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Nursing home adoption of the National Healthcare Safety Network Long-term Care Facility Component

Andrew W. Dick, PhD[a], **Jeneita M. Bell, MD, MPH**[b], **Nimalie D. Stone, MD, MS**[b], **Ashley M. Chastain, MPH**[c], **Mark Sorbero, MS**[a], and **Patricia W. Stone, PhD, RN, FAAN**[c,*]

[a]The RAND Corporation, Boston, MA

[b]National Center for Emerging and Zoonotic Infectious Diseases, Division of Healthcare Quality Promotion, Centers for Disease Control and Prevention, Atlanta, GA

[c]Center for Health Policy, Columbia University School of Nursing, New York, NY

Abstract

Background: Health care-associated infections pose a significant problem in nursing homes (NHs). The Long-term Care Facility Component of the National Healthcare Safety Network (NHSN) was launched in 2012, and since then, enrollment of NHs into NHSN has been deemed a national priority. Our goal was to understand the characteristics of NHs reporting to the NHSN compared to other NHs across the country.

Methods: To meet this goal, we quantified the characteristics of NHs by NHSN enrollment status and reporting consistency using the Certification and Survey Provider Enhanced Reporting (CASPER) data linked to NHSN enrollment and reporting data.

Results: Of the 16,081 NHs in our sample, 262 (or 1.6% of NHs) had enrolled in NHSN by the end of 2015; these early adopting facilities were more likely to be for-profit and had a higher percentage of Medicare residents. By the end of 2016, enrollment expanded by more than 5-fold to 1,956 facilities (or 12.2% of NHs). In our analysis, the characteristics of those later adopting NHs were more similar to NHs nationally than the early adopters. Specifically, bed size and hospital-based facilities were related to both early and late adoption of NHSN.

Conclusions: The types of NHs that have enrolled in NHSN have changed substantially since the program began. The increased enrollment was likely due to the Centers for Medicare & Medicaid (CMS)-funded "*C. difficile* Infection (CDI) Reporting and Reduction Project" that incentivized Quality Innovation Network-Quality Improvement Organizations (QIN-QIOs) to support NH enrollment and participation in NHSN. Further understanding of a facility's ability to enroll in and maintain reporting to NHSN, and how this relates to infection prevention staffing and infrastructure in NHs and infection rates among NH residents, is needed.

[*]Address correspondence to Patricia W. Stone, PhD, RN, FAAN, Center for Health Policy, Columbia University School of Nursing, 560 W 168th St, Mail Code 6, New York, NY 10032. ps2024@cumc.columbia.edu (P.W. Stone).

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Keywords

Infection surveillance; Long-term care; NHSN; Nursing homes

BACKGROUND

Health care–associated infections (HAIs), particularly those caused by *Clostridium difficile* and multidrug-resistant organisms (MDROs) such as methicillin-resistant *Staphylococcus aureus*, pose a significant threat to nursing home (NH) residents.[1] National surveillance is needed to further elucidate the epidemiology of these HAIs in NH settings, monitor trends, and identify prevention targets. The Long-term Care Facility Component of the National Healthcare Safety Network (NHSN) was launched in 2012 by the Centers for Disease Control and Prevention (CDC) and is the first HAI surveillance system available for use by all long-term care facilities across the nation.[2,3] NHSN surveillance enables health care and public health professionals to (1) characterize the incidence and prevalence of HAIs within and across facilities, and (2) use these data to design targeted prevention strategies.

Although the US Department of Health and Human Services has identified NH enrollment into the NHSN as a national priority,[4] relatively few facilities enrolled during the initial years following its launch. As of December 2015, only 1.6% (n = 262) of the nation's NHs had enrolled.[5,6] However, enrollment grew markedly to 12.2% (n = 1,956) of NHs by the end of 2016 with the implementation of the Centers for Medicare & Medicaid (CMS)-funded *C. difficile* Infection (CDI) Reporting and Reduction Project[7] that incentivized Quality Innovation Network-Quality Improvement Organizations (QINQIOs)[8] to support NH enrollment and participation in the NHSN.[9]

Our goal was to better understand the characteristics of NHs reporting to the CDC's NHSN Long-term Care Facility Component compared with other NHs across the nation. Specifically, we describe the characteristics of NHs by NHSN enrollment status and reporting consistency, and characterize variations.

METHODS

Data sources

We utilized 2 data sources: (1) the Certification and Survey Provider Enhanced Reporting (CASPER) data, which are collected during state annual inspection surveys of all CMS-certified NHs and contain information about facility characteristics across the nation,[12] and (2) NHSN NH enrollment status and participation data, provided by the CDC. These 2 data sources were linked by the facility's CMS certification number. We linked the CDC data to the CASPER assessment data, by NH, using the assessment that provided the closest match in time. The CASPER data covered the period from March 2012 through March 2017, and the available NHSN enrollment data covered the period from January 2013 through December 2016. The NHSN data also provided indicators of the completeness of data reporting, including (1) whether complete data were reported for both the number of infections and the number of at-risk days (complete reporting), (2) whether either of these

fields were incomplete (incomplete reporting), and (3) whether no data were reported (not reporting). These data were limited to the period from January 2013 through December 2015.

