ORIGINAL ARTICLE

Simulators help improve student confidence to acquire skills in urology

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KEYWORDS
Medical students; Urethral catheterization; Digital rectal exam

Abstract

Objective: To know the level of confidence of fifth-year medical students in order to perform maneuvers in bladder catheterization and rectal examination before and after training with simulators. To be able to assess student satisfaction regarding the use of the simulation as a learning method.

Materials and methods: The study was conducted in the Simulation Center of the Faculty of Medicine. A total of 173 students who completed a practical workshop on the subject of Urology participated. The students were asked to answer anonymous questionnaires on their level of confidence in performing a bladder catheterization and rectal examination before and after the workshop as well as their satisfaction in using the simulation as a training tool. The workshops were organized using groups of 10 students. A teacher or a resident in that area of expertise supervised each student individually, resolving their doubts and teaching them the proper technique.

Results: All the evaluations made on the different abilities were significantly higher after training (p < .001). Significant differences were found in the confidence level between men and women before the training regarding male urethral catheterization maneuvers and recognition of normal or pathological prostate, The confidence level was lower in women (p < .05). These differences disappeared after training. The level of overall satisfaction with the workshop was high, going from 4.47 ± 0.9 to a maximum score of 5.

Conclusions: Simulation is a training method that helps improve the confidence of the medical student in performing a bladder catheterization and digital rectal examination.

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La simulación mejora la confianza de los estudiantes para adquirir competencias en urología

Resumen

Objetivos: Conocer el grado de confianza de los alumnos de quinto de grado en Medicina para realizar las maniobras de sondaje vesical y tacto rectal, antes y después del entrenamiento con simuladores. En segundo lugar valorar la satisfacción de los estudiantes respecto a la utilización de la simulación como metodología de aprendizaje.

Material y métodos: El estudio se llevó a cabo en el Centro de Simulación de la Facultad de Medicina, y participaron los 173 estudiantes que realizaron el taller práctico de la asignatura de Urología. Mediante cuestionarios anónimos los estudiantes respondieron a preguntas sobre su grado de confianza en la realización del sondaje vesical y el tacto rectal, antes y después del taller, y sobre la satisfacción general respecto a la simulación como herramienta de entrenamiento. Los talleres se organizaron en grupos de 10 alumnos y estaban dirigidos por un profesor o residente de dicha especialidad que supervisaba de manera individual, resolvía dudas e instruía en la técnica correcta.

Resultados: Todas las valoraciones respecto a las distintas competencias fueron significativamente más altas tras el entrenamiento (p < 0,001). Se encontraron diferencias significativas en la confianza antes del entrenamiento entre varones y mujeres en la maniobra de sondaje uretral masculino y reconocimiento de próstata normal o patológica, siendo menor la confianza en mujeres (p < 0,05). Estas diferencias desaparecieron tras el entrenamiento. El grado de satisfacción general con el taller fue alto, de 4,47 ± 0,9 sobre una puntuación máxima de 5.

Conclusiones: La simulación es un método de entrenamiento que mejora la confianza del estudiante de Medicina en la práctica del sondaje vesical y tacto rectal.

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Background

We can define medical simulation as a learning methodology that provides students with competence training using mannequins or simulated clinical scenarios. The use of simulations for teaching in medical degree programs is highly valuable for improving student training and thereby increasing safety in health care.1

According to the Report by the Evaluation Commission of the Title of Degree in Medicine concerning urinary system disease, students should have, upon completion of their training, “practiced the following competencies under tutor supervision: rectal examination, prostate examination and male/female vesical catheterization”.2 These types of examinations are frequently performed in clinical practice; however, student training depends mainly on whether they perform the specific rotation in this department, on the number of patients who allow the examination, as well as the disease the patients present when they visit the specialist.

One of the alternatives for conducting this training is the use of urological simulators, models that enable students to learn the anatomy and practice the skill.3

The aims of our study were to determine the level of student confidence in performing rectal examinations and urethral catheterization, before and after training with the simulators, and to assess student satisfaction with the use of simulators in learning these skills.

Materials and methods

Participants

In the academic year 2012–2013, 173 students in the fifth year of their medical degree at the University of Navarra took the urology course. This was the first class of the Degree in Medicine, and it was in this course that this learning methodology was implemented.

