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ORIGINAL RESEARCH

Knowledge and Skills in Infection Prevention and Control Measures Amongst Visitors to Long-Term Care Homes: A Mixed methods Study

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Purpose: This mixed methods study aimed to assess the knowledge and skills related to infection prevention and control amongst visitors to long-term care homes following the removal of visiting restrictions during the Covid-19 pandemic.

Methods: Forty visitors to residents in long-term care homes were recruited. Participants' knowledge of the Covid-19, infection prevention and control practices, and self-reported use of protective behaviours were assessed through questionnaires. Handwashing skills, donning and doffing of personal protective equipment and decision-making surrounding hand hygiene moments were assessed through laboratory simulation using observation checklists.

Results: Participants' level of knowledge and perceived use of protective behaviours were high. However, no one accurately performed the handwashing steps, few (5.0%) performed all hand hygiene moments recommended, 35.0% donned personal protective equipment and only 12.5% doffed correctly. This is concerning because 90.0% of participants reported receiving infection prevention and control training.

Conclusion: These findings suggest educational interventions, resources and policies are needed to strengthen infection prevention and control training for visitors' to long-term care.

Keywords: long-term care, handwashing utilization, personal protective equipment utilization, simulation

Introduction

The Covid-19 pandemic was marked by an unprecedented global health crisis resulting from the rapid spread of the highly contagious SARS-CoV-2 virus. The novel coronavirus caused severe respiratory illness, leading to significant morbidity and mortality worldwide. [1] Among the most profoundly affected settings were long-term care homes (LTCH) (ie, 24-hour residential and skilled nursing facilities). Alarmingly, a significant proportion of Covid-19-related national deaths occurred within these facilities, with rates reaching as high as 81.0%. [2] The unique vulnerability of LTCH residents, who often have underlying health conditions, contributed to high rates of infection and mortality within these facilities.[3]

As a result, the pandemic exposed significant gaps in infectious disease prevention and control measures within LTCH, highlighting the urgent need for comprehensive strategies to safeguard the health and well-being of residents, visitors, and staff. Recognizing the critical role of education and training in mitigating the spread of infections, LTCH swiftly prioritized the implementation of infection prevention and control (IPAC) practices amongst staff and immediately restricted access to visitors. When reopening the LTCH to visitors, strategies were rapidly implemented to prepare and educate visitors in IPAC, which lacked consistency and coordination across different sites.[3,4] Despite the necessity and ongoing need for education in IPAC for visitors to LTCH, little is known about the effectiveness and adequacy of training efforts and interventions

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implemented.[3–5] Considerable variation in training was especially evident towards the end of the pandemic, which is when this study occurs. Although some LTCH began easing restrictions despite the ongoing presence of the pandemic, others maintained strict Covid-19 protocols and visitor restrictions. Thus, the participants in this study were subject to major variability between sites. Factors such as facility size, resource availability (eg staff, personal protective equipment, PPE), and limited knowledge and skills of staff tasked with training visitors further complicated the situation.[4,6]

Moreover, little is known about visitors' level of understanding and their ability to apply IPAC measures, particularly in areas such as proper PPE donning and doffing. This knowledge gap is concerning, as visitors with limited knowledge or inadequate skills may unknowingly contribute to the transmission of infectious agents during their visits to LTCH.[6] Therefore, the research questions guiding this study are as follows: What is the level of skill and knowledge of Covid-19 and IPAC among visitors of LTCH? Is there a relationship between visitors' knowledge of Covid-19 and their level of skill related to IPAC? By addressing these questions through a simulated LTCH visit, we aim to provide valuable insights into the current state of visitors' education and training in infectious disease control. Ultimately, this research seeks to explore the need to change the approach and develop future standardized training and educational strategies to enhance the safety and well-being of residents and staff in LTCH in the case of future infectious disease outbreaks.

Methods

Study Design and Recruitment

The study was approved by the University of New Brunswick and the Université de Moncton Research Ethics Boards (File #s: 2022–045 and 2122–084), complies with the Declaration of Helsinki, and was conducted from July to November 2022. Efforts were made to recruit participants from different geographic locations in a Canadian province, allowing them to attend one of two simulation labs. In order to be eligible to participate, individuals were required to be visitors to a LTCH during the Covid-19 pandemic; were over 19 years old; and could speak English or French. The decision to offer study materials in both English and French aimed to enhance linguistic inclusivity and minimize language-related barriers. Thirty LTCH were asked to aid with recruitment and advertise the study by posting flyers and through communicating with visitors (eg, newsletters, emails, websites, social media). All homes were government-regulated, had for-profit and not-for-profit funding models, and offered services in both official languages.