Variables

Our work is guided by Rogers' diffusion of innovation theory, which posits that decisions to adopt innovations are related to prior conditions and helps describe how organizations progress through stages in the innovation-decision adoption process.[10,11] The decision stage is when there is acceptance or rejection of the innovation (ie, an NH enrolls into the NHSN and becomes an early or late adopter or chooses not to enroll). During the implementation stage, the innovation is adopted to a varying degree depending on the situation. During the confirmation stage, the decision to continue using the innovation is finalized (ie, maintaining consistent reporting).

Drawing on this theory, we used the merged data set to categorize NHs into 3 enrollment groups: early adopters (enrolled 2012 through 2015), late adopters (enrolled in 2016), and not enrolled; the distinction between the early and late adopters was based on the timing of the CMS CDI Reporting and Reduction Project that began in 2016.[7] To determine how consistently facilities reported infections after NHSN enrollment, we used a dichotomous indicator that defined consistent reporting as the provision of at least 9 months of complete data—that is, reported infection and patient day data were complete for at least 9 months in the year. Since the reporting consistency data were only available through December 2015, we constructed this indicator solely for the early adopters.

Select facility characteristics from CASPER were examined, including bed size, ownership, membership in a chain, hospital-based facility, and staffing. Additionally, we included several CASPER measures that could be related to health care quality in NHs (ie, percentage of residents with advanced directives, percentage of residents receiving influenza vaccination, percentage of residents receiving pneumococcal vaccination, and mean medication error rates), as well as the percentage of Alzheimer beds and percentage of hospice beds, as these latter 2 measures may be related to the overall health of the residents. Both vaccination variables were included as quality measures because influenza and pneumococcal vaccination of patients are recommended quality practices in long-term care settings and because they differ in nature–that is, influenza vaccination is seasonal, and pneumococcal vaccination is longer term. Furthermore, either of these patient immunization rates could be related to infection prevention infrastructure in NHs. Last, we examined CASPER variables associated with resident characteristics, including payer source and activities of daily living (ADL) indices with the notions that (1) the payer source is related resources available to residents, (2) ADLs are related to the underlying health and function of residents (ie, higher ADL indices translate to residents with more health care needs), and (3) both payer source and ADLs may be related to the overall workload of NH staff.

Data analysis

Summary statistics were used to describe the NHs by enrollment group, as well as by facility, quality of care, and resident characteristics. We then developed 3 related

multivariate logistic regression models to identify the characteristics related to enrollment status. A fourth and separate regression model was developed to examine characteristics associated with reporting consistency. We controlled for QIN-QIO region in all regression models because the CMS CDI Reporting and Reduction Project, which was designed to encourage NH enrollment and participation in NHSN and was operationalized through the QIN-QIOs, was ongoing at the time.

In each of the series of 3 related logistic regression models that identified the characteristics related to enrollment status, we used the facility, resident, and quality of care characteristics described earlier as the independent variables. The 3 regression models varied by the samples used and how the dependent variable was developed (Fig 1). In the first regression (Model 1), we examined overall enrollment in the NHSN (including both early and late adopters) by defining a dichotomous enrollment status variable for each NH (1 if enrolled and 0 if not enrolled); the rationale for combining early and late adopters was based on the relatively low number of early adopters available. In Model 2, using the same specification of independent variables as in Model 1, we defined the dependent variable as 1 if an NH enrolled prior to 2016 and 0 otherwise–that is, both NHs that were late adopters and those identified as nonadopters were grouped together as nonadopters in the early period. Model 2 allowed us to determine if patterns of enrollment differed in the NHs categorized as early adopters versus late adopters. In Model 3, we examined late adoption among those that were not early adopters. In other words, we defined late adoption as 1 if an NH enrolled during 2016 and 0 if it never enrolled, and we omitted early adopters. We then estimated a logistic regression model of late adopters using the same specification as the previous models. Comparison of these models allows us to examine NH characteristics of early adopters compared with late adopters, during which the CMS funding generated strong support through the QIN-QIOs.

Our last analysis, which focused on the completeness of reported data, was limited to early adopters (Fig 1). We specified a multivariate logistic regression model with consistent reporting as the dependent variable and included the same facility, resident, and quality of care characteristics as in the preceding 3 related regressions. By doing so, our estimates identified NH factors associated with consistent reporting to the NHSN.

RESULTS

Table 1 presents summary statistics for the sample. Of the 16,081 NHs in our sample, 1,956 had enrolled in the NHSN by the end of 2016, consisting of 262 (or 1.6% of NHs) early adopters and 1,694 (or10.5% of NHs) late adopters. Most enrolled NHs (45.4%) were large facilities (100–199 beds), whereas 35.6% of enrolled facilities had 50–99 beds. Generally, the facilities categorized as early adopters looked quite different from the NH facilities identified in CASPER nationwide, but the late adopters did not. For example, although more than two-thirds of all NHs across the country were for-profit institutions, only 38% of early adopters were for-profit compared with 69.8% of late adopters. NHs that were part of a chain were common among the full population of NHs (56.5%) and among late adopters (59.9%), but only38.5% of early adopters were members of chains. Although hospital-based NHs accounted for only 5.7% of all NHs and 5.6% of late adopters, 27.9% of early adopters

were hospital based. In summary, although the characteristics of early enrollees were substantively different from NHs overall, later NHSN enrollees looked much more similar to all NHs across the nation.

