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Effectiveness of a step-by-step oral recount before a practical simulation of fracture fixation

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KEYWORDS

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ABSTRACT

Objective: To evaluate the effectiveness of a step-by-step oral recount by residents before the final execution of a practical exercise simulating a surgical fixation of a radial diaphyseal fracture.
Material and methods: The study included 10 residents of orthopaedics and traumatology (four second-year and six first-year residents) divided into two groups with five residents each. All participants initially gathered in a room in which a video was presented demonstrating the practical exercise to be performed. One group (Group A) was referred directly to the practical exercise room. The other group (Group B) attended an extra session before the practical exercise, in which they were invited by instructors to recount all the steps that they would perform during the practical exercise. During this session, the instructors corrected the residents if any errors in the step-by-step recount were identified, and clarified questions from them. After this session, both Groups A and B gathered in a room in which they proceeded to the practical exercise, while being video recorded and evaluated using a 20-point checklist.
Results: Group A achieved a 57% accuracy, with results in this group ranging from 7 to 15 points out of a total of a possible 20 points. Group B achieved an 89% accuracy, with results in this group ranging from 15 to 20 points out of 20.
Conclusion: An oral step-by-step recount by the residents before the final execution of a practical simulation exercise of surgical fixation of a diaphyseal radial fracture improved the technique and reduced the execution time of the exercise.

Introduction

The construction of knowledge in the medical field has been constantly debated in the literature. The way in which people learn and the individual differences between students are now better understood: this has enabled the recent development of new teaching techniques.

The traditional way of teaching through lectures, in which students take a more passive stance, has been complemented with other didactic resources that allow active participation of the student. The simulation of clinical situations through practical exercises with models that reproduce a real situation is an example of these "new" teaching modalities [1–6].

According to Lateef, teaching based on simulations is a way to develop the knowledge, skills and behaviour of health professionals, while protecting patients from risks that are often unnecessary [7]. Simulation in the learning curve of the surgeon is also important in an ethical sense.

One of the stages of learning through practical exercises in orthopaedics is the "step-by-step" approach, in which the student presents an oral recount of the steps that will be performed in a simulation before moving on to the hands-on phase. The actual efficacy of this approach has not yet been studied in the literature.

The aim of this study was to evaluate the effectiveness of a session of step-by-step oral recount by residents before a practical simulation exercise of surgical fixation of a diaphyseal radial fracture. This research was approved by the Research Ethics Committee at the Hospital do Trabalhador at Federal University of Paraná (UFPR).

Materials and methods

The study was carried out at the Centre for Studies at Hospital do Trabalhador (UFPR). An auditorium and a large room were used for the video presentation and practical exercises, respectively. Ten orthopaedics and traumatology residents participated in this study, including four second-year and six first-year residents. Ten medical students volunteered as surgical assistants for the resident under evaluation, but were not included in the analyses.

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Second-year residents who had already participated in the AOTrauma course "Basic Principles of Fracture Management" were excluded from the study.

Initially, the 10 residents and 10 medical students gathered in an auditorium under the supervision of two instructors with experience in medical teaching, where they watched a video presentation of a model of a diaphyseal radial fracture treated with axial interfragmentary compression with a 7-hole, 3.5-mm dynamic compression plate (DCP) associated with a traction screw through the plate. The participants first watched the video without audio, and then watched it again with audio.

At the end of the video presentation, the groups were divided. Participants were distributed into two homogeneous groups, each consisting of five medical residents. To enforce a random distribution in both groups, the participants were allocated by drawing of lots to one of two groups. However, the groups were controlled with regard to the number of first- and second-year residents in each group to guarantee a balanced distribution. Thus, each group comprised two second-year and three third-year medical residents in orthopaedics and traumatology.

One group, which by convention was named "Group A", was referred directly to the practical exercise room. The other group, named "Group B", attended an extra session that preceded the practical exercise session. At this step, Group B residents were invited by the instructors to recount in a step-by-step fashion all procedures that they would execute during the practical exercise. During this step-by-step discussion, the instructors could correct mistakes by the residents and were open to taking questions from them. The duration of the step-by-step session attended by Group B was 5 minutes. It should be emphasised that only Group B attended this session, and that this was the only difference between the two groups. At the end of this session, Group B joined Group A in the practical exercise room.

