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Infection Control Citations in Nursing Homes: Compliance and Geographic Variability

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ABSTRACT

Keywords:

Infection prevention deficiencies
geographic disparities

Objectives: To report the initial compliance with new infection control regulations and geographic disparities in nursing homes (NHs) in the United States.

Design: Retrospective cohort study from November 27, 2017 to November 27, 2019.

Setting and Participants: In total, 14,894 NHs in the continental United States comprising 26,201 inspections and 176,841 deficiencies.

Methods: We measured the cumulative incidence of receiving F880: Infection Prevention and Control deficiencies, geographic variability of F880 citations across the United States, and the scope and severity of the infection control deficiencies.

Results: A total of 6164 NHs (41%) in the continental United States received 1 deficiency for F880, and 2300 NHs (15%) were cited more than once during the 2-year period. Geographic variation was evident for F880 deficiencies, ranging from 20% of NHs in North Carolina to 79% of NHs in West Virginia. Between 0% (Vermont) and 33% (Michigan) of states' NHs were cited multiple times over 2 years. Facilities receiving 2 or more F880 deficiencies were more reliant on Medicaid, for-profit, and served more acute residents. Infection Prevention and Control deficiencies were of similar severity but of greater scope in NHs that were cited multiple times.

Conclusions and Implications: As the coronavirus disease 2019 pandemic challenges hospitals with an increased surge of patients from the community, NHs will be asked to accept convalescing patients who were previously infected with the virus. NHs will need to rely on infection control practices to mitigate the effects of the virus in their facilities. Particular attention to NHs that have fared poorly with repeat infection control practices deficiencies might be a good first step to improving care overall and preventing downstream morbidity and mortality among the highest-risk patients.

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Nursing homes (NHs) across the country face a mounting challenge from coronavirus disease 2019 (COVID-19), with early data showing vastly increased fatality rates among those with advanced age and comorbid illness.^{1,2} The deaths of 19 residents from a single NH near

Seattle, Washington, including the first death reported in the United States, had raised the chilling prospect that the 1.3 million NH residents will be among the most severely affected population.³ By June 2020, more than 43,000 NH residents and staff died from COVID-19.⁴ Absent effective treatment against COVID-19 and devoid of existing herd immunity among patients and staff, compliance with recommended infection control practices will be more important than ever to keep residents safe from the COVID-19 pandemic.

Historically, infection control practices within NHs have been important against more conventional illnesses such as influenza and norovirus.^{5–7} Recognizing the challenge of infection control within NHs, the Centers for Medicare and Medicaid Services (CMS) implemented enhanced standards through phases from November 2016

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Table 1
Characteristics of NH that Received 0, 1, or More than 1 Deficiency for F880: Infection Prevention and Control from 2017 to 2019

