

Healthcare and successive natural disasters: Lessons still to be learned

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Abstract

This article explores the increasing impact of natural disasters on healthcare leadership and disaster preparedness, particularly in Fort McMurray, Alberta. It underscores the importance of building disaster resilience in healthcare, distinguishing between emergencies, disasters, and catastrophes, and advocating for a multi-dimensional resilience approach. The need for robust electronic communication channels and comprehensive family-oriented evacuation plans, considering family and pet safety, is emphasized. The protection of vulnerable patients, the importance of resilient healthcare infrastructure, and dedicated protective equipment for first responders are also discussed. The article highlights the critical role of government support in flood prevention and disaster preparedness. Through the experiences of Fort McMurray, the article demonstrates the necessity of comprehensive disaster planning and the crucial role of healthcare systems in rapid recovery and adaptation in the face of disasters. It aims to contribute to an improved understanding and strategies for managing such critical situations in the future.

Introduction

In recent years, the escalation of natural disasters has posed unprecedented challenges to healthcare leadership and disaster preparedness. A prime example of this is seen in the series of events that unfolded in Fort McMurray, Alberta. In May 2016, a catastrophic wildfire triggered the world's biggest, most rapid evacuation of a city due to fire since the Second World War,¹ scorching 1.4 million acres and costing the region an estimated \$9.9 billion.² The only hospital in the remote northern region was evacuated on 4 hours' notice, along with just under 100,000 people, for the next 5 weeks.³ A total of 3,600 staff and physicians were directly and indirectly involved in this wildfire response, an incident that cost the local healthcare organization \$13.5 million prior to insurance and disaster recovery submissions.⁴ In the spring of 2020, the same hospital came perilously close to being evacuated again, this time due to a 100-year flood,⁵ while concurrently operating under COVID-19 pandemic lockdown. The challenges continued into the summer of 2023, when the same hospital was thrust into disaster mode to assist with evacuations during a historic wildfire season, which doubled the previous Canadian record for annual wildfire emissions.⁶

This article aims to explore and analyze the successive, high-stakes disaster responses, particularly focusing on the implications for health leaders and disaster preparedness. It seeks to stimulate contemplation and prompt inquiries into areas where current literature may not offer ready answers, thereby contributing to a deeper understanding and improved strategies for handling such critical situations in the future.

Discussion

Building disaster resilience

In healthcare leadership, understanding and differentiating between emergencies, disasters, and catastrophes is crucial

for effective planning. Emergencies, typically predictable and manageable within regional resources, contrast sharply with disasters, which overwhelm these resources and necessitate broader, multi-regional collaboration. Catastrophes, representing the extreme end of the spectrum, paralyze critical infrastructure and require national and international intervention.⁷

Building disaster resilience in healthcare goes beyond merely preparing for such events. It encompasses the ability to absorb the shock, recover efficiently, and adapt to ensure sustainable development. In following the LEADS framework,⁸ this multi-dimensional approach to resilience is essential in today's healthcare landscape.⁹

While advancements in technology like remote sensing and GIS have significantly improved our ability to predict and detect disasters, they are not foolproof. The role of human judgement¹⁰ and organizational readiness remains paramount. Health leaders must balance technological tools with a keen understanding of their limitations, integrating this awareness into everyday operational decision-making.

This integration is not trivial; it requires cultivating a culture of resilience that permeates all levels of the healthcare system.¹¹ Health leaders play a pivotal role in this process, preparing their organizations not just for the likelihood of disasters but also for the potential impacts on the communities they serve. Such preparation, which extends beyond embracing technology to fostering resilience at its core, is what will define the effectiveness of healthcare leadership in times of crisis.¹²

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The need for protected electronic communication channels

In large-scale disaster responses, maintaining effective communication channels is crucial, especially for healthcare providers and first responders. The 2016 Fort McMurray Wildfire, which necessitated the evacuation of 88,000 people, starkly demonstrated the fragility of current communication systems. During the crisis, the overwhelming cellphone traffic volume led to the collapse of local networks, rendering first responders' cellular communications inoperative. This breakdown was acutely felt during the 8-hour bus evacuation of hospital inpatients, where healthcare providers were left without access to vital patient records.

