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

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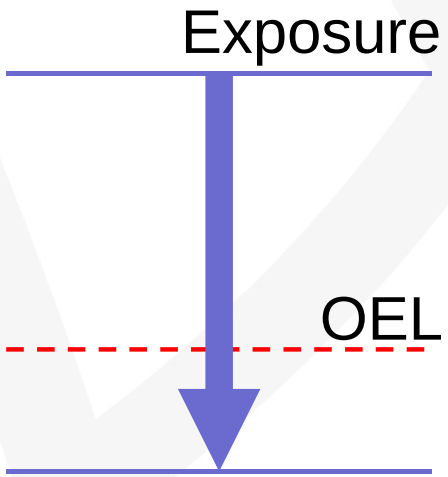
Controls reduce exposure…

- 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



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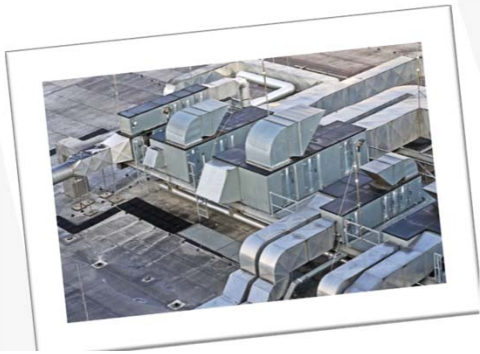
Good control practice…

- 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 ~~substances~~ SARS-CoV-2 virus
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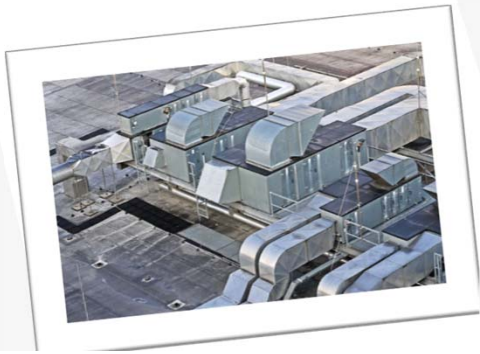
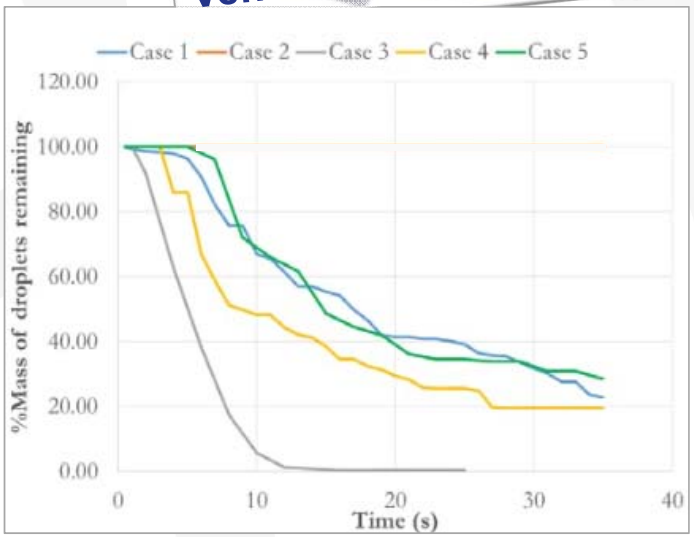


Why is there not more use of local ventilation?