The standardized scenario space was designed as a typical resident room in a LTCH. All participants signed an informed consent prior to the start of data collection. During the simulation, participants interacted with high-fidelity computer-controlled mannequins. The simulation space provided multiple opportunities for sanitizing hands. A staff member (played by a research team member) asked the participant to wash their hands, don and doff PPE.

Data Collection

A member of the research team observed the simulation from a room behind a two-way mirror. This room housed a control panel, the mannequin voice control system, a computer with Laerdal SimCapture software, and remotely operated audiovisual capture equipment. Data were collected using in-person self-report questionnaires aimed at assessing what training participants had previously received, their level of Covid-19 knowledge, perceived use of protective practices and access to education on IPAC in LTCH. No participant was excluded from the simulation due to limited knowledge or access to education on IPAC. Participants' ability to accurately apply knowledge and demonstrate skills in IPAC during simulated visits was evaluated through researchers' structured observations.

Simulations were recorded using four ceiling-mounted cameras and SimCapture software. Simulated visit recordings were reviewed independently by members of the research team, and participants' performances were evaluated using a set of standardized checklists (eg, steps for donning and doffing PPE, steps for handwashing, and moments of hand hygiene). Members of the research team then met together to ensure consistent ratings of observations.

The outcomes of interest were: Covid-19 knowledge, reported use of protective practices, and perceived access to Covid-19 resources in LTCH, as well as demonstrated ability to apply knowledge and demonstrate skills for IPAC measures. Researchers used a questionnaire—comprised of 18 items organized into three subscales—knowledge and attitude (true or false items), protective practices (5-point Likert scale from "I never do this" to "I always do this"), and perceived access to

training in IPAC (5-point Likert scale from "very difficult" to "very easy"). To our knowledge, a questionnaire does not exist to assess Covid-19 knowledge, attitudes or preventative practices for visitors to LTCH. Hence, the research team adapted the Covid-19 Knowledge and Perceptions questionnaire, which has been used with the general adult population (n = 1034) in the United States[7] and was originally developed for use with university students in East Asia (n = 821). Cronbach's Alpha was reported as 0.71 for the original nine-items of the preventative practices subscale.[8]

In the current study, six items were retained to assess Covid-19 knowledge (ie, symptoms, routes of transmission, prevention and control), one item to assess participants' attitude about the effectiveness and use of PPE, and seven items were retained to assess protective practices. Items were refined to sample knowledge relevant for planning a visit to LTCH and preventative practices while in LTCH. For example, the original item, "Covering mouth when coughing or sneezing"[8] was refined to: "When visiting your family member, do you cover your mouth when coughing or sneezing?" Items on the original questionnaires that were perceived as less relevant to a visit in LTCH were excluded, such as: "Eating or contacting wild animals will result in Covid-19 transmission" and "Individuals should avoid going to crowded places and public transportation".[7] Lastly, four items were developed by the researchers to assess participants' perception of access to Covid-19 information and infection control resources based on factors identified as impacting IPAC adherence identified in the literature.[9] These items aimed to address access to information and training opportunities and included, for example, "I have access to information about Covid-19 in the long-term care home". The questionnaire was piloted with three members of the general public who provided feedback that the items were clear and comprehensive.

Participants' ability to apply knowledge and demonstrate skills related to IPAC was evaluated by trained observers using the World Health Organization (WHO) 14 steps handwashing checklist; the recommended five moments of hand hygiene; and the WHO 16-steps PPE checklist for donning and doffing.[10] These checklists have been widely used to evaluate the performance of donning and doffing, handwashing and hand hygiene moments.[11] Completion of all study components took approximately 50 minutes.

Data Analysis

Data were entered into Microsoft Excel and checked for accuracy by two members of the research team. Descriptive statistics were analyzed using SPSS 28 software to describe sample characteristics. Summative totals and mean scores were calculated for outcome measure scales. Correlations were visually examined to identify potential patterns and were analyzed using non-parametric tests (Spearman's Rho test and Mann Whitney test). Data from recorded simulations were extracted independently by two members of the research team using standardized checklists. Any discrepancies that occurred between these reviewers were resolved through discussion.

