



INSTITUTE FOR HOMELAND SECURITY



**Sam Houston
State University**

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**METHODS FOR MODERN EDUCATION & TRAINING
ON EMERGENCY MANAGEMENT & CONTINUITY IN HEALTHCARE –
FOUNDATIONS AND CONCEPTS**

**Institute for Homeland Security
Sam Houston State University**

Bryce S. Allen

Methods for Modern Education & Training on Emergency Management & Continuity in Healthcare Part 2- Practical Application

Bryce S. Allen

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ABSTRACT

Preparing employees for a wide variety of potential hazards is a significant chore for emergency management and continuity professionals. The ability to adequately train staff may be largely dependent on the size, revenue, location, and dedicated preparedness programs an organization has. However, it is more apparent than ever that organizational and staff resilience is a significant priority at all levels and sizes.

In a previous paper by this author, it was highlighted that survey and research data have shown that employees are eager to learn about emergency topics beyond traditional safety and occupational health. Surveys also showed that employees prefer emergency education and training to be conducted in shorter, but more frequent, iterations. (Alert Media, 2024)

In Part One of this paper series, foundations and concepts for adult learning, or andragogy, were explored. It was this author's thesis that emergency management and continuity professionals need to understand how adult learners best grasp concepts. It was also identified that healthcare workers, especially those holding clinical positions, have standardized foundations for how they learn and maintain professional knowledge and skills. Emergency management and continuity professions in healthcare should find ways to blend educational foundations and technology together to enhance our training.

This paper will focus on the application of modern adult learning and, more specifically, aspects of technology that can be adapted to support enhanced learning. Further, this paper will address certain limiting factors many will face in the application of such methods. It is the goal that the reader will be able to identify certain areas of enhancement to their programs and future opportunities to investigate.

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INTRODUCTION

Some semblance of technology has been employed in education and training for professionals for many years. From computer-based training to early adoption of learning management systems, and various programs to enhance facilitation and evaluation of exercise, technology can greatly enhance a learner's ability to comprehend and apply knowledge towards incident response.

Organizations have leveraged computer-based training and learning management systems to provide on-demand training programs, covering a broad number of topics from new employee onboarding, human resources, occupational health and safety, and other mandated employee training. Further, professional development programs for management, leadership, and evaluation are used by a number of small and large organizations alike.

In many of the foundational examples examined in the previous paper for how clinical teams learn and remain proficient in tasks, the use of guiding principles and the adaptation of modern technological advancements were noted. Further similarities were identified between the exercise and training concepts found in emergency management, such as the Homeland Security Exercise & Evaluation Program (HSEEP), and those used by clinical educational staff, such as the International Nursing Association of Clinical Simulation (INACSL). A focus on clear objectives, evaluation standards, well-developed scenarios, and the identification of improvement are common themes.

As will be explored in this paper, other sectors have begun adopting technologies to enhance education and training beyond simple slide decks or pre-recorded videos. Exercises have advanced past discussion-based facilitator-led tabletops into games adapted to organizations, departments, and individuals. Even the use of artificial intelligence (AI) and machine learning (ML) are being applied to the emergency management and business continuity sector at an increasing rate. (Haseley et. Al., 2023)

GAP ASSESSMENT

The issue of effective education and training for emergency management is not new or isolated to one specific sector. It is an international and cross-sector issue addressed in global literature. A 2007 World Health Organization (WHO) report identified a lack of knowledge as a primary reason for disaster injuries. (WHO, 2007).

More recent research has expanded upon some of these observations as applied to hospital environments, identifying that failures to provide education and training on disaster preparedness results in a reduction of a healthcare organization's effectiveness. (Samei et al., 2023). Samei et al noted that "The findings of the majority of studies indicated that if the training is accompanied by retraining and periodic preparation maneuvers, it will have a more significant impact on hospital preparedness."

There are many individual reasons that agencies, communities, and organizations struggle with preparing themselves for disasters. Some of the more commonly identified issues faced by healthcare emergency managers in educating and training personnel, this author has witnessed, include:

- Lack of funding and leadership support for emergency management programs.
- Unfamiliarity with existing and emerging methods of adult training & education.
- Burnout of staff, creating a lack of interest in additional education.
- Continually shifting technology gaps supporting these programs.

