Residential Long-Term Care and COVID-19: Role of the Built Environment in Balancing Infection Control and Quality of Life

Key Findings and Recommendations 2022

10.4.6 Internal Environment

Excerpt from report - For the full report see **www.residentiallongtermcaredesign.ie/resources/**

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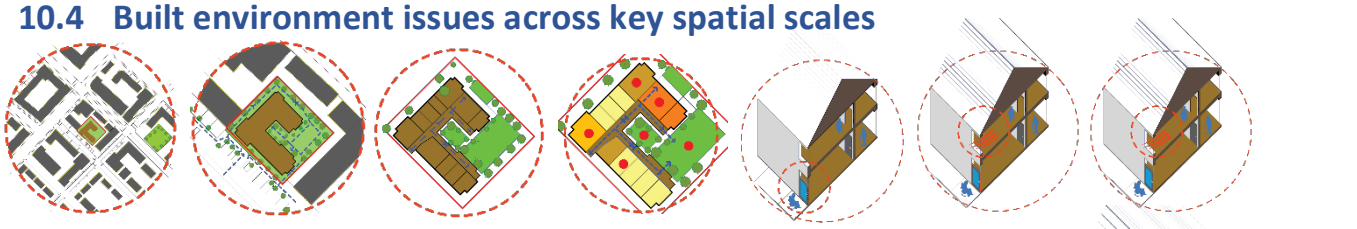
10.4 Built environment issues across key spatial scales



10.4.6 Internal Environment

33: Key spaces in St Marys, Monaghan provided with good levels of natural and artificial light.

a) Comfortable and balanced room temperatures (not too hot, not too cold):

Key design considerations for quality of life

Comfortable temperatures have been shown to be associated with good quality of life amongst RLTC residents. Specifically, high temperatures in the resident's bedroom were associated with lower quality of life (Garre-Olmo, López-Pousa et al. 2012 as cited in Fleming & Bennett 2017).

Stakeholder feedback: Family members believed that residents should be able to modulate room temperature according to their own preferences, but many residents are unable to open windows without assistance. In terms of temperature, some family members thought that it was too cold for their loved one with the window open during window visits.

Some interviewees stated that there were health issues associated with dry, over-heated environments, and that nursing homes tend to be too warm. These conditions can exacerbate health issues with dehydrated people in dry over-heated environments where the virus can linger.

High Priority infection control issues

A large amount of data and studies have found that the spread of pathogens and viruses could be facilitated in cold and dry conditions. The indoor relative humidity between 50 and 60% is suggested to reduce the risk of spreading airborne-infectious diseases.

Key recommendations – Temperature and Humidity

- The virus (SARS-CoV-2) that causes COVID-19, survives longer in cold and excessively dry conditions. These conditions may be problematic in terms of encouraging the spread of COVID-19; therefore, it is advisable to have warm indoor temperatures (e.g., 18-21 degrees Celsius, depending on the room and the occupant's preference/health), and an indoor relative humidity at approximately 50%. (See also below for findings and recommendations around ventilation).

b) Healthful and comfortable ventilation via natural and mechanical ventilation (including appropriate internal relative humidity)

34: Openable window providing good levels of natural ventilation.

Key design considerations for quality of life

Literature findings: Ventilation and air quality are critical to the wellbeing of older people in nursing homes (Mendes et al., 2015). Openable windows should be used to provide natural ventilation and fresh air can improve well-being. The overall building and the design of the windows should be carefully considered where high noise level, pollution or dust levels may be a potential problem (Department of Health (UK), 2015).

Stakeholder feedback: Family members in the Irish case studies reported that rooms with many openable windows were very useful during COVID-19.

Interviewees also stressed the importance of good ventilation and believed that air quality may sometimes be poor in RLTC settings. However, many thought that achieving good natural ventilation can be difficult due to the fact that many older people don't want windows open because they dislike draughts or that windows are often kept closed for energy efficiency. There was a concern that there is very little policy or regulation of ventilation in care settings.

