IS IT TIME TO STOP TALKING ABOUT AEROSOL GENERATING PROCEDURES?

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OBJECTIVES

- DESCRIBE TWO APPROACHES THAT CAN DEMONSTRATE AN INCREASED RISK OF AGPS TRANSMITTING AIRBORNE DISEASES
- DESCRIBE THE DATA SUPPORTING OR REFUTING THE RISK FROM AGPS FROM CASE CONTROL STUDIES
- DESCIBE THE DATA FROM AEROSOL GENERATION FROM PROCEDURES DESCRIBED AS AGPS

SO WHO CARES IF WE HAVE TO WEAR THE PAPRS AND N-95S?

- PAPR REDUCE COMMUNICATION, MOBILITY, AND DEXTERITY
- ANESTHESIOLOGISTS WHO ARE WEARING PAPRS AND N-95 SAID
  - 305 (92%) PERCEIVED REDUCED EFFICIENCY
  - 376 (83%) PERCEIVED A NEGATIVE IMPACT ON TEAMWORK
  - 201 (64%) WERE WORRIED ABOUT ENVIRONMENTAL IMPACT
  - 255 (77%) REPORTED SIGNIFICANT PROBLEMS WITH COMMUNICATION

- SHRIMPTON AJ, OSBORNE CED, BROWN JM, COOK TM, PENFOLD C, ROOSHENAS L, PICKERING AE. ANAESTHETISTS' CURRENT PRACTICE AND PERCEPTIONS OF AEROSOL-GENERATING PROCEDURES: A MIXED-METHODS STUDY. ANAESTHESIA. 2022 SEP;77(9):959-970.

New OSHA Rules Expected in 2023

The Occupational Safety and Health Agency (OSHA) may be publishing two rules in 2023:

1. Subpart U--Emergency Temporary Standard--COVID-19: This final rule would make the temporary COVID-19 ETS permanent. It arrived at OMB for review on 12/7. The final rule was forecasted for September 2022.

OSHA Abstract: In accordance with President Biden's Executive Order 13999 on Protecting Worker Health and Safety (January 21st, 2021), OSHA issued an emergency temporary standard to address the grave danger of COVID-19 in healthcare workplaces. This standard contains provisions necessary to ensure the health and safety of workers. The agency believes the danger faced by healthcare workers continues to be of the highest concern and measures to prevent the spread of COVID-19 are still needed to protect them. OSHA therefore continues to work expeditiously to issue a final standard that will protect healthcare workers from COVID-19 hazards.

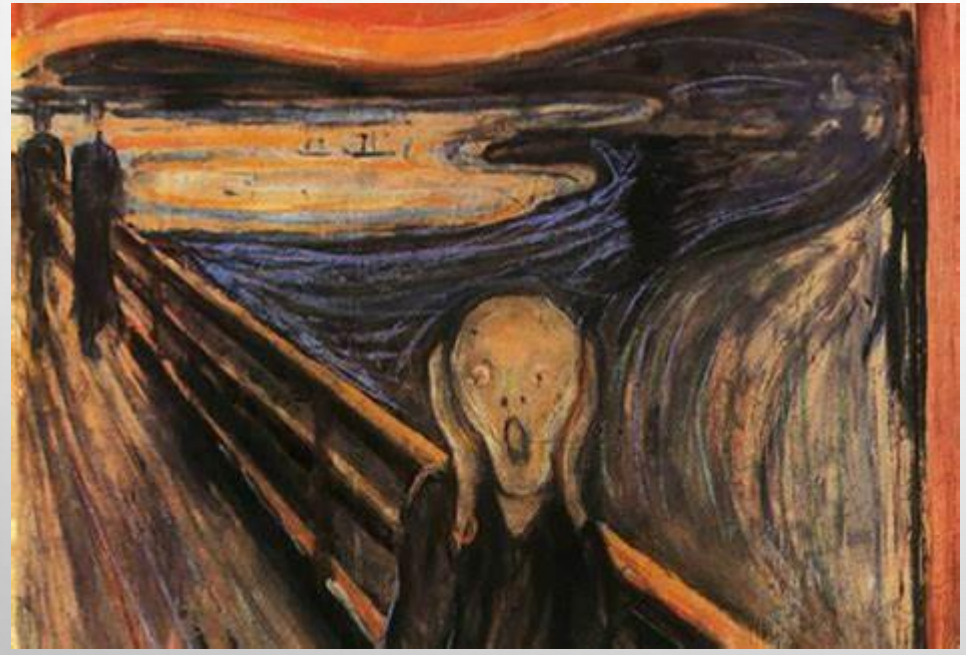
2. Infectious Diseases: This proposed rule would establish an infectious disease standard, so broader than COVID-19. It is forecasted for May 2023.

