Promoting leadership and communication skills in emergency medicine residents: the role of High-Fidelity Simulation

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Abstract

The residency program in Emergency Medicine should include formal training in Non-Technical Skills (NTS). We evaluated the effectiveness of a program based on High-Fidelity Simulation (HFS) to improve the leadership and communication skills of residents in Emergency Medicine. In this prospective observational study, we performed 6 simulation sessions, each with 3 scenarios about the management of the critically ill. In the second to the fifth session, participants received specific training about: the ABCDE (Airway, Breathing, Circulation, Disability, Exposure) approach, leadership, communication, and situation awareness, one topic per session. Technical Skills (TS) were measured as the percentage of critical actions correctly performed by participants during the primary examination. NTS were rated by the Leadership Behavior Description Questionnaire (LBDQ), Communication Competence Questionnaire (CCP), and Clinical Teamwork Scale (CTS). The trend over the following sessions was evaluated. We examined 90 scenarios, 15 scenarios per session (three scenarios repeated 5 times). The LBDQ score reached in the fifth and sixth sessions (fifth: 25 [20-30]; sixth: 25 [22-29]), was significantly higher than that obtained in the first, second, and third ones (first: 23 [18-24]; second: 22 [16-26]; third: 20 [14-26], all $p<0.05$). The percentage of correctly performed actions during ABCDE assessment (10 [7-14] *vs.* 17 [15-19]), as well as CCQ scores (46 [42-48] *vs.* 51 [47-52]) and CTS scores (82 [64-88] *vs.* 94 [91-101], all $p<0.01$), increased significantly between the first and the last session. HFS confirmed to be an effective instrument to allow Emergency Medicine residents to acquire NTS skills in a safe environment.

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Introduction

Emergency Medicine is one of the medical specialties that has undergone the most profound changes in the last decades. Patients attending Emergency Departments (ED) are increasing worldwide, as they search for accessible, timely, and high-quality healthcare. Anyway, the risk to create conditions of overcrowding is high.[1,2] Emergency Physicians (EPs) need unique competencies to manage undifferentiated diseases and acute conditions, potentially life-threatening, with a timely and correct assessment and prompt decision-making.[3] The clinical setting does not allow for classically organizing the work, as the number of patients changes hour by hour, and workforces need to be periodically reorganized to cope with this ever-changing demand. The multi-professional structure of the team and the need to interact with consultants of other specialties complete the framework.[4]

In this complex reality, besides adequate medical knowledge and the ability to correctly perform appropriate procedures, EPs need dedicated practice in Non-Technical Skills (NTS) and training to develop leadership skills.[5,6] In fact, we know that good leadership behaviors affect the culture and the climate of every workplace, the experience and satisfaction of patients and the quality of care provided.[7] The challenge for EPs is that a significant proportion of them are not exposed to any formal teaching program to acquire the key skills, required to cope with the tough environment

of ED.[8]

High-Fidelity Simulation (HFS) is a technique that proved to be effective in the training of healthcare personnel in Technical (TS) and Non-Technical Skills (NTS) both in multi-professional teams, like the resuscitation team and the trauma team,[9,10] as well as during several residency programs.[8,11] It offers the opportunity to train in a safe environment and to reflect on the performance during a structured debriefing, with the aid of facilitators.[12] In this context, also novices can engage in the management of critical scenarios and then consider their strengths, limits, and areas of improvement.[13] The main drawback of simulation is the unfavorable ratio between trainers and trainees, especially in this moment of shortage of physicians, but understanding the great benefits of this kind of training may help overcome difficulties.

The Emergency Medicine residency program has a long tradition in the Anglo-American area, but is relatively new across the rest of Europe, including Italy. In this framework, covering a part of the training with simulation could help overcome the difficulties created by the lack of teachers specifically trained in Emergency Medicine in the clinical arena.

The aim of this study was to evaluate the effectiveness of a training program based on HFS in improving leadership skills as well as the TS of residents in Emergency Medicine.

Materials and Methods

Participants

We conducted a prospective observational single-center study; all training sessions were performed in the same simulation center (Centre for Advanced Simulation in Medicine, CASM) by the same group of facilitators. Participants were Emergency Medicine residents, who attended the five-year training program at the University of Florence, all in their second or third year of training. Every group included nine to ten participants and performed six simulation sessions. We selected this group as, based on the actual organization of the program, the first year is dedicated to the initial approach to the discipline based on the simulation of the typical presentation of the most common encounters in the ED. From the fourth year, the residents begin their training as simulation facilitators.

