



## Immunosenescence and Infectious Disease Risk Among Aging Adults

### Management Strategies for FNP's to Identify Those at Greatest Risk

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#### Keywords

• COVID-19 • Immunosenescence • Leadership • Nursing • Pandemic

#### Key points

- Immunosenescence is a progressive contributing risk for the development of viral infection.
- Cohorting can be an effective means of reducing overall population risk.
- Immunosenescence is a progressive contributing risk factor for the development of viral infection and infectious disease among the older adult population, especially for those residing in nursing homes.
- The use of interventions such as cohorting by nurse leaders in nursing homes can be an effective strategy for reducing overall population risk among older adult residents.

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## INTRODUCTION

Nurses at the point of care face several challenges and concerns related to protecting older adult patients over 65 years who are at the highest risk for coronavirus disease-2019 (COVID-19)-related infections. These age-associated immunologic changes that occur among this age-group are referred to as *immunosenescence*. Progressive decline in immune processes over each passing decade reduces the ability to trigger effective antibodies and cellular responses to infectious diseases and vaccines [1]. It is necessary to understand the risks posed by immunosenescence to plan protective adjuvants and interventions. This article is designed to provide the reader basic information on immunosenescence and its predictable effects on immunocompetence. Implications for decision-making on the part of nursing leadership to protect the vulnerable and control outbreaks are guided by a recommendation framework developed by the *Coronavirus Commission for Safety and Quality in Nursing Homes* [2]. Such strategies include appointing an infection control manager, cohorting, and establishment of consistent testing and monitoring. These concepts are reviewed and followed by a case exemplar to facilitate application to practice.

## PATHOPHYSIOLOGY

### Innate and adaptive immune systems

**The innate immune system:** Immunosenescence emerges from changes to both the innate and adaptive immune systems [3]. The *innate immune system* includes physical barriers and select immune cell classes that are activated without the presence of an antigen. The main cells of the innate immune system and its soluble mediators include cytokines, hormones, and free radicals that remain well preserved throughout aging, but lose their ability to effect protective responses in advanced age. Examples of these age-related changes include decreases in phagocytic capability of neutrophils and diminished functional ability of natural killer cells (refer to Box 1). Blunted febrile responses are seen in response to pyrogenic cytokines [4].

**The adaptive immune system:** Although innate immune changes place the older adult at increased risk for developing infection, changes in the adaptive arm of the immune system are of greater concern for vaccine responsiveness and defense against viral infection.

The *adaptive immune system*, also known as the acquired immune system, includes elements of two intimately linked aspects: *humoral* and *cell-mediated* immunity. Humoral immunity includes a combination of peptides, complement proteins, and antibodies produced by B cells. Cell-mediated immunity affects T-cell responses, which progressively lose their potency with aging. As a result, advancing age is associated with an increase in the number of B cells, to compensate for the progressive decrease in their functional ability. The effectiveness of the antibody released from immunosenescent B cells is diminished and is produced in lower amounts. There are also fewer naïve T cells and a large accumulation of memory T cells. The lower number of naïve T cells reflects a decline in responsiveness to new antigens. Together, reduced responsiveness to new

**Box 1: Main features of immunosenescence**

Cell population	Aging-associated change
B cells	Number of cells increases while the functional ability of these cells decreases. Antibody is produced in lower amounts and generally is of lower quality.
Macrophages	The number of macrophages remains consistent, but phagocytic ability is decreased.
Natural killer	Increased number of cells, with concomitant decrease in functional ability.
Neutrophils	No significant change in the number of cells produced but decrease in functional capacity and a shorter life span.
T cells	<ul style="list-style-type: none"> <li>• Decrease in number of naïve T cells, resulting in diminished response to new antigens.</li> <li>• Increased number of memory cells lineage committed to specific antigen. In other words, large number of cells programmed to respond to other viruses.</li> </ul>

*Adapted from Sorenson, M. (2010). Immunosenescence: An Unappreciated Risk. MedSurg Matters, 1, 6-8; with permission.*

antigen and increased numbers of memory T cells indicates consequences of the older adult's lifelong exposure to viral infections. Common viral etiologies targeting the respiratory system in older adults are provided in Box 2.

Increases in memory T cells, reduced naïve T cells, and lower B cell functional ability, results in less ability to produce an effective response to vaccination. In studies of influenza vaccines, even adding adjuvant immune response enhancers fails to produce the desired antibody responses in older adults [5]. Similar findings are being seen in emerging trials of select COVID-19 vaccine with antibody levels manifesting lower in adults over age 70 [6]. Such findings show the need for nursing leadership to implement protections beyond using vaccination programs.

