immediate release, unknown quantity) poisoning clinical scenarios: 1) stable, without sign or symptom, more than one hour post-ingestion; 2) stable, without sign or symptom, less than one hour post-ingestion; 3) unstable, at ED arrival; 4) unstable, did not respond to support measures defined as fluid, atropine and vasopressors; 5) unstable, did not respond to support measures and calcium; 6) unstable, did not respond to support measures, calcium and high-dose insulin. The physicians were asked to select their strategy in a timely manner. Item generation and reduction was based on the results of a retrospective study conducted in the same Province [1], in order to represent the severity spectrum of this type of poisoning. The questionnaire was pre-tested in a secondary center with 12 emergency physicians and was available in French or English (Annex 1 available online).

All cases were 35-year-old men without previous medical history who presented after a suicidal ingestion. All unstable cases had a heart rate of 36 beats per minute (first-degree atrio-ventricular block), a blood pressure of 80 mmHg systolic, a blood glucose level of 11 mmol/L and a Glasgow Coma Scale (GCS) score of 14/15. The participants were told to consider all scenarios as being non-related to avoid any confusion. After proposing strategies to the clinical cases in the questionnaire, the physicians then identified which resources would be available at their hospital and which factors could have influenced their management of a CCB poisoning. The research ethics board at the "Institut universitaire de cardiologie et de pneumologie de Québec" approved the conduction of the study.

Analysis of the survey data

For each of the key independent variables (type of training, practice setting), outcome variables (interventions considered) were detailed for each case. The reported resources available and the factors perceived as influencing the CCB poisoning management were also described.

Multivariate logistic regression was used to analyze choices of a medical intervention separately because participants were allowed to select multiple interventions (antidotes or not) in the aforementioned clinical Scenario 3 - 5. Outcome variables under consideration were the use of atropine, external pacemakers, IV calcium and high-dose insulin in Scenario 3 (unstable at emergency department arrival); the use of external pacemakers, IV calcium and high-dose insulin in Scenario 4 (unstable, did not respond to support measures defined as fluid, atropine and vasopressors); the use of external pacemakers and high-dose insulin in Scenario 5 (unstable, did not respond to support measures and calcium). In the logistic regression models, the choice of a medical intervention in relation to independent variables was quantified in terms of odds-ratios (ORs). OR> 1 suggests an increase in likelihood of the use of a medical intervention. The key independent variables were type of training and practice setting as categorical variables with family physicians (without a one year CCFP(EM)) certificate and community/primary emergency departments as reference groups, respectively. Participants' age, gender and clinical experiences were included as control variables in the models. 95% confidence intervals (CIs) and *p*-values were assessed using Wald's statistics.

In addition to the logistic regression models on the choices of medical interventions, descriptive data analysis was used to assess resource unavailability reported by the participants. In light of participants working in the same emergency department, we expected strong correlation in responses among participants at the same emergency department. Hence, the data analysis was conducted in a two-step manner. At the first step, the number and the proportions of the participants who reported a medical resource unavailable were summarized by emergency department. A medical resource was deemed unavailable within the emergency department if ≥50% of participants at the same emergency department reported its unavailability. Using this criterion, the numbers and proportions of emergency departments with unavailable medical resources were summarized by practice setting at the second step. Considering the small number of participating emergency departments, Fisher's exact tests were used to evaluate differences in resources unavailability among different types of emergency departments. In addition, we also conducted sensitivity analysis for this analysis by changing the threshold value to 40% and 80%.

Results

Survey data collection

Nineteen emergency departments (6 primary, 6 secondary and 7 tertiary centers), which included a total of 140 emergency physicians, accepted the invitation to participate in the study. Table 1 describes the characteristics of the participating clinicians.

Two academic/tertiary centers, six secondary centers and seven community/primary centers did not participate because they could not find a time to have the survey administered before the end of the study or never answered the emails and phone calls. Thirteen of the 19 participating emergency departments (5 community/primary centers, 4 secondary centers, 4 academic/tertiary centers) agreed to provide information of the physicians who were not present at the meeting. The characteristics of the absent clinicians (Table 2) were generally similar to those who participated in the study, but a greater proportion of males were present at the meetings. Only one clinician who was present at an emergency department meeting refused to participate. All other physicians (a total of 140) eligible for the study agreed to complete the survey.