	Zero F880 Tags	One F880 Tag	≥Two F880 Tags	
Number of NHs	43% (6430)	41% (6164)	15% (2300)	
Total number of beds	682,870	687,913	262,291	
Total number of residents	533,904	540,557	201,440	
	M (SD)	M (SD)	M (SD)	P (0 vs ≥2)
Organizational structure (yes/no)				
For-profit facility	69.04%	73.46%	78.00%	<.001
Not for-profit facility	25.09%	20.77%	16.96%	<.001
Government facility	5.88%	5.78%	5.04%	.14
Chain-facility	59.08%	60.03%	57.35%	.15
Part of a CCRC	12.88%	10.14%	8.22%	<.001
Size (number of beds)	106.20 (61.37)	111.60 (59.19)	114.04 (53.75)	<.001
Occupancy rate (% out of 100)	78.06% (18.67)	78.62% (16.33)	77.31% (15.75)	.08
ADRD special care unit	13.72%	14.88%	13.57%	.86
Non-ADRD special care unit	3.14%	3.80%	4.52%	.002
Any special care unit	16.86%	18.67%	18.09%	.18
Payer-mix (% residents)				
Medicare	13.55% (14.20)	12.98% (12.56)	12.58% (11.52)	.003
Medicaid	57.30% (25.29)	60.65% (22.97)	62.41% (22.11)	<.001
Private pay and other	29.15% (21.43)	26.37% (18.86)	25.01% (18.14)	<.001
Resident characteristics (% residents)				
Acuindex (patient acuity)	10.36 (1.44)	10.43 (1.39)	10.52 (1.41)	<.001
Behavioral healthcare needs	21.38% (18.99)	21.49% (18.67)	21.44% (18.59)	.89
ADRD	45.13% (17.81)	44.57% (16.84)	43.47% (17.03)	<.001
Depression	37.18% (23.81)	36.82% (23.38)	35.58% (23.42)	.005
Intellectual disability	2.20% (5.57)	2.30% (5.40)	2.35% (4.64)	.23
Serious mental illness	32.67% (18.79)	33.85% (18.25)	33.94% (18.70)	.005
Physical restraint use	0.56% (3.68)	0.65% (3.99)	0.75% (4.56)	.04
Antipsychotic use	17.98% (13.52)	19.33% (13.97)	19.80% (13.96)	<.001
Infection risk factors (% residents)				
Pressure ulcer on admission	3.35% (4.15)	3.40% (3.81)	3.64% (3.93)	.004
Pressure ulcer developed	5.97% (5.43)	6.07% (4.99)	6.33% (4.95)	.005
Ostomy care	2.16% (3.22)	2.31% (3.45)	2.40% (3.50)	.003
Tracheostomy care	0.92% (5.29)	1.11% (5.64)	1.47% (6.52)	<.001
Suctioning care	1.04% (5.53)	1.26% (5.86)	1.63% (6.64)	<.001
Tube feeding care	3.79% (6.91)	4.16% (7.10)	4.80% (7.83)	<.001
Received influenza vaccine	65.47% (23.07)	63.53% (22.01)	62.31% (21.20)	<.001
Received pneumococcal Vaccine	63.28% (26.12)	60.97% (25.59)	58.44% (25.80)	<.001
Received antibiotics	8.47% (6.76)	8.72% (6.65)	8.50% (5.99)	.82

ADRD, Alzheimer's disease and related dementias; CCRC, continuing care retirement community; M, mean; SD, standard deviation.

These results use all freestanding nursing homes in the continental United States with at least 10 beds ($N = 14,894$). Characteristics of nursing homes were estimated from the closest inspection to the midpoint of the 2-year time period (ie, November 27, 2018). All F880 deficiencies were summed between November 27, 2017 and November 27, 2019.

through November 2019,⁸ though some surveyor guidelines from phase III are still delayed in 2020. Standards phased in so far require NHs to have programs to prevent, identify, investigate, and control infections and communicable diseases. Unfortunately, professionals responsible for infection control in NHs often have little to no specific training in infection prevention and control, and have additional responsibilities in the NH.⁹ The CMS guidance focuses on standard precautions such as hand hygiene, the use of gloves and masks, and procedures to disinfect equipment. NHs have not been required to have specialized equipment such as respirators or airborne infection isolation rooms.¹⁰

Recent research suggests that infection control has improved since these standards went into effect in 2016,¹¹ which is promising given the high rates of infection control deficiencies reported in the mid-2000s.¹² However, there is also evidence that infection control lapses continue to occur in NHs.¹³ It is conceivable that NHs that receive multiple infection control citations over time will be at greatest risk for adverse events because of communicable diseases. Given the heightened risk of mortality among older adults who contract COVID-19,¹⁴ highlighting these facilities for urgent quality improvement efforts may be in the best interest of public health professionals who seek to curb downstream mortality from the virus. We examined NH

compliance with new CMS infection control regulations and assessed variability by state. Specific attention was paid to identifying facilities that have received multiple citations for infection control.