Immunosenescence presents a dilemma faced in previous pandemics: Immunization is required to achieve immunity, whereas at the same time aging is associated with a reduction in vaccination responsiveness. Responsibly, we

**Box 2: Common respiratory viral etiologies in older adult populations**

Adenovirus  
 Coronaviruses  
 Human metapneumovirus  
 Influenza A and B  
 Parainfluenza  
 Respiratory syncytial virus

must decrease the older resident's exposure to the virus even as the influx of new infections increase. To best address an action plan that informs safer, healthier, resilient nursing homes, in the existing context of immunosenescence, the conceptual framework for this article is aligned with recommendations from the *Coronavirus Commission for Safety and Quality in Nursing Homes* [2].

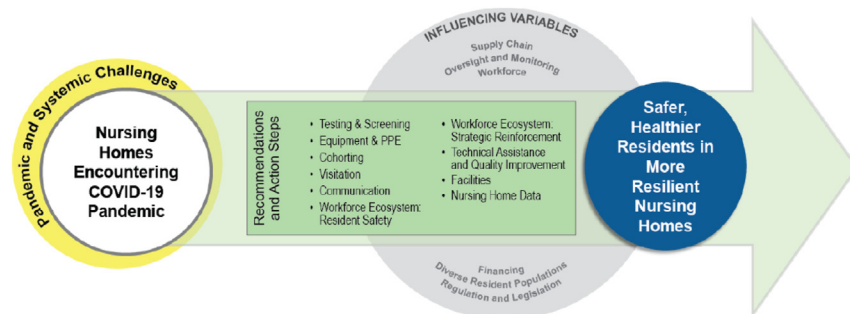
### Conceptual framework

The task of nursing leadership in any setting to prepare for a pandemic response requires specific considerations and steps. Many of these same steps are necessary to manage care of an individual at risk for immunosenescence. The conceptual model developed by the *Coronavirus Commission for Safety and Quality in Nursing Homes* [2] was developed to reduce risk of exposure to COVID-19, but can also inform the care to reduce any viral infection that may be encountered by a population facing immunosenescence (refer to Fig. 1). Regardless of viral etiology, protective measures implemented in response to the latest coronavirus-associated pandemic apply. The model presented here deals not only with nursing leadership but also it shows the importance of collaboration, delegation, and shared responsibility to carry out protective recommendations. These can be readily applied by nursing in facing infectious outbreaks in long-term care situations.

In the model, systemic challenges place older adults at increased risk. Although there are institutional variables that influence implementation of protective actions, select interventions can be readily implemented by nursing leadership to reduce risk and enhance protection of uninfected older adults.

## HISTORY

Severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2), the pathogen responsible for COVID-19, was first identified in in Wuhan, China in



**Fig. 1.** Commission recommendation framework. Recommendations and action steps are designed to improve the ability of long-term care settings to respond to the challenges raised by COVID-19. Implementation of recommendations would result in enhanced resident safety. (© 2020 The MITRE Corporation. All Rights Reserved. Reprinted with permission of The MITRE Corporation.)

December of 2019 and by March of 2020 was declared a pandemic. Older adults, especially in nursing home settings, were affected by the virus by virtue of the proximity of residents and the fact that the transmission of the virus occurs by respiratory droplets. This mode of transmission made it impossible for long-term care residents to avoid contracting the virus especially as mask wearing was not the norm initially.

COVID-19 presents with a wide range of symptomatology, from mild-to-severe life-threatening. Age remains the strongest risk factor for severe COVID-19 outcomes accounting for 81% of US COVID-19-related deaths in people over the age of 65 years. Residents of long-term care facilities accounted for more than 35% of all COVID-19 deaths [7] even though only 1% of the US population lives in long-term care facilities.

The older adult population, many of whom suffer from multiple chronic disease states affecting the cardiovascular, pulmonary, endocrine, and renal systems, are at a higher risk for the development of severe illness from COVID-19. Symptomatology of COVID-19 includes the following: fever or chills, cough, shortness of breath, fatigue, muscle or body aches, headache, new loss of taste or smell, sore throat, congestion, nausea or vomiting and diarrhea [8]. Fatigue and cognitive impairment are the most common debilitating symptoms of post-COVID-19 syndrome (refer to Box 3) [9].

