Evaluating Nurses' Preparedness in Managing Critical Incidences and Disaster Relief: A Survey in Quebec

Shafic Abdulkarim

Department of Experimental Surgery (Global Surgery) McGill University, Montreal

Date of initial thesis submission: August 2022

A thesis submitted to McGill University in partial fulfillment of the requirements of the degree of Masters in Experimental Surgery.

Table of Contents

Abstract

Background

Although nurses play a major role in alleviating the burdens associated with critical incidents, little is known about nursing preparedness in these emergent situations. This study aims to evaluate the degree of preparedness and training of Canadian nurses in disasters and critical incidents.

Methods

An observational cross-sectional survey through self-administered web-based questionnaire was shared with nurses working in Emergency Departments, Adult/pediatric Intensive Care Units, and Cardiac Care Units at five hospitals affiliated with McGill University in Montreal (Quebec, Canada). General demographics, level of experience, critical-care training, and level of confidence in performing trauma-related activities were collected. The statistical significance level was set at p=0.05.

Results

In total, 145 nurses completed the survey. Most nurses have not participated in a disaster management simulation (64.8%, n= 94). Moreover, almost only half of them knew what was their specific role in such a simulation (49.6% , n=72) and where to find their department's code orange (external disaster) plan (44.8% , n=65). The vast majority of participants (78.6%, n=114) never participated in a real code orange scenario. On multiple logistic regression, having over 10 years of experience in critical care setting (OR 5.37, p <0.05) and having completed two (OR 3.75, p= 0.03) or three or more (OR 4.60, p = 0.03) courses in trauma/ critical care were significantly associated with a higher level of preparedness.

Conclusion

Nurses are essential in optimal trauma care provision. This study shows a lack of nurses' preparedness to deal with critical situations based on their self-assessment. The completion of a trauma course was noted to be essential for high level of preparedness.

Abstract in French

Contexte

Bien que les infirmières jouent un rôle majeur dans l'allégement des incidents critiques, on en sait peu sur la préparation des infirmièr(e)s à ces situations émergentes. Cette étude vise à évaluer le degré de préparation et de formation des infirmièr(e)s canadien(ne)s en cas d'incidents critiques.

Méthodes

Cette étude étais un sondage viser aux infirmièr(e)s travaillant dans les services d'urgence, les unités de soins intensifs pour adultes/pédiatriques et les unités de soins cardiaques dans cinq hôpitaux affiliés à l'Université McGill à Montréal (Québec, Canada). Les données démographiques générales, le niveau d'expérience, la formation en soins intensifs et le niveau de confiance dans l'exécution d'activités liées aux situations émergentes ont été recueillis. Le niveau de signification statistique a été fixé à p=0,05.

Résultats

Au total, 145 infirmièr(e)s ont répondu au sondage. La plupart des infirmièr(e)s n'ont pas participé à une simulation de gestion des catastrophes (64,8 %, n = 94). De plus, juste près de la moitié d'infirmièr(e)s savaient quel était leur rôle spécifique dans une telle simulation (49,6 % , n=72) et où se trouves le plan code orange (catastrophe extérieure) de leur département (44,8 % , n=65). La grande majorité des participants (78,6 %, n = 114) n'ont jamais participé à un scénario de code orange en vrai vie. En régression logistique multiple, avoir plus de 10 ans d'expérience en milieu de soins intensifs (OR 5,37, p <0,05) et avoir suivi deux (OR 3,75, p = 0,03) ou trois ou plus (OR 4,60, p = 0,03) cours en traumatologie / les soins intensifs étaient significativement associés à un niveau de préparation plus élevé.

Conclusion.

Les infirmièr(e)s sont essentielles à la prestation optimale des soins de traumatologie. Cette étude montre un manque de préparation des infirmières aux situations critiques. Les cours de traumatologie ont noté d'être essentiel pour un haut niveau de préparation chez les infirmièr(e)s.

Acknowledgement

I would like to thank my supervisor Dr.Tarek Razek for his support and guidance. He was always available to give me feedback and ideas to progress with my project. He is a brilliant clinician and has a huge experience in the field of trauma surgery. I am very lucky to have him as my supervisor.

I would like to also thank Natasha Dupuis , Advanced Practice Nurse , who I am sure the project would not have happened without her support. I could not have received the number of responders to my project without Natasha. I am extremely grateful for her help.

Special thanks also to my colleague Anudari Zorigtbaatar who helped me in analyzing the data. She gave me great feedback on my project which added a lot to the project.

Contribution of Authors

Shafic Abdulkarim , Dr.Tarek Razek and Natasha Dupuis constructed the nursing Questionnaire.

Shafic Abdulkarim and Natasha Dupuis helped in disseminating the questionnaire electronically and physically.

Anudari Zorigtbaatar analyzed the data and helped Shafic Abdulkarim in writing the method and results.

Shafic Abdulkarim wrote the introduction and background, and the discussion.

Introduction

The frequency of disasters, whether man-made or natural, is increasing worldwide[1-3]. In fact, disasters take place on average once a week somewhere in the world[4].

With the high number of natural disasters taking place each year (315 disasters took place in 2018 alone[5]), the recent COVID-19 pandemic and the surge in terrorist attacks like the Christchurch Mosque shooting (New Zealand), the disaster preparedness of medical systems became an international concern.

These critical incidents result in numerous losses in human life and serious destruction in properties and infrastructure. The resulting injuries can rapidly overwhelm the medical facilities.

Therefore, trauma centers' response and the presence of established protocol in these centers are essential components of disaster preparedness. However, worldwide studies, including in the United States and Canada, have shown that trauma centers' disaster preparedness is suboptimal[6-8].

In one of Australia's trauma center, Corrigan et al. found that only 38% of participants attended a disaster drill simulation and 13% participated in a real-life disaster. The majority felt "not prepared" or "unsure" about their disaster preparedness[6].

In Canada, a cross sectional survey of level 1 trauma centers in 2009 showed that 43% had not conducted a recent disaster drill scenario[7].

As the largest healthcare workforce, nurses play vital roles to mitigate the effect of disasters. The recent increase in disasters worldwide even led to changes in disaster policies which highlighted the need to enhance nurses' competencies in critical situations[9,10]. To gain these disaster competencies, nurses require knowledge and skills pertaining to disasters in addition to attitude of disaster preparedness[11]. Nevertheless, several studies showed a lack of disaster training in nursing curricula[12,13].

Despite emphasizing the crucial role of nurses in disasters, few research studies were performed to analyze the nurse's preparedness in critical incidents in North America.

