Canadian Journal of Emergency Management | Revue canadienne de gestion des urgences

Volume 2 Edition 2 | October 2022/octobre 2022

Department-Level Planning and Preparedness: A toolkit to assist in full-faculty hospital evacuations

C. Duval & M. Oberas

Abstract

A full-facility hospital evacuation is highly complex and disruptive to ongoing patient care. In certain emergency situations and after careful consideration and exhaustion of other options, the decision to fully evacuate a hospital facility should be made to ensure the safety of all staff, patients, and visitors. Current literature suggests that staff are unprepared for these situations due to a lack of training and experience. Authors of this paper created a departmental-level toolkit to supplement current hospital evacuation policies in order to assist clinical leaders with planning and preparedness for full-facility evacuations. With the support of evidence-based literature from various countries, this paper discusses key concerns identified in previous hospital evacuations including staff shortages, limited formal partnerships, and availability of appropriate resources. By addressing these shortcomings, the organization can develop further resilience against the negative impacts of a full-facility evacuation. Additionally, this paper outlines recommendations for training and exercises programs to further prepare the staff for full-facility evacuations. In the growing field of emergency management, the implementation of additional resources built on evidence-based research is necessary to increase hospital preparedness in the face of emergencies.

Introduction

Evaluating Hospital Preparedness

There are many elements that should be assessed to guide the organization in planning and preparing for full-facility evacuations. A vital element is the facility's own level of preparedness as this will directly inform the decision-making process about when to prepare to fully evacuate the facility and to identify when it may be necessary to give the order to begin the evacuation. The Agency for Healthcare Research and Quality (AHRQ)'s Hospital Evacuation Decision Guide lays out a specific guide to identify the failures to critical infrastructure that could result in needing to evacuate the facility. (Zane et al., 2010). It can also be used to assist in determining which infrastructure is most at risk and allows hospital leaders to build further resilience in these systems to increase the threshold necessary to require an evacuation. It also outlines a process to identify the timeframe required to fully evacuate the facility, as Tom Kinman wrote in his summary of the AHRQ's guide "Even with a perfect 96-hour plan for resources and assets, at some point incident command might be confronted with a decision to call for evacuation. Simply stated, if the estimated time to evacuate a building is 10 hours, incident command cannot make the call to evacuate later than the 86th hour into an event. Consumption of available resources must be gauged against the total time to evacuate to ensure that all patients are out of the building before the depletion of resources." (Kinman, T., 2019). If the time required to evacuate is unknown, hospital leaders would not be able to ensure the decision is made with enough time to successfully evacuate the patient population of the hospital.

He also suggests that "a perfect evacuation plan would exhaust the most critical resources when the last patient leaves the building" (Kinman, T., 2019) and we believe this is impossible to achieve if the hospital does not prepare for evacuations by identifying the resilience of its critical infrastructure and the resource needs of their evacuation plans.

Limited Evacuation Experience

It is impossible to plan for every possible situation that could require an evacuation – as there are several causes such as natural disasters, critical infrastructure failures, and civil unrest – however, evacuation should often be used as the last resort. It is crucial to understand that "no option is entirely risk-free" (Haynes et al., 2009); the decision to evacuate must come after careful consideration of all other options. There is little Canadian literature relating to a full building evacuation due to the rarity of these events. It is a complex situation requiring even more complex solutions. It involves many logistical and operational problems and considerations. As a result, there are limitations to staff members' evacuation experience, knowledge, and training. The lack of experience, both from real events and from training, makes it difficult for staff to feel confident and be successful in their assigned tasks during a time-sensitive and high-risk situation such as an evacuation (VanDevanter et al., 2017). There may be a decline in prioritizing their safety and the safety of their patients. Without adequate training or experience, staff cannot correctly use the evacuation equipment, may be unfamiliar with the procedures for their units, and will spend considerable time learning their roles and understanding processes that they should already be familiar with. Staff should be cognizant of the fact that training is beneficial to a safe and efficient hospital evacuation process (Fuzak et al., 2010). As individuals with their boots on the ground, staff members' roles in an evacuation directly impact its success or failure.

Staff Preparedness and Response

Most large-scale hospital evacuations will occur over an extended period of time which means it is important to factor in the potentially limited availability of staff. Some staff members may be reassigned to other departments or may be unavailable due to other reasons, it is, therefore, important to identify the staffing requirements of each department and to adapt to the available staffing resources.