Study setting

This project was conducted in the CASM of the Careggi University Hospital in Florence, Italy. We organized a six-session course to train residents in the management of critical patients in view of their internship in the Emergency Department High Dependency Unit (ED-HDU). Every session included three scenarios covering the most frequent encounters in this clinical setting, including cardiac arrhythmias, shock, sepsis, acute respiratory failure, severe metabolic derangements, and trauma.

At the beginning of the course, all participants attended a 2-hour lecture about the relevance of the error in the medical practice and the importance of NTS to promote patients' safety.[14,15] In Figure 1, we showed the structure of the course. The first and the last session included only three scenarios. The sessions from the second to the fifth began with a lecture, which focused respectively on the ABCDE approach, the correct exercise of leadership, communication, and the maintenance of situation awareness, followed by a gaming activity on the same item. The scenarios were designed to mimic rapidly evolving situations and high-acuity illnesses that are routinely experienced in the ED-HDU.

At the beginning of every scenario, teams were invited to identify a leader without explicit rules to regulate their choice. Every participant had the opportunity to exercise as the leader.

The functionalities of the mannequin and the conduct of the scenarios have already been described elsewhere.[16] The debriefing was based on the Plus-Delta-Solutions approach. With the aid of the facilitators, participants highlighted well-done things and amendable actions, and they engaged in finding a solution for every issue, usually among NTS.

All participants gave their informed consent for video recording and analysis, as well as for publication of the results. According to the local Ethics Committee rules, ethics approval was not required.

Measurements

All sessions were digitally recorded and eventually used during

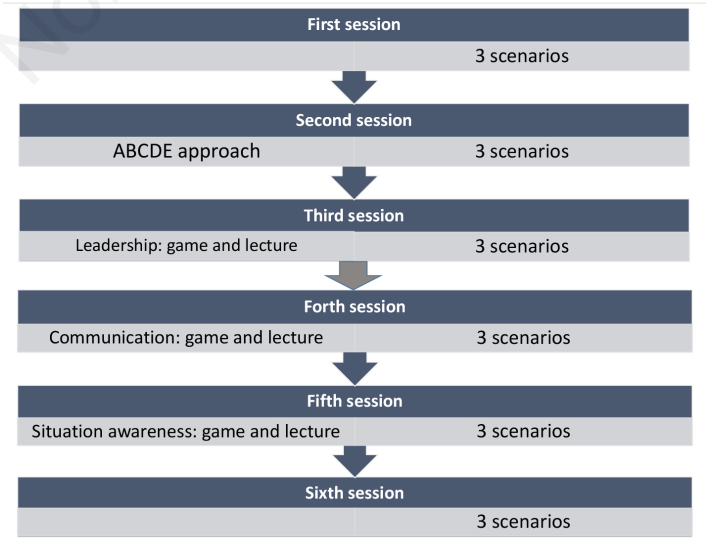

Figure 1. Description of the course structure.

the debriefing. The faculty running the simulation also provided the rating of TS and NTS, immediately after each simulation.

For the evaluation of the TSs, we counted the correctly completed items of the ABCDE approach, as previously described.[16,17]

NTSs were rated by mean of three different tools: i) Leader Behavior Description Questionnaire (LBDQ) Initiating Structure, to specifically rate the performance of the leader;[18] ii) Communication Competence Questionnaire (CCQ), to evaluate the ability of the leader to correctly communicate with the team;[19] and iii) Clinical Teamwork Scale (CTS),[20] for an overall evaluation.

Statistical analysis

The study population included all residents in their second or third year of the training without special exclusion criteria. We did not find analogous studies to base on the calculation of the sample size. Scores' values and the percentage of correctly performed actions were presented as median with interquartile range. Friedmann non-parametric test was employed to evaluate the trend of TSs and NTSs over the following sessions and the Bonferroni correction was applied for post-hoc analysis. Data were analyzed with the IBM SPSS software package (version 25). The level of significance was set at $p<0.05$.

Results

Overall, 49 trainees participated in the program, 43% males, mean age of 31±2 years; all of them had already attended a simulation course of 4 to 6 sessions about the initial approach to the most frequent encounters in the ED. We performed 30 simulation sessions, each including 3 scenarios, with 90 scenarios finally examined.