This incident underscores the need for robust, protected electronic communication channels capable of withstanding the surge in demand during disasters. The frequent cellular blackouts experienced not only hampered patient care but also highlighted a critical vulnerability in our emergency response infrastructure.

While Alberta's First Responders Radio Communications System (AFRRCS) was much welcomed in July 2016,¹³ such a two-way radio network cannot provide critical visual communication in emergencies. To address this, there is an urgent need for updates in the federal regulatory mandates from the Canadian Radio and Telecommunication Commission. These updates should ensure the establishment of protected and targeted cellular communication pipelines for first responders, critical health infrastructure, and public notifications during large disaster responses, through cellular, satellite, and unmanned aerial vehicles bandwidths.¹⁴⁻¹⁶

Implementing such dedicated communication channels will be vital in ensuring that healthcare providers and emergency responders can maintain the flow of essential information, thereby significantly enhancing the overall effectiveness of disaster response.

The need for family oriented evacuation plans

Effective evacuation planning, especially in disaster-prone areas, must take into account not just the logistics of human evacuation but also the emotional and practical aspects of family and pet safety. The 2016 Fort McMurray wildfire, which necessitated the evacuation of the entire town, highlights the importance of this comprehensive approach. RCMP Chief Superintendent Mark Hancock's experience during this event underscores the crucial role played by clear, family-oriented public messaging. The directive to leave immediately, with the expectation of a quick return, enabled the efficient conversion of roads into exit routes, preventing potential catastrophes.

However, evolving scenarios, such as the increasing use of electric vehicles, pose new challenges for evacuation planning. Questions about recharging capacity and the practicalities of long-distance evacuations need to be addressed. The 2023 incident involving a pet disrupting a Canadian Military C-130 Hercules evacuation flight further illustrates the need for

well-thought-out evacuation plans.¹⁷ The pet, having escaped from its owner during the evacuation flight, caused extensive damage to the aircraft's avionics. As a result, the military plane was grounded on the tarmac at Fort McMurray airport for a week following the evacuation. This incident, along with the challenges faced by first responders in rescuing unrestrained pets in a remote first nations reserve, emphasizes the necessity of adapting pet safety plans in future disaster response strategies.¹⁸

In light of these experiences, it is clear that future editions of Accreditation Canada Standards for Emergency and Disaster Management¹⁹ should include extended sections for family plans. By acknowledging the emotional significance of pets in disasters,²⁰ and the particular challenges surrounding pet evacuations during disasters,²¹ we can enhance the effectiveness and humaneness of evacuation procedures, ensuring the safety of all involved—humans and pets alike.

Protecting vulnerable patients and persons

In the aftermath of the 2016 Fort McMurray Wildfire, the local health emergency leadership took a proactive step towards enhancing community safety by initiating a Vulnerable Persons Registry. This registry was designed to ensure that individuals with vulnerabilities could be evacuated promptly and efficiently in the event of natural disasters or evacuation orders. Initially, legal advisors cautioned against the establishment of such a registry, citing potential issues. However, the successful outcomes following its implementation led to a shift in opinion, with legal advisors ultimately endorsing the initiative.

The testament to the registry's effectiveness comes from the community's own leaders: Fort McMurray Fire Chief Jody Butz, RCMP Chief Superintendent Mark Hancock, and Hospital Senior Operating Officer Jordanna Lambert have all praised the registry's benefits in safeguarding the community's most at-risk individuals. Their support underscores the registry's potential as a standard practice in disaster preparedness.

Given the registry's success in Fort McMurray, there is a compelling case for its inclusion in the national discourse on emergency management. It would be prudent for Accreditation Canada to consider integrating such a registry into the future iterations of its disaster and emergency management standards, ensuring a broader adoption of this lifesaving initiative.

Needed infrastructure updates

Infrastructure resilience is a cornerstone of effective disaster response, particularly in healthcare settings. The 2016 Fort McMurray hospital evacuation illuminated a critical oversight: the failure to shut down ventilation systems during the rush to evacuate. The aftermath was a labour-intensive cleaning process and the disposal of a multitude of contaminated supplies.