This decreased staffing can be the result of normal operating procedures, such as having less staff onsite overnight or having a reliance on temp/staffing agencies; these staff members may have other responsibilities outside of the organization and "may not be as readily available as full-time hospital employees during an emergency" (Zane et al., 2010). It can also be the result of staff being unable to come to work if the evacuation is declared due to a situation that impacts the community beyond the hospital, "as many employees may themselves become victims of the disaster, or may have family responsibilities that interfere with their ability to staff the hospital" (Zane et al., 2010).

As part of the evacuation planning process, it is important to work with the organization to develop plans to mitigate the impacts of this potential staff shortage. Solutions could involve having plans to involve visitors or family members in duties that do not require specific training,

are not related to patient care, and carry little to no risk of harm. Building relationships with local volunteer organizations is another potential remedy to the low availability of staff during an emergency situation.

Communication

One main concern in current literature regarding planning, preparing, and responding to an evacuation is communication (Adalja et al., 2014; Childers et al., 2009; Fuzak et al., 2010; Sawano et al., 2021). It is a concern both internally and externally. Establishing effective communication and maintaining it throughout the evacuation contributes to the overall safety of all individuals involved, staff and patients. Proper communication procedures and structure help reduce misunderstandings, confusion, missed information, and the spread of misinformation (Adalja et al., 2014). These challenges result in a delayed response to evacuation, insufficient distribution of resources, and improper implementation of procedures. The lack of information can severely impact the decision-making and response of key stakeholders, so it is essential to have plans in place and be prepared to work with the information given. A toolkit of communication procedures, roles and responsibilities and contingency plans ensures that clinical leaders are mindful of when, how, and what to communicate to their superiors, staff, and patients. Additionally, they can identify clear roles and responsibilities between their staff to reduce overlap or prevent information from being overlooked.

As past events such as 9/11 and Hurricane Katrina have shown, communication lines are often reduced during a disaster. As such, alternate communication methods are required to ensure a continuity of operations between internal and external stakeholders (Dilmaghani & Rao, 2006). Having contingency plans in place ensures that communication methods are always available during critical infrastructure failures. Childers et al. (2009) state that "the success of a healthcare facility evacuation depends on communication and decision making at all levels of the organization, from the coordinators at incident command to the clinical staff that carry out the evacuation." (p.38). Each stakeholder contributes significantly to the overall success of the evacuation.

Patient Priority

Another critical concern in decision-making and hospital evacuations is patient prioritization; there are safety, ethical, and logistical considerations for both patients and staff that must be assessed (Childers et al., 2009; Fairchild et al., 2006; Fuzak et al., 2010). Beyond the available resources, it is vital to consider the response time and operational capacity for evacuation. Staff need to understand their capabilities and limitations to ensure their safety. To identify what new considerations may need to be made, there needs to be a shift of priorities from the pre-evacuation period to an ongoing evacuation. It is challenging to choose which patients to prioritize, especially in emergencies when there might not be enough time to evacuate all patients safely. In addition, departmental staff may not feel qualified or comfortable prioritizing patients as their priority would only be to ensure their own safety. Although clinicians know their patients best, a decision of that magnitude is not necessarily one that staff members are comfortable making,

especially in a time-sensitive and high-stress environment (Childers et al., 2009; Petinaux & Yadav, 2013). A chart, organizing the patient information, such as identification, needed resources, and transferring locations, will help staff make informed decisions and timely responses.

Evacuation Routes

When it comes to evacuating a facility outside the healthcare setting, it is typically a question of determining the routes with the fewest restrictions on the flow of people from the site to an area of safety. In a large-scale hospital evacuation, the situation is more complex as there is a need for staff and first responders to go back to the areas that are being evacuated, either to support the efforts of other staff or to bring back resources that are needed to successfully evacuate the remaining patients.

Therefore, it is vital to consider the typical patient distribution within the hospital and estimate which department may require additional resources, such as evacusleds, and additional batteries for life-support equipment. Routes can then be identified between the storage areas for the equipment and the departments with the greatest need. This ensures that the patients and staff evacuating are not delayed due to equipment needing to be transported via the same routes and increases the efficiency of the evacuation efforts.

