Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

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Commentary: Special care considerations in older adults hospitalized with COVID-19

Introduction

COVID-19 is caused by the SARS-CoV-2 virus. Patients may be completely asymptomatic or present with a spectrum of symptoms from mild cough to severe pneumonia. These myriad clinical phenotypes and severity are particularly evident in older adults [1]. Data from the Centers for Disease Control and Prevention (CDC) demonstrate that older adults are responsible for 40% of hospitalizations and 79% of deaths from COVID-19 (www.cdc.gov). Many mechanisms likely contribute to increased disease severity in older adults, including immune senescence and dysregulation, higher burden of comorbidities, and social behaviors that promote disease spread (e.g. higher proportion of older adults living in congregate housing) [2]. Long-term care facilities represent an epidemiologic nidus for COVID-19; one third of COVID-19 deaths in the United States occurred in nursing home residents or employees [3].

Although the elderly population and nursing home residents have had high vaccine uptake in the United States, until widespread immunization is reached, we anticipate continued outbreaks [4]. Vaccine hesitancy, inequities in vaccine distribution, and viral mutations all present challenges to achieving longterm immunity. Furthermore, increased globalization and human-animal contact through environmental changes increases likelihood of future pandemics [5]. It is important to learn from experiences of this pandemic to improve care during future outbreaks. This paper highlights issues that affect care delivery in older adults with COVID-19 in the inpatient setting, based on a review of available evidence and the authors' experience on a high-volume consult service in Southeastern Michigan. Recommendations are summarized in Table 1.

Acute care management issues

Delirium

COVID-19 causes a number of physiologic disturbances that predispose to delirium, including hypoxemia, fever, acute kidney injury, and other metabolic derangements, as well as direct neurotoxicity [6]. Additionally, healthcare system factors contribute to the risk of delirium [7]. Face masks, although essential, obscure communication with patients and interfere with care, specifically in older adults with hearing impairment who rely on lip-reading. Face masks also impede patients' ability to recognize providers. Infection control measures limit the number of visitors, such that patients are often isolated and lack the opportunity for familial visits or frequent reorientation. It is critically important for healthcare systems and providers to recognize the elevated risk for delirium.

Providers should initiate early prevention and treatment strategies by identifying and addressing risk factors, as delirium increases length of stay, risk of adverse events, and mortality [8,9]. There are a number of COVID-19 specific considerations that healthcare workers and hospitals may employ [10]. As healthcare systems increase telehealth infrastructure, they can leverage this technology for delirium management. Tablets can allow enhanced communication between older adults and their families. "Telesitters" provide video monitoring of patients and two-way voice communication, which can allow for frequent reorientation and reduce high-risk behaviors, such as getting out of bed unassisted [11]. Personalized sound amplifiers and white boards are inexpensive and facilitate communication for hearing-impaired older adults [12]. Facemasks with clear mouth coverings are a promising tool to improve communication, but studies are needed to ensure such masks adequately prevent viral transmission [13]. Whenever feasible, healthcare systems should allow visitors for older adults at highest risk of delirium [14]. Presence of family significantly decreases incidence and severity of delirium, and family at the bedside may lessen the burden of hospital staff.

There is no pharmacologic therapy to treat delirium or shorten its duration, although antipsychotic medications may be used to treat acute agitation that poses an immediate risk of harm to the patient or staff when non-pharmacologic endeavors have failed. It is critically important to consider the cardiac QT interval in COVID-19 patients, as direct cardiac toxicity, experimental treatments, concomitant antibiotics, and supportive medications (e.g. anti-emetics) can all contribute to QT prolongation. If the QT is prohibitively long such that antipsychotics cannot be used, patients may require less desirable sedating agents, such as benzodiazepines or anti-seizure medications. In these instances, we recommend expert consultation.