OSHA Abstract: Employees in health care and other high-risk environments face long-standing infectious disease hazards such as tuberculosis (TB), varicella disease (chickenpox, shingles), and measles, as well as new and emerging infectious disease threats, such as Severe Acute Respiratory Syndrome (SARS), the 2019 Novel Coronavirus (COVID-19), and pandemic influenza. Health care workers and workers in related occupations, or who are exposed in other high-risk environments, are at increased risk of contracting TB, SARS, Methicillin-Resistant Staphylococcus Aureus (MRSA), COVID-19, and other infectious diseases that can be transmitted through a variety of exposure routes. OSHA is examining regulatory alternatives for control measures to protect employees from infectious disease exposures to pathogens that can cause significant disease. Workplaces where such control measures might be necessary include: health care, emergency response, correctional facilities, homeless shelters, drug treatment programs, and other occupational settings where employees can be at increased risk of exposure to potentially infectious people. A standard could also apply to laboratories, which handle materials that may be a source of pathogens, and to pathologists, coroners' offices, medical examiners, and mortuaries.

AEROSOL GENERATING PROCEDURE (AGP) DEFINITION

- 1-AGPS ARE DEFINED AS ANY MEDICAL OR PATIENT CARE PROCEDURE THAT RESULTS IN THE PRODUCTION OF AIRBORNE PARTICLES
- AN AEROSOL GENERATING PROCEDURE (AGP) DESCRIBES AN ACTIVITY THAT CAN RESULT TO THE RELEASE OF SMALL AIRBORNE PARTICLES (AEROSOLS) OR DROPLETS. UNDER CERTAIN CONDITIONS, THE RELEASE MIGHT CONTAIN POTENTIALLY TRANSMISSIBLE QUANTITIES OF VIRIAL MATERIAL; THE CURRENT FOCUS OF THIS DOCUMENT. HTTPS://AEROSOL-SOC.COM/COVID-19/AEROSOL-GENERATING-PROCEDURES/
- WHAT IS AN AEROSOL-GENERATING PROCEDURE? KLOMPAS M, BAKER M, RHEE C. WHAT IS AN AEROSOL-GENERATING PROCEDURE? JAMA SURG. 2021;156(2):113–114.
- HOW SHOULD AEROSOL GENERATING PROCEDURES BE DEFINED? CHUI J, HUI D S, CHAN M T. HOW SHOULD AEROSOL GENERATING PROCEDURES BE DEFINED? BMJ 2022; 378 :E065903 DOI:10.1136/BMJ-2021-065903

WAIT WE DON'T EVEN HAVE A STANDARD DEFINITION OF AN AGP?



OR

THIS LECTURE GOES FORWARD WITH THE FOLLOWING QUASI REASONABLE DEFINITION:

- ANY MEDICAL PRACTICE OR TECHNIQUE THAT ENABLES AEROSOLS TO BE TRANSMITTED FROM ONE PERSON TO ANOTHER AT A GREATER RATE THAN IF THE PRACTICE OR PROCEDURE HAD NOT BEEN DONE.
    - FEM III 2022

WELL WE MIGHT NOT HAVE A DEFINITION BUT WE KNOW WHAT THEY ARE!

- KIND OF……
- WHO
- CDC
- UK
- CA
- RANDOM ORGANIZATIONS DURING COVID-19

WHO

- AUTOPSY
- BRONCHOSCOPY
- CARDIO PULMONARY RESUSCITATION
- DENTISTRY
- ENDOTRACHEAL INTUBATION
- MANUAL VENTILATION INTUBATION BEFORE INTUBATION
- NON-INVASIVE INTUBATION
- SPUTUM INDUCTION USING NEBULIZED HYPERTONIC SOLUTION
- TRACHEOSTOMY

CDC

- BRONCHOSCOPY
- CHEST COMPRESSIONS
- ENDOTRACHEAL INTUBATION AND EXTUBATION
- HIGH FLOW OXYGENATION
- MANUAL VENTILATION AFTER INTUBATION
- MANUAL VENTILATION BEFORE INTUBATION
- NEBULIZER TREATMENT (POSSIBLE)
- NON-INVASIVE INTUBATION
- OPEN SUCTIONING OF AIRWAYS
- SPUTUM INDUCTION

UK

- AUTOPSY AND SURGERIES USING HIGH SPEED DEVICES LIKELY TO PRODUCE AEROSOLS FROM THE RESPIRATORY TRACT
- AWAKE BRONCHOSCOPY
- AWAKE EAR, NOSE AND THROAT PROCEDURES THAT INVOLVE RESPIRATORY SUCTIONING
- AWAKE UPPER GASTRO-INTESTINAL ENDOSCOPY
- DENTAL PROCEDURES USING HIGH SPEED OR HIGH FREQUENCY DEVICES
- OPEN SUCTIONING BEYOND THE ORO-PHARYNX
- SPUTUM INDUCTION
- TRACHEOSTOMY