To further increase the flow of evacuation, simulation tools can be used to model the most efficient routes to be designated as evacuation paths based on crowd modelling with the specific constraints of the hospital (Wong S. et al, 2017). This would inform emergency managers in selecting not only the most appropriate routes to use for the evacuation but also to ensure that the routes designated for movement back to the departments do not overlap.

Equipment Distribution

It is necessary to highlight the importance of planning and preparing for a full-facility hospital evacuation to determine what physical resources are available to ensure continuity of care for patients and staff. Unit leaders must also understand in what capacity they can function with a minimal amount of equipment while ensuring that patient and staff safety is maintained during the evacuation. It will aid in identifying the gaps and resolving the problems before the time of an actual evacuation occurs. Additionally, it will aid in determining which departments will need what resources with the understanding that there will not always be enough to support everyone sufficiently (Hicks & Glick, 2015). Some resources can be used multiple times; however, it is necessary to examine the logistical factors such as a longer wait time for equipment to be disinfected and brought back into the hospital, consequently impacting the evacuation response time.

When assessing resource distribution, it is essential to include the needs of the evacuating hospital and the partnering facilities in which patients will be transferred. Understandably, pre-existing partnerships should be able to support patients with specific needs within their facility; however, an unexpected patient surge may still overwhelm their resources. Therefore, it is essential to plan to provide support to maintain a continuity of care. On the contrary, there are risks to

lending resources - there needs to be a system to track where equipment goes to reduce displacement, damage, insurance, and financial loss (Hicks & Glick, 2015).

External Network of Agencies

A common theme across many past events has been the value of building partnerships and creating a network of external agencies, especially developing them prior to any evacuation occurring (Adalja et al., 2014; Hicks & Glick, 2015; Sawano et al., 2021). It builds trust and leads to more efficient measures for intrahospital and interhospital relations. A hospital evacuation, especially one that involves a full facility, needs widespread support of those within the hospital and the community. It is essential to include all relevant stakeholders at the table when making plans and to work together to implement them successfully. In some cases, like the healthcare facilities impacted by Hurricane Sandy or the Fukushima Daiichi Nuclear Power Plant, staff relied on their personal connections to find other facilities suitable to support their evacuated patients (Adalja et al., 2014; Sawano et al., 2021; VanDevanter et al., 2017). Relying on informal partnerships is not sufficient to sustain a full-facility hospital evacuation. Without this network in place ahead of time, disorganization and chaos develops more prominently during an actual hospital evacuation. The hospital itself and the staff will be unprepared and unsure of their following actions. As Sawano et al. (2021) suggested, "early intervention by external organizations...helped the hospital to complete the evacuation without facing major issues" (p.22); leaders, staff members, and emergency responders were more prepared and able to fulfill their roles more efficiently. Having a pre-established network to exchange information allows for a better use of city resources and a more informed decision-making process for hospital and community leaders.

Regional Resilience

When evacuating a large public space, the focus is typically only on moving people away from the immediate situation that triggered the evacuation. When it comes to evacuating a hospital, however, plans must go further and extend to planning how patients will be transferred to facilities equipped to continue caring for their condition. It is therefore important for hospital organizations to build relationships with regional facilities prior to an emergency as this regional resilience is paramount to successfully evacuating a healthcare facility without severely impacting the patient population. Patient relocation plans must also be created with the notion that some patients may require more specialized care which would greatly limit the possible receiving facilities, this problem is aggravated in regions where specialized care is being centralized to single facilities.

Another key consideration that emergency managers must address is the limited capacity of external resources that are utilized to move evacuated patients. Ambulance services and patient transfer companies have a limited number of vehicles and staff that can be deployed to the evacuation efforts and in emergency situations that are not limited to the healthcare facility, it can have a compounding impact on these resources. During Hurricane Sandy, EMS agencies quickly became overwhelmed by emergency calls from the community-at-large but were also faced with difficulties ensuring ambulances were getting refuelled or maintained adequately for the increased

demand they faced. This shortage also impacted hospitals as fuel was needed for various functions, "Hospitals struggled to secure sufficient fuel supply, which affected all aspects of hospital operations, including staff availability. For twenty-nine hospitals, fuel shortage was a challenge that substantially affected patient care. Fuel needs included running backup generators, operating ambulances, ensuring delivery of supplies, and securing sufficient staffing levels." (Levinson, 2014)

These limitations must be accounted for in the hospital's emergency plans and highlight the need for a regional approach to some parts of the evacuation plans as a hospital would rarely be equipped to respond to this emergency situation with onsite resources.

