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ORIGINAL RESEARCH ARTICLES

In search of an effective teaching approach for skill acquisition and retention: Teaching manual defibrillation to junior medical students



À la recherche d'une approche pédagogique efficace pour l'acquisition et le maintien des compétences: Enseignement de la défibrillation manuelle à des jeunes étudiants en médecine

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Introduction: Although overloaded curricula, the increasing student to educator ratio, limited resources, insufficient curriculum alignment and the unpredictable clinical learning environment contribute to the decay of clinical skill competency, the problem of poor skill retention often lies in inadequate skill acquisition which is associated with the quality of the instruction. The aim of the study was to investigate the influence of three different instructional approaches on the acquisition and retention of skills in order to determine which method would be best suited for teaching in simulation in a resource-constrained environment.

Methods: A randomised controlled trial design was used to compare the efficacy of the traditional, Peyton's four-stage, and a modified five-step method. Regarding the latter, George and Doto's five-step method was altered to include peer teaching and feedback with a tutor in a supervisory role. Groups of first year students were taught 'manual defibrillation'. Subsequent to the teaching session as well as at two months later, students' skills were tested. Additional qualitative data regarding students' perceptions of the different teaching strategies they were exposed to were obtained by means of questionnaires.

Results: None of the three instructional approaches proved to be superior in acquisition or retention. Previous studies reported similar findings. The lack of differentiation between the three teaching methods might be attributed to the fact that all three methods included practice with feedback in one form or another. Numerous studies have identified these as critical components leading to effective learning in a simulation-based learning environment.

Conclusion: Considering that the three instructional approaches were similar in terms of skill acquisition and retention, incorporating peer teaching and feedback is a feasible strategy in a resource-limited environment.

Introduction: Malgré les programmes surchargés, l'augmentation du ratio nombre par éducateur d'élèves, les ressources limitées, l'alignement insuffisant des programmes d'études et l'environnement pédagogique clinique imprévisible contribuent à la dégradation de la maîtrise de la compétence clinique, le problème du faible maintien des compétences résidant souvent dans la mauvaise acquisition des compétences, problème lié à la qualité de l'enseignement. Le but de l'étude était d'enquêter sur l'influence de trois approches pédagogiques différentes concernant l'acquisition et le maintien de compétences de façon à déterminer quelle méthode serait la plus adaptée à un enseignement en simulation dans un environnement limité en ressources.

Méthodes: Une méthode d'essai contrôlé randomisé a été utilisée pour comparer l'efficacité de la méthode traditionnelle de Peyton à 4 étapes et une méthode modifiée à 5 étapes. En ce qui concerne cette dernière, la méthode George et Doto à 5 étapes a été modifiée pour inclure l'enseignement par les pairs et le retour d'information, le tuteur ayant un rôle de supervision. Les groupes d'étudiants de première année ont été formés à la « défibrillation manuelle ». Après la session de formation, ainsi que deux mois plus tard, les compétences des étudiants ont été testées. Des données qualitatives supplémentaires concernant la compréhension par les étudiants des différentes stratégies pédagogiques auxquelles ils ont été exposés ont été obtenues au moyen de questionnaires.

Résultats: Aucune des trois approches pédagogiques ne s'est avérée supérieure en termes d'acquisition ou de maintien. Des études précédentes ont fait état de résultats similaires. L'absence de différenciation entre les trois méthodes d'enseignement pourrait être attribuée au fait que les trois méthodes incluent, sous une forme ou une autre, une pratique avec retour d'information. De nombreuses études ont identifié ces deux éléments comme des composantes essentielles pour un apprentissage efficace dans un environnement pédagogique basé sur la simulation.

Conclusion: Etant donné que les trois approches pédagogiques étaient similaires en termes d'acquisition et de maintien des compétences, l'intégration de l'enseignement par les pairs et le retour d'information constitue une stratégie possible dans un environnement à ressources limitées.

African relevance

- None of the studied teaching approaches proved to be superior.
- When the student to lecturer ratio is high, peer feedback during teaching sessions is useful.
- A demonstration and feedback with practice are the most crucial components of clinical skills teaching and learning.