From the available published literature, it is believed that nurses in most U.S states are largely unprepared to face a major disaster[14]. However, to our knowledge, no Canadian studies have been performed to assess Canadian nursing preparedness in critical incidents.

The aim of this study is to assess the disaster preparedness of nurses working in McGill University Health Centre (MUHC) which is a major healthcare network in Montreal (Quebec ,Canada).

The study also assesses degree of comfort in performing essential nursing activities during critical incidents in addition to more specialized activities that can be shifted to them during these unexpected events.

Methodology

Study design

Our study is an observational cross-sectional survey through self-administered web-based questionnaires constructed with a secure and encrypted platform LimeSurvey (v3). The questionnaire was developed based on previously published surveys in addition to feedback from trauma surgeons , nurse clinicians and nurse educators experienced in the field of trauma and critical care. The aim of this study is to assess the nurses' experience, self-perceived preparedness and formal training in trauma and critical incidents.

The study was approved by McGill faculty of medicine Institutional Review Board (IRB Review Number: A04-E25-20B (20-04-050))

Survey content

The survey was developed in French and English and divided in three sections. In the first section, general demographic, respondents were asked to provide basic demographic and employment information. The second section included a variety of nursing activities (23 activities) that are usually performed during critical situations and respondents were asked to rate each activity based on their level of self-perceived preparedness. The rating was done using a five-point Likert scale with the responses "Not at all prepared (1 point) " , "Not prepared (2 points)" , "Neutral (3 points)" , "Prepared (4 points) " , "Very well prepared (5 points)". In the third section, education, respondents were asked to indicate any formal training they received in trauma and critical care in addition to participation in past simulations/ real experience of disaster relief such as mass casualties.

Nursing preparedness score (NPS)

A nurse preparedness score (NPS) was developed using the second section of the survey and the items included in the self-perceived level of preparedness. All 23 items included in this section represent essential trauma and critical care skills outlined in the Basic Life Support (BLS) course, the American Trauma Life Support (ATLS) course, and based on the practical experience of our survey reviewers. The maximum score possible was 108 if all items were rated at 5 on the Likert scale. The lowest score possible was 23 if all items were rated at 1.

Two categories of respondents were determined based on the NPS: high level of preparedness if the score was equal or above the median and low level of preparedness if the score was below the median.

Survey dissemination

Between October 2020 and April 2021, inclusively, the questionnaire was sent to Head Nurses (HNs) and Assistant Head Nurses (AHNs) working in the Emergency Department, Adult/ pediatric Intensive Care Unit, and Cardiac Care Unit at five hospitals affiliated with McGill University (Royal Victoria Hospital, Montreal General Hospital, Montreal Children's Hospital , Jewish General Hospital , St.Mary's Hospital) as they were more likely to care for critically ill patients. The questionnaire was then disseminated to all nurses working at those departments by HNs and AHNs. We used LimeSurvey software to generate a link to the questionnaire. Afterward ,the link was sent to nurses in an invitation email to participate in the survey. Participants were clearly informed that their participation is completely anonymous and voluntary. Responding to the questionnaire was considered as consent to participate in the study.

Endpoints and covariates

The primary endpoint of this study is the level of preparedness (high or low) based on the NPS. General demographics, experience in resuscitation, number of years of experience in nursing, the number of formal training in trauma care, participation in a mass casualty simulation, and the knowledge of institution-specific protocols were included as covariates.

Statistical analysis

Baseline demographics were presented. Univariate analysis and logistic regression analysis were performed to identify variables associated with a higher level of preparedness. All statistical analyses were

performed using Stata 16.1 (Stata Corp LLC, TX, USA). All p-values were two-sided, and the significance threshold was set at p=0.05

Results

A total of 145 nurses completed the online survey. The general demographics are presented in **Table 1**. The majority of them were women (n=123, 84.8%), between 31- 40 years of age (n=49 , 33.8%), nurse clinicians (n=86, 60.6%), and working in the emergency department (n=112, 77.8%). Almost an equal number of participants had below (n=78, 53.7%) or above (n=67, 42.2%) 10 years of experience in nursing. With regards to experience in the critical care setting, the majority had between 1-10 years of experience (n=82, 56.6%) and 11-20 years (n=42, 29.0%). Almost all nurses in the study (n=134, 92.4%) have participated in the obligatory continuing education activities according to their professional order. Only 51 participants (35.2%) had previously participated in a code orange (external disaster) simulation and among those, only (n=16, 31.4%) had participated in one in the last 2 years. The trauma or critical care courses that were most commonly completed are Basic Life Support (BLS) (n=135), Advanced Life Support (ALS) (n=90), and The Canadian Triage & Acuity Scale (CTAS) (n=36). Of note, only 11 nurses have completed the Pediatric Advanced Life Support (PALS) course **Figure 1**. Most nurses have completed two courses (n=64, 44.1%) while only (n=35, 24.1%) have completed 1 course and (n=46, 31.7%) have completed 3 or more courses.

The mean Likert scale score of each nursing activity in critical care settings is shown in **Table 2**. Starting blood transfusion (M=4.81, SD = +/- 0.40), wound cleaning (M=4.65 , SD = +/- 0.61) , and determining the Glasgow Coma Scale (M=4.58 ,SD = +/- 0.57) were the three skills most highly rated by participating nurses. Inversely, needle thoracostomy, interpretation of a Focused Assessment with Sonography for Trauma (FAST), and wound suturing were the three skills for which nurses feel less prepared to perform.

The median NPS score of the responders was 77 with a minimum of 38 and a maximum of 108. In total, 76 nurses were included in the low-level preparedness group as their NPS score was below the median score of the entire group and 69 nurses were included in the high level of preparedness group. Age, sex, experience in resuscitation settings, number of years of experience in nursing, number of experiences in critical care, participation in a code orange simulation, active role in such simulation, knowledge of hospital protocols during code orange, participation in real-life code orange, and completion of trauma courses were significantly associated with a higher level of preparedness **Table 3**.

Variables found to be significant in the univariate analysis were included in the multiple logistic regression. Having over 10 years of experience in critical care setting (OR 5.37, $p < 0.05$) and having completed two (OR 3.75, $p = 0.03$) or three or more (OR 4.60, $p = 0.03$) courses in trauma/ critical care were significantly associated with a higher level of preparedness.

Discussion

There is an increasing trend in disaster incidences happening worldwide, whether natural or man-made. As per the Ecological Threat Register, the world had witnessed a tenfold increase in number of natural disasters since 1960s[15].
Nurses play a vital role in responding to these critical events acting as a front-line health care professional.