Likely one of the most significant, and commonly identified, issues are found in the first bullet. Despite the size of the healthcare organization, there is a constant battle for budgets to support activities. Compounding the funding issue is a lack of leadership support, or possibly a lack of understanding, regarding these programs and their importance.

The Joint Commission (TJC), an accreditation entity, has spent a considerable amount of time over the last few years revising emergency management standards across the medical community, including hospitals, home health, and ambulatory care. These standards include an emphasis on leadership commitment, education, exercises, and all-hazards approaches to preparedness programs.

Even when one receives leadership support, it may still be difficult to gain funding to levels that will allow an organization to do much more than minimally required items for compliance. Emergency management and continuity professionals must find persuasive arguments to gain that support.

Samei et al. (2023) identified that research literature has supported the concept that “planning and implementing education programs for staff, patients, and companions was one of the most cost-effective approaches to preparedness in various fields.”

The second bullet is one that this paper, and this author’s previous paper, hopes to bring attention to. As will be noted, medical education has advanced to include detailed scenarios, simulations, and virtual or augmented reality to create experiential learning. Failure of the emergency management and continuity fields to adapt these standards and methods to our training programs can be a contributing factor to all of the other pitfalls.

A 2022 US Surgeon General’s report on the US healthcare workforce identifies reducing administrative burdens as a primary action that can be taken to reduce healthcare worker fatigue. (HHS, 2022) Outdated or generic training materials may be interpreted by staff and leadership, already held to high standards of continuing education requirements imposed by both organizations and state certification boards, as a contributing factor in exacerbating learning fatigue.

Lastly, technology and knowledge gaps may develop. Even engaged professionals, with funding and support, may find it challenging to stay up on trends in technology applications that could be beneficial to their education and training programs. Even within one’s own organization, different levels of technological awareness may exist. From artificial reality, interactive virtual reality, widgets and add-ons in existing applications, and large-scale operations-based exercises run with the latest equipment for situational awareness and evaluation, the options can be overwhelming.

This paper will explore how to apply modern adult education methods to develop engaging and effective education and training, leveraging different types of technologies, and how to create more engaging variations of traditional training. This paper will also show how newer forms of training can provide more effective qualitative and quantitative results to support preparedness programs.

DISCUSSION

The previous paper focused on concepts and theories in adult education, specifically those that have been applied to other areas of healthcare education and training. Those concepts alone, are not enough to fully grasp how enhanced training, especially with current or emerging technology, can aid practitioners in creating more effective programs.

Definitions

In order to better understand the different methods of learning this paper will discuss, the following table contains definitions and explanations that are important to consider as this paper moves forward:

Virtual learning is defined as learning that can functionally and effectively occur in the absence of traditional classroom environments. (Simonson & Schlosser, 2006)
Experiential learning theory , time and space for reflection helps learners absorb and make sense of an experience. A quick discussion about an activity with a peer or a coach helps adult learners crystalize ideas and thoughts. Giving students an opportunity to process new information in smaller chunks, raises the likelihood that the information will stick. (The Joyce Foundation, 2016)
Adaptive learning programs use technology to personalize the learning experience. These programs use data about the learner's performance and behavior to adjust the difficulty and pace of the course, providing a more tailored learning experience. (Subramanyam, Medium, 2023)
Simulation is a learning method in which learners become deeply involved in skills training by trying to solve problems in an environment similar to what they encounter in real life. Planning in simulation is a complex subject and depends on the understanding and knowledge of the designer. (Bosak et al., 2024)
Some common definitions of AI [Artificial Intelligence] include: • A branch of computer science dealing with the simulation of intelligent behavior in computers. • Advanced statistical and analytical methods such as machine learning and artificial neural networks, especially deep learning. • A computer system able to perform specific tasks that normally require human intelligence, such as visual perception, speech recognition, decision-making, and language translation. (GSA IT Modernization Center of Excellence, n.d.)

Traditional Training Methods

Many readers who think back to the last formal education or training iteration received may remember a never-ending slide deck presented by a live person, or a similarly never-ending computer-based slide deck being narrated by an antiquated robot voice, or even worse, a never-ending slide deck with no narration and a quiz with no clear answers.

