

学位論文の要旨

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学位論文名 High-fidelity Multidisciplinary Competition-based Simulation Tasks in Prehospital Emergency Medical Service

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論文内容の要旨

INTRODUCTION

Simulation task teams were conducted, with each team consisting of a medical doctor, a nurse, an emergency life-saving technician, and an ambulance crew certified for rescuer tasks. The scenarios were competitive, using high-fidelity manikins and standardized actor patients on-site and at stations, referred to as Rallye Medicina. This study aimed to evaluate tasks in a Japanese medical rally in 2019 for effectiveness. Multiple attribute utility technology was used, as the task was intended to achieve multiple goals.

MATERIALS AND METHODS

Three tasks — pediatric emergency care, care of injured drivers in traffic accidents, and response to multiple casualties in terrorism — out of seven drills were analyzed. Four goals - improving teamwork within the emergency response team, enhancing emergency care skills, increasing patient survival rates, and building public trust in emergency care—were determined. Five stakeholder groups consisting of four types of emergency professionals, one administrator group, and a panel of emergency medical doctors specializing in medical rally, were designated. Stakeholders determined the relative importance of the goals, and the panel assessed the goal achievement rate based on the actual and target values of each achievement. Utility scores for tasks were calculated by group. According to the ethical guidelines for medical and health research involving human subjects in Japan, ethics committee approval was not required for this type of study.

RESULTS AND DISCUSSION

Utility scores in the groups, overall, were as follows: 80.2 for pediatric care, 79.1 for drivers' care, and 88.5 for mass casualty response. All five groups had the highest utility score for mass casualty response among the tasks, with the same priority order.

The current study is the first to evaluate MR simulation tasks by the MAUT methodology for effectiveness in achieving the goal. While skill and knowledge were found to increase and improve with simulation education and team leadership enhanced after technology-assisted simulation for trauma resuscitation, the current study also suggested that drilling MR tasks could perform increase in teamwork. Additionally, the survival rate of casualty and public trust in EMS may be increased with four types of professionals and possibly in association with administrative personnels.

Both stakeholders and Panel joining the current study agreed with 4 goals expecting in 3

simulation tasks and then the MAUT methodology assessed the achievement of goals by the competitor teams. As a result, all three simulation tasks represented utility scores at quite high or moderate values.

The semiquantitative data from our analysis can contribute to the arrangement and revision of simulation tasks for practice and drills. Especially, the data on the MC from bombing and hewing can be composed for education on preparations of local agendas of MC by terrorists, as well as natural, and human disasters.

The Tokyo Sarin Subway Attack by a religion cult, close to Japan Ministers' office arose in 1994. Among 5,500 people harmed, 35 were killed. In the overall emergency responses, only 5% were transported by official rescue/security and emergency paramedics vehicles. The responses from the local authority headquarter to the rescue control of main local hospitals were inefficient, also because of the out-patients clinics and EMS departments being overwhelmed due to a sarin toxicity outbreak.

Since the Tokyo sarin mass casualty, similar terrifying massive killing from chemical toxicity has been modelled and the scenario simulation for drills have been adopted by Japan MRs at many sites. *Rallye Rejviz* also adopted simulation tasks addressing the hazards of toxic chemical substances.

The multiple bombing at Boston Marathon, 1998, which saw three casualties and 264 injured people, is a well-known case of mass casualty terrorism. In this event, hospitals had sent EMS professionals to the site and they collaborated with the triage category to complete the rescue operation in 45 minutes to transport the injured people to the hospitals. Prior to this event, local hospitals, emergency and rescue authority, and local governments did educate and train EMS personnels and hospital resources under the plan for MC. According to this paper, it was owing to the great preparedness against the MC.

In accordance with the Boston Marathon triage service, a one-hour simulation exercise in a computer-controlled room simulating bomb explosion and gun shooting mass casualty was developed for controlling triages.

Gas explosion-simulated event brought in eight seriously injured persons and two teams consisting of paramedics, nurse, or physicians conducted a triage in a limited time which observers consisting of a variety of health providers also conducted. The triage categorization results were judged for both teams and observers. Therefore, observers also can examine theirs being correct or wrong.

However, except for the current study on MC from bombing, gun shooting, or gas explosion, there were none studies concerning high fidelity scenario-based simulation drills by multiple EMS professionals.

As to injuries from car accidents, a study using manikins for bone fracture reported a scenario-based simulation tasks. Another study with a manikin was arranged in a scenario wherein a manikin driver was within a car that could not be opened, causing the trained rescue experts to remove the driver. As for pneumothorax from car accident-derived trauma, there were no mimicking or simulation scenarios drilled for education and training of EMS professionals.

For a laboratory-based simulation tool, high fidelity manikins like a child had been developed and used. The manikin infant appeared flush with eczema on the skin, mimicking anaphylactic manifestations, and needing treatment with venous injections of epinephrine in the appropriate dosage. Besides this simulation on education using high fidelity manikin, there are no reports on

simulation-based drills among school children suffering from anaphylaxis.

Dehydration problems manifest in people walking on hills, and physicians in the USA have developed guidelines to prevent it, which reportedly helped a lot in the preparation of emergency rescue. However, none of such scenarios were simulated in this study.

CONCLUSION

Conducting and participating in the medical rally achieve goals in real-world settings. Simulation tasks would be crucial for the education and revision of local institutions' plans for emergency preparedness, with consideration for potential disasters such as mass casualties.