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An innovative approach to educating primary health care teams about medical emergencies

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ABSTRACT

Management of emergencies is an integral part of primary care. However, the wide range of symptoms and the rarity of the situations make it difficult for primary care workers to be continually updated and competent in providing life support. In Ljubljana Community Health Centre, we use innovative approaches and modern teaching techniques to educate primary health care teams on how to manage medical emergencies.

The three-level educational approach described here enables comprehensive education in managing and recognising dangerous medical situations. It also provides a safe way of learning how to manage difficult, uncommon and serious clinical situations.

This comprehensive educational approach is oriented towards continuous improvement in quality and the safety of patients at the primary health care level.

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Introduction

Management of emergencies is an integral part of primary care. Being first contact care providers, primary health care workers may encounter types of emergencies that require up-to-date knowledge and medication, communication and manual skills, trained staff, appropriate equipment and practice organisation. The wide range of symptoms and the rarity of the situations make it difficult for primary care workers to remain up-to-date and competent in providing life support [1]. A lack of practical skills was the most frequent reason mentioned by primary care physicians as a barrier to not acting appropriately in an emergency [2]. However, it is the responsibility of all to be knowledgeable and skilled in responding, and managing a life-threatening situation, but especially primary health care workers since they are front-line care-givers [1].

Professionals who are not employed in an emergency department require education for treating patients in life-threatening situations in a safe and controlled environment, where they cannot only acquire knowledge and skills, but also learn how to cope with their own feelings, difficult patients, dangerous situations, and unexpected events, as well as sharing competencies as a team [3]. In this article, we describe an innovative, staged educational approach to managing medical emergencies in primary care.

Educational approach

In 2014, Ljubljana Community Health Centre established a Simulation Centre ('SIM Centre') as a response to the educational needs of more than 1500 employees. High-quality, realistic simulations are used to train healthcare and non-healthcare workers in managing medical emergencies.

The SIM Centre's educational approach comprises classroom simulations with 3-dimensional (3D), highly realistic simulators [4]. The focus is on the management of different medical emergencies which rarely occur in primary care (life-threatening situations, childbirth, and trauma), and are intended for family physicians and paediatric teams. The second level of the SIM Centre's educational approach is onsite ('in situ') simulations of a cardiopulmonary resuscitation, which takes the training of the teams from the SIM centre to their working environment. The third level of the approach focuses on augmented reality, managing an emergency situation where the dynamics of the patient's health are rarely seen in practice, but need to be recognised immediately and treated appropriately [5] (see Table 1). The entirety of the training is focused on theoretical knowledge, manual dexterity, simulations, and debriefing. The latter is carried out according to a tool for structured clinical debriefing – 'TALK' [6].

Table 1. A Comprehensive Three-Level Education on Medical Emergencies at Primary Healthcare Level.

LEVEL	CONTENT	METHOD	LEARNING OUTCOMES
One: Classroom high reality simulations	Cardiac arrest Childbirth Trauma	Lecture (theory) Manual dexterity training Classroom high reality simulations Debriefing	Explain theoretical knowledge Improve manual dexterity Work efficiently in a team Manage medical emergencies Cope with difficult situations (i.e. the presence of a patient's relative at the scene)
Two: In situ simulations	Cardiac arrest in the workplace	In situ simulations Debriefing	Manage cardiac arrest in the working environment Use appropriate equipment from the workplace efficiently Work efficiently in a workplace team Improve the competence of the health team for managing cardiac arrest Improve quality and safety of cardiac arrest handling in the workplace
Three: Simulations with augmented reality	Anaphylactic shock	Lecture (theory) Simulations with augmented reality Debriefing	Provide theoretical knowledge Describe the dynamics of evolving anaphylactic shock Recognise evolving anaphylactic shock Manage anaphylactic shock in an appropriate and safe way Cope with own stress in emergency situations

Classroom high reality simulations

The programme of education is offered two formats: classroom education in the SIM Centre and mobile education in a mobile simulation unit ('SIM mobile'). The latter is a 16-metre long trailer with two simulation spaces: an emergency room and a debriefing room, and it is used to bring the classroom to the participants. The programme uses different teaching methods (see Table 1), the most important of which is 'progressive simulation' with highly realistic 3D simulators [4]. Currently, we use models of a newborn baby, a preschool child, 45-year man, and a geriatric patient, with pre-prepared scenarios linked to each.

