Training in the ABCDE approach by simulation for medical students

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Abstract

One-hundred-forty-seven volunteer medical students in the 3rd (G1, 24 teams) and 202 in the 4th (G2, 30 teams) received a 15-minute lecture about the ABCDE approach. Then they managed two simulated patients (one with chest pain, and one with acute dyspnoea), with the task of implementing the strategy. In the second scenario, several items of the ABCDE sequence improved among G1 (SO2 measured in 96% in the second scenario versus 69 % in the first one, RR 92 *vs.* 67%, HR 92% *vs.* 67%, BP 100% *vs.* 832%, GCS 88% *vs.* 58%, Temperature 71% *vs.* 46%, $p<0.05$ for GCS and Temperature). The ability to identify "red flags" improved significantly between the first and the second simulation for both subgroups (G1 96% *vs.* 58%, G2 57% *vs.* 20%). A brief activity in simulation enabled medical students to assess comprehensively critical patients and to identify the "red flags" of each scenario.

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Introduction

The first part of the Medical education programs includes most commonly basic sciences and the exploration of normal anatomy and physiology, all necessary to understand the etiology and the pathophysiology of diseases and related therapeutic interventions in the following years of study. Such organization postpones the first contact between students and the clinical environment by several years, with a demotivating impact on them.[1,2] Allowing students in the first years of their program to take care of patients or to perform procedures for the first time on them is not ethically acceptable. Hence, simulations could allow practicing the first contact with patients in a risk-free environment, while providing medical students with the feeling of becoming doctors.[3-6] We reported the results of a preliminary experience, by which we tested whether medical students in their III- IV year can be trained in the ABCDE approach application in a simulated environment.

Materials and Methods

We proposed a volunteering program for the training in the approach to the critical patient to medical students in their 3th (G1) and 4th year (G2). The activity lasted 1 hour and was structured in a slightly different way for the 2 groups, as we considered that G1 students had not begun any subject about the assessment of a patient, which was otherwise known by G2 trainees. This activity was a part of a 3-hour program, which included 2 stations about technical skills, that were respectively arterial puncture and bag-mask ventilation for G1 and arterial puncture and cardiac auscultation in G2.

At the beginning of the face-to-face activity, we administer a questionnaire to G1 students, including 5 single best answer multiple choice questions. Every question contained a brief vignette and the list of the vitals (heart rate, blood pressure, respiratory rate, O_2 saturation, Glasgow Coma scale and body temperature), among which students had to indicate the most alarming one. Thereafter, we made a brief presentation about the ABCDE approach (Airway, Breathing, Circulation, Disability, External) and the AMPLE (Allergy, Medications, Previous illness, Last meal, Event) acronym to collect the medical history in critical situations. Then students, divided in groups composed by 6/7 members managed two simulated patients, whose chief complain was respectively chest pain and dyspnea. The simulated patient was one of the facilitators, who could answer to questions about their medical history. Participants received the clear request to perform an ABCDE and AMPLE approach. They had about 20 minutes to perform the

assessment. Parameters were shown on a monitor (Skillcube, Accurate) and we considered them assessed when participants mentioned them and gave an evaluation about their value. Thereafter, they had to identify the "red flags" for both patients and organize a plan.

We defined "red flags" as any vital sign or clinical clue indicating an imminent or actual life-threatening condition, such as SpO_2 < 90%, GCS < 13, systolic blood pressure < 90 mmHg, respiratory rate > 30 or < 8, heart rate >100 bpm or <40 bpm and body Temperature >38°C.

Students were instructed to explicitly identify any such findings during the ABCDE assessment.

For G2 patients, the activity included an online and face-to-face parts. We prepared a video available online, containing a schematic presentation of the ABCDE approach. Students had to fill an online questionnaire, with the same design as described for G1, both to get access to the presentation and at its end. The day of the face-to-face activity, we began with a more extensive presentation about the ABCDE and AMPLE approach, as well as the basics about teamwork, with the focus on clear communication and leadership. Then the teams managed the same two simulated patients, with the following tasks: to implement the AMPLE and ABCDE approach, to identify red flags, to formulate a diagnostic hypothesis and to apply correctly communication and leadership principles. The simulated patients were able to answer to questions about their medical history and chief complaint. Parameters were again available on the monitor or were communicated by another facilitator. For the ABCDE approach, we considered the items done when participants asked explicitly for all the points included in each item (Table 1). Criteria for a correct communication were to be clear with the patient, without jargon, to speak one at a time and to listen to each other. The roles division included the identification of the team leader and the assignment of clear tasks to different members of the team.

