


# Disparities in Delirium across the Continuum of Care and Associations with Social Determinants of Health

Anu Khanna, MD<sup>1</sup> Malvika Govil, MD<sup>2</sup> Nohamin Ayele, MD<sup>3</sup> Altaf Saadi, MD, MSc<sup>4</sup> 

<sup>1</sup>Chobanian and Avedisian School of Medicine, Boston University, Boston, Massachusetts

<sup>2</sup>Department of Neurology, New York Langone Health, New York University Grossman School of Medicine, New York City, New York

<sup>3</sup>Department of Neurology, Northwestern Medicine, Feinberg School of Medicine, Chicago, Illinois

<sup>4</sup>Department of Neurology, Harvard Medical School, Massachusetts General Hospital, Boston, Massachusetts

Address for correspondence Altaf Saadi, MD, MSc, Department of Neurology, Massachusetts General Hospital, 100 Cambridge Street, Suite 2000, Boston, MA 02114 (e-mail: asaadi@mgh.harvard.edu).

Semin Neurol 2024;44:752–761.

## Abstract

Disparities exist in the identification, treatment, and management of delirium. These disparities can be most holistically and comprehensively understood by using a social–ecological model—which acknowledges multilevel impacts including individual, interpersonal, organizational, community, and policy-level factors—as well as a social determinant of health framework, that considers nonmedical factors that influence health outcomes. This narrative review leverages both frameworks to identify and discuss existing literature pertaining to the intersection of these social risk factors and delirium, focusing specifically on disparities due to racial and/or ethnic identity, language ability, and socioeconomic differences. We also look at disparities and the potential role of these social risk factors throughout the continuum of care, including prehospitalization, hospitalization, and posthospitalization factors. Understanding and analyzing the role of these inequities is critical to ensuring better health outcomes for patients at risk of and/or with delirium.

## Keywords

- ▶ delirium
- ▶ disparities
- ▶ social determinants of health
- ▶ racial/ethnic
- ▶ socioeconomic status
- ▶ contextual factors

## Delirium and Marginalized Populations: Frameworks

Delirium is a neuropsychiatric syndrome that represents global brain dysfunction and is frequently observed in hospitalized patients, with an incidence range of 11 to 47% in the general hospital wards and up to 87% in critically ill patients.<sup>1–4</sup> It is characterized by acute onset of deficits in attention, awareness, and cognition that fluctuate in severity over time<sup>1</sup> and portends both poor short- and long-term outcomes. In the short term, this includes longer length of hospital stay and increased rate of hospital-acquired complications; in the long term,

this includes increased risk of dementia and earlier mortality.

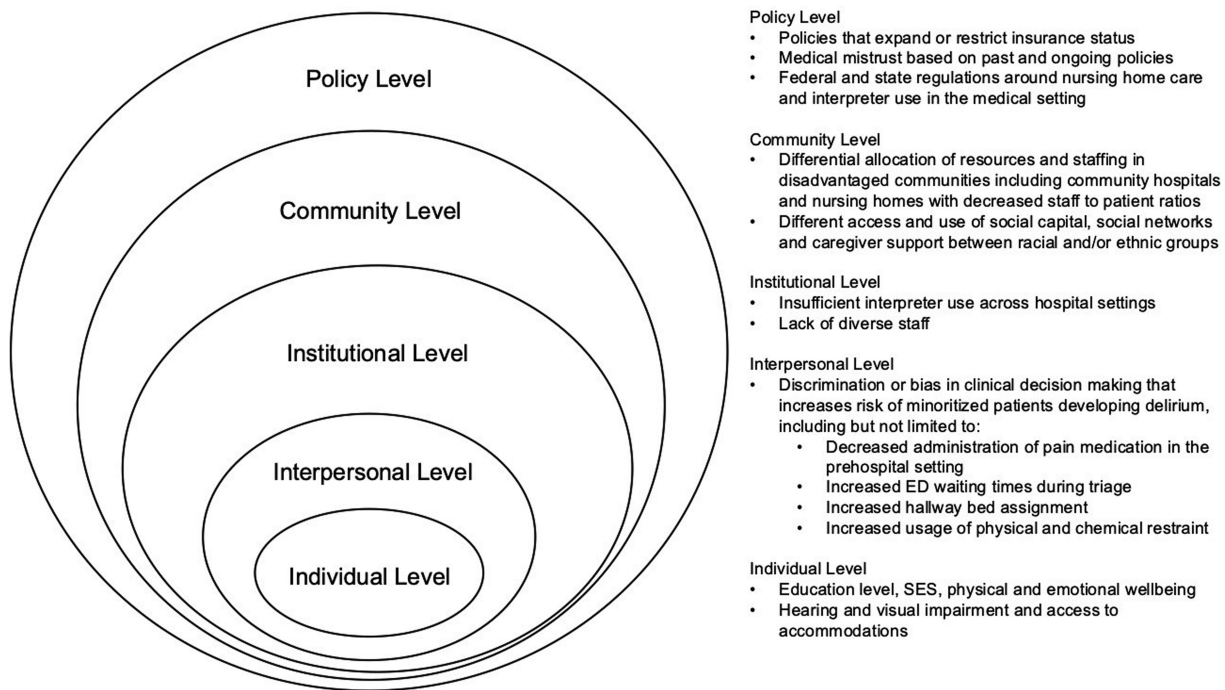
A growing body of research has underscored the importance of nonmedical factors such as education, housing, and income/job security on the risk of morbidity and mortality across a vast spectrum of diseases, including delirium.<sup>4–9</sup> The social–ecological and social determinant of health frameworks can clarify how these nonmedical factors impact delirium—its diagnosis, treatment, and outcomes. The social–ecological model recognizes that an individual's health is impacted not only by individual-level personal behaviors and genetics, but also by a complex interplay of institutional, community, and policy-level factors (▶ **Fig. 1**).<sup>10–12</sup> For

article published online  
August 29, 2024

Issue Theme Altered Mental Status, Encephalopathy, and Delirium; Guest Editors: Catherine S.W. Albin, MD, and Eyal Y. Kimchi, MD, PhD

© 2024, Thieme. All rights reserved.  
Thieme Medical Publishers, Inc.,  
333 Seventh Avenue, 18th Floor,  
New York, NY 10001, USA

DOI <https://doi.org/10.1055/s-0044-1788976>  
ISSN 0271-8235.



