

Long-Term Residential Care and the Built Environment: Improving Quality of Life and Resilience Through a Universal Design Approach

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Abstract. This paper draws on a series of transdisciplinary research projects examining the role of the built environment in supporting quality of life in long-term residential care settings (LTRC) in Ireland. Acknowledging the impact of COVID-19, these projects include airborne infection control as a key theme. Moreover, considering the wide spectrum of needs, impairment, and health conditions experienced by people living in these settings, along with the diversity of residents, staff, and visitors who occupy LTRC buildings, the research is underpinned by a Universal Design (UD) approach. Finally, climate change is examined as emerging challenge, particularly for older people living in LTRC. Starting with these major concerns, this exploratory paper examines how UD can act as a bridging concept to bring together inclusion, quality of life, health and wellbeing, and climate resilience in the context of long-term residential care in Ireland and beyond.

Keywords. Universal Design (UD), long-term residential care (LTRC), ageing, built environment, urban design, quality of life, health, infection control, climate change, resilience

1. Introduction

This paper draws on a series of transdisciplinary research projects examining the role of the built environment in supporting quality of life (QOL) in long-term residential care (LTRC) settings in Ireland (1-3). Acknowledging the impact of COVID-19, these projects include airborne infection control (IC) as a key theme. Considering the wide spectrum of needs, impairment, and health conditions experienced by people living in these settings, along with the diversity of LTRC residents, staff, and visitors, the research is underpinned by a Universal Design (UD) approach (4). Finally, throughout this research, emerging challenges are identified, including climate change, which has the potential to significantly affect older people living in LTRC.

Starting with these major concerns and drawing on the research above, this exploratory paper examines how UD can act as a bridging concept to bring together inclusion, QOL, health and wellbeing, and climate action in the context of LTRC.

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2. Background

Key challenges for long-term residential care: Kane (5) argues that long-term care policies and programs tend to be associated with reduced QOL, while Villeneuve et al. (6) found that many older people experience a “significant drop in their quality of life when entering aged care institution”. QOL is the subjective rating of a person’s physical, emotional, and social well-being (7), and is therefore impacted by the built environment, particularly in LTRC where high levels of frailty, disability, and comorbidity (8) combine with increased time spent indoors (9).

COVID-19 negatively affects QOL in LTRC, illustrated by a Canadian study identifying how a range of COVID related factors such as a lack of access to specialist geriatric professionals and carer exhaustion led to poorer QOL during the pandemic. Irish research shows that LTRC settings were disproportionately affected by COVID-19 (Kennelly et al., 2021) with serious impacts on residents, staff, and family members. Anderson et al. (10) identify how the built environment can precipitate or exacerbate infection related measures such as quarantine, constrained social interaction, or restricted visiting. These interventions are particularly difficult in terms of cognitive impairment (CI) or a person that walks with purpose, formerly called “wandering” (11).

As discussed, people living in LTRC are particularly susceptible to COVID-19 due to comorbidity and frailty, and for similar reasons are also highly vulnerable to climate change. Considering the prevalence of CI and disability in LTRC, it is important to note that climate change disproportionately affects people with dementia (12) and disabilities due to impairment, exacerbation of symptoms, difficulties with thermal regulation, and activity limitations (13). Referring to LTRC, Wollschlaeger et al. (14) highlight the dangers of extreme heat, flooding, changes in infectious agents, and wildfires for settings in Canada. A UK study examining indoor temperatures in care settings during a heatwave recorded daily temperatures $>34.3^{\circ}\text{C}$, much higher than the 26°C threshold suggested by Public Health England (CIBSE 2020). As discussed previously, the built environment plays a significant part in intensifying or mitigating the impacts of climate related events for people in LTRC.

Supporting QOL, achieving IC and pandemic resilience, and climate change mitigation are interconnected priority areas for LTRC design and retrofit. While UD is often linked to QOL (15) and sustainable design (16), it has only recently been connected to IC in LTRC settings (3). Considering the relevance of the above for LTRC, bearing in mind built environment implications, and links to UD, it is important to explore how these challenges can be addressed by UD in a holistic and integrated manner.

