

Original Article

Latin America intensive care unit disaster preparedness: Results from a web-based attitudes and perceptions survey

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ABSTRACT

Background: Disasters burden on hospital emergency intensive care units (ICUs). This burden is increased in Latin America (LATAM) where hospital resources, intrahospital disaster simulations, and perceived level of preparedness vary greatly among different communities. The objective of the study was to assess LATAM ICU leaders' knowledge and attitudes regarding disaster preparedness.

Methods: We developed a ten-item, web-based knowledge and attitude survey administered via LATAM ICU leaders online forums. Descriptive statistics were used. Epi Info™ software was used for analysis. Chi-square and Fisher's exact test with $P < 0.05$ were implemented for statistical significance, and odds ratio was used to measure the strength of association among variables.

Results: There were 68 respondents in the survey. 13/68 respondents felt prepared for disasters. 16/68 worked at hospitals with 250+ beds and 52/68 represented hospitals with <250 beds. 23/68 participated in hospital committees for disaster, 24/68 participated in simulations or drills, and 22/68 participated in trainings or courses for disasters. Feeling prepared for disasters did not correlate with hospital size (odds ratio [OR] = 2.87 [95% confidence interval (CI): 0.83–9.92], $P = 0.91$), participation in hospital committees for disaster (OR = 3.10 [95% CI: 1.02–9.26], $P = 0.08$), and participation in simulations or drills (OR = 2.78 [95% CI: 0.93–8.29], $P = 0.11$), but participation in disaster trainings and courses appeared to directly correlate with the perception of being prepared (OR = 3.43 [95% CI: 1.13–10.41], $P = 0.03$).

Conclusion: Among the 68 centers represented, the majority did not feel their institution to be adequately prepared for disasters, but training appeared to change that perception. A small sample size represents the major limitation of this study.

Key Words: Disaster, intensive care unit, Latin America

INTRODUCTION

In the face of pandemic, terrorism, and natural disaster, hospital emergency intensive care units (ICUs) capacity to efficiently allocate human resources affect their ability to care for multiple casualties. The concept of integrated or multidisciplinary critical care is a key to a nonpermissive disaster response. However, in many Latin America (LATAM) countries, ICUs are differentiated, where different ICU types have different functions in

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disaster, where likely in pandemic flu and its secondary respiratory failure the medical ICUs play a key role, whereas in earthquakes and terrorism violence trauma and surgical ICUs are the principal designated units. Previous literature reviews have examined preparedness of health professionals and support staff in natural disasters and terrorism of the United States; however, few have examined the response of health professionals in countries in the region of LATAM, where resources range from scant to abundant among and within different countries. In developing areas, hospital resources, intrahospital disaster simulations, and perceived levels of preparedness vary greatly among different communities. Even among well-developed countries with abundant training and simulations, perceived aptitude and realistic readiness may be disparagingly incongruent.

The Latin America and Caribbean Region (LACR) is home to some of largest natural hazards on the planet. Some of these hazards such as floods and droughts are widespread and common (684 floods in the region during the 20th century). Others, such as hurricanes, volcanic eruptions, and earthquakes, are restricted to certain regions, mainly the coasts, where many of the region's main cities sit precariously on threatened coasts and fault lines. One of these faults in Southern Chile produces megathrusts like the quake of 1960 with a magnitude of 9.5 on the moment magnitude scale, which accounted for 25% of the seismic energy released by all earthquakes during the entire 20th century.^[1]

The deadly trend of population growth in threatened cities and expansion into flood plains can only increase the loss of life in future disasters if governments, infrastructure, and the health system are unprepared. The World Bank Natural Disaster Hotspots Study found that the threat of this concentration of populations around natural disaster-prevalent zones is not insurmountable, but can be overcome by development, preparation, and risk management. This is shown by the fact that more than two-thirds of the Chilean population live in hazard-prone areas, but only 5.3% of its land area ranks high in mortality risk.^[2] Any of the countries within the LACR, including Belize, Dominica, and Saint Vincent and the Grenadines, are being proactive in their assessments of their preparedness for disaster response by evaluating hospitals with PAHO/WHO hospital safety index.^[3] LATAM and Caribbean governments have increased their efforts to prepare their population and infrastructure to manage disasters prevalent in their region; the objective of this study was to focus on and assess the knowledge and attitudes toward disaster preparedness of LATAM ICU leaders.

METHODS

Based on a focus group assessment, we developed a

ten-item, web-based knowledge, attitude, and practice survey administered via www.surveymonkey.com, and invitations were delivered via LATAM ICU leaders online forums; these forums included social media and personal messaging (WhatsApp) academic forums. Figures 1 and 2 give details on the survey specifics.