CALIFORNIA

- AEROSOLIZED ADMINISTRATION OF PENTAMIDINE OR OTHER MEDICATIONS
- AUTOPSY
- BRONCHOSCOPY
- CLINICAL SURGICAL AND LABORATORY PROCEDURES THAT MAY AEROSOLIZE PATHOGENS
- PULMONARY FUNCTION TEST
- SPUTUM INDUCTION

SPECIFIC ORGANIZATIONS

- WHAT EVER THEY WERE AFRAID THEY WOULD GET COVID-19 FROM
  - LABOR AND DELIVERY
  - LOWER GI ENDOSCOPY

LESS THAN UNIVERSAL AGREEMENT

- UNCLEAR WHAT CRITERIA IS USED TO PLACE AN PROCEDURE ON THE LIST

TWO TESTS FOR AGPS

- MORE DISEASE WHEN THEY ARE DONE
  - CASE CONTROL STUDIES CAN EVALUATE
- MORE AEROSOLS GENERATED WHEN DONE

THE CASE CONTROL STUDIES ON AGPS

- MOST STUDIES STARTED AFTER SARS, HOWEVER SOME GO BACK FURTHER THAN THAT WITH TB (DO VIRUSES BEHAVE DIFFERENTLY THAN BACTERIA IF THEY ARE BOTH IN AEROSOLS)?
- THE CDC CITES A PLOS ONE METANALYSIS ON AGPS

There is neither expert consensus, nor sufficient supporting data, to create a definitive and comprehensive list of AGPs for healthcare settings.

Commonly performed medical procedures that are often considered AGPs, or that might create uncontrolled respiratory secretions, include:

- open suctioning of airways
- sputum induction
- cardiopulmonary resuscitation
- endotracheal intubation and extubation
- non-invasive ventilation (e.g., BiPAP, CPAP)
- bronchoscopy
- manual ventilation

Based on limited available data, it is uncertain whether aerosols generated from some procedures may be infectious, such as:

- nebulizer administration*
- high flow O2 delivery

You may not know references is singular!

*Aerosols generated by nebulizers are derived from medication in the nebulizer. It is uncertain whether potential associations between performing this common procedure and increased risk of infection might be due to aerosols generated by the procedure or due to increased contact between those administering the nebulized medication and infected patients.

References related to aerosol generating procedures:

Tran K, Cimon K, Severn M, Pessoa-Silva CL, Conly J (2012) Aerosol Generating Procedures and Risk of Transmission of Acute Respiratory Infections to Healthcare Workers: A Systematic Review. PLoS ONE 7(4); https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3338532/#!po=72.2222external iconexternal icon).

Table 1

Characteristics of included studies

2004 [27] Canada	cohort study; Intensive care unit; Coronary care unit	outbreak in Toronto			Immunofluorescence	LOW
Ma et al, 2004 [22] China	Case-control study; Five hospitals	2003 SARS outbreak in Beijing	HCWs (nurse assistants, janitors and others) (N= 473)	Yes	Diagnostic criteria for SARS from Chinese Minister of Health	VERY LOW
Teleman et al, 2004 [23] Singapore	Case-control study; Hospital	2003 SARS outbreak in Singapore	86 HCWs (doctors, nurses, others)	Not mentioned	Symptoms, chest X-ray and serology	VERY LOW
Wong et al, 2004 [28] China	Retrospective cohort study; Hospital	2003 SARS outbreak in Hong Kong	66 medical students	Yes, on personal protection equipmentNo, on training	Indirect immunofluorescent to detect antibodies against SARS-CoV	VERY LOW
Scales et al, 2003 [29] Canada	Retrospective cohort study; Intensive care unit	2003 SARS outbreak in Toronto	69 intensive care staff	Unclear	Radiographic lung infiltrates	VERY LOW

All studies were described as very low quality

Risk of SARS Transmission to HCWs Exposed and Not Exposed to Aerosol-Generating Procedures, and Aerosol Generating Procedures as Risk Factors for SARS Transmission

	1.8 (0.8, 4.0) [25]	
Nebulizer treatment (3 cohort studies)	6.6 (0.9, 50.5) [27]	0.9 (0.1, 13.6); 73.1%
	0.1 (0.0*, 1.0) [28]	
	1.2 (0.1, 20.7) [25]	
Manipulation of oxygen mask (2 cohort studies)	17.0 (1.8, 165.0) [27]	4.6 (0.6, 32.5); 64.8%
	2.2 (0.9, 4.9) [25]	
Bronchoscopy (2 cohort studies)	3.3 (0.2, 59.6) [27]	1.9 (0.2, 14.2); 0%
	1.1 (0.1, 18.5) [25]	
Non-invasive ventilation (2 cohort studies)	2.6 (0.2, 34.5) [26]	3.1 (1.4, 6.8); 0%
	3.2 (1.4, 7.2) [25]	
Insertion of nasogastric tube (2 cohort studies)	1.7 (0.2, 11.5) [27]	1.2 (0.4, 4.0); 0%
	1.0 (0.2, 4.5) [25]	
Chest compressions (1 case-control study)	4.5 (1.5, 13.8) [24]	
Chest compressions (2 cohort studies)	3.0 (0.4, 24.5) [25]	1.4 (0.2, 11.2); 27.3%

Anyone know anything about stats?

