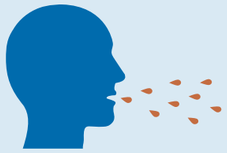
Nebulization and Viral Spread: Knowns and Unknowns in the Healthcare Setting

The publication of this infographic was supported by an Independent Medical Education Grant from Viatris and Theravance Biopharma.
Respir AMJ. 2024;2[1]:50-51. https://doi.org/10.33590/respiramj/BAAZ9654.

Why is nebulizer use important?

- To deliver medications to people with acute and chronic respiratory/pulmonary conditions[1,2]
- For patients who cannot use an inhaler or where a drug formulation requires nebulization[3]

Aerosol terminology[4]



Bioaerosol

- Generated by patients coughing, breathing, talking, and laughing
- Can contain infectious agents

Medical aerosol

- Generated by aerosol devices
- Does not contain infectious agents

Fugitive emissions

- Medical aerosols + bioaerosols released during nebulizing
- Can contain infectious agents

During the COVID-19 pandemic, discordant advice from professional bodies around whether nebulization was an AGP led to preferences for, but then deficits in, other delivery systems such as pMDIs and DPIs[5,6]

Nebulization clearly not classed as an AGP

International Society of Aerosols in Medicine[7]
- No evidence that nebulizer use increases infective load of bioaerosols

Uncertain classification of nebulization as an AGP

Centers for Disease Control and Prevention
- UNCERTAIN whether aerosols from nebulizer use are infectious[8]
- Recommended continuing nebulizer use during COVID-19 pandemic but with AGP precautions (PPE)[9]

World Health Organization[10]
- Nebulization NOT classed as AGP but sputum induced by 'nebulized hypertonic saline' is

Global Initiative for COPD[11]
- Risk of exhaling contaminated aerosol/droplets if coughing during nebulizer use so where possible, use inhalers

American Association for Respiratory Care[12]
- Nebulizer use 'may increase transfer of particles into environment'
- Use pMDIs to deliver bronchodilators

European Centre for Disease Prevention and Control[13]
- Infection risk linked to nebulizer use unclear so no AGP classification consensus

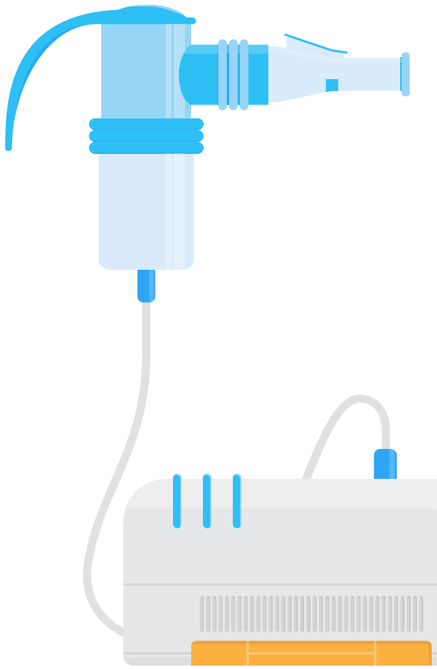
Nebulization clearly classed as an AGP

Global Initiative for Asthma[2]
- Nebulizers transmit respiratory viral particles at least 1 m so follow strict infection control procedures if nebulizer needed where COVID-19 possible

Surviving Sepsis Campaign[14]
- Nebulization categorised as AGP; use appropriate PPE

Spanish Multidisciplinary Group[15]
- Nebulization is an AGP with higher risk of COVID-19 transmission

The COPD Foundation Nebulizer Consortium (CNC) (including HCPs, professional societies, industry partners, and patient advocates) was formed in 2020 to improve understanding of potential nebulization-associated infection risks and develop solutions that ensure patient, caregiver, and HCP safety.[1]



The CNC examined whether studies showed that drug delivery by nebulization was an AGP and if nebulization increases infection transmission

- Neither the CDC nor WHO consider current evidence sufficient to class nebulizer therapy as an AGP associated with COVID-19 transmission[8,10]
- Contamination of medical aerosol in lungs was not found to be supported by evidence[7]
- Some studies examined suggested increased infection risk during nebulization, others did not[1,17]
- A 2024 Italian study of 11 patients with COVID-19 receiving 0.9% saline nebulization did not show increased SARS-CoV-2 spread[17]
- Increased infection risk might be throughincreased HCP/caregiver and patient contact time during nebulization[8]
- In a 2024 US study of 11 patients hospitalized with COVID-19, MDI and nebulizer delivery did not impact the viral load levels or dispersion of virus inpatient rooms[17]

Scientific limitations in studies examined by the CNC included:

- HCPs: Small HCP numbers
- Variable PPE usage
- HCP interaction with COVID-19 prior to testing positive
- Different nebulizer types
- No differentiation between AGPs
- Particle size limitations for air sampling
- Lack of virus viability verification as detection through PCR only
- SARS/MERS: Data for SARS/MERS outbreaks

CNC conclusions and advice:[1]

- Current evidence 'insufficient to classify nebulized therapy as an AGP'
- Most published literature is inconclusive or did not substantiate direct relationships between nebulizer therapy andinfection transmission
- Nebulizer use should not be discouraged when clinically indicated
- Adhere to recommended safety measures
- Large, well-designed, observational studies with microscopic analysis of generated aerosols are needed to better understand aerosol science and clarify whether nebulization presents additional infection risk

Key messages[1-3]

- Nebulization should not be discouraged when clinically indicated
- It is an important route of administration, especially for patients with dexterity issues, cognitive impairment, or low inspiratory flow
- PPE use should be emphasized

Key:

AGP: aerosol-generating procedure; CDC: Centers for Disease Control and Prevention; CNC: COPD Foundation Nebulizer Consortium; COPD: chronic obstructive pulmonary disease; COVID: coronavirus disease; DPI, dry-powder inhaler; HCP: healthcare professional; MERS: Middle East respiratory syndrome; PCR: polymerase chain reaction; pMDI: pressurised metered-dose inhalers; PPE: personal protective equipment; SARS: severe acute respiratory syndrome; SARS-CoV-2: severe acute respiratory syndrome-covariant-2; WHO: World Health Organization

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