In-person training, identified in this author's previous paper as a preferred method of delivery, offers a more intimate setting and a two-way dialogue between student and instructor. (Allen, 2024) However, in-person training requires time commitments, and logistical considerations, and is heavily dependent on the instructor's abilities.

For a practitioner of emergency management and continuity, the utilization of experiential learning – or learning by doing - is a key component of providing effective in-person or virtual adult learning. The audience wants to know what the objective of the training is, how your material applies to them, what they are expected to do with the knowledge, and how their peers are interpreting the information. (Digital Promise, n.d.)

Learners, especially in healthcare settings, need to know that the training brings value to their role. The course designers or instructors need to know that the material is effective – meaning through data and through analysis of the learner's application of the material – so they can revise or create new materials on a regular basis.

The following are important guidelines when considering how to form effective training environments, especially if the training is being conducted virtually:

- 1) Who the target groups are;
- 2) What the content of the training is;
- 3) The facilities, resources, infrastructure, and educational goals and the advantages and disadvantages of each method, the type of method of presenting the content in a virtual way should be determined, and finally;
- 4) The educational effectiveness should be measured. (Bosak et al., 2024)

In the field of emergency management exercises, especially in healthcare, all too often discussion-based exercises become the standard. Workshops and tabletops are convenient, considerate of time, and can be highly effective in encouraging conversations on plans, policies, and procedures. However, these types of exercises lack the stress and realism that one faces during a real event and often

leave front-line employees listening to seasoned staff provide all of the information.

Within the HSEEP guidelines, and part of the joint commission standards, operations-based exercises, such as functional exercises and games, provide an additional level of realism and provide participants the ability to guide the scenario based on their knowledge. (DHS FEMA, 2020)

Properly designed exercises can be a very insightful, and ultimately cost-effective way to teach and evaluate concepts learned from previous instruction. It cannot be reinforced enough that whether the training is in-person or virtual, it is not likely to be effective “unless an accurate learning hypothesis is implemented and learning scenarios developed.” (Mellet-d’Huart, 2009)

As highlighted in the first part of this paper series, both the HSEEP and the INACSL frameworks focus on the importance of objective-based learning tied directly to participants’ performance competencies and goals. Healthcare emergency managers must look towards understanding how the participants would feel the impacts of a scenario and what their likely courses of action would be. Rather than a slide deck of static prompts, it is hypothesized by this author, and supported by previous research, that employees wish to have more engaging training more routinely.

The next section will explore modern ways to develop the training and exercises more effectively through data, visual aids, and other methods while also speaking to how practitioners of all levels can access such technologies to enhance their programs. Many of these methods already have roots in the medical, academic, and research communities. They are becoming more accessible, cost-effective, and robust.

Applying Modern Data, Methods, and Technology

A major gap in healthcare emergency management identified by this author is the lack of use of relevant data to inform the training and education of staff. Many hospital settings are data-driven – whether a hospital employee is a provider, supply chain manager, admissions staff, or a facilities maintainer, data is at the core of what they do.

Traditional data in preparedness programs may focus on the numbers of plans, trainings for incident command, exercises, activations, and improvement planning tasks have been completed. More detailed data may be brought into hazard vulnerability assessments (HVAs). Yet much of this data only speaks to program management goals or are qualitative risk scores that may not represent accurate preparedness and mitigation levels.

Nearly every resource on employee education highlights that the measurement of effectiveness is a crucial metric needed. Yet, it has always been a challenge to gather metrics that truly show an organization's maturity in preparedness.

The technologies and methods outlined over the next few pages provide potential ways to improve training effectiveness and gain valuable data. Some of the metrics that emergency management and continuity professionals should gain from their training and exercises may be:

- Demographics:
 - Number of participants, by specialty and/or by department, who have completed training or exercises
 - Types of departments and business units represented at the training and education events
 - Internal or external locations the exercises have been conducted at
- Plans and procedures tested during the events,
- Types and complexities of scenarios tested,
- Numbers of correct answers, actions, responses to questions, injects, or actions

Artificial Intelligence (AI) is, of course, now an additional component that can aid in analysis of preparedness programs. AI can be applied to the traditional program metrics, the enhanced training metrics listed above, and to other metrics that would enhance the overall understanding of organizational preparedness. While beyond the scope for this paper focusing on training and exercise, these additional data points, especially if aided by trusted AI resources, can be derived in planning, response, and recovery areas:

- Location-based data such as employee or patient zones for impacts from events like flooding or power outages – *NOTE: Before using, ensure compliance with privacy and personal identification laws such as HIPPA*
- Predictive analytics, trend monitoring, and change detection using large amounts of historical data inputs
- Rapid assessment of post-disaster imagery and data (Hopcroft, 2026)

Virtual Reality

Virtual reality (VR) immerses the user into a virtual world using pre-loaded graphics, typically using a headset and peripheral devices for control. Instead of rendering a model through a camera onto a wall, the user now sees a fully immersive scenario surrounding them.

Imagine an operating room nurse needing to work through the procedures during a fire. Suppose your hospital doesn't have the ability to free up an operating room for hours or cannot replicate fire and extinguishing capabilities via physical equipment. In that case, the VR concept allows trainers a way to immerse the trainee anywhere and anytime.

The image below demonstrates how the trainee can interact with the virtual environment to take actions and build visual and muscle memory for emergency events.



Image from <https://ctvr.eu/vr-fire-concept/>

VR is an effective way to develop a trainee's ability to act under pressure and within an artificial but familiar environment. Additionally, studies show that workers trained through this method:

- Have 28% better long-term retention;
- Have the ability to perform procedures correctly 50% more often than non-virtual reality learners, and;
- Create longer-lasting procedural memories with emotional responses to the virtual reality setting (<https://www.hasc.com/virtual-reality/>)

Augmented Reality

Imagine you are looking for some new furniture or a television but misplaced the tape measure. You want to know if it will fit in your house, so you pull out your phone to open the store's mobile application and allow it to access your camera. Next, it pulls up your room as seen by the camera and overlays a digital model of the couch or TV you want to purchase. You get a nearly realistic depiction of the size and area requirements. This is, in the most simplistic terms, the use of augmented reality (AR).

Education and training practitioners can similarly utilize this technology to create realistic virtual props that can be placed within a learner's environment. One use case is to create a digital image of an object, such as a fire sprinkler pump or medical gas shutoff valve. This 3D image can then be used in something as simple as a slide, overlaid on a training room wall as the learner looks through a camera screen so that the learner can visualize the size, look, and components they may have to interact with in a real-life event.

Another example might be having the participant utilize AR glasses/goggles at the actual location of the equipment or facility being exercised and having items such as checklists and procedures seamlessly overlaid within the device. The participant can physically interact while reviewing emergency plans.

Augmented reality blends the virtual and real world to enhance training. This technology can be accessed by most smartphone or tablet users through applications that come at very little to no cost. Some mobile phones contain LiDAR sensors that mix lasers and visual camera data to create a 3D image, as seen below, that can be imported into many applications available to employees to enhance training materials (i.e. Microsoft PowerPoint).

