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Ventilation and air-circulating strategies in general practice

> Good ventilation assists in reducing the risk of spreading airborne diseases and helps to keep your practice staff and patients, especially those who are considered more vulnerable such as the elderly and immunocompromised, safe and comfortable.

This fact sheet provides guidance on improving ventilation in general practice settings. Please note that information provided within this fact sheet should be used as a general guide only. Practices must implement appropriate and safe ventilation methods that suit their unique needs.

To ensure everyone's safety, you may want to organise to have your practice assessed by a ventilation expert such as an industrial or occupational hygienist, or a heating, ventilation and air conditioning professional.

What is ventilation?

To ventilate an indoor space, such as your general practice, means to enable or create air movement that will dilute and disperse particles found in the air, mimicking an outdoor environment.

Effective ventilation is key in minimising build-up and stagnation of infectious aerosols within your practice, and reducing risk of airborne infections spreading among patients and staff.

Ventilation must be designed to achieve 6–8 air changes per hour (ie the number of times per hour that the whole volume of air in each room is replaced by fresh air) in general areas. Fresh air is preferable to recirculated air. Flows less than six air changes per hour are inadequate to help prevent airborne microbial transmission.[1]

Ventilation can be achieved naturally (ie opening windows and vents) or mechanically (ie using individual air conditioning units or centralised heating, ventilation and air conditioning (HVAC) systems to dilute indoor air by introducing fresh air from outside).

Where appropriate, natural and mechanical ventilation methods may be supplemented with tools such as portable fans, otherwise known as augmented ventilation.

Find out more on ventilation methods under Types of ventilation.

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Why is ventilation important?

Ventilation and filtration systems work to maintain a safe practice environment by removing airborne contaminants and aiding to reduce the risk of infection and maintain/improve the quality of your indoor air.

Poorly ventilated workspaces can expose staff and patients to infectious disease and harbour unwanted odours, and those who spend prolonged periods of time within your practice might experience symptoms such as:

- drowsiness and poor concentration
- headaches
- dizziness
- shortness of breath, coughing and sneezing
- hypersensitivity and allergies
- dry or irritated throat, eyes, nose and skin.

Types of ventilation

Natural ventilation: Opening windows, doors and air vents to bring and circulate fresh air inside.

Mechanical ventilation: Using individual air conditioning units or HVAC systems to filter, dilute or replace air from indoor settings with fresh air from outside.

Augmented ventilation: Using supplementary devices such as fans and wall-mounted air conditioning systems to help boost the effectiveness of mechanical and/or natural ventilation.

Please note: As augmented ventilation does not involve bringing fresh outdoor air into a space, it is not sufficient as a standalone method of ventilation. It must be used in conjunction with either natural or mechanical ventilation methods.

The decision whether to use mechanical or natural ventilation should be based on needs, resource availability and the cost of systems to provide the best control to counteract the risks.[2]

Where appropriate, a combination of the above ventilation methods can be adopted. This is often referred to as 'hybrid ventilation'. To avoid improper ventilation and risking unnecessary spread of infectious disease, make sure to consult a ventilation expert to discuss your practice's unique needs before implementing hybrid ventilation methods.

How can our practice improve ventilation?

Natural ventilation strategies

The effectiveness of natural ventilation strategies such as opening doors and windows will vary throughout the year, depending on the weather in your area. It is important to keep patient privacy at front of mind when considering natural ventilation methods – neither acoustic nor visual privacy should be compromised for the purpose of increased ventilation.

Simply opening the windows and doors of your practice will not guarantee adequate airflow. Investing in effective mechanical ventilation methods can assist in maintaining privacy requirements and in ensuring consistently adequate ventilation throughout your practice, irrespective of the time of year or weather in your area.

In situations where effective mechanical ventilation is not available, your practice must:

- have a minimum of one natural ventilation opening available (ie a door or window) to allow outdoor air to circulate inside. However, it is ideal to have two or more openings available
- keep outdoor-facing windows and doors open as often or for as long as reasonably possible

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- keep windows and doors of frequently used rooms open to maximise airflow, where appropriate (tip: consider using fans in these rooms to promote air movement further)
- keep any windows and/or doors located within hallways open at all practical times
- in situations where sufficient natural ventilation might be limited (eg during extreme weather periods), your practice might want to open windows and/or doors intermittently for short durations (eg for 10 minutes every hour). Staff and occupant thermal comfort and safety should be prioritised.

Remember, maintaining patient privacy remains crucial. Neither acoustic nor visual privacy should be compromised for the purpose of increased ventilation.

Remember: Do not open windows or doors to improve air quality in buildings that utilise mechanical ventilation systems unless you have consulted with a ventilation specialist.

Mechanical ventilation strategies

Mechanical ventilation can be used consistently, year-round.

Many practices have individual air conditioning units and/or inbuilt HVAC systems that are designed to distribute fresh outdoor air and recirculated indoor air within the building.

However, it is important to understand if your air conditioner or HVAC system pulls in and distributes fresh outdoor air within your practice, or whether it simply recirculates indoor air.