Subject	Design	#	Sig?
Tracheal Intubation	Cohort	4	Y
Tracheal Intubation	Case-Control	4	Y
Suction before intubation	Cohort	2	N
Suction after intubation	Cohort	2	N
Nebulizer treatment	Cohort	3	N
Manipulation oxygen mask	Cohort	2	N
Bronchoscopy	Cohort	2	N
Non-invasive ventilation	Cohort	2	Y
Insertion of nasogastric tube	Cohort	2	N
Chest compressions	Cohort	2	N
Defibrillation	Cohort	2	N
Chest physiotherapy	Cohort	2	N
High frequency oscillatory ventilation	Cohort	1	N
High flow oxygen	Cohort	1	N
Tracheotomy	Case-Control	1	Y
Intubation, tracheotomy, airway care, cardiac resuscitation	Case-Control	1	Y
Manipulation of BiPAP mask	Cohort	1	N

Subject	Design	#	Sig?
Endotracheal aspiration	Cohort	1	N
Suction of body fluid	Case-Control	1	N
Administration of oxygen	Case-Control	1	N
Mechanical ventilation	Cohort	1	N
Mechanical ventilation before intubation	Cohort	1	Y
Mechanical ventilation after intubation	Cohort	1	N
Manual ventilation	Cohort	1	N
Collection of sputum sample	Cohort	1	N

WELL MAYBE COVID-19 IS DIFFERENT THAN SARS!

AGPs*,†			
Airway suctioning	0 (0)	7 (21)	1.00
Noninvasive ventilation (BiPAP, CPAP)	2 (67)	4 (12)	0.06
Manual (bag) ventilation	1 (33)	2 (6)	0.23
Nebulizer treatments	2 (67)	3 (9)	0.04
Breaking ventilation circuit	0 (0)	5 (15)	1.00
Sputum induction	0 (0)	1 (3)	1.00
Intubation	1 (33)	2 (6)	0.23
Performed or assisted	1 (33)	1 (3)	0.16
Present in room	0 (0)	1 (3)	1.00
Bronchoscopy	0 (0)	3 (9)	1.00
Performed or assisted	0 (0)	1 (3)	1.00
Present in room	0 (0)	3 (9)	1.00
Any AGP	**2 (67)**	**15 (44)**	**0.58**

Nope!

LIMITATIONS ON CASE-CONTROL AND COHORT STUDIES IN LOOKING AT PROCEDURE RISKS

- PROCEDURE IS RELATED TO TIME
  - RUNNING INTO THE ROOM, INTUBATE AND RUN OUT?
- THE PATIENT
  - OLDER PATIENTS SHED MORE AEROSOLS THAN YOUNGER PATIENTS
  - OBESE PATIENTS SHED MORE AEROSOLS THAN NON-OBESE PATIENTS
  - SYMPTOMATIC PATIENTS SHED MORE AEROSOLS THAN ASYMPTOMATIC PATIENTS
    - DO ASYMPTOMATIC PATIENTS GET INTUBATED? DO THEY GET CPR?
  - SOME PEOPLE ARE SUPER SPREADERS
- FAILURE TO CONTROL FOR THESE DIFFERENCES MAY RESULT IN SPURIOUS ASSOCIATIONS
- NONE OF THE STUDIES CITED CONTROLLED FOR THESE VARIABLES

BUT THERE IS NO BETTER WAY TO FIGURE IT OUT

- YOU NEED TO LOOK AT THE FULL STUDY
  - IS ENDOTRACHEAL INTUBATION IN THE ED AN AGP RISK IF NO ONE WAS WEARING A MASK?
    - MASK OR INTUBATION?
- NOT ALL HOSPITALS ARE THE SAME FOR ACH AND A VARIATION WOULD RESULT IN A GREATER IN ROOM CONCENTRATION OF AEROSOLS
- WAS WGS DONE TO MATCH THE PATIENT'S STRAIN VERSUS INFECTED STAFFS STRAIN (LESS IMPORTANT IN LOW PREVALENCE DISEASE)
  - SURGEON AND THE PATIENT

COUNTING THE AEROSOLS

- ~2009 COMPUTERS AND CAMERAS BECAME EFFICIENT ENOUGH TO COUNT AEROSOLS
- TO COUNT YOU MUST DEFINE WHAT AN AEROSOL IS

WHAT IS AN AEROSOL?