Risk stratification

Accurately predicting risk of decompensation and death can help guide resource allocation and also allow providers to have informed discussions with patients and their families. Risk of severe illness and mortality from COVID-19 increases with age. Compared to adults younger than 54 years of age, COVID-19 mortality rate is estimated to be 8 times higher in adults 55–64 years old and more than 62 times higher in adults over age 65 [15]. In a cohort of patients hospitalized in New York in the early stages of the pandemic, mortality rate was > 97% for patients over age 65 who required mechanical ventilation [16]. Since then, with the advent of therapeutics, mortality of patients admitted to acute care facilities and the intensive care unit (ICU) has improved substantially, although mortality rates of admitted patients with COVID-19 remains high, estimated to be 17% [17–19].

There are several other indices that can be used to further risk-stratify older adults admitted with COVID-19. Mortality rate is higher in males compared to females [15]. In the US, mortality rate is disproportionately higher in black, American native, and southeast Asian individ-

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Table 1
Summary of Care Considerations for Older Adults Hospitalized with COVID-19.

Acute Care Management Considerations
Risk Factors for Severe Illness and Mortality
• Increasing age • Male sex • Black and American native race, Hispanic ethnicity • Hematologic Anomalies: lymphopenia, thrombocytopenia* • Laboratory markers for end-organ damage, immune dysregulation, and hypercoagulability* • Comorbidities
Cancer, Cerebrovascular Disease, Chronic Kidney Disease Chronic Lung Disease, Diabetes Mellitus, Heart Disease Neurologic Disease, Dementia, Obesity Sickle Cell Disease, HIV, History of Transplant
• Immunosuppressive medications • Vitamin D deficiency** • Frailty, as determined by the Hospital Frailty Risk Score
Delirium Prevention and Management
• Screen COVID-19 patients for delirium at least once per shift • Use personalized sound amplifiers and white boards to facilitate communication • Consider use of masks with transparent mouth pieces to facilitate lip reading • Providers and staff entering the room should always identify themselves by name and role • Facilitate frequent family contact with the use of telehealth technologies • Telesitters can monitor for unsafe behaviors and provide reorientation • Visitor restriction exemptions for patients with delirium or at high risk for developing delirium
End of Life Care
• Initiate goals of care discussion for all patients admitted with COVID-19 • Educate patients about natural history of COVID-19, including possible sudden deterioration • Compassionate exemptions to visitor restriction policies for critically-ill patients • Opioids and benzodiazepines for treating terminal dyspnea and anxiety
Disposition Considerations
• Assess baseline cognitive and functional status on admission • Assess patient's living situation and support structures and whether this has been compromised • Involve PT and OT early • Work with social workers or case management to understand acceptance criteria of local facilities • Consider alternatives to facility placement, including home-based primary care, enhanced telehealth, and/or virtual transitions of care visits • Hospital at Home programs may provide a viable alternative to hospitalization

* The prognostic value of many of these test results remain uncertain.
** No high-quality evidence supports Vitamin D supplementation to improve clinical outcomes.

uals [20]. While much needs to be learnt, social determinants of health and racial disparities in both risk of acquisition and disease management likely play a role in these mortality differences.

Numerous laboratory abnormalities are associated with higher risk of severe illness, including lymphopenia, thrombocytopenia, and results suggesting immune dysregulation (e.g. elevated interleukin-6), hypercoagulability, or end-organ damage (e.g. elevated liver enzymes, serum creatinine, or troponin) [21,22]. Vitamin D deficiency has been shown to be correlated with increased risk of severe illness, although the causal relationship is uncertain, and there is no high-quality data to support that vitamin D replacement improves clinical trajectories [23]. However, vitamin D replacement has very low risk of adverse effects, and a trial of vitamin D replacement may be warranted for older adults admitted with COVID-19 who are found to be deficient (< 30 ng/mL).