#### Family and adult nurse practitioners

Family and adult primary care nurse practitioners are the key primary care providers working in long-term care facilities. As key providers they need to be vigilant in the management of this resident population by recognizing symptoms early and initiating screening and up to date treatment protocols. Screening for the virus using the reverse transcription polymerase chain reaction (RT-PCR) method has been shown to be the gold standard for making an accurate diagnosis of COVID-19 [10]. Early diagnosis is important as treatment options such as monoclonal antibodies and antivirals need to be started

#### **Box 3: Nonspecific signs and symptoms of viral infection in older adults**

- Increasing weakness
- Delirium, confusion, and restlessness
- Nausea, vomiting, or anorexia
- Partial or total anosmia
- Tremor and ataxia
- Increased urinary incontinence
- Sore throat
- Nasal congestion or drainage
- Diarrhea

early in the disease state and have been shown to reduce the risk of hospitalization and death. It is also important to ensure that all residents have been vaccinated and adequately boosted according to the CDC 2022 guidelines.

The older adult resident is subject to multiple comorbidities and nurse practitioners practicing in long-term care and outpatient care are experts in the management of chronic disease, a predisposition to developing severe COVID-19 symptoms. The treatment goal is to keep residents stable and improving the quality of life among older adults through the practice of primary, secondary, and tertiary prevention.

#### Assessment: testing and screening

Vigilance and steady surveillance are essential elements for weathering the “perfect storm” describing this pandemic and nursing homes [11]. The congregated nature of living, underlying comorbidities and immunosenescence of residents, low numbers of registered nurse (RN) staff and minimal preparation of other caregivers combined with staffing shortages due to the pandemic, all converge in a society aching to break confinement and return to normal.

Concern for the rapid spread of the virus affects both nursing home residents and the staff that attends them. Nearly all nursing home personnel are intimately connected to risk; made clear with Centers for Medicare and Medicaid (CMS’s) estimate of 1632 COVID-19-related nursing home staff deaths at the end of March 2021. Although the country reeled from the waves of rising incidence and deaths, the needs of long-term care facilities for material resources gave way to the priorities of overcrowded acute care settings needing more beds, isolation space, respiratory care, and protective gear. Refer to Box 4 for viral screening tests.

Although some of the current viral pandemic situation may have reached a lull and appeared to subside, the threat persists, and variants of the originating virus have emerged. Older adults will need reimmunization when guidelines are developed. Immunosenescence plays an important part in this equation for the following reasons:

- The length of time (durability) of immunity from current vaccines is still not fully known.
- *Moderna* vaccines show protective antibodies up to 6 months after the second dose in younger and middle-age adults, but these are diminished in older adults.
- Decline in antibody activity, from sensitive “live virus neutralization tests were geometrically lower as adults reached ages 56 and above [6].

#### Clinical management: maintaining a screening and testing plan: staffing

*The importance of a manager.* The centers for disease control (CDC) recommends [2] a full-time role of COVID-19 infection prevention and control (IPC) Manager of at least one person in care facilities with 100 residents, or in residences that also maintain their own ventilator or hemodialysis services. Specific CDC recommendations for the role are available from the online CDC site. There

should also be no ambiguity as to who has been assigned to coordinate and monitor IPC practices in each facility. This can be a new addition to the staff, or a qualified individual already serving the facility. Assigning a central manager with the authority to act, implement immediate changes and relocate the resident, if the situation arises, can avoid issues that arise from segmented roles with differing priorities.

#### *Vaccine protection for older adults*

Ideally, in response to viral outbreak, all residents and staff of nursing homes should be immunized against the threatening virus. Especially as immunization is expected to be less effective in older immunosenescent residents. However, in the early months of the COVID-19 outbreak in the United States, neither the vaccine nor its availability existed. Now, there are still regions in the country that have insufficient vaccine to inoculate their population. Even with the growing availability of vaccines, there are shifting waves of demand for vaccinations by some and anti-vax disinclination by others, along with confusing evidence about the length or durability of the initial vaccination series. There are indications from recent evidence that by the time the majority of the population could be immunized, a booster immunization will be required, particularly for the older adult [6]. These changing scenarios make it essential for the facility's IPC Manager to keep abreast of weekly notices from CDC, CMS, and the state and local infection reports for the nursing home setting. Weekly meetings with all staff are recommended to keep everyone aware of the numbers of active