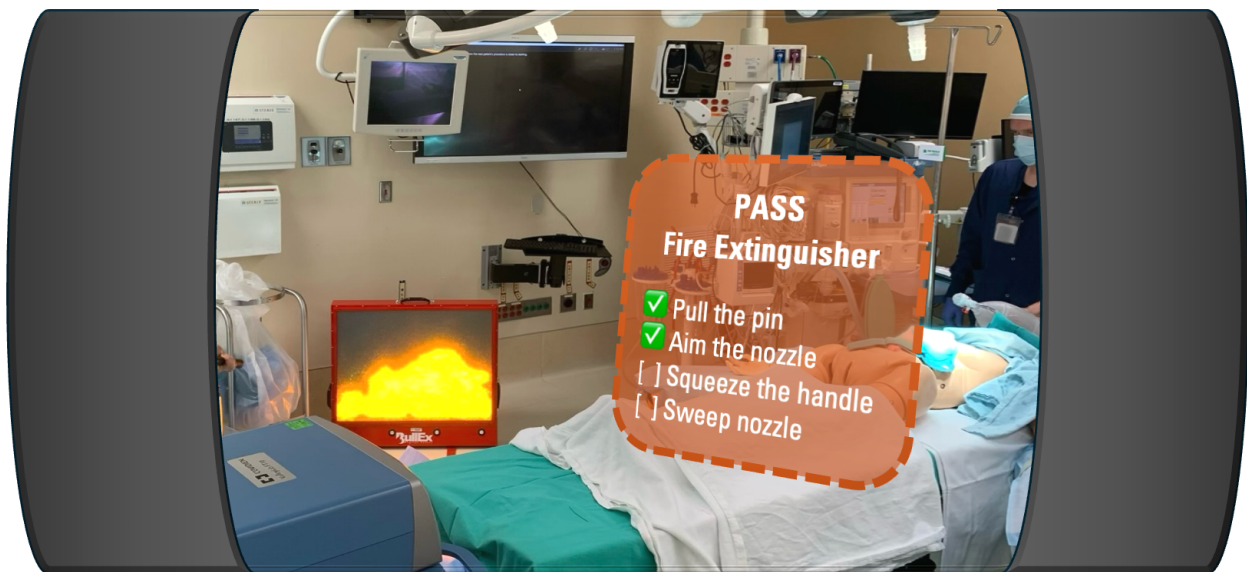


Author's elaboration of a 3D valve created with an iPhone

Wearable technology is furthering the ability to utilize augmented reality in emergency simulations. A number of wearable headsets have been released over the past several years blending virtual and augmented reality with everyday interfaces, such as common social media and mobile phone devices.

The learning curve for utilizing such devices may depend on the specific equipment and the complexity of the activities. However, the complexity of such devices is not a large hurdle to overcome, especially when discussing a user's ability to operate with them. Articles going back to 2018 indicate that AR/VR headsets are used by caregivers to the elderly and disabled, giving them opportunities for entertainment and life-long learning. (AARP, 2018)

VR/AR devices aid in developing metrics surrounding employees' abilities to perform emergency actions in ways that discussion-based exercises cannot, and in ways that are not as time consuming as large operations-based drills and exercises.



Author's elaboration of a mixed reality headset or handheld device to present an overlay of the fire extinguisher procedure in OR fire response.

Orozco (2021) summarizes that in a post-pandemic world, "the use of AR and VR for educational purposes presents great potential to supplement or replace traditional learning methods, and to develop novel learning experiences." Further, AR systems can also be utilized in real-world events to provide live information to the user and enable remote collaboration with other practitioners. (DHS: AR Training Systems for First Responders, 2024)

Simulations and Games

Simulations are widely used in the healthcare setting to train providers on procedures. Simulations assist with putting participants into life-like situations that they may face while creating a demanding, realistic, and challenging scenario all while being completed in a safe and controlled environment. Medical simulation labs may contain elements of physical, augmented, and/or virtual reality to develop a sense of reality.

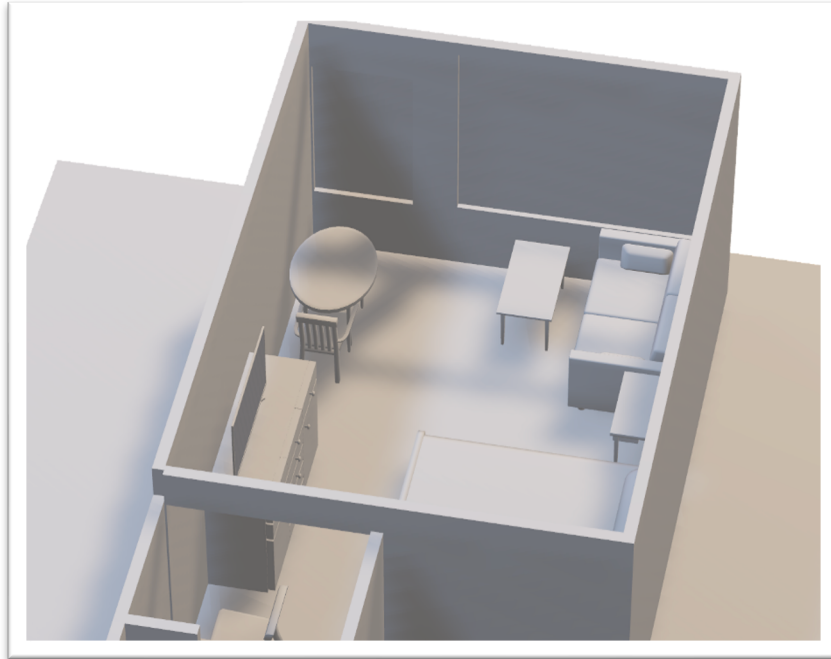
One method of digital simulations that can be applied to training and exercises is gaming. Rather than requiring a complex simulation room, games take elements of physical and virtual simulation to create self-paced and on-demand sessions for users to engage in. Games provide the “opportunity to teach complex spatial concepts that pose challenges to get real-world first-hand experience.” (*Shelton & Hedley, 2002*)

