



REVIEW

Full-scale simulation may be used to train medical students in disaster medicine



Monika Afzali*, Sandra Viggers

Students' Society of Anaesthesiology and Traumatology, the University of Copenhagen, Denmark

S U M M A R Y

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The international medical community has identified medical students as a viable resource to be used in response to national and international disasters. However today there is still no formal pre- or postgraduate training in disaster medicine for medical students in Denmark. The Students' Society of Anaesthesiology and Traumatology (SATS) in Copenhagen developed a three-day disaster medicine course called Trauma Days 2013. The course curriculum was designed to give participants insight in and the basic skills required during a disastrous event and consisted of lectures, workshops, and full-scale simulations. The course may be useful as an educational introduction to the topic of disaster medicine. A formalized curriculum in medical schools, eventually as an elective course, may educate medical students in disaster medicine.

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1. Introduction

Estimates indicate that more than 3.4 million people have died over the past quarter century directly due to disasters. Billions of dollars have been spent to rebuild and take care of the communities and people affected by these disasters.¹

Disasters can be defined as events in which the number of those affected and injured, and the severity of their injuries, exceed the capacity of available medical resources.² For disaster management to be effective it must be organized at local, regional, and national level. Moreover international contributions are often necessary as multiple casualties lead to great demands on the available health-care resources.³ Generally speaking, medical preparedness for disasters can be seen as a “chain of disaster management” with medical care divided into three categories:

On-scene healthcare personnel, transportation and distribution of the injured, and stationary locations such as pre-hospital facilities or general hospitals.^{2,3}

Therefore, pre-hospital cooperation between medical personnel and valuable participants in emergency care such as the Red Cross is necessary for optimal disaster management.

Disasters are complex events that involve many casualties and environmental factors that are hard to reproduce inside a

classroom. Simulation-based training appears to be effective⁴ and in Denmark medical simulation is an increasing part of the education process for doctors and nurses, especially for those working in the field of anaesthesiology. Simulation training allows clinical situations to be recreated and trained in a controlled environment and can also be used to train teamwork and communication skills.^{4,5} Simulations are traditionally performed at simulation centres. However, it is generally recommended to choose a location for simulation depending on the learning possibilities and objectives desired.⁴ The increased use of medical simulation in both pre- and postgraduate medical training makes the use of simulation in disaster medicine obvious. In disaster medicine it is advantageous to conduct the simulation outside of the simulation centre. Research indicates that students enjoy simulation training and that it can enhance their learning experience.^{6–8} Other studies have shown that students are motivated for learning about disaster medicine and that education in disaster medicine can be taught in a reasonable time.^{7,9,10}

Recently, the international medical community has identified medical students as a viable resource to be used in response to national and international disasters.^{6,9,11–13} A 1997 workshop in disaster medicine organized by the European Community Core Group recommended the implementation of a one-week course devoted to disaster medicine in medical schools.¹¹ This recommendation was not implemented in Denmark and today there is still no formal pre- or postgraduate training in disaster medicine for medical students in Denmark. In the United States there is an

* Corresponding author. Vibekegade 29, 2.tv., 2100 Copenhagen, Denmark.
E-mail address: monika_afzali@hotmail.com (M. Afzali).

increasing awareness of including disaster medicine in the medical school curriculum¹² and literature from Germany and Sweden describes how a curriculum in disaster medicine has been taught for years.^{9,11} Although no published works exist, at the Arctic University of Tromsø in Norway, a week-long course in disaster medicine is a regular part of the medical school curriculum. In Tromsø, the students help organize and teach an annual disaster medicine course. The fourth year students participate in workshops, attend lectures, and ultimately participate in a one-day disaster simulation. The fifth and sixth year students teach some of these workshops. On the last day there is a simulated disaster where the students participate as figurants and emergency personnel.

Therefore in May 2013 the Students' Society of Anaesthesiology and Traumatology (SATS) in Copenhagen, Denmark hosted a three-day full-scale mass-casualty simulation course in disaster medicine for medical students.

The goal was to increase the students' knowledge about disaster medicine and introduce the concept of triage and decision-making in emergency care. Organizers also wanted to enhance the students' interest in disaster medicine and present and practice the skills necessary not only in disaster medicine but also in everyday clinical practice. A Lickert scale was used to describe the participants' self-assessed capability and confidence in managing the patients during a disaster.¹⁰

2. The course

The course was conducted on a military training facility in Vordingborg in the southern part of Zealand, Denmark. A total of 66 medical students, 62 from SATS and four from the Norwegian sister organization in Tromsø, participated in the course. The participants were represented from all 12 semesters, thereby ranging from first year to last year medical students.

