



## Letter to the Editor

# Negative-pressure rooms and *Aspergillus* risk—Air balance alone is insufficient

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*To the Editor*—The recent article by Biebelberg et al<sup>1</sup> reported on increased healthcare-acquired (HA) aspergillosis among severe acute respiratory coronavirus virus 2 (SARS-CoV-2)-positive patients cared for in “negative pressure” or “modified AIIR” rooms. The conclusion was that negative air balance in a room compared to the hallway may increase risk of HA aspergillosis. There are a number of issues with this conclusion, which implies that airborne infection isolation rooms (AIIRs) may increase the risk of nosocomial disease.

Biebelberg et al<sup>1</sup> neglected to define what they meant by a “negative pressure” or “modified AIIR” room. The term ‘negative-pressure room’ is often used to mean AIIR, but it addresses only 1 of 4 requirements for the latter. Guidance published for US and Canadian facilities require an AIIR to: (1) be negatively balanced to adjacent spaces; (2) provide a minimum of 12 air changes per hour (ACH); (3) provide a minimum of minimum efficiency reporting value (MERV) 14 filtration; and (4) exhaust directly to the outside.<sup>2,3</sup> An anteroom that is negatively balanced to the corridor and positively balanced to the AIIR with a minimum of 10 ACH is required in Canada and has been recommended based on a risk assessment in the United States.<sup>2–4</sup> The anteroom allows for safe donning or doffing of personal protective equipment and acts as an airlock between the adjacent space and the patient to minimize risk of exposure to contaminated aerosols.<sup>5</sup> The Centers for Disease Control and Prevention and Health Canada guidance for managing SARS-CoV-2-positive patients undergoing aerosol-generating procedures (AGPs) is to do so in AIIRs when available.<sup>6,7</sup>

Modifying existing spaces to accommodate demand from a large-scale airborne infectious disease outbreak by increasing the number of AIIRs available involves managing air balance, ACH requirements, presence of anterooms, a pressure-sealed/leak-proof space and more.<sup>2,3,8</sup> Biebelberg et al do not describe how Brigham and Women's Hospital (BWH) created their “modified AIIR” rooms. Specifically, whether they rebalanced the rooms to be

negative to adjacent spaces alone, or if they also accounted for the amount of pressurization, ACH, filtration, or exhaust. If the conditions for an AIIR were not met, it is plausible that the risk of HA aspergillosis was increased because environmental pathogens were actively drawn into rooms and were not cleared effectively. This would also explain the reduced rates when only AIIRs were used in both hospitals.

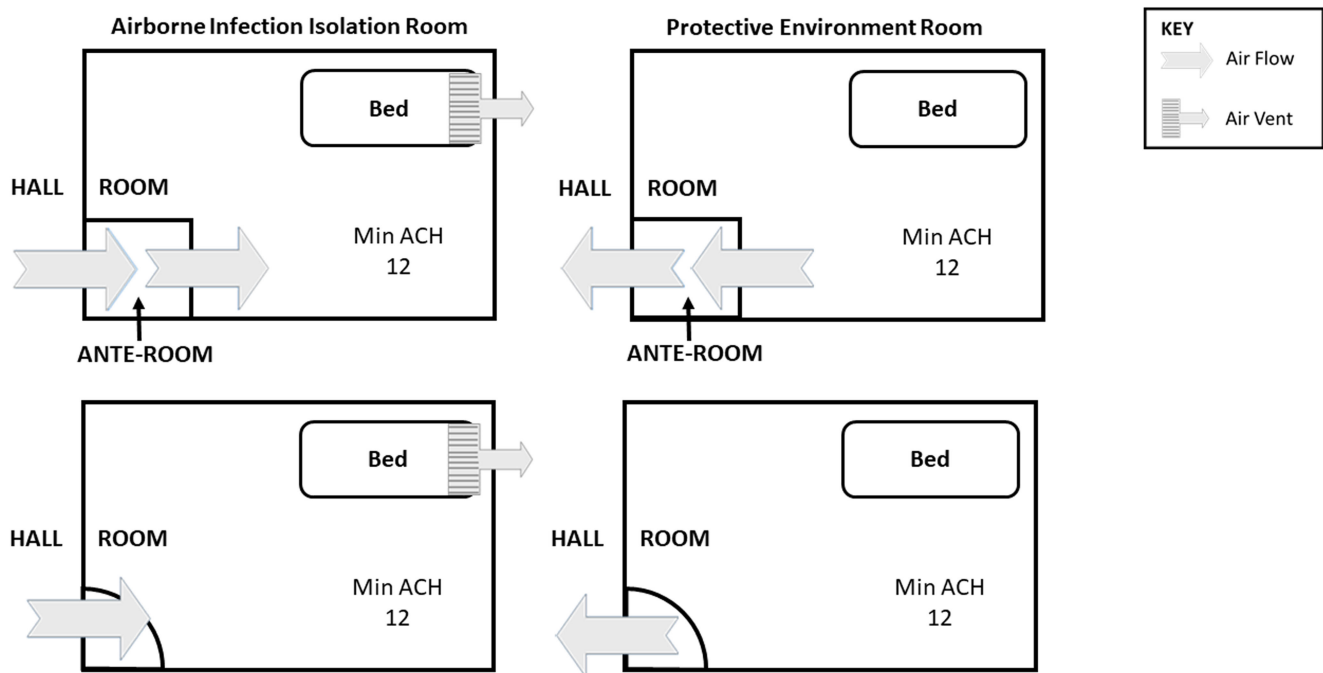
Rather than focusing on air balance alone, it may be more appropriate to frame the issue as risk generated by using space for purposes other than those for which it was designed. Any room can be balanced positive, negative, or neutral, but providing sufficient protection to patients and staff against contaminated aerosols in an isolation room is multifactorial.<sup>9</sup> Ventilation, meaning introducing fresh air to dilute potentially contaminated air and reduce risk of exposure, is a key piece of the puzzle. Indeed, guidance for COVID-19 prevention in communities and schools has focused mainly on ventilation.<sup>10</sup> Other factors include the presence or absence of an anteroom and how it is balanced and ventilated, the degree of negative balance between spaces, how well-sealed are the spaces, filtration of supply air, and the placement of air supply and exhaust within the spaces.<sup>5,9</sup>

Design and proper use of healthcare spaces is important for effective protection from nosocomial infections. Those of us involved in infection control and prevention should engage in design, construction, renovation, and environmental modification actively. We must be familiar with terminology and requirements of all types of room configuration (Fig. 1) to ensure that clinical and operational stakeholders are communicating effectively with the shared goal of patient and staff safety. Asking a physical plant colleague to make a room ‘negative’ is not the same as asking for conversion of the room to an AIIR. Creating strong partnerships with colleagues in design, construction, and physical plant would enable safe practice, especially for modifications necessitated by a public health emergency.

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**Figure 1.** Illustrations depicting air balance and air change per hour (ACH) standards for airborne infection isolation rooms and protective environment rooms. Each is depicted with (required in Canada<sup>3</sup>) and without an anteroom.

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