BRIEF REPORT

An Island-Wide Disaster Drill to Train the Next Generation of Anesthesiologists: The SIAARTI Academy Experience

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ABSTRACT

Objective: Anesthesiologists play a pivotal role in mass-casualty incidents management. Disaster medicine is part of the anesthesiologist's core skills; however, dedicated training is still scarce and, often, it does not follow a standardized program.

Methods: We designed and delivered a crash course in disaster medicine for Italian anesthesiology residents participating in the nationwide program, Italian Society of Anesthesia, Analgesia, Resuscitation and Intensive Care (SIAARTI) Academy Critical Emergency Medicine 2019. Residents totaling 145, from 39 programs, participated in a 75-minute workstation on the principles of disaster management. Following this, each participant was involved in a full-scale mass-casualty drill. A plenary debriefing followed to present simulation data, maximize feedback, and highlight all situations needing improvement.

Results: Overall, participant performance was good: Triage accuracy was 85% prehospital and 84% in-hospital. Evacuation flow respected triage priority. During the debriefing, residents were very open to share and reflect on their experiences. A narrative qualitative analysis of the debriefing highlights that many participants felt overwhelmed by events during the exercise. Participants in coordination positions shared how they appreciated the need to switch from a clinical mindset to a managerial role.

Conclusion: This was an invaluable experience for anesthesiology trainees, providing them with the skill set to understand the fundamental principles of a mass-casualty response.

Key Words: disaster drill, disaster medicine education, mass-casualty incident drill, residents education

Anesthesiologists play a pivotal role in mass-casualty incidents (MCI) management.[1,2] Responding to an MCI is not an unlikely possibility for tomorrow's specialist. According to Italian and European Board of Anesthesiology European Training Requirements in Anesthesiology (Domain 1.7, Critical Emergency Medicine [CREM]), disaster medicine is part of the anesthesiologist's core skills[3]; however, dedicated training is still scarce and, often, it does not follow a standardized program.[4] With this in mind, a dedicated mass-casualty training exercise for anesthesiology trainees was created and delivered during a nationwide summer school organized by the Italian Society of Anesthesia, Analgesia, Resuscitation and Intensive Care (SIAARTI).

METHODS

SIAARTI Academy 2019 was designed as a CREM-oriented event. Residents from all around the country were invited to participate in the program, which was organized by the scientific society as a complementary elective educational event. It was delivered on a small Mediterranean island, Lampedusa, with a total surface of 20.2 km^2 and a total resident population of around 5800, from May 19 to 24, 2019. One hundred forty-five residents, from 39 out of 40 anesthesiology residency programs, participated in the 6-day program. With residents divided in small groups, the first 4 days were dedicated to different educational workshops. One of the 75-minute workstations was about MCI management principles where participants were exposed to interactive case-based scenarios, using table top and computerized simulations, to introduce them to the basics of disaster response, including the command chain, communications, roles, and responsibilities during a disaster response and principles of MCI triage. During the fifth day, all of the Academy participants took part in a full-scale MCI simulation. The exercise was held from 2:00 PM to 6:00 PM on May 23, 2019. The following day, an educational plenary debriefing was held to present simulation data, maximize feedback, and highlight all situations needing improvement, representing the most important moment of the drill (exactly how debriefing after real events needs to be). All procedures followed were in accordance with the ethical standards of the Helsinki Declaration of 1964 and its later amendments. Because the information

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was recorded in such a manner that subjects cannot be identified, directly or through identifiers linked to the subjects, the study was considered exempt from an institutional review board approval. All residents expressed informed consent for participating in the drill, which included data collection for debriefing and research purposes.

Participants and Exercise Design

Roles were allocated on a voluntary basis; 98 participants played the role of smart-casualties, receiving a predetermined storyboard and being given instructions on how to evolve and collect data; 16 participants were allocated as observers, whereas the remaining 31 were assigned the role of health care providers. Among them, 4 key roles were defined a priori: first responder, dispatch center coordinator, hospital director, and advanced medical post director. Each figure led a team with specific functions and was tasked to formulate appropriate response guidelines. Participants acting as observers were assigned to different key areas of the exercise and were tasked with producing notes and observations for the debriefing. The debriefing was performed using the PEARLS health care debriefing tool.[5]

