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Coronavirus Pandemic

COVID-19, frailty and long-term care: Implications for policy and practice

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Abstract

Older adults have been disproportionately affected by the COVID-19 pandemic, with many outbreaks occurring in Long Term Care Facilities (LTCFs). We discuss this vulnerability among LTCF residents using an ecological framework, on levels spanning from the *individual* to *families and caregivers, institutions, health services and systems, communities*, and *contextual* government policies. Challenges abound for fully understanding the burden of COVID-19 in LTCF, including differences in nomenclature, data collection systems, cultural differences, varied social welfare models, and (often) under-resourcing of the LTC sector. Registration of cases and deaths may be limited by testing capacity and policy, record-keeping and reporting procedures. Hospitalization and death rates may be inaccurate depending on atypical presentations and whether or not residents' goals of care include escalation of care and transfer to hospital. Given the important contribution of frailty, use of the Clinical Frailty Scale (CFS) is discussed as a readily implementable measure, as are lessons learned from the study of frailty in relation to influenza. Biomarkers hold emerging promise in helping to predict disease severity and address the puzzle of why some frail LTCF residents are resilient to COVID-19, either remaining test-negative despite exposure or having asymptomatic infection, while others experience the full range of illness severity including critical illness and death. Strong and coordinated surveillance and research focused on LTCFs and their frail residents is required. These efforts should include widespread assessment of frailty using feasible and readily implementable tools such as the CFS, and rigorous reporting of morbidity and mortality in LTCFs.

Key words: COVID-19; frailty; older adult; long-term care; biomarker.

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Around the world, older adults are being hit hard by COVID-19. Outbreaks in Long-Term Care Facilities (LTCFs) are particularly devastating [1,2]. Given shortages of both people and resources, there is a pressing need to provide well-resourced and compassionate care for COVID-19 illness during outbreaks in LTCFs. Residents of LTCFs are at great risk for poor outcomes for many reasons, discussed here within an ecological framework. These multi-level factors have a major impact on the spread and severity of COVID-19, and are critical to understand if we are to achieve better outcomes in this vulnerable sector. In this paper we aim to discuss both challenges to gaining full understanding of the impact of COVID-19 in LTCF settings and the importance of frailty, an easily ascertained clinical factor, to inform risk and care planning. We draw from related experience in the study of frailty in relation to influenza, and suggest future directions for COVID-19 research through a frailty lens.

Why have LTCF emerged as the centre of the global pandemic?

The many factors that put residents of LTCFs at great risk for poor outcomes can be conceptualized at several levels within an ecological framework (Figure 1) [3,4]. At an *individual* level, LTCF residents have many chronic conditions, contributing to their high levels of frailty [5]. One consequence is that any disease, including COVID-19, presents differently ("atypically") in them [6]. This is a pragmatic challenge to case definition and ascertainment, making them more

vulnerable to severe outcomes. Cases going unrecognized have clinical and infection control ramifications, and increases the risk of future transmission. At the level of *family, friends and peer groups*, visitor limitations aim to limit introduction of illness into the facility but also serve to isolate residents from those who could be advocates (e.g. in the detection of early signs that "something is not right" as subtle signs of illness begin). On an *institutional* facility level, prior to the COVID-19 pandemic, social interaction and sense of community within facilities were considered something to strive for. These are now considered as contributors of spread of COVID-19 within facilities, along with others facility characteristics including close living quarters and shared dining facilities. Limited resources (and sometimes motives for profit) contribute to staffing models that rely on low paid staff without benefits and thus unable to take sick leave, or inadvertently spreading infection among facilities by working part-time at several LTCF. At the level of *communities*, disease transmission may be facilitated when facilities and/or staff are located in community clusters or marginalized communities. Relationships with community planning also arise, for example when staff must rely on crowded public transit (or transit routes and schedules that are affected by pandemic measures taken by transit authorities) to commute to and between their workplaces. On a *contextual policy level* within jurisdictions, funding and resourcing may be suboptimal for care provision at the best of times, even without the added demands of local outbreaks within a global pandemic. There may be barriers to testing due to limited resources or other constraints or agendas.

