

Briefing Note on CADTH Health Technology Review of Heating, Ventilation, and Air Conditioning Systems in Public Spaces
for Ontario Ministry of Health Research, Analysis, and Evaluation Branch (RAEB) and the Evidence Synthesis Network

CADTH addressed five questions about Heating, Ventilation and Air Conditioning (HVAC) Systems in public spaces in a health technology review.

1. What is known about airflow transmission of Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) and risks of transmission attributable to HVAC systems?
2. What is known about airflow transmission of coronaviruses and risks of transmission due to air cooling, air heating, and air circulation from HVAC systems?
3. Is there a scientific evidence basis for actively encouraging the ventilation of indoor spaces?
4. Is there a scientific evidence basis for actively encouraging or discouraging the use of fans or air conditioners?
5. What guidance is being provided in other jurisdictions with respect to HVAC systems?

Key Messages

- Heating, ventilation, and air conditioning (HVAC) systems are a common and important part of building operations for both health care and non-health care settings.
- HVAC systems impact the distribution of air and can therefore impact the transmission of airborne infectious diseases, while simultaneously decreasing risk through particle dilution, particularly in closed spaces such as elevators and 'dead zones' in room corners, atria, or hallways.
- Adding air purification strategies to ventilation can further decrease risks. Filtering, natural ventilation, ultraviolet light, and photocatalytic oxidation and ionization may have roles in air purification. However, more research is needed to ensure emerging air purification options do not include harmful by-products with unintended health effects.
- SARS-CoV-2 is found in a spectrum -concentrated in large droplets and dispersed in small droplets or aerosols. The larger the droplet, the greater the response to gravity, falling near their source, and are then infectious to others through close contact and surface contact. Aerosols may travel farther distances and stay diluted and suspended in the air for a period of time, and the significance of their role is an active area of study and debate.
- A significant amount of the available evidence comes from studies in experimental laboratories and may not necessarily mimic what is seen in clinical practice. More robust, published, peer-reviewed evidence will help clarify the potential role that HVAC systems play in mitigating the risk of the virus's transmission and provide more concrete evidence-based recommendations.
- Until the evidence base suggests otherwise, the most substantial risk of transmission of SARS-CoV-2 is from close personal contact. As such, public health recommendations regarding hand hygiene, respiratory etiquette, physical distancing, wearing non-medical masks or face coverings when physical distancing is not possible, and cleaning and disinfecting surfaces and objects with appropriate and safe products and methods remain critical.

Methods

Three approaches were used to answer the questions:

1. Targeted literature review
2. Multidisciplinary expert panel–recommended evidence
3. Multidisciplinary panel discussion

- Targeted Literature Review

- A targeted literature search was conducted by an information specialist, completed June 3, 2020.
- Resources included MEDLINE, PubMed, Cumulative Index to Nursing and Allied Health Literature (CINAHL), Scopus, and websites of selected Canadian and international health resources. Preprints (preliminary reports, not peer reviewed) were also searched.
- Both controlled vocabulary such as the National Library of Medicine’s MeSH (Medical Subject Headings) and keywords were used. The main search concepts were “HVAC systems” and “coronavirus”. No filters were applied.
- Key literature from scientific evidence, clinical guidelines, recommendations, national standards, and guideline groups that were directly relevant were included.
- Members of CADTH’s Implementation Support and Knowledge Mobilization team screened the literature of relevant, high quality reports. A draft report was then published.

- Multidisciplinary Expert Panel-Recommended Evidence

- Experts in the disciplines of fluid dynamics, mechanical engineering, infectious diseases, epidemiology, public health, medical microbiology, and policy evaluated the literature summarized in the literature review.
- Panel members included those individuals who worked or volunteered at a leadership level in a Canadian academic institution or organization with demonstrable insight into the science of transmission, use of HVAC systems, and/or implementation of measures to potentially mitigate transmission risk through HVAC systems.
- The final multidisciplinary panel was formed in July 2020 and provided input based on evidence up to and including August 10, 2020.
- Panel members were asked to provide feedback on the CADTH draft report through each discipline’s lens of expertise to verify or challenge the observations and conclusions in the report, recommend additional essential literature, and to identify any risk-mitigation strategies that had not been addressed in the draft report.
- A summary of the input received from the panel members was incorporated with the original draft report and can be found in the final CADTH report.

- Multidisciplinary Panel Discussion

- Panelists were asked to identify issues they wished to raise for consideration during a single interactive two-hour panel teleconference held on August 21, 2020.

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- The panel teleconference was structured to allow each individual panel member to present pre-identified issues, and then all panel members engaged in a discussion.
- A summary of the key discussion points raised during this meeting can be found in the final CADTH report.

For further details, please see the full CADTH report available here:

<https://cadth.ca/sites/default/files/covid-19/hd0002-covid-19-hvac-report-final.pdf>