Results

Demographics

Participants were predominantly female (*n*=27; 68.0%), and ages ranged from 31 to 85 years, with the majority between 51 and 65 years. Most participants (*n*=36, 90.0%) reported receiving IPAC training between March 2020 and October 2022, with only 8.3% (*n*=3) of those reporting they received additional retraining. The most common form of training reported was individual (*n*=29, 81.0%) in-person sessions (*n*=27, 75.0%). The frequency of visitations ranged from daily to every 3 months, with the visits being between 30 minutes to 8 hours long. Participants reported engaging in several activities while visiting: sitting at the bedside, watching television, participating in recreational activities, going on outings with the resident outside, assisting with meals, and helping other residents. Descriptive statistics for the sample characteristics are presented in Table 1.

Covid-19 Knowledge, Use of Protective Practices, and Perceived Access to Resources

Participants scored highly on the Covid-19 knowledge questionnaire subscale with 80.3% of participants correctly answering 5/6 questions. One area of weakness was knowledge of common symptoms of Covid-19, which only 40.0% of participants answered correctly. The most frequently reported protective practices that participants stated

Table 1 Demographic Information

Characteristics	
Sex n *(%)*	
Female	27 (67.5)
Male	13 (32.5)
Language n *(%)*	
English	30 (75.0)
French	10 (25.0)
Location of LTCH n *(%)*	
Urban	38 (95.0)
Rural	2 (5.0)
Initial IPAC training n *(%)*	
Received	36 (90.0)
Did not receive	3 (7.5)
Unsure	1 (2.5)
Training format n *(%)*	
Individual	29 (72.5)
Group	6 (15.0)
Combination	1 (2.5)
Did not receive/unsure	4 (10.0)
Training method n *(%)*	
In-Person	27 (75.0)
Telephone	3 (8.3)
Internet	2 (5.6)
Combination/other	2 (5.6)
Unable to recall/did not receive	6 (15.0)
IPAC Re-Training *n (%)*	
Received	3 (8.3)
Did not receive	37 (92.5)
Time Since Initial Training [in months] M *(SD)*	18.5 (9.67)
Frequency of Visits per Month M *(SD)*	11.6 (9.71)

they "always do" while visiting included covering their mouth if coughing, wearing a mask and washing their hands before entering a space (range 82.0–100.0%). However, some protective measures were not frequently practiced, such as washing hands after coughing, touching contaminated objects or before entering another resident's space (61.5–64.1%). The least performed self-reported practice was avoiding touching one's face during visits (23.1%).

Participants perceived access to resources in LTCH was relatively low. Receiving answers to questions regarding safe visiting, accessing training/information related to Covid-19 and information on PPE use were perceived as "very easy to access" by less than 50.0% of participants (38.5–46.2%) (Table 2). Access to information about handwashing was reported as slightly better, with 64.1% reporting hand-washing information was very easy to access.

Observed IPAC Measure Skills

No participant correctly performed all recommended steps for handwashing with soap and water. Common errors included not removing wrist jewelry, missing areas (eg, under fingernails and wrists), washing for less than 15 seconds, and turning off the faucet with hands rather than a paper towel. Only two participants (5.0%) performed all recommended moments of hand hygiene. The most common missed moments were: "washing before and after entering another resident"s space' and 'washing after removing PPE" (Table 3).

It was observed that 14 participants (35.0%) donned PPE correctly, and five participants (12.5%) doffed PPE correctly. Steps performed incorrectly or missed included tying the gown and wearing the gloves over the cuff of the gown. Participants

Table 2 COVID-19 Knowledge, Protective Practices Reported, and Perceived Access to Resources in LTCH (N = 40)

Subscale	n (%)
COVID-19 knowledge, correct responses	
Common symptoms	17 (40.0)
Less common symptoms	37 (90.0)
Transmissible without fever	37 (90.0)
Droplet transmission	33 (82.5)
Contaminated object transmission	34 (87.2)
Risk/severity in older adults	40 (97.5)
Attitude about IPAC	
Perceived effectiveness of IPAC	37 (92.5)
Protective practices reported, "I always do this"	
Cover mouth if coughing	39 (100.0)
Wear a mask	32 (82.0)
Avoid touching face	9 (23.1)
Wash hands before entering space	33 (84.6)
Wash hands before approaching another resident	25 (64.1)
Wash hands after coughing	24 (61.5)
Wash hands after touching contaminated objects	24 (64.1)
Access to resources in LTCH, "Very easy to access"	
PPE use information	18 (46.2)
Hand-washing information	25 (64.1)
COVID-19 training	17 (43.6)
Answers to questions about safe visiting	15 (38.5)

Table 3 Observed Handwashing Skills and Moments of Hand Hygiene (N = 40)