**Fig. 1** The social–ecological model grounds the individual in a broader environment that involves an interplay of individual, interpersonal, institutional, community, and policy factors that can inform both a framework for identifying the extent of disparities and solutions to address them.

example, at the organizational level of hospital institutions, environmental and physical factors such as visitor restrictions and disparate use of physical restraints among different racial or ethnic groups can influence the development and trajectory of delirium.<sup>13</sup>

Social determinants of health are the conditions in which people are born, grow, live, work, and age. These nonmedical factors include education and socioeconomic status (SES) that have the ability to impact health outcomes.<sup>14,15</sup> Especially pertinent to delirium is the concept of the “cognitive reserve model,” defined as the brain’s ability to deal with an insult through preexisting cognitive capacity or compensation through alternative processes.<sup>16,17</sup> A patient’s “cognitive reserve” may be impacted by social determinants of health such as level of education and occupational role.<sup>5,17</sup> Social determinants of health can also influence a patient’s social engagement (i.e., volunteering and participating in group activities) and social capital (i.e., resources derived from social networks such as the availability of caregivers), which have been shown to reduce the incidence of delirium.<sup>5,18–20</sup> For example, these resources are not uniformly available across racial/ethnic groups who may have less flexibility and accommodations in their work environments, creating caregiving challenges.<sup>21</sup>

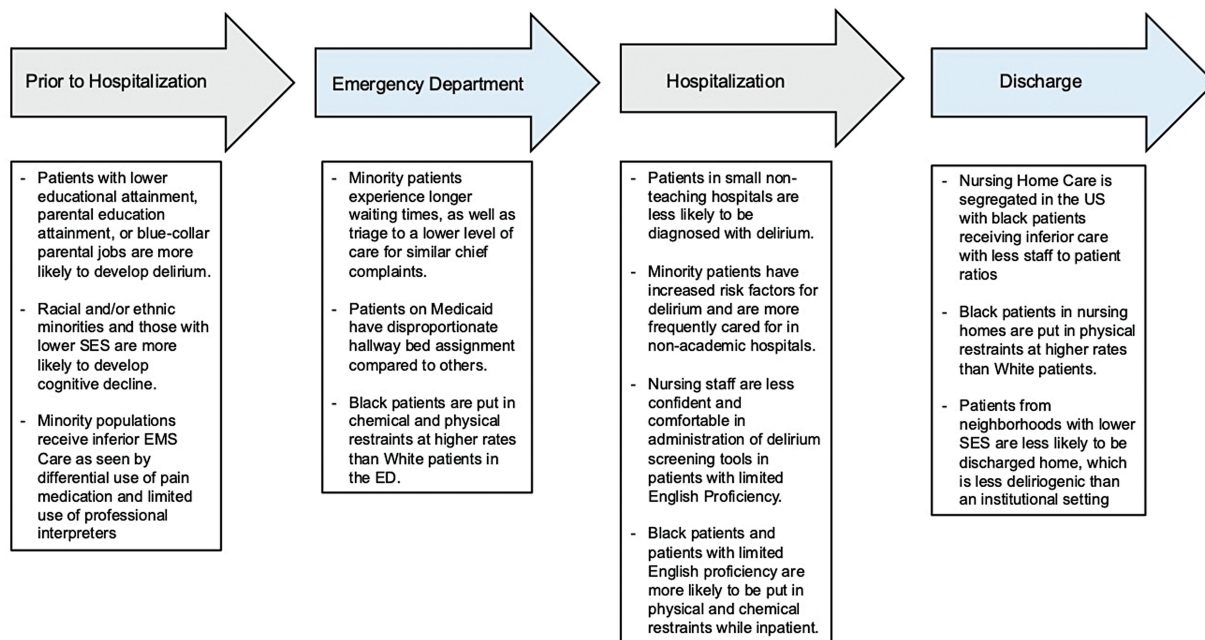
This article uses these two frameworks to review the existing literature on disparities in delirium, building on seven previously proposed domains relevant to delirium in older adults: demographic factors, social and economic factors, physical and mental well-being, social capital, activities and social engagement, built and social environment, and life course factors.<sup>5</sup> We then review the extant

literature and risk factors across the continuum of care: prehospitalization, perihospitalization involving emergency care, hospitalization including inpatient and/or intensive-care-unit setting, as well as posthospitalization transition to a nursing home or community (→Fig. 2). The current literature is nascent, although there are studies that have identified a higher incidence of delirium among non-Hispanic Black and Hispanic/Latinx patients.<sup>22</sup> In instances where the literature is less established, we draw from literature in other areas of medicine, within and outside of neurology, to discuss how disparities may manifest. Given that much of the relevant literature focuses on racial and/or ethnic disparities, we do so as well, although we recognize that “race” actually serves as a proxy for racism. We also recognize that disparities can occur across other dimensions of an individual’s identity, that is, gender/sexual orientation,<sup>23</sup> immigration status,<sup>24</sup> and ability/disability (vision and hearing deficits<sup>5</sup>), which can intersect and exert a compounding negative influence for those with multiple marginalized identities.

## Prehospital Risk Factors for Delirium

### The Cognitive Reserve Model and Delirium Risk

A patient’s cognitive reserve—the brain’s ability to remodel after a medical insult—is impacted by social determinants of health across a patient’s life course (i.e., including childhood and early adulthood experiences, and factors like education and SES).<sup>25</sup> Patients with lower cognitive reserve have increased brain vulnerability and are subsequently more likely to develop delirium later in life.<sup>17</sup> Conversely, high-reserve



**Fig. 2** The role of social determinants of health in delirium across the continuum of care.

individuals are better able to cope with disruptions to brain networks and less likely to develop delirium.<sup>26</sup>

Studies in the United States have shown that early life experiences (life course factors<sup>5</sup>) such as educational attainment,<sup>27</sup> neighborhood socioeconomic disadvantage,<sup>28</sup> parental educational attainment,<sup>29</sup> and paternal occupation<sup>30</sup> influence rates of delirium, possibly via lowering cognitive reserve capacity. Notably, it is not simply a matter of “years of education” but also educational quality, with one study showing attending higher-quality schools is associated with improved later-life cognitive performance among older adults.<sup>31</sup> Life experience is shaped by SES. SES can be conceptualized as education, income, wealth and assets, employment, or a combination of these at individual or neighborhood levels. SES also broadly influences a patient’s cognitive reserve and, as a result, the risk of delirium.<sup>32</sup>

There are multiple proposed mechanisms that may explain the association between low SES and the risk of delirium. One mechanism is that higher cognitive reserve, found in higher SES populations, protects against the delirigenic effects of inflammation. For example, in a study of geriatric adults without dementia, higher vocabulary knowledge (a measure of cognitive reserve) was generally protective and modified the association between C-reactive protein and postoperative delirium.<sup>33</sup> Another proposed mechanism is that higher cognitive reserve is associated with the ability to compensate in the face of neuropathological burden or medical insult through the recruitment of novel brain networks.<sup>26</sup> Finally, lower SES populations, often those who are racial and/or ethnic minorities, are also at higher risk for developing cognitive decline and dementia, which in turn puts them at higher risk of delirium. Patients with dementia need fewer precipitating factors to increase their likelihood of developing delirium.<sup>34</sup>

In support of this theory, studies have shown that the risk for dementia and cognitive decline occurs at higher rates in Black and Hispanic populations,<sup>35</sup> as well as in patients with low SES in terms of occupation, education, and employment status.<sup>36</sup> Other studies have also identified immigrant communities, across racial and/or ethnic groups, as being at higher risk of cognitive decline owing to unique barriers such as heightened social isolation exacerbated by the immigration experience, low acculturation to their host country, and increased trauma exposure.<sup>37</sup> Immigrants often have lower social capital and emotional health as a result of social isolation.<sup>5,38</sup> Therefore, adverse social risk factors increase the risk of cognitive decline among marginalized communities, including racial and/or ethnic minority populations, immigrant patients, and patients with lower SES, which increases the risk of developing delirium.