Descriptive statistics were used to present group characteristics. Descriptive statistics and confidence intervals (CIs) were used to present group characteristics. For categorical variables, Chi-square test and Fisher's exact test were used to assess associations; for these variables, the odds ratio was used as the measure of strength of association. Levene's test for equality of variances was used to assess homogeneity of variance for continuous variables, and the Student's *t*-test was used for the assessment of associations between these variables. For all tests, statistical significance was set at the 0.05 level. The StatCalc application of Epi Info™ software Version 7, 2018 (Atlanta, GA, USA, CDC) was used for statistical analysis.

The authors of this manuscript declare that this scientific work complies with reporting quality, formatting, and reproducibility guidelines set forth by the EQUATOR Network.^[4] The authors also attest that this clinical investigation was determined to be a minimal risk protocol under the Institutional Review Board/Ethics Committee Review, and the corresponding protocol/approval number is not applicable. The study does not require to have a Clinical Trial Registry.

RESULTS

The attitude and practice survey had 68 respondents. There were 68 respondents in the survey. Countries represented include Venezuela (2/68), Ecuador (6/68), USA (2/68), Costa Rica (8/68), Mexico (8/68), Guatemala (5/68), Panama (4/68), Nicaragua (1/68), Dominican Republic (7/68), Puerto Rico (2/68), Argentina (5/68), Columbia (3/68), El Salvador (2/68), Bolivia (1/68), Belize (1/68), and N/A (2/68).

Figure 1: English translation of survey items

Survey questions

1. What country are you from?
2. What type of ICU does your hospital have?
3. What is the size of your hospital?
4. Does your ICU have a committee for disaster preparedness?
5. What type of disaster simulations does your hospital participate in?
6. Does your ICU participate in disaster simulations offered at the hospital?
7. Do you consider your ICU prepared for disasters?
8. Have you participated in courses for disaster preparedness other than the ones offered by your hospital?
9. What barriers affect your preparation for disasters?
10. What type of disasters do you face is most frequently?

ICU: Intensive care unit

Encuesta UCI Latinoamericanas y Preparacion ante Desastres Externos

1. Pais (es) que representa/ donde labora

2. Tipo de UCI (puede escoger mas de una respuesta)

Medica

Quirurgica/ Trauma

Coronaria

Academica

Otra

3. Tamano de su hospital

<100 camas

100-250 camas

250-500 camas

> 500 camas

4. Participa la UCI de forma activa en el comite hospitalario para desastres?

SI

No

No existe un comite para desastres en mi institucion

5. Que tipos de simulacros para desastres hacen en su hospital (puede escoger mas de una respuesta)

Ejercicio de mesa (table-top)

Simulacro total (todo el hospital)- NO de mesa

Simulacro parcial (solo algunas unidades) NO de Mesa

Con aviso previo

Sin aviso previo

Otro

6. Participa la UCI de forma activa en los simulacros?

SI

No

Cuando fue el ultimo simulacro en el que participo?

7. Considera que su UCI (personal y equipo) esta preparada para desastres?

SI

No

Explique su respuesta

8. Ha participado usted y/o su personal de UCI en cursos/ entrenamientos para manejo de desastres?

SI

No

Cual curso?

9. Cuales barreras considera afectan su ideal preparacion ante desastres?

Personal

Espacio

Equipo

Capacitacion

Otra

10. Que tipo de desastres considera el principal reto para su UCI?

Huracan

Terremoto

Terrorismo (explosiones, tiroteos etc..)

Pandemia (Zika, SARS, H1N1 etc..)

Otro

Favor explicar

Done

Figure 2: Actual survey delivered (in Spanish)

Of 68 respondents, 19 (27.94%) felt prepared for disasters. When looking at specific hospital size, we found that 16/68 worked at hospitals with >250 beds and 52/68 represented hospitals with <250 beds. Practice and activities assessment found that 23/68 participated in hospital committees for disaster, 24/68 participated in simulations or drills, and 22/68 participated in trainings or courses for disasters.

When assessing perceptions of preparedness, feeling prepared for disasters did not correlate with hospital size (odds ratio [OR] = 2.87 [95% CI: 0.83–9.92], $P = 0.91$), participation in hospital committees for disaster (OR = 3.10 [95% CI: 1.02–9.26], $P = 0.08$), and participation in simulations or drills (OR = 2.78 [95% CI: 0.93–8.29], $P = 0.11$), but participation in disaster trainings and courses appeared to directly correlate with the perception of being prepared (OR = 3.43 [95% CI: 1.13–10.41], $P = 0.03$).

