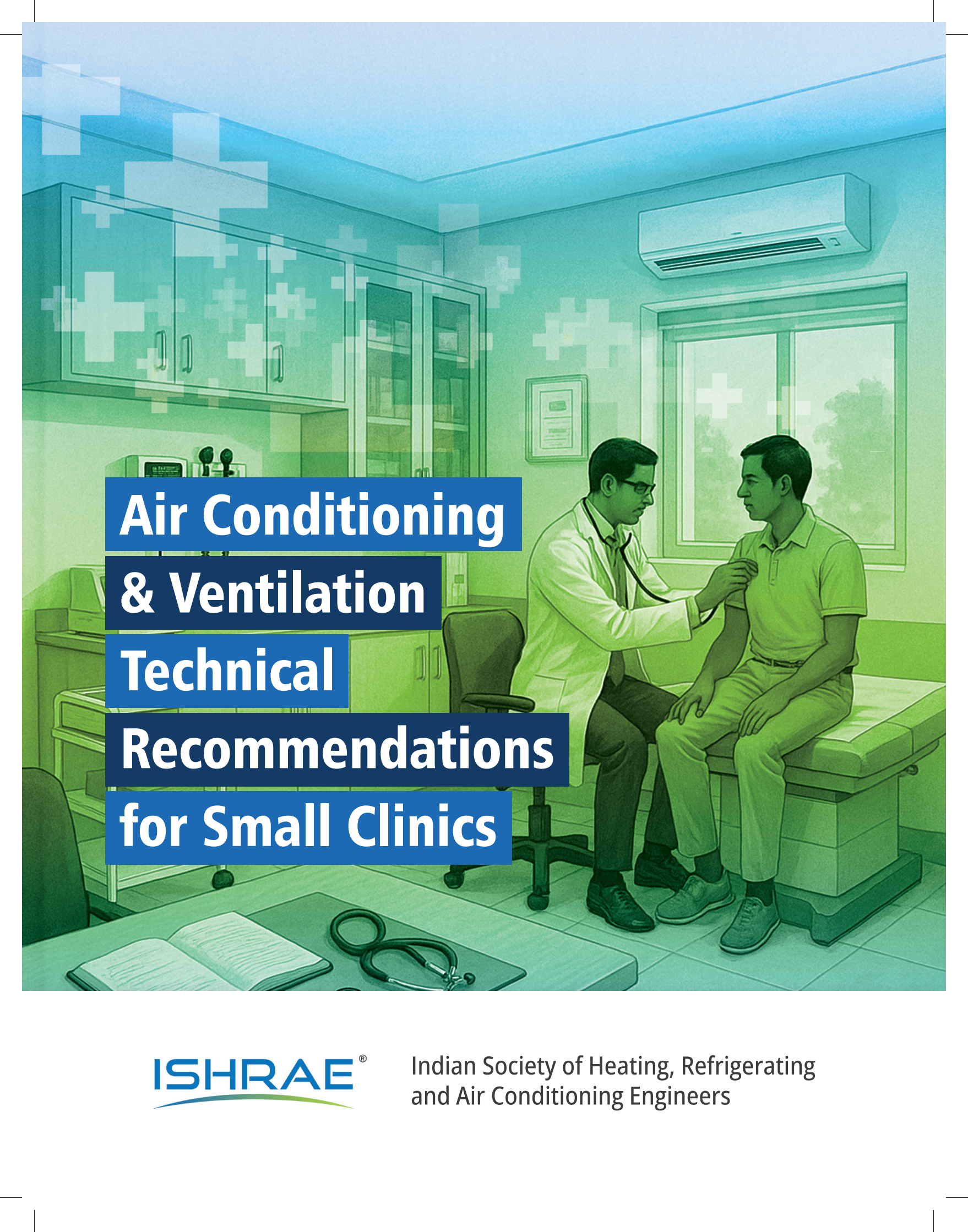


An illustration of a medical clinic. A doctor in a white coat and glasses is sitting on a stool, using a stethoscope to examine a patient's chest. The patient is sitting on an examination table. In the background, there are medical cabinets, a window with a view of trees, and a wall-mounted air conditioner. The entire scene is overlaid with a semi-transparent blue grid pattern.