Since SES and other life course factors are racially patterned due to historic and ongoing societal discrimination, residential segregation, and racism, there exist multiple potential interventions at the policy level (i.e., further investment in disadvantaged schools and neighborhoods) that could mitigate these risks later in life (► **Table 1**).

### The Role of Emergency Management Services in Delirium Risk and Care

More proximal to an individual’s presentation to the hospital encounter is care management by Emergency Management Services (EMS) personnel—emergency medical technicians and paramedics. There are limited data examining the practices and outcomes of EMS personnel in delirium. However, some of the documented disparities in care at this stage may put marginalized patients on a steeper trajectory to the development of delirium once hospitalized. For example, studies have shown that EMS providers inadequately treat

**Table 1** Examples of social determinants of health-related interventions for addressing delirium risk and care

Social determinant of health category	Potential interventions
Education	- Early childhood education - Investment in schools in disadvantaged communities
Employment	- Enhanced paid sick leave and family leave policies to support caregivers of patients - Enhanced family caregiver reimbursement policies
Social and community context	- Investment in the community, working to improve access to infrastructure such as grocery stores and public transport - Improved urban planning, i.e., increased street lighting or signage, increased green spaces to promote physical activity, and reduce risk of falls
Healthcare access and quality	- Expansion of health care insurance eligibility, i.e., Medicaid expansion, universal health care, coverage for immigrant populations

racial and/or ethnic minority patients' pain, which is a strong risk factor for developing delirium.<sup>5,39,40</sup> In a cohort study of 4.7 million patient encounters from the National Emergency Medical Services Information System from 2019 to 2021, racial and/or ethnic minority populations—Black, Native American, Alaskan Native, Asian, and Hispanic—were less likely to have a recorded pain score after an acute traumatic injury.<sup>41</sup> Even when they had a recorded pain score, Black patients were half as likely to receive pain medications as compared with White patients.<sup>41–43</sup> Similarly, in a 2015 to 2017 study of data from the Oregon Emergency Medical Services Information System, patients with limited English proficiency (LEP) were less likely to have a recorded pain score, most likely due to the lack of professional interpreter use, as only 5.5% EMS encounters used a professional interpreter.<sup>44</sup> While EMS providers commonly note their inability to communicate with a patient due to a language barrier, they do not take steps to overcome this barrier.<sup>44</sup> Other studies have found racial and/or ethnic disparities in EMS recognition of symptoms of acute myocardial infarction or stroke, which could delay care, increase the length of hospitalization, and potentially increase the risk of delirium.<sup>45,46</sup>

EMS personnel have identified the treatment of agitation in the setting of hyperactive delirium as particularly challenging. One qualitative study involving focus groups with EMS providers found that although they felt comfortable recognizing delirium, they desired additional screening tools and guidance on the management of agitation due to delirium during ambulance rides.<sup>47</sup> EMS personnel frequently treat agitation using both chemical (ketamine, benzodiazepines, antipsychotics) and physical restraints.<sup>48</sup> There is a lack of data analyzing social factors and disparities involved in the use of physical and chemical restraints by EMS, although racial and/or ethnic disparities have been identified in restraint use in emergency departments (EDs), as discussed further below<sup>49</sup>; presumably the same mechanisms of racism at the interpersonal, institutional, and structural levels exert influence on EMS providers similar to ED providers even if that has yet to be documented. Furthermore, it is important to highlight the use of “excited delirium” by law enforcement to justify violence against Black and Hispanic patients outside of the hospital setting. The term “excited

delirium” is not recognized as a valid diagnosis and is not to be confused with agitation in the context of delirium.<sup>50</sup>

### Delirium Risk Factors in the Emergency Department

Patients often spend a prolonged period of time in the ED from triage to either admission or discharge. The risk of delirium during this time is impacted by social determinants of health.

#### Triage Factors

Racial and/or ethnic minority patients wait longer before being seen by a provider in the ED. This is significant for the development and trajectory of delirium as studies have shown that total ED length of stay, including waiting room time, treatment time, and boarding, is significantly associated with the development of delirium in older patients.<sup>51,52</sup> Time to triage has become one of the most important determining factors for a patient's waiting time in the ED, and based on the analysis of 2013 to 2017 data from the National Hospital Ambulatory Care Survey, Black, Hispanic, and Asian patients were more likely to wait for “extreme” wait times (>139 minutes) compared with White patients, even when adjusted for age, sex, comorbidity status, health system indicators, and geographic region.<sup>53</sup> This can potentially be attributed to interpersonal racism leading to these patients being skipped over despite the same acuity triage level.<sup>54</sup> Black patients have also been shown to be triaged to a lower acuity than White patients, although this is seen most frequently with subjective diagnoses like “shortness of breath” and less with observable diagnoses like “altered mental status.”<sup>55,56</sup> Given the documented disparities in wait times and the association between long wait times and delirium, it is highly plausible that increased delirium in marginalized patients is in part driven by their treatment during triage, although future studies will be needed to confirm the association.

#### Emergency Department Factors

Even once triaged, patients suffer from disparities in ED experiences based on insurance and SES. For example,

patients on Medicaid are placed in ED hallway beds at higher rates than those with private insurance, which can increase the risk of delirium.<sup>51,57</sup> In one study of two academic EDs from 2013 to 2016, patients with Medicaid or self-pay had 22% greater odds of being placed in a hallway bed after adjusting for various ED factors and patient demographics.<sup>58</sup> This trend was similarly found in a separate study looking at an academic and a community ED from 2017 to 2020.<sup>59</sup> As insurance status is likely unknown at the point of triage, these data serve as a proxy for broader socioeconomic factors; for example, individuals are potentially placed in hallways based on provider biases from appearances alone.

Another potential delirium risk factor is the use of both physical and chemical restraints in the ED. Both are highly influenced by a patient's race, SES, and medical history. Physical restraints include mittens or limb restraints, while chemical restraint refers to the use of psychoactive and sedating medication. Although there are no published data on the influence of physical restraints in the ED in the development of delirium, studies in both the ICU<sup>60</sup> and patients with stroke<sup>61,62</sup> show that physical restraints increase the risk of delirium. Chemical restraints are often used alongside physical restraints, though few studies examine the use of chemical restraints alone. Most medications used as chemical restraints (intramuscular benzodiazepines or antipsychotics) are known to be delirium inducing. A patient is more likely to be physically restrained if they are Black,<sup>49,63–66</sup> have Medicaid,<sup>63,66</sup> are unhoused,<sup>63,66</sup> or have a diagnosis of bipolar or psychotic disorder.<sup>49,63,64</sup> In a systematic review/meta-analysis involving 10 articles, Black patients had a 31% higher relative risk of being physically restrained than White patients in the ED, even when adjusting for various sociodemographic and medical indicators.<sup>49</sup> One study of all ED visits at a regional healthcare network in New England found that Black, non-Hispanic patients had significantly higher adjusted odds of receiving chemical restraints compared with White, non-Hispanic patients.<sup>67</sup>

Taken together, there are a host of potentially addressable delirium risk factors in the ED that are influenced by race and/or ethnicity and SES.

## Hospital Course of Patients with Delirium

### Diagnosis of Delirium

Delirium can be challenging to diagnose due to its multifactorial nature, variable manifestations (including three subtypes of delirium—"hyperactive," "hypoactive," and "mixed"), and fluctuating time course. There are multilevel factors that could contribute to disparities in the diagnosis of delirium.