Smart-casualties profiles were based on scenario characteristics and previous epidemiological reports of similar real events.[6] Each casualty received a dedicated storyboard accurately describing injuries, make-up, and evolution, as well as a set of Dynamic Casualty Cards (DCC); very briefly, casualties have a series of predefined statuses, each including a predetermined set of vital parameters, major complaints, and expected treatments and intervention times. A casualty can evolve (improve or worsen) on the basis of the intervention performed (vs the expected one of the database) and appropriate timing (set by cutoffs in the database). DCCs presented all vitals needed for allocation of casualties within a triage code according to the simple triage and rapid treatment (START) system.[7] Based on these vitals, each casualty had an expected (correct) triage code. Participants acting as casualties also collected data. They recorded their assigned triage codes and key times of their evolution during the drill. These data were then used in the after-action debriefing. Details about the casualty evolution method, general structure of the simulation, and DCCs were described in a series of previous papers.[8-10]

Scenario

A tsunami-like story was written for the exercise. Four simultaneous injury sites, called *Alfa*, *Bravo*, *Charlie*, and *Delta*, respectively, were designed and deployed. Two of them were urban scenarios, within Lampedusa village, and 2 were coastal events. Scenario Alfa represented a building collapse, with multiple crash and trapped casualties. It was delivered within the renovation works of Lampedusa primary school. It included a total of 51 casualties, alone representing 52% of the casualty load for the exercise. Scenario Bravo represented an isolated group of casualties lost at sea in an inaccessible road by the beach 5 km from the main village. Casualties were floating in the water approximately 50 m from the shore. The scenario included 12 casualties. Scenario Charlie represented a group of casualties crashed on a pier by the sea waves and again stuck on the dock with no access by land. The scenario included 24 casualties. Finally, scenario Delta represented the collapse of Lampedusa's only medical facility injuring all of the admitted patients and medical personnel. It included 11 casualties.

Resources

Resources deployed included health care providers, vehicles, medical and logistical facilities, and equipment. A multiagency dispatch center was realized in the airport operation rooms. It hosted the radio center and the residents acting as dispatch medical coordinators along with representatives from other agencies participating in the drill, including a fire brigade, law-enforcement, coast guard, and air force. Four ambulances were available on the island, 2 civilians, and military from both the army and the local air force base. Each was staffed with residents. The Italian coast guard also participated with a search and rescue naval unit, which was staffed by residents as well. An advanced medical post tent was available by the local civil protection. Finally, the first floor of Lampedusa hospital had been previously planned by the exercise staff to act as a temporary hospital in case of unavailability at the Lampedusa health care facility (unavailable in the drill story). Medical equipment was reproduced and accounted for in a realistic, finite manner, using printed images on cardboard boxes. Communication was provided by means of dedicated radio and phone lines among the providers.

RESULTS

All participating residents took part in the MCI simulation. Their post-graduate training year, exposure to prehospital care training, and previous disaster medicine training are presented in Table 1.

Overall participant performance was good: Triage accuracy was 85% prehospital and 84% in-hospital, with no significant differences among the 4 prehospital scenes. Evacuation flow respected triage priority, with patients being evacuated and treated according to severity: mean incident to definitive care times of 121 minutes for immediate care, 163 minutes for delayed care, and 130 minutes for minor wounds. These times are significantly affected by the logistics of different scenes, with the longest evacuation time of 222 minutes for casualties in scene Bravo and 127 minutes for casualties in scene Charlie (water evacuation), versus 121 minutes and 72 minutes for Alfa and Delta (land evacuation), respectively.

Morbidity and mortality

Out of the 98 casualties from the 4 scenes, 70 were evacuated to a health care facility during the simulation; of these, only 11

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TABLE 1

Participants' Postgraduate Training Year, Gender, Previous Prehospital, and Disaster Medicine Education (Exposure to Any Kind of Seminar, Lecture, Elective)

	Number (%)	Male (%)	Prehospital Education (%)	Disaster Medicine Education (%)
PGY-1	6 (4%)	5 (83%)	3 (50%)	4 (66%)
PGY-2	15 (10%)	3 (20%)	11 (73%)	7 (47%)
PGY-3	21 (14%)	9 (43%)	12 (57%)	4 (19%)
PGY-4	62 (43%)	11 (18%)	41 (66%)	26 (42%)
PGY-5	42 (29%)	15 (36%)	26 (62%)	18 (43%)
Total	**146**	**43 (29%)**	**93 (64%)**	**59 (40%)**

PGY = postgraduate year.

required hospital admission, whereas 44 were promptly discharged following medical assessment, 11 were still awaiting assessment at the end of the exercise, and for the remaining 4, island evacuation was deemed urgent. At the end of the exercise, all casualties had been triaged and assessed at least 1 time. All scenes were cleared; however, 10 casualties from scene Alfa were still awaiting definitive evacuation from a first-aid area that had been established just outside the scene to collect casualties waiting for transport, and 6 more casualties were waiting at the civil protection advanced medical post. This was a result of the limited transportation resources available to participants in the exercise. Twelve casualties were left dead on the scene, including the 5 casualties who were already dead at the beginning of the exercise.

