

Building resiliency in emergency room physicians: anticipating the next catastrophe

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Although media coverage of the COVID-19 crisis may have gradually desensitised us to the daily updates on numbers of cases and deaths, broadcast interviews with distraught front-line health workers continue to evoke an empathic response as we hear about the traumatic conditions of their experiences. It is natural to ask how greater foresight and preparation might have mitigated their emotional distress. In the major pandemic epicentres, even the most experienced emergency physicians confide that they have never before tried to deal with the stress of caring for the pressing needs of overwhelming volumes of patients with gut-wrenching illness and rapid progression of disease, amplified by inadequate staffing and a shortage of essential supplies. These conditions create internal struggles and unusual mental health challenges for the affected physicians.¹

The director of the COVID-19 response at the University of California-San Francisco Medical Centre emergency department recently explained how the lockdown and burnout are still wearing on her and her colleagues: “Nine Months Into It, the Adrenaline Is Gone and It’s Just Exhausting”.² It is accordingly appropriate to ask how our emergency physicians and other front-line health professionals might have been better prepared for the ongoing unique, high intensity and unexpected circumstances.³ We propose here an approach to learning from the current situation so that, with the development of new immersive training technologies, our emergency health workers might better anticipate and be more resilient when dealing with intense and prolonged experiences that may entail watching their coworkers become ill and even die (similar to war-related post-traumatic stress disorder (PTSD) and its associated sequelae).⁴

Specialised knowledge and skills of emergency physicians distinguish them as experts

in dealing with complex situations under uncertainty and time pressure. When such physicians are confronted with unexpected situations, their organised knowledge allows them to respond adaptively and flexibly to the constraints of a rapidly changing environment, demonstrating instinctive responses to high-intensity circumstances. The novelty of the required decisions or interventions, the simultaneity of multiple such challenges and a barrage of expectations from others, including fellow workers, patients and their families, exacerbate the situation. Such an environment, with constant trade-offs, can contribute to significant emotional distress and burnout.^{4,5}

Others have drawn parallels between preparing emergency physicians for extreme circumstances and training airline pilots to handle unique and unforeseen emergencies that can occur in the air.⁶ Commercial pilots undergo innovative virtual training and evaluation to develop and maintain their skills, and the industry has developed and leveraged advanced simulation methods to mimic the experience of real-world flight operations. Such simulators are designed not only to train pilots regarding new aircraft or instruments but also to give them experiences designed to prepare them for unexpected situations, and the cognitive pressures, that can arise mid-flight, on landing or during take-off. While recognising that there are differences between aviation and healthcare, we believe that our recent COVID-19 experience suggests that emergency physicians may benefit from similar training and evaluation on simulators designed to capture the emergency room experience and its most stressful aspects, thereby building resiliency.

Medicine has recognised that the useful role of simulations in clinical education, including the creation of simulated patients for learning how to interview and examine

patients and how to reach accurate diagnoses.⁷ In particular, providing a foundational framework, Gaba pioneered the use of aviation simulation concepts in training and evaluating anaesthesiologists for the rare but extreme situations that can arise in the operating room.⁸ His work used instrumented mannequins in realistic operative suites with observational tools that captured the trainee's dialogue and actions while they were handling routine simulated cases that were interrupted by unexpected and diagnostically challenging crisis situations. As is expected, such simulators can document both the errors that occur during a routine case and the recognition and correction processes that typically follow among the more expert clinicians.⁹

Current safety strategy trains physicians to anticipate potential threats rather than preparing them to deal with the unpredictability of real-life emergency situations, where unexpected and surprising conditions can make it difficult to maintain cognitive control. A different training approach is needed to prepare individuals to be unprepared!