Our study assessed the comfort level of nurses in performing nursing activities that are usually performed in critical situations. Many of these activities are usually taught in (BLS) and (ALS). This study also assessed training in critical incidents and disaster preparedness.

Several surveys conducted specifically in Asia found a lack in both skills and knowledge in (BLS) /(ALS) among nurses[16-18]. Among nurses in our study, 77/145 had a low NPS comparing to 69/145 who had a high NPS. Therefore, we can conclude that our nurses' preparedness in (BLS) /(ALS) is low.

Disasters cannot be predicted or controlled, thus far, knowledge and training (i.e., executing disaster drills) are considered the most practical method to enhance disaster preparedness.

Although designing and implementing disaster drills are time and resource consuming[19], they are considered the cornerstone for disaster preparedness.

Disaster drills provide information on what works and what does not work in a disaster situation. They allow assessing the performance and refining of procedures[20,21]. Therefore, periodic disaster drills are strongly recommended.

In 2011, Gomez et al. found that less than half of trauma centers in Canada had conducted a disaster drill[7]. A trauma center in Australia also showed that only 38% of survey respondents had participated in a disaster drill[6]. These findings are consistent with our study, as only 35.2% of nurses participated in a code orange simulation.

On the individual level, nurses are also believed not to be prepared for disasters[7,12]. It is no surprise as the majority of nursing curricula lacks knowledge and training on disasters[12,13]. This is congruent with our findings, as only 49.6% of participants knew what was their specific role in a disaster simulation and only 44.8% knew where to find their department's code orange plan.

It is also worth mentioning that even trauma and critical care teaching scenarios performed in level-1 trauma centers are usually small and more focused on resident physicians rather than nursing staff. This probably leaves nurses not fully engaged in a situation where teamwork is the cornerstone of disaster preparedness.

With regards to our NPS, we found that having worked over 10 years in critical care settings and having completed two or more critical care courses were associated with higher level of preparedness.

On the other hand, what we expect to have a negative impact on nursing preparedness is the recent cancellation of critical care/trauma nursing courses secondary to the COVID-19 pandemic in the last 2 years.

It was understandable that activities scored the lowest by nurses in our study were more specialized activities (i.e., wound suturing and debridement, interpreting a FAST etc.) and are usually done by physicians and surgeons. This was expected as nurses are not trained to do such specialized activities. However, during critical incidents, studies have shown that nurses perform activities that are usually done by more specialized health care professionals. For example, Chinese nurses during earthquakes provided surgical care for victims like wound debridement, suturing, fracture fixation[22,23].

"Surgical Task Shifting (STS) "implies the delegation of certain surgical responsibilities to health care workers like Nurses or Non-Physicians Clinicians (NPS). STS has been taking place in many Low- Middle Income Countries (LMICs) whether in the elective or emergent clinical settings[24-26].

In Quebec, Canada, the "Ordre des infirmières et infirmiers du Québec (OIIQ)" regulates nurses' activities and their scope of practice.

As part of OIIQ regulations, a Collective Prescription (CP) is given by a physician or a group of physicians to a nurse or group of nurses which allows them to engage in certain medical activities and act on their own without seeing a physician first [27]. So we can argue that there is some sort of task shifting to nurses in Quebec.

This kind of task shifting is more pronounced in the austere environment of Northern Quebec (also called: Le Grand Nord), where there is a severe shortage in physicians, and it is very common to encounter places where nurses are the sole health care providers.

Future studies should assess specific tasks that can be shifted to nurses during disasters as the resulting effect of these situations can overwhelm any medical facility regardless of the number of nursing and medical staff available.

Although Canada might not be a prime target for terrorism, The Canadian Disaster Database suggests that an all-hazards plan should be available to deal with any kind of disasters, whether natural or terrorism related[28]. Nurses will be the frontline Health Care Workers to deal with such events. This highlights the need to include disaster preparedness in nursing curricula, implementing disaster drills more frequently, and engage nurses more in the hospitals' disasters response policies.

Limitations

One of the study's limitations was the small sample size which may have statistically underpowered the results. Moreover, despite that majority of the questionnaire's contents have been validated in previous nursing surveys, the fact that NPS is based on self-perceived preparedness makes it subjective. Another limitation is that majority of respondents were working

in the ED n=112 (77.8%) and their preparedness might not be representative of nurses working in other critical environments like the ICU. This may preclude the generalizability of this study's findings.

Conclusion

Nurses play an essential role in critical incidents and disaster relief. . This study showed lack of nursing preparedness in (BLS) /(ALS) activities and disaster response. Completing critical care courses and participating in disaster drills were findings associated with higher nursing preparedness. Nurses should actively seek to participate in such courses and mock drills. Administrators should encourage and support disaster preparedness in nursing curricula to enhance hospital readiness in responding to these critical events.

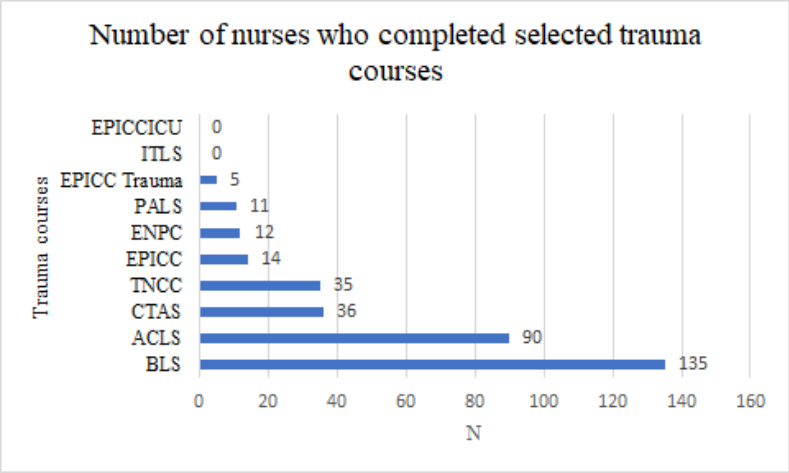
Tables and figures

Table 1. General demographics of the study population

		N (%)
Age	20-30 years	46 (31.7%)
	31-40 years	49 (33.8%)
	41-50 years	35 (24.1%)
	51-60 years	14 (9.7%)
	> 60 years	1 (0.7%)
Gender	Female	123 (84.8%)
	Male	22 (15.2%)
Title	Nurse	40 (28.2%)
	Nurse Clinician	86 (60.6%)
	Advanced Practice Nurse	2 (1.4%)
	Assistant Nurse Manager	9 (6.3%)
	Nursing Practice Development	5 (3.5%)
Department	Adult Intensive Care Unit	15 (10.4%)
	Coronary care unit	17 (11.8%)
	Emergency Department	112 (77.8%)
Years of experience in nursing	< 1 year	5 (3.4%)
	1-10 years	73 (50.3%)
	11-20 years	42 (29.0%)
	21-30 years	18 (12.4%)
	>30 years	7 (4.8%)

