Short Communication

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Development of a new feedback system using groupware in surgical technique education focused on laparoscopic surgery

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In line with recent reforms in the medical education system, the Japan Surgical Society has taken the lead in standardizing surgical education, developing curricula and e-learning systems, and building a new system for Board Certified Surgeon[1]. Many methods of active learning have been developed for surgical techniques, including hands-on training, virtual simulation, animal models, cadaver training, video clinics, and on-the-job training in actual operating rooms, and each method has been evaluated from a pedagogical standpoint[2]. On-the-job training is provided not only at university hospitals associated with medical schools but also at regional core hospitals and designated training hospitals with medical specialist programs. When acquiring surgical skills, repetitive practice is considered to be useful, and the significance of the learning curve has also been reported[3]. In addition, even in surgical education, evaluation is shown to be particularly useful in the plan-do-check-act (PDCA) cycle of learning. To date, the introduction of an evaluation method using an evaluation form for laparoscopic cholecystectomy has shown advantages such as reducing procedural incidents and complications and shortening the learning curve[4]. However, as this method is purely paper-based, analysis has proven to be cumbersome, and this method cannot be applied to many surgical operations. Therefore, we have developed the information technology-based "Oita Rapid Assessment System of Operative Procedures (Oita-RASOP)" using groupware, which is currently under trial.

Oita-RASOP is analysis software using evaluation tables that was developed based on the groupware "kintone" (Fig. 1), Patent pending: 22022-127155). In this system of evaluation tables, learners and instructors each access the server after the surgical operation to enter their self-evaluations. The learners and instructors are then able to analyze the data as needed. The program administrators also have access to the server and can analyze learning progress, status of instruction, learning effectiveness, and even compare between instructors. Since this system uses groupware, it can be accessed from anywhere with an internet environment. Everyone requires an ID and password to access the server, and all of these databases can only be accessible by administrators, thus ensuring security. Regarding practical use of this system, the users pay the usage fee, and the administrator maintain this system. The evaluation tables include perioperative management, basic surgical techniques, and procedure-specific surgical techniques. The evaluation of perioperative management comprises 20 items, including patient care, explanation of the patient's condition, and preoperative and postoperative management. The evaluation of basic surgical technique comprises eight items, including dissection and resection. The evaluation of procedure-specific surgical techniques consists of evaluation items for 12 procedures with a focus on laparoscopic surgery (laparoscopic cholecystectomy, laparoscopic appendectomy, inguinal hernia repair, abdominal incisional hernia repair, laparoscopic repair for hiatal hernia, acute abdominal surgery, laparoscopic distal gastrectomy, laparoscopic proximal gastrectomy, laparoscopic total gastrectomy, laparoscopic right colectomy, laparoscopic sigmoid colectomy, and laparoscopic low anterior resection). These evaluations are based on a 5-point rating scale (excellent, good, fair, poor, and very poor) for each perioperative management, and each operative step (Items 9–22) in each of the procedures, using a simple pull-down format (Fig. 2). For example, in laparoscopic cholecystectomy, each item is built-up for surgical field, confirmation of critical view of safety, dissection of cystic artery, dissection of cystic duct, separation from liver bed, lavage, and so on. The system makes it

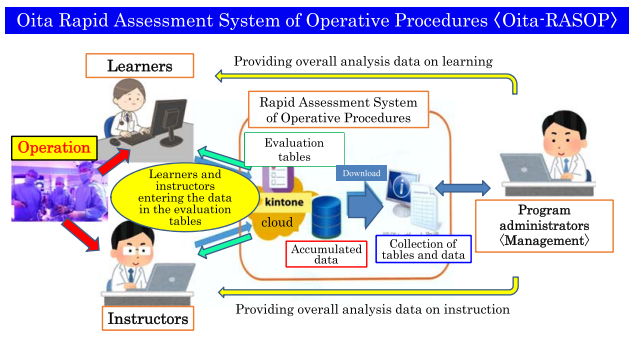

Figure 1. Schematic diagram of Oita Rapid Assessment System of Operative Procedures (Oita-RASOP).