Analysis of the survey data

Only the second scenario (Case 2) had a patient presenting less than one hour post-ingestion. Most physicians (134/140) decided to decontaminate the second case, but the responses for the chosen method varied. Some used more than one method and/or considered multiple-dose charcoal. Table 3 describes the decontamination method(s) or the enhanced elimination therapies considered depending on the practice setting, clinical experience and training. For the other cases, while the majority did not decontaminate the patient.

In terms of intervention, fluid management was consistent among the different groups. Most clinicians (105/140) selected to give fluid to the third case, but gave less and less as the clinical scenarios showed that the patient was not responding to therapies (47/140 for the last case). Nearly two-thirds (64%) of the physicians considered giving calcium at emergency department arrival, while 54% proposed atropine and 30% suggested starting vasopressors.

Glucagon was ordered by 44-61% of the clinicians, but the high-dose insulin was initiated only in 50% of the sickest patients (27 to 50%, depending on the scenario). Milrinone, internal pacemaker, intralipids and extracorporeal life support were rarely identified as potential therapies for CCB poisonings.

Table 4 details the proportion of clinicians who considered specific therapies for CCB poisoning (calcium, high-dose insulin) depending on their training and practice setting. Antidote use was more frequent in FRCPC (EM) *vs.* family physicians and external pacemaker was used less frequently. Physicians with a 5 year FRCPC (EM) certificate were more likely to order high-dose insulin in Scenario 3, 4 and 5 than family physicians (p-values of 0.0047, 0.0301 and 0.0695, respectively). The same observation can be made for the order of calcium in FRCPC (EM) and CCFP (EM) *vs.* family physicians in Scenario 4 although the evidence was not as strong as the use of high-dose insulin (p-value= 0.0543). Annex 2 (available online) provides the details for all the interventions considered.

Table 1: Characteristics of study participants (n=140).

Characteristics	Overall		Practice setting							Training[2]						
			Primary centres		Secondary centres		Tertiary centres		p-values[3]	Family physicians		CCFP(EM)		FRCPC(EM)		p-values[3]
Age (mean; std)	40 (8)		39 (7)		40 (7)		41 (9)		0.3603	39 (8)		38 (8)		49 (8)		0.0003
Years of clinical experience (mean; std)	12 (9)		10 (8)		12 (8)		13 (9)		0.4105	11 (8)		10 (8)		20 (9)		0.0015
	N	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**p-values[3]**	**N**	**%**	**N**	**%**	**N**	**%**	**p-values[3]**
N	140		33		42		65			83		39		15		
Male[1]	78	57%	18	59%	24	59%	36	55%	0.9499	43	53%	20	53%	13	87%	0.0423
Previous experience or training concerning CCB poisoning	29	21%	4	17%	7	17%	18	28%	0.1474	10	12%	15	39%	4	27%	0.0083
Practice setting																<0.0001
Primary centres	33	24%	_	_	_	_	_	_		31	37%	2	5%	0	0%	
Secondary centres	42	30%	_	_	_	_	_	_		28	34%	10	26%	3	20%	
Tertiary centres	65	46%	_	_	_	_	_	_		24	29%	27	69%	12	80%	
Training[2]									<0.0001							
Family physicians	83	61%	31	94%	28	68%	24	38%		_	_	_	_	_	_	
CCFP(EM) (one year)	39	29%	2	6%	10	24%	27	43%		_	_	_	_	_	_	
FRCPC(EM) (5 year)	15	11%	0	0%	3	7%	12	19%		_	_	_	_	_	_	

Notes: 1) Two participants (1 family physician in a primary centre and 1 CCFP(EM) in a secondary centre) did not report their sex.
2) Three participants (1 in a secondary centre and 2 in a tertiary centre) did not report the types of training.
3) P-values were evaluated using Kruskal-Wallis tests for continuous variables and X2 tests for binary and categorical variables.

Citation: St-Onge M, Chun-Po SF, Blais R (2016) Impact of Training and Practice Setting on the Physician's Opinion Regarding the Treatment of Calcium Channel Blocker Poisoning: A Survey of Emergency Physicians. Adv Toxicol Toxic Effects 1(1): 001-006.

Table 2: Characteristics of the physicians not present at the meetings.

Characteristics	Primary centers (n=22) 60% present	Secondary centers (n=44) 48% present	Tertiary centers (n=33) 66% present	Total (n=99)
Sex (% of male)	48% (56%)	50% (59%)	48% (55%)	49% (57%)
Years of clinical experience (mean)	9 (10)	13 (12)	15 (13)	13 (12)
Training, n (%)				
Family physicians	91% (94%)	77% (68%)	55% (38%)	71% (61%)
CCFP(EM)	9% (6%)	23% (24%)	24% (43%)	21% (29%)
FRCP(EM)	0% (0%)	0% (7%)	21% (19%)	7% (11%)

Table 3: Proposed decontamination strategies for Case 2 (less than one hour post-ingestion).