Universal Design and long-term care: The UN Convention on the Rights of Persons with Disabilities defines UD as “the design of products, environments, programmes and services to be usable by all people” (17). This approach is articulated by the seven principles of UD (18) which focus on accessibility, ease of understanding, and usability. Steinfeld and Maisel (19) propose UD as a “process that enables and empowers a diverse population” by improving the three key areas of “human performance, health and wellness and social participation”. Following this, they set out eight UD goals including Body fit, Comfort, Awareness, and Understanding covering accessibly and usability, but also go further to include Wellness, Social integration, Personalisation, and Cultural

appropriateness. Mosca and Capolongo (20) refer to this three part approach and associated UD goals to develop criteria and indicators as part of their UD assessment framework, thereby reinforcing this holistic approach to UD.

Looking at LTRC, Grey et al. (3) adapt the four key UD principles in the Irish UD homes guidelines (21), which include: Integrated into the neighbourhood; Easy to approach, enter and move about in; Easy to understand, use and manage; Flexible, cost effective, safe, and adaptable over time. Like the UD goals, these principles refer to usability, health and safety, and social integration, however, while including flexibility, and adaptability over time. They also adopt a multi-spatial approach i.e. from location and site layout, down to building design and detailed architectural features.

Participatory design and co-creation are central to the UD approaches described above. Steinfeld and Maisel (18) advocate for 'design participation', while Grey et al. (3) argue that LTRC residents, family members, staff, and health and social care professionals should be involved in co-research and co-creation processes.

Bearing in mind QOL, and the impacts of airborne infection, and climate change, how can this multi-spatial and multisectoral approach to UD be used to interrogate the built environment in LTRC, and address these interconnected challenges?

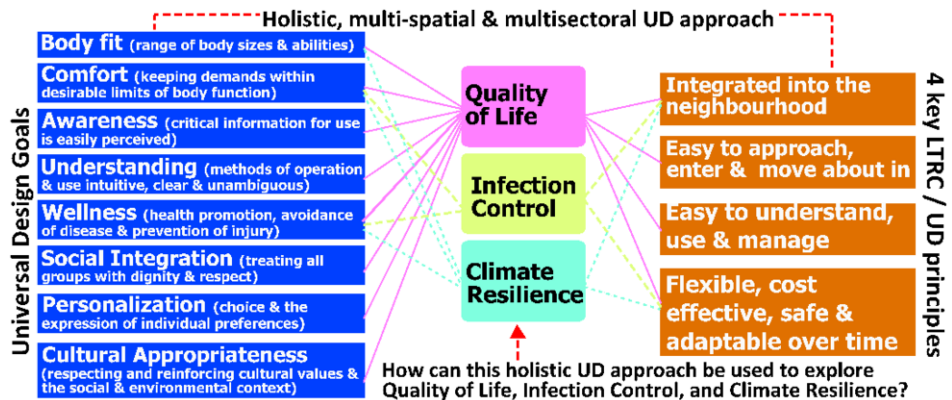


Figure 1. Holistic UD approach to explore QOL, IC, and Climate Resilience in LTRC

3. Methodology

As mentioned previously, this paper draws primarily on three research projects (1-3) involving Irish partners and international experts from the UK, the Netherlands, and Canada who formed a steering committee to direct the research and review key outputs. These projects share a common research methodology drawing on literature reviews, interviews, questionnaires, Irish case studies, and international best practice. An example of this methodology is illustrated by Grey et al. (1). The research findings are primarily structured according to Underpinning issues (e.g. QOL), Overarching design characteristics (e.g. models of care), Built environment issues across spatial scales (e.g. location, building layout etc.), Planning policy and guidance, and finally, Barriers, challenges, and opportunities. Reporting on all the findings is beyond the scope of this paper, therefore a sample of relevant findings are presented herein.

4. Key findings and discussion across key spatial scales

In broad terms, UD can be used to improve the accessibility and usability of any environment, product, or system, while UD based participatory design and co-creation is also beneficial. In this paper, both these aspects of UD are taken as given, and instead it focuses on how a holistic UD approach, at a more fundamental level, may influence QOL, IC, and climate resilience across five key spatial scales (see Figure 2 below). These five spatial scales emerged from the previously mentioned projects (1-3) as important spatial levels at which to explore the built environment of RLTC settings.

