Developing guidance for surgical training in hospital context

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Background

- So far, the surgeons have mostly learned their professional skills alongside real patient work where guidance has been offered by the *master-apprenticeship* model.
- Previous studies have shown that surgical operations include various risks and potential errors.
- These were related to organizational culture, utilizing of simulation-based training, specification of learning goals (including risk and error prevention), assessing learning outcomes, and the role and quality of guidance (Ruoranen et al, 2013)
- Challenges of guidance were manifested as the lack of competence assessment and assessment-base learning curriculum, organizing and sequencing learning in the simulation and authentic (Operation theatre) environment (Ruoranen et al, 2013)
- Organizing training of surgical subskills by focusing on risk management, previous study has identified the most basic and necessary skillsets to be learned before proceeding safely into authentic patient treatment (Silvennoinen et al. 2015.).
- This study focused on developing guidance for productive and patient-safe training of surgical residents in hospital context

Aims and research questions

The study aims

- to develop work-related curriculum for productive and patient safe learning in the hospital context

Research question:

- How to organize, combine and sequence learning of surgical subskills in authentic and simulation environments in the hospital context?

Methods

- The study was conducted in participatory collaboration of senior surgeons and education experts in the Central Hospital of Central Finland using design-based methods.
- In our first sub-study (Ruoranen et al. 2017), five authentic video-recorded surgical operations were analyzed, all of which were organized as training sessions for surgical residents.
- The data were analyzed by a consultant surgeon and an education expert working together.
- In our second sub-study (Ruoranen et al. 2019), eight residents trained using the portable simulation-training tools developed (Table 1) for this purpose.
- They self-assessed their skills by completing OSATS (Objective Structured Assessment of Technical Skills) questionnaires, before and after the training period.
- The skills were also assessed by the supervisor at the end of the training period using the same OSATS.
- The development of the portable simulation-training tools were developed using design-based strategy.

Authentic context of the Operation theatre;

Four synchronized video camera angels were developed for research purposes

Teaching operations (gall bladder removals) were audio and video recorded. The recordings were thereafter analyzed by a consultant surgeon and an education expert working together.

The research aim was to support the learning of this operation, but at the same time enhance the safety of the patient.

As a result a new learning framework based on risks and potential errors was introduced. The research continued on how to organize, combine and develop all available training methods in order to further enhance safety of the patient, but also taking into account the productive interests of the hospital administration.

Developing portable simulation tools and equipments

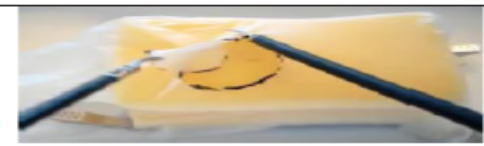
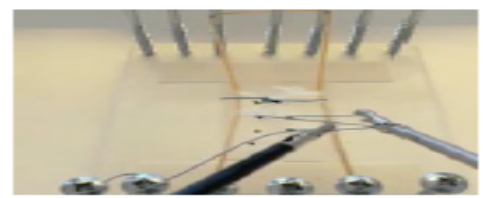
Purpose: for training and assessing basic surgical skills, such as instrument (needle, scalpel) handling, tissue handling, cutting, suturing, and knot tying

Learning goals including time frames were derived from the sub-competences specified in OSATS (achivement level 4)

Self-assessment skills and expert-asessments skills were also aimed to be developed

Portable training equipments were mainly used outside the hospital context (at home), because the skills training called for numerious repetitions

Table 1. Contents, Targeted Skill Level, and Visual Illustration of the Four Tasks Included in the Portable Simulation Training Equipment.

Content of the task	Competence-based goals and time frames for each task (example: OSATS level 4)	Screen shots of the video recording for each task (used as instructional tools)
1. Cutting through a drawn circle	• Cutting should clearly follow the shape of the pattern (at a distance of 1mm or less) more than half of the time. • Both instruments should be used in a controlled manner and move smoothly, more than half of the time. • There may still be some uncertainty and imprecision in the instrument work. • The time limit (90s) should not be exceeded by more than 10 seconds.	
2. Needle handling	• The needle should only rarely cling to the loops. • The needle should not slip from the instrument. • Movement of the needle between the two instruments should be conjoint and bi-manual most of the time. • The turns of the needle in following the track should be mostly fluent and non-hesitant. • The time limit (90s) should not be exceeded by more than 10 seconds.	
3. Finding an object ("tissue handling")	• All 4 objects should be removed successfully. • The inner water-filled glove should not break. • Separate and clumsy (non-fluent) use of instruments should be occur less than half of the entire task time. There should be very few obviously erroneous movements. • The work should shift from object to object fairly confidently and smoothly. • The time limit (100s) should not be exceeded by more than 10 seconds.	
4. Suturing and knot tying	• The tying of the knots should take place technically, as instructed by a demo video. • The majority of the knots should be tight. • The separate and bi-manual use of the instruments should be secure and firm more than half of the task time. • The needle should not slip from the grip of the needleholder unintentionally • The targetting of the needle (hitting the dots) should be mainly accurate and non-hesitant. • The suture may slip from the instrument tips only a few times when tying the knots. • The time limit (120s) should not be exceeded by more than 20 seconds.	

