ORIGINAL ARTICLE

Validation and reliability of Global Operative Assessment of Laparoscopic Skills for surgical residents and consultants

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Abstract

Objective: To institute and validate the Global Assessment of Laparoscopic Surgery score as a measure of intraoperative performance.

Methods: The observational study was conducted at the Services Hospital, Lahore, and the National Hospital and Medical Centre, Lahore, from August 1, 2013, to February 28, 2014, and comprised Residents, Senior Registrars and Consultants who were divided into 3 groups. The Junior group comprised Residents from years 1, 2 and3; the Intermediate group had year 4 Residents and Senior Registrars; and the Senior group included Consultants. All participants had their evaluation using Global Assessment of Laparoscopic Surgeryscore while performing dissection of gall bladder from the liver bed during laparoscopic cholecystectomy. SPSS 20 was used for statistical analysis.

Results: Of the 24 subjects in the study, 12(50%) were Residents, 6(25%) Senior Registrars and 6(25%) Consultants. The mean score for Junior group was 7.64±0.988, for Intermediate group 16.25±2.602 and for Senior group 22.83±1.169The score was highly reliable with intra-class coefficient 0.96, and internal consistency was excellent with Cronbach's Alpha 0.981.

Conclusion: Global Assessment of Laparoscopic Surgery was found to be a valid and reliable measure of intraoperative laparoscopic skills.

Keywords: Simulators, Laparoscopic cholecystectomy, Training, Box trainers, GOALS, Residents. (JPMA 66: 18; 2016)

Introduction

Over the last 30 years there has been an explosive growth in the use of laparoscopic surgery for routine as well as complicated procedures. Laparoscopic surgery requires additional training compared with open surgery. It challenges surgeons' skills on multiple grounds, including an inability to touch tissue, a lack of a 3-dimensional view, counterintuitive fulcrum lead, and the loss of finger dexterity. Adding to it, the rising costs of operation theatre times, and the teaching of this modality becomes very cumbersome.[1-4] Because of patient safety constraints and financial considerations, achieving proficiency in an operating room through clinical experience has become more challenging.[3-5]

The use of bench training for laparoscopic surgery has gained much popularity. Simulators are being used more and more for teaching and testing laparoscopic skills in a cost-effective and controlled environment.[6-8] This form of training allows residents to attain a basic level of laparoscopic skills that can be transferred from the laboratory to the operating room environment. A study[9] involving surgeons from 5 countries showed that even laparoscopy experts can improve their performance by practising on simulators.

Keeping in view the difficulty experienced in training residents in laparoscopic surgery, the Department of Surgery at Services Institute of Medical Sciences/Services Hospital, Lahore (SIMS/SHL) has also started its own inanimate training lab consisting of box trainers for training its Residents in laparoscopic surgery. A one-day workshop is regularly conducted by the department based on the McGill Inanimate System for Training and Evaluation of Laparoscopic Skills (MISTELS). This system is based on skills unique to laparoscopic surgery which have been modelled into exercises that can be carried out in a physical simulator (a simple box trainer in our case).

The most important aspect of this system is to evaluate the relationship between the skills acquired through the box trainers and actual skills shown in the operating theatre. There is evidence for transferability of skills acquired in the simulator to operating room. To assess the level of intraoperative laparoscopic skills various scores have been developed.[10-16]

A similar score has been established at the Steinberg-

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Bernstein Centre for Minimally Invasive Surgery at McGill University for assessment of intraoperative laparoscopic skills.[11] Global Assessment of Laparoscopic Surgery (GOALS) is based on the concept that intraoperative laparoscopic performance can be evaluated in several categories called domains. It evaluates performance in five domains (depth perception, bimanual dexterity, efficiency, tissue handling, and autonomy), and each domain is scored with an integer rating from 1 to 5. A descriptive anchor is provided for scores of 1, 3, and 5 for each domain (Table).[16]

GOALS has construct validity in the evaluation of surgical Residents' intraoperative performances of dissection of the gallbladder from the liver bed. Construct validity means that the test has the ability to discriminate between novice and expert surgeons. Experienced surgeons and surgeons with more training (experts) should perform better than surgeons with less experience or less training (novices).[10]

The current study was designed to test the validity of GOALS score on surgical residents in a Pakistani setup.