At the individual level, screening for delirium also necessitates the investigation of possible underlying organic disease processes that may precipitate this altered state, including existing cognitive impairment, sepsis, metabolic disturbances, and respiratory failure.<sup>68,69</sup> Multiple studies have highlighted disparities across several social risk factors in the timely diagnosis and treatment of these predisposing

illnesses. For example, Black patients are more likely to experience delays in the initiation of sepsis treatment compared with White patients, and hospitals that treat predominantly Black patients are less likely to provide timely antibiotic therapy.<sup>70</sup> An Argentinian-based study identified longer delays in sepsis treatment for patients admitted to public hospitals compared with private hospitals; these patients were also significantly more likely to be from lower SES and educational backgrounds.<sup>71</sup> Racial and/or ethnic biases in the interpretation of pulse oximetry accuracy have been associated with greater occult hypoxemia in Black and Hispanic patients with COVID-19, contributing to unrecognized or delayed recognition of eligibility for therapies.<sup>72</sup> Black patients admitted to the ICU for heart failure were less likely than their White counterparts to be seen by a cardiology specialist, which was associated with higher mortality.<sup>73</sup> These findings strongly suggest that racial and/or ethnic and socioeconomic disparities likely exist in the timely and appropriate diagnosis and treatment of underlying disease processes that precipitate delirium.

Disparities in delirium incidence and diagnosis likely also exist between LEP patients compared with English-proficient patients, with one study citing a twofold increase in risk for LEP patients.<sup>74</sup> A systematic review of 26 internationally published articles on clinical psychiatric care for LEP patients concluded that language discordance and the use of untrained interpreters can cause errors in assessing mental status, delusions, and disorganized thinking, findings that have been replicated across clinical settings.<sup>75–77</sup> Despite this, professional interpreters continue to be underutilized.<sup>78</sup> Furthermore, immigrants from an LEP background may present with different predominant delirium symptoms than nonimmigrant patients. For example, one large retrospective study in Australia found that immigrants were more likely to present with agitation/aggression, potentially related to frustration with a language barrier.<sup>79</sup> Nursing staff in one qualitative study reported lower confidence in administering the Confusion Assessment Method (CAM) screening test for delirium in LEP patients, citing uncertainty about adapting the tool to languages other than English, difficulty assessing baseline mental status, and technical difficulties with virtual interpreters.<sup>80,81</sup> However, one single-center study that made a concerted effort to include patients with LEP demonstrated no statistical difference in the incidence of delirium based on LEP status. Interpretation is limited because the sample size was small and delirium was assessed only at one time point, which may have led to bias.<sup>82</sup> Overall, these data suggest possible underdiagnosis or delay in the diagnosis of delirium among LEP patients which requires further dedicated attention and study.

At the hospital level, there may be differences in delirium diagnosis due to patient volume, academic versus community setting, and proportion of patients from racial and/or ethnic minority backgrounds. For example, one retrospective study in the United States showed that patients in small, nonteaching hospitals were diagnosed with delirium less frequently compared with those at large, urban teaching centers.<sup>83</sup> Based on national survey data, 75% of hospitals in

the United States are nonteaching hospitals, and they account for 50% of admissions, indicating that a vast number of patients are inherently at risk of underdiagnosis of delirium due to lack of proximity to teaching hospitals in urban areas.<sup>84</sup>

Further hindering the diagnosis of delirium in marginalized populations is that delirium can be time-consuming to diagnose. Several focus group studies have identified time and heavy workload among nursing staff as diagnostic barriers.<sup>85,86</sup> However, nurses serving marginalized patients may be the ones least equipped to diagnose the condition. For example, there is evidence that institutions that serve predominantly Black patients tend to employ less trained nurses, and that those nurses work fewer hours than nurses employed by institutions primarily serving White patients.<sup>87,88</sup> Additionally, a study on nursing staffing ratios for post-cardiac arrest patients—who are predisposed to delirium—found that each additional patient per nurse lowered the odds of survival for Black patients more than White patients.<sup>88,89</sup> Together, these findings suggest that systemic factors like nursing hiring and staffing practices may contribute to racial and/or ethnic disparities in delirium diagnosis and management.

### Management of Delirium

The management of delirium is highly heterogeneous across institutions and healthcare providers given its poorly understood pathophysiology and multifactorial nature.<sup>90</sup> It includes both prevention and treatment, which can involve various social factors that could result in disparate outcomes among patients.

In terms of prevention, there is consensus that multicomponent nonpharmacologic interventions such as the “Hospital Elder Life Program” and “ABCDEF bundle” are highly effective in preventing delirium.<sup>91,92</sup> These approaches encompass frequent reorientation and cognitive stimulation, pain control, sleep optimization, regular sedation weaning trials, and early mobilization. As discussed earlier, underutilization of professional language interpreters may limit the use of reorientation techniques with patients to prevent delirium, introducing disparities in the prevention for LEP patients.<sup>78</sup> Although there is a lack of research on racial and/or ethnic and other disparities in these interventions pertaining to delirium outcomes, there is evidence of racial and/or ethnic disparities in these interventions more generally. Multiple studies have demonstrated that patients identifying as racial and/or ethnic minorities receive less acute pain therapies than their White counterparts, leading to suboptimal pain control and consequently likely increasing the risk of delirium incidence.<sup>93,94</sup> Early mobilization as part of delirium prevention typically invokes consultation of physical and occupational therapy services (PT and OT), and studies have found that racial and/or ethnic minorities and LEP patients received fewer PT and OT consults.<sup>95</sup> This suggests potential mechanisms for likely racial, ethnic, and linguistic disparities in the prevention of delirium.

Once delirium is recognized and diagnosed, patients with delirium are often managed with physical and/or chemical

restraints due to perceived concerns about their risk of self-harm. Although concerns about self-harm can be valid, the use of physical restraints has been widely shown to be a precipitating factor for delirium, and recent clinical trials have shown that antipsychotic use is ineffective in the prevention and treatment of ICU delirium.<sup>61,96,97</sup> Despite these concerns, there is evidence to suggest a lack of standardized selection criteria, inconsistent documentation in the chart, and insufficient reevaluation for discontinuation of physical restraints.<sup>60,90,98</sup> This invites bias and consequently racial, ethnic, and socioeconomic disparities in the treatment and prevention of delirium.

In fact, just as prior studies have shown disparities in the use of restraints in ED settings across multiple dimensions of an individual's identity—by race,<sup>49</sup> but also modified by age and gender<sup>65,67,99,100</sup>—at least one study in the inpatient setting found that patients with LEP had significantly increased risk of receiving both physical restraints and antipsychotic medications.<sup>80</sup> While these studies were not conducted with a focus on delirium, it is reasonable to suspect that the use of physical and chemical restraints is similar for patients with hyperactive delirium that manifests as agitation, across hospital settings.

### Hospital Discharge Destination

Patients can be discharged to a variety of settings, including homes, rehabilitation centers, or nursing homes. Social determinants of health and risk factors can impact discharge destination.

