

Skill qualifications in pediatric minimally invasive surgery

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Abstract

Purpose In 2006, The Japanese Society of Pediatric Endoscopic Surgeons devised a plan to develop a pediatric endoscopic surgical skill qualification (ESSQ) system. This system is controlled by The Japan Society for Endoscopic Surgery. The standard requirement for skills qualification is the ability of each applicant to complete common types of laparoscopic surgery. The main goal of the system is to

decrease complications of laparoscopic surgery by evaluating the surgical skills of each applicant and subsequently certify surgeons with adequate skills to perform laparoscopic operations safely.

Methods A committee of pediatric ESSQ created a checklist to assess the applicant's laparoscopic surgical skills. Skills are assessed in a double-blinded fashion by evaluating an unedited video recording of a fundoplication for pediatric gastroesophageal reflux disease.

Results The initial pediatric ESSQ system was started in 2008. In 2008 and 2009, respectively, 9 out of 17 (53%) and 6 out of 12 (50%) applicants were certified as expert pediatric laparoscopic surgeons.

Conclusions Our ultimate goal is to provide safe and appropriate pediatric minimally invasive procedures and to avoid severe complications. To prove the predictive validity of this system, a survey of the outcomes of operations performed by certified pediatric surgeons is required.

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Introduction

The skills required to perform laparoscopic surgery are very different than those needed for open surgery. The surgeon has to enter the peritoneal cavity using a smaller incision, use long instruments, and perform surgery by viewing a two-dimensional video image on a screen with limited tactile feedback.

Because various types of procedures are done using minimally invasive surgery (MIS) techniques in children, but with an insufficient number of patients available in each category, young pediatric surgeons have limited

opportunities to perform each type of pediatric MIS. However, all procedures using MIS techniques must be performed safely and accurately without any intra- and postoperative complications.

In 2003, the endoscopic surgical skill qualification (ESSQ) system started in Japan in the fields of gastrointestinal surgery, urology, and gynecology. The entire system is controlled by the Japan Society for Endoscopic Surgery [1, 2]. The standard requirement for skill qualification by this system is the ability of the applicant to complete common types of laparoscopic surgery in each field. The main goal of the system is to decrease complications of laparoscopic surgery by evaluating the surgical skills of each applicant and certifying surgeons with sufficient skills to perform laparoscopic operations safely [1, 2]. Herein, we describe the ESSQ system in the pediatric surgical field that was started in 2008.

Methods

The ESSQ system in the pediatric endoscopic field was established in 2006 in accordance with a formal agreement at the general assembly of The Japanese Society of Pediatric Endoscopic Surgeons (JSPES) [3]. The system is controlled by the Pediatric ESSQ Committee consisting of 11 expert pediatric laparoscopic surgeons, each with more than 10 years of experience, who were selected at the Councilors meeting of JSPES. This system was designed to certify pediatric surgeons who have the capability to complete a pediatric laparoscopic fundoplication safely and appropriately by their own efforts.

To qualify for certification, applicants must fulfill the following criteria: They should have completed at least a 7-year general and pediatric surgical training program; must have performed more than 50 pediatric MIS procedures, including 20 advanced procedures; must be a certified pediatric surgeon by the Board of The Japanese Society of Pediatric Surgeons; the formal application must be sponsored by at least two supervisors with personal knowledge of the applicant's endoscopic surgical skills. To demonstrate their surgical skills, applicants are required to submit a DVD of an unedited video recording showing an endoscopic view of an entire pediatric laparoscopic fundoplication, from insertion of ports to their removal. An outside view of the operating team is not required. To assess the applicant's laparoscopic surgical skills, the committee created a set of guidelines and a checklist (Table 1). A perfect procedure would score 100 points, while 1–8 points would be deducted if a dangerous or inappropriate maneuver was made. The submitted video recording is discussed and scored in a double-blinded fashion by two referees on the ESSQ committee.