Recommendations

As discussed previously, planning for a full-facility evacuation requires evaluating not only the organization's resilience but also requires the evaluation of regional resilience and assessing current relationships with other facilities within the region. Part of this process is to review incidents at other facilities that have required a full-building evacuation and identify what plans led to successes and what gaps led to failures. For example, when examining the evacuation of hospitals surrounding the Fukushima Daiichi Nuclear Power Plant, Sawano et al. determined that a significant factor in whether a facility was successful in evacuating its patients or not was its relationship with external agencies such as the Japan Self-Defense Forces especially as the designated agencies for evacuation-assistance were not able to support the immediate evacuation due to limited access to the area of the incident (Sawano et al., 2021). This touches on previous points regarding the importance of not only having external communication plans but also having a robust network of partners outside the organization.

By evaluating these events, it is possible to identify what plans should be prioritized for implementation and training. It can also help identify where an organization is more resilient and offers a chance to further the relationship with other facilities by working together to achieve similar levels of resilience. This can include specific systems or training exercises.

Patient Priority Classification System

Concerning the challenges to patient prioritization, having a pre-established system allows clinicians to make informed decisions on which patients to prioritize in a short amount of time. As suggested by Childers et al. (2009), "a patient classification scheme could provide facility operators and personnel (in case of short-notice threats) guidance in setting patient priorities for evacuation... clinical staff will be relieved of some decision responsibility, which will allow them to focus on their primary function – safely performing patient transfers" (p.38). Making these decisions in advance reduces the time it takes to formulate decisions and reduces the need to second-guess, or rush into action. It puts more focus on evacuating patients safely as opposed to rapid decision-making.

Training and Exercises

Although hospital evacuations are low-probability events, consistent training and exercises are necessary to ensure preparedness. Using the toolkit and developing a clinical department evacuation plan is insufficient if the plan is untested and the staff is untrained. A combination of discussion-based and operational-based exercises is needed to identify the gaps and strengthen the hospital community's preparedness for an evacuation. However, training all staff in an acute tertiary care hospital is highly complex. It takes years to plan and implement because it is a complex situation that involves various agencies and organizations in partnership with the community.

Command Structure

Leaders and staff members should understand the importance of basic IMS training for better control and coordination of emergency response. In addition, hospital-based policies and procedures need to be accessible to staff with a monitoring system to ensure staff use it to their benefit (VanDevanter et al., 2017). As a result, during an emergency situation, clinical staff are more aware of their command structure within their patient unit and their expectations and where to seek guidance if necessary. It will allow staff to respond sufficiently despite their lack of experience in a full-facility hospital evacuation. Additionally, the Incident Management Team can better assess the needs of the hospital and allocate the necessary resources to ensure that staff and patients are evacuated safely (Petinaux & Yadav, 2013).

Parallel Evacuation Circuit

Fuzak et al. proposed a parallel evacuation circuit as a form of hospital movement plan to mass transfer patients in pediatric tertiary care to provide more efficiency and reduce congestion for emergency personnel, patients, and equipment (2010). It differs from a series circuit often used, which aims to transfer patients by section or unit. With the support of drills and simulations, evidence shows that it resulted in better resource allocation and reduced overload within one department or one area within the hospital (Fuzak et al., 2010). The conveyor belt formation ensured that traffic flowed in parallel to avoid crossing paths with other evacuating units and incoming responders (Fuzak et al., 2010). Each area would have its own set of responsibilities to maintain the continuity of operations. This method improves traffic flow and results in more rapid patient movement.

Conclusion

As situations requiring full-facility evacuations are rare, it can be easy to overlook the preparation required to ensure both staff and the organization are equipped and trained to ensure the safety of patients and visitors. It also requires staff to make decisions in areas that are not part of the regular operating procedures which can lead to uncertainty and confusion. It is therefore important for emergency managers to support these decisions by implementing policies that will guide the process. This paper aimed to provide more clarity on what should be assessed and implemented to develop an appropriate level of preparedness. With tools such as organizational policies and departmental toolkits, a hospital organization can reassure their staff and patients

that the procedures in place are adequate support to ensure their safety even when an evacuation of the entire facility must be ordered.

