

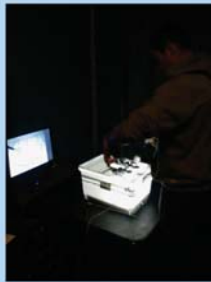
INTRODUCTION

The goal of modern medicine is to provide the best treatment option for maximum comfort and quality of life of the patients. Recently, there is a tendency of applying mini-invasive methods to reduce social and economic consequences of treatment. Laparoscopic surgery is a minimally invasive method with proven advantages, compared to conventional surgery, such as less post-operative infections, smaller need of pain relief and shorter recovery time of patients. Laparoscopic surgery is a proven method of choice in oncology even in cases of large-volume surgery. Several studies, like COLOR II, confirmed oncological security and safety of laparoscopic surgery. From a technical point of view, the basic techniques of laparoscopic surgery are significantly different from those of conventional surgery. Work in two-dimensional environment, the different sense, technique of handling tools and applying basic techniques in surgery (knot typing, stitching, ligation etc.) require adequate hands-on preparation.

**AIM:** The aim of the study is to present simulated laparoscopic training sets for young surgeons and medical students, who are interested in surgery.

METHODS AND MATERIALS

The study included 25 medical students, interested in general and operative surgery (5th and 6th year) from Medical University of Sofia and Sofia University, 11 residents in general surgery from different hospitals in Sofia and 10 people without medical education, used as a control group.



All participants performed four practical tasks after demonstration and instructions given by an experienced surgeon. All tasks were performed by our less-expensive modification of a laparoscopic simulator – Penchev et al. Training Box, using self-made models for practical training.

Time was measured for every participant for each task. For a period of six months each non-experienced participant performed ten practical exercises. Statistical analysis was done, using the statistical package IBM SPSS 19 and descriptive methods, linear regression model and Mann Whitney U test for non-parametric variables.

Practical Tasks

Figure 1: Task №1 - A model for two-dimensional laparoscopic orientation



Figure 2: Task №2 - Hold a Needle and Dancing Needle for basic principles of laparoscopic stitching



Figure 3: Task №3 - Over and Under Wrap for basic principles of surgical knotting



Figure 4: Task №4 - Another orientation model



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RESULTS

Table 1. Descriptive analysis.

	Control Group	Student Group	Experienced group
Number of participants	10	25	11
Age (Mean ± SD)	26±6,5	24±2	34±9
SD = ( Standard Deviation )			

Table 2. Comparison of the measured time between the control group and the group of the students

Mann-Whitney U Test	Control Group N=10	Student Group N=25	P Value
Task 1 (Median ± SD) Time	111,5±15,7	112±14,1	,859
Task 2 (Median ± SD) Time	54,5±19,3	68±18	,250
Task 3 (Median ± SD) Time	36,5±10,2	36±7,7	,687
Task 4 (Median ± SD) Time	207,5±66,6	220±70,9	,794

Table 3. Comparison of the measured time between the control group and the experienced group

Mann-Whitney U Test	Experienced Group N=11	Control Group N=10	P Value
Task 1 (Median ± SD) Time	65±4,5	111,5±15,7	,000
Task 2 (Median ± SD) Time	30±6,1	54,5±19,3	,000
Task 3 (Median ± SD) Time	21±2,1	36,5±10,2	,000
Task 4 (Median ± SD) Time	42±8	207,5±66,6	,000

