

AT A GLANCE

The Use of Portable Fans and Portable Air Conditioning Units during COVID-19 in Long-term Care and Retirement Homes

Key Findings

- Careful consideration should be given to the use of portable fans and air conditioning units in long-term care homes or retirement homes.
- Portable fans and portable air conditioning units require routine cleaning and preventative maintenance.
- Portable fans and portable air conditioning units need to be strategically located to minimize risk of potential healthcare-associated infections.
- Alternative cooling methods should be explored in the long-term care setting.

Introduction

Seasonal hot weather including extreme heat events (EHE) can impact our health and well-being, including those residing in long-term care homes (LTCH) and retirement homes (RH) where central air conditioning is unavailable. Several long-term care and retirement homes have old building design with no centralized heating, ventilation, and air conditioning (HVAC) system. Long-term care and retirement homes need to use alternative methods such as portable fans or portable air conditioning (AC) units to improve residents' comfort and reduce the illnesses associated with excessive heat. Health care facilities such as LTCH need to be aware of the potential risk of infection transmission associated with some of the heat relief options. This document provides recommendations for consideration on the use of portable fans and air conditioning units in these facilities.

Background

The risk of heat-related illnesses is higher in elderly people in residential homes due to their frailty.^{1,2} Reports suggest that an indoor air temperature of 26°C is associated with lower mortality rates, and is the most suitable indoor temperature for at-risk groups.³ The Canadian Standards Association recommends that the ambient temperature for resident rooms be kept between 22°C and 24°C, and the relative humidity between 30% and 60%.⁴ There is a regulatory requirement for LTCHs to have written heat preventive measures in place.⁵

A guidance document by Health Canada reports that air conditioning has been shown to be an effective way of preventing adverse health outcomes related to heat events.⁶ Central air conditioning is not mandatory in LTCHs in Ontario, so some facilities have adopted alternative methods to keep residents cool and safe, including the use of portable fans and air conditioning units.

In Ontario's long term care and retirement homes (LTCH/RH), mechanical air conditioning is required in common areas such as corridors, lounges, program/activity areas, dining areas, the kitchen, and the laundry space. Although they are not required to have central air conditioning in areas such as resident rooms, bath and shower rooms, they should have a system for tempering the air to keep air temperatures at a level that considers resident needs and comfort.⁷

Homes are required to have a separate designated cooling area for every 40 residents.⁸ Advice for preventing adverse health events related to heat stress has been published by various agencies.^{6,9} Homes should have a written heat stress plan in place for both resident and worker safety, which includes monitoring indoor heat and determine thresholds to implement cooling strategies.¹⁰ The Ministry of Labour Training and Skills Development (MLTSD) recommends using the Threshold Limit Values (TLVs) for Heat Stress and Heat Strain published by the American Conference of Governmental Industrial Hygienists (ACGIH). These values are based on preventing workers' core body temperatures from rising above 38°C.¹⁰ The management should ensure LTCH/RH personnel are working according to ACGIH TLV® Guidelines for work-rest cycles in the heat, and using personal cooling options such as cooling vests.¹¹

Infection Transmission and Room Ventilation

Microorganisms survive and reproduce on dust, air, and water. HVAC systems can provide an ideal environment for them to grow.¹² Reports have shown a link between poorly maintained or malfunctioning air conditioning systems and clusters of healthcare-associated infections caused by organisms such as *Aspergillus spp.*, *Pseudomonas aeruginosa*, *Staphylococcus aureus*, and *Acinetobacter spp.*, highlighting the importance of routine maintenance and monitoring the acceptable indoor air quality efficiently, particularly in acute care settings.¹² Excess condensation accumulating in drip pans and improper filter maintenance are known issues of non-central air-handling systems as well.¹²

The contaminated drip pans and its other components may cause severe healthcare-associated infections or outbreaks by spreading the responsible pathogens such as *Aspergillus spp.* and *Legionella* species.^{13,14}

Turbulence has been implicated as a factor for indoor survival and spreading of infectious agents,¹⁵ and this may be a mechanism by which portable fans and air conditioning units may contribute to the onset of HAI outbreaks. Alsaffar et al. 2018¹⁶ showed that bladeless fans can be contaminated with different bacterial species in a hospital environment. Dhanda et al. 2019¹⁷ showed that that both bladed and bladeless fans significantly increase microbial air counts, and concluded they should not be used when patients have airborne infectious conditions.