Subjects and Methods

The observational study was conducted at the Services Hospital, Lahore, and the National Hospital and Medical Centre, Lahore, from August 1, 2013, to February 28, 2014, and comprised Residents, Senior Registrars and Consultants who were divided into 3 groups. The Junior group comprised Residents from years 1, 2 and 3; the Intermediate group had year 4 Residents and Senior Registrars; and the Senior group included Consultants. All participants had their evaluation using Global Assessment of Laparoscopic Surgery score while performing dissection of gall bladder from the liver bed during laparoscopic cholecystectomy.

After approval from the institutional review committee and taking informed consent from all the participants, the subjects were required to perform dissection of gall bladder from the liver bed. The procedure was video-recorded which was then assessed by two assessors who were blinded to the level of competence of the surgeon concerned, and also to each other's assessment. Assessment was done using the GOALS score. Each assessor provided his/her own score for each participant. The average of the two scores was taken as the final score for each individual.

Data was analysed using SPSS 20. Demographic data, including age, gender, level of training, and GOALS score were recorded. The difference in GOALS score among the groups was evaluated using one-way analysis of variance (ANOVA) with post hoc analysis. $P<0.05$ was taken as significant. The GOALS score of the two evaluators was also compared to establish inter-rater reliability using the interclass correlation coefficient.

Results

Of the 24 subjects in the study 10 belonged to Junior group, 8 to Intermediate group and 6 to Senior group. Of

Table-1: Global Assessment of Laparoscopic Surgery scoring system.

Domains	Anchor Descriptors		
Depth Perception	Constantly overshooting target, hits backstop, wide swings, slow to correct	Some overshooting or missing plane but corrects quickly	Accurately directs instruments in correct plane to target
Bimanual Dexterity	Use of one hand, ignoring nondominant hand, poor coordination between hands	Use of both hands but does not optimize interactions between hands to facilitate conduct of operation	Expertly uses both hands in a complementary manner to provide optimal working exposure
Efficiency	Uncertain, much wasted effort, many tentative motions, constantly changing focus of operation, or persisting at a task without progress	Slow, but planned and reasonably organized	Confident, efficient and safe conduct of operation, maintaining focus on component of procedure until better done by another approach
Tissue Handling	Rough, tears tissue by excessive traction, injures adjacent structures, poor control of coagulation device (recoil), grasper frequently slips off	Handles tissues reasonably well, with some minor trauma to adjacent tissues, eg, coagulation of liver, causes unnecessary liver bleeding, occasional slipping of grasper	Handles tissues very well with appropriate traction on tissues and negligible injury of adjacent structures. Uses energy sources appropriately but not excessively
Autonomy	Unable to complete entire procedure, even in a straightforward case and with extensive verbal guidance	Able to complete operation safely with moderate prompting	Able to complete operation independently without prompting

Adapted from Vassiliou et al, American Journal of Surgery, with permission.

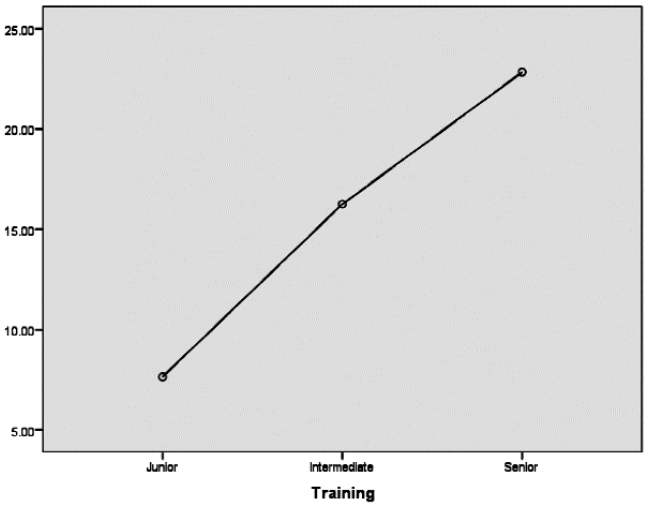

Figure-1: Value of Global Assessment of Laparoscopic Surgery score and level of training.
[One Way Analysis of Variance with post Hoc Analysis showed significant improvement from Junior to Intermediate group (p<0.001) and from Intermediate to Senior group (p<0.001)]

