

SAFETY

simulation for medical practice

SIMULATION APPROACH FOR
EDUCATION AND TRAINING
IN EMERGENCY

R1.2 Desk Research on scientific literature review - Action Plan



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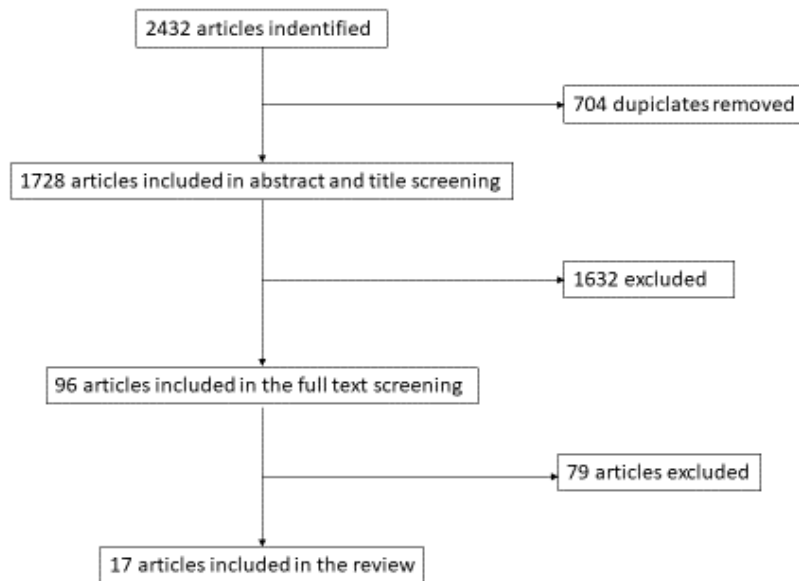
Optimal Team Composition in Emergency – a Systematic Review Simulation Approach For Education and Training in emergency / (SAFETY)

Resuscitation simulation training has been shown to improve interdisciplinary team performance, which can lead to improved patient outcome.(1) To optimize the benefits of simulation training it is essential that we identify the optimal composition of resuscitation teams so that we can reproduce these in training. Unfortunately, there exists little research on optimal team composition either for simulation or in real life. As part of the ERASMUS+ project 'Simulation Approach For Education and Training in emergency (SAFETY)' we have reviewed the current scientific literature and performed a systematic review to answer the question – what is the optimal team composition in medical emergencies?

Search Strategy

We searched the databases Embase, Medline and PsycInfo using the terms: team, trauma team, healthcare, treatment, emergency, medicine, and centre. These searches lead to 1565 results from Embase, 748 from Medline and 119 from PsycInfo. 704 duplicates were removed, leaving 1728 articles included in the initial abstract and title screening. After this screening, 1632 articles were removed as the main topic of the article was not optimal team composition in emergency, and the remaining 96 articles were included in full text screening. After full-text screening 17 articles were included in this analysis. See Fig 1. for study flow

Figure 1 Study Flow



Quality of the included studies

The methodological quality of the studies included in the review was graded using the Medical Education Research Study Quality Instrument (MERSQI). This instrument allows scoring of articles based on study design, sampling, data analysis and outcomes. (2) The MERSQI scores of the 17 articles included in the final report were 1.5, 2.5, 8, 10, 10.5 (2), 11 (4), 12, 12.5, 14. Four reports were deemed inappropriate for this scoring system.

Table 1 – Quality of the studies

Domain	MERSQI Item	Score	Studies. No. (%)
Study design	Single group cross-sectional or single group posttest only	1	8
	Single group pretest & posttest	1,5	1
	Nonrandomized, 2 groups	2	1
	Randomized controlled trial	3	
Sampling	<i>Institutions studied:</i>		
	1	0,5	7
	2	1	1
	3	1,5	4
	<i>Response rate, %:</i>		
	Not applicable		5
	<50 or not reported	0,5	1
50-74	1	1	
>75	1,5	4	
Type of data	Assessment by participants	1	4