Skill performed correctly	**n (%)**
Handwashing steps	
1. Removed jewelry	1 (3.0)
2. Wet hands with warm running water	14 (35.0)
3. Applies soap from dispenser	24 (60.0)
4. Rubbed hands for 15 seconds	15 (39.5)
5. Retained soap on hands	21 (60.5)
6. Washed front	31 (81.6)
7. Washed back	22 (57.9)
8. Washed fingers	16 (42.1)
9. Washed under fingernails	3 (7.9)
10. Washed wrists	7 (18.4)
11. Did not raise hands	22 (57.9)
12. Rinsed	21 (55.3)
13. Dried thoroughly	17 (44.7)
14. Turned off faucet with towel	5 (27.8)
Total: All 14 steps	0 (0.0)
Moments of hand hygiene	
1. Before entering the resident's space	35 (87.5)
2. Before entering a different resident's space	8 (20.0)
3. After giving a resident blanket	20 (50.0)
4. After disposing of a dirty tissue	29 (72.5)
5. After removing PPE	22 (55.0)
Total: All 5 moments of hand hygiene	2 (5.0)

also frequently touched their masks, contaminating them with their gloves. While doffing, the most common errors included removing the first glove incorrectly and touching contaminated areas when removing the gown and mask (Table 4).

Correlations

Spearman's Rho test was completed evaluating potential relationships between variables. Weak positive correlations were found between participants' Covid-19 Knowledge and Moments of Hand Hygiene scores (r=0.338, p=0.033); Moments of Hand Hygiene and PPE Donning Checklist scores (r=0.345, p=0.029), and between PPE Donning and PPE Doffing Checklist scores (r=0.349, p=0.027). The duration of time since participants' initial training was not correlated with any outcomes. A Mann Whitney test was conducted to observe gender differences in outcomes, with no significant results (Table 5).

Table 4 Observed PPE Donning and Doffing Skills (N = 40)

Skill performed correctly	n (%)
PPE donning steps	
1. Tied gown at neck and waist	6 (15.0)
2. Placed mask over nose and mouth	30 (75.0)
3 .Tied mask	33 (82.5)
4. Adjusted mask nose piece	31 (79.5)
5. Applied gloves	34 (85.0)
6. Placed glove cuff over gown	12 (30.0)
Total: Donned PPE correctly	14 (35.0)
PPE doffing steps	
1. Removed away from resident	36 (92.3)
2. Removed first glove	19 (47.5)
3. Removed second glove	32 (80.0)
4. Discarded gloves	34 (85.0)
5. Untied gown at neck and waist	18 (46.2)
6. Removed gown	11 (28.2)
7. Rolled inside of gown into bundle	16 (41.0)
8. Discarded gown	34 (85.0)
9. Does not touch the laundry hamper with hands	21 (52.5)
10. Removed mask ties	22 (55.0)
Total: Doffed correctly	5 (12.5)

Table 5 Correlations for Study Outcomes

	1	2	3	4	5	6	7
1. Covid-19 knowledge	1.00	0.000	0.174	0.179	0.338*	0.258	0.085
2. Protective practices	0.000	1.00	0.260	0.193	0.060	0.248	0.161
3. Access to PPE resources	0.174	0.260	10.00	0.003	0.023	0.100	0.023
4. Handwashing steps checklist	0.179	0.193	0.003	1.00	0.057	0.059	0.270
5. Moments of hand hygiene	0.338*	0.060	0.023	0.057	1.00	0.345*	0.096
6. PPE donning steps checklis	0.258	0.248	0.100	0.059	0.345*	1.00	0.349*
7. PPE doffing steps checklist	0.085	0.161	0.023	0.270	0.096	0.349*	1.00

Note: *p is significant at the 0.05 level.

Discussion

To our knowledge, this is the first study to identify the training received, level of Covid-19 knowledge, use of protective practices, perceived access to resources, and skills in IPAC measures amongst visitors to LTCH. The most common forms of training reported in our study were individual in-person sessions, which in-person sessions are frequently

recommended delivery mode of education and/or training delivery for visitors of LTCH in the literature.[12–21] Despite having high scores on the Covid-19 knowledge subscale, a positive attitude towards the effectiveness of IPAC and previous training in IPAC in 90.0% of participants, missed and/or incorrect performance of IPAC measures were prevalent. These findings may be due to lack of access to resources (eg, PPE use, and answers to questions about safe visiting) and/or lack of access to training that meets visitors' needs.