Type of setting or training	No decon-tamination	Method of decontamination				Method of enhanced elimination	
		Ipecac syrup	Gastric lavage	Activated charcoal	Whole bowel irrigation	Multiple-dose charcoal	Dialysis
Practice setting							
Primary centers (n=33)	1 (3%)	1 (3%)	5 (15%)	21 (64%)	1 (3%)	2 (6%)	0 (0%)
Secondary centers (n=42)	2 (5%)	0 (0%)	7 (17%)	26 (62%)	3 (7%)	8 (19%)	0 (0%)
Tertiary centers (n=65)	3 (5%)	1 (2%)	19 (29%)	42 (65%)	1 (2%)	13 (20%)	0 (0%)
Training							
FP (n=83)	1 (1%)	2 (2%)	21 (25%)	56 (67%)	0 (0%)	17 (20%)	0 (0%)
CCFP(EM) (n=39)	1 (3%)	0 (0%)	6 (15%)	25 (64%)	4 (10%)	7 (18%)	0 (0%)
FRCPC(EM) (n=15)	2 (13%)	0 (0%)	4 (27%)	8 (53%)	1 (7%)	4 (27%)	0 (0%)

The resources reported as being unavailable (or unknown) varied across practice settings. Table 5 shows that variations across practice setting were statistically significant for internal pacemakers, extracorporeal life support and levosimendan. Of note, an important proportion of clinicians identified milrinone (68%) and lipid emulsion (63%) as unavailable therapies, regardless of practice setting.

Finally, FRCPC(EM) trained clinicians mentioned access to critical care units as influencing the management of CCB poisoning. Family physicians (without CCFP(EM)) were the only ones who mentioned the poison control centre as influencing the management of their poisoned patients. Family physicians with or without CCFPM(EM) also underlined guidelines and protocols as having an influence on their strategy. Table 6 details the perceived influencing factors on the management of CCB poisonings.

Discussion

This study highlights that there is a variation in opinion among emergency physicians concerning management of CCB poisoning and that it may be influenced by their training. Therapies specific to CCB poisoning [6], were more often considered by physicians with a 5 year FRCPC(EM) certificate. In fact, clinicians without formal toxicology training (family physicians) tended towards emphasizing guidelines and protocols as influencing their practice. In order to improve adherence to recommendations which has been documented by previous studies as being poor [1,2,7], poison control centre should consider using implementation strategies, providing toxicology trainings and adapting their approach depending if the bedside clinicians have toxicology included in their training or not. In fact, Grol et al., performed an observational study looking at factors influencing guidelines adherence which determined that recommendations demanding a change in existing practice routines were less likely to be followed [8]. Therefore, for physicians who never learned about high-dose insulin during their training, it may be more difficult to apply the recommendation even if they called the poison control centre. Providing a mandatory training such as ACLS-toxicology for physicians working in acute care setting [9], having outreach programs or offering bedside consultation services [10], may help solving this issue.

Nevertheless, reported resources available varied with practice setting. Having access to extracorporeal life support and internal pacemakers may be problematic in community/primary centers. In addition, more experienced physicians and FRCPC(EM) physicians pointed out that access to critical care might play a role in their patient's management. Therefore, poison control centres should ensure that their recommendations are perceived as easy to implement in the respective physicians' setting. Rogers (2003) mentioned that diffusion of innovation should be perceived as beneficial, compatible with beliefs and easy to implement. He also underlined the importance that the outcome of the intervention should be visible by the practitioner [11].

This study has some limitations. First, despite tremendous effort to recruit centers, only 19 were included. Fortunately, a proportional numbers of community/primary, secondary and academic/tertiary centers declined the invitation to participate in the study. However, because family physicians were absent more often, they were proportionally underrepresented in this study. This could cause a selection bias, but considering that nearly 100% of physicians who attended meetings participated in the study, it is unlikely that this systematic error was directly related to the survey's subject.

Secondly, desirability bias might have impacted. One case could impact the answers of in the subsequent scenarios, although the study design of the progression of cases increasing in severity and that physicians were unable to change previous prevented it.