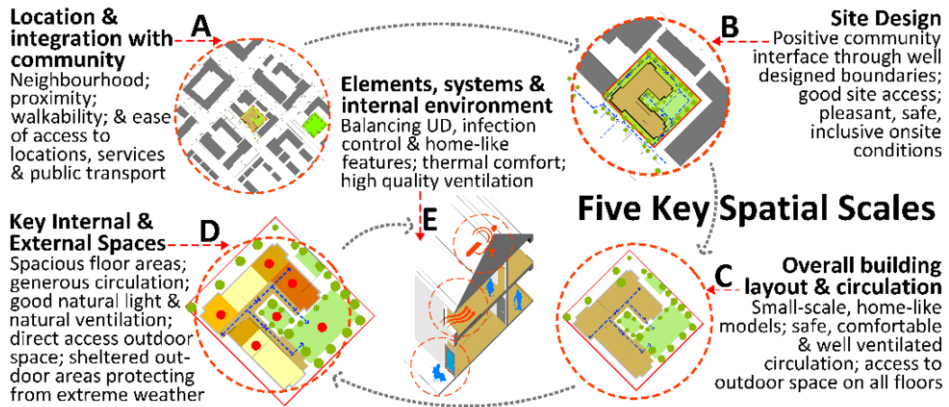


Figure 2. Five spatial scales to explore the intersection of UD, QOL, IC & climate resilience

A. Location and integration with community: Integration with community, proximity, walkability, and ease of access to locations, services, and public transport are all fundamental UD considerations (19). The first UD principle in the LTRC guidelines (3) calls for integration with the neighbourhood to avoid cutting “residents off from community life and social interaction...thereby lessening their quality of life.” (22). Here QOL overlaps with UD to help embed LTRC settings into the community. Anderson et al. highlight the importance of maintaining a sense of self and connectedness through continuity with community (10), which according to Christie (23) is a protective factor in terms of adaptation to adversity. They argue that proximity to a person’s home community may be a critical factor in supporting resilience. This may apply to a pandemic or indeed challenges arising from climate change.

Adlakha and Sallis (24) explore how walkable neighbourhoods may reduce the risk of diseases, for example by facilitating physical exercise to improve immune system and inflammation responses, or by supporting physical distancing through walking and cycling. In terms of climate change, diverse and walkable communities are linked to carbon reduction (25), while some walkability features such as green space, are found to support climate resilience by mitigating urban heat and managing storm water (26). Therefore, ensuring that LTRC are located and integrated within walkable communities may be important in terms of UD, QOL, and pandemic and climate resilience.

B. Site design: Site boundaries that create positive engagement between the setting and the community provide a range of benefits. In terms of UD, creating good visual

access is important for orientation and wayfinding (27). A visual connection from the setting to the community can create familiarity and recognisability, a sense of place and belonging, and engagement with the community (28). Connection to the outside world may be significant if LTRC residents need to quarantine or shelter in place during a pandemic to help alleviate loneliness and isolation (1).

Air quality on the site will often be dictated by external factors, but where relevant onsite conditions should be carefully considered. EN 17210: 2021- Accessibility and usability of the built environment, includes immunological functions and air quality as UD issues given their impact on human functioning and health. Furthermore, research shows links between poor air quality and higher rates of COVID-19 (29), making air quality at site layout level a UD, QOL, and a resilience issue.

The location and quality of a setting's outdoor space is influenced by the site design and overall building layout, among other factors. Good outdoor space that is accessible and usable for all residents is a crucial QOL (30) and UD consideration (1). Research also points to reduced transmission of respiratory viruses in outdoor spaces (31) making them an important part of pandemic resilience.

C. Overall building layout and circulation: Small-scale household models that contain less than 12 residents, have single rooms, and shared home-like sitting and dining areas, have been linked to improved QOL (32). More recently, research looking at small-scale settings found that COVID-19 infections and mortality were significantly lower. Overall, these smaller scale settings can improve QOL and reduce infection risk, while also supporting UD by providing smaller, more legible, and manageable settings (1).

Regarding circulation, the principles 'Easy to approach, enter and move about in' and 'Easy to understand, use and manage' are important UD considerations (1). While wide, spacious corridors are beneficial in terms of access, usability, and QOL, they also allow social distancing and lower occupant density during a pandemic (1). Well-ventilated circulation areas are important for comfort and air quality, and are critical for IC (33), as natural ventilation can dilute airborne pathogens and extract them outside.

D. Key internal and external spaces: A typical LTRC setting will include a range of key spaces such as bedrooms, bathrooms, living spaces, kitchens, etc. Spacious floor areas, generous circulation, good natural lighting and natural ventilation, and a range of other design issues are important for UD, QOL, and pandemic resilience (1).

