Communication between Mentor and Mentee Using Videoconferencing in Surgical Training

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***Abstract*—In surgical training, mentors and mentees communicate to expand mentees' technical skills. However, access to mentors for education in surgical subspecialties is a challenge in many hospitals. Videoconferencing (VC), which enables real-time communication between mentors and mentees in different geographical locations, can overcome this challenge. This study examines a practice in Norway in which VC is used to provide education on a specific laparoscopic surgical procedure. Specifically, the study explores the characteristics of communication between a mentor and mentee using VC and how it affected communication. The empirical material consists of video recordings of an educational trajectory that included eight patient cases and focus group meetings. The communication reveals knowledge gaps and their closure through establishment of a shared understanding. In this way, VC supported the learning of technical skills while enabling feedback on non-technical elements. Both the mentor and mentee could reach their full potentials—expanding their own communicative skills and reflecting on their own abilities. VC also affected the relationship between the mentor and mentee, who were peers and colleagues rather than participants in the traditional mentee–mentor relationship. The results of this study will enable the development of an activity for non-technical skills to become relevant using VC.**

Keywords—non-technical skills; surgical training; communication; videoconferencing; qualitative study.

I. INTRODUCTION

Although technical skills in surgery are obviously important, communication in the operating room (OR) plays an important role in patient safety, as operations are social situations in which tasks are accomplished through communication between team members. Communication errors within surgical teams have been studied in terms of communication failures [1], and studies have attempted to explain how surgical procedures are influenced by the quality and efficiency of teamwork. The results have shown that deficiencies in teamwork in the OR contribute significantly to adverse events and patient harm [2], as there is a strong relationship between teamwork failure and technical errors [3]. In other words, a good surgeon is more than just a good "pair of hands" [4]; he or she must be a good team player, must listen and communicate with colleagues, and must empower colleagues to reach their full potential [4]. These qualities are related to collective and cognitive competence, defined as non-technical skills.

Non-technical skills are gaining importance in surgery and surgical training [4]. The Royal College of Surgeons of Edinburgh defines non-technical skills as skills and behaviors related to situational awareness, decision-making, communication, teamwork, and leadership [5]. Others have defined non-technical skills as interpersonal (e.g., communication, teamwork), cognitive (e.g., decision-making, situational awareness), and personal resource skills (e.g., coping with stress and fatigue) [6]. Communication and teamwork related to decision-making are also important non-technical skills. All of these skills are essential for surgeons to operate safely in the OR, and, although they are developed in an informal and tacit manner [5], they need to be explicitly addressed in training.

Surgical training involves individual work and guidance from an expert mentor. Mentees gain significant skills and experience by participating in simulated environments with virtual simulators and models prior to performing procedures on patients in the OR. Work in the OR involves collaboration; each team member has his or her own tasks to perform. Although each team member's individual technical skills are important, good collaboration is necessary for a good surgical outcome [7][8]. Hence, both mentors and mentees need to develop non-technical skills in surgical training. A recent review of surgical telementoring reported limited understanding of VC in surgical practice; the review concluded that little attention has been paid to the educational and non-technical elements but has instead been focused on piloting the technology [9][10].

Surgical training is an educational process in which the mentor's and mentee's competence and work serve as parts of a collective activity and communicative process. Both communication and teamwork are important for modern surgical education and practice; indeed, a review of the role of non-technical skills in surgery stated that the key root cause of surgical errors worldwide is a lack of non-technical skills [3]. The review also provided evidence that non-technical skills have an effect on technical performance and suggested that training that is focused on improving non-technical skills can improve teamwork, performance, and safety in the OR and thereby positively contribute to patient outcomes [3]. This indicates that there is a need to focus on the development of non-technical skills in surgical training.

In surgical training, access to local mentors for surgical subspecialties is a challenge in many hospitals. Videoconferencing (VC) is a technology that enables real-time communication between mentors and mentees, even if they are in different geographical locations. It can thus help to overcome the issue of lack of access to local experts. This study focuses on a practice in Norway during which VC was used as a tool for surgical education concerning a specific hernia procedure.

