

Does bench model fidelity interfere in the acquisition of suture skills by novice medical students?

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Summary

Objective: Although several inanimate bench models have been described for training of suture skills, so far, there is no ideal method for teaching and learning this skill during medical education. The aim was to evaluate whether bench model fidelity interferes in the acquisition of suture skills by novice medical students. **Methods:** 36 medical students with no surgical skills' background (novices) were randomized to three groups (n = 12): theoretical suture training alone (control); low-fidelity suture training model (synthetic ethylene-vinyl acetate bench model); or high-fidelity suture training model (pig feet skin bench model). Pre- and post-tests were applied (performance of simple interrupted sutures and subdermal interrupted sutures on ox tongue). Three tools (Global Rating Scale with blinded assessment, effect size, and self-perceived confidence based on Likert scale) were used to measure all suture performances. **Results:** The post-training analysis showed that the students that practiced on bench models (hands-on training) presented better (all p < 0.0000) performance in the Global Rating Scale evaluation, compared with the control, regardless of the model fidelity. The magnitude of the effect (training) was considered large (> 0.80) in all measurements. Students felt more confident (all p < 0.0000) to perform both types of sutures after training. **Conclusion:** The acquisition of suture skills on the low-fidelity bench model was similar to that of the high-fidelity bench model, and the increase in the performance of participants that received bench model training was superior to those who received training based on theoretical teaching materials.

Keywords: Medical education; surgery; sutures; teaching; teaching materials.

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Resumo

Será que a fidelidade do modelo de bancada interfere na aquisição das habilidades de sutura por estudantes de medicina iniciantes na prática cirúrgica?

Objetivo: Embora vários modelos de bancada inanimados tenham sido descritos para o treinamento de habilidades de sutura, até o momento, não existe um método ideal para esse ensino e aprendizagem durante a formação médica. O objetivo foi avaliar se a fidelidade dos modelos de bancada interfere na aquisição de habilidades de sutura em estudantes de medicina iniciantes na prática cirúrgica. **Métodos:** 36 estudantes de medicina sem exposição prévia a habilidades cirúrgicas foram randomizados em três grupos (n = 12): treinamento de suturas baseado em materiais didáticos (controle); treinamento de suturas em modelo de baixa-fidelidade (modelo de bancada de etileno vinil acetato); ou treinamento de suturas em modelo de alta-fidelidade (modelo de bancada de pele de pata de porco). Foram aplicados pré e pós-testes (realização de pontos simples e pontos subdérmicos invertidos em língua de boi). Três ferramentas (*Global Rating Scale* com avaliação cega, tamanho do efeito e autopercepção da confiança baseada em uma escala de Likert) foram utilizadas para mensurar todas as performances de sutura. **Resultados:** A análise após o treinamento demonstrou que os estudantes que treinaram nos modelos tiveram um melhor (p < 0.0000) desempenho na avaliação pela *Global Rating Scale*, quando comparados com o controle, independente da fidelidade do modelo. A magnitude do efeito (treinamento) foi considerada grande (> 0.80) em todas as mensurações. Após o treinamento os alunos sentiram-se mais confiantes (p < 0.0000) para executarem os dois tipos de suturas. **Conclusão:** A aquisição de habilidades de suturas no modelo de baixa fidelidade foi semelhante à prática no modelo de alta fidelidade, sendo que a melhora no desempenho dos participantes que treinaram nesses dois modelos foi superior à aprendizagem baseada em materiais didáticos.

Unitermos: Educação médica; cirurgia; suturas; ensino; materiais de ensino.

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INTRODUCTION

Since suture technique is the foundation upon which most surgical skills will be built¹, and general practitioners are routinely confronted with situations that demand performance of minor surgical procedures (e.g., cutaneous surgery)²⁻⁵, the acquisition of this technical skill during medical school (suture technique) is necessary. However, since this foundation is not acquired by a large percentage of students during their education^{1,6}, it is necessary to establish a program of teaching and training of surgical skills during medical education²⁻⁷.