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	Objective measurement	3	7
Validity of evaluation instrument	<i>Internal structure:</i>		
	Not applicable		4
	Not reported	0	3
	Reported	1	4
	<i>Content:</i>		
	Not applicable		4
	Not reported	0	3
	Reported	1	4
	<i>Relationships to other variables:</i>		
	Not applicable		4
	Not reported	0	3
	Reported	1	4
Data analysis	<i>Appropriateness of analysis:</i>		
	Inappropriate for study design or type of data	0	2
	Appropriate for study design, type of data	1	9
	<i>Complexity of analysis:</i>		
	Descriptive analysis only	1	7
	Beyond descriptive analysis	2	3
Outcomes	Satisfaction, attitudes, perceptions, opinions, general facts	1	3
	Knowledge, skills	1,5	2
	Behaviors	2	1
	Patient/health care outcome	3	6
Total possible score		18	

Results

We found no articles describing optimal team composition for emergency training. All the reviewed articles describe real life treatment, not simulation. When presenting the results we have divided our findings into two different sets of teams: those involved in inpatient resuscitation and those concerned with acutely admitted patients resuscitation. Most of the literature was related to management of acutely admitted patients with major trauma.

Outpatients/ Acutely admitted patients

Trauma teams

The advent of trauma teams has been shown to improve patient outcomes. (3) One of the key features of the trauma team that is believed to contribute to the improved patient outcome is the multidisciplinary nature of the team. (4-7) The 1996 NICE guidelines from the UK recommend that trauma units should have a multispecialty trauma team available to receive patients with major trauma. They recommend not to use a tiered trauma team response. They should however have a

paediatric trauma team immediately available for children under 16. For the larger major trauma centres, they recommend also having a paediatric trauma team but suggest considering a tiered trauma response for adults with either a standard multispecialty trauma team or a standard multispecialty trauma team with involvement of specialists from supporting departments and services such as transfusion, interventional radiology and surgery. They do not describe members of this multispecialty trauma team. (Major Trauma: Service Deliver. National Institute for Clinical Excellence, www.nice.org.uk/guidance/ng40 (accessed 15 July 2021).

There is considerable variation in trauma team composition internationally, although there appears to be a consensus that a basic trauma team requires a team leader, who is usually a surgeon but can also be an emergency physician. The team should also include an anaesthetist, one or two emergency nurses and a radiology technician. (8) Some hospitals include specifically trained response nurses in their trauma teams, which improves the overall function of the team as suggested by staffing surveys. While the team leader coordinates the resuscitation and performs the initial survey, the anaesthetist manages the airway, the radiologist performs the imaging and the nurse scribes and assists with procedures. (9)

Trauma teams can be strengthened by the addition of a neurologist or neurosurgeon to perform the neurological assessment and a radiologist to conduct a focused assessment sonography (FAST) and to interpret the images. However, other members of the basic trauma team can also fill these roles. (8) Although additional team members are often present, it is important not to have an excessive number of people in the team, as it becomes more difficult to ensure that the team leader has overview and that all team members adhere to the advanced trauma life support (ATLS) protocol. (8)

In some hospitals the composition of the trauma team varies according to the reported trauma mechanisms and expected injuries. (10-12)

A survey sent to the directors of all 64 approved emergency medicine residency programs in the US with an 84% response rate (54 programs) found that 39 programs (72%) had functioning trauma teams. However, the trauma team composition varied widely in the different hospitals. Only 38% of the trauma teams included an anaesthetist and only 54% included a surgeon. On the other hand, 90% of the teams included an emergency-medicine resident. This emergency medicine resident served as trauma leader in 50% of trauma cases, sharing the role with the general surgical resident 23% of the time. (13) This survey suggests that in the US many traumas are managed without an anaesthetist or surgeon in the team.