Handwashing is widely considered the most important IPAC practice; however, only 5.0% of participants demonstrated all five recommended hand hygiene moments during the simulation. Although it is possible that the low compliance with handwashing does not reflect participants' typical practices, the findings are consistent with others who report visitors of healthcare institutions have low rates of handwashing and sanitizing despite receiving education, training, and other support (eg, posters).[22–24] Lee et al,[9] for example, found only 11.0% hand hygiene compliance amongst visitors to maternity and pediatric wards. In addition to being included in the mandatory education and training participants received prior to visiting LTCH, the importance of handwashing was the focus of many mass media campaigns during the Covid-19 pandemic.[10,25,26]

In the current study, hand hygiene was completed most often by participants before entering a residents' space (87.5%) and after disposing of a dirty tissue (72.5%). However, compliance was much lower when entering a different resident's space, providing a blanket or removing PPE (range 20.0–55.0%). These incidents represent opportunities for transmission either to the participant (by touching a contaminated object) or to the resident, which is concerning. Other researchers have similarly reported that individuals such as hospital visitors (55.0%) and nurses (65.1%) are more likely to wash their hands after exposure to bodily fluids than after touching a patient, resident or their environment.[9,27] Individuals who perceive an object or environment to be "dirty" are more likely to wash their hands after making contact and hand-washing information frequently focuses on the importance of the "first moment" of hand hygiene (ie, washing upon entering a room).

Participants also reported using protective practices when visiting more frequently than they demonstrated during the simulation. For example, although 64.0% of participants reported always performing hand hygiene before entering another resident's space, during the simulated visit only 20.0% of participants did so. This overestimation of hand hygiene compliance is similar to findings from a study visitors' hand-hygiene knowledge, attitudes and practices in maternity and pediatric hospitals in Canada.[9] Lee et al[9] found that visitors reported following hand hygiene guidelines 96.0% of the time on average, although covert observers reported an average compliance amongst visitors of only 11.0%.

A weak positive correlation was found between Covid-19 knowledge and moments of hand hygiene. This implies that participants who possessed more knowledge about Covid-19 demonstrated a slightly higher frequency of engaging in hand hygiene practices during the simulated visit. However, the correlation was not particularly strong, as exemplified by the fact that 87.0% of participants were aware that Covid-19 could be transmitted via objects, yet only 50.0% of participants performed hand hygiene after coming into contact with another resident. Overall, the weak relationship suggests that other factors beyond knowledge may influence individuals' hand hygiene behaviors.

It is suggested that compliance with handwashing practices diminishes over time, as does the effectiveness of visual cues, such as signage.[28] Given that the pandemic has been ongoing for nearly three years, it is possible that the low compliance with handwashing practices has been gradual. Considerations should be given for re-retraining or the development of regular updates and/or refreshers on IPAC practices. For instance, visual cues displayed in LTCH should be replaced periodically to avoid being overlooked or dismissed by visitors.

Less than half of the participants reported that it was very easy to access PPE information and Covid-19 training, and the mean time since participants' initial training was 18.5 months. Difficulty in accessing information and time since training may help to explain participants' performance of IPAC measures in this study. Further research should be conducted to examine factors that promote handwashing practices and compliance within LTCH given that many existing studies focus on acute care. Additionally, the main consideration in the environmental design of LTCH is often on creating homelike spaces that are aesthetically pleasing over being sterile.[29–31] Therefore, the physical environment of LTCH must support evidence-informed handwashing practices through the accessibility and visibility of sinks or washing stations and providing access to hydroalcoholic solutions.

Another noteworthy finding is that only 35.0% of participants donned PPE correctly and 12.5% doffed correctly. However, this suboptimal performance and adherence to PPE donning and doffing have also been observed in studies of healthcare workers, wherein only 50.0% of healthcare workers donned PPE correctly and 37.0–51.0% doffed PPE correctly.[32–36] This suggests the need for further training for both visitors and staff. In this study, participants perceived lack of access to Covid-19 training and PPE information may have been a barrier to IPAC measures. Centers for Disease Control and Prevention and Ontario Health[17–37] recommend education and/or training for LTC visitors when admitting residents and when implementing precautions. The WHO,[38] the Ontario Ministry of LTC,[39] Ontario Public Health[18] recommend repeated education and training: general visitors should complete IPAC education and training before the first visit; essential caregivers should complete training every six months; and visitors should retrain if they are observed as being non-compliant.