Aiming at this, the simulation-based training has been described^{8,9}. However, the practice on fresh human cadavers and on live animals is associated with high costs, risks of infections, need for specialized facilities, and legal and ethical aspects⁸⁻¹⁰, and the use of virtual reality simulators is hampered by its high cost and lack of access^{8,9}. As an alternative, inanimate simulators can be used¹¹⁻²¹, including parts of *postmortem* animals (ox tongue, cattle digits, and pig, rat, chicken skins) and synthetic materials such as the ethylene-vinyl acetate (EVA) bench model described recently by this group²⁰, polyurethane foam, and others.

These inanimate simulators vary widely regarding their level of fidelity or “realism” to living human patients^{8,9}. High-fidelity bench models (e.g., pig, rat, and chicken skins) are limited by high costs, low availability, potential for transmission of infectious diseases, and ethical concerns. Lower-fidelity synthetic bench models (e.g., EVA plates and polyurethane foam) sacrifice “realism” in exchange for portability, lower costs, and potential for repetitive use⁸⁻¹⁰.

Despite the fact that the intuitive belief “the more realistic, the better”²² cannot be based on subjectivity alone, and, that there is no ideal model for training suture skills yet¹³, few studies have directly compared the effectiveness of synthetic bench models (low-fidelity simulator) *versus postmortem* animal bench models (high-fidelity simulator) on the acquisition of suture skills during medical education. Therefore, the purpose of this study was to assess objectively whether the fidelity of bench models alters the acquisition of suture skills by novice medical students. Two inanimate simulators made with plates of 4 mm of EVA (low-fidelity) and pig foot skin (high-fidelity) were compared through a randomized, controlled, and blinded study.

METHODS

PARTICIPANTS

The protocol consisted of 36 first- and second-year medical students with no surgical skills background (novices) from a single academic center that volunteered to participate in the study, enrolled after signing an informed

consent, in accordance with the Helsinki Declaration of 1975, as amended in 1983. Local institutional research ethics board approval was obtained for this study.

STUDY DESIGN

This was a randomized controlled study with blinded examiners, comprising a pre-test, an one-hour practice phase, and a post-test. The pre- and post-tests were identical and consisted of the performance of five simple interrupted sutures and five subdermal interrupted sutures for closing two elliptical incisions (8 x 2 cm each) on ox tongue. Each student was tested individually and had a total of five minutes for each task. No feedback was provided during the pre- and post-tests.

PRE-TESTING

On the day of the experiment, all participants were taught how to use surgical instruments, as well as the techniques for both types of sutures (simple interrupted sutures and subdermal interrupted sutures), by means of an instructional video²³ presentation, which was repeated and discussed six times (verbal teaching based on video). This stage took one hour. Next, all participants underwent a pre-test.

GROUPS AND TRAINING PROGRAM

Immediately after the pre-test, all students were randomized into one of the three study groups (n = 12). The three groups were placed in separate rooms, and were unable to communicate with one another. In group 1 (control), students received faculty-directed training based on theoretical materials (text books and instructional videos) about the handling of surgical instruments and the performance of sutures. In group 2, the students practiced handling surgical instruments and suturing using the EVA bench model (Figure 1) (lower-fidelity model) with the help of instructors (concurrent feedback) according to the training described by the authors²⁰. Students in group 3 received similar training to group 2, but all learning was carried out on the pig foot skin bench model (Figure 2) (high-fidelity simulator) according to some features described by Purim¹⁶. In order to standardize the learning, one faculty instructor was assigned for every four students¹; all instructors were directed to teach suture skills using the same method. This stage lasted one hour¹ for all three groups.

POST TESTING

After the training phase, the instructors demonstrated to all students, in ten minutes, how to perform simple interrupted sutures and subdermal interrupted sutures. Subsequently, all medical students were randomly assigned to post-test.

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