Years of experience in critical care setting	< 1 year	8 (5.5%)
	1-10 years	82 (56.6%)
	11- 20 years	40 (27.6%)
	21-30 years	11 (7.6%)
	>30 years	4 (2.8%)
Mandatory educational requirements	No	11 (7.6%)
	Yes	134 (92.4%)
Participation in a real code orange	No	114 (78.6%)
	Yes	31 (21.4%)
Participation in a code orange simulation	No	94 (64.8%)
	Yes	51 (35.2%)
Last code orange simulation	>2 years	31 (66%)
	1 year - 2 years	16 (34%)
Knowledge of roles and responsibilities during code orange	No	72 (49.7%)
	Yes	73 (50.3%)
Knowledge of institutional protocol	No	65 (44.8%)
	Yes	80 (55.2%)
N of critical care courses completed	1 course	35 (24.1%)
	2 courses	64 (44.1%)
	3 or more courses	46 (31.7%)

Figure 1. Number of nurses who completed selected trauma courses



Emergency ,Practice, Interventions and Care (Intensive Care Unit) (EPICC-ICU)
International Trauma Life Support (ITLS)
Emergency ,Practice, Interventions and Care (Trauma) (EPICC-Trauma)
Pediatric Advanced Life Support (PALS)
Emergency Nursing Pediatric Course (ENPC)

Emergency ,Practice, Interventions and Care – Canada (EPICC)
Trauma Nursing Core Course (TNCC)
The Canadian Triage & Acuity Scale (CTAS)
Advanced Cardiovascular Life Support (ACLS)
Basic Life Support (BLS)

Table 2. Mean level of self-reported preparedness for each nursing activity in critical settings

Trauma skills	**N**	**Mean**	**SD**	**Median**
Needle Thoracostomy	145	1.48	0.88	1
FAST interpretation	145	1.57	0.71	1
Wound suturing	145	1.79	0.93	2
Interpreting Abdominal x rays	145	1.81	0.84	2
Inserting a King LT Laryngeal	145	1.88	0.95	2
Interpreting Chest x-rays	145	2.30	1.01	2
Ensuring IO access	145	2.91	1.29	3
Wound debridement	145	3.13	1.17	3
Preparing a Hotline Fluid Warmer	145	3.28	1.39	4
Setting a Level 1 Rapid Infuser	145	3.28	1.39	4
Insertion an OPA	145	3.51	1.20	4
Triaging patients	145	3.54	1.50	4
Inserting an NPA	145	3.64	1.19	4
Jaw Thrust Maneuver	145	3.74	1.10	4
Recognizing Tetanus indications	145	3.77	1.33	4
Chin lift maneuver	145	4.05	0.89	4

Using an AED	145	4.20	0.91	4
Ambu Mask Ventilation	145	4.21	0.85	4
Evaluating airway	145	4.34	0.63	4
Performing CPR	145	4.48	0.67	5
Evaluating GCS	145	4.58	0.57	5
Wound cleaning	145	4.65	0.61	5
Starting a blood transfusion	145	4.81	0.40	5

FAST: Focused assessment with sonography for trauma
IO: Intraosseous
OPA: Oropharyngeal airway
NPA: Nasopharyngeal airway
AED: Advanced Electronic Device
CPR: Cardiopulmonary resuscitation
GCS: Glasgow Coma Scale

Table 3. Univariate analysis of factors associated with a high level of preparedness.

		Low level of preparedness	**High level of preparedness**	**p-value**
	N	76	69	
Age	20-30 years	36 (47%)	10 (14%)	**<0.001**
	31-40 years	25 (33%)	24 (35%)	
	41-50 years	10 (13%)	25 (36%)	
	51-60 years	5 (7%)	9 (13%)	
	> 60 years	0 (0%)	1 (1%)	
Sex	Female	70 (92%)	53 (77%)	**0.01**
	Male	6 (8%)	16 (23%)	
Title	Nurse	23 (31%)	17 (25%)	0.18
	Nurse Clinician	47 (64%)	39 (57%)	
	Advanced Practice Nurse	0 (0%)	2 (3%)	
	Assistant Nurse Manager	3 (4%)	6 (9%)	
	Nursing Practice Development	1 (1%)	4 (6%)	
Department	Adult Intensive Care Unit	9 (12%)	6 (9%)	0.21
	Coronary care unit	12 (16%)	5 (7%)	
	Emergency Department	55 (72%)	57 (84%)	
Experience in resuscitation setting	No	43 (57%)	14 (20%)	**<0.001**
	Yes	33 (43%)	55 (80%)	
Years of experience in nursing	< 1 year	5 (7%)	0 (0%)	**<0.001**
	1-10 years	49 (64%)	24 (35%)	
	11-20 years	15 (20%)	27 (39%)	
	21-30 years	5 (7%)	13 (19%)	
	>30 years	2 (3%)	5 (7%)	

Years of experience in critical care setting	< 1 year	8 (11%)	0 (0%)	**<0.001**
	1-10 years	53 (70%)	29 (42%)	
	11-20 years	12 (16%)	28 (41%)	
	21-30 years	2 (3%)	9 (13%)	
	>30 years	1 (1%)	3 (4%)	
Mandatory educational requirements	No	5 (7%)	6 (9%)	0.63
	Yes	71 (93%)	63 (91%)	
Participation in a code orange simulation	No	61 (80%)	33 (48%)	**<0.001**
	Yes	15 (20%)	36 (52%)	
Time of last orange simulation	>2 years	5 (42%)	26 (74%)	**0.04**
	1 year - 2 years	7 (58%)	9 (26%)	
Knowledge of roles and responsibilities during code orange	No	49 (64%)	23 (33%)	**<0.001**
	Yes	27 (36%)	46 (67%)	
Knowledge of institutional protocol	No	43 (57%)	22 (32%)	**0.003**
	Yes	33 (43%)	47 (68%)	
Participation in a real code orange	No	68 (89%)	46 (67%)	**<0.001**
	Yes	8 (11%)	23 (33%)	
Number of critical care courses completed	1 course	30 (39%)	5 (7%)	**<0.001**
	2 courses	35 (46%)	29 (42%)	
	3 or more courses	11 (14%)	35 (51%)	

Table 4. Logistic regression of the factors associated with a high level of preparedness.