Table 1 Checklist for endoscopic technical skill assessment in pediatric laparoscopic funduplications

A. Team performance and leadership (total 44 points)
Planning of procedure (6 points)
Collaboration with assistants (6 points)
Maintaining good surgical field
Appropriate distance between camera and instruments (4 points)
Keeping surgical field in the center of the camera view (4 points)
Procedures under vision with unfogged lens (4 points)
Smooth camera movement including zoom-in and zoom-out (4 points)
Performance of important procedures by an assistant (4 points)
Performance of important procedures by an applicant (4 points)
Use of appropriate energy source (4 points)
Control of bleeding (4 points)
B. Individual performance of maneuvers (total 56 points)
Introduction of the ports (6 points)
Dissection plane between esophagus and crus of diaphragm (6 points)
Division of short gastric vessels (4 points)
Dissection and freeing of gastric fundus (4 points)
Blunt dissection to develop the posterior abdominal esophagus (4 points)
Gentle maneuver of esophagus and stomach (4 points)
Gentle maneuver of vagal nerves including hepatic branch (4 points)
Appropriate crural repair (8 points)
Fundoplication
Position of secure wrapping (4 points)
Length of wrapping (4 points)
Suturing technique (8 points)

Applicants who get more than 75 points are certified. If the two referees disagree, the final judgment is made by a third expert referee. For applicants, who do not obtain certification, the referees describe in detail the inappropriate or dangerous maneuvers seen in the video recording. Failed applicants can apply again the following year after more training in laparoscopic surgical techniques.

The referees are chosen from among active ESSQ committee members, as well as certified laparoscopic pediatric surgeons. The certification score for referees was set at 80 points; 5 points more than that of applicants.

Both referee and applicant candidates can choose a video from their own library, and they can select an easier case, such as a young infant without any hiatal hernia. However, they need to attach a case report that includes the patient's condition, including his/her body weight, height, grade of gastroesophageal reflux disease, positive or negative scoliosis, and possible neurological impairment.

Results

Because the main purpose of this system is to decrease complications by increasing safety, the assessment is focused on dangerous maneuvers that may result in accidents or complications. Because all referees need to agree on deducting the same number of points for similar dangerous maneuvers, we continue to discuss the details of the technical skills assessment form.

The skills of each committee member were first evaluated in a blinded fashion by all members. Each member judged to be “certifiable” by a majority of the committee members then became a referee (Table 2). 10 of 11 members were finally certified as referees. In Table 2, score A shows the mean scores of all referees with the standard deviation being within 5 points, except for referees F and J. Referee F’s scores ranged from 71 to 91; four referees scored less than 75 points, while two received more than 90 points. The mean scores of referees H, I, and J did not reach 80 points, but a majority of committee members scored more than 80 points.

This skills evaluation of the committee members is then used to achieve consensus on the guidelines for technical assessment of the applicants, however, achieving consensus is quite difficult. Score B in Table 2 shows the fluctuation in scoring by each referee. Referee B’s scores ranged from 65 (for referee J) to 90 points (for referee A) (81.4 ± 8.6), whereas referee C gave 84 points for referee J and 83 points for referee A (range from 78 to 88). Thus, referee B tended to give higher scores for good, and lower scores for bad performance. The self-assessment scores of five referees (B, E, F, H, and J) were higher than the mean score by all referees. Only one referee (C) evaluated himself as being uncertifiable in self-assessment.

The application of the pediatric ESSQ system started in 2008. Figure 1 shows the results of the applicants in 2008 and 2009. In 2008, 2 of 9 (22%) applicants became certified, whereas in 2009, 3 of 9 (33%) were certified. Seven video recordings were certified by one referee, while the same recordings were rejected by another. Evaluation of these recordings by the committee chairman, serving as an additional referee, certified three applicants (Fig. 1). The number of certified pediatric endoscopic surgeons, including referees in the ESSQ system, was 9 of 17