This study provides insight into the IPAC knowledge and practices of visitors to LTCH. Findings highlight specific areas of weakness that may be targeted for future education and training. Causes of non-compliance vary widely: lack of knowledge/training, scepticism on the effectiveness and/or need for IPAC measures, lack of mindfulness when visiting, complacency, or disregard for rules. Therefore, it may be necessary to employ other strategies when developing visitation policies during an infectious outbreak or pandemic rather than a single standardized approach for all visitors like signage[13,19,34,37] and online modes such as videos.[16,19,37] The authors of a scoping review state that printed information and videos are the preferences of older adults for education materials[40] which are a great proportion of visitors of LTCH.

LTCH should recognize and prioritize resources needed to support visitors' compliance, such as education and training by staff who are knowledgeable and skillful, sinks and hand hygiene stations that are visible and accessible, and visual cues of how and when to employ IPAC measures. When developing strategies to address the education and training of visitors, consideration should be given to the organizational and personal factors that influence how staff are able to support visitors. Despite the findings in this study, LTCH should continue to support safe visitation by ensuring visitors understand when and how to uphold IPAC measures. This is key to minimizing the threats that infectious agents pose to residents and staff of LTCH.

Study Limitations

The results must be considered in light of limitations. First, the small sample size and sampling method (convenience with snowball sampling) limits the generalizability of the results to broader contexts. Second, the variability of previous training (ie provider, frequency, timing, mode of delivery, content) and the chronological gap without follow-up in IPAC training are variables that considerably affect participants' current knowledge and practices. Third, the study took place two years after the Covid-19 pandemic was declared, and LTCH was open to visitors. It is possible that the expectations of visitors to uphold IPAC measures lessened over time. Finally, our study assumes that LTCH abided by public health guidelines and ensured staff who provided visitors education and training on IPAC had the expertise to do so. However, given the limited availability of professional staff in LTCH and the reliance on unregulated workers, it is possible that the findings reflect the quality of education and training provided rather than compliance with IPAC protocols. In addition, although the Covid-19 Knowledge and Perceptions questionnaire has been used previously in descriptive studies with large sample sizes, only one study has previously reported on internal consistency on the preventative practices' subscale, and our adapted version has not been tested or validated for use beyond a pilot test with the target population. Hand hygiene during the donning/doffing steps was not in the items on the checklist of moments to observe and was assessed separately. We recognize the timing of hand hygiene in the donning/doffing sequences should've been assessed. Hand hygiene should be carried out at key moments during donning/doffing, to avoid cross-contamination (from one resident to another via the visitor, or directly to the visitor by self-contamination). Lastly, while observers met initially to promote consistency in structured observations and use of the checklists, we did not formally evaluate inter-rater reliability.

Conclusion

Most of the LTCH visitors demonstrated very low skills in IPAC, notably none accurately performing hand hygiene, nor at recommended moments. In addition, most of them performed PPE donning and/or doffing incorrectly. This deserves further attention to strengthen the adequation with IPAC measures among LTCH visitors.

