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Assessment of Basic Laparoscopic Skills for Surgical Residents on Simulation Based Endotrainer

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ABSTRACT:

Aim

To assess the role of simulation-based Endo trainer practice for developing basic laparoscopic skills amongst surgical residents.

Materials & Methods:

A prospective observational study done for 2 months (May 2022-June 2022) with 18 Surgery postgraduates in the Department of General Surgery, RRMCH, Bangalore.

The trainees performed 2 basic tasks (ball transfer & thread transfer) and 2 procedural skills (precision cutting and intracorporeal suturing) on Endo trainer box for a period of 2 months. An orientation teaching program was conducted before the onset of training on the principles of laparoscopy by senior faculty of the department. The tasks performed was evaluated and compared on the basis of Global Rating Scale and the time taken to perform each task was evaluated by an experienced laparoscopic surgeon on Day 1, Day 30 and Day 60 of training program. Regular feedback was taken from the trainees and the faculty members.

Results

Significant improvement was noted in the performance of the trainees over the span of 60 days both with respect to Task Completion Time (TCT) as well the Global Rating scale (GRS) scores. It was observed that the overall performance for basic task (task 1&2) showed promising results compared to procedural skills (task 3&4). Improvement rate between day 0 to 30 and 30-60, plateau phase.

Conclusion

TCT and GRS are easy and practical tools in laparoscopic Endo trainers for assessing acquired technical skills.

Keywords: Task completion time, laparoscopy, Global rating scale, simulation

INTRODUCTION:

Surgical history provides plentiful insight on continuous evolution in the field from open surgeries to laparoscopy to robotics, newer technology is sure to follow along. To master this coming of era in surgery, laparoscopy is the gateway tool to build enthusiasm, familiarize with the craft, develop dexterity and precision in both skills and ergonomics of the tools. Minimal invasive surgery (MIS) revolution has bestowed surgeons the power to gain maximum access surgical area of interest while inflicting minimum trauma. Endo trainer training process develops cognitive and psychomotor skills which identifying the

limitations and strength of individual learner's before losing the safety net of an attending surgeon. Without assessing performance of the trainees, this program would not attain the optimal promise it holds for improvement.

MATERIALS AND METHODS:

Eighteen trainees, all general surgery residents comprising of first to third year, underwent basic laparoscopy training program on the "Cliniva Ethicon, Laparoscopic Virtual Endo trainer set" under the guidance of one surgery consultant. No residents have prior training in the live laparoscopy procedures. 3 attempts each for the four designated tasks were carried out sequentially. The trainees performed two basic tasks (Task1: ball transfer & Task 2: thread transfer) and two procedural skills (Task. 3: precision cutting and Task 4 intracorporeal suturing) on Endo trainer box for a period of 2 months.

An orientation teaching program was conducted before the onset of training on the principles of laparoscopy by senior faculty of the department.

Task 1: ball transfer task for acquiring hand eye coordination with the instrument in 2-D plane. Task was carried out with a laparoscopic grasper in left hand and a laparoscopic Maryland in right hand, using the left hand to grasp a cup, then pick the ball with right hand and place it in the cup.

Task 2: thread transfer for 3-D manipulation of the laparoscopic instruments by threading with a Maryland into rings held by the grasper.

Task 3: cutting; by doing this the trainees gained precision skills and range of movements in rigid instruments.

Task 4: intracorporeal suturing with the use of both laparoscopic instruments.

The tasks performed was evaluated and compared on the basis of Global Rating Scale (GRS) and the Task Completion Time (TCT) time taken to perform each task by an experienced laparoscopic surgeon on Day 1, Day 30 and Day 60 of training program.

TCT define as task completion time for the given task (task 1 to 4) in one attempt.

Data was analyzed on Day 1, Day 30 and Day 60.

	Rating				
Variable	1	2	3	4	5
Time and motion moves	Struggling	Not confident	Moderate hand eye coordination	Minimal difficulty	Able to complete task
Instrument Handling	Difficult	Shaky	hesitant	Average	Complete task
Knowledge of instruments	Not Aware of all instruments	Not Able to identify	Not sure of names	Some instruments	Able to identify and handle
Use of assistants	No knowledge ,how to get assistance	Not able to use optimum assistance	Use assistance some what	Better understanding	Optimal use

Maximum score 20

Table 1 - Global Rating Scale

Figure 1 - Cliniva Ethicon, Laparoscopic Virtual Endo trainer set.

