

Skill development in Laparoscopic surgery using endotrainers for House interns in a Teaching Hospital

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Abstract

Background:

Traditional way of teaching is effective only in transferring knowledge, not in skill development. We have to apply new teaching learning methods to develop skills in interns, who are going to be clinicians soon. Since the paradigm shifted to minimal access, training in this area is crucial to interns. As developing skills in patients is not feasible for interns in minimal success surgery, we introduced Box endo trainers in our department for developing Laparoscopic skills for interns.

Methods: 15 Interns (House surgeons) posted in surgical department, who had no previous Laparoscopic skills were given training for five days ,one hour each day, in Basic laparoscopic skills using Box endotrainers in surgery department. Assessment done, comparing the skills developed post training with pre training test by independent trained faculties.

Results: 90 % of the Interns Who undergone training, found to have better hands eye coordination, transferring skills, while 68% improved the suturing skills compared to pre test evaluation. There was remarkable increase in scores represented as mean for the whole program found to be $46.5\% \pm 7.230$ (Mean \pm SD) .The score was better for basic Beads task ($59.4\% \pm 7.548$ Mean \pm SD) As expected the basic tasks using the global rating scale showed better performance than suturing, which is technically more demanding , improvement was ($32.6\% \pm 8.4$ Mean \pm SD). Using Wilcoxon matched-paired test, P-value<0.0001 which is very significant

Conclusions: In a teaching hospital, with resource constrains, laparoscopic training using affordable box endotrainers found to be effective in skill development of interns.

Keywords: Interns, box trainers, skill development

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I. Introduction

As Max Plank said '*any innovations rarely make its way by gradually winning over and converting opponents. What does happen in opponent gradually die out and the new generation is familiarized with the ideas from the beginning*' Meaningful and effective teaching can benefit the interns in developing skills, when mentors apply different concepts, innovation in teaching ,curriculum enhancement, course design and assessment¹. Today interns want something more practical, relevant, and applicable in their professional life. Since the future of surgery is Minimal access, conventional training may not be sufficient. MCI has introduced vast curriculum changes, giving more importance to (CBME) competency based medical education, which are learner centric, integrated and interactive². In a resource constrained place where state of the art trainers not affordable, this simple box trainers meets the need in developing laparoscopic skills.³ Box endotrainer is economical, many can share one endotrainer, can practice anytime convenient to the interns.⁴ Acquiring this skill by practising daily, he or she will be better prepared and confident and inspired to take postgraduate course in surgery. Though this type of teaching methods exists in many institutes, we tried this as a pilot program in our institute.

Objective

To assess the impact of Endotrainer, in Laparoscopic skill development for interns compared to Observational and assisted learning.

II. Methods

Study was conducted at Karpaga Vinayaga Institute of Medical Sciences, a Private teaching hospital in South India. Study subjects were 15 interns, who were posted in surgery department, and not exposed to any laparoscopic training. Initial coaching given in focused group discussions about Laparoscopic instruments, Box endotrainers, by lectures and audio visual presentation of Basic laparoscopic skills by qualified, trained faculties, for one hour daily for 5 days.

Endotrainer, a locally made rectangular box with holes in a rubber sheet for working with Laparoscopic instruments, source of light and video screen to get a 2D image all set up in a room adjacent to Surgical wards. Trainees were provided with beads of different colours, and sponge suture pads and 30 vicryl for suturing technique. Pre Evaluation done by DOPS (Direct observation of performance skills) by independent qualified faculties, and scored using global rating, for the three tasks performed 1. Arranging two colour beads in two lines. 2. Transferring beads and 3. sutring task using synthetic suture pad and scored by Global rating scale and skill based scoring

Post evaluation: Training was given hand on in box endo trainer for one hour daily for five days, under observation by trained faculties different from assessor. Beads arrangement in lines based on colours, Beads transfer and intracorporeal knot training were given. The scoring done the same way as for pre test evaluation. All the interns were asked to perform the same three tasks in the same set up, and scored by different competent faculties. Both scores were analysed by Wilcoxon matched pair test.