Research indicates that private bedrooms and bathrooms are preferred by residents and families (34), are linked to QOL in nursing homes (35), and improved IC (1). The quality of these rooms is important and therefore size, good natural light, ventilation, and ideally access to a private outdoor space are important (3, 36).

The role of external spaces providing safer environments in terms of COVID-19 has already been discussed. This was reiterated in the Irish context, where stakeholders expressed being able to access nature and the outdoors as a contributor to positive health and well-being during the COVID restrictions. Lack of access to outdoor space for residents living on upper floors is a major concern for many stakeholders in the Irish context (1). Many larger settings contain multiple floors without direct access to outdoor

space on upper levels. Stakeholders referred to ground floor bedrooms allowing 'window visits' during COVID-19 restrictions, which was impossible for many people on upper floors. It was recommended that residents on all floors have access to usable outdoor space (e.g. roof terraces, balconies).

Ickert et al. (37) note the importance of sheltering residents from the elements when outside. Covered outdoor spaces also help moderate the impacts of extreme weather associated with climate change. Vecellio et al. (38) outline the risks of excess heat for older residents, and identify how vegetation, covered walkways, and shaded areas can help with the thermal comfort of older people in outdoor spaces during extreme heat.

E. Elements, systems, and internal environment: In line with UD, finishes, materials and fittings should be easy to understand, use and manage, but they must also support good IC practices without being too institutional in appearance. Allen and Marr (39) state that frequent cleaning and disinfection of surfaces and finishes may help reduce secondary airborne transmission. They highlight the role of technological controls such as ultraviolet C or UV-C germicidal irradiation, for deactivating virus replication.

Returning to the critical issue of air quality, Mendes emphasises how ventilation is critical to the wellbeing of older people in LTRC (43). For COVID-19, Allen and Marr (42) recommend increasing air ventilation rates above current minimums; using high-efficiency filtration for recirculated air (MERV 13 or greater); or managing air flow direction and speed to prevent spread of aerosols. Elsewhere (1) purge ventilation, or the rapid ventilation of a room, via an openable window or external door, is advised.

Thermal conditions are also an important LTRC consideration where comfortable temperatures are associated with QOL. SARS-CoV-2 survives longer in cold, dry conditions, therefore it is advisable to have warm indoor temperatures (18-21 °C) and an indoor relative humidity at approximately 50% (1).

High temperatures in LTRC reduce QOL (40) and disproportionately affect residents with disabilities and CI (12, 13). This is also an emerging climate concern as discussed earlier. Oikonomou et al. (41) looking at LTRC and heat waves, find that older buildings with higher heat loss and higher thermal mass capacities may benefit from the application of high albedo materials (high reflectance of sunlight), whereas newer, highly insulated buildings may benefit from higher ventilation rates and external shading systems. They found that nighttime window opening to purge heat was one of the most beneficial cooling measures. Returning to purge ventilation for COVID-19, it is interesting to see synergies between pandemic and climate measures.

5. Conclusion and next steps

The previous section follows the threads of UD, QOL, IC, and climate resilience as they appear and intersect across key spatial scales in LTRC. While much more research is required, it starts to illustrate how a holistic approach to UD can be used to explore and address various overlapping aspects of the built environment (19) in care settings. This

research also points to the synergies that may exist between different concerns which are often examined in isolation.

The findings from this research are being used to inform the planning and design of LTRC settings in Ireland. This sector is going through a period of change following COVID-19, and therefore it is important that the next stage of LTRC development in Ireland is underpinned by evidence-based policy and practice. While this research focusses on the Irish context, it is relevant to other locations with comparable LTRC systems, or who experience similar conditions related to aged-care, pandemic resilience, or the impacts of climate change.

This exploratory paper highlights a number of areas that require further research:

- Setting location and associated planning and urban design policy in terms of the intersection of UD, QOL, IC, and climate resilience.
- The role of the local neighbourhood and site design issues on the above.
- Research at a building level looking at space requirements, building materials, internal environment, technology, and other detailed building related issues.
- Explore the synergies that may exist at the nexus of these issues.
- Potential trade-offs that need to be balanced in resolving these challenges.

This exploratory paper presents UD as a bridging concept that brings together inclusion, QOL, health and wellbeing, and climate action in the context of LTRC. Individually these are complex issues, and this complexity vastly increases at their nexus. However, UD provides an important opportunity to create an integrated and synergistic approach to QOL, IC, and climate resilience so LTRC residents can thrive.

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