		Odds ratio	**SD**	**P-value**
Age	31-40 years	2.349	1.367	0.14
	41-50 years	2.852	2.588	0.25
	51-60 years	1.208	1.284	0.86
	> 60 years	1	(empty)	
Sex	Male	2.726129	1.666331	0.10
Experience in resuscitation setting	Yes	2.395272	1.275213	0.10
Years of experience in nursing	> 10 years	0.448649	0.382111	0.35
Years of experience in critical care setting	> 10 years	5.37413	4.649666	0.05
Number of critical care courses completed	2 courses	3.752844	2.259057	0.03
	3 or more courses	4.595929	3.272953	0.03
Participation in a code orange simulation	Yes	1.82561	0.951736	0.25
Number of completed critical care courses	2 courses	3.752844	2.259057	0.03
	3 or more courses	4.595929	3.272953	0.03

List of abbreviation

McGill University Health Centre (MUHC)
Nursing Preparedness Score (NPS)
Head Nurses (HNs)
Assistant Head Nurses(AHNs)
Emergency ,Practice, Interventions and Care (Intensive Care Unit) (EPICC-ICU)
International Trauma Life Support (ITLS)
Emergency ,Practice, Interventions and Care (Trauma) (EPICC-Trauma)
Pediatric Advanced Life Support (PALS)
Emergency Nursing Pediatric Course (ENPC)
Emergency ,Practice, Interventions and Care – Canada (EPICC)
Trauma Nursing Core Course (TNCC)
The Canadian Triage & Acuity Scale (CTAS)
Advanced Cardiovascular Life Support (ACLS)
Basic Life Support (BLS)
FAST (Focused assessment with sonography for trauma)
IO (Intraosseous)
OPA (Oropharyngeal airway)
NPA (Nasopharyngeal airway)
AED (Advanced Electronic Device)
CPR (Cardiopulmonary resuscitation)
GCS (Glasgow Coma Scale)

References

1. Al Khalaileh MA, Bond E, Alasad J. Jordanian nurses' perceptions of their preparedness for disaster management. *Int Emerg Nurs.* 2012;20(1):14-23.

2. Hodge AJ, Miller EL, Skaggs MKD. Nursing self-perceptions of emergency preparedness at a rural hospital. *J Emerg Nurs.* 2017;43(1):10-14.

3. Park H-Y, Kim J-S. Factors influencing disaster nursing core competencies of emergency nurses. *Appl Nurs Res.* 2017;37:1-5.

4. Veenema TG. *Disaster nursing and emergency preparedness.* Springer Publishing Company; 2018.

5. *Natural disasters 2018*. https://www.cred.be/natural-disasters-2018 2018.

6. Corrigan E, Samrasinghe I. Disaster preparedness in an Australian urban trauma center: staff knowledge and perceptions. *Prehosp Disaster Med*. 2012;27(5):432-438.

7. Gomez D, Haas B, Ahmed N, Tien H, Nathens A. Disaster preparedness of Canadian trauma centres: the perspective of medical directors of trauma. *Can J Surg.* 2011;54(1):9.

8. Lewis AM, Sordo S, Weireter LJ, et al. Mass casualty incident management preparedness: a survey of the American College of Surgeons Committee on Trauma. *Am Surg.* 2016;82(12):1227-1231.

9. Fung OW, Loke AY, Lai CK. Disaster preparedness among Hong Kong nurses. *J Adv Nurs.* 2008;62(6):698-703.

10. Yamamoto A. Development of disaster nursing in Japan, and trends of disaster nursing in the world. *Jpn J Nurs Sci.* 2013;10(2):162-169.

11. Ibrahim FAA. Nurses knowledge, attitudes, practices and familiarity regarding disaster and emergency preparedness–Saudi Arabia. *Am J Nurs.* 2014;3(2):18-25.

12. Littleton-Kearney MT, Slepski LA. Directions for disaster nursing education in the United States. *Crit Care Nurs Clin North Am.* 2008;20(1):103-109.

13. Weiner E, Irwin M, Trangenstein P, Gordon J. Emergency preparedness curriculum in nursing schools in the United States. *Nurs Educ Perspect.* 2005;26(6):334-339.

14. Pfrimmer D, Twedell D. Duty to care. *Journal of Continuing Education in Nursing.* 2009;40(2):53-54.

15. *Echological Threat Register*. https://ecologicalthreatregister.org/ 2020.

16. Nambiar M, Nedungalaparambil NM, Aslesh. Is current training in basic and advanced cardiac life support (BLS & ACLS) effective? A study of BLS & ACLS knowledge amongst healthcare professionals of North-Kerala.*WJEM.* 2016;7(4):263.

17. Roshana S, Batajoo K, Piryani R, Sharma. Basic life support: knowledge and attitude of medical/paramedical professionals.*WJEM.* 2012;3(2):141.

18. Xanthos T, Akrivopoulou A, Pantazopoulos I, Aroni F, Datsis A, Iacovidou. Evaluation of nurses' theoretical knowledge in Basic Life Support: A study in a district Greek hospital. *Int Emerg nursing.* 2012;20(1):28-32.

19. Hsu EB, Jenckes MW, Catlett CL, et al. Effectiveness of hospital staff mass-casualty incident training methods: a systematic literature review. *Prehosp Disaster Med.* 2004;19(3):191-199.

20. Briggs SM. Disaster preparedness and response. In: *Surgery during natural disasters, combat, terrorist attacks, and crisis situations.* Springer; 2016:7-18.

21. Skryabina E, Reedy G, Amlot R, Jaye P, Riley P. What is the value of health emergency preparedness exercises? A scoping review study. *Int J Disaster Risk Reduct.* 2017;21:274-283.

22. Yan Y, Turale S, Stone T, Petrini M. Disaster nursing skills, knowledge and attitudes required in earthquake relief: Implications for nursing education. *Int Nurs Rev.* 2015;62(3):351-359.

23. Yin H, He H, Arbon P, Zhu J. A survey of the practice of nurses' skills in Wenchuan earthquake disaster sites: implications for disaster training. *J Adv Nurs.* 2011;67(10):2231-2238.

24. Beard JH, Oresanya LB, Akoko L, Mwanga A, Mkony CA, Dicker R. Surgical task-shifting in a low-resource setting: outcomes after major surgery performed by nonphysician clinicians in Tanzania. *World J Surg.*2014;38(6):1398-1404.