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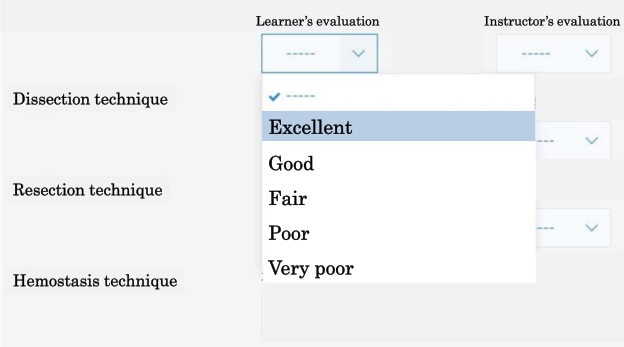

Figure 2. Template of the 5-point rating scale.

easy to analyze the learning curve after having experienced a certain number of cases, search for weak points in operations, and evaluate instructors for faculty development.

In recent years, the usefulness of the System for Improving and Measuring Procedural Learning (SIMPL), which evaluates and provides feedback on surgical skills, has been reported in the United States[5]. This evaluation system, which is a smartphone-based application, allows both learners and instructors to enter three items: operative autonomy achieved, their overall performance, and the complexity of the case. Instructors can also record voice comments. Although we consider this system to be useful in terms of easily recording evaluations of surgeries, it does not evaluate the basic manipulations of individual surgeries or surgical procedures step by step and is not designed to help inexperienced learners learn surgical techniques efficiently. In contrast, Oita-RASOP is a system in which both learners and instructors enter their evaluations for each step of a surgical procedure, and we consider that this system will be useful not only for learners to acquire surgical techniques but also for instructors' self-reflection, and also for system administrators to perform inter-facility evaluations. In Australia, the eLogbook have been created, and they are delivered through a readily accessible smartphone application[6]. However, although this system supports the trainer, it seems that this system does not go as far as to feedback the trainer's teaching method. We consider that our system can provide trainers feedback on their own teaching methods.

Data entry has been made less complex by using a pull-down format with a 5-point rating, and registration for each surgical procedure can be made in less than 10 min. Another feature of this system is the easy comparison of evaluations between learners and instructors, thereby promoting interactive learning. After experiencing a certain number of cases, learners can perform the following analyses and implement a new feedback system for surgical education. (1) Evaluation of surgical operation proficiency using a learning curve, (2) Identification of weaknesses in surgical manipulation based on the average value of each evaluation item, (3) Reflection on self-evaluation by comparison with the instructor's evaluation, (4) Reflection on cases with complications. Instructors can understand their own evaluation performance and their evaluation characteristics using the following analyses, which is useful for faculty development. (1) Understanding the number of instructions for each surgery, (2) Comparison of average evaluation scores of learners and instructors for each surgical step, and (3) Comparison of average evaluation scores for each step with those of other instructors (based on information provided by the system administrator). In addition, the system administrator can take advantage of the characteristics of groupware to periodically evaluate the learning progress of learners, perform analysis by comparing the evaluations between instructors and between facilities, and provide feedback on this information to the surgeons. Thus, Oita-RASOP system would appear to be a useful feedback system for learners, instructors, and learning program administrators. Both of learners and instructors can assess not only their overall score for each procedure but also their score of procedure-specific surgical techniques. We believe that feedback can be given not only to learners but also to instructors by this system. Currently, the system is under trial, and we are applying for approval from the Ethics Committee for practical use of this system. We will plan to conduct clinical study using this system in near future. As soon as this clinical study is completed, we would like to report the data of this study and evidence of usability in this system.

A better feedback system is needed so that inexperienced learners can learn surgical techniques efficiently, instructors can acquire good teaching skills, and the educational skills of the entire group that uses system for Board Certified Surgeon can be improved. We think that the newly developed Oita-RASOP system will be useful in implementing a new surgical technique feedback system.

Ethical approval

No ethical approval was required for this paper.

Consent

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Author contribution

Y.U., T.K., and N.S. contributed to concept and design. Y.U. contributed to writing. M.I. and N.S. contributed to review.

Conflicts of interest disclosure

We have no financial conflict of interest to disclose.

Guarantor

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Provenance and peer review

Our paper was not invited.

Data availability statement

Data sharing is not applicable to this article.

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