Figure 2 - Trainees practicing the various task on the Cliniva Ethicon, Laparoscopic Virtual Endo trainer set.

Statistical analysis*:* was done by T test for 2 dependent means using SPSS version23 with P value of <0.05 was considered significant.

Results*:*

Task 1: mean TCT for the 18 trainees on Day 1, Day 30 and Day 60 was 9, 4 and 2 respectively; with a highly significant p value of <0.00001. (Figure 3)

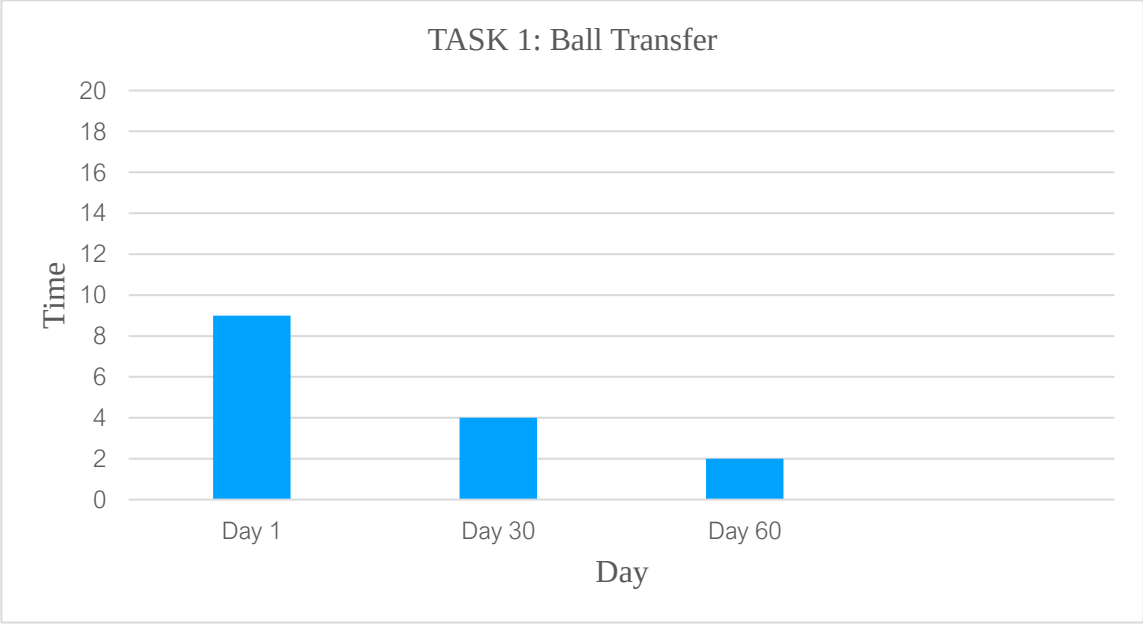
Task 2: Mean TCT on Day 1, Day30 and Day 60 was 11, 7 and 4 respectively; with a highly significant P value of <0.00001.(Figure 4)

Task 3: The TCT for Day 1, Day 30 and Day 60 was 13, 10 and 8 mins respectively; with a highly significant p value of <0.00001. (Figure 5)

Task 4: The TCT for Day 1, Day 30 and Day 60 was 16, 13 and 11 mins respectively; with a highly significant p value of <0.00001.(Figure 6)

And the GRS mean for Day 1, Day 30 and Day 60 was 9, 14 and 16 respectively. (Figure 7)

