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The trends and challenges in orthopaedic simulation

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ABSTRACT

Generally, in some universities of medicine, orthopaedic training procedures represent a difficult task due to the inadequacies of the systems, the resources, and the use of technologies. This article explains the challenges and the needs for more research in the issue of orthopaedic simulation around the world.

The Making of a Cardiothoracic Surgeon: An Appolonian Quest (Aldo R. Castaneda)

1. Orthopaedic research in the past 50 years

In the last decade, literature has shown that the medical research is based on simulation-based medical education (SBME). The points that are treated by the researchers include: feedback, teamwork, skills acquisition and simulation fidelity. According to Azevedo and Bernard,[1] the feedback used in educational contexts is generally regarded as crucial to improving knowledge and skills acquisition. There are two types of feedback which are formative[2] and summative.[3] Most of the feedback is formative in order to improve the performance of surgeons. The objective is to identify the gap between programs of training and the progression of technologies, to clarify the clinical outcomes and to diagnose the misunderstandings in learning. The Fig. 1 illustrates the formative feedback taking account the context and characteristics of the learner. The informations concerning the

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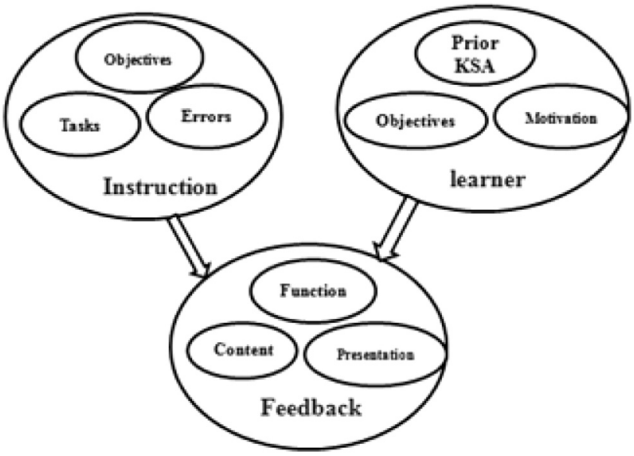

Fig. 1 – Feedback.

learner are important that include skills and academic motivation (see Fig. 2).

The problems of the formation of a teamwork increase because of the communication between surgeons and other specialists which has an impact on the quality, safety, and outcome in orthopaedic simulation. The communication includes the procedures, data analyses, results, and error analyses. We can speak of "interdisciplinary" team work. Stephen et al[4] explain the importance of Emergency Medicine (EM) and its effect on clinician performances, the increase of the patient safety, and decrease of liability. Today, the collaborative effort has become a necessity to align with the complexity of surgical expertise. Three categories have been mentioned for assessing surgical performances which are technical skills, clinical skills, and social skills. Kopta[5] defines the technical skills in three phases: cognitive, integrative, and autonomous. The cognitive phase is composed of three components (observation, coaching, and practice) that are performed by the student (reflecting, exploring, etc.). In the second phase, the student was engaged to communicate with team members and to clarify the results. Moreover, automation is achieved if the surgeon practices the same process several times. Lippert[6] thinks that technical competencies are achieved through reviews of surgical books and medical journals. The surgeon needs a background of knowledge such as the ability of directing, organizing, and coordinating to avoid communication failures and to improve the knowledge of the situation.[7] Ethan et al[8] discuss the relationship between surgical hand training and sign language learning. They proved that

Table 1

Scores on examinations for technical and cognitive skills

Test		Mean group score, % (& SD)		Group difference,* % (& SD)
		Technical	Cognitive	
Pre-course technical skills (average of 2 normal knees)				
	Task-specific checklist	27 (24)	26 (26)	−1 (25)
	Global rating scale	22 (16)	19 (19)	−3 (17)
	End-product analysis	26 (32)	15 (15)	−11 (25)
Postcourse technical skills				
Normal knee	Task-specific checklist	83 (10)	83 (13)	0 (12)
	Global rating scale	70 (24)	72 (14)	2 (20)
	End-product analysis	81 (15)	80 (17)	−1 (16)
Arthritic knee	Task-specific checklist	88 (12)	77 (14)	−11 (13)
	Global rating scale	68 (19)	62 (17)	−6 (18)
	End-product analysis	83 (10)	78 (25)	−5 (19)
Difference from pre-course test				
Normal knee	Task-specific checklist	56 (25)	57 (28)	1 (26)
	Global rating scale	48 (24)	53 (19)	5 (22)
	End-product analysis	55 (40)	65 (26)	10 (34)
Arthritic knee	Task-specific checklist	61 (26)	51 (21)	−10 (24)
	Global rating scale	46 (21)	43 (24)	−3 (22)
	End-product analysis	57 (27)	63 (24)	8 (26)
Cognitive skills (post-course only)				
Multiple-choice		57 (16)	62 (10)	5 (13)
Error-detection		57 (20)	76 (10)	19 (16)†

*None of the differences seen between groups were statistically significant, except for †$p = 0.02$.
SD = standard deviation

Fig. 2 – Scores on examinations for technical and cognitive skills.[9]