3D-printed, low-cost video laryngoscope designed for resource-constrained settings

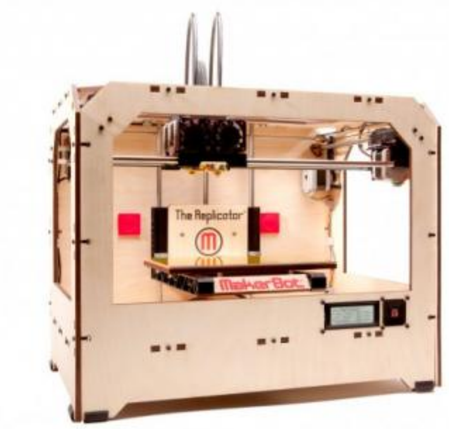
Eve Nyrhinen[1], Michael Lipnick[1], Aki Nyrhinen[2]
1. UCSF Department of Anesthesia & Perioperative Medicine

Background

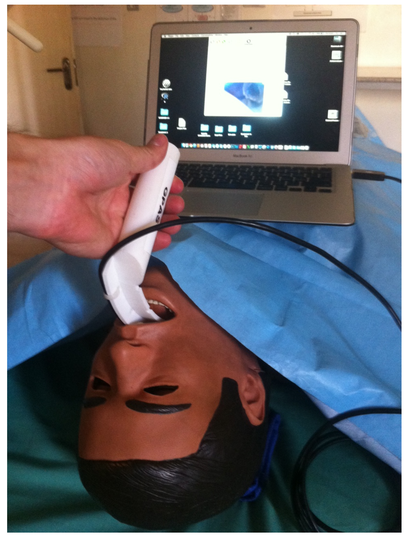
- Video laryngoscopy has become an important tool in the management of difficult airways
- Currently available commercial video laryngoscopes retail for upwards of US $20,000 per unit
- Limited opportunities for training and utilization with video laryngoscopy exist in low- and middle-income countries
- Aside from cost constraints, it is the ease of use, high utility and reliability of video laryngoscopes that could make them an appropriate technology for anesthetists in all settings
- We hypothesized that a low-cost video laryngoscope could be made for use in settings where difficult airway equipment is needed yet relatively inaccessible due to high costs

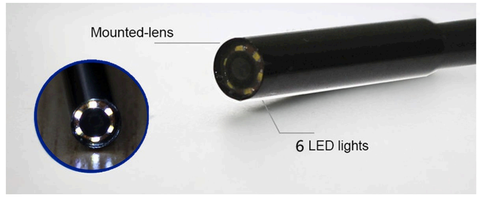
Methods

- Video laryngoscope handles were created using free, TinkerCad software - tinkercad.com
- Blades were printed using a 3D printer and ABS and PLA plastics
- For the camera and light source - a waterproof, 5.5mm diameter, 5m flexible, 640x480 ccd with 6LED lights was used
- Compatibility with video sources includes USB to android, USB to LCD screen and USB to Mac or PC
- Video laryngoscopes were used for teaching purposes on mannequins during a first-year anaesthesia orientation training course



Images: 3D printer used for making laryngoscope handles above (left); printed and assembled laryngoscope handle with USB video camera (above right); CCD USB camera with LEDs (bottom left); assembled laryngoscope is use connected to laptop (bottom right)





Results

- We created a functional video laryngoscope for under $20
- Video laryngoscopes were used during a first-year anesthesia orientation training course with positive reception

Conclusion

- Creation of low-cost, functional video laryngoscopes is feasible
- Low-cost, 3D-printed video laryngoscopes can be useful for simulation teaching purposes, as access to more expensive video laryngoscopes is often restricted to patient use only, thereby limiting opportunities for learning techniques
- Video laryngoscopy is desired in resource-constrained settings, though training opportunities and use in practice are limited by access and cost
- Additional work is needed to complete design of a low-cost, video laryngoscope for patient use

Future Directions

- Construction of a more durable aluminum handle is underway at comparable cost
- Testing and redesign to ensure easy cleaning/sterilization is feasible
- Creation of free templates to print handles with instructions for assembly
- Creation of different blade shapes & sizes
- Fundraising to scale development and distribution
- Create opensource software for using devices with smartphones, tablets or inexpensive OEM LCD screens

Contact

Eve Nyrhinen
eve.nyrhinen@gmail.com
www.globalsurgery.org/devices