#### **Box 4: Viral screening tests**

Description	Concerns	Implications
<p>Antibody serology test Detects antibodies present in the blood soon after infection or vaccination.</p>	<ul style="list-style-type: none"> <li>• Cannot distinguish between current coronavirus infection or vaccination [7].</li> <li>• Negative result can emerge if resident is tested during window of antibody development</li> </ul>	<ul style="list-style-type: none"> <li>• While of value, such testing cannot be completely relied upon due to variability in individual's ability to generate antibody [4, 12].</li> <li>• Those with negative results should still be subject to protective measures.</li> </ul>
<p>Viral COVID test Detects presence of virus through use of real-time reverse-transcriptase polymerase chain reaction.</p>	<ul style="list-style-type: none"> <li>• Will likely require a laboratory outside the facility.</li> </ul>	<ul style="list-style-type: none"> <li>• Nasal swabbing may be uncomfortable for residents.</li> <li>• Rather than a specific viral test, may be more beneficial to consider use of a screening panel to assess for other causative agents.</li> </ul>

cases, suspected cases, isolations, and relocations of the facility. Transparency will help avoid rumors or feelings of distrust.

#### *Screening and testing of older adults*

Why are we so concerned? Navigating symptoms, symptom severity and progression related to COVID versus age-related changes (change in function)—it is reasonable to suspect.

Screening and testing methods are an important part of maintaining vigilance against infection, but each approach has its values and limitations. Continuous screening is necessary throughout a resident's stay during a pandemic situation. It should consist of a regular checklist of assessments, and determinations for testing. Some signs and symptoms are tried and true warnings of infection in younger adults and children but provide confusing information in the case of older adults. The following screening steps are examples.

#### *Hazards of over-reliance on fever in assessment*

Fever for example, is widely being used as a screen for COVID-19 infection in the general population. In some cases, screening temperatures with a hand-held or wall device is used to allow admission to facilities if no temperature elevation is detected. This screening approach, while useful in younger or middle-aged persons, is less reliable as a person ages. Clinical studies, done two decades ago, showed that older adult body temperatures run a lower baseline and age incrementally produces a lower febrile response for each decade of life [12]. The older adult is therefore less likely to mount a temperature elevation, even if infected. The exact mechanisms for this decline have been speculated more recently to implicate immunosenescence as the source of this blunted febrile response [4]. To use body temperature as a screen for elevation in an older adult requires a record of an individualized "norm" for that older resident. Keeping track of their non-febrile or "well" baseline temperatures, with any detectable increase, will be more meaningful when combined with the more reliable surrounding signs and symptoms of any suspected illness. Other important signs of infection in older adults besides temperature elevation are generalized malaise, loss of appetite, acute cognitive changes and/or increase in respiratory rate (tachypnea) at rest.

*Non-specific signs of infection* do not designate the presence of infection, nor can they specify COVID-19 or coronavirus infection specifically. However, they can signal a need for action, which may include observation, specific testing, relocation, isolation, or even evaluation for a different infection source. Some of these signs of infection are shown by older adults, without an infection, and with possibility of blunted febrile response, can challenge assessment. However, the key to recognition is greater severity and often the confluence of several signs at once.

#### *Testing for coronavirus disease-2019 in nursing homes*

As with all guidelines for testing, screening, immunizing and treatment of COVID-19, the prudent IPC Manager will follow evolving CDC, CMS, and



State guidelines that are often reported as “Interim” recommendations. New testing measures and devices are under research and development by government, academic, and commercial groups, but the two most prevalent in use today are the antibody serology test and the viral COVID-19 test of respiratory secretions (see Box 3 [6,13,14]).

Communicating the differences in test capabilities to residents, visitors, and personnel can help them understand why many quarantine decisions are necessary:

#### *Testing of older adults in nursing homes*

- The IPC Manager will ideally align CDC recommendations [13,14] with state and federal requirements to clarify process for testing residents.
  - Triggers for testing (eg, routine admission to facility, symptoms consistent with COVID-19, new resident with active infection in facility).
  - Identify available access to tests capable of viral tests and arrangements with laboratories to process or carry out and process point-of-care tests on-site.
  - Establish the process and capacity to perform testing for all residents and staff.
  - Train health care staff to collect and process specimens correctly and safely using personal protective equipment.
  - Prepare health care staff to deal with situations where residents decline or refuse to be tested.
  - Prepare a plan for responding to test results before initial testing.
- The IPC Manager will periodically explore additional information about testing residents by State and local health departments and other nursing homes.

