Initial Experience and Feasibility of Telementoring in Dry Lab Robotic System Training Using a Telementoring Device

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Objective

To evaluate the feasibility of telementoring in dry lab robotic system training using a telementoring device, with the Senhance® Connect (Asensus Surgical, NC, USA) platform as an example.

Background

The Senhance ® Connect (Fig.1) is intended to assist in the remote support of Senhance cases, the remote observation of surgical cases, and the remote viewing and troubleshooting of Senhance and Senhance-compatible devices. It can also be used for virtual training purposes to educate and proctor remote users on the use of Senhance (proctorship) or to enable a real-time knowledge exchange within the Senhance community (preceptorship). The device is intended for use inside and outside of an operating room before, during, or after clinical procedures by clinicians to communicate regarding surgical technique, instrument use, and device troubleshooting.



Fig 1: Small footprint Senhance® Connect cart (Components from top)
A. Pan Tilt Zoom camera
B. Touch-screen computer installed VSee™ Software
C. Camera for Senhance® console view
D. Speaker & Microphone
E. Standalone mobile cart

Methodology

A non-medical university student underwent robot-assisted dry lab training under remote guidance using a telementoring device with two-way live audio and video communication (Fig. 2). The telementor had access to a three-camera view: top, front, and endoscopic, overlaid with the robotic system interface (RHMI) (Fig. 3). Before the telementoring session, the trainee prepared by reading textual instructions and watching video tutorials.

Two different training methods were compared: real-time feedback from the telementor and self-review using video playback. During the telementoring sessions, the telementor provided verbal and visual guidance via an embedded laptop webcam, utilizing telestration (real-time drawing annotations) and two-way audio over a 7,000 km distance via a public DSL connection (Max download: 100,000 Kbit/s, Max upload: 40,000 Kbit/s). During the video playback sessions, the trainee reviews the training video after each repeat. The training task was repeated six times, and all sessions were screen-recorded. Post-exercise evaluations included task completion time, skill assessment, and ergonomic analysis. The mentoring interface was rated using a multifactorial Likert-based survey.

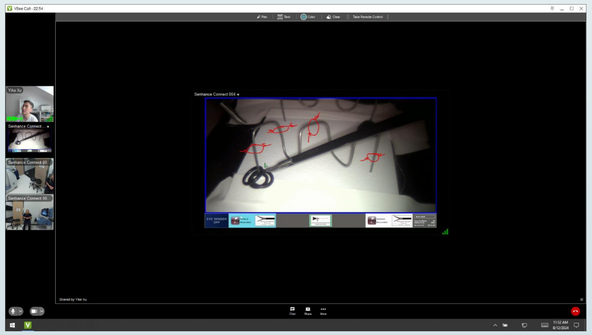


Fig 2: Trainee's interface view with telestration during training

Results

The trainee successfully completed the task without any observable latency in video or audio communication. Skills assessment showed no significant difference between telementor and self-review session. Task completion time decreased significantly in self-review session. The compact telementoring cart allowed flexible positioning near the surgical field for optimal viewing, while live annotations significantly improved communication. Robotic skill assessments showed no significant improvement across training sessions. However, ergonomic evaluation suggested low risk but highlighted areas for further investigation and potential adjustments.

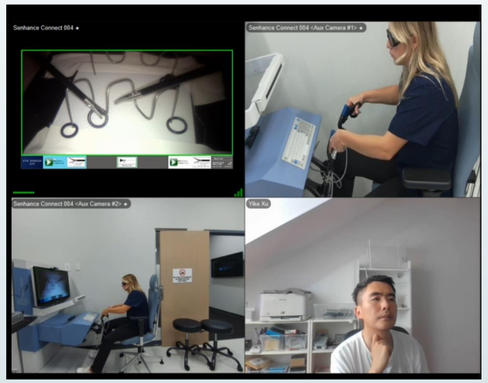


Fig 4: Telementor's interface view during training

Data Security

The Senhance ® Connect platform has a medical grade all in one device, running the medical teleconferencing software VSee. VSee indicates they are HIPAA secure & offer a Business Associate Agreement (BAA) for HIPAA compliance. They also are responsible for processing of personal data under the Privacy Shield Framework & European Union General Data Protection Regulation (GDPR). All data is encrypted at transmission using 256-bit AES. Patient information is not shared nor stored locally.

Conclusion

This study demonstrates the feasibility of using telementoring and telestration for robotic dry lab training over the internet. The small, mobile telementoring platform- Senhance® Connect, enables effective remote training and communication. This platform could also potentially be beneficial for live surgery transmission (Fig. 4). Future studies with larger sample sizes and clinical validation will be necessary to confirm these findings.

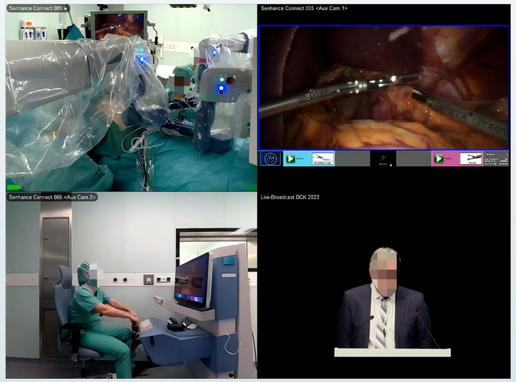


Fig 4: Senhance® Connect was used in live surgery transmission during congress of the German society of surgery

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