Methods

This study used data from the Certification and Survey Provider Enhanced Reports (CASPER) to examine 26,201 inspections of 14,894 freestanding NHs in the continental United States from November 27, 2017 to November 27, 2019. Hospital-based NHs ($n = 640$) and facilities with fewer than 10 beds ($n = 23$) were excluded as they do not represent typical NHs and may have drastically different resources. The final sample represents 96% of all NHs in the continental United States. We analyzed all F880: Infection Prevention and Control deficiencies (Appendix 1 lists the federal regulations). Facilities with consecutive citations for F880 over the 2-year period were examined.

Deficiencies related to infection control were evaluated for the breadth of the problem (scope) and the relative harm caused to residents (severity). In accordance with classifications developed by CMS (Supplementary Table 1), scope of deficiencies was categorized as isolated, pattern, or widespread, and severity was categorized as potential for minimal harm, potential for more than minimal harm,

actual harm, or immediate jeopardy. Bivariate results (t -tests and χ^2 tests) with associated P values are reported in Table 1 to compare NHs with no F880 citation to NHs with more than one F880 citation.

Results

In total, 176,841 deficiencies were given to 14,894 NHs between November 27, 2017 and November 27, 2019. Of those deficiencies, 10,806 (6.11%) were for F880: Infection Prevention and Control (Table 1). A total of 8464 NHs (57%) in the continental United States received at least 1 deficiency for F880; 2300 NHs (15%) were cited more than once during the 2-year period. Infection Prevention and Control deficiencies were of similar severity but of greater scope in NHs that were cited multiple times (Supplementary Table 2).

In general, facilities receiving more than 1 Infection Prevention and Control deficiency in comparison to facilities receiving none were larger, for-profit, less likely to be a continuing care retirement community, more reliant on Medicaid, and had greater utilization of antipsychotics (all $P < .001$; Table 1). Residents dwelling in NHs that received multiple F880 deficiencies were more acutely ill and were more likely to require services that may increase the risk of contracting infectious diseases (eg, tracheostomy care, suctioning, and tube feeding; all $P < .001$). Though statistically significant, the effect size differences between resident characteristics are small (all Cohen $d \leq 0.21$).

Geographic variation was evident for Infection Prevention and Control deficiencies, ranging from 20% of NHs in North Carolina to 79% of NHs in West Virginia (Figure 1); 31 states cited 50% or more of their NHs. One-third of NHs in Michigan and Missouri were cited for multiple F880 deficiencies over 2 years, though receiving more than 1 deficiency varied by state (0% in Vermont) (Figure 2).

Discussion

Over a 2-year period, greater than one-half of all NHs in the United States received at least 1 regulatory citation for infection control

practices, with 31 states citing 50% or more of their facilities. More than 15% of all NHs received multiple Infection Prevention and Control citations over 2 years, whereas 43% received none. The effect size differences were small when comparing resident characteristics of NHs with none vs more than 1 Infection Prevention and Control deficiency. This may suggest that receiving an F880 deficiency is more related to process measures (eg, staffing levels, staff compliance with regulations) or geographic variability (ie, differences in vigilance and stringency may be found across states) rather than resident predispositions.

Considering geographic variability, prior research has found geographic differences in deficiency citations overall. CMS contracts with state agencies to conduct annual surveys to assess NHs' federal regulatory compliance. Several studies have found differences among states in the training and availability of regulatory staff to conduct surveys^{15–17} and in numbers of deficiencies cited.^{18–20} Walshe and Harrington²¹ found a significant relationship between state NH regulatory funding and deficiencies, with more well-funded states citing NHs for more deficiencies and a higher percentage of severe deficiencies. Others have highlighted regulatory differences among states that affect NH quality outcomes.²²

Whether the numbers of infection control deficiencies we found are a result of differences in survey practices, varying attention to infection control or differences in quality is unknown. However, the data do suggest that infection control practices are lagging in some regions and lapses may be worse among NHs with more vulnerable residents. Prior work by the United States Government Accountability Office²³ found similar results when analyzing deficiencies prior to the new F880 regulations. From 2013 to 2017, 82% of NHs received at least 1 Infection Prevention and Control deficiency, with 48% receiving multiple deficiencies in consecutive years and 19% receiving multiple deficiencies in nonconsecutive years.²³ Future work should examine if these patterns persist with the new tags and regulations.

