Project Title

Protective Mask/ Hood Over Patient for Aerosol Generating Scope Procedures

Project Lead and Members

Project lead: Dr Chew Hui Sing, Consultant, ENT

Project members: Marcus Tan, Gabriel Tan, Dr Brenda Ang, Dr Rupesh Agarwal, Dr Ho Eu Chin, Dr Wei Xin

Organisation(s) Involved

Tan Tock Seng Hospital, The Biofactory

Healthcare Family Group(s) Involved in this Project

Medical

Applicable Specialty or Discipline

Otorhinolaryngology, Infectious Diseases, Ophthalmology

Project Period

Start date: 16 Nov 2020

Completed date: 16 Nov 2022

Aims

To develop a novel protective device that will

1. Protect both HCWs and patients during aerosol generating procedures
2. Be easy to use and comfortable for patients
3. Enable aerosol generating procedures to be safely carried in routine clinical settings
4. Cost effective and commercially viable

Background

COVID-19 transmission occurs through respiratory droplets, aerosols and contact with contaminated surfaces. COVID-19 is also unlikely to be the last respiratory transmitted infectious disease humans will encounter. Standard surgical masks have been shown to be effective in reducing the emission of virus particles but not in aerosols. As such, aerosol generating procedures (AGPs), which are conducted with patient un-masked, are considered high-risk procedures. During the COVID-19 pandemic, the World Health Organisation recommended airborne, droplet and contact precautions when AGPs are performed. Rooms with negative pressure are scarce and costly resources. During the pre-COVID-19 pandemic, these AGPs were performed in normal pressure clinic consultation rooms. Few health care facilities have sufficient resources to cater to the volume of AGPs if they must be done in negative pressure rooms. It is also technically impossible, and extremely costly, to convert existing clinic consultation rooms into negative pressure rooms. Terminal cleaning is also time-consuming. The consequent reduction in scope volumes translates to increased waiting time, reduced efficiency and patient satisfaction and delayed diagnoses. As clinical services resume despite the pandemic and the ongoing threat of future respiratory viral epidemics, we need to explore ways to allow safe and efficient resumption of clinical service.

Methods

Collaboration with engineering and infection disease expertise to develop a dual function protective scope mask and filtration system to be used on patients during the conduct aerosol generating scope procedures. The device efficacy in control of environmental contamination was evaluated and proven via pilot particle counter study with healthy subjects performing aerosol generating activities. The device's end user acceptability and feedback was evaluated.

Results

Compared to no mask and the standard surgical mask, under experimental conditions, the mean fold reduction in the rate of rise of cumulative particle counts resulting from

prototype mask/ filtration system usage was estimated to be 4.89 and 1.83 for speaking and 5 and 2.43 for singing and 21 and 29 for coughing, respectively. More than 90% of surveyed end-users felt safer when the device is in use.

- Final version of prototype ready and in use in ENT clinic (5 units)
- Trademark and international patent filing completed. Published online May 2022.
- Laryngoscope Investigative Otorlaryngology (IF2.5). Accepted for publication in October 2022.

  HS Chew et al. Innovative dual-function protective scope mask and filtration system for aerosol generating ENT scope procedures. Laryngoscope investigative Otorlaryngol. 2022 Sept 9; 7 (5): 1376-1383. Doi:10.1002/lio2.913
- Conference presentations: Poster presentation at SHBC 2022, Oral presentation at 6th Congress of European Otorhinolaryngology- Head and Neck Surgery (CEORLHNS), Milan 29 October- 2 November 2022.

Lessons Learnt

Administrative: Tedious administrative paperwork from grant writing, dsrb, collaboration agreements, technical disclosures, IP filing, service agreements, WOC, progress reports etc. involved in grant funded collaboration studies made doing the project difficult. Advice from CMTI with the various agreement matters was useful. Uncertainties with innovation projects – delays due to covid situations, supply chain shortage/ delays, experimental conducts. A test of resilience.

Conclusion

Our simple-to-use, dual-function portable protective scope mask and filtration system will allow nasal scope procedures as well as flexible laryngoscopy to be performed safely and efficiently in the current COVID pandemic setting. The increased safety was supported by our systematic quantification of aerosols emitted into the environment during `scope provoked' aerosol generating activities, which was greatly reduced by the prototype mask.

Additional Information

Aerosol-generating procedures (AGPs), such as nasoendoscopy, are considered high-risk during the Covid-19 pandemic due to risk of virus aerosol transmission. We aimed to develop and evaluate the efficacy of an innovative system to be used on patients during such procedures to allow for safe and efficient resumption of clinical services.

Project Category

Technology

Product Development, Commercialisation, Product Evaluation, Safety Evaluation, Prototype Resourcing

Care & Process Redesign

Value Based Care, Safe Care

Keywords

Aerosol, COVID-19, Nasoendoscopy, Prevention, Transmission

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