

COVID-19

LITERATURE REPOSITORY

What risk do AGP's (Aerosol-Generating Procedures) pose to healthcare workers?

Author(s)

¹ Kirsty Ross, ^{2,3,4} David Isaacs, ^{2,3,4} Philip Britton,
² Annaleise Howard-Jones, ² Alison Kesson, ² Claire
Nayda

Submission date 11th June 2020

Publication date 9th July 2020

Department, Hospital

¹Departments of Emergency Medicine, ²Infectious Diseases & Microbiology and Infection Control and ³Clinical Ethics, The Children's Hospital at Westmead and ⁴Discipline of Child & Adolescent Health, University of Sydney

Discussion

In the COVID-19 pandemic, understanding SARS-CoV-2 transmission risk in the health care setting is critical, as is ensuring appropriate and safe use of personal protective equipment (PPE). Much debate has centred around aerosol-generating procedures (AGPs) which *may* enhance transmission of the virus from an infected patient to surrounding patients and staff.

AGPs are health-care procedures resulting in the production of aerosols which may be infectious.¹ Table 1 provides a comprehensive list. There are other procedures or behaviours that may generate aerosols but for which increased risk of transmission has not been demonstrated.

Some experts believe better terminology for AGPs would be 'increased transmission risk' (ITR) procedures. This more accurately reflects the reason driving current interest amongst healthcare workers (HCWs) in these procedures.

Evidence from Previous Epidemics: Attributing risk to a procedure is difficult because procedures are not performed in isolation. We can therefore only estimate risk of transmission of infection from AGPs by studying aerosol and virus characteristics, but this has limited meaning in the clinical setting.

A more rational approach would be to review virus transmission dynamics. The best available evidence for this is from the 2003 SARS epidemic. A systematic review suggested that certain procedures capable of generating aerosols were associated with an increased risk of SARS transmission from infected patients to HCWs. The review did not, however, enable authors to conclude with certainty that HCWs caring for patients undergoing AGPs were at higher risk of contracting infection compared to those caring for patients not undergoing AGPs.²

COVID-19: During the current pandemic there are some reassuring early observations. The single study from China that suggested risk to HCWs was highest in areas where AGPs are performed is confounded by self-reported poor hand hygiene amongst these same HCWs.³ Reports of HCWs exposed to patients with COVID-19 undergoing AGPs without recommended PPE have documented minimal, if any, nosocomial infection.⁴⁻⁶ When PPE is used, statistics are encouraging. Small studies from Italy, Singapore and the UK show either no transmission of disease to HCWs wearing PPE (despite performing AGPs on infected patients) or no increased risk of transmission of infection to HCWs performing AGPs compared to HCWs with no patient contact.^{5, 7-8}

HCW Protection: Data from the 2003 SARS epidemic demonstrated that - with appropriate use of PPE, patient risk stratification and re-organisation of workflow processes where AGPs were performed - risk of transmission of



The Sydney
children's
Hospitals Network

care, advocacy, research, education

infection to HCWs was low.⁹ Available information, including a systematic review and meta-analysis by Chu et al, suggests that the current systems, processes, PPE and training implemented in our workplace settings are effective at protecting HCWs from COVID-19.¹⁰⁻¹¹

Transmission Dynamics in the Healthcare Setting: AGPs aside, it appears that the rate of HCW workplace acquisition of COVID-19 is no greater than the HCW community acquisition. This is true in settings where the prevalence of disease is low as well as in high disease burden settings where there is increased pressure on the health-care system.¹²⁻¹³ Early Australian data demonstrate that COVID-19 is very uncommon in HCWs and that most Australian HCWs who have contracted infection did so outside of the workplace setting.¹⁴

Table 1: List of aerosol-generating procedures (AGPs)

- Intubation and extubation
- Disconnection of a closed ventilator circuit
- High frequency oscillatory ventilation (HFOV)
- Open oropharyngeal or tracheal suctioning
- Upper respiratory instrumentation or surgery, e.g. bronchoscopy, ENT surgery
- Surgical or post mortem procedures on respiratory tract involving high-speed devices
- Chest drain for relief of pneumothorax
- Thoracic surgery that involves entering the lung
- Manual or non-invasive ventilation: BiPAP, CPAP, BVM ventilation
- Collection of induced sputum
- High flow nasal oxygen (HFNO)
- Nebulisation therapy
- Trans-oesophageal echocardiography (TOE)
- Cardiopulmonary resuscitation (CPR)
- Nasopharyngeal aspiration (NPA)

Conclusions

There is limited evidence that AGPs can transmit respiratory coronaviruses to HCWs who do not wear appropriate PPE. Existing PPE protocols provide an additional level of protection supported by studies from viruses with comparable transmission dynamics.¹⁵ Meanwhile, there is reasonable evidence that HCWs who adhere to protocols in the workplace, including meticulous hand hygiene and recommended PPE use, are no more likely to acquire infection at work than in the community.