To allow NHs the ability to focus on resident care and avoid distractions with routine inspections, CMS initially suspended inspections for at least 3 weeks in March 2020. On March 23, 2020 in

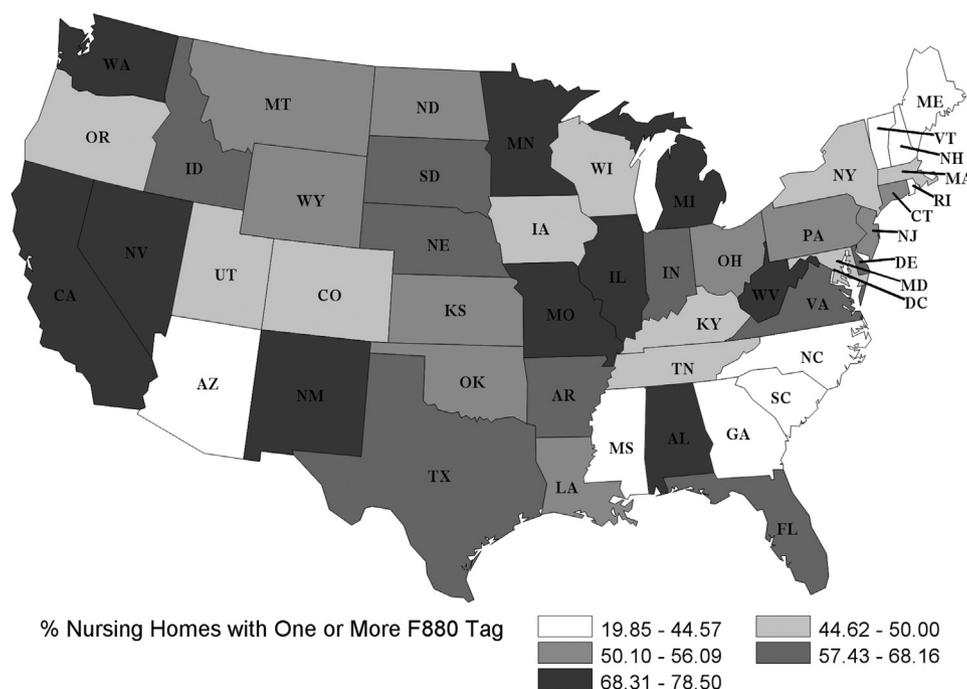


Fig. 1. Percentage of NHs that received at least 1 deficiency for F880: Infection Prevention and Control from 2017 to 2019. Of US NHs, 57% ($n = 8464$) received at least 1 F880 deficiency over 2 years. Cumulative incidence was lowest in North Carolina at 19.85% and highest in West Virginia at 78.50%.