An interview with an architect with expertise in the area of building ventilation has set out the following prevention strategy for COVID-19 Risks in Nursing Homes:

- Purge ventilation at intervals to disperse the virus with regular 'airing out' of rooms. Purge ventilation is the introduction of intermittent, rapid ventilation into a habitable room, usually via an openable window or external door, to maintain or restore a pleasant living environment.
- Improve background ventilation to dilute the virus and keep air moving (windows slightly open, doors open for cross ventilation etc.). Wall vents must not be blocked, and hit/miss vents kept open.
- Increase humidity with humidifiers and/or bowls of water for evaporation.
- Monitor poor ventilation and low humidity with CO2 (carbon dioxide monitors) to keep CO2 below 600ppm. CO2 build up is a proxy for inadequate ventilation.
- Use air purification fans to 'clean' the air. Proprietary units are available.

The steering committee also noted that good ventilation is often a problem in many buildings, but COVID-19 has highlighted the importance of ventilation in terms of removing or diluting virus laden air from internal and external spaces. However, they also recognised that ventilation and the balancing of air quality and comfort can be difficult in settings with older people.

High Priority infection control issues

Literature findings: Allen and Marr (2020), point to emerging evidence indicating that COVID-19 can be transmitted via inhalation of aerosols. To combat this, they recommend:

- increasing outdoor air ventilation rates above current minimums.
- using high-efficiency filtration for recirculated air (MERV 13 or greater).
- verifying that sensitive areas, such as bathrooms and rooms where infected patients are cared for in hospitals and senior homes, are negatively pressurised relative to adjacent areas.
- managing air flow direction and speed to prevent spread of aerosols across occupants.

Wang (2021) identifies the following important ventilation issues:

- Natural ventilation helps reduce the concentration of virus in the air and has been strongly suggested in the guidelines for infection control. Associated with functional

declines, older adults spend a lot of hours inside their rooms, and thus, natural ventilation in their rooms is of great significance to reduce the risk of infection. The availability of indoor natural ventilation is generally influenced by factors associated with site planning and building design, such as site location, building location, building orientation, window location and size.

- Air-conditioning systems need to be integrated with zoning and provide an orderly design of air flows by zone to ensure negative air pressures in contaminated zones. Due to the high concentration of airborne virus emitted from contaminated zones, it is recommended to have relatively high ceilings in these zones and set the return vent near the ceilings and as far away as possible from the supply vent.
- Window air conditioners may be considered to ensure dedicated air-conditioning.
- For single rooms, where it is not possible to achieve sufficient natural ventilation through windows, mechanical ventilation for outdoor air exchange should be applied and necessary equipment at the room level and spaces for installation were recommended.

Key recommendations– Ventilation and Air Quality

- Increase natural ventilation to dilute the virus in the air and help extract it outside.
- Perform purge ventilation at regular intervals to air out the rooms by opening windows and doors to replace any stale air in the room with fresh air. Ensure windows are capable of being easily operated and fully opened when required (while considering safety and security). Ensure window design provides good views to the outside from both a seated and standing position.
- Monitor poor ventilation and low humidity with CO2 (carbon dioxide monitors) to keep CO2 below 600ppm (parts per million).
- Use portable air filters in the bedrooms of residents with COVID-19, (portable high-efficiency particulate air (HEPA) filters) to help remove aerosols from the air. Many domestic type filters are equipped with H13 HEPA filters capable of filtering 99.97% of particles at a clean air delivery rate of 467 m3 per hour on the highest fan speed setting.
- See - https://www.hse.gov.uk/coronavirus/equipment-and-machinery/air-conditioning-and-ventilation/improve-mechanical-ventilation.htm

c) A well-balanced acoustic environment

Key design considerations for quality of life

Stakeholder feedback: Interviewees noted that generally, there is excessive noise levels and a lack of good noise insulation/sound proofing in residential long-term care settings. Considering that a significant proportion of RLTC residents have some sort of audio impairment, and the widespread use of technology such as call bells etc., RLTC settings are often very noisy. This impacts on resident comfort and quality of life in general. More specifically, poor noise insulation negatively affects resident privacy, especially during visiting times. Family members from the Irish case studies also note noise levels as an issue in their loved ones RLTC setting, particularly impacting on visiting times.

Additionally, interviewees note that the use of large communal spaces such as dayrooms etc., for visiting and other activities is made more difficult by high noise levels. Due to a lack of private/smaller visiting spaces, it is difficult to facilitate visiting.

Key recommendations – Acoustic environment

- Residential long-term care settings should consider noise insulation or sound proofing, to allow for private visiting and peaceful rest times.
- Smaller, private visiting spaces allow for improved privacy and lower noise levels.