Nursing home placement is common after hospitalization. The 2013 National Inpatient Sample showed that 22.3% of patients were discharged from the hospital to postacute care settings with Skilled Nursing Facilities being the most common institutional setting.<sup>101</sup> Based on the National Post-Acute and Long-term Care Study, there are 1.3 million nursing home residents in the United States, and this number is likely to rise as the population ages.<sup>102</sup> Like other healthcare services, nursing home placement is often determined based on insurance status which frequently manifests as segregated facilities with unequal resources. For example, homes with  $\geq 50\%$  of Black patients had more Medicaid-funded residents and had lower ratios of registered nurses (RNs) and medical aide (MA) hours per resident.<sup>87</sup> In a study analyzing the 2014 Medicare admissions to nursing homes, Black and Hispanic patients with Alzheimer's dementia were less likely to go to nursing homes with special dementia care units and more likely to go to for-profit institutions.<sup>103</sup> These for-profit institutions yielded poorer outcomes for their patients.<sup>104,105</sup> This unequal care leads to medical complications. For example, the prevalence of pressure ulcers among high-risk nursing home residents is higher in Black residents compared with White residents, which increases a resident's risk of delirium.<sup>106</sup> While there are no studies that specifically look into the disparities of delirium diagnosis and treatment in marginalized patients in nursing homes specifically, it is known that delirium is underdiagnosed in nursing homes and long-term care

facilities, possibly due to lack of proper training or lack of documentation.<sup>107,108</sup> It is reasonable to hypothesize that less resourced facilities do a less adequate job in the diagnosis and management of delirium, and that marginalized populations are likely disproportionately effected. Studies will be needed to investigate the extent to which this occurs.

As in other healthcare settings, racial and ethnic minority patients are put in physical restraints at a higher rate than White patients in nursing homes, which increases their risk of delirium. Chemical and physical restraints continue to be used in nursing homes to varying degrees, with an estimated 9% using physical restraints and 26 to 27% using chemical restraints in the United States in 2003.<sup>109</sup> The use of physical restraints, especially chair restraints, in nursing homes is a significant risk factor for delirium.<sup>110</sup> In an analysis of the National Nursing Home Survey 2004, Black nursing home residents were more likely to be physically restrained (bed rails, side rails, and trunk restraints) compared with White nursing home residents.<sup>111</sup>

Just as with nursing homes, racial and/or ethnic disparities have been identified in rehabilitation settings.<sup>112</sup>

Patients from neighborhoods with lower SES are less likely to be discharged home. While this may be attributed to a desire to facilitate safe discharges, a home discharge is less delirigenic than other institution-based discharge destinations.<sup>113</sup> However, even when patients are discharged home, differential neighborhood physical disorder (presence of trash, vandalism, observed or perceived crime) and social cohesion (connectedness and solidarity within groups in a community) can affect recovery. There is limited research on these posthospitalization factors with respect to delirium risk and recovery, as well as long-term cognitive trajectory, representing an area of future study in better understanding and ultimately mitigating delirium disparities.

## Recommendations for Future Research and Action

The role of social determinants of health in the development, diagnosis, treatment, and outcome of delirium is understudied, particularly in the prehospital and posthospital settings. However, existing literature suggests there are multiple potential areas for intervention to prevent and treat delirium based on social determinants of health and the social-ecological frameworks, like increased investment in schools to improve later life cognitive function, as well as more proximal factors to patient care, like institutional policies and individual provider training to mitigate disparate restraint use.<sup>31,49</sup> We outline some potential interventions for various social determinants of health categories in ► **Table 1**. Using the social-ecological model, we can also consider multilevel interventions. At the interpersonal level, research and associated actions should be inclusive of family caregivers who are impacted by delirium and can play a facilitative role in recovery.<sup>114–116</sup> At the institutional level, other actions could include increasing collection and monitoring of disparity metrics as part of broader quality improvement efforts (i.e., around restraint use, and triage decisions), improving access to and training around the use of interpreters with

patients with delirium, and increasing workforce diversity to facilitate race and language-concordant care. At the policy level, other actions could include increasing resource allocation to nursing homes serving minoritized populations or enhancing reimbursement of interpreter services including for EMS. Lack of action, whether that is increased research to expand the limited research on delirium disparities or targeted multilevel interventions, would simply mean that modifiable risk factors are left unaddressed and an opportunity for improving patient care is missed.

### Funding

Altaf Saadi is supported in part by grant number K23NS128164 from the National Institute of Neurological Disorders and Stroke.

### Conflict of Interest

None declared.

## References

- 1 Thom RP, Levy-Carrick NC, Bui M, Silbersweig D. Delirium. *Am J Psychiatry* 2019;176(10):785–793
- 2 Maldonado JR. Acute brain failure: pathophysiology, diagnosis, management, and sequelae of delirium. *Crit Care Clin* 2017;33(03):461–519
- 3 Siddiqi N, House AO, Holmes JD. Occurrence and outcome of delirium in medical in-patients: a systematic literature review. *Age Ageing* 2006;35(04):350–364
- 4 Gilchrist NA, Asoh I, Greenberg B. Atypical antipsychotics for the treatment of ICU delirium. *J Intensive Care Med* 2012;27(06):354–361
- 5 Arias F, Alegria M, Kind AJ, et al. A framework of social determinants of health for delirium tailored to older adults. *J Am Geriatr Soc* 2022;70(01):235–242
- 6 Shinozaki G, Chan AC, Sparr NA, et al. Delirium detection by a novel bispectral electroencephalography device in general hospital. *Psychiatry Clin Neurosci* 2018;72(12):856–863
- 7 Lawlor PG, Bush SH. Delirium in patients with cancer: assessment, impact, mechanisms and management. *Nat Rev Clin Oncol* 2015;12(02):77–92
- 8 Fong TG, Davis D, Growdon ME, Albuquerque A, Inouye SK. The interface between delirium and dementia in elderly adults. *Lancet Neurol* 2015;14(08):823–832
- 9 Richardson SJ, Davis DHJ, Stephan BCM, et al. Recurrent delirium over 12 months predicts dementia: results of the Delirium and Cognitive Impact in Dementia (DECIDE) study. *Age Ageing* 2021;50(03):914–920
- 10 Golden SD, Earp JAL. Social ecological approaches to individuals and their contexts: twenty years of health education & behavior health promotion interventions. *Health Educ Behav* 2012;39(03):364–372
- 11 McLeroy KR, Bibeau D, Steckler A, Glanz K. An ecological perspective on health promotion programs. *Health Educ Q* 1988;15(04):351–377
- 12 Kumar S, Quinn SC, Kim KH, Musa D, Hilyard KM, Freimuth VS. The social ecological model as a framework for determinants of 2009 H1N1 influenza vaccine uptake in the United States. *Health Educ Behav* 2012;39(02):229–243
- 13 Rashid M. Developing scales to evaluate staff perception of the effects of the physical environment on patient comfort, patient safety, patient privacy, family integration with patient care, and staff working conditions in adult intensive care units: a pilot study. *Crit Care Nurs Q* 2007;30(03):271–283