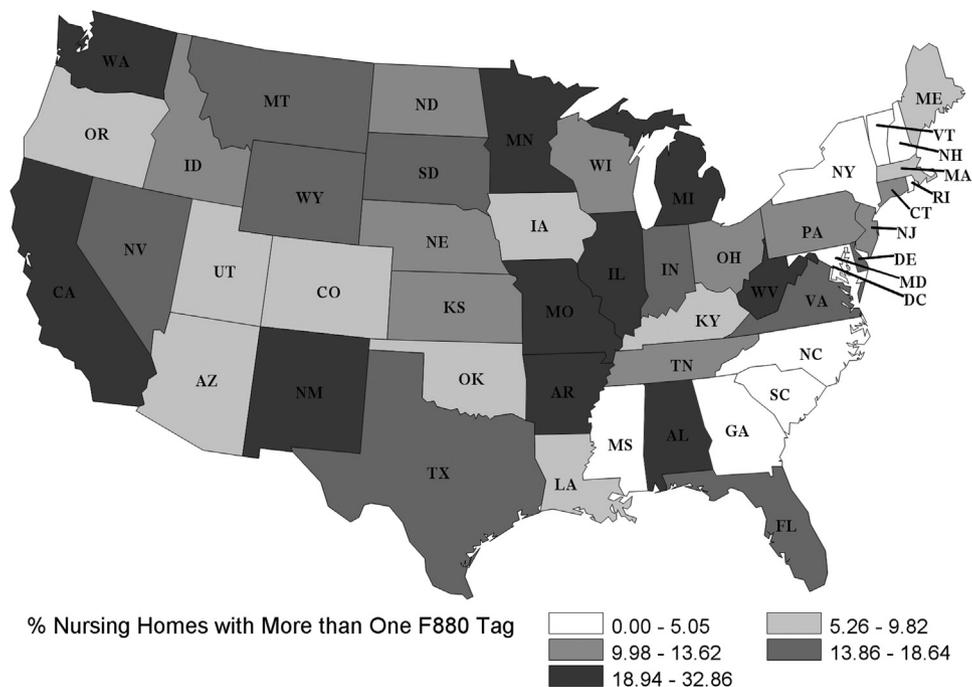


Fig. 2. Percentage of NH that received more than 1 deficiency for F880: Infection Prevention and Control from 2017 to 2019. Of US NHs, 15% (n = 2300) received more than 1 F880 deficiency over 2 years. Cumulative incidence was lowest in Vermont at 0% and highest in Michigan at 32.86%.

congruence with guidelines set by the Centers for Disease Control and Prevention (CDC), CMS announced a focused survey process that would highlight complaint inspections, targeted infection control inspections, and self-assessments to drastically limit the increasing number of NH residents with COVID-19.²⁴ By May 2020, CMS developed COVID-19 deficiencies (F884: COVID-19 Reporting to CDC, F885: Reporting to Residents, their Representatives, and Families) to enhance compliance with national guidelines on mandatory screening and reporting.²⁵ As the COVID-19 pandemic challenges hospitals with an increased surge of patients from the community, NHs will be asked to accept convalescing patients who were previously infected with the virus. NHs will need to rely on infection control practices to mitigate the effects of COVID-19 among other threats such as the increase in multidrug resistant organisms and influenza outbreaks in their facilities.²⁶ Paying particular attention to NHs with repeated infection control deficiencies would be a good first step to improving care overall and preventing downstream morbidity and mortality among the highest risk patients.

The relationship between past infection control citations and current COVID-19 cases and deaths is complex given the time-sensitive nature of a developing pandemic. Some have suggested that NHs with at least 1 COVID-19 case are larger, situated within an urban area, and have a greater proportion of residents identifying as racial or ethnic minorities, though 5-star rating and prior infection control deficiencies do not yet appear to be associated in the national data.²⁷ However, the relationship between 5-star quality and COVID-19 cases or deaths may be different between states. In California, a 5-star rating was associated with having fewer COVID-19 cases and deaths.²⁸ As the pandemic progresses quickly across the country, researchers must continuously update the literature on emerging associations. In all likelihood, it may be several months until we better understand the predisposing factors that led to heightened COVID-19 cases and deaths in some—but not all—NHs.

Equally as important are 2 additional infection control measures requiring NHs to hire infectious disease preventionists and to provide appropriate infection control training (F882 Infection Preventionist

Qualifications and Role; F945 Infection Control Training).²⁹ These new regulations were to have been implemented in November 2019 as part of phase III of the enhanced standards. However, CMS delayed the guidelines and training that would enable NH inspectors to assess for compliance of the new requirements. Whether this impacted the preparedness of NHs to mitigate particularly virulent infectious diseases like COVID-19 will never be known. The guidance is now scheduled to be released in the second quarter of the calendar year of 2020.²⁹ Given that the staffing of infection preventionists has not changed from 2014 to 2018,³⁰ these requirements may be especially impactful.