- NO SUCH STANDARD CURRENTLY EXISTS.
- ADDITIONALLY, AN OPERATIONAL DEFINITION IS NEEDED OF WHAT AN AEROSOL CAPABLE OF DISEASE TRANSMISSION IS.
- KNOWN HOW SMALL A PARTICLE NEEDS TO BE TO STAY AFLOAT FOR A PROLONGED PERIOD OF TIME WITH NO AID
- VERY SMALL PARTICLES MAY BE LESS EFFECTIVE OR INEFFECTIVE AT DISEASE TRANSMISSION.
  - NOT CONTAIN ENOUGH PATHOGENS TO TRANSMIT
  - DESICCATE OR EXPOSE TO UV LIGHT
- VIRUSES CAN REMAIN STABLE IF THOSE AEROSOLS ARE IN THE 0.3– 9.0 μ RANGE FOR HOURS IN THE AIR
- AEROSOLS LESS THAN 2 μ CONTAIN MUCH OF THE INFECTIOUS VIRAL LOAD

NUMBER OF AEROSOLS NEEDED FOR TRANSMISSION

- VARIES BY PATHOGEN
- SURROUNDING VENTILATION (AEROSOLS ARE EVACUATED QUICKLY)

1. Airborne Contaminant Removal

Table B.1. Air changes/hour (ACH) and time required for airborne-contaminant removal by efficiency *

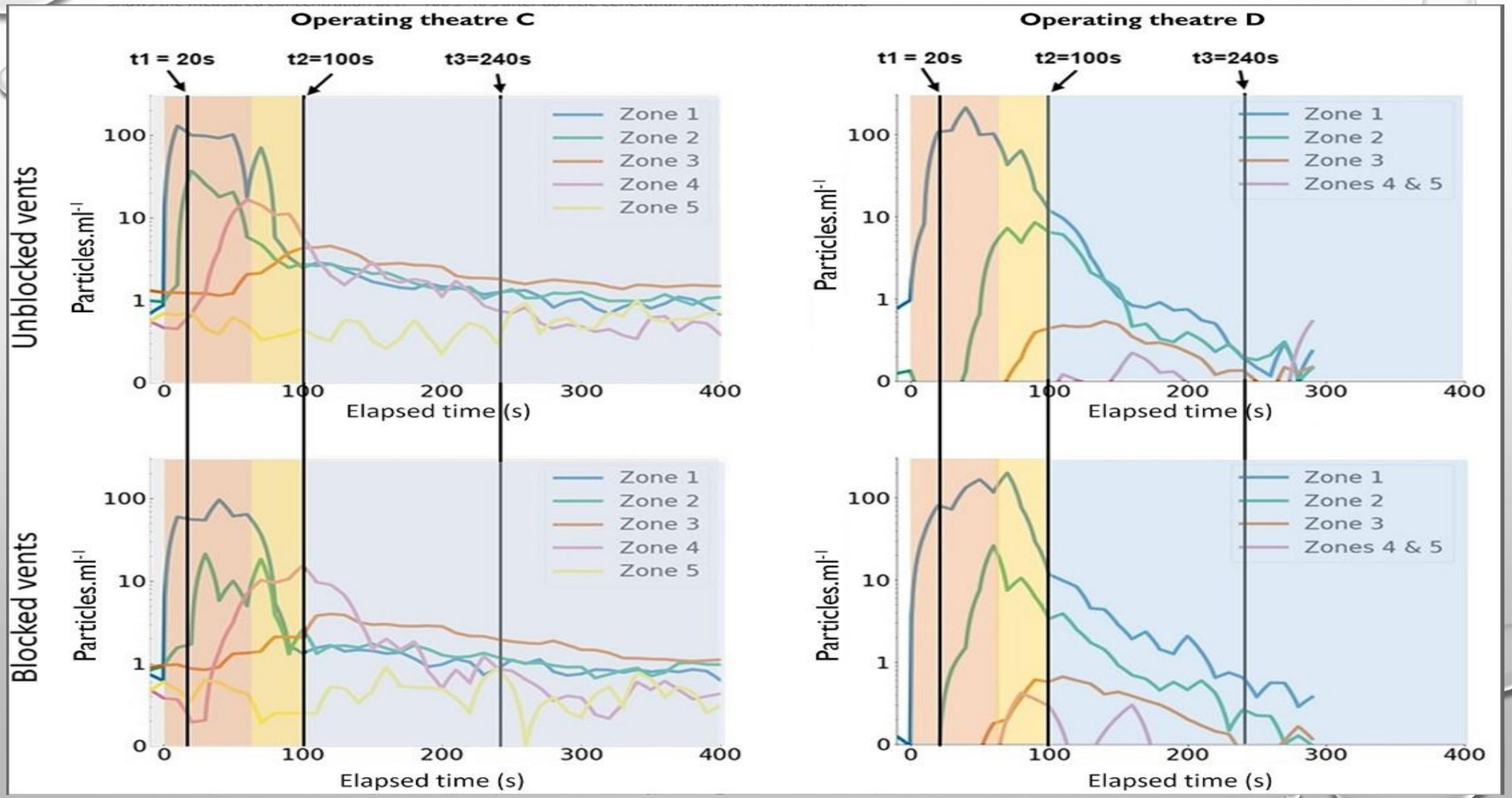
ACH § ¶	Time (mins.) required for removal 99% efficiency	Time (mins.) required for removal 99.9% efficiency
2	138	207
4	69	104
6+	46	69
8	35	52
10+	28	41
12+	23	35
15+	18	28
20	14	21
50	6	8