Air Conditioning & Ventilation Technical Recommendations for Small Clinics



Indian Society of Heating, Refrigerating
and Air Conditioning Engineers

Foreword

Clean air is the first line of defense against infection. This *Air Conditioning and Ventilation Guide for Infection Control in Small Clinics* provides practical, affordable solutions to improve indoor air quality and reduce airborne transmission risks in smaller healthcare facilities.

The guide was developed under the leadership of **Mr. Rajen Vyas**, Chair of the Working Group, with **Dr. Kishor Khankhari** contributing detailed Computational Fluid Dynamics (CFD) analyses and technical compilation. We gratefully acknowledge the CFD diagrams prepared by **Dr. Kishor Khankhari**, courtesy of AnSight LLC, USA. Committee members **Mr. Jitendra Bhambure**, **Ms. J. Jameela**, **Mr. Gautham Baliga**, **Mr. Sabhari Nathan**, and **Mr. Suraj Sanjeev** brought valuable field experience and practical insights..

This publication reflects ISHRAE's commitment to empowering India's small clinics and outpatient centers with actionable guidance that enhances safety, comfort, and infection control. Implementing these recommendations will help create healthier indoor environments for both patients and healthcare providers.

B. Gautham Baliga

Chair, ISHRAE Healthcare Technical

Air Conditioning and Ventilation Guide for Infection Control in Small Clinics

This guide offers clear and practical steps to enhance air quality and minimize infection risks in small outpatient clinics. It is designed for doctors managing standalone practices and suggests simple, actionable solutions to protect patients, staff, and healthcare providers. The scope of this guide includes general practitioner offices, dental and physiotherapy clinics, pediatric and geriatric care centers, and minor procedure rooms. It does not cover hospitals or specialized environments such as operation theaters.

Why Air Quality Matters in Clinics

Small clinics serve a wide range of patients, increasing the potential for airborne disease transmission. Vulnerable groups such as infants, the elderly, and those with weakened immunity are particularly at risk. Effective ventilation and airflow can:

- Reduce airborne transmission of germs
- Eliminate stale air and unpleasant odours
- Create a safer, more comfortable environment

Common Challenges in Small Clinics

Many clinics, whether urban, small towns, or rural, face the following issues:

- **Poor Air Circulation:** Lack of ventilation leads to stagnant air and higher infection risks.

- **Improper AC Placement:** Air conditioners are often installed without airflow planning, potentially spreading germs.
- **Limited Exhaust Ventilation:** Exhaust fans are usually confined to restrooms and don't support fresh air intake.
- **Low Awareness:** Many doctors are unfamiliar with tools like UV lamps, air cleaners, or airflow management strategies that can improve safety.

Role of Air Movement in a Small Clinic

Airborne pathogens and infectious aerosols are carried by air within indoor clinic environments. The amount of fresh, clean air that enters the clinic and its movement throughout the space are crucial in controlling airborne infections and protecting doctors, staff, and visitors.

Cross ventilation plays a vital role in bringing outside air into the clinic, which helps to dilute contaminants. As outside air flows through the clinic, it helps to sweep away pathogens and remove contaminated air through open windows and doors. Once the air picks up pathogens, it should not be allowed to circulate or linger in the clinic. Stagnant air can result in the accumulation of pathogens in corners of the clinic.

The importance of air movement is further illustrated by Computational Fluid Dynamics