Debriefing

The debriefing was held immediately after the drill. It consisted of a presentation of both the quantitative data regarding performance (triage, morbidity, and mortality) and observations from the participants' observers' team and the drill staff. Using a self-assessment approach to the debriefing, participants were very open to share and reflect on their experiences. Many participants felt overwhelmed by events during the exercise. Participants in coordination positions shared how they appreciated the need to mentally switch from a clinical perspective and mindset to a more managerial role. This attitude was shared by most participants, as the first on the scene of 1 injury site reported: "The most difficult thing of the exercise has been to switch from my usual (health care) role, my zone of comfort, to a new job. As soon as I arrived on the scene, … it was crowded by people asking for help, I had to ignore them, to liaise with the command on scene, trying to focus on my new job and my team, trying to understand how we can really help here…." Attention and focus under stress, the limited amount of mental resources were constant topics during the debriefing. The need to seek help was covered as well. Junior residents who happened to be in command positions by course of events shared the need and relief of asking for help and, when feasible, transferring command to a more senior colleague, as it would happen in real life as well.

Among selected topics of debriefing, finally, a major role was covered by communication. Communication was felt as the single sole determinant of decreased outcome and quality of response during the drill. One participant reported: "What really struck me was seeing red codes deteriorating to black, and not because I couldn't clinically treat them prehospitally, but because I was unable to communicate with dispatch to expeditely transfer them to hospital, where they could have been saved with pretty ordinary interventions. They were dying because of lack of communications." The whole debriefing was run with focused facilitation (exploring deeper key aspects of performance). At the end of the participants' feedback, the facilitators integrated the debriefing with information aiming at closing knowledge gaps as they emerged.

DISCUSSION

Participating trainees had the unique opportunity to experience a preparatory hands-on skill training and a subsequent full-scale simulation of an MCI. To the best of our knowledge, this is a unique training program organized by a national scientific society exposing residents throughout the country to a systematic practical training in the field of disaster medicine and management. Residents acting as responders experienced management responsibilities and exercise procedures, while observers assessed and evaluated procedures and the medical response. Casualties followed the entirety of the scenario management "from the inside," both interacting with multiple rescue agencies and appreciating the overall response. Globally, participants could see firsthand the consequences of their efforts in the preparatory phase. Following the exercise, residents participated in a post-event debriefing session, which allowed them to critically rethink about the taken decisions and the performed actions, to share reflections and lessons learned from the day.

Overall technical performance, as measured by triage correctness and key-time measurement, was very good compared to the limited exposure that participants had with theoretical knowledge. This could be explained by the fact that triage and basic principles of disaster medicine can be taught in simple, short, and focused educational interventions as previously suggested by other educational works.[8,11]

We know that many of the problems experienced during disasters are not caused by clinical inexperience, but rather in failures in leadership and management.[12] The role of manager, leader, and the importance of protocols and communications were all highlighted during the debriefing. During the after-action review, residents were able to autonomously extrapolate all of the fundamental principles of disaster management directly from participating in the simulation.

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The participation to the debriefing of other agencies allowed residents to discuss the concerns, limitations, and capabilities of other professionals in the process of disaster response and the exercise.

We believe that this program should be of inspiration to other training programs and national scientific societies. This exercise allowed this group of anesthesiology residents to include disaster management training, as stated in their training requirements, into their curriculum. Programs looking at duplicating these experiences can identify scenarios and resources relevant to their local settings, base their curriculum on the intended target learning, and can easily find resources on drill organization on the Internet and in published literature. A limitation of this brief report is that it does not present data regarding knowledge retention over time, as this was not assessed. A dedicated research project investigating the educational effectiveness, including retention, of the overall Academy program is currently ongoing.

CONCLUSION

This was an invaluable experience for the anesthesiology trainees, providing them with the skill set to understand the fundamental principles of a mass-casualty response, as stated by the European Board of Anesthesiology European training requirements, and overall for becoming better and more prepared doctors and anesthesiologists of the future (we hope).

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