these 12(50%) were Residents, 6(25%) Senior Registrars and 6(25%) Consultants. GOALS score had strong construct validity as the mean score for Junior group was 7.64±0.988, for Intermediate group 16.25±2.602 and for Senior group 22.83±1.169. An intergroup comparison using one-way analysis of variance (ANOVA) with post-hoc analysis showed a significant improvement of scores from Junior to Intermediate group (p<0.001) and from Intermediate to Senior group (p<0.001) (Figure-1).

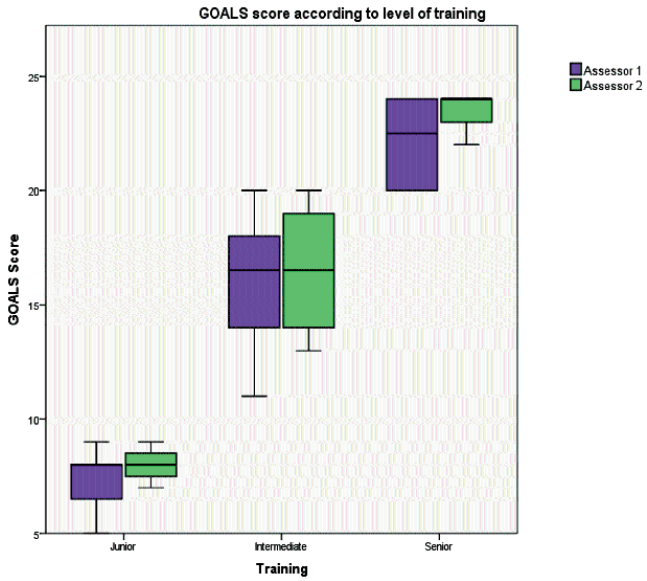

Figure-2: Global Assessment of Laparoscopic Surgery score of the two independent assessors (Intraclass Correlation Coefficient 0.96).

Goals assessment was done by two independent raters (Figure-2). GOALS score were highly reliable Withintra-class coefficient of 0.96 at 95% confidence interval (CI) (0.904 to 0.985).Internal consistency was also tested using Cornbach's alpha and the results were excellent at 0.981.

Discussion

As more and more procedures are being done with laparoscopic/endoscopic approach it is not only important to learn and acquire these skills, but there is also a need to be able to assess these skills. Assessment of laparoscopic skills will not only help the training Residents improve on their skills but also provide a system to assess the level of a surgical resident. This assessment is necessary to make sure that resident has acquired enough skills before letting him operate on patients independently.

One such means of assessment of laparoscopic skills is the GOALS score developed at McGill University.[11] We acquired permission from the authors to be able to use this score on our Residents and Consultants. We found GOALS to have face validity and construct validity. The score could easily differentiate Junior from Intermediate and Intermediate from Senior groups. We found a strong correlation between GOALS and level of training. There was a progressive increase in score as the level of training improved. This is at par with a lot of international studies which also show GOALS score to have construct validity.[10,12,13] When looking at the GOALS score, we found GOALS to be highly reliable and very consistent. Again our results were similar to other international studies.[10-13]

Our assessment was done through video recordings of the procedures and assessment was done by two independent assessors. Assessment of GOALS score through video recordings was not difficult and both assessors were very comfortable with the assessment. Video recordings though they increase cost, are definitely a great tool as they also help to identify areas of skill deficiency that require improvement and is in fact a very good way of removing any bias.[14,15] Both assessors were blinded and were unaware of the candidate who they were assessing. A study[16] has proved that video tape assessment of laparoscopic skills is reliable, feasible and valid.