The design of modern simulators requires a deep understanding of both the technical skills that are being explored and the nature of potential stresses and how they can affect accuracy and error management. Emergency medicine can be described as a *complex adaptive system*¹⁰ and any attempt to develop simulators for training and evaluation purposes would need to be preceded by a careful assessment of how such clinicians behave emotionally and psychologically, especially as they make patient-care decisions at times of high-intensity crises. The lessons we can learn by studying current health workers, challenged by the COVID-19 crisis, are akin to the data analyses that aviation performs using contents of 'black boxes' retrieved after accidents. Such studies are difficult to perform during actual crises, however, when clinicians are unable to cooperate and observational assessments are intrusive and may be constrained by privacy concerns. Yet retrospective data capture, based on interviews with physicians' weeks or months after the trauma, is unlikely to capture accurately the pressures of actual events, which get blunted and reconstructed in memory as a function of time.

Real-world scenario-based immersive simulations for physician trainees can be designed to elicit an emotional response similar to their response in real emergency medicine situations. In carefully constructed scenarios, these psychological stresses will induce real physiological manifestations, thereby allowing actual measurement of emotional responses similar to those in emergency situations. Training on such simulators over time, with appropriate supportive behavioural feedback, is likely to help physicians to develop resiliency to cope with such situations when they are encountered in real emergencies. Repeated exposure to such psychologically stressful situations, even in training simulations, does raise some concerns about the ethical and psychological implications of the long-term impact of such practice on ER

physicians.¹¹ Therefore, training for unexpected, high acuity crisis events should take into account both the training to expect the unexpected and the training for stress management skills leading to resilience.

Virtual simulation (VS) methods are considered a viable platform for high-stakes training and assessment.¹² As such, immersive virtual reality (VR) can be used for training in high-acuity, low-frequency events, including disaster and mass casualty events such as the response to the influx of patients with COVID-19.¹³ It is a significant additional benefit that they provide convenience as well as the ability to scale and distribute simulations widely with lower costs.

The medical use of VS is not new, particularly in managing the mental health of returning military personnel. However, with the introduction of cheaper, more accessible and sophisticated simulation technology, there is a new emphasis on the clinical use of VR and augmented reality (AR). It has been shown that people can be exposed to anxiety, phobias and characteristics of PTSD using immersive technology to train them to manage trauma before they encounter these events in the real world.^{14 15} For example, veterans from Afghanistan have often had heart-thumping real-life experiences that can be recreated by an immersion programme called *Bravemind*, which leverages a VR system created almost 16 years ago to confront veterans with simulated experiences and to build resilience to such events if they are encountered in the future.¹⁶ Subsequent VR programmes have also been used to incorporate traumatic cues from actual combat events realistically to build AR simulations for treating combat-related PTSD.¹⁷ This trauma management programme's efficacy has been assessed through a randomised controlled trial of Iraq and Afghanistan veterans and active-duty military personnel with combat-related PTSD. During these virtual training experiences, users were monitored physiologically before and after the training.

The current heart-rending interviews of front-line physicians and other health workers demonstrate the value of capturing the nature of the emotional and cognitive challenges close to the time when they have been experienced. We accordingly suggest that preparedness for the next significant crises, whether a pandemic like COVID-19 or something totally different and unexpected, requires us to begin with the capture of detailed information regarding the current psychological and emotional challenges and what has driven them. This preparedness will also allow for the development of crisis management simulators inspired by those used in the training and preparation of pilots or members of the military.

The problems we have described are likely to be even more severe in low resource settings with fragile health systems. Although this would generally include low and middle-income countries, it also refers to rural, remote settings in high-income countries. In such environments, availability of trained health workers and fiscal resources for innovative simulation-based training are constrained

and there is often poor governance, leadership and delineation of roles and responsibilities. Preparation may also be more dependent on counselling and frugal educational efforts that must be undertaken with an understanding of how demographic as well as resource characteristics may aggravate some of the mental health challenges associated with the kinds of stress discussed here.¹⁸ As in high resource settings, it is cognitive and emotional preparation, rather than straightforward knowledge of emergency medicine practices, that is needed to help emergency health workers as they build resilience for potential disasters that may lie ahead.

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