Data were analyzed from 155 students who had not rotated through the Department of Urology, with a mean age of 21.96 ± 0.6 years and a gender distribution of 61.3% women and 38.7% men.

Workshop implementation

The theoretical subject matter was explained in class, and the practical skills training was performed at the simulation center.

The workshops were organized in groups of 10 students and were directed by a teacher or resident of this specialty. Attendance at the practical training was mandatory, and each workshop lasted 2 h.

The workshops were divided into 2 parts: a theoretical introduction lasting approximately 20 min covering the necessary material for performing vesical catheterization, the indications, contraindications and care required for patients who carry vesical catheters, as well as the proper technique for performing catheterization in men and women. Similarly,
Simulators help improve student confidence in acquiring skills in urology

Table 1  Assessment rubric.

<table>
<thead>
<tr>
<th></th>
<th>Urinary catheter</th>
<th>Rectal examination</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Male items</strong></td>
<td><strong>Score</strong></td>
<td><strong>Female items</strong></td>
</tr>
<tr>
<td>Knows why the catheterization is to be performed</td>
<td>1</td>
<td>Knows why the catheterization is to be performed</td>
</tr>
<tr>
<td>Cleans the area</td>
<td>1</td>
<td>Cleans the area</td>
</tr>
<tr>
<td>Wears sterile gloves and does not contaminate</td>
<td>1</td>
<td>Wears sterile gloves and does not contaminate</td>
</tr>
<tr>
<td>Holds the penis properly</td>
<td>1</td>
<td>Properly exposes the urethral meatus</td>
</tr>
<tr>
<td>Uses lubricant</td>
<td>1</td>
<td>Uses lubricant</td>
</tr>
<tr>
<td>Properly inserts the catheter</td>
<td>1</td>
<td>Properly inserts the catheter</td>
</tr>
<tr>
<td>Checks that it is placed properly</td>
<td>1</td>
<td>Checks that it is placed properly</td>
</tr>
<tr>
<td>Inflates the balloon</td>
<td>1</td>
<td>Inflates the balloon</td>
</tr>
<tr>
<td>Retracts the foreskin</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td><strong>Total score</strong></td>
<td><strong>Total score</strong></td>
<td><strong>Total score</strong></td>
</tr>
</tbody>
</table>

the technique and usefulness of a rectal examination were explained.

Subsequently, all students performed the rectal examination and vesical catheterization under supervision in the simulator. The students’ individual questions were answered at this time and the correct technique was demonstrated. Before completing the workshop, all students were required to undergo a small practical assessment consisting of performing a rectal examination, a female catheterization and a male catheterization. To perform the evaluation objectively, a rubric was performed that established a series of tasks that the students had to perform (Table 1).

The students worked with 2 simulators (Fig. 1): a vesical catheterization simulator (Advanced catheterization trainer, Limbs & Things, United Kingdom) and a rectal examination simulator (Prostate examination simulator, Kyoto Kagaku, Japan).

Collection of questionnaires

Before starting the workshops, the students completed an anonymous questionnaire on confidence concerning the maneuvers that they were about to perform. Once they had completed the practice session, the students answered the questionnaire again. We defined “confidence” as the student’s perceived ability to undertake the performance of a specific skill, which in this workshop consists of a rectal examination and vesical catheterization.

In another questionnaire distributed at the end of the workshop, the students assessed simulation as a learning methodology in urology.

Both questionnaires were scored according to the Likert 5-digit numerical scale, with 1 being the lowest score (very unsure or strongly disagree) and 5 being the highest score (very sure or strongly agree).

Statistical analysis

The data analysis was performed with the mean value and standard deviation for each item on a numerical scale. The statistical analysis was performed with parametric tests, using Student’s t-test for independent or related samples. Statistical significance was established at p < .05. The statistical analysis was performed using the SPSS 15.0 program (SPSS Inc., Chicago, IL, USA).

Results

Confidence

We analyzed student confidence, before and after the workshop, in the various practical skills they had practiced. All assessments were significantly higher after the training (p < .001) (Table 2).