Table 1. Global rating scale

Variable	Rating				
	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 2: Task based scoring for suturing skills using sponge suture pad

Procedure	Right	Wrong
Instrument selection	Two	Zero
Orientation and holding of needle	Two	Zero
Needle entry in to suture pad	Two	Zero
Single bite	Two	Zero
Optimal interval	Two	Zero
Squaring of knots	Two	Zero

Maximum score 10

Post test

Post training test:

All the interns were asked to perform the same three tasks in the same set up, and scored by different competent faculties. Both scores were analysed by Wilcoxon matched pair test.

Statistical Analysis:

For every single completed task, Wilcoxon matched-paired test was used for statistical significance between two groups and a *P* value <0.05 was considered significant. Scores between the second and first task performance was calculated and difference calculated as a percentage of the initial scores.

III. Results

Fifteen interns doing their surgical posting included in this study. All the 15 interns able to complete all the three tasks under Direct Observation of qualified faculties, who are different from the trainers, Values entered and mean percentage, calculated using Global scale. (Table 3) 20 is the maximum score for 3 completed tasks. The mean percentage improvement in the scores using global rating scale was (Mean ± SD) 46.5% ± 7.230

Mean Scores in percentage (Global rating scale)

Table 3

	Pre training	Post training	Improvement	
	Mean	Mean	Mean	S
Task 1	36	86	59.5	9.548
Task 2	26	56.6	32.6	8.4
Total	30	71.3	46.5	7.23

RESULTS For task Table 4 using the global rating scale mean percentage 9.548. Wilcoxon matched-paired test, *P*-value <0.0001 which is significant.

Table 4 Bead Transfer

Mean, median, and Standard deviation

	Pre Training	Post Training
Mean	5.6	19.4
Standard deviation	1.479	1.914
Median	6	17

Using Wilcoxon matched-paired, *P*-value<0.0001 which is significant

Table 5 (Suturing)

Mean percentage improvement using global rating scale was 32.6% (Pre 4.8 ± 1.14 vs. Post 11.12 ± 1.66) with a standard deviation of 9.4 using Wilcoxon matched-paired signed-ranks test, 2-tailed *P*-value <0.0001 which is significant

Table 5

Mean, median and Standard deviation

	Pre Training	Post training
Mean	1.041	1.965
Standard Deviation	4	9.4
Median	5	12

Using Wilcoxon matched-paired signed-ranks test, 2-tailed *P*-value<0.0001 which is extremely significant

Table 6

The mean improvement in suturing skills [using task-based checklist was 32.64% with a standard deviation of 9.4 (Pre 3.12 ± 1.51 vs. Post 8.6 ± 1.08). Using Wilcoxon matched-paired test, *P*-value <0.0001 which is extremely significant

Task 2 Pre and post training scores using checklist for suturing

	Pre-training	Post-training
Mean	3.51	8.6
Standard deviation	1.51	1.08
Median	3	9.4

Using Wilcoxon matched-paired -ranks test, *P*-value<0.0001 significant

Interns were made to perform different tasks to assess their basic skill and advanced skill. a.Cognitive,b. psychomotor c.hand eye coordination d.instrument handling, e optimal use of assistance f. orientation to the computer two dimensional images all assessed.. Since the participants had no prior exposure to laparoscopic surgery they performance significantly improved. The post-training assessment of the same skills were in the range of 72%-100% for almost all the interns..Faculty involvement and training crucial for better outcome as in this study

IV. Discussion

Interns learn skills only by observation which is not sufficient. It is not possible for interns to get hands on training without acquiring skills. Skill development outside Operation Theater using endotrainer fills the gap.⁵ Though virtual reality 3 D, animal, turtle models available, endotrainer is very affordable, any time any number of hours you can practice and develop skills. If done under supervision by trained faculties, attitude, skills and confidence of the interns will definitely improve.⁶