Using simulation, we can replicate patient cases in order to mirror real-life situations in clinical settings [7] and compare the knowledge of different teams. This provides a safe way of learning how to manage difficult, uncommon, or serious clinical situations. The scenarios are standardised but at the same time flexible, which allows adaptation to the level of competence of the participants. The training process is uniform and standardised, which fosters high quality learning and does not require years of exposure to accident scenes. Realistic, stressful scenarios using highly realistic 3D full-body simulators enhance simulated learning, where primary health care teams can interact with the patients. Using this approach, it is also possible to repeat the same scenario and hence increase the level of experience [8]. The simulations can also be used for assessment [9], which adds value to training with simulations. The outcomes of the training with simulations have included social and structural improvements, and a sustainable culture of patient safety [10], as training of this type enables the recognition of safety risks whilst managing the patient [11,12]. There is some evidence that training with simulation improves patient outcomes [8,13,14], but more and better evidence is required.

On-site ('in situ') high reality simulations

Learning using simulation is extended by on-site ('in situ') simulation, where the simulation is delivered in the actual clinical environment of health care workers [10,11,15]. During the simulations, participants are located in their usual workplace and use their own medical equipment. We developed a model of training using in situ simulation for resuscitation and the identification of critically ill patients at thirteen locations, for 1500 employees, mostly family physicians and paediatricians. Throughout the simulation, all the employees at the various locations were checked for how well they knew the protocol for calling the medical team (e.g. the specific phone number, actions to be taken by other health care providers and so forth) and observed for how the team on duty reacts. Following each in situ simulation, a report is presented.

Augmented reality

Augmented reality is a fusion of projected computer-generated images in the real-life clinical environment [16], and is usually used to enhance perception of a real situation. Visually, the scene a person sees is augmented by computer-generated objects. These 'virtual objects' are placed in the scene (i.e. 'registered') in such a way that the computer-generated information appears in the correct location with respect to the real objects in the scene [5] that the participant sees whilst wearing the head-mounted displays used [17]. We developed an augmented reality scenario for managing a patient with anaphylactic shock, which is rarely seen in practice, as a part of an education programme (see Table 1). When the head-mounted display is put on, the wearer can see a woman with symptoms of anaphylactic shock

that gradually worsen. Her breathing becomes difficult, an urticarial rash appears, and she says that she is not feeling well and that she cannot breathe. When asked questions, she answers. The participant is then required to apply the steps necessary to treat this patient in the correct way, otherwise the augmented patient dies.

Augmented reality differs from virtual reality, it is a technology which allows users to explore and manipulate computer-generated real or artificial 3D multimedia sensory environments in real time to gain practical knowledge which then can be used in practice [18]. Augmented reality has been used in clinical practice, for example in emergency medicine (for a user-environment interface, telemedicine, and in education and training) [19].

Lessons learned for educators

The AR teaching method allows the anaphylactic shock scenario to be blended into any clinical or non-clinical environment. It mirrors real life situations which are rare, and this can induce a high level of stress and anxiety in learners, which is very similar to the actual situation of a patient with anaphylactic shock. This enables more comprehensive learning and prepares participant better should the real situation occur. With this method, a learner can learn the dynamic of change to the patient's health status, and how to prevent a fatal outcome.

Teaching with simulations also enables team learning which is essential for harmonised work when faced with real situations [14]. Through the learning process in the SIM Centre, teams can learn to trust each other's ability to handle a situation appropriately. Primary care teams that have been involved in team education have indicated that their clinical management skills and confidence is improved, taking a lead role, giving instructions and delegating tasks as required [14]. However, the transferability of the educational outcomes to the clinical setting needs to be more clearly demonstrated [13].

Learning in the SIM Centre is based on structured feedback [6], which fosters learning from mistakes and prepares teams for managing stressful situations in the workplace [8]. They can safely explore their feelings and fears, and learn how to face and overcome them.

Implications and next steps

The staged structure of this educational approach enables comprehensive training in managing medical emergencies on the one hand and recognising potentially dangerous medical situations on the other. Through this approach, we can assess performance and identify potential safety risks in the treatment of

patients. Such an approach enables continuous quality and safety improvement for patients in primary health.

Our next steps involves evaluating the education delivered with augmented reality [20] to examine the educational effect of this method, compare it to other educational methods [21], and to determine its advantages and disadvantages. We also plan to develop more scenarios, not only for medical emergencies but also for other primary care topics, such as mental health, communication, and so forth, and to expand the participant populations to lay people and even children [22]. In addition, we would like to roll out implementation of this education programme to all regions of Slovenia.

Conclusion

We have described a unique educational approach using simulations to teach primary health care teams at the Ljubljana Community Health Centre to manage medical emergencies in a safe and effective way. It has been developed as a dynamic answer to recognised educational needs, and is being continuously adapted to meet new educational demands. The approach consists of three stages, starting with classroom or mobile simulations with the purpose of presenting medical teams with the most common emergencies. This is followed by in situ simulations developed as a consequence of noted safety risks in practice, mostly associated with a lack of clarity about the roles of professionals during resuscitation. The training course ends with simulations in augmented reality, which is especially important for those who have never seen anaphylactic shock before.

Disclosure statement

No potential conflict of interest was reported by the authors.

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