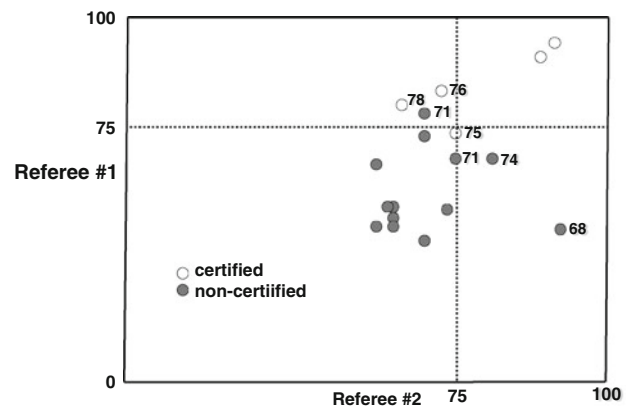


Fig. 1 The scores of applicants. Unedited DVD is scored by two referees. If their judgments differ, an additional expert referee decides whether to “certify” or “non-certify”. The number next to the circle is the score awarded by the additional expert referee. Applicants who got more than 75 points were certified

applicants (53%; 7 referees and 2 applicants) in 2008, and 6 of 12 (50%; 3 referees and 3 applicants) applicants in 2009. All applicants who chose neurologically impaired older children with severe chronic reflux esophagitis failed their skill certification test.

Discussion

The skills required to perform laparoscopic surgery are very different from those needed for open surgery. The traditional apprenticeship model for acquiring surgical skills cannot accommodate the new skills required for laparoscopic surgery. Thus, it was necessary for the surgical curriculum to evolve towards the teaching of skills in a systematic and logical fashion by having the students actually perform the surgeries rather than just observe them [4, 5].

There are two types of introductory course on MIS for pediatric surgeons; one teaches basic laparoscopic skills within a structured curriculum using a surgical trainer, a virtual reality system, and simulated surgery on animal models. The other teaches the skills by letting the students perform laparoscopic surgery on adult human patients [6, 7]. It is after several laparoscopic training procedures, both inside and outside the operating theater that young

Table 2 Reliability, validity, and discrepancy in the scores of referees

Referee	A	B	C	D	E	F	G	H	I	J
Score A	87.1 ± 4.7	87.9 ± 3.2	82.3 ± 4.4	88.7 ± 4.3	82.6 ± 3.5	81.2 ± 7.9	81.3 ± 3.3	76.9 ± 4.4	79.1 ± 2.6	77.1 ± 6.4
Score B	82.4 ± 4.1	81.4 ± 8.6	82.7 ± 2.9	82.4 ± 3.6	82.1 ± 6.6	82.5 ± 6.9	78.7 ± 6.6	81.5 ± 6.1	87.2 ± 5.8	83.3 ± 6.9
Score C	87	91	78	84	87	88	81	82	80	80

Score A is mean ± SD of each referee evaluated by all referees. Score B is mean ± SD of ten referees (ex. The mean score of referee A’s judgment from A to I). Score C is the self-assessment score

pediatric surgeons begin to perform pediatric MIS. However, because of the inconsistencies of the judges, as described above, it is very difficult to evaluate the surgical competency of the students, including assessment of knowledge and technical skill.

We have reported the efficacy of laparoscopic pyloromyotomy and its learning curve, and found that despite it being such an easy procedure, each pediatric surgeon needed to perform about 7–10 of these procedures to achieve safe and good surgical skills [8]. Simulators currently have the ability to teach basic laparoscopic skills, thus enabling novice surgeons to progress along the early part of the learning curve before entering the operating theater. With further developments in technology, it may be possible to practice complete procedures, such as Nissen funduplications, using simulators. However, further training will still be needed for surgeons to reach expert levels of skill in the operating theater [4]. Every patient wants and deserves a laparoscopic surgeon with good skills, but it is not easy to identify an expert pediatric laparoscopic surgeon.

Efforts to establish the ESSQ system in Japan were initiated soon after a fatal intraoperative complication during an adult laparoscopic prostatectomy. The ultimate goal of the pediatric ESSQ system is to provide safe and accurate pediatric procedures that are minimally invasive and to avoid severe complications. This system also has the potential to set appropriate standards for pediatric endoscopic surgery. Feedback on the scoring of the skill assessment will result in improvements of the skills of each applicant. In this system, the assessment of skills is performed on the basis of an unedited video recording of an entire laparoscopic fundoplication. Intraoperative assessments are quite useful in evaluating surgical competency because referees can judge all of the parameters required for a safe operation [5]. In addition to evaluating the technical skills, the quality evaluation of the entire operation should include overall surgical team performance, team leadership of the surgeon, and performance of individual surgeons. Our assessment guidelines allocate 44 points for team performance and leadership, and 56 points for the individual surgeon's performance (Table 1).