- 14 Braveman P, Gottlieb L. The social determinants of health: it's time to consider the causes of the causes. *Public Health Rep* 2014;129(suppl 2, suppl 2):19–31
- 15 Hahn RA. What is a social determinant of health? Back to basics. *J Public Health Res* 2021;10(04):2324
- 16 Stern Y, Barnes CA, Grady C, Jones RN, Raz N. Brain reserve, cognitive reserve, compensation, and maintenance: operationalization, validity, and mechanisms of cognitive resilience. *Neurobiol Aging* 2019;83:124–129
- 17 Tow A, Holtzer R, Wang C, et al. Cognitive reserve and postoperative delirium in older adults. *J Am Geriatr Soc* 2016;64(06):1341–1346
- 18 Martinez FT, Tobar C, Beddings CI, Vallejo G, Fuentes P. Preventing delirium in an acute hospital using a non-pharmacological intervention. *Age Ageing* 2012;41(05):629–634
- 19 Finucane AM, Lugton J, Kennedy C, Spiller JA. The experiences of caregivers of patients with delirium, and their role in its management in palliative care settings: an integrative literature review. *Psychooncology* 2017;26(03):291–300
- 20 Wang YY, Yue JR, Xie DM, et al. Effect of the tailored, family-involved hospital elder life program on postoperative delirium and function in older adults: a randomized clinical trial. *JAMA Intern Med* 2020;180(01):17–25
- 21 Lahaie C, Earle A, Heymann J. An uneven burden: social disparities in adult caregiving responsibilities, working conditions, and caregiver outcomes. *Res on Aging* 2013;35(03):243–274
- 22 Dicks R, Choi J, Waszynski C, et al. Health disparities in delirium. *Innov Aging* 2021;5(suppl 1):147
- 23 Simmasalam R, Zuniga MC, Hinson HE. Neurological health in sexual and gender minority individuals. *Semin Neurol* 2024;44(02):193–204
- 24 Saadi A, Prabhu M, Snyder SA, Daboul L, Mateen FJ. Neurological care of refugees and other forcibly displaced persons. *Semin Neurol* 2024;44(02):217–224
- 25 Stern Y. Cognitive reserve. *Neuropsychologia* 2009;47(10):2015–2028
- 26 Stern Y, Habeck C, Moeller J, et al. Brain networks associated with cognitive reserve in healthy young and old adults. *Cereb Cortex* 2005;15(04):394–402
- 27 Jones RN, Yang FM, Zhang Y, Kiely DK, Marcantonio ER, Inouye SK. Does educational attainment contribute to risk for delirium? A potential role for cognitive reserve. *J Gerontol A Biol Sci Med Sci* 2006;61(12):1307–1311
- 28 Arias F, Chen F, Fong TG, et al. Neighborhood-level social disadvantage and risk of delirium following major surgery. *J Am Geriatr Soc* 2020;68(12):2863–2871
- 29 Arias F, Chen F, Shiff H, et al. Parental education and delirium risk after surgery in older adults. *Clin Gerontol* 2023;46(02):253–266
- 30 Shiff HM, Arias F, Dufour AB, et al. Paternal occupation and delirium risk in older adults: a potential marker of early-life exposures. *Innov Aging* 2022;6(05):igac050
- 31 Seblova D, Eng C, Avila-Rieger JF, et al. High school quality is associated with cognition 58 years later. *Alzheimers Dement (Amst)* 2023;15(02):e12424
- 32 Williams DR, Priest N, Anderson NB. Understanding associations among race, socioeconomic status, and health: patterns and prospects. *Health Psychol* 2016;35(04):407–411
- 33 Cizginer S, Marcantonio E, Vasunilashorn S, et al. The cognitive reserve model in the development of delirium: the successful aging after elective surgery study. *J Geriatr Psychiatry Neurol* 2017;30(06):337–345
- 34 Voyer P, Richard S, Doucet L, Cyr N, Carmichael PH. Precipitating factors associated with delirium among long-term care residents with dementia. *Appl Nurs Res* 2011;24(03):171–178
- 35 Kornblith E, Bahorik A, Boscardin WJ, Xia F, Barnes DE, Yaffe K. Association of race and ethnicity with incidence of dementia among older adults. *JAMA* 2022;327(15):1488–1495
- 36 Röhr S, Pabst A, Baber R, et al. Social determinants and lifestyle factors for brain health: implications for risk reduction of cognitive decline and dementia. *Sci Rep* 2022;12(01):12965
- 37 Kovaleva M, Jones A, Maxwell CA. Immigrants and dementia: literature update. *Geriatr Nurs* 2021;42(05):1218–1221
- 38 Saadi A, Morales B, Chen L, Sudhinaraset M. Understanding the function of social capital among Mexican and Chinese immigrants in Southern California: a qualitative study. *SSM Qual Res Health* 2023;3:100247
- 39 Kosar CM, Tabloski PA, Travison TG, et al. Effect of preoperative pain and depressive symptoms on the risk of postoperative delirium: a prospective cohort study. *Lancet Psychiatry* 2014;1(06):431–436
- 40 Ali MA, Hashmi M, Ahmed W, Raza SA, Khan MF, Salim B. Incidence and risk factors of delirium in surgical intensive care unit. *Trauma Surg Acute Care Open* 2021;6(01):e000564
- 41 Brunson DC, Miller KA, Matheson LW, Carrillo E. Race and ethnicity and prehospital use of opioid or ketamine analgesia in acute traumatic injury. *JAMA Netw Open* 2023;6(10):e2338070
- 42 Daoust R, Paquet J, Boucher V, Pelletier M, Gouin É, Émond M. Relationship between pain, opioid treatment, and delirium in older emergency department patients. *Acad Emerg Med* 2020;27(08):708–716
- 43 Lynch EP, Lazor MA, Gellis JE, Orav J, Goldman L, Marcantonio ER. The impact of postoperative pain on the development of postoperative delirium. *Anesth Analg* 1998;86(04):781–785
- 44 Kennel J. Treatment Disparities in Emergency Medical Services: The Influence of Race/Ethnicity, Obesity, and English Proficiency. Ph.D. Portland State University; 2022. Accessed February 11, 2024 at: <https://www.proquest.com/docview/2701048194/abstract/46CF11122CB5498BPQ/1>
- 45 Farcas AM, Joiner AP, Rudman JS, et al. Disparities in emergency medical services care delivery in the United States: a scoping review. *Prehosp Emerg Care* 2023;27(08):1058–1071
- 46 Perez MA, Reyes-Esteves S, Mendizabal A. Racial and ethnic disparities in neurological care in the United States. *Semin Neurol* 2024;44(02):178–192
- 47 LaMantia MA, Messina FC, Jhanji S, et al. Emergency medical service, nursing, and physician providers' perspectives on delirium identification and management. *Dementia* 2017;16(03):329–343
- 48 Kupas DF, Wydro GC, Tan DK, Kamin R, Harrell AJ IV, Wang A. Clinical care and restraint of agitated or combative patients by emergency medical services practitioners. *Prehosp Emerg Care* 2021;25(05):721–723
- 49 Eswaran V, Molina MF, Hwong AR, et al. Racial disparities in emergency department physical restraint use: a systematic review and meta-analysis. *JAMA Intern Med* 2023;183(11):1229–1237
- 50 Saadi A, Naples-Mitchell J, da Silva Bhatia B, Heisler M. End the use of “excited delirium” as a cause of death in police custody. *Lancet* 2022;399(10329):1028–1030
- 51 Elder NM, Mumma BE, Maeda MY, Tancredi DJ, Tyler KR. Emergency department length of stay is associated with delirium in older adults. *West J Emerg Med* 2023;24(03):532–537
- 52 Moura Junior V, Westover MB, Li F, et al. Hospital complications among older adults: better processes could reduce the risk of delirium. *Health Serv Manage Res* 2022;35(03):154–163
- 53 Lu FQ, Hanchate AD, Paasche-Orlow MK. Racial/ethnic disparities in emergency department wait times in the United States, 2013–2017. *Am J Emerg Med* 2021;47:138–144
- 54 Sangal RB, Su H, Khidir H, et al. Sociodemographic disparities in queue jumping for emergency department care. *JAMA Netw Open* 2023;6(07):e2326338
- 55 Peitzman C, Carreras Tartak JA, Samuels-Kalow M, Raja A, Macias-Konstantopoulos WL. Racial differences in triage for



