



Smart glasses – A new mobile tool for health care and education

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What is Google Glass ?



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- A communicator, handsfree telephone
- A camera and voice recorder/transmitter
- A display for reading short messages/texts images
- A voice input interface for steering applications from local storage or internet sites

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Smart Glasses – A new tool in medicine

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Method

- A literature search in December 2014 using Pubmed and Web of Science.
- Fifty-nine abstracts were found and read. We included articles in the review if they: (1) included original data, and (2) were evaluating Google Glass in a clinical setting. Articles should be in English and of full length.
- 17 studies were found to meet the criteria

Brief History of the device

- The Google Glass Explorer Edition became available in February of 2013 to individuals in the U.S. in a limited beta test. In April of 2013, Google released the first iteration of the development platform known as the Mirror API, followed by release of the Glass Development Kit in November of 2013, which allowed for the development of a number of Glass applications.
- On January 15, Google announced that the production of the Glass prototype was stopped but Google remains committed to the development of the product.
- While the Google Glass product is the most publicized, a number of start-ups and larger companies have also developed different types of smart glasses

Other smart glasses

- The Google glass product is being redesigned and after January 2015 it is not available right now in July. Google has announced they will relaunch a new product but not when.
- However other products are available and coming
 - One interesting is the VUZIX M100 smart glasses
 - They have teamed up with Octovis in their Telemedicine kit named "Telle" which contains a bag for remote monitoring by a not so skilled person communicating to a physician at a remote location with a desktop application

The Telle kit

- A tablet PC
- Smart glass from Vuzix: Display, camera and audio
 - 5 hours battery life
- A digital stethoscope
- A pulsoximeter that also records heart rate
- The Physician desktop application

Table 1 – Different application areas described

Application area	Findings
Remote instruction of users wearing Glass	Beneficial use in cardiologist education [4] Orthopedic surgery training [5] Cancer surgery [6] Central venous access [7] Ultrasound interpretation [8] Diabetic limb assessment [9]
Documenting procedures	Autopsy documentation [10] Airway intubation [11]
Patient empowerment	Allergy patients getting access to information [12] Macula patients getting augmented vision [13]
Reading signal data	ECG assessment [14], Immunochromatography [15] Vital signs during radiological intervention [16]
Providing instructional films and simulation	Disaster medicine [17], Anatomy and palpation [18]

Glass in the operating room

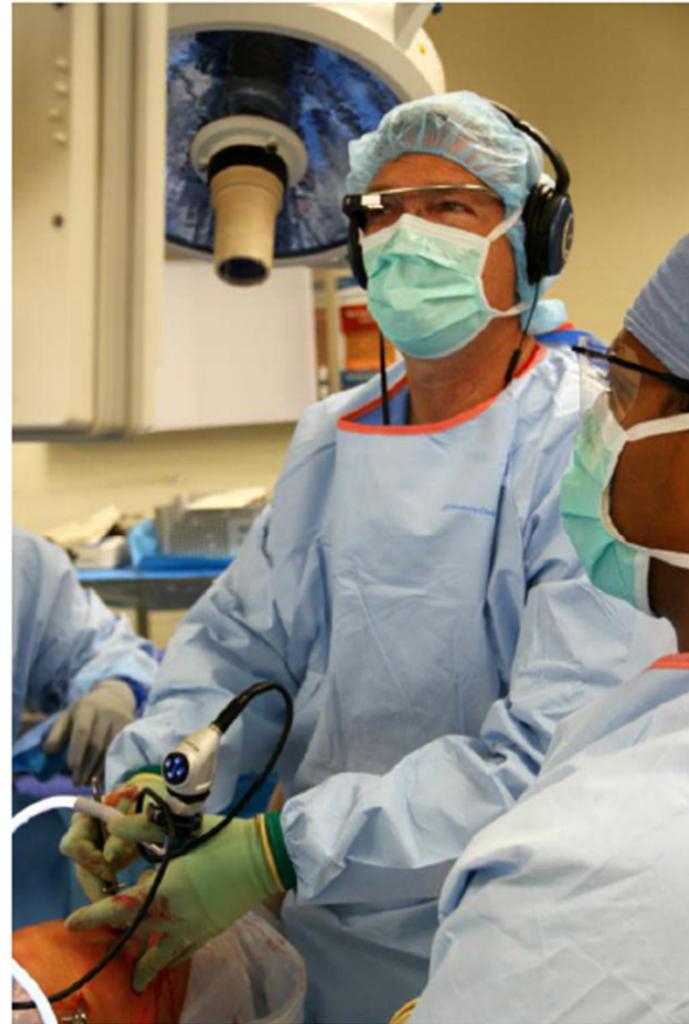


Photo: The Ohio State University

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Google Glass in pediatric surgery: an exploratory study

Muensterer et al. Int J Surg. (2014)

- Evaluation of Google Glass for 4 weeks in a hospital
- Google Glass allows to visualize a situation from the student's perspective in a way previously not feasible.

Google Glass for documentation of medical findings: evaluation in forensic medicine

Albrecht et al. J Med Internet Res. (2014)

- Google Glass was used during autopsy and postmortem examinations of 4 decedents
- A large number of students can observe the procedure

Wearable technology to improve education and patient outcomes in a cardiology fellowship program - a feasibility study

Vallurupalli et al. Health Technol. (2013)

- Four different scenarios in cardiovascular practice
- The fellow wears the Google glass and contacts his senior

The use of Google Glass for airway assessment and management.

Spencer et al. Paediatr Anaesth. (2014)

- Google Glass was used in two cases
- A video of the intubation process can be a useful tool for teaching

The study in Boston with Dr Singh

A smart glass based record is being developed

- Patients that are the concern of a specific physician on a particular day or on a short list easily retrievable for review of essential facts on the glass display
- The location system and time combined makes it possible to propose and display the relevant patient for retrieval
- The physician documents based on a pre-defined structure where key words are displayed on the smart glass display
- The physician has a task list of things to do which is displayed on the device

The patient as a user

- A very advanced system for augmented reality where patients with severe macula degeneration and thus impaired vision were equipped with glasses with a very special purpose to enhance vision by providing more visual information to the peripheral field which was relatively unimpaired. The authors report promising results and seem determined to continue studies.
- The other study reported is for patients with allergies who can benefit from the use of smart glasses by asking for the detailed content of consumer products when for instance doing grocery shopping.

The potential is great but unproven

- There is are many potentially important applications where patients will use this technique both without the direct contact with health care and in treatment partnerships where they are reporting on their state to a remote health professional. The combination of an audio conferencing technique and the possibility of showing what they are doing including e.g. the state of a wound or other skin lesion is interesting.

Applications in education

- This is an area where there should be more studies
- Physicians at various stages may use glasses to communicate in real time to a remote supervisor where a specially challenging patient encounter may be done with the assistance as needed, e.g. during surgery
- It is also a way of recording patient doctor interviews
- An alternative approach is to put the glasses on a patient to record what the doctor in training is doing as seen from the perspective of the patient

Conclusions

- Interesting opportunities with smart glasses in many areas.
- Initial enthusiasm must be replaced by scientific evaluations
- It is hardly a solution for all problems
- The general use of smart glasses in society by patients and other citizens for health is one vision but not without many concerned opponents
- Privacy issues are important
- Watch out for new product releases from Google and other companies