Before the beginning of the training program, we tested the reproducibility of the measurements of the NTSs between the two facilitators, who rated them during the simulation sessions. They reviewed the same five scenarios, collected from our archive, and rated the NTS by the CTS, LBDQ, and CCQ. The inter-rater reliability evaluated by Cronbach's Alpha was very good (0.955 for CTS, 0.979 for LBDQ, and 0.964 for CCQ). The Intraclass Correlation Coefficients were high both for single measurements (0.914 for CTS, 0.958 for LBDQ, and 0.930 for CCQ) and for the mean measurements (0.955 for CTS, 0.979 for LBDQ, and 0.964 for CCQ).

LBDQ (23 [18-24] *vs* 25 [22-29], $p<0.001$) and CCP scores (46 [42-48] *vs* 51 [47-52], $p=0.002$) increased significantly from the first to the sixth session. The percentage of correctly performed actions during ABCDE assessment (10 [7-14] *vs* 17 [15-19], $p<0.001$), as well as CTS scores (82 [64-88] *vs* 94 [91-101], $p=0.005$), improved as well.

The analysis for repeated measures, performed with the non-parametric Friedmann test, confirmed a significant improvement in the LBDQ global score through the following sessions. The scores reached in the fifth and sixth sessions were significantly higher than those obtained in the first, second, and third ones (Figure 2, top), as demonstrated by the post-hoc analysis. The following items "The leader made sure that his/her part in the team was understood by the team members", "The team leader planned the work to be done" and "The team leader maintained definite standards of performance" all significantly improved (Table 1), while "The leader let the team know what was expected of them (through direction and command)" and "The leader decided how things should be done" only marginally improved. The CCQ score, as shown in Figure 2, bottom, showed an analogous trend.

CTS score progressively increased from the first to the last session, with a significant improvement (Figure 3), both considering the global score and the communication and role responsibilities subscores, coherently with the findings of previously mentioned scores.

In the same way, the global number of correctly performed actions in the ABCDE assessment significantly increased (Table 2 and Figure 3). Considering single items, C and D significantly improved, while B was already assessed completely at baseline; A and E did not show a relevant change, probably because of the limited number of assessed actions.

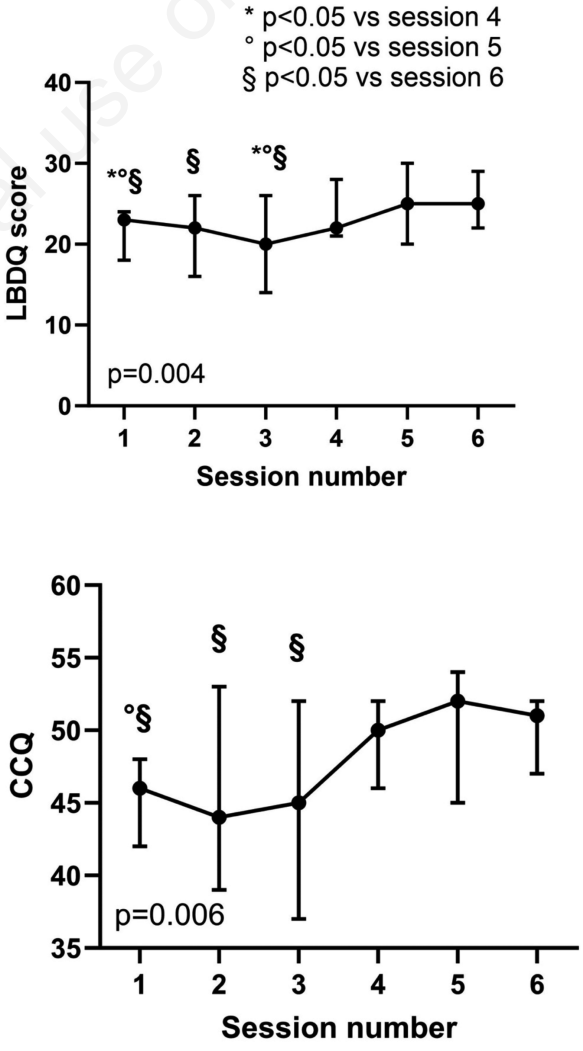

Figure 2. Trends of the Leader Behavior Description Questionnaire (LBDQ) and Communication Competence Questionnaire (CCQ) scores.

Discussion

A six-session program with HFS, aimed at training Emergency Medicine residents in the management of critically ill patients, determined a significant improvement in leadership skills as well as in the number of completed items of the ABCDE evaluation. During the training in Emergency Medicine, trainees need to develop both technical and non-technical skills. Therefore, learning to manage the most common encounters in an ED-HDU gave us the opportunity to help residents reflect and apply their teamwork abilities, especially leadership and communication.