Thirdly, 45 of 140 participants did not answer the last question concerning the factors influencing their management of CCB poisonings. It is possible that the single open-ended question included at the end of the survey discouraged some of the respondents who

were less motivated compared to previous questions. It is possible that we would have collected more information with closed-ended questions. Alternatively, the physicians may have had no specific answer for this question.

Finally, this survey reports the opinions of clinicians and may not completely reflect how physicians would actually respond with a CCB poisoned patient. Nevertheless, the previously mentioned retrospective study [1], identified a 58% non-compliance rate for

Table 4: Interventions considered depending on training and practice setting.

Intervention	HDI			Calcium		External pacemaker			Atropine
Scenario	**3**	**4**	**5**	**3**	**4**	**3**	**4**	**5**	**3**
Level of training									
CCFM vs FP unadjusted OR	1.26 (0.46-3.35) p=0.0058	1.16 (0.48-2.76) p=0.0976	2.40 (1.03-5.81) p=0.0790	1.39 (0.57-3.50) p=0.7301	**3.28 (1.21-10.09) p=0.0108**	0.54 (0.22-1.27) p=0.0116	0.67 (0.28-1.59) p=0.0363	0.59 (0.25-1.40) p=0.1491	1.07 (0.46-2.56) p=0.9231
adjusted OR	1.08 (0.36-3.11) p=0.0047	1.03 (0.39-2.65) p=0.0301	2.35 (0.93-6.09) p=0.0695	1.08 (0.42-2.87) p=0.9742	2.43 (0.85-7.81) p=0.0543	0.68 (0.26-1.71) p=0.0309	0.75 (0.29-1.88) p=0.0556	0.64 (0.25-1.61) p=0.3419	0.95 (0.37-2.43) p=0.8810
FRCPC vs FP unadjusted OR	**7.25 (2.07-28.62) p=0058**	**3.69 (1.10-13.90) p=0.0976**	2.68 (0.81-9.95) p=0.0790	1.43 (0.41-5.85) p=0.7301	**8.36 (1.45-159.41) p=0.0108**	**0.12 (0.02-0.52) p=0.0116**	**0.18 (0.03-0.67) p=0.0363**	0.32 (0.09-1.06) p=0.1491	0.84 (0.24-2.78) p=0.9231
adjusted OR	**9.40 (2.26-45.68) p=0.0047**	**5.97 (1.48-28.17) p=0.0301**	3.83 (0.97-17.33) p=0.0695	1.16 (0.29-5.27) p=0.9742	7.62 (1.15-153.91) p=0.0543	**0.13 (0.02-0.61) p=0.0309**	0.17 (0.03-0.74) p=0.0556	0.40 (0.10-1.50) p=0.3419	1.35 (0.34-5.28) p=0.8810
Type of emergency department									
Secondary vs primary unadjusted OR	1.32 (0.42-4.45) p=0.8911	2.17 (0.79-6.33) p=0.3255	1.63 (0.62-4.35) p=0.6088	1.50 (0.58-3.94) p=0.4037	1.04 (0.38-2.86) p=0.9964	0.61 (0.23-1.59) p=0.1268	**0.36 (0.13-0.96) p=0.0310**	0.65 (0.24-1.68) p=0.2451	**0.34 (0.11-0.96) p=0.0061**
adjusted OR	1.14 (0.34-4.06) p=0.8923	2.25 (0.79-6.80) p=0.3097	1.69 (0.62-4.68) p=0.5803	1.37 (0.51-3.68) p=0.4678	0.93 (0.33-2.66) p=0.9794	0.66 (0.24-1.75) p=0.1197	**0.35 (0.13-0.93) p=0.0241**	0.64 (0.23-1.69) p=0.1701	**0.30 (0.09-0.89) p=0.0020**
Tertiary vs primary unadjusted OR	1.24 (0.39-4.25) p=0.8911	1.61 (0.57-4.79) p=0.3255	1.33 (0.50-3.57) p=0.6088	1.96 (0.74-5.30) p=0.4037	1.01 (0.36-2.81) p=0.9964	1.51 (0.57-4.06) p=0.1268	1.07 (0.39-2.92) p=0.0310	1.33 (0.49-3.65) p=0.2451	**0.19 (0.06-0.54) p=0.0061**
adjusted OR	1.14 (0.34-4.06) p=0.8923	1.57 (0.53-4.87) p=0.3097	1.29 (0.46-3.63) p=0.5803	1.88 (0.68-5.26) p=0.4678	0.90 (0.30-2.60) p=0.9794	1.68 (0.63-4.63) p=0.1197	1.06 (0.39-2.85) p=0.0241	1.48 (0.53-4.20) p=0.1701	**0.14 (0.04-0.43) p=0.0020**

Notes: - Data are adjusted for age, gender, years of clinical experience and previous experience with CCB poisoning.
- OR>1 indicates an increase in likelihood of using the intervention.
- P-values were evaluated based on Type 3 statistics using likelihood ratios.
- Values in bold are statistically significant.