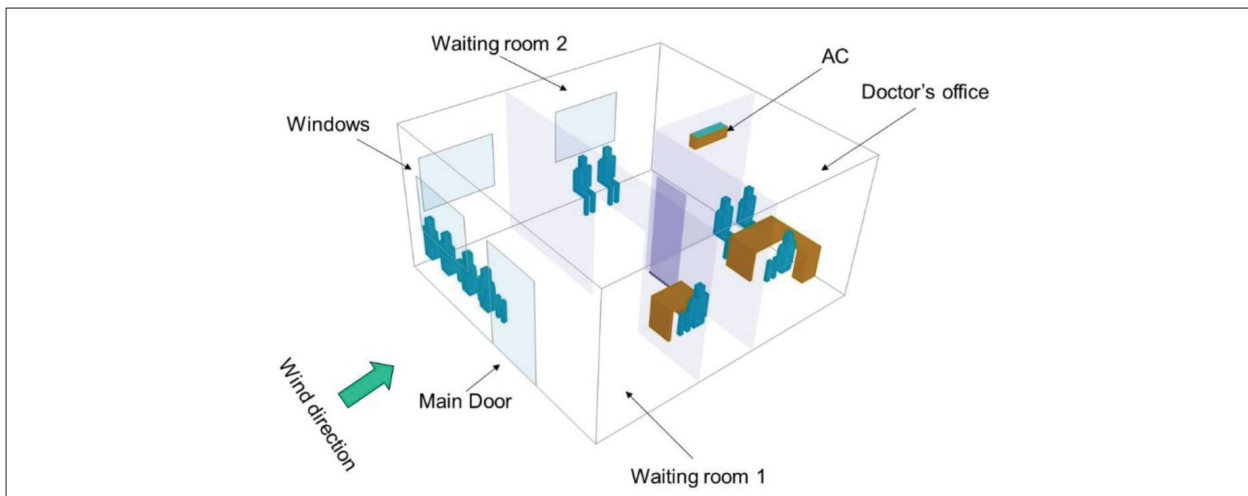


Figure 1: CFD model of a small clinic showing main entrance door, windows, waiting areas, doctor's office with AC. Door to doctor's office is closed.

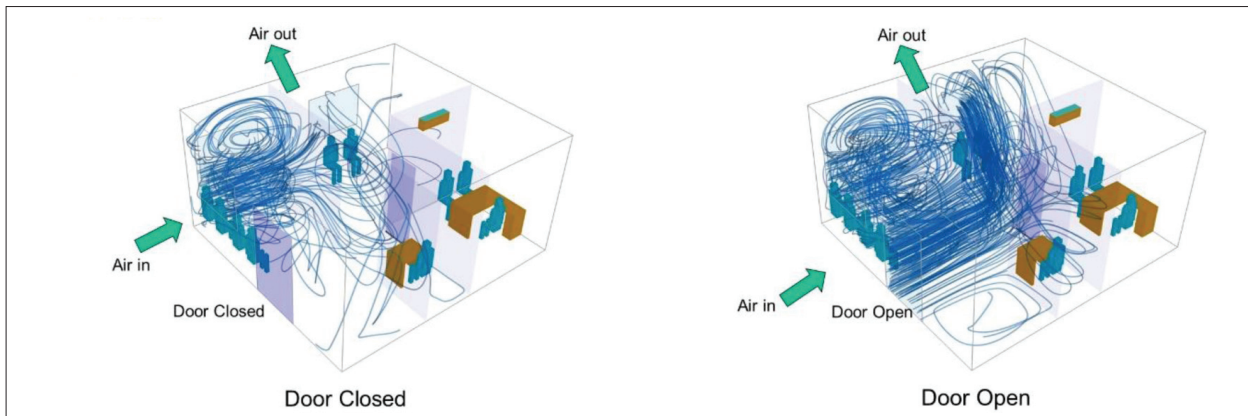


Figure 2: These images illustrate the importance of keeping as many windows and doors open as possible. When the main door is left open, more air flows through the clinic. Air enters through the open windows and doors and exits after circulating throughout the clinic via the open windows.