A Danish cross-sectional questionnaire study covering all hospitals in Denmark with emergency departments examined the composition of Danish trauma teams. The study found that all hospitals had a designated trauma team that consisted of a

median of nine (7-11) different personnel groups including four (2- 6) physicians and three (2-4) senior physicians. (14)

Trauma team Leader

An essential component of the trauma team is the trauma team leader responsible for leading the resuscitation. (1) Strong leadership has been shown to improve speed and quality of patient care in trauma resuscitation, therefore leadership and teamwork training should be focused on in order to optimize patient care. (15)

The role of trauma team leader is often filled by a surgeon or an emergency physician (16). A retrospective study from a trauma registry in Canada analysing 571 patients over a period of one year found no difference in patients' outcome when the team leader was a resident emergency physician or a resident surgeon. (16) The finding that the specialty of the team leader does not affect patient outcome is consistent with other studies. (17, 18)

Further studies comparing a surgical vs. non-surgical team leader found similar results including no difference in predicted survival or length of stay in the emergency department. (17-19) Having a surgeon on the trauma team has been shown to reduce resuscitation time and time to surgery but not patient mortality. (18, 20)

One study looked at using a senior nurse as the trauma team leader. Survey feedback from the nursing staff was positive regarding team communication and leadership skill. However, there was no analysis of impact on patient outcomes, and the study was single centre and small. (21)

Paediatric Trauma Teams

The American Academy of Paediatrics guidelines recommend that a paediatric trauma team should be composed of 10-12 members, including one physician as team leader, two additional physicians, one neurosurgeon, one anaesthetist, one orthopaedic surgeon, emergency nurses, one respiratory therapist, one laboratory technician and one radiology technician. (Paediatric emergencies: An excerpt from 'Guidelines for Categorization of Hospital Emergency Capabilities.' Endorsed by the American Academy of Paediatrics. Paediatrics 85:897,1990.)

However, retrospective studies analysing patients' outcome with smaller paediatric trauma teams have shown similar patient outcomes. (22, 23) This includes a study in a Canadian hospital of 146 patients where the trauma team consisted of five members including one paediatric emergency physician, one paediatric emergency resident, one paediatric critical care resident, one respiratory therapist and one paediatric nurse. (23)

Specialised Trauma Teams

Limb amputation team

One centre has reported that they have a specific field team for limb amputations. This team consists of an attending trauma surgeon, a resident surgeon, a nurse, and a pilot. This team is able to perform amputation in the field if required. (24) Other centres report a larger limb amputation team also including the trauma surgeon and the nurse but also an anaesthetist, an orthopaedic surgeon and a cardiologist, thereby also allowing for intubation of the trauma victim prior to limb amputation. (25) The centre with the smallest team argues that the small size is meant to minimize the number of people to fit into the helicopter. In such cases, the trauma surgeon administers the drugs to induce pain relief and amnesia to the patient. This amputation field team will therefore add support to the emergency services team already present at the scene and the trauma surgeon can take command and perform the amputation. (24)

Paediatric Transport Teams

Another study relating to emergency team composition was a retrospective study looking at transport of 25 mechanically ventilated paediatric patients. It found that the addition of a physical therapist to the transport team consisting of a physician, a nurse and a nursing technician contributed to minimizing clinical complications. However, this study was also small and had no control group. (26)

Neurological Emergencies

Acute Stroke

Several hospitals have their own 24-hour acute stroke team whose composition varies among hospitals. (27) However, this may be challenging to achieve in smaller hospitals. In one community-hospital this was resolved by developing a stroke team facilitator role to assist in the treatment of strokes. These facilitators were from several health care professions including nurses, physical therapists, respiratory therapists and EKG technicians. They were specifically trained in the timely treatment of stroke and in charge of liaising with neurology-, radiology-, laboratory- and pharmacology-staff, thereby assisting the nurses and doctors in the acute management of stroke. With their stroke team facilitator they were able to provide a 24 hours-acute stroke service and showed (although with small numbers) an increase in the number of patients treated with intravenous tenecteplase. (27) Another stroke study, a retrospective study of 105 patients treated with recombinant tissue plasminogen activator for acute ischemic stroke between 2008 and 2012 in the emergency department of a comprehensive stroke centre, found benefits of adding a pharmacist to the acute stroke team. The addition of a pharmacist to the team reduced median door-to-treatment time significantly,

however dosing accuracy and percentage of patients with a door-to-treatment time of less than 60 minutes was not significantly reduced. (28)