Conclusion

As shown by the study, GOALS is an easy-to-use, valid and reliable tool and can easily be done postoperatively by a consultant in no more than a few minutes.

References

1. Dankelman J, Chmarra MK, Verdaasdonk EG, Stassen LP, Grimbergen CA. Fundamental aspects of learning minimally invasive surgical skills. Minimally invasive therapy & allied technologies. Minim Invasiv Ther Allied Technol 2005; 14: 247-56.
2. Chmarra MK, Dankelman J, van den Dobbelsteen JJ, Jansen FW. Force feedback and basic laparoscopic skills. Surg Endosc 2008; 22: 2140-8.
3. Roberts KE, Bell RL, Duffy AJ. Evolution of surgical skills training. World J Ggastroenterol 2006; 12: 3219-24.
4. Fried GM, Feldman LS, Vassiliou MC, Fraser SA, Stanbridge D, Ghitulescu G, et al. Proving the value of simulation in laparoscopic surgery. Ann Surg 2004; 240: 518-25; discussion 25-8.
5. Aggarwal R, Grantcharov T, Moorthy K, Milland T, Papasavas P, Dosis A, et al. An evaluation of the feasibility, validity, and reliability of laparoscopic skills assessment in the operating room. Ann Surg 2007; 245: 992-9.
6. Scott DJ, Bergen PC, Rege RV, Laycock R, Tesfay ST, Valentine RJ, et al. Laparoscopic training on bench models: better and more cost effective than operating room experience? J Ame Coll Surg 2000; 191: 272-83.
7. Sarker SK, Chang A, Vincent C, Darzi SA. Development of assessing generic and specific technical skills in laparoscopic surgery. Am J Surg 2006; 191: 238-44.
8. Halvorsen FH, Elle OJ, Fosse E. Simulators in surgery. Minimally invasive therapy & allied technologies. Minim Invasiv Ther Allied Technol 2005; 14: 214-23.
9. Feldman LS, Sherman V, Fried GM. Using simulators to assess laparoscopic competence: ready for widespread use? Surgery 2004; 135: 28-42.
10. Hogle NJ, Liu Y, Ogden RT, Fowler DL. Evaluation of surgical fellows' laparoscopic performance using Global Operative Assessment of Laparoscopic Skills (GOALS). Surg Endosc 2014; 28: 1284-90.
11. Vassiliou MC, Feldman LS, Andrew CG, Bergman S, Leffondre K, Stanbridge D, et al. A global assessment tool for evaluation of intraoperative laparoscopic skills. Am J Surg 2005; 190: 107-13.
12. Kurashima Y, Feldman LS, Al-Sabah S, Kaneva PA, Fried GM, Vassiliou MC. A tool for training and evaluation of laparoscopic inguinal hernia repair: the Global Operative Assessment Of Laparoscopic Skills-Groin Hernia (GOALS-GH). Am J Surg 2011; 201: 54-61.
13. Korndorffer JR, Jr., Dunne JB, Sierra R, Stefanidis D, Touchard CL, Scott DJ. Simulator training for laparoscopic suturing using performance goals translates to the operating room. J Am Coll Surg 2005; 201: 23-9.
14. Matsuda T, Kanayama H, Ono Y, Kawauchi A, Mizoguchi H, Nakagawa K, et al. Reliability of laparoscopic skills assessment on video: 8-year results of the Endoscopic Surgical Skill Qualification System in Japan. J Endourol 2014; 28: 1374-8.
15. Oropesa I, Sanchez-Gonzalez P, Chmarra MK, Lamata P, Fernandez A, Sanchez-Margallo JA, et al. EVA: laparoscopic instrument tracking based on Endoscopic Video Analysis for psychomotor skills assessment. Surg Endosc 2013; 27: 1029-39.
16. Dath D, Regehr G, Birch D, Schlachta C, Poulin E, Mamazza J, et al. Toward reliable operative assessment: the reliability and feasibility of videotaped assessment of laparoscopic technical skills. Surg Endosc 2004; 18: 1800-4.