Fast forward to the wildfire season of 2023, with PM_{2.5} concentrations occasionally breaching the severe danger threshold of 400 µg/m³—far exceeding the recommended health limit of under 13 µg/m³. The hospital's

location in the river valley made it vulnerable, and its outdated ventilation system failed to adequately filter the hazardous air, leading to respiratory and eye irritation even among the healthy. This highlighted a significant shortfall in our healthcare infrastructure's resilience: the inability to segregate air circulation between public and critical areas when needed.

There is a clear and present consensus that substantial improvements are required to bolster the resilience of our healthcare facilities. Federal standards for healthcare infrastructure resilience, particularly regarding ventilation systems, are not just necessary—they are overdue. Furthermore, it is imperative that infrastructure disaster preparedness is met with the corresponding funding to implement these vital upgrades.

Protecting first responders

In the face of wildland-urban-interface fires, which emit highly toxic smoke, the safety of first responders is paramount. Portable Powered Air Purifying Respirators (PAPRs) have proven to be a game-changer in such scenarios. These devices are not only effective in filtering out harmful particles but are also lightweight and can be worn comfortably for extended durations, offering superior protection compared to the standard-issue bandanas, common N95 masks, or cumbersome self-contained breathing apparatuses that are often used during prolonged exposure to wildfire smoke.

There is a pressing need to establish national standards and provincial action plans to ensure that all frontline workers—be it firefighters or healthcare professionals—who find themselves in the thick of wildfire smoke, are equipped with these advanced powered air filtering systems. It is a matter of duty and care to provide them with the most effective equipment to safeguard their health.

Moreover, the experiences of various organizations during the same natural disasters have provided us with valuable insights. For instance, the mandatory time off instituted by the RCMP provincial leadership during the 2016 Fort McMurray fire, as recalled by Chief Superintendent Mark Hancock, was instrumental in managing the mental and physical stress of the officers. Such practices are not just commendable but necessary. They should be adopted universally to mitigate the long-term psychological and physical impacts on first responders, who are often on the front lines of crisis for extended periods. Instituting such measures universally can serve as a protective factor against the enduring effects of trauma experienced by these vital members of our emergency response teams.

Responsibility for flood prevention

The May 2020 flood in downtown Fort McMurray, which saw waters lapping at the edges of the local hospital's parking lot, underscored the precarious balance between disaster preparedness and infrastructural foresight. The hospital's mechanical room, housing critical power and ventilation controls, narrowly escaped inundation thanks to the labour of

a single sump pump and the rapid response of the engineering team amidst the pump's failure and the fortuitous recession of floodwaters. Originally constructed in 1981 with the mechanical room situated marginally below the 100-year flood line, the hospital's design did not anticipate the subsequent pattern of increasingly frequent and severe flooding.

This event raises the question: Whose responsibility is it to prevent flood damage—municipal, provincial, or federal authorities? And more pressingly, what proactive measures can be implemented to bolster the flood resilience of essential facilities like hospitals?

The destruction of the community's sole nuclear diagnostic facility, a critical health resource located in a vulnerable basement area, further highlighted the consequences of such events. The absence of a contingency plan following the flood resulted in the permanent loss of local access to PET scans and other vital nuclear medicine services. The repercussions for patients and the community are profound, encompassing not just health implications but also economic and personal burdens due to the necessity of travelling long distances for essential diagnostics.

These experiences prompt several crucial considerations for future disaster response planning. Firstly, the importance of strategic placement for essential health infrastructure, ensuring it is well above known flood risks. Secondly, the need for robust contingency planning that includes the rapid restoration of medical services following a disaster. Lastly, and perhaps most importantly, the question of whether federal or provincial funding should be specifically allocated for the swift replacement of essential services disrupted by natural calamities. Lessons from these events must inform not only local planning but also national policy, driving the creation of targeted funds to ensure that healthcare services can be quickly and effectively restored in the aftermath of disasters.