While systems that only recirculate indoor air (such as split-system air conditioners) will help to improve air movement, they must be used in conjunction with mechanical or natural ventilation strategies in order to achieve adequate ventilation results. Find out more under Augmented ventilation strategies.

Mechanical ventilation systems can be enhanced by:

- disabling control systems that vary the amount of fresh air introduced based on room occupancy or other environmental factors. This will maximise the amount of fresh outside air coming into your practice
- changing relevant settings on your systems to avoid recycling air between rooms or spaces
- directing any exhaust outdoors and away from windows, air intake systems or areas where people may congregate
- operating your mechanical ventilation equipment for as long as it takes to complete a total change of air in a space (as per the manufacturer's guidance/information) after hours, or when staff and patients are off-site, to flush your practice with clean air post-occupancy
- installing high-grade filters within your HVAC system. Where compatible and feasible, filters can be installed in HVAC systems that do not currently have filters. Please note that installing incompatible or incorrect filters within your ventilation system will not only be ineffective, but can cause serious mechanical damage. Contact your HVAC system's manufacturer to discuss which types of high-grade filters are compatible with your system and to organise installation.

It is paramount that each of your practice's HVAC systems and air conditioning units are professionally serviced regularly and as per the manufacturer's instructions to maintain optimal functionality.

Augmented ventilation strategies

Augmented ventilation devices, or air-recirculation and filtration devices, can be used in conjunction with mechanical or natural ventilation strategies to further improve the indoor air quality of your practice.

Common air-recirculation and filtration devices include:

- air cleaners / purifiers
- split-system air conditioners / non-ducted air conditioners
- fans.

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Air cleaners/purifiers

When used appropriately, air cleaners/purifiers such as those fitted with high-efficiency particulate air (HEPA) filters can assist in improving indoor air quality and are useful additions in areas with poor ventilation. Air cleaners can either recirculate air back into a room, or be ducted to exhaust air to the outside.

It is important to keep in mind that air cleaners/purifiers do not reduce build-up of carbon dioxide (CO_2). At high levels, CO_2 might affect comfort and concentration. For this reason, ventilation with fresh air is preferred to air cleaning where possible.

If your practice chooses to use air cleaners/purifiers, you should:

- place them in locations within your building with poor ventilation. Consider consulting a ventilation expert to determine best placement and maximise benefits
- ensure that they do not interfere with existing HVAC airflow
- avoid placing them near openings such as windows and doors, near sources of heat or areas that are highly humid or dusty
- use them in conjunction with fans and split-system air conditioners to boost clean air distribution
- operate air cleaner/purifiers in the highest mode available.

Air cleaners/purifiers should be used and maintained in accordance with the manufacturer's instructions.

Split-system air conditioners/non-ducted air conditioners

Split-system air conditioning systems are designed to boost air movement and recirculation within an indoor space. However, these systems do not typically bring fresh outdoor air inside. For this reason, split-system air conditioners should only be used in conjunction with mechanical or natural ventilation to meet sufficient ventilation requirements.

Ventilation rates in healthcare settings

As outlined in the World Health Organization's (WHO's) Roadmap to improve and ensure good indoor ventilation in the context of COVID-19,[2] the minimum amount of outdoor air pulled into and distributed within a healthcare-setting space (otherwise referred to as ventilation rate) should be 60 litres per second per patient, or six air changes per hour. Reach out to your air conditioning or HVAC system's manufacturer for more information on ventilation rates and to ensure that your system is meeting relevant requirements.

Visit the WHO's Roadmap to improve and ensure good indoor ventilation in the context of COVID-19[2] to read more on:

- minimum ventilation requirements
- key considerations when assessing ventilation
- potential ventilation strategies your practice might want to implement
- evaluating ventilation.

While the roadmap was developed in response to the COVID-19 pandemic, the guidance provided on ventilation might remain relevant for other respiratory-illness breakouts, as well as in 'business as usual' scenarios.

If you are unsure whether your air conditioning system brings fresh outdoor air inside, or if it simply recirculates indoor air, contact the manufacturer or consult with a ventilation specialist.

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Fans

Fans offer a cost-effective and convenient solution to boosting air movement in a range of indoor settings, including general practice. Types of fans include:

- portable fans – these can help to increase the effectiveness of open windows and doors
- extractor fans / hirlybird fans – these fans can be installed in your practice roof to enhance the effects of natural and mechanical ventilation strategies
- electrical fans – these can be installed on the ceiling of appropriate rooms within your practice to increase air recirculation and movement within a space
- box or exhaust fans – these fans can be installed in a window to facilitate air movement in or out of a space, dilute aerosol particles in the space and improve air movement. Toilets within your practice must be fitted with exhaust fans. You can find more information on this in The Royal Australian College of General Practitioners' (RACGP's) Infection Prevention and Control Guidelines.[1]

Considered and well-executed fan placement is vital. Should your practice choose to utilise fans for the purpose of improving air flow, you must consider the relevant room's setup and intended air flow direction.

It is important to avoid:

- positioning fans in a way that might cause contaminated air to flow directly from one person to another
- using high-speed settings.

Instead, aim to:

- direct fan airflow towards a suitable unoccupied space, or above the occupied zone
- use ceiling fans at low velocity and possibly in the reverse-flow direction (this will pull air up towards the ceiling).