#### Management: isolation and cohorting

Isolation is seldom a possibility when residents or new admissions rapidly multiply. Cohorting refers to the grouping of individuals with the same condition in the same location (eg room, wing, or building). Concerning this article, the term cohorting refers to keeping residents who are COVID-19 positive or are suspected to have COVID-19 in the same space (wing, floor, etc.), that is separate from those who are COVID-19 negative or do not have exposure to COVID-19. Cohorting was a universal prevention and control approach from the World Health Organization (WHO) early in the COVID-19 pandemic [15]. It continued as part of a national disaster mitigation strategy recommended by the Centers for Medicare and Medicaid Services (CMS), the American Health Care Association (AHCA), and the National Center for Assisted Living, to deal with the US outbreak in skilled nursing facilities and long-term settings [6,15]. Cohorting was also a strategy recommended by the CMS in their *COVID-19 Long Term Care Facility Guidance alert* with actions needed to prevent the virus transmission [2]. This announcement included unprecedented flexibility with blanket waivers allowing facilities to transfer residents within the facility, to another facility, or to other non-certified locations to cohort older adults based on their COVID-19 status [2].

Cohorting patients is not a new approach; it has long been used in hospitals to locate patients, with the same or similar conditions, in the same space for

efficiency, specialization of staff, and proximity to condition-specific equipment. In pandemics, however, the primary reason for cohorting in nursing homes is to reduce or prevent interaction between infected and uninfected residents. Rates of morbidity and disease severity are particularly high for older adults during outbreaks of infectious diseases because of their age, comorbidities, and associated immunosenescence.

*A collaborative model.* The declaration of COVID-19 as a US national emergency was followed by a collective outbreak of new cases in Michigan nursing homes, where cases rose from 1 case to 1,035 cases in two weeks [16,17]. Three nursing homes in southeast Michigan took rapid action to cohabit that provides a model of collaboration, cooperation, and communication with positive containment of spread. It involved moving together residents from across facilities into categories of positive infection, need for isolation, and freedom from infection. Moving, isolation, and separation from familiarity provided some downsides for residents and staff, and these are issues that also bear consideration in one-facility cohorting [13,14]. The report credits the preexistence of the collaborations of local hospitals and public health officials, infectious disease experts, and an academic health system, for their impressive outcomes to lower mortality and reduce hospitalization. These affiliations were reasons for choosing cohorting as a reasonable way to mitigate transmission. But recognition of the power of collaboration offers lessons about the need for heightened readiness to meet possible resurgence or new mutant strains of existing infectious diseases. The key in this case was proactive collaboration across local skilled nursing facilities, hospitals, laboratory services, parent corporations and health care providers. Laboratory testing for the SARS-CoV-2 positive residents by the local the hospital is also credited for early identification, testing at points of prevalence, and cohorting of infected patients. Environmental cleaning and protected traffic patterns for staff and provided separate entry and exits to the facility.

*Isolation and cohorting of residents within the facility*

Given the lack of preexisting facility collaborations, most nursing homes are faced with decisions of how to manage isolation and cohorting in their own facility. CMS offers some guidance in recommending a period of assessment for all new admissions or transfers. If space allows, a separate area, or if this is not possible, waivers in the codes are recommended that would allow them to be observed in a separate facility [12]. The availability of rapid diagnosis is difficult for nursing homes without close or affiliated laboratories. But as unit-based tests for COVID-19 become more reliable and available, they will become essential to streamline the process of triage and identification of infected residents. In the meantime, one hospital has developed a triage tool that uses physical signs (temperature, cough, shortness of breath, myalgia, sore throat), computed tomography (CT) of chest (pneumonia), low lymphopenia, neutrophilia, and existing comorbid conditions, to categorize patients into four groups: (1) high risk of poor outcome/low risk of infection, (2) low risk of

poor outcome/high risk of infection, (3) low risk of poor outcome/low risk of infection, and (4) low risk of poor outcome/high risk of infection. This kind of categorization, administered in the emergency department with a nursing home resident becomes ill, may be a useful way of early assessment that necessitates hospital admission for those at highest risk while identifying those needing cohort accommodation in the nursing home.