25. Falk R, Taylor R, Kornelsen J, Virk R. Surgical task-sharing to non-specialist physicians in low-resource settings globally: a systematic review of the literature. *World J Surg.*2020;44(5):1368-1386.

26. Hoyler M, Hagander L, Gillies R, et al. Surgical care by non-surgeons in low-income and middle-income countries: a systematic review. *The Lancet* 2015;385:S42.

27. OIIQ: Ordre des infirmières et infirmiers du Québec & Collège des médecins du Québec http://www.cmq.org/publications-pdf/p-1-2016-10-03-en-ordonnances-individuelles-faites-par-un-medecin.pdf.2016

28. *The Canadian Disaster Database*.https://www.publicsafety.gc.ca/cnt/rsrcs/cndn-dsstr-dtbs/index-en.aspx.2007.

Appendices

(Questionnaire English Version)

Evaluating nurses' preparedness and training in managing critical incidences and disaster relief : A survey in Quebec.

Dear Sir / Madame,

We invite you to participate in this research project that aims to evaluate:

1) Your preparedness level in managing critical incidences.
2) Your training in response to critical incidences

-The expected time to answer this survey is **5-10 minutes.**

-Please note that your participation is essential for ameliorating our response to urgent situations.

-Your participation is **strictly anonymous**, and the data collected from this survey will be used in a **completely confidential** manner.

-The results will be presented in a scientific publication and a graduation thesis.

-We would like to thank you for taking the time to answer this questionnaire.

If you would like more information about this project, please don't hesitate to communicate with us via the contact information bellow:

Shafic Abdulkarim , MD

General Surgery Resident (PGY-1)
Global Surgery Master's candidate
McGill University Health Centre
Shafic.abdulkarim@mail.mcgill.ca
Tel : 438 520 2445

Natasha Dupuis RN , MSc. (A)

Nurse in Advanced Clinical Practice -Emergency
McGill University Health Centre
Nataha.dupuis@muhc.mcgill.ca
Tel: 514 934 1934 ext. 42464

For section 1, please choose the response (s) that **best suits your situation**

1.Demographic Information:

How old are you?

☐ 20-25 years ☐ 26-30 years ☐ 31-35 years ☐ 36-40 years
☐ 41-45 years ☐ 46-50 years ☐ 51-55 years ☐ 56-60 years ☐ > 60 years

Sex :

☐ Man ☐ Woman

What is your title?

☐ Licensed Practical Nurse (LPN)
☐ Nurse
☐ Nurse Clinician
☐ Advanced Practice Nurse
☐ Assistant Nurse Manager
☐ Nursing Practice Development Educator

☐ other title(s) : _____

In which hospital (s) have you worked? *(please choose all that apply)*

☐ Montreal General Hospital
☐ Royal Victoria Hospital (Glen Site)
☐ Montreal Children's Hospital (Glen Site)
☐ St. Mary's Hospital
☐ Jewish General Hospital.

☐ Other Hospital(s) : _____

In which department do you currently work? *(please choose all that apply)*

☐ Emergency Department
☐ Adult Intensive Care Unit
☐ Coronary Care Unit
☐ Pediatric Intensive Care Unit

☐ Other departments : _____

Have you worked in an Emergency Department Resuscitation Room?

☐ Yes ☐ No

How many years of experience do you have as a nurse?

☐ < 1year
☐ 1-5 years
☐ 6-10 years
☐ 11-20 years
☐ 21-30 years
☐ >30 years

How many years have you been working in a critical care setting?

☐ < 1year
☐ 1-5 years
☐ 6-10 years
☐ 11-20 years
☐ 21-30 years
☐ >30 years

Have you worked in the **Northern Quebec Area** (eg: Nunavik , Chisasibi)?
☐ Yes ☐No

If yes, please indicate in which setting you have worked in the **Northern Quebec Area**?
☐ Hospital ☐ Nursing station ☐ Both

How many years of working experience do you have in the **Northern Quebec Area**?

☐ < 1year
☐ 1-5 years
☐ 6-10 years
☐ 11-20 years
☐ 21-30 years
☐ >30 years

For sections 2, 3 ,4 and 5 please **encircle your comfort level** in performing the following clinical activities:

*(For activities out of your scope of practice, presume that a **Collective Order** is **available** to perform the activity)*

2 .Activities in Urgent Situations

❖ Airway & Breathing

	Not at all prepared	Not prepared	Neutral	prepared	Very well prepared
Evaluating the Upper Airway (Ventilation and Oxygenation)	0	1	2	3	4
Chin lift maneuver	0	1	2	3	4
Jaw thrust maneuver	0	1	2	3	4

Inserting a Nasopharyngeal Airway (NPA)	0	1	2	3	4
Inserting an Oropharyngeal Airway (OPA)	0	1	2	3	4
Using a Bag Valve Mask (Ambu Bag)	0	1	2	3	4
Inserting a King LT (Laryngeal Tube)	0	1	2	3	4
Needle Thoracostomy	0	1	2	3	4
❖ **Circulation**					
Cardio-pulmonary resuscitation	0	1	2	3	4
Using an Automated External Defibrillator (AED)	0	1	2	3	4
Intraosseous access	0	1	2	3	4
Transfusing blood	0	1	2	3	4
Administering fluids through a Hotline Fluid Warmer	0	1	2	3	4
Administering fluids through a Level 1 Rapid Infuser	0	1	2	3	4

3.Radiographic imaging interpretation in emergency situations					
	Not at all prepared	Not prepared	Neutral	prepared	Very well prepared
Interpreting Chest X-rays (eg; Pneumothorax, Hemothorax)	0	1	2	3	4
Interpreting Abdominal X-rays	0	1	2	3	4

interpreting an Abdominal Ultrasound (FAST)	0	1	2	3	4

4.Managing superficial wounds					
	Not at all prepared	Not prepared	Neutral	prepared	Very well prepared
Wound cleaning	0	1	2	3	4
Wound debridement	0	1	2	3	4
Wound suturing	0	1	2	3	4
Deciding when tetanus vaccination is necessary	0	1	2	3	4

5.Other activities					
	Not at all prepared	Not prepared	Neutral	prepared	Very well prepared
Triaging patients	0	1	2	3	4
Evaluating the neurological status through a Galsgow Coma Scale (GCS)	0	1	2	3	4

For sections 6, 7 and 8, please choose **the best response (s)** that suits your situation.