The concept of clinical leadership has been largely dealt with, especially in the nursing context, but there is a lack of an accepted definition. Harper (1995) offered one of the earliest definitions of clinical leadership, suggesting that "a clinical leader yields clinical expertise in specialist practice domains and uses interpersonal communication skills to support nurses and other healthcare providers to deliver high-quality patient care".[21] Cook and Leathard defined a clinical leader as an "expert clinician, involved in providing direct clinical care, who influences others to improve the care they provide continuously".[22] Therefore, common characteristics of good clinical leadership can be identified in different definitions. A leader needs to be an expert clinician, directly involved in the care of patients, and able to create positive relationships with coworkers in order to improve the final result, which in our context is the quality of care given to our patients.[7,23] The research has shown that successful leadership entails specific tasks, including the ability to organize the teams, to explicitly clarify objectives, and to make timely decisions.[6,24] By assertiveness rather than authority, the leader empowers the members of the team, in order to obtain the best possible contribution from anyone. Clear communication is the cornerstone for good leadership, as a clear exchange of information is crucial to avoid mistakes. Being sure that every member of the team had the opportunity to share their point of view, to be listened to, and to contribute with their ideas to the successful work of the team is also of utmost relevance.[19] In the healthcare context, teams include people, who do not regularly work together, especially in critical care and in the ED.[25] The team is formed when the round begins and only a shared knowledge of the critical actions required to manage emergencies as well as a common understanding of the functioning of the team may enhance the performance of the team itself and patients' safety. HF simulation offered our participants, who were not expert clinicians, the opportunity to exercise as clinical leaders during a medical emergency.[8,26] They could experience difficulties, to make

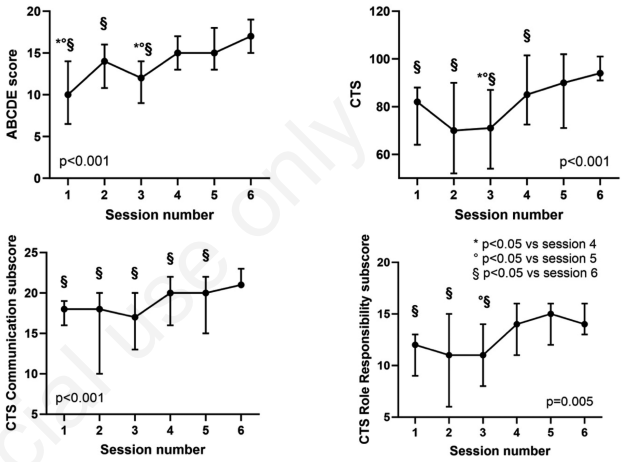

Figure 3. Trends of the ABCDE assessment and global Clinical Teamwork Scale (CTS) score along with subscores. .

Table 1. Assessment of Leader Behavior Description Questionnaire (LBDQ) single items in the following sessions.

	Session 1	Session 2	Session 3	Session 4	Session 5	Session 6
The leader let the team know what was expected of them (through direction and command)	2 [1-3]	2 [2-3]	2 [2-3]	2 [2-3]	2.5 [1.8-3.3]	2 [2-3]
The leader demonstrated the use of uniform guidelines	3 [2-3]	3 [1.5-3]	2 [1-3]	3 [2-3]	3 [2-3]	3 [3-3]
The leader displayed a positive attitude	3 [3-3]	3 [2-3]	3 [2-3]	3 [3-3]	3 [3-3]	3 [3-3]
The leader decided what should be done	3 [1-3]	2 [2-3]	3 [1-3]	3 [2-3]	3 [2-4]	3 [2-3]
The leader decided how things should be done	2 [2-3]	3 [1-3]	3 [1-3]	2 [2-3]	3 [1.8-4]	3 [2-3]
The leader assigned group members to particular tasks	3 [1-3]	2 [2-3]	2 [2-3]	3 [2-3]	3 [2.8-3.3]	3 [3-3]
The leader made sure that his/her part in the team was understood by team members	2 [1-3]*	3 [2-3]	3 [1-3]	3 [2-3]	3 [2.8-4]	3 [3-4]
The team leader planned the work to be done	2 [1-3]*	2 [2-3]*	2 [2-3]	2 [2-3]	2.5 [2-4]	3 [2-3]
The team leader maintained definite standards of performance	3 [2-3]	2 [2-3]	2 [1-3]*	3 [2-3]	3 [2-3.3]	3 [3-3]

Table 2. ABCDE score in the following sessions.

