Ventilated headboards and the need for novel controls for SARS-CoV-2

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Controls reduce exposure...

- Reduce below an occupational exposure limit
  - However, we have little idea of the exposure
  - Don’t know the “safe” level
  - Don’t know the effect of controls because of multiple routes of exposure
- We should therefore be precautionary when recommending control measures
Good control practice...

- Design and operate processes to minimise emission, release and spread of substances
- Control exposure proportionate to the health risk
- Choose the most effective and reliable control options
- Check and review regularly all elements of control measures for their continuing effectiveness
- Inform and train all employees on the hazards and risks, and the use of controls

https://www.hse.gov.uk/coshh/detail/goodpractice.htm#
Good control practice...

- Design and operate processes to minimise emission, release and spread of SARS-CoV-2 virus
- Control exposure proportionate to the health risk
- Choose the most effective and reliable control options
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Why is there not more use of local ventilation?

- Computational fluid dynamics test
  - Source from patient cough
  - Tested with four scenarios:
    - Case 1: base, Case 3: full system operating
    - Face velocity 0.2 m/s
    - 12 air changes per hour
  - Claimed to remove 99% of aerosol within 20 s of the start of the cough
- Experimental trial confirm efficacy

Dungi et al (2015) Effectiveness of a Local Ventilation/Filtration Intervention for Health-Care Worker Exposure Reduction to Airborne Infection in a Hospital Room. ASHRAE Winter Conference

https://blogs.cdc.gov/niosh-science-blog/2020/04/14/ventilated-headboard/
Ventilated headboards

- We have formed a not-for-profit consortium in Scotland to develop a practical ventilated headboard
- Key design issues:
  - Effectiveness in reducing aerosol and droplet emissions
  - Improved containment, particularly for droplets
  - Easily installed
  - Quiet and acceptable to patient and staff
  - Patient access around the system
  - Ability to clean and maintain the unit safely
Other local ventilation systems...

- A number of reviews discuss precautions needed to allow dental surgery to restart
  - Most do not mention local ventilation
  - In a review of international guidance only in India is local exhaust ventilation mentioned
- Typically recommended...
  - pre-operative mouthwash; high volume suction; rubber dam; PPE; cleaning and disinfection procedures

Droplet spatter in dentistry...

- Fluorescein in liquid in an ultrasonic scaler and procedures performed on a mannequin in triplicate
- Filter papers used to collect droplet deposition

There are local ventilation systems ...
What do we know about efficacy...

The entry could be improved...

- Forehead position about 85% efficacy

Efficacy...

- It’s important we understand the efficacy of the control measures
  - Reduction in surrogate aerosol concentrations with the system operating
  - Reduction in area contaminated around the source using fluorescent tracer
  - Model impact on exposure of workers
  - Plus real-life validation of the efficacy in reducing exposure
Conclusions...

- Source controls are an important omission from most SARS-CoV-2 control strategies
- Systems exist but they are generally not used and mostly not fully validated
- Systems need to be usable off-the-shelf
- ...and need to be endorsed as part of routine clinical care