Creating Learning Opportunities by Using Videoconferencing in Surgical Education

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Abstract. Access to mentors for education in surgical subspecialties is a challenge in many hospitals. Videoconferencing (VC) provides real-time communication between mentors and mentees despite dispersed geographical locations. In Norway, an educational pathway of a specific laparoscopic surgical procedure was carried out using VC. The surgical training lasted for three months and was video recorded. The dataset covers the educational procedure, constituting of a trajectory of eight patient cases. During a model of stepwise distancing of the physical presence of the mentor, the collaborative work using VC leads the mentee to become an expert. VC is a tool for both collaboration and representation, as the picture on the VC offers the same information to both the mentor and the mentee. The communication is characterized by guidance and explanations of why specific actions are necessary for problem-solving. The use of VC was a presumption for becoming an expert in this procedure.

Keywords. Videoconferencing, learning, communication, surgical education

1. Introduction

Surgical training involves hands-on training, during which the surgeons who are being educated (mentees) are instructed by an expert surgeon (mentor). Access to mentors for surgical subspecialties is a challenge in many hospitals. Videoconferencing (VC) is a technology that provides real-time communication between mentors and mentees despite their different geographical locations.

An educational pathway of a hernia procedure was carried out using VC in a hospital in Norway. I followed the surgical training in the operating room (OR) of a mentee in a hernia procedure using laparoscopy. Laparoscopy is a 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, and the image is transmitted to a monitor in the OR. VC occurs by connecting the laparoscopic surgery—the mentee, mentor, and the technological artifacts—to the monitor in the OR. The monitor is connected to the VC so that the mentor sees the same picture as the mentee.

Studies have stated that VC is well-suited for overcoming distance [1,2], allowing surgeons with no formal advanced laparoscopic training to benefit from expert advice during procedures [3] and providing better visibility and verbal accuracy in describing the procedures, as the instructor is not standing in the way [4]. These studies illustrated

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the outcomes possible with the technology, but few studies have reported on collaborative and communicative work in such settings. Related to the educational outcomes using VC, one review pointed out a strong focus on effectiveness in surgical mentoring and highlighted the need for in-depth understanding of instructions during surgical mentoring [5].

I report on the use of VC for instructions in real-time surgical education, where the mentor and mentee collaborated during the trajectory of becoming an expert. How is surgical training using VC organized, and what characterizes the communication? The hands-on training involved a mentee surgeon experienced with laparoscopy. Before practicing this specific procedure on patients, he had gone through the traditional education pathway for a new procedure, i.e., simulation using models and videos of the procedure.

2. Method

This research is related to a previous ethnographic study, which explored the mentor and mentee's views on the educational process [6] and was carried out during 2014–2016 in Norway, combining observations, interviews, focus groups, and field notes. Here, I present findings from three months of observations in 2014–2015, when the surgical training of a mentee in a specific hernia procedure was videotaped. The dataset covers the entire educational procedure, constituting a trajectory of eight cases and six hours of video observations. The whole dataset was transcribed. The presented excerpt is representative of this setting. The data protection officer at the selected hospital approved the study, and the study participants signed an informed consent form.

An interpretative analysis approach that uses an activity theoretical perspective [7] was used to conceptualize learning as a collective activity and a communicative process mediated by cultural tools, i.e., the VC. The analysis focused on the interactions between the mentor and the mentee where tensions appeared [7] and knowledge gaps needed to be closed, which directed the opportunities for learning.

3. Results

The educational practices in the OR were organized into eight sessions (Table 1) before the mentee became an expert.

Table 1. The organization of the educational practice and the use of VC.

The educational practice in the operation room (OR)								
Session	1	2	3	4	5	6	7	8
Mentor	Onsite operating	Onsite assisting	Onsite mentoring	Remote mentoring	Remote mentoring	Remote mentoring	Remote mentoring	Remote mentoring
Mentee	assisting	operating	operating	operating	operating	operating	operating	operating
Use of VC				In OR	In house	In house	Overseas	Overseas

The mentor performed the first operation while the mentee assisted. Then the mentee performed the operation while the mentor stepped aside, i.e., assisting and then observing and mentoring the mentee. The first session of mentoring observation (session 3) was done in the OR without using VC. In the fourth session, the mentor used the VC in the OR. In the fifth and sixth sessions, he moved to another room at the same hospital, and the last two remote mentoring sessions were done using the VC from overseas while the

mentee was in the OR. The first three sessions were onsite in the OR, preparing for the VC, while the next five sessions used VC. After the eighth session, the mentee was evaluated as educated as an expert in this specific procedure, terminating the use of VC from overseas.

What characterized the communication using VC is illustrated in Table 2. In this extract, we see the data about 20 minutes into the 5th session, which was videotaped for about 40 minutes.

Table 2. Content in the communication (A: mentee. B: mentor).