Research on VC has stressed its educational benefits [9] and described VC for mentoring as an effective way to develop surgical skills [11]. However, within this field, special focus on communication and team performance is needed to better understand the factors that influence surgical outcomes [12]. Specifically, a systematic literature review of communication in the OR concluded that further detailed observational research that provides detailed transcripts and analyses of communication patterns is needed to gain a better understanding of non-technical skills [13].

This study explores communication and teamwork between a mentor and mentee using VC as well as the knowledge needed to complete a surgery. Even though it is important to gather information about the outcomes of work in the OR, it is also necessary to gain a detailed understanding of the processes and communication patterns that lead to those outcomes, and these are often overlooked in favor of technical skills. This study therefore aims to provide insight into how mentors and mentees organize and accomplish collaborative work through VC in the OR.

This study expands upon previous work by investigating knowledge-sharing between a mentor and mentee—specifically, the manner in which individual knowledge is shared and constructed—to ensure that mentees apply best practices. The use of VC and communication between a mentor and mentee were followed in real-time surgical training regarding a laparoscopic hernia procedure. The characteristics of communication between the mentor and mentee through VC and how VC affects communication were explored.

The rest of this paper is organized as follows: Section II describes the framework and scenario of the study, Section III describes the methods used, Section IV presents the results, and Section V presents the discussion. The article ends with Conclusions and Acknowledgments.

II. Scenario and Framework

Laparoscopy is a visual technique that uses several small ports in the abdomen with an instrument inserted through each. The procedure is visual, as a small camera is inserted into the patient`s abdomen. The images obtained from the camera are transmitted to a monitor in the OR and enable communication with participants outside the OR. In the case examined in this article, the mentee in the surgical team used VC to communicate with a geographically distant mentor. The mentee was experienced with laparoscopy; before practicing this procedure on patients, he underwent the traditional education pathway for a new procedure (i.e., simulations using models and videos of the procedure).

Communication in the OR was framed with an activity theoretical perspective [14], focusing on the complex interactions between individual subjects and their wider context [15]. The mentor and mentee were part of a collaborative educational and communicative process mediated by a cultural tool (i.e., VC). This approach enabled expansion of the unit of analysis of education and learning beyond the individual [16]. The collaborative activity happened between the activity system of the mentor and mentee, enabling the use of VC in practice.

III. Methods

This is an ethnographic study [17] that explores the use of VC for communication between a mentor and a mentee within an educational process. The study was carried out from 2014–2016 in Norway and involved observations, interviews, focus groups, and field notes. Five semi-structured interviews, which lasted a total of six hours, took place from 2015–2016, and all were transcribed and analyzed. For three months in 2014 and 2015, surgical training of a mentee on the specific hernia procedure was observed and videotaped. The dataset covers the entire educational trajectory, which included eight cases and six hours of video observations. The whole dataset was transcribed. All participants participated in two focus group meetings to discuss the procedure. These meetings were also videotaped and transcribed. The data protection officer at the selected hospital approved the study, and the study participants provided informed consent.

The analysis focused on the interactions between the mentor and the mentee, particularly when tensions appeared [17] and knowledge gaps needed to be closed, which directed the opportunities for expanding verbal decision-making and non-technical skills [18]. The observations allowed communication and team performance (as opposed to individuals) to be studied. The eight sessions revealed communication patterns and non-technical skills (but not individual deficiencies) in a series of operations that utilized VC for educational purposes.

IV. Results

The surgical training examined in this study was organized into eight sessions. The first three sessions occurred onsite in the OR and involved preparation for the VC, and the next five sessions used VC. After the eighth session, the mentee was considered an expert in this procedure and the VC sessions ceased [19].

A. Communication using VC

The characteristics of communication using VC are illustrated in Figure 1. This extract includes data starting from the four-minute mark of the seventh session, which was videotaped for about 25 minutes.

The mentee referred to a history of communication by suggesting a course of action for the day based on previous sessions. Specifically, he suggested cauterization and

pulling the sack into the abdominal cavity. He then asked the mentor what he thought about the suggestion (utterance 1). The mentor supported the proposal but had a hunch that simply pulling the sack was not adequate, based on his own practice with stitches (utterance 2).