Satava suggested skill development by simulation as early as 1990. Over the past decade evidence has progressively accumulated in favor of use of simulation as a means of training and as an evaluation tool in the field of laparoscopy. Since the way medical students are taught shifted from didactic lectures to Integrated, competency based teaching methods, it is essential that this kind of training should be include in Undergraduate curriculum.⁷

Skills simulators are available from basic to animal model and virtual 3 D simulation; here we have used only a basic box endotrainer which is affordable as a pilot project in our Institute. Only if the interns get trained in basic skills, they can understand in actual hands on situation. Mere training in basic skills will not make the intern competent Laparoscopic surgeons, but definitely will help him to develop his skill by continuous practice. Interns to get these kind of training will make him in better position to master his skills, if he/or she choose to be a surgeon. A suitable training schedule must be in place under the supervision of dedicated faculty, for different lap surgery modules .Interns may choose their own timings and pace, since all may not be have same level of competence. Formative assessment by way of scoring and feedback certainly improve the outcome.MCI now wants the Indian medical graduate to be trained by competency based (CBME) programs and Integrated interactive Teaching learning methods. This kind of programs will help the interns achieve competency⁸.

Basic skills such as Bead arrangement and transfer improve cognitive psychomotor abilities and better hand eye coordination. In specific laparoscopic procedures, optimal use of assistance, hand dexterity also very essential. Suture training using sponge pad mainly used to address this skill development.⁹ Though suturing in endotrainer difficult initially, easy to master with practice. Since future of surgery is minimal access it is important that the interns should learn the skill and getting used to the two dimension images in video screen. Sponge pad suturing training will help the students to learn the correct way of intracorporeal suturing a must for laparoscopic surgeons.¹⁰ The interns were not exposed to laparoscopic surgery, the post test score was less in suture technique compared to work with beads. They feedback from interns also reflected the same, as they found suturing technically more difficult.

Regehr *et al.* in their article implied that reliability by checklists not the preferred method of assessment, but Anender Kaur et al in their studies used both Global scoring scale and Checklist scoring and found effective.¹¹ High end virtual simulators and animal models may give better exposure, purpose of this study is giving exposure to Laparoscopy to interns and box trainers serve the purpose. With limited resources available these inexpensive box trainers are well received.

Munz et al compared simulation training using high end simulator with box endotrainers, and found no significant differences by way of scoring. They concluded box endotrainers is ideal for aspiring surgeons in developing skills. Scott et al also concurred that endotrainers give better results for interns who have no prior exposure¹²

Direct observation of performance skills (DOPS) is found to be an effective tool of assessment. This will improve the quality of teaching, structuring of course modules according participants. Psychomotor skills and dexterity improve with regular box training ... This study proves that focused small group, short duration intensive, courses helps in improving laparoscopic skills of surgical interns. Formative assessment improves the clinical skills...

V. Conclusion

Skill development in Laparoscopic skills using endotrainers certainly have a role in training interns'. The box endotrainer is very affordable, which is particularly relevant in the Indian context, not be hurdle in the widespread usage. Box simulators provide a reasonable improvement in performance of laparoscopic skills. Effective well organized laparoscopic skills training using box trainers and assessment by way of feedback from Interns and faculties can be made a part of training interns.

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DECLARATIONS

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Ethical approval: Not required

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References should be numbered consecutively as they appear in the text. Reference citations in the text should be identified by numbers in superscript after the punctuation marks. All authors should be quoted for papers with up to six authors; for papers with more than six authors, the first six should be quoted followed by et al.

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Garber A, Klein E, Bruce S, Sankoh S, Mohideen P. Metformin-glibenclamide versus metformin plus rosiglitazone in patients with type 2 diabetes inadequately controlled on metformin monotherapy. Diabetes Obes Metab 2006;8(2):156-63.

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Table 2: Aaaaa aaaaaa aaaaaaaaaaaaaa aaaaaaaaaaaaaa.

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Figure 2: Aaaaa aaaaaa aaaaaaaaaaaaaa aaaaaaaaaaaaaa.

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