The PxLens: Novel Solution for Operating Room Telepresence

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Introduction & Aims

Surgical telepresence is an increasingly popular method for remote medical consultations, education and training. The PxLens is a new technology that offers a unique platform for real-time surgical telepresence by providing a head-mounted smart glasses system with embedded software that connects to a secure cloud-based operating room software. The PxLens is designed to allow users to interact and extract editable, high-resolution content in a secure digital ecosystem.

We will present the results of a study evaluating the usability and effectiveness of the PxLens for surgical telepresence across a range of surgical procedures, using Proximie.

Methodology & Description of Technology

Methodology

1. In this study the PxLens was connected to Proximie's cloud-based Operating Room software, across 20 consecutive procedures.
2. The session is initiated by logging into the Proximie app and scanning the QR code with the PxLens, connecting over WIFI and Bluetooth with the capacity for unlimited users (Figure 1).
3. PxLens provides a full-color heads-up display with 854x480 resolution, allowing the surgeon to see-through the glasses and view the operative field.

Description of technology

Hardware

- **Visuals:** up to 4K resolution and 30 FPS, pending connection speed, auto-focus, and image stabilization for high-quality video capture and real-time streaming.
- **Sound and audio:** Integrated speaker and noise-cancelling microphones to enhance the audio experience for remote participants.
- **Battery life:** 4 hours of battery life on single charge. Includes multiple battery packs that can be hot-swapped during use without interruption.
- **Portability**: lens weigh 3.5 oz, does not impinge on Loupes or eyewear, enabling extended wear periods of the device.

Software

- **Seamlessness**: The platform extends the value of a surgical telepresence session by enabling real-time interaction, recording, immediate upload to the wearer's secure cloud-based storage, and sharing, all within the same software application (Figure 2+3).

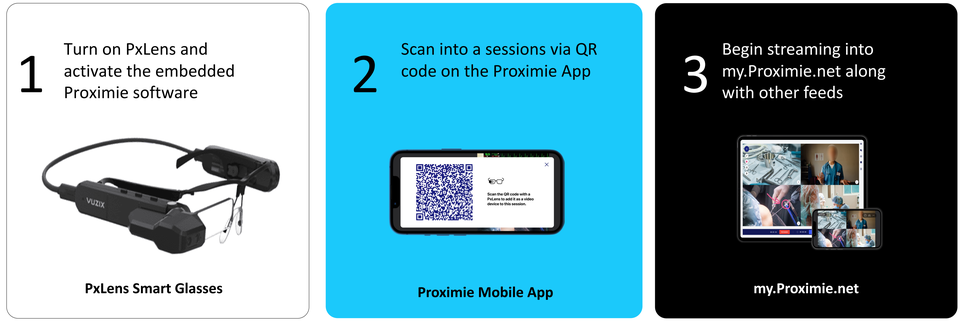


Figure 1: Visual representation of setup and login process.



Figure 2: (above) Operating room video feeds broadcasted onto online surgical telepresence platform (Viewable from any browser or mobile device (iOS/Android)).

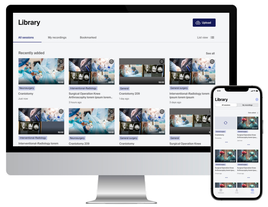


Figure 3: (above) Telepresence sessions can be recorded and stored in secure online library for future review and to provide additional learning opportunity.

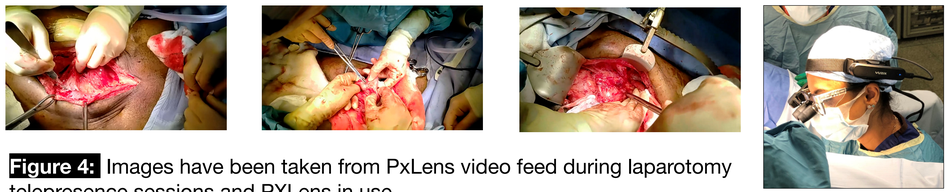


Figure 4: Images have been taken from PxLens video feed during laparotomy telepresence sessions and PXLens in use

Results

The PxLens was used in 20 consecutive procedures, where it provided a stable, unobstructed view of all the transanal and abdominal cases (including : Colostomies, Laparotomies/Abdominal wall reconstructions and Hemicolectomies). (Figure 4)

Main findings:

- Login to stream took less than 30 seconds
- There was clear, uninterrupted audio and video feed to multiple international users.
- Users gave the highest ratings for video quality and connection reliability. (6/10 surgeons voted 'very satisfied' for video quality, 4/10 voted 'very satisfied' for quality of internet connection)
- Specifically, users commented that first-person views provided a new and useful way to train and be trained since even standing side by side in the OR can have physical and viewing limitations.

The surgeons rated high satisfaction with the ease of setup, personalization of the device, ease of use, and a seamless telepresence during all cases. There was no need to reposition the device during any case. There was no surgeon fatigue from wearing the device during the entirety of all cases.

Conclusion

The PxLens opens new learning opportunities beyond any existing presence or platform.

While use of smart glasses for OR telepresence in itself may be considered novel, the greater value of the PxLens lies in its integration with Proximie's digital platform, which takes the live first-person video feed, synchronizes it with multiple video feeds from the OR, relevant medical and imaging devices, and introduces the prospect of training, coaching, and consultation with every procedure.

Because the platform enables recording, storage, editing, review and sharing of each telepresence session, this opens up applications for live as well as pre and post-operative case review, development of artificial intelligence models, and research collaborations.