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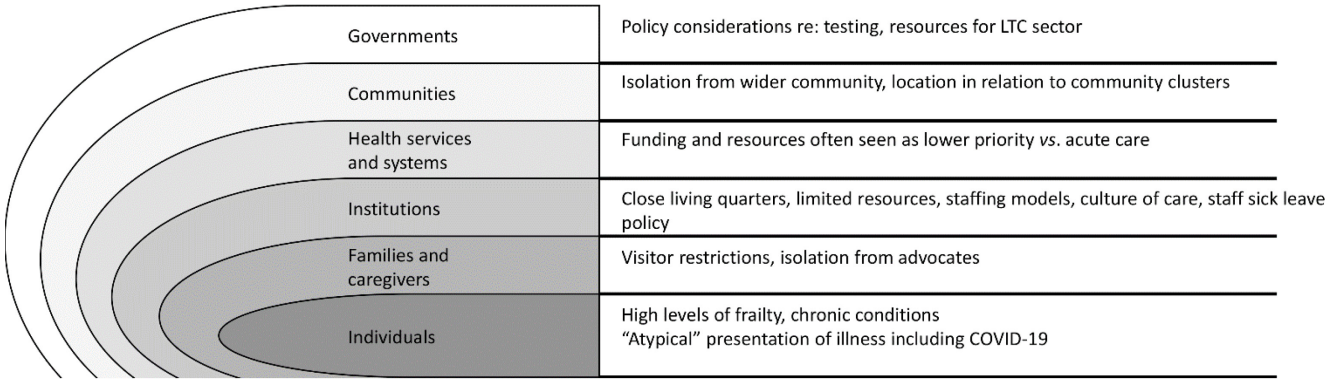
Challenges to understanding the impact of COVID-19 in LTCFs

Reliable estimates of the impact of COVID-19 on morbidity and mortality within LTCFs are hard to come by. In Canada, it has been reported that 79% of deaths have been in LTCFs [7]. In Europe, deaths in care homes reportedly account for approximately a third to more than a half of COVID-19 deaths across several countries [8].

There are many challenges to achieving a full understanding of the full implications of COVID-19 in this population. LTCFs come in all shapes and sizes, are called different names in different jurisdictions (e.g. care homes, retirement communities, Skilled Nursing Facilities, convalescent homes, homes for the aged etc…), and may or may not be formally regulated or registered with local authorities and data collection systems. Cultural differences (e.g. the common Asian doctrine of filial piety) [9], varied social welfare models (e.g. expectations on family vs. state for care of older adults) [10] and differential resource availability also impact the numbers and organization of such residences. When it comes to registering cases of COVID-19 and the morbidity and mortality the SARS-CoV-2 virus leaves in its wake, additional layers of challenges abound. Testing capacity and policy are understandably highly variable. Hospitalization rates may be misleading as an indicator of illness burden case mix severity where care pathways exist to support managing illness in place within the LTCF. Importantly, LTCF residents with severe illness whose goals of care do not include transfer to acute care or further escalation of care (e.g. mechanical ventilation, Intensive Care Unit) may stay in LTCF and thus not get counted [11]. Residents who presented atypically and did not get tested before their death will also go uncounted, or COVID-19 may not be reported as a cause of death if a frail resident was seen to die "with" rather than "of" COVID-19. Analyses based on place of

Figure 1. Ecological model of COVID-19's impact on LTCFs.



death recorded on death certificates will exclude any residents who have been transferred to hospital and die there.

Frailty, vulnerability and resilience

Frailty, which is a measure of how the accumulation of health and functional problems makes older people vulnerable to poor health outcomes, is an important part of this story [12]. It is imperative to better understand how clinical assessments of frailty, ideally integrated with routinely collected clinical data, can be used as predictors of illness severity and recovery. Many measures of frailty exist, from those based on deficit accumulation abstracted from Electronic Medical Record data or from comprehensive geriatric assessments, to performance-based measures or a frailty phenotype, to integrative measures based on clinical judgment [13]. The right tool for the job will of course vary by setting and according to existing data sources. When considering how to efficiently capture frailty status in pandemic management settings where time and resources are limited, feasibility and ease of use are paramount. The Clinical Frailty Scale has emerged as a widely used measure for these reasons. The CFS is a 9 category scale based on a clinician's judgment (or even self- or caregiver report) in which a patient is categorized on a scale where 1 = very fit, 2 = well, 3 = managing well with treated comorbid illness, 4 = vulnerable, 5 = mild frailty, 6 = moderate frailty, 7 = severe frailty, 8 = very severe frailty, and 9 = terminally ill. (https://www.dal.ca/sites/gmr/our-tools/clinical-frailty-scale.html) It has been well validated and used in more than 20 countries, and numerous translations are available including a freely downloadable App for use on mobile devices [14,15].