Medical comorbidities and frailty status are also correlated with a greater risk of severe illness and mortality. Data from the CDC suggests cancer, cerebrovascular disease, chronic kidney disease, chronic lung disease, Diabetes mellitus, heart disease, neurologic conditions, dementia, obesity, and sickle cell disease are all associated with increased risk of severe disease, as is a suppressed immune system from human immunodeficiency virus (HIV), prior transplant, or use of immunosuppressive medications. Data from the United Kingdom Biobank, examined in over 500,000 patients admitted with COVID-19, demonstrated frailty, as measured by the Hospital Frailty Risk Score, and Charlson comorbidity index were correlated with increased mortality risk at population level, but proved of limited value in the inpatient setting [24].

End of life care

Given the high risk of mortality in older adults hospitalized with COVID-19, all such patients require a goals of care discussion on admission. When discussing goals of care, providers will have to overcome many challenges, as families may not be at the bedside. Providers should engage family, ideally through telehealth technology allowing simultaneous engagement with the patient. In addition to standard practice, such as eliciting patients' values and preferences and referencing previous goals of care discussions, providers must take into account the realities of their healthcare systems, such as limited availability of advanced life support, e.g. extracorporeal membrane oxygenation (ECMO), or possibly requiring transfer to a higher acuity facility. During peaks of outbreaks, when health systems have reached maximal critical care capacity, providers need to engage in context-appropriate decisions. Healthcare systems may provide scripts to help providers with these difficult conversations, and expert consultation with palliative care or ethics teams may be of assistance if families have unrealistic expectations for their loved ones' care [25]. Providers may also make the distinction between "do not attempt resuscitation" and "do not intubate," acknowledging the probability of an extremely poor prognosis

of intubated COVID-19 patients who experience cardiac arrest [26]. Patients and families should be informed about the unique natural history of COVID-19. Many patients experience a fluctuating course, including abrupt clinical decompensation, particularly 8–10 days after symptom onset [27].

Patients dying of COVID-19 deserve high-quality end-of-life care. The most common symptoms noted in end-stage COVID-19 are breathlessness and agitation along with associated drowsiness, pain, and delirium [28]. Adoption of standardized palliative order sets may help to systematically improve end of life care. For instance, Dingfield et al. built an order set linked in a cloud-based platform that enables use of sublingual opioids and opioid infusions. This order set allows nursing titration when populated with dose ranges [29]. Opioids and benzodiazepines seem effective to ameliorate breathlessness and agitation. Although benzodiazepines may worsen delirium, the risk-benefit ratio changes in end-of-life care, such that the anxiolytic effect outweighs risk of ongoing delirium.

As with delirium care, health systems should offer end of life compassionate exemptions to visitor restriction policies and provide visiting families with infection prevention training, including how to properly don and doff personal protective equipment [30]. If in-person visitation is not feasible, then providers and health systems should maximize family contact utilizing telehealth technologies. Early studies support this strategy. In a qualitative study of end-of-life care provided to COVID-19 patients in Veterans Affairs medical centers, bereaved family members identified staff accessibility, frequent clinical updates, and available and properly functioning remote technologies to be associated with high-quality communication and improved satisfaction [31].

Providers should be sensitive that many spiritual and cultural norms may be violated due to inability to access the body or hold traditional funeral services [32]. Involvement of hospital chaplains or community religious leaders can help families to reconcile preferences with public health guidance.

Disposition and post-acute care

Many COVID-19 patients have functional decline due to their illness, comorbidities and prolonged hospital stays. Providers and families should engage with an interdisciplinary team when determining discharge disposition. To facilitate discharge planning, providers should assess patients' baseline cognitive and functional status, living situation, and support structure on admission [33]. Physical and occupational therapy should be involved early, and whenever feasible, patients should spend time out of bed to prevent hospital-associated functional decline. Additionally, providers should assess whether the patient's support structure has been disrupted if other family members are also ill from COVID-19. Case management or social work should reach out to patients' household members early, to ensure family members are healthy and to provide appropriate guidance on self-quarantining. If family members are particularly vulnerable to COVID-19 infections or complications, patients may not be able to safely return home until a sufficient time period has passed.