Extract from the 7th session (A: mentee, B: mentor)

1	A:	I thought maybe today we could try just to cauterize it, if it's possible to, uh, pull the sack out into the abdominal cavity. Or, what do you think?
2	B:	Yeah. You can see. You can try. Um, it depends. You can try. I always start by turning and, and then if it seems like it's not adequate, then I put a stitch in.
3	A:	It's quite deep, you see….
4	B:	Yeah, it might be hard to do with just cauterizing.
5	A:	Yeah, I think so too. Because it goes into the….
6	B:	All the way down.
7	A:	Labia majora. Yeah. Okay, I think we will go for….
8	B:	Yeah.
9	A:	I don't think it's even necessary to try. Do you agree?
10	B:	No, you […] but the good thing is, you could do a lot of cauterizing, you don't have to worry about, uh, injuring it.
11	A:	That's good. Okay.

Figure 1. Communication using VC.

The mentee referred to the hernia as deep and acknowledged the suggestion to use stitches (utterance 3). The mentor then confirmed that it might be hard to just cauterize (utterance 4). The mentee considered going deep with the instrument (utterance 5), and the mentor elaborated on the depth (utterance 6). After this reflection, the mentee decided to use stiches (utterance 7), a decision that was supported by the mentor (utterance 8). The mentee reconsidered his decision to try to pull the sack into the abdominal cavity and asked the mentor to support this decision (utterance 9). The mentor did support the decision and elaborated on the opportunity to perform cauterization without injuring the patient (utterance 10). The mentee confirmed the shared understanding (utterance 11).

The characteristics of the communication involved skills related to choosing an appropriate course of action and a shared understanding. First, the mentee presented a knowledge gap (i.e., whether to use stiches). This tension between the mentor's and mentee's knowledge provided an opportunity to close the knowledge gap, thereby expanding the collective activity of decision-making. The mentor supported the suggestion while mentioning the tension between the possible actions (i.e., pulling the sack or using stiches). Drawing upon the mentor's experience and knowledge, the mentor and mentee communicated, closing the knowledge gap by establishing a shared understanding. This shared understanding was based on a collective activity in which the participants were able to bridge the gap and perform a successful procedure.

B. Reviewing the procedure

After two training sessions, focus group meetings were held to review the sessions and allow the mentor and mentee to discuss the content and how VC affected communication. Figure 2 illustrates how this meeting progressed. The mentor asked the mentee about his experience in one of the sessions and how he could improve as a mentor (utterance 1). The mentee pointed out the tension between anticipated and "comfortable" knowledge, referring to the fact that the mentee had watched the training videos of the procedure (utterance 2). The mentor asked if the mentee felt that he provided too little instruction during the session (utterance 3). As the session went well, he was not sure whether there was a gap in knowledge between the mentor and mentee, but guidance would have made the mentee feel "safer" during decision-making (utterance 4). The mentor then reflected on the communication between the mentor and mentee, illustrating the tension between the traditional way of locally training mentees (in which the expert mentor holds a more powerful position) and the use of VC as a pre-planned tool for collaborative distributed work (in which the mentor and mentee act as colleagues; utterance 5).

Reviewing a session (A: mentee, B: mentor)

1	B:	What was not good? Don't be polite […] What could I have done better as a mentor?
2	A:	We just assumed that I had seen the video that I knew […] You just let me do it, and then you corrected me….
3	B:	I didn't give enough instructions […]? You wish I had given more instructions?
4	A:	I don't know if it was necessary, but maybe it would […] feel more safe in a way.
5	B:	This is a problem that […] Not feeling comfortable as a mentor, knowing not to say too much. When I have a relationship with a resident, I say whatever I want. He is my resident. But, when it is a colleague, I am a little bit more shy about being too talkative. Does that make sense? So, it is that different relationships exist between an attending and a trainee, a resident, than between an attending and another surgeon. I don't want them to be annoyed too much….

Figure 2. Reviewing the procedure.

Overall, the extract shows the mentor's and mentee's reflections on their own communicative skills, including how the mentor related to those around him. By exchanging reflections after the surgical procedure, the mentor could better understand his performance as a mentor. This learning activity led to a shared understanding between the activity systems of the mentee and mentor.