* This table is revised from Table S3-1 in reference 4 and has been adapted from the formula for the rate of purging airborne contaminants presented in reference 1435.

+ Denotes frequently cited ACH for patient-care areas.

BUT WAIT!

Hecker JG, He J, Rochlin R, et al. Measuring aerosols in the operating theatre and beyond using a realtime sensor network. Anaesthesia 2022; 77: 1097–105.



COUGHS OR TALKING?

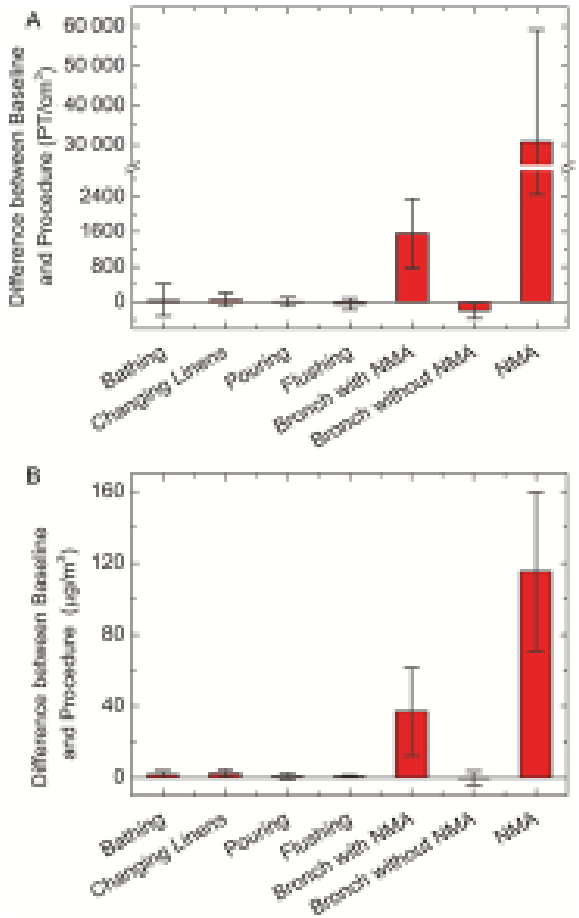
- THE ORDER OF INCREASING AEROSOL GENERATION IS:
  - BREATHING, TALKING, COUGHING, SINGING
- SO SHOULD THE STANDARD BE IT CREATES MORE AEROSOLS THAN TALKING OR COUGHING?
- WHAT ABOUT COUGHING INDUCED BY THE PROCEDURE?
- I SAY COUGHING AS PATIENTS ROUTINELY DO IT AND WE DON'T ADD PPE WHEN THEY DO OR REMOVE PPE WHEN THEY DON'T

THE LIST OF "AGPS" THAT CREATE ***LESS*** AEROSOLS THAN COUGHING

- TRACHEAL INTUBATION
- HIGH-FLOW NASAL OXYGEN
- BRONCHOSCOPY (BUT NOT WHEN YOU ADD AEROSOL MEDICATIONS DURING BRONCHOSCOPY)
- NON-INVASIVE VENTILATION
- UPPER AIRWAY SUCTIONING
- MANUAL FACE MASK VENTILATION