- 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

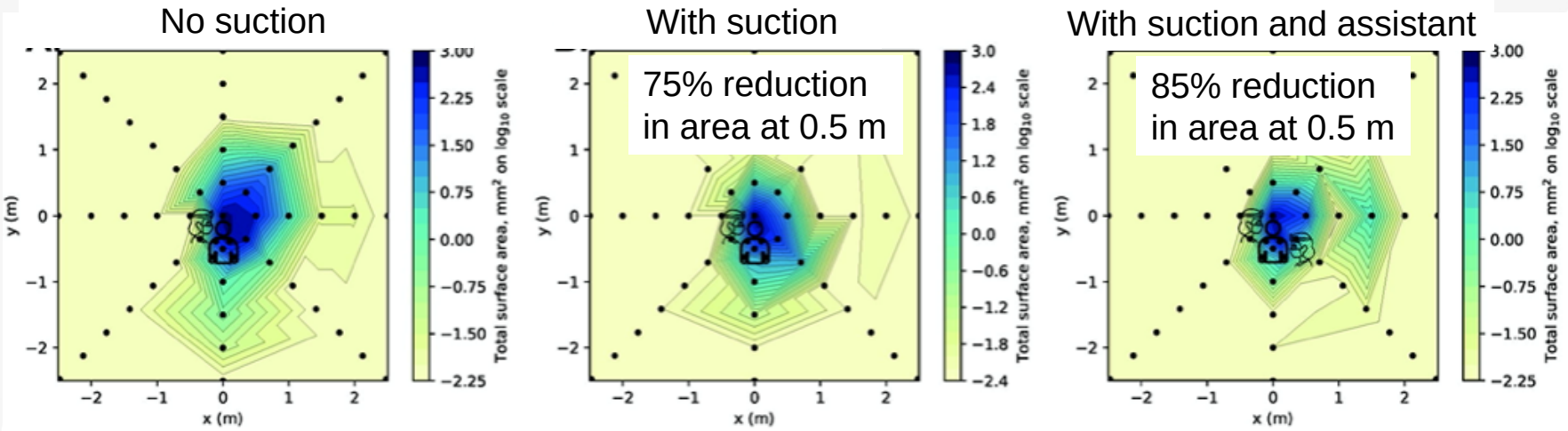
Other local ventilation systems…

- 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

CoDER (2020) Recommendations for the re-opening of dental services: a rapid review of international sources. Manchester: Cochrane Oral Health.

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



Allison J, Currie C, Edwards D, Bowes C, Coulter J, Pickering K, Kozhevnikova E, Durham J, Nile C, Jakubovics N, et al. (2020) Evaluating aerosol and splatter following dental procedures: addressing new challenges for oral healthcare and rehabilitation. bioRxiv.

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There are local ventilation systems …

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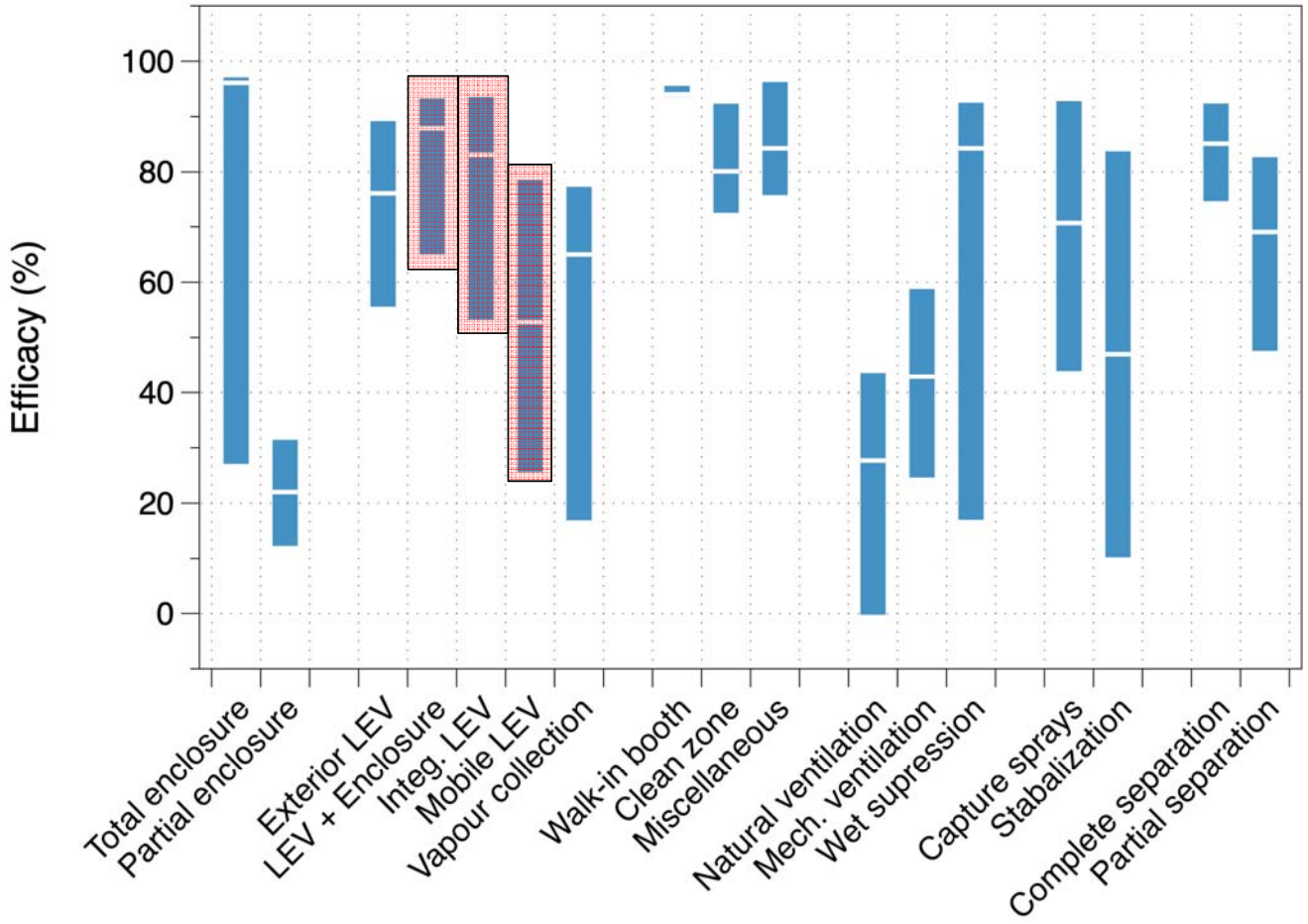
What do we know about efficacy…