Viruses including COVID-19 are obligate parasites and will not multiply on inanimate objects. Usual duct cleaning and maintenance procedures are recommended during viral outbreaks including the COVID-19 pandemic.¹⁸

Methods

A rapid search was conducted to review existing guidance (e.g., PIDAC, CDC, WHO, PHAC, and other jurisdictional authorities). Google Scholar and PubMed were searched using key terms including “Fan”, “AC”, “Conditioning”, “Conditioner ” paired with “transmission”, “spread”, “airborne”, “droplet”, “inhalation”, “aerosol”, “epidemiology” “COVID-19”, “SARS-CoV-2”, “nCoV-2019”, “2019-nCoV”, “coronavirus” , “Health Care”. Reference lists of articles were scanned. Articles were also obtained from experts, and a grey literature search was performed beyond jurisdictional guidance documents. A single reviewer summarized data and informally performed a critical appraisal without using a critical appraisal tool due to time constraints.

Portable Fans and Portable Air Conditioning Units

Operational Considerations and Practices

The administration of LTCH and RH is responsible for ensuring and verifying that any portable air conditioning units and fans used in resident care areas are capable of being cleaned and disinfected, regardless of whether these devices are purchased, loaned, borrowed or donated. Facilities should have policies that include criteria for the selection of portable air conditioning units or fans for use in resident care areas, in order to ensure that these cooling devices meet infection prevention and control requirements for cleaning and disinfection.¹⁹

LTCH and RH should also have written policies and procedures for the appropriate cleaning and disinfection of portable fans and air conditioning units that clearly defines the frequency and level of cleaning, and assigns responsibility for the cleaning.¹⁹

To ensure effective cleaning and disinfection, manufacturers’ cleaning and disinfection instructions must be included with these portable cooling devices; if disassembly or reassembly is required, there should be detailed instructions with pictures as well.¹⁹

- Careful consideration of when and where portable fans and air conditioning units are placed is important.
- Large industrial hall fans are to be avoided in resident care areas and in any outbreak unit.
- Some portable air conditioning units use a condensation exhaust system to force out water vapor which is collected during the cooling or dehumidification process. This is preferable as the moisture is released through an exhaust hose along with the hot air to the outside.²⁰

Infection Prevention and Control (IPAC) Considerations

When the ambient temperature is lower than one’s skin temperature, sitting in the direct path of a fan’s airflow can achieve a cooling effect by convective heat loss and evaporative heat loss. Placing a bowl of ice in front of the fan further increases convective heat loss. However, when the ambient temperature is higher than one’s skin temperature, heat loss will only be achieved by evaporation if the person is sweating. Otherwise, the person may feel hotter as the hot air flows by.⁶ Note that excessive evaporation may result in fluid and electrolyte imbalance if these are not replaced promptly.²¹ Portable fans may not prevent heat-related illnesses if the temperature is more than 35°C.²

Portable fans can disperse dust particles and microorganisms,^{17,22,23} and change the airflow pattern.²² Also, portable fans could theoretically spread infectious droplets beyond two metres and contribute to COVID-19 transmission.¹⁸

The use of portable air conditioning units and fans (both table top and pedestal) may play a role in transmitting COVID-19 by propelling infectious droplets beyond 2 metres.¹⁸ A study²⁴ of an outbreak in a restaurant in Guangzhou, China reported that strong airflow from air conditioning units could have spread infectious COVID-19 droplets further than they might have otherwise. Although non-peer-reviewed, another analysis of the same outbreak²⁵ suggested that the main reason for the outbreak was the recirculation of indoor air due to non-functional exhaust fans resulting in poor ventilation in a crowded environment. Therefore, the use of portable fans and air conditioning units are not recommended in rooms with Droplet and Contact Precautions and alternative cooling methods should be used whenever possible.^{22,26}

Portable fans^{22,26} and air conditioning units should be turned off during any aseptic or sterile procedure such as catheterization, intravenous cannulation, wound care, or any aerosol generating medical procedures. When using a portable fan or air conditioning unit keep the fan setting to low in order to minimize turbulence and reduce particle spread.