- BROWN J, GREGSON FKA, SHRIMPTON A. A QUANTITATIVE EVALUATION OF AEROSOL GENERATION DURING TRACHEAL INTUBATION AND EXTUBATION. ANAESTHESIA.. 2021;76:174–181
- HAMILTON F, GREGSON F, ARNOLD D. AEROSOL EMISSION FROM THE RESPIRATORY TRACT: AN ANALYSIS OF RELATIVE RISKS FROM OXYGEN DELIVERY SYSTEMS. *BIORXIV*. 2021
- O'NEIL CA, LI J, LEAVEY A, ET AL; CENTERS FOR DISEASE CONTROL AND PREVENTION EPICENTERS PROGRAM. CHARACTERIZATION OF AEROSOLS GENERATED DURING PATIENT CARE ACTIVITIES. CLIN INFECT DIS. 2017;65(8):1335-1341.
- WILSON NM, MARKS GB, ECKHARDT A. THE EFFECT OF RESPIRATORY ACTIVITY, NON-INVASIVE RESPIRATORY SUPPORT AND FACEMASKS ON AEROSOL GENERATION AND ITS RELEVANCE TO COVID-19. ANAESTHESIA. 2021 DOI: 10.1111/ANAE.15475.
- SHRIMPTON AJ, BROWN JM, COOK TM, PENFOLD CM, REID JP, PICKERING AE. QUANTITATIVE EVALUATION OF AEROSOL GENERATION FROM UPPER AIRWAY SUCTIONING ASSESSED DURING TRACHEAL INTUBATION AND EXTUBATION SEQUENCES IN ANAESTHETIZED PATIENTS. J HOSP INFECT. 2022 JUN;124:13-21
- SHRIMPTON AJ, GREGSON FKA, BROWN JM, ET AL. A QUANTITATIVE EVALUATION OF AEROSOL GENERATION DURING SUPRAGLOTTIC AIRWAY INSERTION AND REMOVAL. ANAESTHESIA 2021

Figure 1. Change from preprocedure baseline in particle number (A) and mass (B) concentrations during the sampled ...



Clin Infect Dis, Volume 65, Issue 8, 15 October 2017, Pages 1342–1348, https://doi.org/10.1093/cid/cix535

Anaesthesia 2021, 76, 174–181 doi:10.1111/anae.15292

Original Article

A quantitative evaluation of aerosol generation during tracheal intubation and extubation

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Summary

The potential aerosolised transmission of severe acute respiratory syndrome coronavirus-2 is of global concern. Airborne precaution personal protective equipment and preventative measures are universally mandated for medical procedures deemed to be aerosol generating. The implementation of these measures is having a huge impact on healthcare provision. There is currently a lack of quantitative evidence on the number and size of airborne particles produced during aerosol-generating procedures to inform risk assessments. To address this evidence gap, we conducted real-time, high-resolution environmental monitoring in ultraclean ventilation operating theatres during tracheal intubation and extubation sequences. Continuous sampling with an optical particle sizer allowed characterisation of aerosol generation within the zone between the patient and anaesthetist. Aerosol monitoring showed a very low background particle count (0.4 particles.l^{-1}) allowing resolution of transient increases in airborne particles associated with airway management. As a positive reference control, we quantitated the aerosol produced in the same setting by a volitional cough (average concentration, 732 (418) particles.l^{-1}, n = 38). Tracheal intubation including facemask ventilation produced very low quantities of aerosolised particles (average concentration, 1.4 (1.4) particles.l^{-1}, n = 14, $p < 0.0001$ vs. cough). Tracheal extubation, particularly when the patient coughed, produced a detectable aerosol (21 (18) l^{-1}, n = 10) which was 15-fold greater than intubation ($p = 0.0004$) but 35-fold less than a volitional cough ($p < 0.0001$). The study does not support the designation of elective tracheal intubation as an aerosol-generating procedure. Extubation generates more detectable aerosol than intubation but falls below the current criterion for designation as a high-risk aerosol-generating procedure. These novel findings from real-time aerosol detection in a routine healthcare setting provide a quantitative methodology for risk assessment

SO WHERE DOES THE SCIENCE LEAVE US?

	WHO	CDC	UK	California
Non- aerosol generating/No Risk Identified	-bronchoscopy -autopsy (not tested for aerosols) -dentistry (no aerosol studies published nor any risk data identified)	-bronchoscopy -high flow oxygenation - open suctioning of airways (not tested for aerosols) -manual ventilation after intubation (not tested aerosols)	-*awake bronchoscopy - *awake ear nose and throat procedures that involve respiratory suctioning - dental procedures using high speed or high frequency devices (no aerosol studies published nor any risk data identified) -open suctioning beyond the oro-pharynx (not tested for aerosols) -autopsy & surgeries using high speed devices likely to produce aerosols from the respiratory tract (not tested for aerosols)	-bronchoscopy - pulmonary function testing -autopsy -clinical, surgical and laboratory procedures that may aerosolize pathogens

*-Awake including ‘conscious’ sedation (excluding anaesthetized patients with secured airway)

	WHO	CDC	UK	California
Non-aerosol generating/ Elevated Risk	-endotracheal intubation -non-invasive ventilation	-endotracheal intubation and extubation -non-invasive ventilation		
Not evaluated for aerosol generation but with risk	- cardiopulmonary resuscitation -manual ventilation before intubation -tracheostomy	-chest compressions -manual ventilation before intubation	-tracheotomy	