	Session 1	Session 2	Session 3	Session 4	Session 5	Session 6
ABCDE	10 [7-14]*	14 [11-16]	12 [9-14]*	15 [13-17]	15 [13-18]	17 [15-19]
A	1 [1-2]	1 [1-3]	1 [1-2]	2 [1-2]	2 [1-3]	2 [1-3]
B	4 [3-5]	4 [3-5]	3 [2-4]	5 [4-5]	4 [3-5]	4 [3-5]
C	3 [2-4]	4 [3-5]	4 [3-5]	5 [4-5]	5 [4-6]	5 [5-6]
D	1 [0-2]	3 [1-4]	2 [1-3]	3 [2-4]	3 [2-4]	4 [3-5]
E	1 [0-1]	1 [1-2]	1 [0-2]	1 [1-2]	1 [0-2]	2 [1-2]

mistakes, and to reflect on them, as only during the debriefing is it possible for the inherent difficulties to make a debriefing during the daily clinical work. Every member of the team was allowed to be the leader in different sessions, not necessarily the most expert, in order to give all the participants, the opportunity to train.[27] This choice could partially explain the improvement, which did not cover all the explored dimensions. Anyway, the trend toward a progressive ability to guide the team was clear and significant, probably because the direct experience, as well as the observations of others' behaviors, contributed to enhancing this attitude. It is very difficult for a trainee to guide the team during a critical situation, as the most expert physician on the scene usually covers that role. On the other side, leadership skills, as all the NTS, cannot be taken for granted or considered a character inclination, but all professionals who work in the critical care setting need to be able to exercise that role during an emergency, conscious that the presence of a practical guide improves the results alongside the work climate.[28] The novelty of this experience was that a brief course of sessions, which included different clinical scenarios of critically ill patients, allowed Emergency Medicine residents to train and improve their leadership skills specifically.

The adapted LBDQ Initiating Structure was employed: the original scale explored two main leader behaviors, "consideration" and "initiating structure". The first pertains to the ability to explicitly appreciate well-done work and support the team members' self-esteem. Initiating structure refers to the ability to maintain standards and communicate clearly what needs to be done and how it should be done. The first dimension is less important during the management of a critical patient for the limited available time, while the second is crucial for a successful intervention.[18] Our participants improved in these specific aspects, the ability to plan the work and to explicit how things had to be done, with the final results of maintaining a high standard of performance.

A significant improvement in the primary assessment paralleled the improvement in the ability to be a good leader. Whether it is not obvious which one came first, theories about human cognitive function may explain this association. During a crisis, as in the medical emergencies we simulated, participants have to process multiple pieces of information, maintain an appropriate situation awareness, and make timely decisions. They can rely on their intuitive abilities, but managing adequately these rapid and complex operations also requires analytic thinking. Simulation allows training those NTS, like clear communication or effective leadership, which both allows to use ways of mental functioning and improves the completeness of the assessment and the management of critical patients.[29]

Limitations

The study has several limitations. First, this is an observational single-center study, without comparison to a control group, and the results may not be applicable elsewhere. Every scenario was evaluated by a single rater at the end of each simulation and TSs and NTSs were contemporary rated. The division of the tasks between the facilitators guaranteed a relative independence of judgment. Including participants from different professions, especially nurses, would have increased the simulation's realism and the program's educational value but was not feasible for organizational reasons. It remains a possibility for future projects and research. Finally, we could not evaluate the transferability of the abilities acquired during simulation in clinical practice. In fact, during their training program, residents work in different structures, both inside and outside the hospital, altogether with personnel not involved in the simulation program. The residency curriculum in actuality does not include training in NTS. Therefore, it becomes tough to establish how their leadership abilities could be transferred in the daily clinical activity. The definition of a standard curriculum for the training in NTS is needed, in order to introduce a formal testing of NTS mastery before the conclusion of the residency programs.

Conclusions

In conclusion, training with HFS improved the ability of Emergency Medicine Residents in managing critical patients, both considering TSs and NTSs. Currently, the medical community acknowledges which technical knowledge and abilities residents have to acquire during their training program. On the other side, despite the absence of an accepted definition of NTS skills, we are all aware of their relevance to improving patients' safety, considering the growing complexity of the healthcare systems. Simulation represents a feasible tool to allow young doctors to train in both dimensions and to acquire adequate confidence in managing critical situations safely and effectively. This kind of training is expensive in terms of technical and human resources. Still, an appropriate design of the scenarios allows their performance in low-fidelity or in-situ settings, with a possible reduction of costs. Further studies are needed to identify the most efficient and effective use of simulation.

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