Games allow for the use of custom or generic graphics, scenario-based stories, interactive engagement through prompts, selectable items, and other methods, and can be linked to learning management systems (LMS) used for other computer-based training.

One threat scenario in which games can be effective for emergency scenarios is workplace violence/active threat situations. It is extremely resource-intensive and time-consuming to conduct real-world active shooter drills. Yet, active threats remain a high priority amongst emergency management, police/security, leadership, and front-line staff. Using video-game technology, vendors have been able to create virtual training providing schools, public agencies, and private sector organizations the capability to exercise active threat response simulations. (CRLT, n.d.)

For those worried about the financial impacts of contracting vendors for such training, there are readily available applications, such as PowerPoint, that can blend traditional computer-based education platforms with enhanced multimedia – much of which can be created in-house by utilizing phone cameras to capture your workspaces, photos of previous drills, and stock media of similar workspaces available online. Many vendors have also developed online hosted gaming systems for professional education. For lower-cost options, generic graphics and standard training instruction can be provided out of the box at much lower costs than a customized solution.

The following image was created utilizing similar capture methods as described in the previous section on augmented reality. This image can be imported to PowerPoint to create an interactive 3D image to aid in discussion. It could also be sent to a developer for use in developing a video game-style interactive environment.



Author's elaboration of rendering an image for use in a computer-based training session where the user can describe potential ways to avoid, deny, and defend in a patient care setting – created on iPhone.

Another option that requires little to no technology is the use of in-person games, such as an exercise based on an escape room. An escape room method puts participants in a controlled setting, offering clues to solve puzzles in a collaborative environment. Escape room games are being used in both healthcare and emergency management spaces, commonly seen at professional conferences.

Simulations and games provide a modern way to present experiential active learning and scenario-based training. Utilizing elements of previous technologies described, and blending them with static slides, in-person meetings, or survey feedback-receiving applications (i.e. Qualtrics or MS Forms), can enhance training for users while providing useful metrics to the evaluators.

Micro-Learning

All of the above methods support the concept of micro-learning, or minimal and short-duration learning sessions. Micro-learning supports the previously discussed employee desire to have more frequent, but time considerate, learning sessions on safety and emergency management topics. This method “aims to present information on a regular basis, sometimes daily.” (EPP, n.d.)

These sessions allow for busy staff to take a few minutes during a break to conduct a refresher course on a topic of concern. Micro-learning and micro-simulation support leaders who may want to refresh a team on an emergency plan or procedure during a morning huddle without taking the entire meeting. Micro-learning sessions may be conducted through phone applications, videos, interactive quizzes/surveys, or by gaming.

In the clinical world, morning safety huddles, CE events, and other routine meetings can offer a great opportunity to conduct micro-learning at an individual or group level. Many times, these meetings or huddles contain a safety moment that can be leveraged for a short 5-to-10-minute micro-learning session. An example might be conducting a survey on how many nurses know where the BCA computer is located or where the downtime forms are kept. Using an online survey, all meeting attendees can log responses, which in turn feeds data on downtime procedure awareness, while providing the participants a reminder of where such tools are located in their clinical setting. This survey can be replicated around the hospital in order to identify knowledge gaps for the continuity program.

One last option of micro-learning is recording a short audio session, in a podcast format, covering important emergency preparedness topics. Many healthcare providers can be seen walking through hospitals listening to podcasts and music while in transit. Emergency management and continuity professions could leverage their internal public relations teams to develop high-quality podcasts covering a range of topics, including bringing in employees to share their own thoughts around previous emergency responses from their perspective.

Whether leveraging technology or using more traditional methods, micro-learning is an area that preparedness practitioners should utilize more. This method of training supports the previous observations that employees want to receive more regular training and education, without overwhelming their busy schedules.