6.Continuing Education

Have you participated in the obligatory continuing education activities according to your professional order (20 hours / year for Nurses)

☐ Yes ☐No

7.Specific training

Please choose the course(s) that you have taken in the past

☐ Basic Life Support (BLS)
☐ Advanced Cardiovascular Life Support (ACLS)
☐ Trauma Nursing Core Course (TNCC)
☐ Emergency Nursing Pediatric Course (ENPC)
☐ The Canadian Triage & Acuity Scale (CTAS)
☐ Emergency ,Practice, Interventions and Care – Canada (EPICC)
☐ EPICC-Trauma
☐ EPICC-ICU
☐ International Trauma Life Support (ITLS)
☐ Pediatric Advanced Life Support (PALS)
☐ Course in Advanced Trauma Nursing (CATN)

8.Training in External Disasters

Have you participated in a Code Orange simulation? ☐ Yes ☐ No	**<u>If yes</u>,** when was the last time since you have participated in such a simulation: ☐ < 1 year ☐ 1-2 year(s) ☐ > 2 years
Do you know what is your role in a Code Orange scenario? ☐ Yes ☐ No	
Do you know where to find your department's Code Orange plan? ☐ Yes ☐ No	
Have you participated in a real-life Code Orange (not a simulation)? ☐ Yes ☐ No	

Thank you for your time

Questionnaire (version française)

Évaluer la préparation et la formation des infirmières à la gestion des événements critiques

Madame/Monsieur,

-Nous sollicitons votre participation dans un projet de recherche, qui a comme objectifs d'évaluer :

1) votre niveau de confort dans la gestion des incidents critiques et
2) la formation que vous avez reçue dans le passé.

-Nous vous invitons à répondre à un sondage d'une durée d'environ **5-10 minutes**.

-Veuillez-noter que votre participation est essentielle afin d'améliorer notre réponse aux situations d'urgences.

-Votre participation est **strictement anonyme**, et les données recueillies par cette étude seront traitées de manière **entièrement confidentielle.**

-Les résultats seront présentés dans un article scientifique et une thèse.

-Nous vous remercions à l'avance de prendre le temps d'y répondre.

Si vous avez des questions concernant ce projet de recherche, n'hésitez pas à communiquer avec nous aux coordonnées indiquées ci-dessous :

Shafic Abdulkarim , MD

(PGY-1) Chirurgie Générale
Etudiant à la Maitrise en Chirurgie Mondiale
Centre Universitaire de Santé McGill
Shafic.abdulkarim@mail.mcgill.ca
Tel : 438 520 2445

Natasha Dupuis RN , MSc. (A)

Infirmière clinicienne en pratique avancée-Urgence
Centre Universitaire de Santé McGill
Nataha.dupuis@muhc.mcgill.ca
Tel: 514 934 1934 ext. 42464

Dans Section 1 , sauf si indications contraires, veuillez cocher la réponse qui s'applique **le mieux à votre situation** parmi les choix suivants :

1.Information démographique

Quel âge avez-vous?

☐ 20-25 ans ☐ 26-30 ans ☐ 31-35 ans ☐ 36-40 ans
☐ 41-45 ans ☐ 46-50 ans ☐ 51-55 ans ☐ 56-60 ans ☐ > 60 ans

Sexe :
☐ Homme ☐Femme

Quel est votre titre d'emploi?

☐ Infirmier(ère) auxiliaire (Licensed Practical Nurse)
☐ Infirmier(ère) (Nurse)
☐ Infirmier(ère) clinicien(ne) (Nurse Clinician)
☐ Infirmier(ère) clinicienne en pratique avancée (Advanced Practice Nurse)
☐ Assistante Infirmier(ère) Chef (Assistant Nurse Manager)
☐ Infirmier(ère) Educatrice (Nursing Practice Development Educator)

☐ Autre Catégorie : _____

Dans quel hôpital (aux)avez-vous travaillé ? *(veuillez cocher tout ce qui s'applique)*

☐ Hôpital Général de Montréal
☐ Site Glen (Hôpital Royal Victoria)
☐ Site Glen (Hôpital de Montréal pour enfants)
☐ Centre Hospitalier de St. Mary
☐ Hôpital Général Juif

☐ Autre hôpital (aux) : _____

Où travaillez-vous présentement? *(veuillez cocher tout ce qui s'applique)*

☐ Département de l'urgence
☐ Unité des soins intensifs adulte
☐ Unité des soins coronariens
☐ Unité des soins intensifs pédiatrique

☐ Autres unités : _____

Avez-vous travaillé dans la salle de réanimation à l'urgence ?

☐ Oui ☐ Non

Combien d'années d'expérience avez-vous en tant qu'Infirmier(ère) ?

☐ < 1 an
☐ 1-5 ans
☐ 6-10 ans
☐ 11-20 ans
☐ 21-30 ans
☐ >30 ans

Depuis combien d'années travaillez-vous en soins critiques ?

☐ < 1 an
☐ 1-5 ans
☐ 6-10 ans
☐ 11-20 ans
☐ 21-30 ans
☐ >30 ans

Avez-vous travaillé dans **Le Grand Nord Québécois** (ex: Le Nunavik, Chisasibi)?
☐ Oui ☐Non

Si Oui, veuillez indiquer où vous avez travaillez dans cette/ces région(s)
☐ Hôpital (aux) ☐ Station(s) des infirmiers(ères) ☐Les deux

Combien d'années avez-vous travaillé dans cette/ces région(s) ?

☐ < 1 an
☐ 1-5 ans
☐ 6-10 ans
☐ 11-20 ans
☐ 21-30 ans
☐ >30 ans

Pour les sections 2, 3 et 4, veuillez encercler votre **niveau de confort** à effectuer les activités cliniques mentionnées :

*(Pour les activités hors de votre champ de pratique, présumez qu'une **ordonnance collective** est **disponible**.)*

2.Activités en cas d'urgence:

❖ Voies respiratoires & Ventilation					
	Pas du tout prêt	Pas prêt	Neutre	Prêt	Bien prêt
Évaluer les voies respiratoires supérieures (Ventilation et Oxygénation)	0	1	2	3	4
La manœuvre de poussée de menton (Chin Lift)	0	1	2	3	4
La manœuvre de poussée de mâchoire (Jaw thrust)	0	1	2	3	4
Insérer une canule Naso-pharyngées (NPA)	0	1	2	3	4
Insérer une canule Oro-pharyngées (OPA)	0	1	2	3	4
Utiliser un Ballon Autoremplisseur à Valve Unidirectionnelle (Ambu Bag)	0	1	2	3	4
Insérer un tube Laryngé King LT	0	1	2	3	4
La thoracostomie par aiguille	0	1	2	3	4
❖ Circulation					
Faire une Réanimation Cardiorespiratoire	0	1	2	3	4
Utiliser un défibrillateur externe automatisé	0	1	2	3	4