Conclusions and Implications

As the world tackles an unprecedented challenge to its infection control infrastructure, greater attention must be paid to NH infection control practices and to the resources required to assist those with deficiencies, particularly those with repeated deficiencies, who serve the most vulnerable residents.

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Supplementary Material.**Appendix 1. F880: Infection Prevention and Control Regulation***F880 §483.80 Infection Control*

The facility must establish and maintain an infection prevention and control program designed to provide a safe, sanitary and comfortable environment and to help prevent the development and transmission of communicable diseases and infections.

§483.80(a) Infection prevention and control program

The facility must establish an infection prevention and control program (IPCP) that must include, at a minimum, the following elements:

§483.80(a)(1) A system for preventing, identifying, reporting, investigating, and controlling infections and communicable diseases for all residents, staff, volunteers, visitors, and other individuals providing services under a contractual arrangement based upon the facility assessment conducted according to §483.70(e) and following accepted national standards;

§483.80(a)(2) Written standards, policies, and procedures for the program, which must include, but are not limited to: A system of

surveillance designed to identify possible communicable diseases or infections before they can spread to other persons in the facility; (ii) When and to whom possible incidents of communicable disease or infections should be reported; (iii) Standard and transmission-based precautions to be followed to prevent spread of infections; (iv) When and how isolation should be used for a resident; including but not limited to: (A) The type and duration of the isolation, depending upon the infectious agent or organism involved, and (B) A requirement that the isolation should be the least restrictive possible for the resident under the circumstances. (v) The circumstances under which the facility must prohibit employees with a communicable disease or infected skin lesions from direct contact with residents or their food, if direct contact will transmit the disease; and (vi) The hand hygiene procedures to be followed by staff involved in direct resident contact.

§483.80(a)(4) A system for recording incidents identified under the facility's IPCP and the corrective actions taken by the facility.

§483.80(e) Linens. Personnel must handle, store, process, and transport linens so as to prevent the spread of infection.

§483.80(f) Annual review. The facility will conduct an annual review of its IPCP and update their program, as necessary.

Missing subsections reflect new deficiencies being developed for Phase II (eg, §483.80(a)(3) became F881: Antibiotic Stewardship) or Phase III (eg, §483.80(b) Infection Preventionist will begin in 2020).

Supplementary Table 1

CMS Deficiency Scoring Criteria

Deficiency Severity	Deficiency Scope		
	Isolated	Pattern	Widespread
Potential for minimal harm	A	B	C
Potential for more than minimal harm	D	E	F
Actual harm	G	H	I
Immediate jeopardy	J	K	L

Letters designated by CMS are used in the calculation of star ratings for Nursing Home Compare.

Supplementary Table 2

Severity and Scope of F880: Infection Prevention and Control Deficiencies by NHs that had 1 or Repeated Citations

	One F880 Tag NHs = 6164 Tags = 6164	≥Two F880 Tags NHs = 2300 Tags = 4642
Deficiency severity		
Potential for minimal harm (B, C)	0.78% (48)	0.95% (44)
Potential for more than minimal harm (D, E, F)	98.49% (6071)	98.28% (4562)
Actual harm (G, H, I)	0.05% (3)	0.15% (7)
Immediate jeopardy (J, K, L)	0.68% (42)	0.62% (29)
Deficiency scope		
Isolated (D, G, J)	53.72% (3311)	48.58% (2255)
Pattern (B, E, H, K)	32.45% (2000)	36.54% (1696)
Widespread (C, F, I, L)	13.84% (853)	14.89% (691)

N = 8464 nursing homes with at least 1 F880 deficiency. In total, 10,806 F880 deficiencies from November 27, 2017 to November 27, 2019 were reported.