Artificial Intelligence

AI will undoubtedly bring more capabilities, as well as enhancing all of the other methods addressed above. Used appropriately, AI can assist practitioners in making more realistic scenarios, tailored closer to your specific personnel's training needs. (Pottle, 2019)

However, practitioners must be aware of the risks of AI integration into healthcare. AI not vetted by internal information and cybersecurity teams can create vulnerabilities, data integrity issues, ethical dilemmas, and operational risks. (Davis, 2026)

WAY FORWARD

To summarize, both modern adult learning theories and technological capabilities are vital to a successful healthcare emergency manager's education and training program.

Gross et al. (2019) urge that "modern e-learning should be embraced to foster the educational landscape in patient safety." These methods allow for more staff and leadership to "understand concepts that require spatial understanding and visualization" (*Hamilton et al., 2021*). They also allow practitioners to gather more useful data through the collection of how users interact with the scenarios and the technologies.

Texas has a strong coalition of Regional Advisory Councils (RAC) supporting Trauma Service Areas (TSA). Many RACs also provide significant resources and collaborative efforts toward emergency management and continuity throughout their regions. This author urges those RACs to assist hospitals, especially those with limited resources, to build a basis for adapting these technologies into their preparedness programs.

Other important resources are the academic institutions across the state, including Sam Houston State University's Institute for Homeland Security (IHS), that offer resources to emergency management practitioners and access to industry partners. Texas A&M University's Engineering Extension Service (TEEX) offers many free or low-cost training courses covering emergency management, continuity, cyber, and physical security. Lone Star College offers low-cost degree programs in emergency management. Many of these organizations will also assist in exercise development and provide opportunities to utilize technology to support training programs.

Lastly, practitioners need to assess what is already available internally to their organizations. Do your facilities teams already utilize some form of virtual training for systems, do your clinical staff have access and familiarity with AR/VR, are there applications you can access to create more immersive training, and are there vendors who may offer enhanced live or virtual training as part of existing contracts?

Healthcare emergency managers and continuity practitioners face a continued evolution of threats and hazards. Employees also recognize these elements more than ever and desire engaging and realistic training. Practitioners should evolve the training and education space by embracing technology and methods that are already familiar to healthcare workers. Blending clinical methodologies into preparedness education and training programs should allow for wider engagement, line-worker familiarity, and enhanced metrics for preparedness programs.

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AUTHOR'S BIOGRAPHY

Bryce Allen is currently an Enterprise Security Business Continuity Specialist at a major North American natural gas pipeline company. He is also a senior consultant at Agravic Solutions, LLC.

Bryce Allen formerly served as Manager, Emergency Management at The University of Texas MD Anderson Cancer Center's Facilities Management Division – Environmental Health & Safety, Sustainability, and Emergency Management (EHSSEM) Department.

Bryce is a former active-duty US Army and Army National Guard Officer specializing in aviation support to Homeland Security & Safety operations and overseas contingency operations during Operation Enduring Freedom and Operation Spartan Shield in the Middle East.

After honorable discharge, Bryce served as an emergency management and business continuity consultant to international corporations and government agencies. During this time, he oversaw hundreds of hours of unmanned/uncrewed aviation support to large international incidents, served on incident management teams for multinational corporations, and advised critical infrastructure sectors on all-hazards preparedness, response, and continuity.

Bryce is a Certified Emergency Manager (CEM) through the International Association of Emergency Managers and a Master Business Continuity Professional (MBCP) through Disaster Recovery Institute International. He holds a bachelor's from Benedictine College, a master's from The George Washington University, and a certificate from FEMA's EMI National Emergency Management Advanced Academy (NEMAA).

Affiliations and Disclosure Statements

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All data and references are available to the public through open-source methods.



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The Institute for Homeland Security at Sam Houston State University is focused on building strategic partnerships between public and private organizations through education and applied research ventures in the critical infrastructure sectors of Transportation, Energy, Chemical, Healthcare, and Public Health.

The Institute is a center for strategic thought with the goal of contributing to the security, resilience, and business continuity of these sectors from a Texas Homeland Security perspective. This is accomplished by facilitating collaboration activities, offering education programs, and conducting research to enhance the skills of practitioners specific to natural and human caused Homeland Security events.

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