Figure 3 and 4 - showing task 1 and 2 respectively



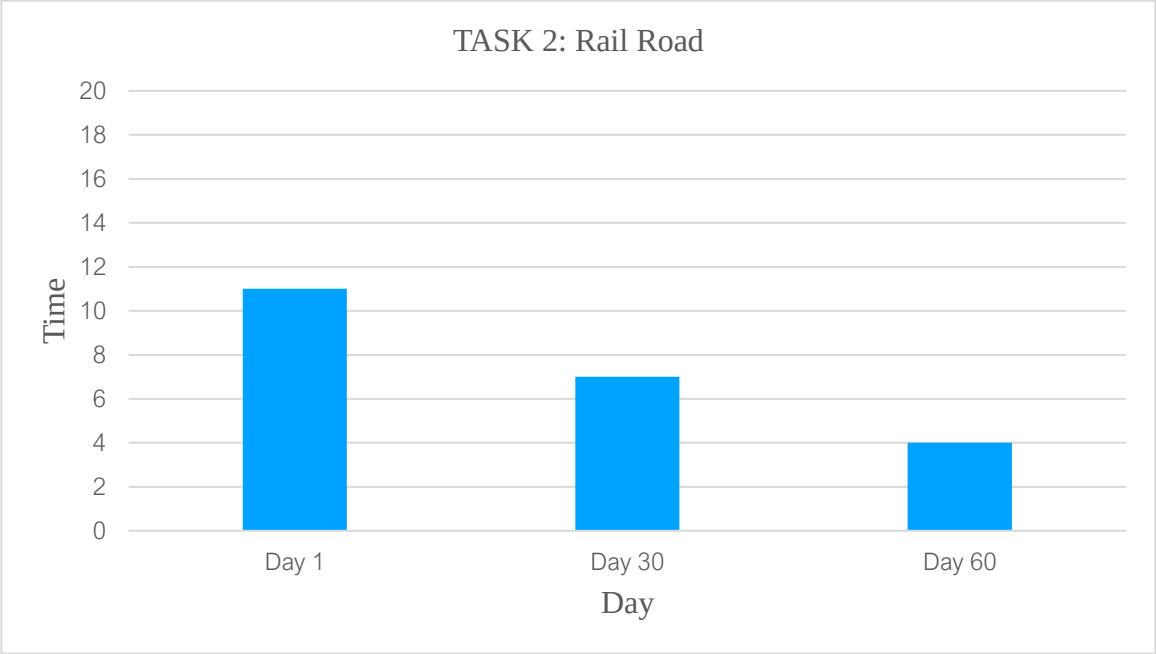
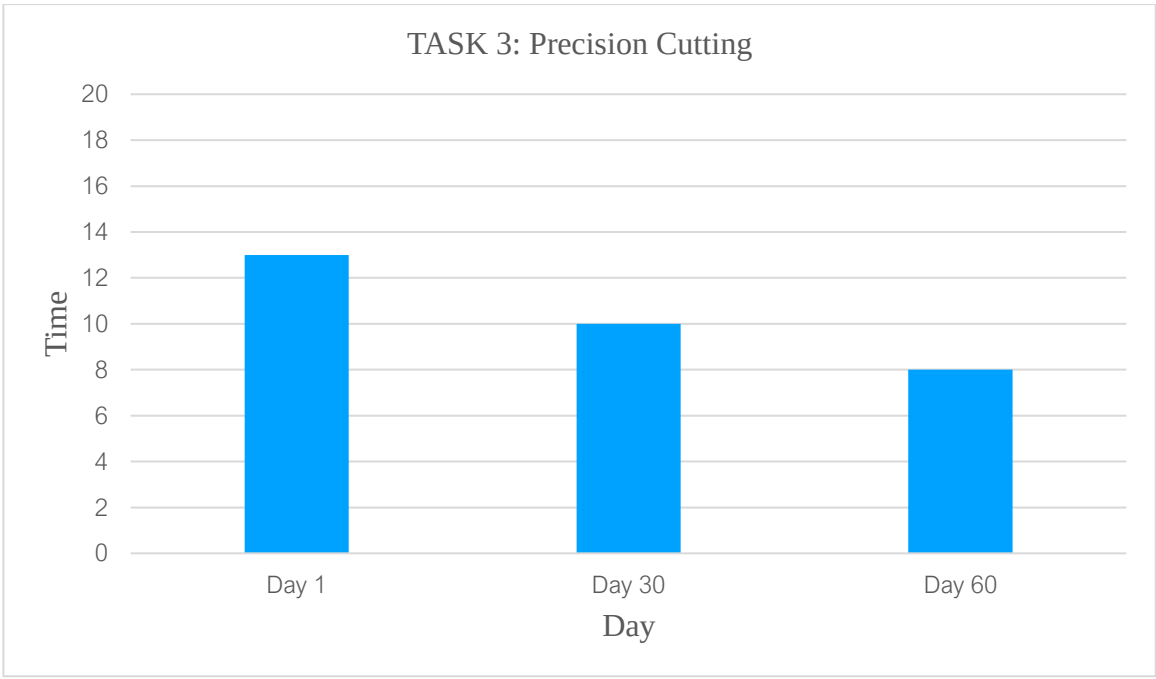