DISCUSSION

The web-based survey of LATAM ICU leaders' emergency attitudes and preparedness emphasizes the multifactorial nature of actual readiness in the face of disaster. Overwhelming majority of respondents revealed that regardless of hospital size, simulation practice, and access to hospital resources, the common sentiment was still one of unpreparedness, whereas education and participation in courses appeared to improve the readiness perception. While our study was limited by small sample size and a polling centered around ICU physicians and leaders, the results are still important with regard to LATAM being a region that stands to benefit largely from pinpointing high-yield areas of hospital operation whose efficacy may be maximized in the face of abundant natural disasters and a recent Zika pandemic. It is alarming that the majority of ICU leaders representing these countries feel unprepared when their role stands at the forefront of disaster relief. In addition, although our study comprised responses from 15 countries, response from individual countries was not uniform, thus possibly skewing results to be more representative of countries with a greater response rate. Studies with a larger sample size are needed to further elucidate and accurately depict the preparedness of health-care leaders in individual countries of LATAM.

Future studies should also address the different demographics of the health-care system that are responsible during an emergency in LATAM. A limitation of our study was that the survey did a focused polling of ICU leaders only, thus not considering the opinions of other hospital staff likely to respond during disaster. Unlike in the United States where health-care workers are stratified rigidly within defined roles that may only

be blurred in the chaos of disaster, in developing nations, this delineation of roles may be principally blurred out of necessity. As nursing professionals comprise the largest group of health-care workers worldwide, they play a key role in disaster relief.^[5] Nurses with experience in perioperative care, community, and public health backgrounds will most likely be the first responders in a massive casualty incident and should be specifically trained with disaster nursing specialty programs.^[6] If nurses comprise a large portion of the first wave of relief in LATAM countries in a national disaster, obtaining accounts of their perceived efficacy and competency in addition to actual percentage of nurses per unit population served will reveal a more accurate picture of disaster preparedness in those countries.

Furthermore, other studies need to elucidate on the role of simulations in emergency training and resulting efficacy measured by perceived competency and knowledge. There is contention that simulations of natural or provoked disasters may not be accurate representations of the actual event. In a simulation-based crisis management course for emergency medicine, Emergency Medicine Crisis Resource Management (EMCRM), participants followed through one of three pilot courses which were created using Anesthesia Crisis Resource Management as a template. Courses involved computer-enhanced mannequin simulators and were followed by didactic sessions. EMCRM participants affirmed that the knowledge gained in the course would be beneficial in practice and was therefore valuable in training residents.^[7] However, postsimulation opinions concerning actual adequacy in response time and resource utilization were not and have not been widely polled. If efficacious, hospitals may benefit by mandating simulation and training hours from all hospital staff not just physicians responding during emergency.

When health-care workers (HCWs) report to duty during a health crisis, competence alone is not enough to ensure good outcome. Previous exposure to an emergency setting may make an individual more inclined to report in a future emergency.^[8] Considering this, personal characteristics such as perceived self-efficacy based on prior experience or via simulation exposure become equally important. This is a separate but equally important factor from organizational or physical barriers that stand between the first responder and the victim. Although the very nature of natural and health disasters is one synonymous with unpredictability, the notion that nothing should therefore be done in preparation is born out of complacency. In LATAM, a region fraught with abundant natural disaster and recent pandemic, it is important to analyze the HCWs' perceived individual efficacy and the role of disaster simulations and utilization of hospital resources to

augment actual preparedness on all the fronts of hospital staff during various health crises. Our group has developed and validated simple educational tools for capacity building in disaster and emergency care;^{9,10]} the results of this study point at future opportunities that include new technologies utilized in better training of ICU providers and leaders in how to deal with disaster and emergencies.

CONCLUSION

Among the 68 centers represented in this study, the majority did not feel their institution to be adequately prepared for disasters, but participation in training programs appeared to improve this perception. While our sample size was small, this study still highlights an important finding that must be addressed to improve disaster medicine in LATAM countries. By improving the preparedness of disaster responders and leaders, these HCWs will be more apt to respond to the various disasters that affect their respective countries. Limitations of this study include the survey nature and sample size; further studies should look at interventions to create resilient ICUs.

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Nil.

Conflicts of interest
There are no conflicts of interest.

Ethical conduct of research
The authors attest that this clinical investigation was

determined to be a minimal risk protocol under the Institutional Review Board/Ethics Committee Review, and the corresponding protocol/approval number is not applicable. The study does not require to have a Clinical Trial Registry. The authors followed applicable EQUATOR Network (<http://www.equator-network.org/>) guidelines during the conduct of this research project.

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