References

1. Chu DK, Akl EA, Duda S, et al. Physical distancing, face masks and eye protection to prevent person-to-person transmission of SARS-CoV-2 and COVID-19: a systematic review and meta-analysis. *Lancet* 2020. Published online June 1, 2020. Link: [http://doi.org/10.1016/S0140-6736\(20\)31142-9](http://doi.org/10.1016/S0140-6736(20)31142-9)
2. Tran K, Cimon K, Severn, M et al. Aerosol Generating Procedures and Risk of Transmission of Acute Respiratory Infections to Healthcare Workers: A Systematic Review. *PLoS ONE*. 2012; **7**(4): e35797. doi:10.1371/journal.pone.0035797 Link: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3338532/pdf/pone.0035797.pdf>
3. Ran L, Chen X et al. Risk factors for healthcare workers with corona virus disease 2019: A Retrospective Cohort Study in a Designated Hospital of Wuhan in China. *Clin Infect Dis*, 2020 Mar 17th. doi: [10.1093/cid/ciaa287](https://doi.org/10.1093/cid/ciaa287) [Epub ahead of print]
4. Heinzerling, A, Stuckey M, Scheuer T, et al. Transmission of COVID-19 to Health Care Personnel During Exposures to a Hospitalized Patient - Solano County, California, February 2020. *MMWR Morb Mortal Wkly Rep*. 2020 April 17; **69**(15): 472-476.
5. Ng K, Poon BH, Kiat Puar, TH et al. COVID-19 and the Risk to Health Care Workers: A Case Report. *Ann Int Med*. 2020 June 2; 172: 766-767. doi: <http://doi.org/10.7326/L20-0175>
6. Wong SCY, Kwong, RTS, Wu, TC et al. Risk of nosocomial transmission of coronavirus disease 2019: an experience in a general ward setting in Hong Kong. *J Hosp Inf*, 2020 April 4. doi:



The Sydney
children's
Hospitals Network

care, advocacy, research, education

<http://doi.org/10.1016/j.jhin.2020.03.036> [Epub ahead of print]

7. Kromm S, Bourassa L et al for the COVID-19 Scientific Advisory Group Alberta Health Services. Rapid Response Report: Are healthcare workers at increased risk of COVID-19? 2020 May 4th. Link: <https://www.albertahealthservices.ca/assets/info/ppih/if-ppih-covid-19-hcw-risk-rapid-review.pdf> Accessed 22nd May 2020
8. Hunter E, Price D, Murphy, E et al. First experience of COVID-19 screening of health-care workers in England. *The Lancet*. 2020 April 22; 395: E77-78 doi: [https://doi.org/10.1016/S0140-6736\(20\)30970-3](https://doi.org/10.1016/S0140-6736(20)30970-3)
9. Chee VWT, Khoo MLC, Lee SF et Al. Infection control measures for operative procedures in severe acute respiratory syndrome-related patients. *Anesthesiology*. 2004 Jun; 100: 1394-1398.
10. Tarantini G, Masiero G, Fovino LC. Impact of a 10 Rules Protocol on COVID-19 Hospital-Related Transmission: Insights From Padua University Hospital, Italy. *Circinterventions*. 2020 May 15. doi: <https://www.ahajournals.org/doi/10.1161/CIRCINTERVENTIONS.120.009279>
11. Bohmer MM, Buchholz U, Corman VM et al. Investigation of a COVID-19 outbreak in Germany resulting from a single travel-associated primary case: a case series. *The Lancet*. 2020 May 15. doi: [https://doi.org/10.1016/S1473-3099\(20\)30314-5](https://doi.org/10.1016/S1473-3099(20)30314-5) (Epub ahead of print)
12. Heneghan C, Oke J, Jefferson T. COVID-19 How many Healthcare workers are infected? Centre for Evidence Based Medicine. 2020 April 17. Link: <https://www.cebm.net/covid-19/covid-19-how-many-healthcare-workers-are-infected/> Accessed 22nd May 2020
13. Folgueira MD, Munoz-Ruiperez et al. SARS-CoV-2 infection in Health Care Workers in a large public hospital in Madrid, Spain, during March 2020. medRxiv. 2020 April 17. doi: <https://doi.org/10.1101/2020.04.07.20055723> Link: <https://www.medrxiv.org/content/10.1101/2020.04.07.20055723v2> Accessed 22nd May 2020
14. Muhi S, Irving L, Busing KL et al. COVID-19 in Australian healthcare workers: Early experience of the Royal Melbourne Hospital emphasises the importance of community acquisition. *Med J Aust*. 23 April 2020. Link: <https://www.mja.com.au/system/files/2020-04/Preprint%20Muhi%2023%20April%202020.pdf>
15. New South Wales Clinical Excellence Commission. Quick Guide to PPE for the Emergency Department. Sydney: NSW Health, 2020.

Conflicts of Interest: None declared



The Sydney
children's
Hospitals Network

care, advocacy, research, education