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Smart Glasses in Surgery: The Theatre and Beyond

Dr. S.Gollapalli ¹, Dr. A. AlGhazwi ², Ms. L. Heskin ³

¹ Royal College of Surgeons, Ireland, Clinical Lecturer, Department of Surgery

² Royal College of Surgeons, Ireland, Clinical Lecturer, Department of Surgery

³ Royal College of Surgeons, Ireland, Simulation technology development lead.

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INTRODUCTION

Uses for Google Glass have been described in a variety of surgical fields including General Surgery, ENT, Plastics, Paediatric, Orthopaedics and Neurosurgery.

In 2015, Mitrasinovic et al. initially described the clinical applications of smart glasses¹. This paper explores Google Glass, Picolinker, Infolinker, Epson Moverio BT-300 and the Realwear smart glasses.

This study explores uses in surgical education, on-call communication, consultations, patient monitoring and focuses on the applications intra-operatively.

AIMS

1. Do smart glasses improve time-efficiency in a theatre setting without compromising the quality of the procedure performed?
2. What is the value of smart glasses in medical education?
3. How can smart glasses benefit surgeons outside the theatre and educational settings?

METHODS

Information Search: Pubmed, Cochrane and Wiley Online Library

Included-

1. Smart glass technology = main topic of investigation.
2. Smart glass technology = used for either procedural or other surgery-related settings.

Excluded-

1. Studies that solely included uses of smart glasses for non-procedural applications in hospitals.
2. Simulation technology without the use of smart glasses or head-mounted displays

Risk of Bias- Cochrane risk of bias tool.

RESULTS

Search: “(smart glasses OR Google glass OR head mounted displays)” yielded 1453 results in PubMed; 274 results in the Cochrane Library and 5410 in the Wiley Online Library.

- Models included Google Glass, Moverio, Infolinker, HMS 3000MT, Wrap TM video eyewear, Vuzix M400, XL50 and the Oculus Rift.

PAPER	TECHNOLOGY	TIME TAKEN	OTHER FINDINGS
<i>Ultrasound-Guided Central Venous Catheterisation.. Kaneko et al.</i>	Moverio BT 200	MOVERIO: 48s MONITOR: 51s	0 guidewire malpositionings with either MOVERIO or Monitor
<i>Ultrasound-Guided Fine-Needle Aspiration in the neck.. Kaneko et al.</i>	Moverio BT 200	MOVERIO: 31s MONITOR: 35s	Increased physical and eye fatigue in participants with Moverio
<i>Minimally invasive spinal instrumentation surgery.. Matsukawa et al.</i>	Picolinker	PICOLINKER: 100 min MONITOR: 105 min	Reduced screw perforation rate and blood loss with Picolinker
<i>Wire insertion in Fracture surgery.. Tsubosaka et al.</i>	Infolinker	INFOLINKER: 15s MONITOR:19s	Smaller mean error angle with Picolinker
<i>Wire Insertion under fluoroscopy.. Hiranaka et al.</i>	Picolinker	PICOLINKER: 14s MONITOR: 19s	Less radiation exposure time with Picolinker
<i>Percutaneous fixation hand fractures.. Chimenti et al.</i>	Google Glass	GOOGLE GLASS: 86s MONITOR: 128s	Less fluoroscopic images required with Google Glass
<i>Comparison of 3D HMD, 3D passive polar display. 2D for first Lap inguinal hernia repair.. Hanani et al.</i>	HMS 3000MT	HMS 3000MT: 4m51s 3D PPD: 4m 46s 2D MONITOR: 6m 21s	More Physical discomfort and headaches with HMS 3000MT, However, better Depth perception
<i>US guided regional anaesthesia using HMD.. Przkora et al.</i>	HMD (Vuzix corporation)	HMD: 59s MONITOR: 171cm	Mean attempts HMD: 1 vs Mean attempts Monitor: 1.4

CONCLUSION

- **Smart glasses increase efficiency in theatre.**
- **No increased adverse patient outcomes.**
- More enjoyable than conventional teaching for trainees
- Remote supervision made possible
- Enhanced surgical education at various levels.
- Patient monitoring intra-operatively.
- On-call/Social distancing applications

- **Operator fatigue.**
- **Poor resolution**
- **Inadequate battery life**
- **Ergonomics/neck pain**
- **Motion sickness**
- **Internet connectivity issues**
- **Data protection concerns**
- **Cost - \$1500-\$2500**

Future:

- VIPAAR Technology: allows the virtual guidance of a senior surgeon such that the operating surgeon could view the presence of the remote surgeon's hands in the operating field.
- New smart glass technologies: Apple Vision Pro
- Head Mounted Display Market Poised to Reach USD 203.7 Billion by 2032 ²



REFERENCES

QR Code: University of Alabama at Birmingham: UAB does virtual surgery with VIPAAR and Google Glass

1. Mitrasinovic S, Camacho E, Trivedi N, Logan J, Campbell C, Zilinyi R, et al. Clinical and surgical applications of smart glasses. Technol Health Care. 2015;23(4):381-401.
2. Market Research Future Article, globalnewswire.com

CONTACT INFORMATION

Dr. Syama Gollapalli
syamagollapalli@rcsi.com