The course was designed stepwise after the TüPASS model for scenario design.¹⁴ First the financial and logistic resources were identified, which has to be the first step in program design, and then the subject was chosen and the key learning goals established.⁵ The course curriculum consisted of workshops and lectures related to disaster medicine, along with three additional full-scale simulation-training scenarios. The lectures were held by experts within the given fields and the workshops and simulations were facilitated by junior doctors and paramedics with great experience in medical simulation and workshop-based education. The program (Table 1) was organized to ensure that all students participated actively. This was achieved by mixing the participants across semesters during the workshops and simulations to ensure adequate competencies within the groups. The participants were divided into four groups, three groups of 16 and one of 18 participants, with two instructors per group. To optimize learning material was sent to the participants prior to arrival at the course.⁴ This material included articles on the systematic ABCDE approach,¹⁵ algorithm for the treatment of accidental hypothermia,¹⁶ drowning,¹⁷ and a packing list to ensure participants safety and comfort throughout the course.

2.1. Economy and funding

A course of substantial size made by students for students, requires a great deal of resources. Event planning began in early 2011. The Danish Society for Anaesthesia and Intensive Care Medicine (DASAIM), The Society for Junior Anaesthesiologists in Denmark (FYA), Faculty of Health Sciences at the University of Copenhagen, the Association of Danish Medical Students (FADL), and the Tryg Foundation provided funding for the event. In all € 30,000 was received and along with the course fee of € 45 á person, a total of €

33,000 was raised to fund the event. In addition to the financial support, a private fire and ambulance company contributed ambulances, fire trucks, and an emergency medical service crew. The Danish Red Cross contributed their international mobile communication unit, radios and additional resuscitation equipment.

The organizing group consisted of 21 volunteers from SATS Copenhagen. Volunteer instructors and speakers conducted the lectures, workshops, and simulation scenarios. The faculty of instructors and speakers consisted of anaesthesiologists, junior doctors, orthopaedic surgeons, paramedics, a police officer, and a historian.

2.2. Workshops

Five workshops were designed to prepare the participants for the ensuing simulations. The workshops included training in technical skills such as radio communications, the emergency kit, tourniquet use, and transportation of patients. The workshops also included training in non-technical skills to be used during radio communication and prioritizing systems including the ABCDE approach and triage.

The emergency kit workshop was conducted to make all participants familiar with an emergency kit which every 2-person response team could make use of in the event of a disaster. The kit contained standard basic emergency equipment for the management and interventions related to the ABCDE approach. Due to limited resources some equipment was homemade, such as oxygen bottles made out of painted plastic bottles and finger pulse oximeters made out of matchboxes. Fig. 1 shows a picture of one of the emergency kits.

The triage workshop was conducted to teach the participants to prioritize patients. As volunteers were limited, patient cards were used in place of live figurants. The triage system was taught from a medico-organizational point of view where casualties can be divided into four categories^{2,3}; patient category 0; dead and dead on arrival, patient category 1; life-threatening cases demanding immediate attention, patient category 2; non life threatening cases demanding immediate attention and patient category 3; casualties not necessarily requiring hospitalization but less demanding care.

The radio communication workshop was conducted to train the participants to manage the radio equipment and to prepare the participants for the challenges related to communication in a disaster scenario environment.

2.3. Lectures

The goals of the lectures were to provide the participants with basic theoretical knowledge. The lectures preceded the simulations and were specifically related to the topic of the scenarios and learning goals of the simulations.

The lectures were presented on infrastructure, the history of disasters, primary care of casualties, personal safety, triage, and general theory about the ensuing simulation exercises.

2.4. Scenarios

The course included three simulation scenarios. The course faculty made a conscious decision to present the participants with a high volume of stress in these scenarios. This was done to amplify the participants' decision-making process, which is a key element in disaster medicine.¹¹ To heighten the participants stress levels an alarm went off at the end of each lecture and the participants were presented with a video played on a big screen in the auditorium. The video was prepared as a news report, briefly describing the accident they would encounter in the field. Thereafter the

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