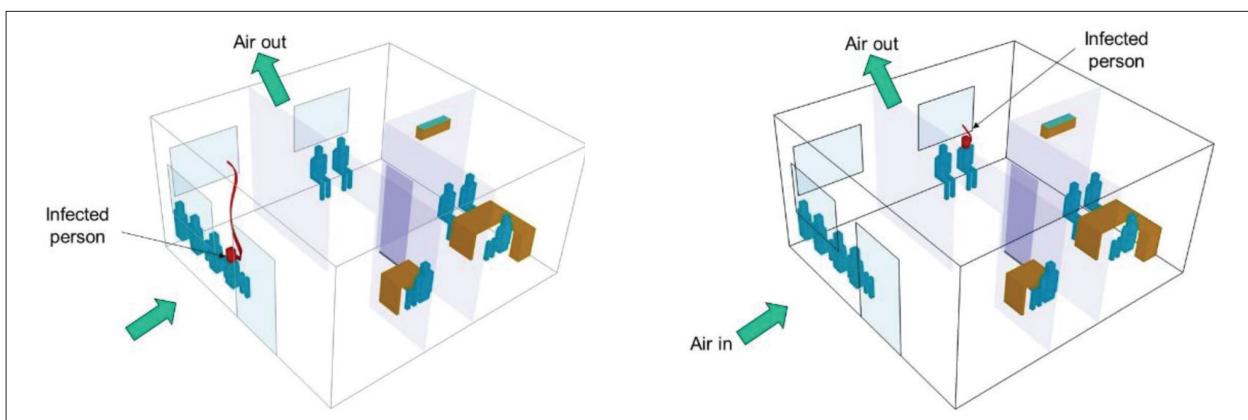


Figure 3: This illustration depicts the trajectories of pathogens exhaled by an infected individual. The pathogens travel with the air currents. Fresh outdoor air carries these pathogens from the person's mouth to an open window, allowing them to exit the clinic. Patients exhibiting symptoms can be seated near windows that face into the wind. This arrangement ensures that the airflow moves across the patients' faces, effectively sweeping the pathogens out of the window and reducing their spread within the clinic.

Air Conditioning and Ventilation Guide for Infection Control in Small Clinics

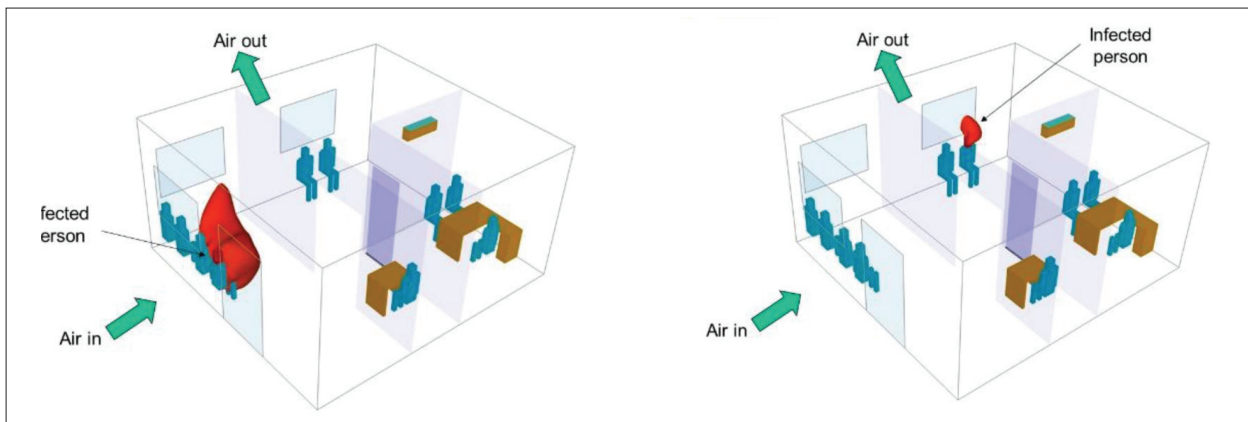


Figure 4: This illustration depicts the areas within the clinic that are occupied by high concentrations of pathogens. It demonstrates that when an infected person is seated near the windows, the airflow in the clinic limits the zone of high pathogen concentration only to the vicinity of the infected individual, preventing it from spreading to other parts of the clinic. The air flow will depend on the flow of wind pattern outside the clinic. The figures are illustrative to indicate that dilution happens when there is adequate ventilation. In actual scenarios the air may flow from the windows and exit from the door.