Extract from the 5th session:

1. **B**: Go a little more in, into the abdomen. Don't stay at the ring. Yeah, try that, inject.
2. Okay, if that's the vas you have to move the vessels, so the vas is still in there.
3. **A**: Oh.
4. **B**: I think, the opening in peritoneum, so now you're not gonna be [in the right spot].
5. **A**: Yes, it's sleekly [moving].
6. **B**: Yeah, exactly. Anyway, try that. Yes, nice, slide the needle forward, and it's easier to stay in the
7. abdomen instead of at the ring.
8. **A:** Yeah. I have to organize my needle first. Cause there's so much hydro dissection [fluid] here, I
9. can't see anything.
10. **B:** I know. So, you have to almost push the needle, all the way through (…) just get in that space and
11. push it forward. Keep going .... It's okay if you go out, go back in again now.
12. That's fine. That's nice, very nice. You got in. So you see how you …
13. If you take your needle out, and then take your Maryland [forceps].
14. I don't see your vas now, which means you did it nicely. Yeah. Very nice.

The mentor gave advice about moving into the abdomen [inside] and not staying at the ring [outside] (line 1). Then he recommended moving the vessels to keep the vas inside the ring (line 2). By referring to the opening in the peritoneum (line 4), he argued that the mentee was not in the right spot (line 4). The mentee explained it was sleekly [moving], and that's why he moved the forceps (line 5). The mentor recommended that the mentee slide the needle forward to stay in the abdomen instead of in the ring (line 6-7). The mentee had problems seeing, because there was too much hydro dissection [fluid] (line 8), and the mentor guided the mentee through by saying "push forward" and "keep going" (line 10-11). The mentee went out of the ring, and the mentor advised him to "go back in again now" (line 11) and advised him to take the needle out and use the forceps (line 13). At the end, he explained why he thought the performance was very nice—the vas was not visible (line 14) because it was left inside the ring.

The characteristics of the communication concerned the following: the mentor said what to do (lines 1–2, 4, 6–7, 10-14) and what not to do (lines 1, 4), explaining why (lines 4, 6-7, 11, 14). Both the mentor (lines 2, 12, 14) and the mentee (lines 9) referred to the picture on the monitor to reassure themselves of what was inside the abdomen (what they could and could not see).

4. Discussion

The organization of this educational practice using VC as a tool exemplifies instructional activities during surgical mentoring and how the mentor and mentee communicated, approaching new knowledge. After practicing for eight sessions in the OR, the mentee became an independent expert surgeon in this specific procedure. The sessions were organized according to the physical closeness–distance to the mentor. In the beginning, the mentor was in the OR, and thereafter there was a stepwise process of moving out of

the OR into another room at the hospital and then overseas. This model makes expert knowledge assessable despite geographical distances.

Widening existing studies', these findings report in-depth on collaborative and communicative work during surgical mentoring. The talk during the surgery illustrated how the mentor drew on his expertise, closing the knowledge gaps by instructing what to do and what not to do and explaining why. This communication pattern created opportunities for learning by sharing knowledge repertoires for medical problem-solving.

The VC was a tool for the activity, making the interaction between the mentor and mentee possible over great geographical distances. Additionally, the visuals on the monitor was of importance. Using a laparoscopic technique, the mentor and mentee approached the same video monitor, which made the physical presence of secondary importance. What became relevant in the interaction and communication was how the mentor and mentee contributed to the medical problem-solving and how these social practices for educating surgeons were organized.

5. Conclusion

During a model of stepwise distancing of the mentor's physical presence, collaborative work using VC helped the mentee become an expert. The communication in VC sessions was characterized, in the OR, in house, and overseas by guidance, explaining why the performance was necessary for problem-solving. The communication pattern during surgical training created opportunities for learning, while the VC was the tool and presumption for becoming an expert in this procedure.

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References

[1] K.M. Augestad, R.O. Lindsetmo, Overcoming distance: video-conferencing as a clinical and educational tool among surgeons, *World J Surg* **33** (2009), 1356–65.
[2] R. Latifi, K. Peck, R. Satava, M. Anvari, Telepresence and telementoring in surgery, *Stud Health Technol Inform* **104** (2004), 200–6.
[3] H. Sebajang, P. Trudeau, A. Dougall, S. Hegge, C. McKinley, M. Anvari, Telementoring: an important enabling tool for the community surgeon, *Surgical Innovation* **12** (2005), 327–31.
[4] C. Kaufmann, P. Rhee, D. Burris, Telepresence surgery system enhances medical student surgery training, *Stud Health Technol Inform* **62** (1999), 174–8.
[5] K.M. Augestad, H. Han, J. Paige, T. Ponsky, C.M. Schlachta, B. Dunkin, J. Mellinger, Educational implications for surgical telementoring: a current review with recommendations for future practice, policy, and research, *Surg Endosc* **31** (2017), 3836–46.
[6] H.K. Andreassen, L.L. Warth, The impact of telementoring, *Stud Health Technol Inform* **255** (2018), 127–131.
[7] Y. Engeström, Expansive learning at work: towards an activity theory reconceptualization, *Journal of Education and Work* **14** (2001), 133–156.