To ensure correct use and the safety of patients and staff, organise to have your practice assessed by a ventilation expert prior to installing or setting up fans for ventilation purposes.

Remember: If ever in doubt, and to ensure the safety of patients and staff, organise to have your practice assessed by a ventilation expert.

Using CO_2 monitors to assess ventilation

Build-up of CO_2 in indoor settings can indicate poor ventilation. Harbouring high levels of CO_2 can affect the comfort and concentration of staff and patients.

If used correctly, CO_2 monitors can be useful and cost-effective tools for assessing the effectiveness of your current ventilation methods and can assist you in identifying areas of your practice that need better air movement.

Which type of CO_2 monitor should we use in our practice?

While there are a few different types of monitors available, non-dispersive infrared (NDIR) CO_2 monitors are considered the most appropriate and reliable for use in workplace settings. They can be purchased from a variety of online and physical electrical and home renovation stores.

How to use CO_2 monitors

CO_2 monitors should be placed at approximately head height, and at least one metre away from where someone might sit or stand. This is to avoid having people breathe directly onto the monitor/s, which would affect readings. The monitors should also be kept away from windows, doors and vents.

Depending on how many people use the room being monitored, CO_2 levels, which are measured in parts per million (ppm), will rise and fall.

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As outlined by Safe Work Australia in its Improving ventilation in indoor workplaces: COVID-19 webpage,[3] measurements to keep in mind when using CO_2 monitors in your practice are as follows:

- a consistent indoor air concentration of **less than 800 ppm** CO_2 indicates good ventilation
- an average indoor air concentration of **between 800 – 1500 ppm** CO_2 over the occupied period indicates that action needs to be taken to improve ventilation
- consistent indoor air concentrations **higher than 1500 ppm** CO_2 indicate poor ventilation and that action should be taken immediately to improve air flow.

CO_2 levels should be recorded at different times with different room occupancies in order to build a more thorough understanding of the effectiveness of your current ventilation systems.

Keep in mind that CO_2 monitors are not suitable for use in areas with air cleaning or filtering units. This is because air cleaning or filtering units are designed to remove contaminants from the air; however, they do not remove CO_2 or improve ventilation. While the air in these rooms might be safer, CO_2 levels could still be high.

Always read the manufacturer's instructions carefully before using CO_2 monitors, to ensure you are using them correctly. If you have any questions, require further advice or are in doubt at all, make sure to contact the CO_2 monitor's manufacturer and/or a ventilation expert.

Ventilation and aerosol-generating procedures

Some aerosol-generating procedures (AGPs) have been associated with an increased risk of transmission of infectious diseases.

In rooms where AGPs (eg spirometry) occur, a ventilation rate of 12 air changes per hour is recommended[1] with controlled direction of air flow when using mechanical ventilation.

Where it is not possible to achieve 12 air changes per hour, additional strategies, such as air cleaning units, should be used.

The following resources provide guidance on ventilation while performing AGPs:

- WHO: Roadmap to improve and ensure good indoor ventilation in the context of COVID-19[2]
- ANZSRS/TSANZ position statement: Pulmonary function testing during SARS-CoV-2[4].

Both resources were developed in response to the COVID-19 pandemic. However, the guidance regarding ventilation considerations while performing AGPs remains relevant in most scenarios.

Please note: Subject to local public health orders in the event of an infectious disease outbreak, general practices might be advised not to undertake AGPs.

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Further information

- The RACGP's Infection prevention and control guidelines.
- The RACGP's Winter planning toolkit.
- The Centers for Disease Control and Prevention's Ventilation in buildings.
- Safe Work Australia's Improving ventilation in indoor workplaces: COVID-19.
- The Victorian Department of Health's guidelines on COVID-19: Ventilation principles and strategies to reduce aerosol transmission in community and workplace settings.
- The WHO's Roadmap to improve and ensure good indoor ventilation in the context of COVID-19.
- The Australian Standard AS 1668.2-2012 The use of ventilation and airconditioning in buildings: Mechanical ventilation in buildings.

References

1. The Royal Australian College of General Practitioners. Infection prevention and control guidelines. East Melbourne, Vic: RACGP, 2022. Available at www.racgp.org.au/running-a-practice/practice-standards/racgp-infection-prevention-and-control-guidelines [Accessed 22 December 2022].
2. World Health Organization. Roadmap to improve and ensure good indoor ventilation in the context of COVID-19. Geneva: WHO, 2021. Available at www.who.int/publications/i/item/9789240021280 [Accessed 22 December 2022].
3. Safe Work Australia. Improving ventilation in indoor workplaces: COVID-19. Canberra: SWA, 2021. Available at https://covid19.swa.gov.au/doc/improving-ventilation-indoor-workplaces-covid-19 [Accessed 22 December 2022].
4. Borg BM, Osadnik C, Adam K, et al. Pulmonary function testing during SARS-CoV-2: An ANZSRS/TSANZ position statement. Respirology 2022;27:688–719.

We acknowledge the Traditional Custodians of the lands and seas on which we work and live, and pay our respects to Elders, past, present and future.

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