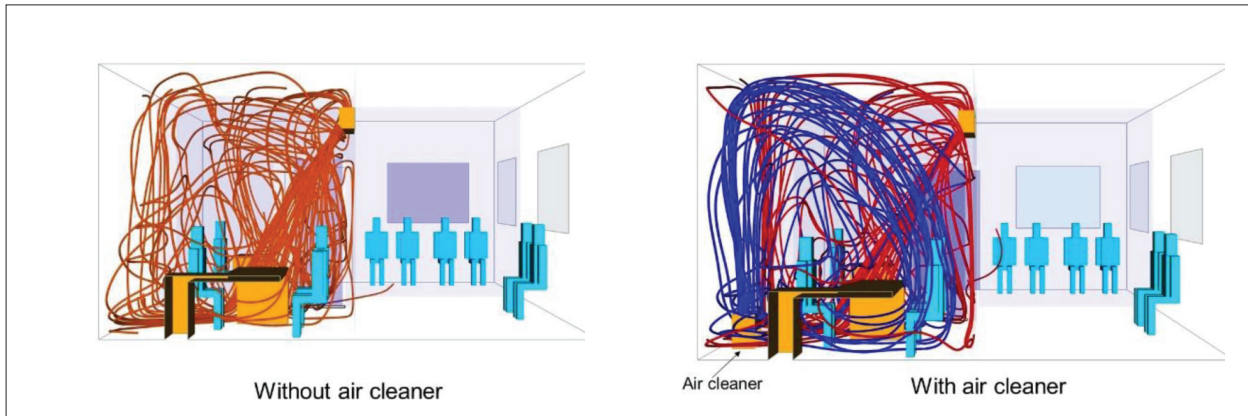


Figure 5: These illustrations depict air movement in a doctor's cabin equipped with an air conditioner. In a doctor's cabin (consultation room) with an air conditioner but without an air cleaner, the air circulates inside the cabin without any fresh air dilution. In contrast, the doctor's cabin with both an air conditioner and an air cleaner provides filtered air (represented in blue) from the air cleaner.

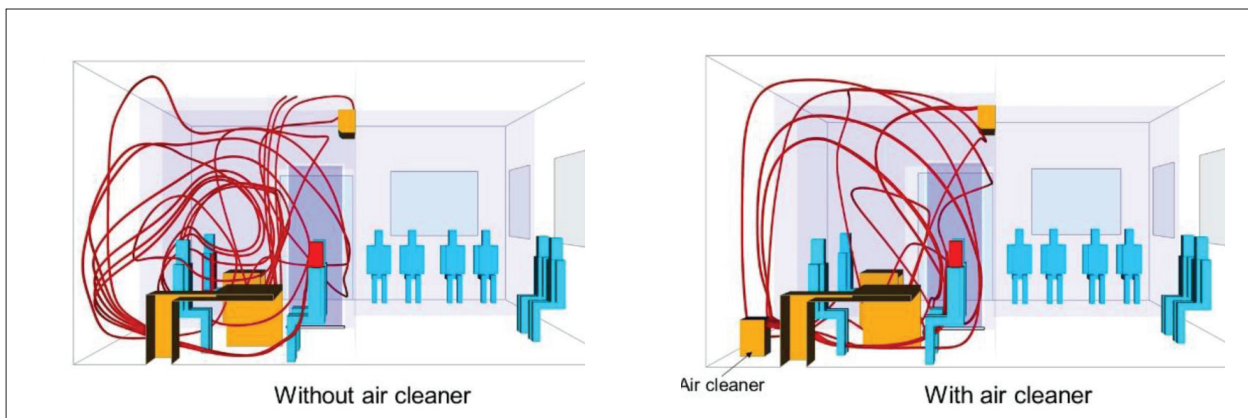


Figure 6: The images illustrate the pathways of pathogens exhaled by an infected individual in a doctor's cabin (consultation room). In the absence of an air cleaner, the pathogens released from the person circulate throughout the room. However, when an air cleaner is introduced, the contaminated air carrying these pathogens is drawn towards the air cleaner and filtered out.