To achieve high reliability and validity of the assessment systems, and to decrease discrepancies in qualification, the pediatric ESSQ committee has frequent consensus meetings. Each member first independently judges and scores the DVD submitted by each of the other members. Subsequently, all members discuss the scores in a consensus meeting. However, it was very difficult to achieve a consensus on how many points should be deducted for each dangerous maneuver. The range of deduction points was very narrow for referee C, but very wide for referee B and such fluctuations in scoring by each referee must become

smaller. On the other hand, the mean discrepancy between self-assessment and assessment by other referees was only 1.2 points, which was not statistically significant. This discrepancy was attributed to the stringency of scoring among the referees. These differences in the judgment and scoring by each referee will likely be eliminated by frequent consensus meetings.

Seven video recordings were certified by one referee, while the same recordings were not certified by another. In subsequent consensus meetings, these seven DVDs were reviewed, and the decisions of the committee chairman were upheld. Even though there were discrepancies in qualification by the referees, we believe that, based on each applicant's DVD, the final decision was appropriate.

All of the referees always considered "risk adjustment" of the videos. In young infants, the applicant's gentle techniques in a small operating field were evaluated most carefully, whereas in elder neurologically impaired children more emphasis was directed to the skills exhibited in appropriate dissection in the adhesive layers. Most of the applicants chose the easier cases, who were young children or small infants without hiatal hernia. Only some applicants selected older children with severe chronic reflux esophagitis, and all of them failed at their skill certification test. The degree of difficulty of a surgical procedure generally depends on the condition of each patient, especially with regard to patients with neurological impairments. The pediatric ESSQ committee discussed frequently the different degrees of difficulty in individual patients and decided to appreciate that difficulty only through the endoscopic view of the recorded video. However, we need to continue to evaluate this "risk adjustment."

The minimum requirements for qualification are open to debate. How much experience with pediatric laparoscopic surgery is necessary for a surgeon to be considered safe and reliable? We picked the laparoscopic fundoplication in children as the procedure suitable for qualification because the laparoscopic fundoplication includes all kinds of maneuvers, such as planning, dissection, using an energy device, suturing, and team collaboration, which all are necessary to perform safe and accurate surgery. In the pediatric surgical field, there are many types of advanced endoscopic surgery, such as anorectoplasty and pulmonary lobectomy, but there are not many of these cases in Japan. The pediatric ESSQ committee discussed whether to expand the number of procedures eligible for qualification tests, but standardization of scoring and assessing the checklist are very difficult, so these discussions will be continued.

From the beginning of the ESSQ system, the requirement was that the applicant should have performed at least 50 pediatric laparoscopic surgeries, including more than 20 advanced laparoscopic surgeries, such as fundoplication,

anorectoplasty, and pulmonary lobectomy. Although the majority of the 18 applicants had performed more than 100 pediatric laparoscopies, only 5 applicants (27.8%) were certified by the pediatric ESSQ committee (Fig. 1). The pediatric ESSQ committee also continues to discuss the pass rate. Some committee members felt that the certification requirements are too rigorous, but the committee decided to keep the same certification level to offer safer procedures for the patients and recommended to hold more frequent hands on courses on safe and accurate pediatric Nissen fundoplication using animal models.

In Japan, the ESSQ systems have been implemented in the fields of urology [1], gynecology, and gastrointestinal surgery [2], but such a system in pediatric surgery has never been reported in the English literature. Because the ESSQ committee requires very safe and accurate operations, the certification rate is still very low. The difference in the rate of complications between certified and non-certified applicants is significant in the gastrointestinal field [2]. Patients deserve and desire to be operated on by the most skilled surgeons. We hope that our ESSQ system will be widely accepted in the pediatric surgical field. A survey of the outcomes of the operations performed by ESSQ certified pediatric surgeons is necessary to prove the predictive validity of this system.

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Conflict of interest The authors declare that they have no conflict of interest.

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