Figure 4 and 5 - task 3 and 4 respectively



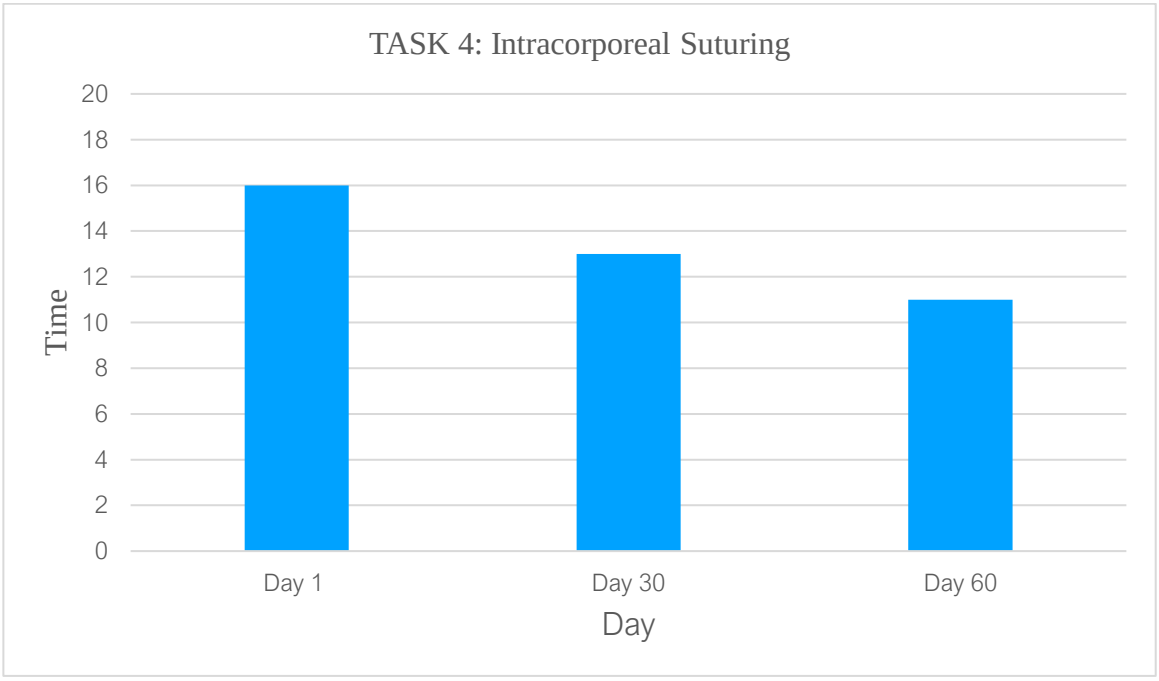


Figure 6 - GRS mean on Day 1, 30 and 60 respectively

It was observed that the overall performance for basic task (task 1&2) showed promising results compared to procedural skills (task 3&4).

Improvement rate between day 0 to 30 and 30-60, plateau phase. The results showed that repetition of the tasks as listed above in the Endo trainer had a positive effect on the 2D and 3D visual depth perception by the participants. As the total time spent on training increased, decreasing TCT reflected improvement in cognitive ability.