NO ONE MEETS THE GOLD STANDARD (YET)

	WHO	CDC	UK	California
Aerosol generating/ No risk	-sputum induction using nebulized hypertonic saline (p=0.09 for risk)	-sputum induction (p=0.09 for risk) - nebulizer treatment (listed as possible)	-sputum induction (p=0.09 for risk) - *awake upper gastrointestinal endoscopy (no risk data identified)	-sputum induction (p=0.09 for risk) -aerosolized administration of pentamidine or other medications
Aerosol generating/ Elevated Risk	None	None	None	None

UK STANDARD WITH AGP LISTING JULY 2022

- THE UK IS LOOKING AT THE AEROSOL DATA RESULTING IN THE REMOVAL FROM THE AGP LIST OF:
  - TRACHEAL INTUBATION
  - EXTUBATION
  - FACEMASK VENTILATION
  - NON-INVASIVE VENTILATION
  - HIGH-FLOW NASAL OXYGENATION
- WHY DID BRONCHOSCOPY STAY ON? UK BIAS?

SINCE WE ARE IN CALIFORNIA

- N-95 ARE WITHOUT SCIENTIFIC SUPPORT BASED ON INFECTIONS
  - N-95 WAS ONLY SUGGESTED AS NEEDED IN 1994 “RECENTLY, NOSOCOMIAL TB OUTBREAKS HAVE DEMONSTRATED THE SUBSTANTIAL MORBIDITY AND MORTALITY AMONG PATIENTS AND HCWS THAT HAVE BEEN ASSOCIATED WITH INCOMPLETE IMPLEMENTATION OF CDC'S GUIDELINES FOR PREVENTING THE TRANSMISSION OF TUBERCULOSIS IN HEALTH-CARE FACILITIES, WITH SPECIAL FOCUS ON HIV-RELATED ISSUES PUBLISHED IN 1990. * FOLLOW-UP INVESTIGATIONS AT SOME OF THESE HOSPITALS HAVE DOCUMENTED THAT COMPLETE IMPLEMENTATION OF MEASURES SIMILAR OR IDENTICAL TO THOSE IN THE 1990 TB GUIDELINES SIGNIFICANTLY REDUCED OR ELIMINATED NOSOCOMIAL TRANSMISSION OF M. TUBERCULOSIS TO PATIENTS AND/OR HCWS.”
  - UMMM…… THE 1990 GUIDANCE SAID USE SURGICAL MASKS

ANNUAL FIT TESTING NEEDED FOR N-95S

- IN OUR STUDY USING DATA FROM 12,565 HEALTHCARE WORKERS, THE PROBABILITY OF SURVIVAL FREE FROM FIT-TEST FAILURE AFTER 3 YEARS WAS 99.4%, SUGGESTING THAT LESS FREQUENT FIT TESTING EVERY 3 YEARS WOULD BE SAFE.
  - MARTIN, T., CURTIN, G., MARTIN, N., & TORRIANI, F. (2023). ANNUAL N95 RESPIRATOR FIT-TESTING: AN UNNECESSARY BURDEN ON HEALTHCARE. *INFECTION CONTROL & HOSPITAL EPIDEMIOLOGY,* 1-3. DOI:10.1017/ICE.2023.187

- NO TB CONVERSIONS ASSOCIATED WITH FAILED FIT-TESTS AT A HOSPITAL WITH THE SECOND MOST CASES OF TB IN THE NATION (AND MOST YEARS WE NEVER SEE A TB CONVERSION AMONG NURSES, SITTERS, RESPIRATORY THERAPISTS AND PHYSICIANS

INTO THE FUTURE

- SOME PROCEDURES WILL MOST LIKELY BE DROPPED FROM THE AGP LIST.
- WILL WE ADD SOME LIKE UPPER GI ENDOSCOPY THAT WE HADN'T PREVIOUSLY CONSIDERED?
- GIVEN THE CONFOUNDING VARIABLES IN THE COHORT AND CASE CONTROL STUDIES DOES IT, FOR THE TIME BEING, MAKE SENSE TO STOP USING THEM TO DETERMINE IF A PROCEDURE IS AN AGP WHEN A AEROSOL PRODUCTION CAN BE MEASURED?
- FOR SOME SUGGESTED AGPS (CPR) THERE WILL NEVER BE A WAY TO MEASURE AEROSOL GENERATION IN HUMANS
- WILL CACC AND APIC WORK WITH CAL-OSHA AND CDC TO REDUCE THE BURDEN AND SAFETY RISK IMPOSED BY THE APPARENTLY UNNECESSARY USE OF EXTRA PPE?

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