References

Adalja, A.A., Watson, M., Bouri, N., Minton, K., Morhard, R.C., Toner, E.S. (2014). Absorbing citywide patient surge during Hurricane Sandy: A case study in accommodating multiple hospital evacuations. *Annals of Emergency Medicine, 64*(1), 66-73. http://dx.doi.org/10.1016/j.annemergmed.2013.12.010

Childers, A.K., Visagamurthy, G., Taaffe, K. (2009). Prioritizing patients for evacuation from a health-care facility. *Journal of the Transportation Research Board*, 2137, 38-45. DOI: 10.3141/2137-05

Clark, M., Biddinger, P. (2014). MDPH Hospital Evacuation Toolkit. *Massachusetts Department of Public Health, Office of Preparedness and Emergency Management.*

Dilmaghani, R. B., & Rao, R. R. (2006). On Designing Communication Networks for Emergency Situations. *2006 IEEE International Symposium on Technology and Society.* https://doi.org/10.1109/istas.2006.4375882

Fairchild A.L., Colgrove, J., Jones, M.M. (2006). The challenge of mandatory evacuation: Providing for and deciding for. Health Affairs, 25(4), 958-67. DOI: 10.1377/hlthaff.25.4.958

Fuzak, J.K., Elkon, B.D., Hampers, L.C., Polage, K.J., Milton, J.D., Powers, L.K., Percell-de'Shong, K., Wathen, J.E. (2010). Mass transfer of pediatric tertiary care hospital inpatients to a new location in under 12 hours: Lessons learned and implications for disaster preparedness. *The Journal of Pediatrics, 157*(1), 138-43.

Haynes, K., Coates, L., Leigh, R., Handmer, J., Whittaker, J. Gissing, A., Mcaneney, J., Opper, S. (2009). Shelter-in-place vs. evacuation in flash floods. *Environmental Hazards, 8*(4), 291-303. DOI: 10.3763/ehaz.2009.0022

Hicks, J. & Glick, R. (2015). A meta-analysis of hospital evacuations: Overcoming barriers to effective planning. *Journal of Healthcare Risk Management, 34*(3), 26-36. DOI: 10.1002/jhrm.21162

Kinman, T. (2019). Facility evacuation decision guidance. *Health Facilities Management.* https://www.hfmmagazine.com/articles/3623-facility-evacuation-decision-guidance

Levinson, D. R. (2014). *Hospital emergency preparedness and response during superstorm sandy* (U.S.A., Department of Health and Human Services, Office of Inspector General). Washington, D.C.: U.S. Dept. of Health and Human Services.

Petinaux, B. & Yadav, K. (2013). Patient-driven resource planning of a health care facility evacuation. Prehospital and Disaster Medicine, 28(2), 120-26. DOI: https://doi.org/10.1017/S1049023X12001793

Sawano, T., Shigetomi, S., Ozaki, A., Nishikawa, Y., Hori, A., Oikawa, T. Maeda, M., Tsubokura, M. (2021). Successful emergency evacuation from a hospital within a 5-km radius of Fukushima Daiichi Nuclear Power Plant: the importance of cooperation with an external body. *Journal of Radiation Research, (62)*S1, il22-il28. DOI:10.1093/jrr/rraa122

VanDevanter, N., Ravels, V.H., Kovner, C.T., McCollum, M., Keller, R. (2017). Challenges and resources for nurses participating in a Hurricane Sandy hospital evacuation. *Journal of Nursing Scholarship, (49)*6, 635-43. DOI: 10.1111/jnu.12329

Wong, S-K., Wang Y-S., Tang, P-K., Tsai, T-Y. (2017). Optimized evacuation route based on crowd simulation. *Computational Visual Media, 3*(3), 243-61. DOI 10.1007/s41095-017-0081-9

Yaghoubi T, Ardalan A, Ebadi A, Nejati A, Khorasani-Zavareh D. (2021) Exploring factors affecting the decision of emergency hospital evacuation in disasters: A qualitative study. *Journal of Nursing and Midwifery Sciences* 2021; 8:27-33

Zane, R., Biddinger, P., Hassol, A., Rich, T., Gerber, J., DeAngelis, J. (2010). Hospital evacuation decision guide. *Agency for Healthcare Research and Quality, Publication No. 10-0009*.