After performing the confidence analysis, stratified by gender, the differences after the training continued to be significant for both men and women.

However, significant differences were found in the confidence before training between men and women in the male urethral catheterization maneuver and in the ability to differentiate a normal from a diseased prostate (p < .001 and p = .04, respectively), with lower confidence
levels in women. These differences disappeared after training (Table 3).

### Satisfaction

The level of overall satisfaction with the workshop was high (4.47 out of a maximum score of 5) (Fig. 2).

There were no differences in the analysis of satisfaction stratified by gender (information not shown).

### Assessment with feedback

The trained skills of each student were evaluated at the end of the workshop. They repeated the maneuvers until the maximum score was achieved in all the items evaluated (10 out of 10).

### Discussion

Our study found that training with urology simulators for vesical catheterization and rectal examination improved

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**Table 2** Confidence before and after workshop in terms of urological examination maneuvers.

<table>
<thead>
<tr>
<th></th>
<th>Before (n = 155)</th>
<th>After (n = 155)</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male urethral catheterization</td>
<td>2.25 ± 1.07</td>
<td>4.23 ± 0.96</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Female urethral catheterization</td>
<td>2.23 ± 1.04</td>
<td>4.41 ± 0.90</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Rectal examination</td>
<td>2.61 ± 1.31</td>
<td>4.30 ± 1.05</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Do you believe that you are capable</td>
<td>1.99 ± 1.03</td>
<td>3.91 ± 1.20</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>of differentiating between a normal</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>and diseased prostate?</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Likert 5-digit numerical scale, with 1 the lowest score and 5 the highest score. Mean values ± standard deviation.

**Table 3** Confidence before and after workshop in terms of urological examination maneuvers stratified by gender.

<table>
<thead>
<tr>
<th></th>
<th>Men (n = 60)</th>
<th>Women (n = 95)</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male urethral catheterization</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Before</td>
<td>2.70 ± 1.06</td>
<td>1.96 ± 0.97</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>After</td>
<td>4.33 ± 0.91</td>
<td>4.16 ± 0.98</td>
<td>.27</td>
</tr>
<tr>
<td>p</td>
<td>&lt;.001</td>
<td>&lt;.001</td>
<td></td>
</tr>
<tr>
<td>Female urethral catheterization</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Before</td>
<td>2.40 ± 1.09</td>
<td>2.13 ± 1.00</td>
<td>.11</td>
</tr>
<tr>
<td>After</td>
<td>4.48 ± 0.89</td>
<td>4.36 ± 0.90</td>
<td>.40</td>
</tr>
<tr>
<td>p</td>
<td>&lt;.001</td>
<td>&lt;.001</td>
<td></td>
</tr>
<tr>
<td>Rectal examination</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Before</td>
<td>2.63 ± 1.24</td>
<td>2.59 ± 1.36</td>
<td>.84</td>
</tr>
<tr>
<td>After</td>
<td>4.42 ± 0.98</td>
<td>4.22 ± 1.09</td>
<td>.26</td>
</tr>
<tr>
<td>p</td>
<td>&lt;.001</td>
<td>&lt;.001</td>
<td></td>
</tr>
<tr>
<td>Do you believe that you are capable</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>of differentiating between a normal</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>and diseased prostate?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Before</td>
<td>2.20 ± 1.07</td>
<td>1.85 ± 0.99</td>
<td>.04</td>
</tr>
<tr>
<td>After</td>
<td>4.00 ± 1.14</td>
<td>3.85 ± 1.24</td>
<td>.46</td>
</tr>
<tr>
<td>p</td>
<td>&lt;.001</td>
<td>&lt;.001</td>
<td></td>
</tr>
</tbody>
</table>

Likert 5-digit numerical scale, with 1 the lowest score and 5 the highest score. Mean values ± standard deviation.

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**Figure 2** Satisfaction questionnaire for the workshop and the simulation as a learning methodology. Likert 5-digit numerical scale, with 1 meaning strongly disagree and 5 meaning strongly agree. Mean values:

- **P1** - The use of simulators is an important complement to the theoretical classes, which promotes the integration of theoretical-practical expertise.
- **P2** - The practice in simulators has helped me improve my understanding of the diseases studied.
- **P3** - The workshops are well organized.
- **P4** - Level of overall satisfaction with the workshop.