Providers and families can consider a range of post-acute care services based on preference, support, and availability. The option of recovering at home with wrap-around post-acute care services should be considered first. Many healthcare systems offer a wide array of telehealth services, which may include vital-sign tracking via remote patient monitoring, psychological support services, and virtual transition of care visits [34]. The University of Michigan has implemented a COVID-19 Completion at Home Pathway program, consisting of remote vital sign monitoring and alternating virtual medical provider visits and in-person nurse visits for the first 4 days post-discharge, along with PT/OT support, in an effort to allow earlier hospital discharge and patient recovery at home [35].

Traditional skilled nursing facility transfers post-hospitalization is an option for those who are too debilitated and cannot be adequately supported at home. Case managers can provide insight into which local facilities are accepting COVID-19 patients and specify acceptance criteria. Families should be reassured that several states, foundations, and societies are developing taskforces to improve structures and processes within nursing homes to keep residents safe [36]. Patients and families may be resistant to transfer to a facility, due to the significant media coverage of nursing home outbreaks, concerns regarding restrictions implemented as infection control measures, and restricted utilization of gyms and equipment during quarantine period. It is important to remind patients and families that nursing facilities have been prioritized for vaccine distribution and as a result, outbreaks in nursing homes have reduced substantially.

Home-based primary care services, where available, can also enhance in-home support and provide close patient monitoring. Many home health agencies are expanding their capacity to work with COVID-19 patients. With the expansion of home-based post-acute care services, providers should keep themselves updated on the alternate resources available within their healthcare system to facilitate a safe and efficient discharge. Finally, where available, hospital-at-home programs have been shown to be cost-saving without compromising standards of care, and may alleviate many of the concerns related to infection control, isolation, and need for post-acute care at a facility [37].

Prevention of hospitalization

Despite advances in care, older adults remain at significant risk of severe illness and death from COVID-19. Providers and health systems should continue to focus on infection control measures to prevent outbreaks and limit community spread of COVID-19. Individuals should continue to practice precautions as recommended by the CDC, including maintaining social distancing, wearing an appropriate face covering in recommended settings, avoiding individuals who are ill, and avoiding large crowds in poorly ventilated areas. Additionally, all patients should be encouraged to be vaccinated.

There are a number of challenges to vaccinating eligible older adults. Logistically, many older adults may struggle to schedule a vaccination appointment. A survey from August 2020 estimated that one third of older adults may struggle with telehealth technology due to lack of appropriate equipment, unreliable internet access, sensory impairments, and/or cognitive impairment [38]. Although we are not aware of any currently published literature on this topic, a number of health departments have cited difficulty scheduling eligible seniors who lack internet access and have limited social support [39]. Additionally, homebound older adults with limited mobility, lack of reliable transportation, or social isolation may have difficulty attending a vaccination clinic appointment. Healthcare systems can partner with local area agencies on aging, senior centers, grocery stores, pharmacies, religious sites, and other community organizations to increase accessibility to vulnerable older adults.

Vaccine hesitancy poses another potential challenge. Although vaccine hesitancy is more prevalent in younger adults, data from the Kaiser Family Foundation (KFF) suggests approximately 15% of older adults are uncertain or do not intend to get vaccinated (https://www.kff.org/coronavirus-covid-19, accessed April 14 2021). Polling data from KFF suggests patients value opinions of their healthcare providers when considering vaccination, so providers should continue to emphasize the importance of vaccination. Staff members in skilled nursing facilities and nursing homes are also a valuable target in vaccine uptake and have lagged behind residents of nursing homes thus far [4].

Conclusions

Despite advances in care, older adults carry a high burden of morbidity and mortality from COVID-19. Older adults can be further risk stratified based on demographic and laboratory data, comorbidity burden,

and frailty status. Special consideration must be given to delirium prevention strategies, early need for a nuanced goals of care discussion that evolves with the patient's clinical trajectory, and considerations about disposition with expanding telehealth and remote monitoring technologies for patients to recover at home. All providers should encourage infection control measures and emphasize the importance of vaccination to prevent hospitalization.

Declaration of Competing Interests

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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