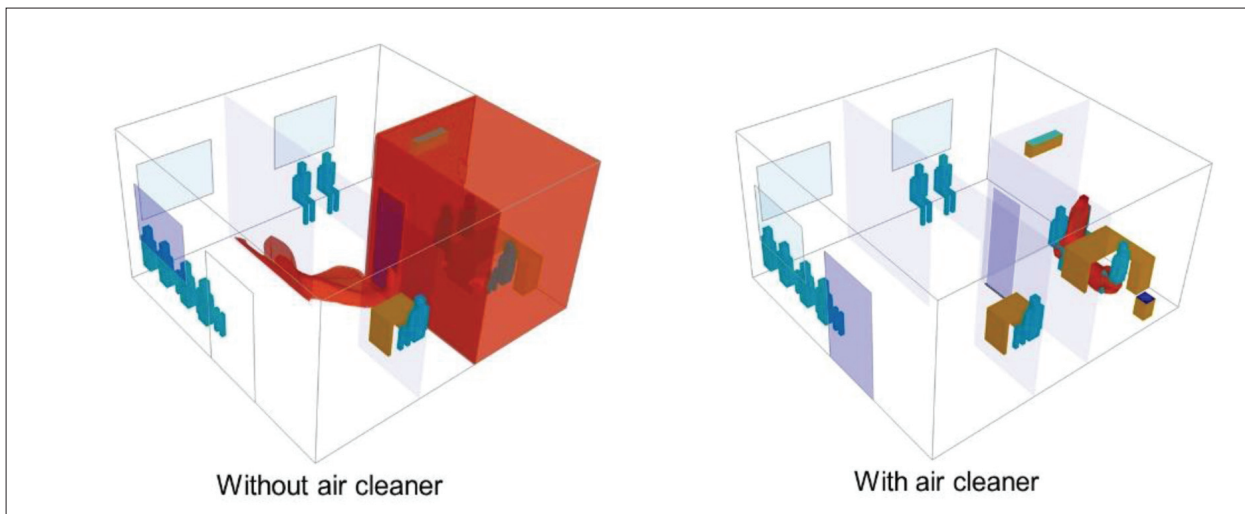


Figure 7: This illustration demonstrates the zone of high concentration of pathogens in a doctor's cabin (consultation room). Without an air cleaner, the consultation room shows a high concentration of pathogens throughout the space. Contaminated air from the doctor's office can leak through gaps in the door, potentially infecting individuals in the waiting room. However, when an air cleaner is added, the zone with a high concentration of pathogens decreases, thereby lowering the likelihood of infection.

(CFD) analyses of a small clinic. This analysis was conducted by AnSight LLC, located in Ann Arbor, Michigan, USA.

Recommendations

- To reduce the risk of infection in a clinic, it is essential to promote cross ventilation by keeping as many windows and doors open as possible. This allows fresh air to flow through the space, helping to disperse germs and pathogens.
- Patients displaying symptoms should be seated near the windows, facing the direction of the wind. This positioning allows air to flow across their faces, which helps sweep pathogens out of the clinic instead of allowing them to spread. In cases where natural cross ventilation or sufficient wind velocity is lacking/ unfavorable, it is advisable to install exhaust fans on the side opposite to the windows or doors, thereby enabling effective cross ventilation through mechanical means.
- In locations where outdoor air is polluted, relying solely on natural or mechanical ventilation may do more harm than good. In such cases, air-conditioning becomes the preferred option for maintaining indoor air quality and thermal comfort.
- However, air-conditioning alone – especially in closed spaces – can recirculate indoor air without adequate dilution, potentially increasing the concentration of airborne pathogens. This poses a significant infection risk to others.
- To mitigate this, every air-conditioned clinical room should be equipped with a high-efficiency air cleaner or air purifier. These units help filter out pathogens and particulate matter, supplying cleaner, safer air and thereby reducing the risk of cross-infection in clinical environments.
- All patients and visitors should be encouraged to wear masks at all times within the clinic to restrict the release of pathogens into the surrounding air and reduce the risk of airborne transmission.
- The exhaust fan in the bathroom/toilet should remain on continuously to promote the circulation of fresh air.

Air Conditioning and Ventilation Guide for Infection Control in Small Clinics

- In case the waiting room is also air conditioned, it is advisable to have an air-cleaner.
- It is crucial to purchase only certified air cleaners, and the filters in the air conditioning units should be replaced regularly to maintain effective air quality.
- Filters in air conditioning and air cleaner units should be cleaned or replaced carefully by trained service personnel or individuals with proper knowledge, as these components can harbor harmful pathogens.