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student confidence in performing these skills. The subsequent evaluation with feedback might be related to the students' increased confidence.

Vesical catheterization is a very common procedure in clinical practice and is not without complications, especially when the technique is not appropriately performed due to lack of experience. The most common complications include infections, urethral trauma, false passage, paraphimosis and urethral stenosis.4

Until recently, students learned these techniques by observation; however, we believe that if students do not perform the technique themselves, such learning is not effective. As we noted earlier, one of the competencies that students should practice under the supervision of tutors in the degree of medicine is male/female vesical catheterization. However, due to the limited time that students can spend with patients and the lack of time for physicians due to patient load, it is difficult for all students to learn these techniques during their internships. Therefore, one of the methods that we believe can solve these issues is the use of specific simulators for acquiring this technique. In addition to helping students acquire these skills, simulation laboratories decrease student stress by allowing them to repeat the procedure until good technique has been achieved after correcting their errors.5

Our students reported low confidence in their ability to perform vesical catheterization (both in men and in women) before taking the workshop. Only 15.5% of the students stated that they were confident (4 or 5 on the Likert scale) in their ability to perform catheterization in men; only 10.3% expressed similar confidence for performing catheterization in women. Similarly, other studies have indicated that only 9% of students have high confidence before taking the workshop.6 Other authors have recorded a slightly higher level of confidence in final year students, 26% for male catheterization and 38.3% for female catheterization.7

After the workshop, the confidence of our students increased significantly, to 87% for male catheterization and 94% for female catheterization. Nayler et al. observed an improvement of up to 98%.9

Rectal examination is an important component of the physical examination and is a simple and effective method for diagnosing prostate hypertrophy and carcinoma but which is underutilized, especially in recent years.8-10 Rectal examinations are also useful in other specialties such as general surgery, digestive system, emergency and internal medicine and for the assessment of multitrauma. Many patients are referred to specialists without previously undergoing a rectal examination,11 and in a number of prostate diseases the diagnosis is delayed due to the failure to perform this examination.12

Several studies have shown that the performance of rectal examinations by medical students is uncommon, and therefore confidence levels are low. The causes for this low confidence include the limited willingness of patients and not having a supervising physician, with a consequent lack of feedback.13-14

In our study, the percentage of students with a high level of confidence for performing a rectal examination was 27.7% (4 or 5 on the Likert scale) before taking the workshop and 84.5% after completing the workshop. Similar data have been observed in the study by Isherwood et al., which saw a rate of 21% of students with high levels of confidence increase to 87% after taking the workshop.8

After analyzing student confidence in differentiating a normal from a diseased prostate, we found a significant increase, from 8.4% before the workshop to 71.6% after the workshop. We have found no data in the literature on this issue.

We therefore believe that a method for achieving this competency is simulation; we have shown, as have other authors, that simulation improves confidence9 and the acquisition of knowledge.15

By performing a stratified analysis by gender, we observed that before participating in the workshop, female students had a lower level of confidence than male students in 2 of the skills: male urethral catheterization and the recognition of normal or diseased prostate. Data from the literature on this issue demonstrate that the level of confidence in almost all competencies is lower in female medical students, especially in the final years. A possible explanation for this is that women in general downplay their abilities.16

In terms of the level of satisfaction with the workshop, our study found high overall satisfaction. In a study by Nayler et al.6 86% of the students stated that vesical catheterization simulators were useful. In a study by Isherwood et al.8 on the satisfaction of rectal examination workshops, 76% of the students felt it was useful, and 97% considered the workshop to be well organized. Our results reflect that 93% of the students believe that this workshop was useful and 87% thought it was well organized.

In conclusion, we would like to highlight one of the strengths of this study: the considerable number of students who responded to the workshops. However, we cannot demonstrate that the methodology achieved in the simulators translates to patients. Further studies on this issue are therefore warranted.

Conclusion
Simulation is a training method that improves the confidence of medical students in the practice of vesical catheterization and rectal examination.

Conflicts of interest
The authors declare that they have no conflicts of interest.

Acknowledgments
We would like to thank all the students who participated in the study.

References