Disclosure

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References

1. World Health Organiszation. *Who director-general's opening remarks at the media briefing*; 2020.
2. Canadian Institue for Health Information (CIHI). Organ replacement in Canada: CORR annual statistics; 2019Availabe from: https://www.cihi.ca/en/organ-replacement-in-canada-corr-annual-statistics-2019. Accesssed July 12, 2024.
3. Estabrooks C, Staus S, Flood C, et al. Restoring trust: COVID-19 and the future of long-term care. *FACETS*. 2020;32(4–5):358–364.
4. Koopmans R, Verbeek H, Bielderman A, et al. Reopening the doors of Dutch nursing homes during the COVID-19 crisis: results of an in-depth monitoring. *Int Psychogeriatr*. 2022;34(4):391–398. doi:10.1017/S1041610221000296
5. Armstrong DA, Lucas J. Measuring and comparing municipal policy responses to COVID-19. *Can J Polit Sci*. 2020;53(2):227–238. doi:10.1017/S000842392000044X
6. Low L, Hinsliff K, Sinha S, et al. Safe visiting at care homes during covid-19: A review of international guidelines and emerging practices during the COVID-19 Pandemic. *Int Long Term Care Policy Net*. 2021.
7. Clements J. Knowledge and behaviors toward COVID-19 among US residents during the early days of the pandemic: cross-sectional online questionnaire. *JMIR Public Health Surveill*. 2020;6(2):e19161. doi:10.2196/19161
8. Zhao B, Kong F, Aung M, Yuasa M, Woo Nam E. Novel coronavirus (COVID-19) knowledge, precaution practice, and associated depression symptoms among university students in Korea, China, and Japan. *Int J Environ Res Public Health*. 2020;17(18):66–71. doi:10.3390/ijerph17186671
9. Lee Z, Lo J, Luan YL, et al. Patient, family, and visitors hand hygiene knowledge, attitudes, and practices at pediatric and maternity hospitals: a descriptive study. *Am J Infect Control*. 2021;49(8):1000–1007. doi:10.1016/j.ajic.2021.02.015
10. World Health Organiszation. Infection Prevention and Control: guidelines.; 2022Available from: https://wwwwhoint/health-topics/infection-prevention-and-control#tab=tab_1. Accesssed July 12, 2024.
11. Lambe KA, Lydon S, Madden C, et al. Hand hygiene compliance in the ICU: a systematic review. *Crit Care Med*. 2019;47(9):1251–1257. doi:10.1097/CCM.0000000000003868
12. Agency for Integrated Care. Caregiver Train Course Summary. 2023Available from: https://www.aic.sg/caregiving/caregiver-training-course/Documents/PN_Caregiver%20Training%20Course.pdf. Accesssed July 12, 2024.
13. Australian Government Department of Health. Visitation Guidelines for Residential Aged Care Facilities; 2021Available from: https://www.health.gov.au/sites/default/files/documents/2021/06/coronavirus-covid-19-national-aged-care-guidance-aged-care-visitation-guidelines_0.pdf. Accesssed July 12, 2024.
14. Bergman C, Stall N, Haimowitz D, et al. Recommendations for welcoming back nursing home visitors during the COVID-19 pandemic: results of a Delphi panel. *J Am Med Dir Assoc*. 2020;21(12):1759–1766. doi:10.1016/j.jamda.2020.09.036
15. Centers for Disease Control and Prevention. CDC's core infection prevention and control practices for safe healthcare delivery in all settings; 2022Availabe from: https://www.cdc.gov/infectioncontrol/guidelines/core-practices/index.html?CDC_AA_refVal=https%3A%2F%2Fwww.cdc.gov%2Fhicpac%2Frecommendations%2Fcore-practices.html. Accesssed July 12, 2024.
16. Centers for learning research & innovation in long-term care. New IPAC ELearning Course Released2023Available from: https://clri-ltc.ca/2023/04/new-ipac-elearning-course-released/. Accesssed July 12, 2024.
17. Ontario Health. Infection prevention and control standard for long-term care homes; 2022Availabe from: https://ltchomes.net/LTCHPORTAL/Content/12.%20IPAC%20Standard%20-%20EN.pdf. Accesssed July 12, 2024.
18. Ontario Public Health. visitor policy long-term care homes during COVID-19 Pandemic; 2022.
19. Public Health Agency of Canada.Infection prevention and control for covid-19: Interim guidance for long-term care homes; 2021Availabe from: https://www.canada.ca/en/public-health/services/diseases/2019-novel-coronavirus-infection/prevent-control-covid-19-long-term-care-homes.html#a10. Accesssed July 12, 2024.
20. Tupper S, Ward H, Parmar J. Family presence in long-term care during the covid-19 pandemic: Call to action for policy, practice, and research. *Can Geriatr J*. 2020;23(4):335–339. doi:10.5770/cgj.23.476
21. UniversalCare. Pandemic, Epidemic & Outbreak Plan Policy; 2022Availabe from: https://villamarconi.com/sites/villamarconi.com/files/villa/villa_marconi_pandemic_epidemic_outbreak_plan.pdf. Accesssed July 12, 2024.
22. Hummel A, Vleck K, Greenough W. Quality improvement initiative for improving hospital visitors hand hygiene. *J Hosp Infect*. 2019;101(4):422–423. doi:10.1016/j.jhin.2018.12.019
23. Jung M, Kang J. Hand hygiene compliance among visitors at a long-term-care hospital in Korea: a covert observation study. *J Korean Acad Community Health Nurs*. 2019;30(1):99–107. doi:10.12799/jkachn.2019.30.1.99
24. Kim D, Lee O. Effects of audio-visual stimulation on hand hygiene compliance among family and non-family visitors of pediatric wards: a quasi-experimental pre-post intervention study. *J Pediatr Nurs*. 2019;46:e92–e97. doi:10.1016/j.pedn.2019.03.017
25. Center for Disease control. Life Is Better with Clean Hands; 2020Availabe from: https://wwwcdcgov/handwashing/campaigLTCHtml. Accesssed July 12, 2024.
26. Government of Canada. Coronavirus Disease (COVID-19); 2022Availabe from: https://www.canada.ca/en/public-health/services/diseases/coronavirus-disease-covid-19.html?utm_campaign=hc-sc-phaccovidphmsem-22-23&utm_medium=sem&utm_source=ggl&utm_content=ad-text-en&utm_term=covid&adv=2223-266650&id_campaign=17228525447&id_source=137771703978&id_content=597194351934&gclid=Cj0KCQiAm5ycBhCXARIsAPldzoX7WvOyzZ8U5RhAbmQWvkgNvunAjPDvz8gOrIlR1uNXbYptC9Y_npcaAqzdEALw_wcB&gclsrc=aw.ds. Accesssed July 12, 2024.
27. McDonald MV, Brickner C, Russell D, et al. Observation of hand hygiene practices in home health care. *J Am Med Dir Assoc*. 2021;22(5):1029–1034. doi:10.1016/j.jamda.2020.07.031
28. Fakhry M, Hanna G, Anderson O, Holmes A, Nathwani D. Effectiveness of an audible reminder on hand hygiene adherence. *Am J Infect Control*. 2012;40(4):320–323. doi:10.1016/j.ajic.2011.05.023
29. Chaudhury H, Cooke H, Cowie H, Razaghi L. The influence of the physical environment on residents with dementia in long-term care settings: a review of the empirical literature. *Gerontologist*. 2018;58(5):e325–e337. doi:10.1093/geront/gnw259