Conclusion

Maintaining clean, well-ventilated air is a vital yet often overlooked aspect of infection control in small clinics. By following the practical guidance outlined in this document – focused on ventilation, filtration, and regular maintenance – clinics can create safer environments for patients and staff alike. Implementing even modest improvements in air circulation and hygiene can significantly reduce the risk of airborne transmission, especially in high-contact outpatient settings.

About ISHRAE

The Indian Society of Heating, Refrigerating and Air Conditioning Engineers (ISHRAE) was founded in 1981 at New Delhi by a group of eminent HVAC&R professionals. ISHRAE has over 13,000 HVAC&R professionals as its members today along with 10,000 student members, and operates from over 50 Chapters and sub-Chapters spread all over India, with its HQ in Delhi. It is led by a team of elected officers who are members of the Society working on a voluntary basis, collectively called the Board of Governors. In pursuance of its objectives, ISHRAE works in the areas of Research, Standards, Education and Training, and Publication of Technical Books and a Journal. It also organizes world-class annual exhibitions ACREX and REFCOLD, besides hosting technical seminars and conferences. ISHRAE is a responsible and socially-conscious Technical Society.

Objective

- Advancement of the Arts and Sciences of Heating, Ventilation, Air Conditioning and Refrigeration Engineering and Related Services.
- Continuing education of members and other interested persons in the said sciences through lectures, workshops, product presentations, publications and expositions.
- Rendition of career guidance and financial assistance to students of the said sciences.
- Encouragement of scientific research.

Activities

Knowledge Dissemination: ISHRAE conducts conferences, seminars, exhibitions, workshops, panel discussions and product presentations throughout the country with both national and international participants to discuss, promote and display the state-of-the-art technologies, systems, products and services.

Books and Publications: ISHRAE publications help its members and the industry to keep up with technical developments, latest trends and sunrise technologies. ISHRAE publishes Standards, books on fundamentals of various topics, HVAC&R Handbooks and the extremely popular and informative ISHRAE Journal. The latest publication is on Insulation

Exhibitions cum Conferences: ISHRAE organises ACREX India, the largest international exposition in South Asia on the Air Conditioning, Refrigeration, Ventilation and Building Services industry. Held annually, ACREX showcases the latest technologies and innovations, and provides a platform for buyer-seller meets for technical and commercial personnel in the HVAC&R field. To serve the interests of the Refrigeration and Cold-chain sector, ISHRAE organises REFCOLD annually. ISHRAE is a member and active supporter of the National Centre for Cold-chain Development (NCCD).

Education: ISHRAE is actively engaged in Education and Training, and offers several courses for technical professionals, some with post-examination certification. This helps to bring trained manpower into the HVAC&R industry.

Research: ISHRAE promotes research in the field of HVAC&R technologies. It offers financial support to graduate and post-graduate students to carry out innovative R&D work in technology, systems and processes. ISHRAE partners with the industry, academia and the government to carry out scientific research at Institutes of Excellence associated with ISHRAE.

Standards: ISHRAE works in the national interest with various government ministries and departments; for example, in the development of Standards and drafting of the National Building Code for the Bureau of Indian Standards, working on Energy Conservation Building Code with the Bureau of Energy Efficiency, and with the Ozone Cell of the Ministry of Environment, Forest and Climate Change on refrigerant gases. ISHRAE has also developed a pioneering Standard on Indoor Environmental Quality.

Student Activities: ISHRAE student chapters in more than 150 engineering colleges encourage students to opt for careers in the HVAC&R industry with industry exposure including factory visits. The K-12 initiative of ISHRAE reaches out to young school children to make them aware of subjects like energy conservation and environmental concerns through drawing competitions, poster designs, quizzes and more, with emphasis on STEM education to inculcate scientific fervour and help them to grow up as responsible citizens.

Global Reach: ISHRAE works in close co-operation with other similar societies and organisations, both at national and international levels, for the promotion and development of concepts like health and safety, sustainability, Green buildings, energy efficiency and environmental responsibility, often interacting with UN bodies like UNDP and UNEP.

ISHRAE is indeed looked upon as a repository of technical knowledge in the HVAC&R and Building Services Industry globally by peer organizations and the Government.