- emergency department patients with subjective chief complaints. *West J Emerg Med* 2023;24(05):888–893
- 56 Schrader CD, Lewis LM. Racial disparity in emergency department triage. *J Emerg Med* 2013;44(02):511–518
- 57 van Loveren K, Singla A, Sinvani L, et al. Increased emergency department hallway length of stay is associated with development of delirium. *West J Emerg Med* 2021;22(03):726–735
- 58 Kim DA, Sanchez LD, Chiu D, Brown IP. Social determinants of hallway bed use. *West J Emerg Med* 2020;21(04):949–958
- 59 Tuffuor K, Su H, Meng L, et al. Inequities among patient placement in emergency department hallway treatment spaces. *Am J Emerg Med* 2024;76:70–74
- 60 Pan Y, Jiang Z, Yuan C, et al. Influence of physical restraint on delirium of adult patients in ICU: a nested case-control study. *J Clin Nurs* 2018;27(9–10):1950–1957
- 61 Rollo E, Callea A, Brunetti V, Vollono C, Marotta J, Della Marca G. Physical restraint precipitates delirium in stroke patients. *J Neurol Sci* 2021;421:117290
- 62 Rollo E, Callea A, Brunetti V, et al. Delirium in acute stroke: a prospective, cross-sectional, cohort study. *Eur J Neurol* 2021;28(05):1590–1600
- 63 Schnitzer K, Merideth F, Macias-Konstantopoulos W, Hayden D, Shtasel D, Bird S. Disparities in care: the role of race on the utilization of physical restraints in the emergency setting. *Acad Emerg Med* 2020;27(10):943–950
- 64 Carreras Tartak JA, Brisbon N, Wilkie S, et al. Racial and ethnic disparities in emergency department restraint use: a multicenter retrospective analysis. *Acad Emerg Med* 2021;28(09):957–965
- 65 Smith CM, Turner NA, Thielman NM, Tweedy DS, Egger J, Gagliardi JP. Association of Black Race With Physical and Chemical Restraint Use Among Patients Undergoing Emergency Psychiatric Evaluation. *Psychiatr Serv* 2022 Jul;73(07):730–736
- 66 Wong AH, Whitfill T, Oluabunwa EC, et al. Association of race/ethnicity and other demographic characteristics with use of physical restraints in the emergency department. *JAMA Netw Open* 2021;4(01):e2035241
- 67 Robinson L, Cramer LD, Ray JM, et al. Racial and ethnic disparities in use of chemical restraint in the emergency department. *Acad Emerg Med* 2022;29(12):1496–1499
- 68 van den Boogaard M, Pickkers P, Slooter AJC, et al. Development and validation of PRE-DELIRIC (PREdiction of DELIRium in ICU patients) delirium prediction model for intensive care patients: observational multicentre study. *BMJ* 2012;344:e420
- 69 Wassenaar A, van den Boogaard M, van Achterberg T, et al. Multinational development and validation of an early prediction model for delirium in ICU patients. *Intensive Care Med* 2015;41(06):1048–1056
- 70 Taylor SP, Karvetski CH, Templin MA, Taylor BT. Hospital differences drive antibiotic delays for black patients compared with white patients with suspected septic shock. *Crit Care Med* 2018;46(02):e126–e131
- 71 Estenssoro E, Loudet CI, Edul VSK, et al; Investigators of the SATISEPSIS Group. Health inequities in the diagnosis and outcome of sepsis in Argentina: a prospective cohort study. *Crit Care* 2019;23(01):250
- 72 Fawzy A, Wu TD, Wang K, et al. Racial and ethnic discrepancy in pulse oximetry and delayed identification of treatment eligibility among patients with COVID-19. *JAMA Intern Med* 2022;182(07):730–738
- 73 Breathett K, Liu WG, Allen LA, et al. African Americans are less likely to receive care by a cardiologist during an intensive care unit admission for heart failure. *JACC Heart Fail* 2018;6(05):413–420
- 74 Soto GJ, Hsieh S, Madahar P, Park SB, Gong MN. Health Disparities In The Development Of Delirium In The Intensive Care Unit. In: B94. Neuromuscular, cognitive and psychiatric issues in the intensive care unit. American Thoracic Society International Conference Abstracts. American Thoracic Society; 2012: A3643–A3643
- 75 Bauer AM, Alegría M. Impact of patient language proficiency and interpreter service use on the quality of psychiatric care: a systematic review. *Psychiatr Serv* 2010;61(08):765–773
- 76 Nápoles AM, Santoyo-Olsson J, Karliner LS, Gregorich SE, Pérez-Stable EJ. Inaccurate language interpretation and its clinical significance in the medical encounters of Spanish-speaking Latinos. *Med Care* 2015;53(11):940–947
- 77 Karliner LS, Jacobs EA, Chen AH, Mutha S. Do professional interpreters improve clinical care for patients with limited English proficiency? A systematic review of the literature. *Health Serv Res* 2007;42(02):727–754
- 78 Schenker Y, Pérez-Stable EJ, Nickleach D, Karliner LS. Patterns of interpreter use for hospitalized patients with limited English proficiency. *J Gen Intern Med* 2011;26(07):712–717
- 79 Chejor P, Atee M, Cain P, Whiting D, Morris T, Porock D. Comparing clinico-demographics and neuropsychiatric symptoms for immigrant and non-immigrant aged care residents living with dementia: a retrospective cross-sectional study from an Australian dementia-specific support service. *BMC Geriatr* 2023;23(01):729
- 80 Reppas-Rindlisbacher C, Shin S, Purohit U, et al. Association between non-English language and use of physical and chemical restraints among medical inpatients with delirium. *J Am Geriatr Soc* 2022;70(12):3640–3643
- 81 Chary AN, Torres B, Brickhouse E, et al. Language discordance in emergency department delirium screening: results from a qualitative interview-based study. *J Am Geriatr Soc* 2023;71(04):1328–1331
- 82 Wand AP, Thoo W, Ting V, Baker J, Sciuriaga H, Hunt GE. Identification and rates of delirium in elderly medical inpatients from diverse language groups. *Geriatr Nurs* 2013;34(05):355–360
- 83 Taha A, Xu H, Ahmed R, et al. Medical and economic burden of delirium on hospitalization outcomes of acute respiratory failure: a retrospective national cohort. *Medicine (Baltimore)* 2023;102(02):e32652
- 84 Burke LG, Frakt AB, Khullar D, Orav EJ, Jha AK. Association between teaching status and mortality in US hospitals. *JAMA* 2017;317(20):2105–2113
- 85 Ragheb J, Norcott A, Benn L, et al. Barriers to delirium screening and management during hospital admission: a qualitative analysis of inpatient nursing perspectives. *BMC Health Serv Res* 2023;23(01):712
- 86 Eagles D, Cheung WJ, Avlijas T, et al. Barriers and facilitators to nursing delirium screening in older emergency patients: a qualitative study using the theoretical domains framework. *Age Ageing* 2022;51(01):afab256
- 87 Travers JL, Castle N, Weaver SH, et al. Environmental and structural factors driving poor quality of care: an examination of nursing homes serving Black residents. *J Am Geriatr Soc* 2023;71(10):3040–3048
- 88 Brooks Carthon M, Brom H, McHugh M, et al. Better nurse staffing is associated with survival for black patients and diminishes racial disparities in survival after in-hospital cardiac arrests. *Med Care* 2021;59(02):169–176
- 89 Keijzer HM, Klop M, van Putten MJAM, Hofmeijer J. Delirium after cardiac arrest: phenotype, prediction, and outcome. *Resuscitation* 2020;151:43–49
- 90 Teece A, Baker J, Smith H. Identifying determinants for the application of physical or chemical restraint in the management of psychomotor agitation on the critical care unit. *J Clin Nurs* 2020;29(1–2):5–19
- 91 Inouye SK, Bogardus ST Jr, Charpentier PA, et al. A multicomponent intervention to prevent delirium in hospitalized older patients. *N Engl J Med* 1999;340(09):669–676