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Introduction

The teaching of practical skills remains a vital component of medical education. Simulation has become an important and effective tool in healthcare education due to limited and unpredictable clinical opportunities.¹⁻³ Increased student numbers and a greater emphasis on patient safety are amongst the many reasons.^{2,3} Despite the global movement to augment clinical exposure with simulation training, the teaching and learning of clinical skills remains a challenge for most training institutions. Studies suggest that inadequate skill acquisition, which is associated with the quality of teaching, could be the main contributor of poor skill retention.^{4,5} For this reason, there is a continual inquiry into the factors that influence both the acquisition and the retention of clinical skills.⁶⁻⁹

Procedural skills teaching has evolved over the last decades from the apprenticeship model (see one, do one, teach one) where learning is a result of social guidance,¹⁰ through the traditional two-step approach, to more structured approaches such as Peyton's four-stage or George and Doto's five-step approach (Table 1).^{5,7,11,12} However, the different approaches might not alter learning outcomes. There was no difference in either the acquisition or the retention of procedural skills when comparing the traditional method to Peyton's four-stage approach.^{6,7,9} The studies were conducted for laryngeal mask insertion, gastric tube insertion and needle cricothyroidotomy using part task trainers, manikins and pig larynxes. This led the authors to conclude that the complexity of the procedural skill may influence the efficacy of the four-stage teaching approach and subsequently proposed that teaching more complex skills might favour the four-stage approach. The five-step method was used on inexperienced dental students and proved that they were able to perform the skill efficiently.¹³

Another aspect to learning is the effect of assessment (the testing effect). In addition to the extrinsic motivational effect of assessments, the intrinsic effect on students' learning is just as valuable.¹⁴ Research has indicated that the use of tests resulted in improved retention of the studied material compared to students re-studying the material, regardless of feedback given to the students.¹⁴ The testing effect was further illustrated by Kromann et al. in a study on medical students attending a cardio-pulmonary resuscitation (CPR) course; those that were tested immediately after the course had significantly better skill retention after two weeks.¹⁵

At Stellenbosch University's Faculty of Medicine and Health Sciences, students start attending simulated teaching sessions towards the end of their first year (of six) and continue to do so throughout the remainder of their studies as part of their clinical rotations. These sessions are, however, limited due to the already full curriculum and fairly high student to educator ratios. Most educators are also involved in clinical work and constantly struggle to find a balance between service delivery and the training of students. Consequently, there are few opportunities for students to practise skills under supervision and to receive individual feedback during the teaching sessions, both crucial elements of the learning process.¹⁶ George and Doto's five-step teaching approach is used widely in the teaching of procedural skills, but has been modified for the American College of Surgeon's Advanced Trauma Life Support (ATLS) course.¹⁷ The five-step approach was further modified to make it more appropriate to our setting (Table 1).

The large groups of students and limited time per session lead to the idea of exchanging step four and step five of the five-step teaching approach; peer-teaching in step four was followed by a final step that summarised the process to ensure the procedure was done correctly. The thinking was that ending the session with a summary of how the procedure should be performed might compensate for any misunderstandings that could have happened due to the peer teaching and feedback part of the session.

Methods

Students were randomly divided to compare the efficacy of the different teaching approaches. Feedback from the students was collected using a self-designed non-validated questionnaire. The study was approved by the Stellenbosch University Health Research Ethics Committee (Ref: N12/02/005).

The study was conducted at the Faculty of Medicine and Health Sciences of Stellenbosch University (SU) in South Africa. The undergraduate medical programme follows a six year curriculum, with student numbers increasing to about 300 students in the first and second years. The Clinical Skills Centre (CSC) plays an integral role in the teaching and learning of clinical skills in the undergraduate medical curriculum. Small groups of students (instructor to student ratios of 1:20) attend practical teaching sessions in the CSC as they rotate through the various clinical disciplines. These practical sessions are supported by logbooks the students complete for various clinical areas, followed by a practical assessment at the end of the module.

All first year medical students of 2012 and 2013 were invited to participate. These students had not been exposed to clinical medicine and the assumption was that their prior knowledge and experience of the selected clinical skill was non-existent. Students were asked at the beginning of the study whether they had done the procedure before and all students responded negatively.

Informed written consent was obtained from participants. Participation was voluntary and students were free to decline participation or to withdraw from the study at any point without any consequences.

Students were randomly allocated to the three teaching approaches (the traditional two-step approach, Peyton's four-stage approach, or modified five-step approach) using a computerised random-number generator. Each teaching group was further divided into two: with or without an immediate post-teaching practical assessment. Those who were assessed straight after the teaching were told so at the beginning of the session. All groups were assessed after two months (Fig. 1). Students only received feedback after the two month assessment.

Manual defibrillation of a manikin with ventricular fibrillation was categorised by the researchers as a moderately complex skill and therefore identified as an appropriate skill for the purposes of this study. Students attended a 40 min teaching session in the CSC in groups of approximately 20 students with one defibrillator and one manikin that could be defibrillated for each of the groups. This was a real defibrillator used with full charge and the clinical skills educators were well aware of optimal safety precautions. These training sessions took place over a period of two days. Three different clinical skills educa-

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