V. Discussion

The purpose of this study was to explore the characteristics of communication between a mentor and mentee using VC and how VC affected communication. Observing communication using VC (Figure 1) enabled identification of successful communication and teamwork. This educational process was a collective activity mediated by VC as a cultural tool. Tensions in the work illustrated the limitations of the mentee's individual knowledge, opening up opportunities to bridge the knowledge gap between the expert mentor and mentee. Collective decision-making led to learning opportunities, which allowed the mentee to become an expert in the procedure. Hence, communication using VC supported the learning of technical skills.

VC also has the capacity to support collaborative (i.e., non-technical) skills. The communication examined here refers to prior sessions (a history) and the progress made in expanding the mentee's knowledge. The mentor reflected on his prior actions and modified his teaching according to the mentee's needs.

The emphasis on decision-making skills in the training allowed the mentee to develop skills related to assessing situations and agreeing on an appropriate course of action within the team. Even though there was a gap in the mentee's knowledge that the mentor had to bridge, the mentor and mentee discussed options in a balanced way, considering the consequences and benefits of each option, and maintained flexibility while making the shared decision. Afterwards, the mentor explained why he recommended a specific course of action.

The communication built upon traditional problem-solving in the OR. Laparoscopy is a visual procedure in which a small camera is inserted into the patient's abdomen and the image is transmitted to a monitor in the OR. In this case, VC was used to show the mentee the same images seen by the mentor. Unlike in traditional training, where both the mentor and mentee are in the OR, this training occurred using VC. This created tension between the traditional method of local training, in which the mentor and mentee are both at the patient's bedside and are aware of all activity in the OR, and remote guidance, in which the mentor has expert knowledge of the procedure but not complete knowledge of all the activity in the OR.

The problem-solving process and the technical skills are both based on the same information, using the monitor. Nevertheless, there is teamwork in the OR that cannot be experienced by the mentor using VC. Both mentor and mentee develop awareness of the situation, which includes all activities in the OR and the pre- and post-operative situations of the patient. Hence, as both have responsibilities, the mentee is more of a colleague than a resident.

When reviewing the procedure (Figure 2), the mentor and mentee discussed both the technical skills and dynamics of communication patterns (i.e., non-technical skills). This allowed the mentor to support the mentee while improving his own communicative skills through reflection. This activity also supported the mentee in reflecting on his own communicative skills.

VC was used because the mentee had experience, but not in this specific procedure; the competences of the mentor and mentee were therefore unequal. However, the VC tool seemed to reformulate this inequality between the mentor and mentee and redefine the traditional mentee/resident–mentor/expert relationship as one between peers and colleagues. Based on the division of labor, the mentee held the leadership in the OR, but the mentor was the expert on the procedure (defined as the picture on the monitor). This allowed non-technical skills, rather than just technical skills, to be developed, and enabled the participants to reflect on how teamwork could be improved.

Communication is shaped by organizational culture and historical activities, which play an important role in how work is performed. Communication problems are attributed to a lack of clarity regarding roles and power relationships [14]. Implementing VC for collaboration in surgical education challenges traditional surgical training and communication patterns between mentors and mentees. Specifically, the results of this study illustrate that VC promotes effective reasoning and good communication between mentors and mentees. Communication and teamwork related to decision-making are characterized by reflection on performed work, which leads to the development of non-technical skills and the ability to emphasize non-technical skills as important in surgical training.

VI. Conclusion

In the case studied, collaboration occurred between the activity systems of the mentor and mentee, and their communication and use of VC in practice were examined. It was found that VC allowed knowledge exchange during surgical training, resulting in the mentee becoming an expert on this procedure. The results provide insights into the way in which surgical training and practice are performed, the use of VC within surgical training in the OR, and how VC facilitates the development of communication skills.

Incorporating VC into surgical training within the current training paradigm would allow both technical and non-technical elements to be included in the feedback provided to mentees. The use of VC in surgical training could be a step toward raising awareness of non-technical skills, facilitating changes in the workplace, and emphasizing collaborative skills (i.e., communication and teamwork) among both mentors and mentees in the educational process (and, later, in daily work). In this way, VC could help produce a new generation of surgeons who are competent in all the skills required for knowledge expansion and safe, high-quality patient care.

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