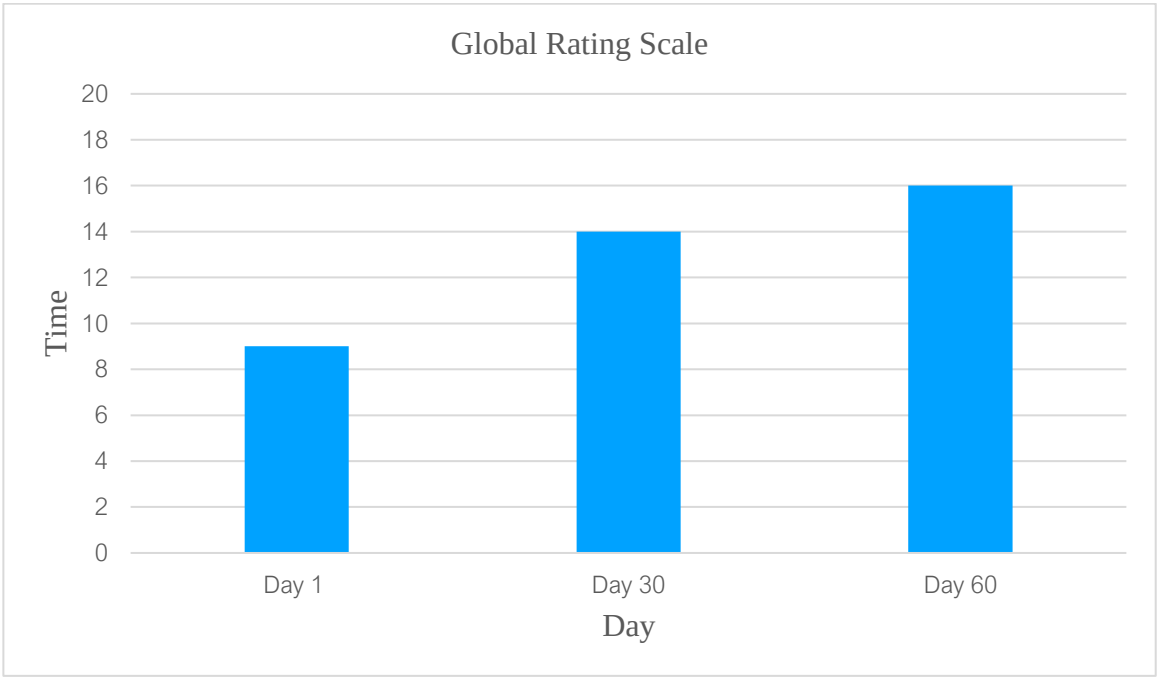


Figure 7 - P value for Day 1-30, 30-60 and 1-60 respectively

Day	P value
Day 1-30	<0.00001
Day 31-60	0.00054
Day 1-60	<0.00001

Discussion:

Simulation as a tool for developing skills in residents can be best compared to aviation community where type conversion training is given to young pilots. (2) The tasks were designed to teach generic laparoscopy skills (instrument navigation and manipulations, depth perception, video-hand-eye-coordination, and dexterity). The resulting difference on Day 1-Day 30 is more as compared to Day 30-Day 60 for which it attains a plateau phase which attributes that beginners make dramatic improvement in a few days, although it takes much more time and practice to become skilled. (3) In a study conducted by Shashi K Mishra et al, validity of task completion time (TCT) as a tool for acquiring technical skills using Endo trainer was assessed.(4) The findings of the present study is similar to that reported by Anender Kaur Dharewal et al, which concludes Global rating scale provides an inexpensive and effective way of objective assessment of performance of laparoscopic skills.(5) Whereas, our study incorporated both qualitative as well as quantitative parameters by including Global Rating Scale and TCT respectively. Feedback revealed training program helped the residents in sharpening surgical skills, creating a sense of healthy competition among peers, strengthening mental faculties as well as developing patience; a key factor for becoming a successful surgeon.

Conclusion:

"The man who gets most out of his life is the man who takes advantage of every opportunity."

This article explores feedbacks, limitations and time to acquire new skillsets. Skills sets learnt and polished: I-VITROS by Time and GRS, Insufflate/create space, Visualise, Identify, Triangulate, Retract, Operate, Seal/haemostasis.

The journey to acquire this beautiful art of laparoscopic surgery is full of challenges, yet worth the time invested. Prior training allows surgeon to concentrate on making intra operative decisions without any lack of expertise being a distraction. Hence, we conclude that simulation-based training is the need of the hour in this laparoscopy era and should be incorporated as a compulsory module in the curriculum of postgraduate training.

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