*Resident perspectives of cohorting.* Two action points designated by the CMS Coronavirus Commission for Safety and Quality in Nursing Homes [1] address the tensions existing between rigorous infection control measures and quality of life issues that exist in cohorting and visitation policies. Their recommendations and action steps reflect the intent to update cohorting guidance to balance resident and staff psychological safety with IPC. Action steps are to prioritize resident social and emotional health and minimize disruption of resident daily routines. They point out the need to be transparent with the needs of isolation or cohorting, and any possibilities of moving to different facilities [1]. The Michigan example also emphasizes the anticipatory *Collaboration* as key to their project's success, and addresses the value in partnering with local agencies, care facilities, and care providers in a way not addressed by the CMS Commission [2]. Communication methods included in this report were emphasized between residents, health care personnel, and families, informing all of the planned response. Residents received updates of their testing results or exposure to infected roommates. Additional daily communication with other skilled nursing facilities not only kept them informed, it allowed these allied groups to plan a collaborative response that included allocation of personal protection equipment (PPE), distribution of staffing (nurses, nurse assistants, occupational and physical therapists, and equipment technicians) across facilities. Universal testing of residents allowed mapping of prevalence at specific points. Separate break rooms, eating areas, and free meals and beverages were provided to dedicated COVID unit staff, with incentive pay for dedicated nursing staff. These attributes were only possible by cooperation and shared responsibility with pre-existing partnerships that are a model for possible preparation for an uncertain future in infectious disease.

## SUMMARY

The impact of viral infections to the older adult residing within the long-term care setting poses a significant threat not only to their physical health, but to their emotional well-being. Although beneficial for containing viruses, primary care providers' use of isolation or other cohorting measures described in this article can cause emotional damage. These measures must be instituted along with practice measures to ensure regular human contact [18]. Many of the frail older adults residing in long-term care are particularly vulnerable to social isolation and feelings of loneliness because of their limited mobility, reduced stamina or fatigue. The presence of cognitive impairment compounds limitations in mobility and significantly increases risk of loneliness or isolation—especially if they are placed

in isolation. All residents placed in isolation will be susceptible to social isolation. Research evidence has shown frail older adults who are lonely or socially isolated experience higher rates of mortality [16]. In response to the National Workforce Recommendations made by the Coronavirus Commission For Safety And Quality In Nursing Homes, the panel of Nurse Experts in Aging of the American Academy of Nursing developed a must-read of important guidelines for practitioners working with older residents in long-term care settings [18]. These guidelines detail nursing interventions such as frequent communication and reassurance, walking rounds, daily contact with trusted significant others and altering the plan of care to focus on bedside nursing care. These nursing interventions are protective measures which caregivers may use to keep the resident engaged with staff, family caregivers and significant others. The family nurse practitioner working as primary provider in the long-term care setting must use the public health framework of primary, secondary and tertiary levels of prevention to contain the virus, screen at-risk residents for social isolation and enact protective measures.

### **CLINICS CARE POINTS: IMMUNOSENESCENCE**

Nursing leadership needs to maintain an awareness of the risks posed by immunosenescence, not only in terms of increased risk for acquisition of coronavirus disease-2019 (COVID-19) but infection in general. Key points for leadership to remain focused upon:

1. Progressive immunosenescence raises the vulnerability of the older adult resident, regardless of vaccination status.
2. Blunted febrile responses makes fever a less reliable indicator of infection in older adults.
3. Older adults should be regularly screened for other indicators of infection besides a febrile response, such as loss of appetite, cognitive changes and/or tachypnea at rest.
4. Immunosenescence poses a unique risk for the development of viral infection.
5. Vaccination of the older adult provides some seroprotection but may require a repeat immunization 6 to 7 months later.
6. Mutations in viruses (COVID-19 and influenza) require boosters and repeat vaccination when available.
7. Antibody tests are unable to distinguish COVID-19 from other coronavirus infection.
8. An aging staff force is also at risk for viral infection along with residents.

### **CLINICS CARE POINTS: IMPLICATIONS FOR LEADERSHIP**

1. Nursing leadership needs to maintain an effective tracking system for not only routine immunization but for tracking of pandemic-associated vaccination and monitor for symptom development.
2. Awareness is needed related to concerns tied to testing, and effective testing plan needs to be established for each setting.
3. An infection prevention and control (IPC) Manager is a key person to stay abreast of local, state, and national information to guide care.

4. The IPC Manager is necessary to coordinate, consult, and communicate with personnel, residents, and families in an informative, transparent manner.
5. Some residents will not be able to understand or tolerate masking. Seeing others masked may be confusing or frightening to cognitively impaired residents. Alternative considerations require leadership investigation.
6. Maintaining an isolated location is the safest way to protect the older adult but can deeply affect the quality of life for the resident and the family, and lead to social isolation, depression, and worsening mobility.
7. Keeping a reliable cohort of infection-free personnel to attend uninfected and infected cohorts of residents is desirable.

## DISCLOSURE

The authors have no financial or commercial conflicts associated with the information presented in this article.

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