PORTABLE FANS

POSITIONING

- Place the fan on a clean surface at the resident's bed level or higher.^{23,26} Never place the portable fan at the floor level.²³
- Airflow should be aimed in the direction of the resident, and also aimed upwards, toward the ceiling, avoiding smoke detectors.^{23,26}
- Airflow should not be directed towards the door of the room or across environmental surfaces.^{23,26}
- In non-resident areas, such as healthcare nursing stations, airflow should be directed within the area and not at face level.²⁶
- Fans should not be placed in areas used for storage of clean and sterile medical devices/supplies, or in areas where medical devices are reprocessed.^{23,26}
- Fans should not be used in a closed room where no doors or windows are able to be opened in order to allow for introduction of fresh air.

CLEANING AND MAINTENANCE

- Plan preventative maintenance to ensure ongoing suitability (safe) for use.²⁷ Follow the manufacturer's instructions on how to clean, disinfect, and maintain the portable fan, including fan blades prior to use and on a scheduled basis (e.g., daily, weekly, monthly).^{19,22,23,26}
- Assign a person who is responsible for cleaning and disinfecting the fan.^{19,23,26}
- Perform hand hygiene before and after cleaning, handling, or maintaining fans.^{19,22}

PORTABLE AIR CONDITIONING UNITS

POSITIONING

- Most portable air conditioning units are window units. Some may be wall-mounted. If an air conditioning unit with a condensation exhaust system has been selected, rather than a drip pan, collected water vapor should be drained to the outside of the building through an exhaust hose.¹³
- In non-resident areas, such as healthcare nursing stations, airflow should be directed within the area rather than blowing into the hallway or other adjoining rooms.
- Some air conditioning units including wall-mounted ones are designed to function with recirculating indoor air. When such systems are used for cooling then additional ventilation with outdoor air should be secured; for example, by regular/periodic ventilation through a window opening.²⁸

CLEANING AND MAINTENANCE

- Follow the manufacturer's instructions on how to clean, disinfect, and maintain the air conditioners on a scheduled basis (e.g., daily, weekly, monthly).^{14,19}
- Assign a person who is responsible for cleaning and disinfecting the air conditioners.¹⁹
- Perform hand hygiene before and after cleaning, handling, or maintaining air conditioner components.^{14,19}
- Do not leave water sitting in the air conditioners when they are not in daily use. Empty, clean, and disinfect the drip pan and allow dry completely before storing.¹⁴

Alternative Cooling Methods

Alternative cooling methods are strategies to decrease the possibility of heat-related illnesses and important to implement when portable fans and air conditioners are not in use.

Alternative cooling methods include:

- Adequate hydration of residents and staff (e.g. water coolers, popsicles).
- Adequate cooling supplies (e.g. cool washcloths, ice packs, cooling jackets, cooling blankets, ice water baths) and appropriate resources are available to support your residents¹¹
- The offer of cooling options/areas for several hours each day (e.g. designated cool room, cool showers, fan, portable air conditioner, and a place to bathe hands/forearms or sponging with cool water)¹¹
- Blocking out direct sunlight using window awnings, shutters, thermal curtains or blinds, and outdoor umbrellas.¹¹
- Increasing air flow by opening windows,¹¹ provided the humidity outside is low (relative humidity of 30% to 50% is normal).

- Consider using central dehumidification which is effective in areas with high humidity.¹¹ Note: portable dehumidifiers can give off heat and may raise the temperature in the room.
- Consideration of room(s) evacuation if extremely high temperature occurs.¹¹ This is determined on a case by case basis.

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At a Glance

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