Inpatients

Rapid Response Team /Critical Care Outreach Team

A rapid response team deals with inpatient emergencies, which involves the clinical deterioration of hospitalized patients. These teams are often also referred to as critical care outreach teams. Our review of the literature revealed a few studies relating to the composition of such teams. Among these was a survey of 77 hospitals in the Netherlands, which found that in 65% (55) of these hospitals the rapid response team only consisted of two members. (29)

Addition of a Pharmacist

A single centre pre/post interventional study retrospectively analysed 175 patient records post the introduction of a pharmacist to the rapid response team compared with 161 preceding the introduction. The primary objective was to observe if the addition of a pharmacist to the team reduced medication turnaround time. (30) Medication turnaround time is the time interval from prescription until drug administration. (31) It did show a reduction in both median turnaround time and in the percentage of patients where the turnaround time was less than 30 min; however neither of these results was statistically significant. (30)

Addition of a physician assistant

The effect of adding a physician assistant to a critical care outreach team was studied in a retrospective analysis of two hospitals in New York, USA, looking at over 3099 patients. Despite finding that the addition of the physician assistant led to a significant reduction in time to transfer to the ICU, there was no difference in mortality or length of hospital stay for these patients. (32)

Cardiopulmonary resuscitation teams (inpatient)

In a survey of 77 hospitals in the Netherlands, they found that cardiopulmonary resuscitation (CPR) teams consisted of a minimum of five team members. These team members included cardiologists, anaesthetists, intensivists and physicians from the emergency department.

Cardiac resuscitation team leader

The role of team leader varied according to the hospital type. In university hospitals the role was most often performed by the resident anaesthetist. On the other hand, this task was most commonly performed by emergency department doctors in teaching hospitals and by intensive care doctors in non-teaching hospitals. The role

of airway manager was always allocated to the resident anaesthetist in university hospitals; however in both teaching and non- teaching hospitals this task was performed mainly by intensive care doctors. (29)

In a study about cardiac arrest teams covering all hospitals in Denmark involved in emergency care they found that these teams consisted of a median of six (range 5-10) different personnel groups, including three (1-6) physicians and one (0-2) senior physician. (14)

Psychiatric emergencies

A single centre report of patients admitted to the emergency department with psychiatric emergencies argues that they can be cost effectively managed by an interdisciplinary team consisting of a psychiatrist, psychiatric nurse, social worker, and clinical psychologist. (33)

Discussion

Based on published papers on clinical practices, there appears to be "several roads to Rome" regarding the optimal team composition in an emergency resuscitation. Some hospitals advocate a large team while others manage with a smaller team. The minimum team described, a rapid response team, appears to require only two members, a doctor team leader and a nurse.

Most of the literature refers to trauma teams. Here the consensus is that a basic trauma team should consist of at least a team leader, one or two emergency nurses, a radiology technician and, preferably, an anaesthetist.

Our review of also shows that a trauma team needs a team leader but that this leader may not need to be a surgeon or even a doctor. (21)

Specialized team compositions are required for paediatric patients and acute stroke patients but again there are local variations.

Regarding the overall quality of the studies we reviewed, many of these scored low on the MESRSQI score. There were no randomized control trials and most studies were of single groups. The studies were also primarily single centres with descriptive analysis only.

In our search through the literature for the optimal team composition to deal with emergencies, we have therefore discovered variations in how to treat these emergencies efficiently. What is clearly lacking is any discussion of the optimal team composition **for training in** emergency medicine. In our literature search we found no articles on this topic. This leads us to assume that the "characters" used in simulation for training in emergencies are based on real life rather than on what would be required for the optimal training scenario. While this is a sensible

approach, it does not answer our key question: what is the optimal team composition of training in emergencies?

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