A debriefing was performed after each simulation, based on the Plus-Delta-Solution scheme, for both G1 and G2. After the activity, students were requested to fill a new questionnaire online, with the same structure as before. All participants gave their informed consent for publication of the results. According to the local Ethics Committee rules, an ethics approval was not required.

Results

We involved 349 students, 147 in G1 and 202 in G2, who were grouped respectively in 24 and 30 teams. As shown in Table 1, most of G1 and G2 teams were able to apply the structured approach from the first simulation, with an improvement in the second scenario, which was significant for several items of the ABCDE sequence among G1. The ability to identify "red flags" improved significantly between the first and the second simulation for both subgroups, as shown in the Table 1.

Among G1 students, we observed a non-significant improvement in the proportion of correct answers between the pre- and post-activity questionnaire (Figure 1). Among G2 students, the proportion of correct answers significantly increased from the first to the second evaluation, respectively before and after the online explanation about the ABDCE approach, with a further slight improvement after the simulated scenarios (Figure 1).

Discussion

A mixed online and simulation activity was effective in teaching medical students at the beginning of their clinical training the correct application of the ABCDE approach and the ability to early identify "red flags" in simulated critical patients. On the other side, participants were not able to apply teamwork abilities consistently,

Table 1. Performance in AMPLE and ABCDE approach in the first and second scenario by G1 (3th year of the graduation program) and G2 students students (4th year of the graduation program).

	G1 students				G2 students		
	1st scenario (%)	2nd scenario (%)	p		1st scenario (%)	2nd scenario (%)	p
AMPLE				**AMPLE**			
A	21 (87)	24 (100)	NS	A	17 (57)	21 (70)	NS
M	22 (92)	24 (100)	NS	M	19 (63)	21 (70)	NS
P	20 (83)	24 (100)	NS	P	16 (53)	18 (60)	NS
L	18 (75)	21 (88)	NS	L	14 (47)	18 (60)	NS
E	19 (79)	22 (92)	NS	E	14 (47)	21 (70)	NS
ABCDE				**ABCDE**			
SO_2	19 (79)	23 (96)	NS	A (able to speak)	24 (80)	25 (83)	NS
RR	16 (67)	22 (92)	0.070	B (RR, SO2, lung auscultation)	13 (43)	17 (57)	NS
HR	19 (79)	22 (92)	NS	C (HR, BP, CRT, cardiac and abdominal exam.)	10 (33)	13 (43)	NS
BP	20 (83)	24 (100)	NS	D (GCS, glycemia)	15 (50)	16 (53)	NS
GCS	14 (58)	21 (88)	0.016	E (BT, cutaneous signs)	9 (30)	9 (30)	NS
BT	11 (46)	17 (71)	0.031				
Red flags identification	14 (58)	23 (96)	0.004	Diagnostic assessment	15 (50)	14 (47)	NS
Critical action	13 (54)	22 (92)	0.012	Red flags identification	6 (20)	17 (57)	0.007
				Critical actions	15 (50)	18 (60)	NS
				Roles division	3 (10)	2 (7)	NS
				Correct communication	1 (3)	3 (10)	NS

especially in correct communication and the identification of the team leader.