Installer un dispositif intra-osseux	0	1	2	3	4
Administrer une Transfusion Sanguine	0	1	2	3	4
Administrer des liquides avec Hotline Fluid Warmer	0	1	2	3	4
Administration des liquides avec Infusion rapide -Level 1	0	1	2	3	4

3.Interpréter les Radiographies en cas d'urgence					
	Pas du tout prêt	Pas prêt	Neutre	Prêt	Bien prêt
Interpréter une radiographie des poumons (ex: Pneumothorax, Hémothorax, etc.)	0	1	2	3	4
Interpréter une radiographie abdominale	0	1	2	3	4
Interpréter une Échographie Abdominale(FAST)	0	1	2	3	4

4.Plan de traitement relié aux plaies superficielles:					
	Pas du tout prêt	Pas prêt	Neutre	Prêt	Bien prêt
1. Nettoyage de la plaie	0	1	2	3	4
2. Débridement de la plaie	0	1	2	3	4
3. Faire des points de suture	0	1	2	3	4

4. Décider quand l'administration du Vaccine Tétanos est nécessaire	0	1	2	3	4

5.Autres activités					
Faire un triage des patients	0	1	2	3	4
Évaluer l'état Neurologique d'un patient avec l'Échelle de Glasgow	0	1	2	3	4

Pour les sections 5, 6 et 7, veuillez cocher **la réponse qui s'applique le mieux** à votre situation.

6.Formation Continue

Avez-vous participé à des activités de formation continue obligatoires selon votre ordre professionnel (20 heures/an pour les Infirmier(ère)s, 10 heures/an pour les Infirmières Auxiliaires) ?

☐ Oui ☐Non

7.Formations spécifiques

Veuillez choisir les cours que vous avez déjà faits

☐ Basic Life Support (BLS)

☐ Advanced Cardiovascular Life Support (ACLS)

☐ Trauma Nursing Core Course (TNCC)

☐ Emergency Nursing Pediatric Course (ENPC)

☐ The Canadian Triage & Acuity Scale (CTAS)

☐ Emergency ,Practice, Interventions and Care – Canada (EPICC)

☐ EPICC-Trauma

☐ EPICC-ICU

☐ International Trauma Life Support (ITLS)

☐ Pediatric Advanced Life Support (PALS)

☐ Course in Advanced Trauma Nursing (CATN)

8.Formations en Désastre Externe	
Avez-vous participé à une simulation de Code Orange ? ☐ Oui ☐ Non	**<u>Si oui</u>**, c'était quand la dernière fois que vous avez participé à une telle simulation : ☐ < 1 an ☐ 1 an-2ans ☐ > 2 ans
Connaissez-vous votre rôle dans un scenario de Code Orange? ☐ Oui ☐ Non	
Savez-vous où se trouve votre plan de Code Orange départemental ? ☐ Oui ☐ Non	
Avez-vous participé à un Code Orange en réalité (pas une simulation)? ☐ Oui ☐ Non	

Merci de votre temps

IRB approval form

McGill

Faculty of Medicine
3655 Promenade Sir William Osler #633
Montreal, QC, H3G 1Y6

Faculté de médecine
3655, promenade Sir William Osler #633
Montréal, QC H3G 1Y6

Fax/Télécopieur:
(514) 398-3870
Tél/Tel: (514) 398-3124

April 20, 2020

Dr. Tarek Razek
Department of Experimental Surgery
Montreal General Hospital
1650 Cedar Avenue
Montreal, Quebec H3G 1A4

RE: IRB Review Number: A04-E25-20B (20-04-050)

Evaluating nurses' preparedness and training in managing critical incidences: A survey in Quebec

Dear Dr. Razek,

Thank you for submitting the above-referenced study for an ethics review, on behalf of Shafic Abdulkarim.

As this study involves no more than minimal risk, and in accordance with Articles 2.9 and 6.12 of the 2nd Edition of the Canadian Tri-Council Policy Statement of Ethical Conduct for Research Involving Humans (TCPS 2 2018) and U.S. Title 45 CFR 46, Section 110 (b), paragraph (1), we are pleased to inform you that approval for the study (IRB dated April 13, 2020) was provided by an expedited/delegated review on 20-Apr-2020, valid until **19-Apr-2021**. The study proposal will be presented for corroborative approval at the next meeting of the Committee.

The Faculty of Medicine Institutional Review Board (IRB) is a registered University IRB working under the published guidelines of the Tri-Council Policy Statement 2, in compliance with the Plan d'action ministériel en éthique de la recherche et en intégrité scientifique (MSSS, 1998), and the Food and Drugs Act (17 June 2001); and acts in accordance with the U.S. Code of Federal Regulations that govern research on human subjects (**FWA 00004545**). The IRB working procedures are consistent with internationally accepted principles of good clinical practice.

The Principal Investigator is required to immediately notify the Institutional Review Board Office, via amendment or progress report, of:

- Any significant changes to the research project and the reason for that change, including an indication of ethical implications (if any);
- Serious Adverse Effects experienced by participants and the action taken to address those effects;
- Any other unforeseen events or unanticipated developments that merit notification;

- The inability of the Principal Investigator to continue in her/his role, or any other change in research personnel involved in the project;
- A delay of more than 12 months in the commencement of the research project, and;
- Termination or closure of the research project.

The Principal Investigator is required to submit an annual progress report (continuing review application) on the anniversary of the date of the initial approval (or see the date of expiration).

The Faculty of Medicine IRB may conduct an audit of the research project at any time.

If the research project involves multiple study sites, the Principal Investigator is required to report all IRB approvals and approved study documents to the appropriate Research Ethics Office (REO) or delegated authority for the participating study sites. Appropriate authorization from each study site must be obtained before the study recruitment and/or testing can begin at that site. Research funds linked to this research project may be withheld and/or the study data may be revoked if the Principal Investigator fails to comply with this requirement. A copy of the study site authorization should be submitted the IRB Office.

It is the Principal Investigator's responsibility to ensure that all researchers associated with this project are aware of the conditions of approval and which documents have been approved.

The McGill IRB wishes you and your colleagues every success in your research.

Sincerely,

Roberta Palmour, PhD
Chair
Institutional Review Board

cc: Shafic Abdulkarim
Dr. S. Baillet, Associate Dean, Research
A04-E25-20B (20-04-050)