- 92 Marra A, Ely EW, Pandharipande PP, Patel MB. The ABCDEF bundle in critical care. *Crit Care Clin* 2017;33(02):225–243
- 93 Lee P, Le Saux M, Siegel R, et al. Racial and ethnic disparities in the management of acute pain in US emergency departments: Meta-analysis and systematic review. *Am J Emerg Med* 2019;37(09):1770–1777
- 94 Wing E, Saadat S, Bhargava R, Yun H, Chakravarthy B. Racial disparities in opioid prescriptions for fractures in the pediatric population. *Am J Emerg Med* 2022;51:210–213
- 95 Jolley S, Nordon-Craft A, Wilson MP, et al. Disparities in the allocation of inpatient physical and occupational therapy services for patients with COVID-19. *J Hosp Med* 2022;17(02):88–95
- 96 van den Boogaard M, Slooter AJC, Brüggemann RJM, et al; REDUCE Study Investigators. Effect of haloperidol on survival among critically ill adults with a high risk of delirium: the REDUCE randomized clinical trial. *JAMA* 2018;319(07):680–690
- 97 Girard TD, Exline MC, Carson SS, et al; MIND-USA Investigators. Haloperidol and ziprasidone for treatment of delirium in critical illness. *N Engl J Med* 2018;379(26):2506–2516
- 98 Thomann S, Zwakhalen S, Richter D, Bauer S, Hahn S. Restraint use in the acute-care hospital setting: a cross-sectional multicentre study. *Int J Nurs Stud* 2021;114:103807
- 99 Boley S, Sidebottom A, Vacquier M, Watson D. Investigating racial disparities in chemical and physical restraint of mental health patients in the emergency department. *J Racial Ethn Health Disparities* 2023. Doi: 10.1007/s40615-023-01863-4
- 100 Pino EC, Gonzalez F, Nelson KP, Jaiprasert S, Lopez GM. Disparities in use of physical restraints at an urban, minority-serving hospital emergency department. *Acad Emerg Med* 2024;31(01):6–17
- 101 Wen T An All-Payer View of Hospital Discharge to Postacute Care, 2013. HCUP Statistical Brief #205. Accessed May 14, 2024 at: <http://www.hcup-us.ahrq.gov/reports/statbriefs/sb205-Hospital-Discharge-Postacute-Care.pdf>
- 102 Biennial Overview of Post-Acute and Long-Term Care in the United States from 2020. Centers for Disease Control and Prevention. National Center for Health Statistics (NCHS); 2020. Accessed August 6, 2024 at: <https://www.cdc.gov/nchs/npals/webtables/overview.htm>
- 103 Rivera-Hernandez M, Kumar A, Epstein-Lubow G, Thomas KS. Disparities in nursing home use and quality among African American, Hispanic, and White Medicare Residents with Alzheimer's disease and related dementias. *J Aging Health* 2019;31(07):1259–1277
- 104 Bos A, Boselie P, Trappenburg M. Financial performance, employee well-being, and client well-being in for-profit and not-for-profit nursing homes: a systematic review. *Health Care Manage Rev* 2017;42(04):352–368
- 105 Comondore VR, Devereaux PJ, Zhou Q, et al. Quality of care in for-profit and not-for-profit nursing homes: systematic review and meta-analysis. *BMJ* 2009;339:b2732
- 106 Li Y, Yin J, Cai X, Temkin-Greener J, Mukamel DB. Association of race and sites of care with pressure ulcers in high-risk nursing home residents. *JAMA* 2011;306(02):179–186
- 107 Voyer P, Richard S, McCusker J, et al. Detection of delirium and its symptoms by nurses working in a long term care facility. *J Am Med Dir Assoc* 2012;13(03):264–271
- 108 Sepúlveda E, Franco JG, Leunda A, Moreno L, Grau I, Vilella E. Delirium clinical correlates and underdiagnosis in a skilled nursing home. *Eur J Psychiatry* 2019;33(04):152–158
- 109 Feng Z, Hirdes JP, Smith TF, et al. Use of physical restraints and antipsychotic medications in nursing homes: a cross-national study. *Int J Geriatr Psychiatry* 2009;24(10):1110–1118
- 110 Boorsma M, Joling KJ, Frijters DHM, Ribbe ME, Nijpels G, van Hout HPJ. The prevalence, incidence and risk factors for delirium in Dutch nursing homes and residential care homes. *Int J Geriatr Psychiatry* 2012;27(07):709–715
- 111 Cassie KM, Cassie W. Racial disparities in the use of physical restraints in U.S. nursing homes. *Health Soc Work* 2013;38(04):207–213
- 112 Jaffe KM, Jimenez N. Disparity in rehabilitation: another inconvenient truth. *Arch Phys Med Rehabil* 2015;96(08):1371–1374
- 113 Jung D, Rajbhandari-Thapa J, Chen Z. Disparities in successful discharge to the community following use of Medicare Home Health by level of neighborhood socioeconomic disadvantage. *J Appl Gerontol* 2023;42(10):2119–2128
- 114 Halloway S. A family approach to delirium: a review of the literature. *Aging Ment Health* 2014;18(02):129–139
- 115 McKenzie J, Joy A. Family intervention improves outcomes for patients with delirium: systematic review and meta-analysis. *Australas J Ageing* 2020;39(01):21–30
- 116 Shrestha P, Fick DM. Family caregiver's experience of caring for an older adult with delirium: a systematic review. *Int J Older People Nurs* 2020;15(04):e12321