30. de Boer B, Bozdemir B, Jansen J, Hermans M, Hamers JPH, Verbeek H. The homestead: developing a conceptual framework through co-creation for Innovating Long-Term Dementia Care Environments. *J Environ Res Public Health*. 2021;18(1):57. doi:10.3390/ijerph18010057
31. Seetharaman K, Chaudhury H, Kary M, Stewart J, Lindsay B, Hudson M. Best practices in dementia care: A review of the grey literature on guidelines for staffing and physical environment in long-term care. *Can J Aging Rev Can Vieil*. 2022;41(1):55–70. doi:10.1017/S0714980820000392
32. Lamhoot T, Ben Shoshan N, Eisenberg H, et al. Emergency department impaired adherence to personal protective equipment donning and doffing protocols during the COVID-19 pandemic. *Isr J Health Policy Res*. 2021;10(1):1–6. doi:10.1186/s13584-021-00477-7
33. Phan L, Maita D, Mortiz D, et al. Personal protective equipment doffing practices of healthcare workers. *J Occup Environ Hyg*. 2019;16(8):575–581. doi:10.1080/15459624.2019.1628350
34. Suen L, Yue P, Tong D, et al. Self-contamination during doffing of personal protective equipment by healthcare workers to prevent Ebola transmission. *Antimicrob Resist Infect Control*. 2018;7:1–9. doi:10.1186/s13756-018-0433-y
35. Zhang H, Sha Y, Hong-Xia L, Jian-Ping Y. The error-prone operational steps and key sites of self-contamination during donning and doffing of personal protective equipment by health care workers. *Disaster Med Public Health Prep*. 2022;16(6):2486–2491. doi:10.1017/dmp.2021.142
36. Alao MA, Durodola AO, Ibrahim OR, Asinobi OA. Assessment of health workers'knowledge, beliefs, attitudes, and use of personal protective equipment for prevention of COVID-19 infection in low-resource settings. *Adv Public Health*. 2020;2020:1–10. doi:10.1155/2020/4619214
37. Centers for Disease Control and Prevention. Interim Infection Prevention and Control Recommendations for Healthcare Personnel during the Coronavirus Disease 2019 (COVID-19) Pandemic.; 2023Available from: https://www.cdc.gov/infectioncontrol/guidelines/core-practices/index.html?CDC_AA_refVal=https%3A%2F%2Fwww.cdc.gov%2Fhicpac%2Frecommendations%2Fcore-practices.html. Accesssed July 12, 2024.
38. World Health Organiszation. Infection Prevention and Control during Health Care When Coronavirus Disease (COVID-19) Is Suspected or Confirmed; 2021Availabe from: https://www.who.int/publications/i/item/WHO-2019-nCoV-IPC-2021.1. Accesssed July 12, 2024.
39. Ontario Ministry of Long-Term Care. IPAC Program Guidance.; 2021Available from: https://hpepublichealth.ca/wp-content/uploads/2021/01/20210114-Ministry-of-Long-Term-Care-Infection-prevention-and-control-IPAC-January-2021.pdf. Accesssed July 12, 2024.
40. Goodman C, Lambert K. Scoping review of the preferences of older adults for patient education materials. *Patient Educ Couns*. 2023;108:107591.