Organizing and sequencing learning in authentic and simulation environments?

License to operate was developed: the training modules and learning aims build on each other

Training modules	Learning goals	Quidance and assessment	Sequence and content of learning
i) Knowledge package	theory related to gall bladder disease and mini-invasive surgery, instructions and the idea of the training program	self-learning, self-assessment based on a written test	both gall bladder surgery and disease, mini-invasive instrumentation and operation technics
ii) Take home training kit	competence based training of basic surgical skill sets (4 tasks)	self-learning, OSATS assessment and video clip instructions	competence based training at home enables learning of basic skills to a defined skills level, additional supervision by individual demand
iii) Simulation traning **iv) Team training**	surgical operation (gall bladder operation) specific skills training	self-learning and DOPS (direct observation of practical skill) assessment	the basic skills used to learn a safe way to perform a spesific surgical procedure (gall bladder removal)
v) Authentic operations	real world challanges and patient related issues	self-assessment. Assessment by supervisor (DOPS)	learning of the operation in a real surgical environment (Operation theatre) addressing patient specific issues such as risk and failure points

License to operate: overal structure and design (all residents in surgery complete)

TIETOTAITOPAJA
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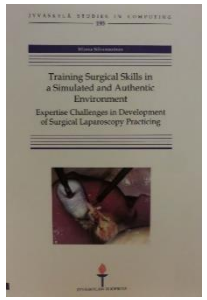
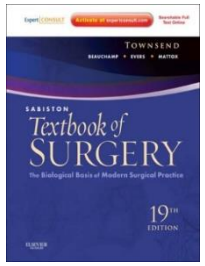
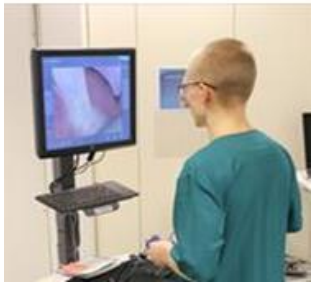
SAIRAANHOITOPIIRI





Knowledge package

Take home practice kit: basic skills



Black box and LapSim simulators: procedural training and team work

NETWORK OF ACCREDITED SKILLS CENTRES IN EUROPE

Sairaala Nova

Supervision: learning objectives and assessment methods matched according to module

Authentic operation: focus on workflow, patient safety and real world team work; new learning framework to be implemented including risks and potential errors

Evaluation of the training program and feedback

evaluation

- known and equal performance (of each surgeon)
- Patient safety enhanced

Conclusions and Findings

- Assessment skills were understood as critical competences in the guidance of risk management and learning from errors.
- Self-assessment and expert evaluation of the surgical subskills, which were necessary competences to proceed to the next level in the training program, were reported to have developed (Ruoranen et al. 2019).
- After the simulation training (Ruoranen et al 2019), the residents proceeded into the authentic environment (operating room) and real patient cases. However, authentic environment was not the optimal context of learning about the procedural elements related to the risk framework and potential errors of surgical operations. For this the simulation training served better.
- Instead, case-based risks and potential errors (related to the framework) should be considered and learned during authentic operations with the supervisor, and further addressed before and after the authentic operation.
- While developing and implementing the training program in the hospital organization, we tried to optimize different constraints and resources including **i)** expert surgeons' time for guidance, **ii)** working in accordance with the patient safetpoy guidelines, and **iii)** emerging competencies of residents. Our preliminary pilot study implies, that these goals could be achieved. However, further study will be conducted to confirm these findings.

References

Ruoranen, M., Antikainen, T. & Eteläpelto, A. (2017). Surgical learning and guidance on operative risks and potential errors. *Journal of Workplace Learning, 29*(5), 322-338.

Ruoranen, M., Antikainen, T. & Mattila, A., Hämäläinen, R. & Eteläpelto, A. (2019). Promoting surgical residents' basic skills via the design and implementation of a simulation training tool. *Simulation & Gaming, 50*(4), 463-447.

Ruoranen, M., Collin, K., Paloniemi, S. & Eteläpelto, A. (2013). Challenges for surgical trainees' practice-based learning. In J. Higgs, D. Sheeran, J. Baldry-Currens, W.Letts & G. Jensen (Eds.) *Realising Exemplary Practice-based Education* (pp. 101-110). Rotterdam: Sense.

Silvennoinen, M., Antikainen, T. & Mecklin, J-P. (2015). Video-assisted surgery: suggestions for failure prevention in laparoscopic cholecystectomy. *Cognition, Technology & Work, 17*(1), 145-155.