Notably, the story is not simply one of understanding and grading *vulnerability* - it is also critical to understand *resilience*, as in why it is that some frail LTCF residents end up with mild (or no) symptoms, while others, just as frail, become critically ill [16]. Needed is an understanding of what factors lead to higher risk for more severe illness, and how to maximize residents' chances of recovering with good quality of life.

Lessons learned from frailty and influenza

Because of its importance for influencing risk and outcomes of infections such as influenza and COVID-19, frailty is ideally integrated into surveillance efforts. For example, the Canadian Immunization Research Network's Serious Outcomes Surveillance (SOS) Network has long included a focus on measures of health status and outcomes that are relevant for older adults, notably frailty. Key findings have included: a) the importance of frailty for understanding vaccine effectiveness [17], b) that frailty is associated with atypical illness presentation and the potential for under-recognition of influenza cases using ILI case definitions [18], c) baseline frailty sets older adults up for poor recovery following infection (including further progression of frailty itself) [19], and d) hospitalization with influenza not uncommonly leads to an important burden of persistent functional decline and need for increased caregiving supports including incident LTCF placement [20]. As international recognition of the importance of frailty mounts, the Clinical Frailty Scale has been included in data collection of the Global Influenza Hospital Surveillance Network (https://www.gihsn.org/the-network/protocol), for use in sites around the world in low, middle and high income country settings.

Can biomarkers predict COVID-19 severity?

A search is under way to identify biomarkers and immune function indicators to try and understand how older adults' immune responses help (or hinder) in fighting off the illness. These include biomarkers associated with inflammation, endothelial function, mitochondria and apoptotic function, calcium homeostasis, fibrosis, neuromuscular function, sarcopenia, and bone/hormone metabolism and nutritional status [21,22]. Again drawing from experience on influenza, while it is well known that older people are not well-protected by current influenza vaccines, what is less understood is that frailty is an important predictor of vaccine effectiveness against influenza-related hospitalization [17]. However, there are limited studies of the relationship between frailty and immune biomarkers of the response to influenza vaccination, [23-25] influenza illness, or other respiratory infections such as COVID-19 [26]. Monitoring cytokine levels in the plasma or serum has yielded important clues to disease severity in SARS-CoV-1, pandemic influenza (H1N1) and COVID-19 infections [27-29]. Elevated levels of IL-6 is a biomarker for severe disease in, influenza and COVID-19 and IL-6 levels are used to guide treatment with IL-6 receptor blockers [27,28]. The interest in biomarkers is that 1) along with clinical history biomarkers may be useful in identifying individuals at the highest risk for severe COVID-19 infection, 2) biomarkers may be used to stratify patients into treatment groups, and 3) biomarkers may yield important information on the mechanisms of severe disease.

Just as it is not clear how frailty affects illness presentation and recovery, it is not clear whether similar immune responses will be shared in healthy individuals versus older frail residents of LTCF. It is therefore imperative that older frail participants are included in studies so that findings from healthier people are not generalized to the older, frailer and more high-risk population.

Implications for policy and practice

An understanding of frailty and the contextual factors outlined in the ecological model presented above is important to inform clinical and policy decision-making on how care and management strategies can be implemented to best support COVID-19 outbreaks. Understanding frailty also obliges an acknowledgement of the many medical and social factors that contribute to illness in older people. It underscores why so much care provision, modeled on people having a single dominant illness at a time, has such difficulty in managing older people with "the 'flu", resulting in increased risk of admission to long term care [20].

Strong and coordinated surveillance and research focused on LTCFs and their frail residents is required to provide fundamental insights as to how COVID-19 affects this high risk and vulnerable population, so that we may develop and inform efforts to develop better prevention and treatment strategies to combat COVID-19. Addressing locally relevant factors at each of the levels of influence presented in the ecological framework will be important. We recommend that these efforts should include widespread assessment of frailty using feasible and easily implementable tools such as the CFS. Rigorous reporting of morbidity and mortality in LTCFs is also required so that residents, families and the general public can be reassured that all efforts are being made to provide well-resourced and compassionate care for residents of LTCFs during the COVID-19 pandemic and beyond.

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