The practical exercise was carried out in a large room with four tables, in which two of the tables had two workstations and two others had three workstations, totalling 10 workstations (one for each resident), numbered from 1 to 10. Each of these stations presented a model of an oblique diaphyseal radius fracture, instruments for the reduction and fixation of the fracture with a Synthes 3.5-mm DCP (DePuy Synthes, Paoli, PA, USA) and the implants necessary to perform the exercise. Each of the participants was assisted by a medical student (also distributed by drawing lots) who acted as the surgical assistant. The students had the sole function of assisting the resident to execute the exercise and were oriented before the beginning of the work to avoid making any comment during the execution of the exercise. The medical students were not part of Group A or B and were not evaluated.

Before the start of the practice, the participants were randomly distributed to the stations through a drawing of lots to avoid any bias in the evaluation. Thus, the stations at the same table were occupied by participants from both Groups A and B. The time to perform the practice was similar for both groups and stipulated at a maximum of 60 minutes.

To evaluate the results of this study, the practices were filmed with video recorders distributed on each table, supported by a tripod and positioned in a way to preserve the participant's identity.

The performance was assessed according to each group's ability to reproduce the steps demonstrated in the educational video. This indicator was assessed with a checklist or a list of tasks. Each task list item corresponded to a practical exercise step from the beginning to the end of the performance, when the fracture was then fixed. The list of tasks that each participant should carry out from the beginning to the conclusion of the practice is presented below:

1 Manual reduction of the fracture;
2 Use of an aluminium mould as a template for the plate, with the correct positioning;
3 Plate moulding according to the aluminium mould;
4 Pre-tensioning;
5 Adaptation of the plate to the radial edge of the bone model;
6 Temporary fixation of the plate to the bone model with a reduction clamp;
7 Drilling of the neutral hole near the fracture, at position 5 of the plate, using the neutral (green) position of the DCP drill guide, a 2.5-mm drill bit, and the corresponding male bit;
8 Avoidance of fully tightening of the screw;
9 Drilling of the eccentric hole at position 3 of the plate using the eccentric position (yellow) of the DCP drill guide, a 2.5-mm drill bit, and the corresponding male part;
10 Alternation of the tightening of the inserted screws; position 3 and 5 of the plate;
11 Approximation of the fracture focus (axial interfragmentary compression);
12 Correct accomplishment of the following: positioning of the interfragmentary screw in position 4 of the plate; drilling with a 3.5-mm drill bit; use of the 3.5-mm guide; drilling and screw placement on a direction perpendicular to the fracture trace; introduction of the 3.5-mm/2.5-mm guide through the 3.5-mm drill hole; drilling of the opposite cortical with a 2.5-mm drill bit; use of the 3.5-mm male bit with the male guide and insertion of the screw;
13 Achievement of additional interfragmentary compression;
14 Insertion of the remaining neutral screws alternately;
15 Insertion of the remaining neutral screws, starting from the closest up to the farthest holes from the focus;
16 Divergence of the screws in the longitudinal plane;
17 Retightening of the screws alternately;
18 Retightening of the screws in the same sequence in which they were introduced;
19 Achievement of the final reduction quality;
20 Total time under 40 minutes.

All recorded videos were sent to a third researcher, who was not present on the day of the video presentation and execution of the practical exercises. This examiner had no access to any information related to the group to which the participants belonged. The only information that this evaluator had was the number of the station being evaluated. The task of this third researcher was to evaluate which and how many steps from the list of tasks the participant was able to reproduce and to forward this information to the other researchers.

With the list of tasks for each participant already evaluated, the results were verified. The results from Groups A and B were then compared against the checklist items with regard to the number of correct steps and the total duration of execution of the exercise.

Statistical analysis

Performance data, including the number of tasks completed correctly and final time to execute the exercise, were compared between the two groups using paired Student's t test, with significance set at $p<0.05$.

Results

After the drawing of lots, the groups were divided as follows in relation to the workstations: Group A, stations 2, 5, 8, 9 and 10; Group B, stations 1, 3, 4, 6 and 7.

Group A (whose subjects had not attended the step-by-step recounting session) scored 57 points out of a possible 100 points. The individual results from the residents in Group A varied between 7 and 15 points out of a possible 20 points (Table 1).

Group B (whose subjects had attended the step-by-step recounting session) scored 89 points out of a possible 100 points.