Table 5: Resources reported as being unavailable across practice settings.

Practice setting		Total n=19		Primary centers n=6		Secondary centers n=6		Tertiary centers n=7		P-value
		N	%	N	%	N	%	N	%	
Resource unavailability	IV calcium	0	0%	0	0%	0	0%	0	0%	
	HDI	0	0%	0	0%	0	0%	0	0%	
	External pacemaker	0	0%	0	0%	0	0%	0	0%	
	Glucagon	1	5%	1	17%	0	0%	0	0%	0.6316
	Internal pacemaker	5	26%	4	57%	1	17%	0	0%	0.0183
	Lipid emulsion	12	63%	4	67%	3	50%	5	71%	0.8437
	Milrinone	13	68%	6	100%	3	50%	4	57%	0.2067
	ECLS	15	79%	6	100%	6	100%	3	43%	0.0168
	Levosimendan	16	84%	6	100%	3	50%	7	100%	0.0413
	Sufficient human resources	1	5%	1	17%	0	0%	0	0%	0.6316

Table 6: Perceived influencing factors on management.

Influencing factors	Practice setting			Training			TOTAL (n=140)
	Primary centers (n=33)	Secondary centers (n=42)	Tertiary centers (n=65)	FP (n=83)	CCFP(EM) (n=39)	FRCPC(EM) (n=15)	
Cases' frequency	0%	0%	3%	1%	0%	7%	**1%**
Physicians' experience and knowledge	2%	14%	9%	8%	13%	7%	**11%**
Nurses' experience and knowledge	0%	0%	2%	0%	3%	0%	**1%**
Past medical history	7%	5%	3%	5%	5%	0%	**4%**
Co-morbidities	0%	0%	0%	0%	0%	0%	**0%**
Co-ingestions	12%	5%	11%	**10%**	**10%**	7%	**9%**
Time of ingestion	15%	7%	11%	**11%**	**13%**	7%	**11%**
CCB formulation	11%	5%	5%	7%	3%	7%	**6%**
Clinical state	**21%**	**17%**	5%	**20%**	**26%**	**27%**	**24%**
Response to therapy	0%	0%	3%	0%	3%	7%	**1%**
Access to antidote	**21%**	**17%**	5%	14%	8%	13%	**12%**
Access to invasive treatment	9%	0%	3%	4%	0%	7%	**3%**
Access to consultant	12%	3%	6%	4%	13%	7%	**6%**
Access to critical care	3%	14%	9%	4%	**15%**	**27%**	**9%**
Access to human resources	9%	5%	9%	7%	10%	7%	**8%**
Access to poison control center	**12%**	**9%**	6%	**10%**	0%	0%	**6%**
Access to guidelines	7%	12%	3%	**8%**	**5%**	0%	**6%**
Access to other info	0%	5%	0%	1%	3%	0%	**1%**
Time of the day	3%	3%	0%	1%	3%	0%	**1%**

poison control centre recommendations. High-dose insulin was not started when indicated, consistent with results in the survey in this report (only 50% of physicians started high-dose insulin in the fifth scenario), and decontamination seemed to be erratic, as reflected in the diversity of reported approaches in this study. Therefore, this suggests that the physicians' responses to the hypothetical scenarios may indeed reflect, at least closely, how they would manage a real case.

Conclusions

In conclusion, the physicians' opinion regarding the treatment of CCB poisonings can be influenced by their training. FRCPC(EM) physicians were more likely to consider specific therapies used in toxicology, whereas family physicians were the only one who requested toxicology guidelines/protocols and guidance from the poison control centre. Access to resources varied mainly depending on the practice setting. Having access to internal pacemakers or extracorporeal life support was reported as problematic in primary centers, while FRCPC(EM) trained physicians working principally in tertiary centers mentioned access to critical care as influencing the care of CCB poisoned patients.

Author's Contributions

MSO designed the study, collected, analyzed, interpreted the data, and wrote the manuscript; SFCP analyzed the data and reviewed the manuscript; RB planned the study and reviewed the manuscript.

Acknowledgements

We would like to thank Jennifer Butters for editing the manuscript

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