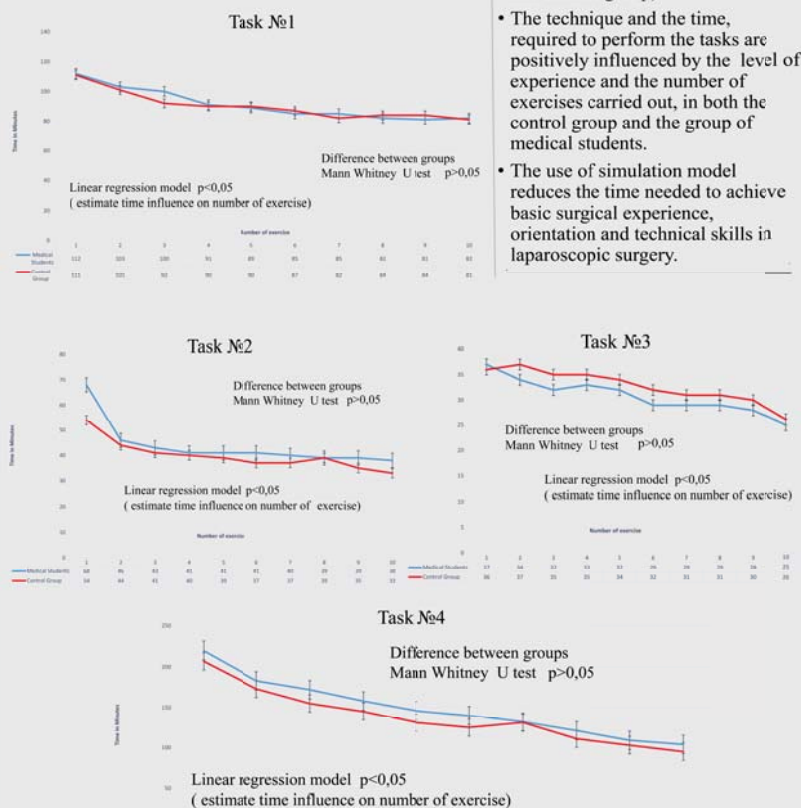
Table 4. Comparison of the measured time between the group of the students and the experienced group

Mann-Whitney U Test	Experienced Group N=11	Student Group N=25	P Value
Task 1 (Median ± SD) Time	65±4,5	112±14,1	,000
Task 2 (Median ± SD) Time	30±6,1	68±18	,000
Task 3 (Median ± SD) Time	21±2,1	36±7,7	,000
Task 4 (Median ± SD) Time	42±8	220±70,9	,000

Table 5. Comparison of the measured time between the experienced group and the non-experienced group.

Mann-Whitney U Test	Experienced Group N=11	Non-experienced group After 10 exercise N=35	P Value
Task 1 (Median ± SD) Time	65±4,5	81,5±5,6	,000
Task 2 (Median ± SD) Time	30±6,1	35,5±5,1	,035
Task 3 (Median ± SD) Time	21±2,1	29,7±3,5	,001
Task 4 (Median ± SD) Time	42±8	95±5	,000

Figure 5-8. Measured time of the unexperienced group after passing the training lessons : Task 1 – Task 4



DISCUSSION

The results from our study show that practical experience, even of those medical students, interested in surgery, did not differ from the general population of the community, used as a control group. Most of the people from the control group are students in economics or people without university education. The needs of medical students and young residents in surgery to learn basic laparoscopic skills on simulator model should be encouraged before introducing them to real surgical situation in the operating theatre. Workshops, courses and masterclasses in laparoscopic surgery are extremely useful, but they can't replace daily practice. Daily practice on a training simulator is invaluable for getting technical skills and for improving various methods of laparoscopic surgery. The original software simulation devices are useful for practical education, but unfortunately are extremely expensive and unaffordable for personal daily practice at home. There is only one center for practical education on endoscopic simulator in Bulgaria – in Medical University of Pleven. Our rationalization of laparoscopic simulator is extremely cheap (less than 300\$, including laparoscopic instruments), comfortable, portable and easy for home use and daily workout, with many positive reviews from Bulgarian surgeons with experience in laparoscopic surgery.

CONCLUSIONS

- There is no statistically significant difference between the control group and the group of medical students in terms of technique and speed of completing the practical tasks.
- The time, required to perform the tasks is significantly different among the group with experience in laparoscopic surgery, versus unexperienced (medical students and control group).
- The technique and the time, required to perform the tasks are positively influenced by the level of experience and the number of exercises carried out, in both the control group and the group of medical students.
- The use of simulation model reduces the time needed to achieve basic surgical experience, orientation and technical skills in laparoscopic surgery.