Fransman et al. (2008) Development and Evaluation of an Exposure Control Efficacy Library (ECEL). The Annals of Occupational Hygiene; 52: 567-75.

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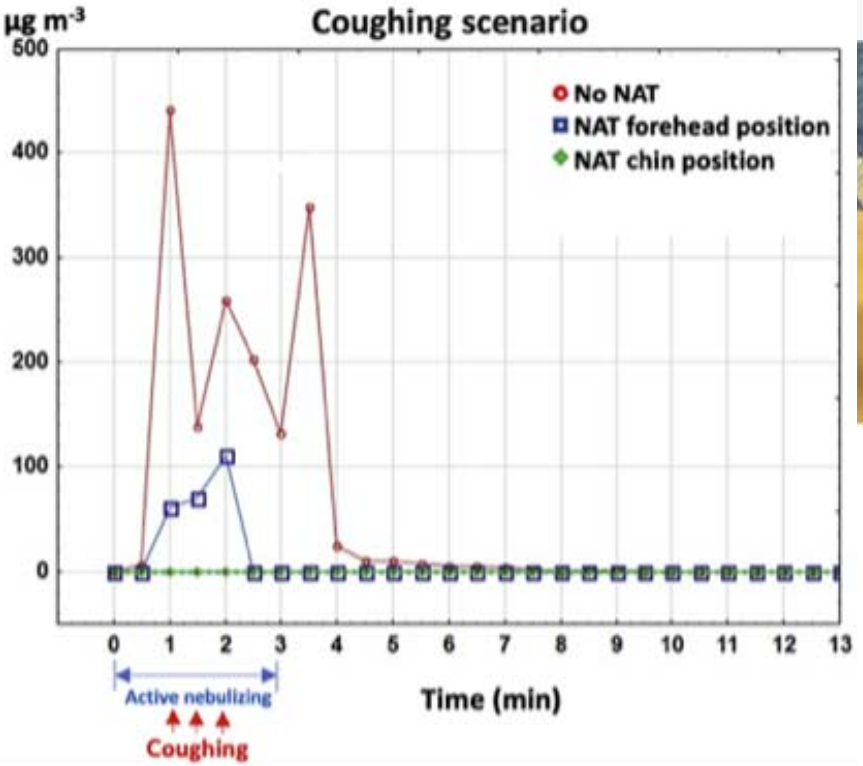
The entry could be improved…

Mask ventilation (NAT forehead position)

Intubation (NA



- Forehead position about 85% efficacy

Tsui BCH, Deng A, Lin C, Okonski F, Pan S. (2020) Droplet evacuation strategy for simulated coughing during aerosol-generating procedures in COVID-19 patients. Br J Anaesth.

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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