The Airway, Breathing, Circulation, Disability and Exposure (ABCDE) approach is an accepted structured approach for the initial assessment and management of critically ill patients in all age groups, regardless of the underlying cause. It enables healthcare professionals to assess and treat possibly life-threatening conditions, based on a defined priority order. Its use is recommended in international guidelines, but in actuality, adherence appears to be suboptimal, even in critical care settings.[7] To the best of our knowledge, this was one of the first attempts to teach medical students this approach. Due to the shortage of medical personnel, the entry of young newly graduated doctors into the workforce is very early. New physicians are often employed in the Emergency Service and have to face critical situations. Mastering a structured approach for the early identification of life-threatening conditions can be a valid help for both physicians and patients. The early beginning of this kind of training is of utmost importance to enhance the acquisition of the ABCDE approach as the "operating standard". G1 students, who were asked to assess specific parameters, reached a comprehensive assessment, especially in the second scenario. G2 students had to apply the global ABCDE approach, including several items for each step, a more complex task than that required to G1 students. Moreover, G2 participants were asked to divide roles and to clearly communicate. The higher cognitive load could have distracted trainees from systematically completing all the ABCDE steps. Their performance was suboptimal and similar in the 2 scenarios. We could argue that it takes a longer time than 2 simulations to acquire and apply in a comprehensive way the complete assessment.

Simulations are gaining an increasingly relevant role in healthcare education worldwide.[8] Through simulations, students can learn procedures and other skills hands-on but in a safe environment, where it is possible for them to exercise without time constraints and to rehearse tasks several times, to master the procedure before implementing it in the clinical arena. Moreover, reflections on the actions performed and the feedback from the supervisors help them to develop clinical competence, defined as "the knowledge and skills for safe and effective practice when working without direct supervision".[9,10] Beyond the technical aspects, students can deal with the cognitive skills inherent to any procedure, such as the ability to plan, anticipate issues, detect errors and make timely decisions.[11-14] Finally, simulation-based activities allow teachers to assess learners' performance in a standardized way, with the opportunity to evaluate whether acceptable standards are met.[15] Simulation can be used to identify performance gaps, knowledge errors, and skill deficiencies.

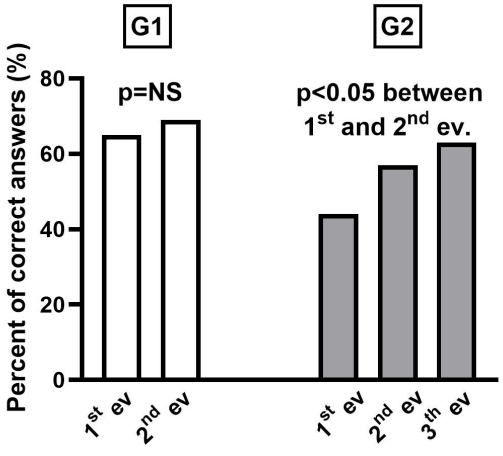

Figure 1. Percent of correct answers at following evaluations in G1 and G2.

Employing simulation to exercise in the ABCDE approach allowed students to apply their knowledge and test their ability to follow a structured scheme. They experienced the need to systematically apply the sequence, as elements that seem of secondary importance at first look, may be crucial for assessing patients correctly. They had the opportunity to assess patients by themselves, which would have been very difficult with real patients. Probably the need to stay focused on the approach distracted students from paying attention to communication and role assignments and these tasks were performed by a minority of teams. We did not consider the possibility of re-evaluating the maintenance of the acquired abilities, as it was our first experience in this field and we were unsure about its effectiveness. It will represent the next step of our program.

Among the advantages of simulation as a training modality, the possibility of coupling the training in technical and non-technical skills is one of the most relevant. Training programs, based on simulation, should include a stepwise approach to clinical reasoning and procedures, from simple tasks to be performed in the correct order, to the integration into more complex clinical scenarios. Trainees would be able to engage in motivating and practical learning experiences, hands-on, tailored to their level of training. The drawback of using simulation to train a large number of students is its low cost-effectiveness, both in terms of personnel and equipment. The bet will be to find the right space for this training modality, with a correct balance between limits and benefits, as with any other interventions in the medical field.

Conclusions

In summary, we presented our experience in simulation, involving medical students at the beginning of their clinical training, about the ABCDE approach. For most of them, this was the first contact with "patients". Anyway, in a relevant proportion of cases, they were able to assess comprehensively critical patients and to identify the "red flags" of each scenario. We did not collect systematically their feed-back, but the activity, although voluntary, was attended by the 80% of the invited students and highly appreciated by the vast majority of them. This experience will be the beginning to understand to what extent the training may be done online and how to maximize the opportunities offered by simulation.

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