Federal and provincial government support

The flooding in downtown Fort McMurray not only devastated the community but also severely disrupted medical services when doctors' offices were destroyed or became inaccessible due to power outages. While alternative commercial spaces were not readily available, the health authority eventually provided temporary office space, for which patients and doctors were thankful. However, this situation has prompted a critical examination of our preparedness for such disasters and the lessons that can be learned to mitigate future disruptions.

In Canada, the federal government is charged with monitoring flood conditions nationwide and coordinating the federal response to significant events, including those that threaten the safety and security of Canadians or critical infrastructure. With the publication of Accreditation Canada's disaster preparedness standards for hospitals in 2020,¹⁷ the question now arises whether it is the appropriate time to call upon both provincial and federal Health Ministers to assess risks pertaining to their jurisdictions, especially those affecting critical healthcare infrastructure.

The impact of the flood extended to healthcare services provided to First Nations communities, as many physicians serving these communities were among those with flooded offices. This raises the issue of whether the federal government should have been more proactive in extending support to these physicians, given its responsibility for First Nations health. It is imperative to consider how federal and provincial support mechanisms can be activated more efficiently and effectively in the wake of such disasters.

Therefore, this incident serves as a stark reminder of the need for a comprehensive, proactive approach to disaster preparedness that includes clear delineation of responsibilities and prompt support from both federal and provincial governments. It also underscores the necessity for a strategic reserve of resources that can be mobilized swiftly to ensure the continuity of critical healthcare services following catastrophic events.

Lessons learned: 2023 wildfires evacuations

The wildfires of 2023 will be remembered for the mass evacuations they necessitated and the declaration of a state of emergency by the Government of Alberta on May 6.²² Over 26,000 individuals were displaced, including the residents of Fort Chipewyan, who were evacuated by air as the flames encroached upon their community.²³ As the wildfires raged throughout the summer,²⁴ reaching as far as the capital of the Northwest Territories, Yellowknife,²⁵ the logistical challenge of evacuating hospital patients and long-term care residents came to the fore, placing unprecedented demands on neighbouring communities whose healthcare facilities were already at maximum capacity.

This scenario prompts a repeat of the critical self-inquiry we initiated in 2017,²⁶ which was aimed at continual quality improvement in our disaster response protocols. It challenges healthcare leaders to reflect on their state of preparedness: If tasked with the responsibility of evacuating an entire hospital within the next 12 hours, would there be a sense of confidence and readiness to execute such a directive?

The lessons from these wildfire evacuations are multifaceted. They compel us to scrutinize our emergency protocols, communication strategies, and infrastructure resilience. They also demand a reassessment of our collaborative networks and the capacity of our healthcare systems to handle such crises. More than a hypothetical exercise, the question of preparedness is a litmus test for our actual capability to protect the vulnerable in times of disaster. It underscores the need for an ongoing, dynamic approach to disaster readiness that evolves in tandem with the lessons learned from each event.

Conclusions

The repeated confrontations with natural disasters in Fort McMurray, as well as broader regions of Alberta and the Northwest Territories, starkly highlight the escalating challenges that **climate change** and environmental shifts pose. The evolving domain of healthcare disaster science is not merely

academic—it is a clarion call for action, demanding pre-emptive and dynamic strategies to bolster our preparedness.

The insights gained from these events are invaluable. They affirm the necessity of comprehensive disaster planning and robust resilience-building within healthcare systems. Critical infrastructure must not only be updated but also be designed with foresight, incorporating the capacity to deal with unprecedented events. Similarly, the role of government at all levels becomes pivotal in fortifying support structures and ensuring swift, effective responses.

The ultimate measure of our preparedness will be our healthcare system's ability to not just endure but to rapidly recover and adapt in the face of disaster. As we venture into an uncertain future, the lessons drawn from past disruptions must illuminate the path forward, ensuring that readiness and resilience become cornerstones of healthcare provision. Our commitment to our patients mandates nothing less, for they depend on us to navigate through the chaos of crises with unwavering competence and compassion. In embracing these lessons, we not only fulfil our duty to those we serve but also set a precedent for healthcare excellence in disaster management.

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