Table 2 describes multivariate regressions (Models 1–3). In Model 1 (ie, the regression that compares all enrolled NHs to those that are nonenrolled), NHs enrolled in the NHSN were larger, more likely to be hospital based, had a higher percentage of residents with pneumococcal vaccination, had a higher percentage of Medicare residents, and had residents with a higher transferring index than nonenrolled NHs. In addition, nonenrolled NHs were less likely to be for profit and use fewer licensed practical nurses per resident day than enrolled NHs (all $P < .05$).

A comparison of the estimation results across all 3 models shows the similarities and differences in enrollment predictors in the 2 periods and how different characteristics during the 2 different enrollment time periods contributed to the results in Model 1. For example, most ADL indices were not related to enrollment status, and bed size consistently was an independent predictor in both early (Model 2) and late (Model 3) enrollment time periods, with larger facilities being more likely to be enrolled at each stage (all $P < .01$). However, there are notable differences across time periods.

In Model 1, NHs that were chain members (odds ratio [OR] = 1.13, $P = .023$) or associated with a hospital (OR = 2.18, $P < .001$) were more likely to be enrolled overall. However, in Model 2, NHs that joined the NHSN in the early adopter time period were less likely to be a member of a chain (OR = 0.69, $P = .011$); in Model 3, those joining in the late adopter time period were more likely to be a member of a chain (OR =1.20, $P < .001$). Furthermore, although NHs joining the NHSN in both the early and late adopter time periods were more likely to be associated with hospitals than NHs that did not adopt NHSN, the result is much stronger in early adopters than in late adopters (Model 2: OR = 4.93, $P < 0.001$; Model 3: OR = 1.54, $P = .001$).

All staffing variables were independent predictors of late NHSN adoption in Model 3. NHs with registered nurses (OR = 0.92, $P = .044$) and licensed practical nurses (OR = 0.79, $P < .001$) who worked fewer hours per resident day were less likely to enroll in the NHSN in 2016. However, NHs with more certified nursing assistant hours per resident-day were more likely to be enrolled in 2016 (OR = 1.04, $P = .042$).

Of the measures that could be proxies for quality of care, only higher pneumococcal vaccination rates and higher availability of hospice beds in NHs were predictive of enrollment (all $P < .01$). Early adopters also had a higher percentage of hospice beds (OR = 14.69, $P = .019$); however, because of the small number of early adopters, this effect has a very large standard error (16.86) and is therefore imprecisely estimated.

Relative to the proportion of Medicaid residents, NHs with a greater proportion of Medicare residents were more likely to be enrolled in the NHSN in all models (all $P < .05$). Although significant in both Models 2 and 3, this result was particularly strong in Model 2–that is, in Model 2, the association was quite strong (OR = 3.41, $P < .001$) compared with Model 3 (OR = 1.52, $P = .037$).

Table 3 describes characteristics of the NHs that enrolled in the early adoption period with consistent reporting to the NHSN compared with those early enrolled facilities with inconsistent or no reporting. One QIN with 5 observations was dropped because none of the 5 NHs reported complete data, reducing the sample from an n = 262 to n = 257 observation. These results should be viewed with caution because of the small sample size and the resulting large estimated standard errors. Hospital-based NHs had an almost 6-fold higher odds of consistently reporting to the NHSN (OR = 5.98, $P < .001$). NHs with a higher pneumococcal vaccination rate also had a higher probability of consistently reporting their data (OR = 6.82, $P = .04$). The only ADL index that was related to consistent reporting was bathing, and those NHs with a higher resident bathing index were less likely to consistently report to the NHSN (OR = 0.09, $P = .03$).

DISCUSSION

We identified characteristics of NHs that were related to early and late adoption of the NHSN compared with facilities that had not yet enrolled in the NHSN. During the early enrollment period (2012–2015), relatively few NHs enrolled in the NHSN, and the profile of the early enrollment NHs was quite different from NH facilities nationwide. In contrast, enrollment expanded by more than 5-fold in 2016, and the characteristics of those later-adopting NHs were more similar to NHs nationally than the early adopters. This is likely owing to the CMS CDI Reporting and Reduction Project, which substantially increased NHSN enrollment through QIN-QIO involvement. Because our study was completed prior to the enrollment target dates specified in the CMS initiative, we are unable to report on the extent to which the QINQIOs were able to achieve their enrollment targets, or whether regional variations in QIN-QIO strategies may have been more or less effective at stimulating NHSN enrollment. We note here only that the dramatic increase in enrollment following the introduction of the CDI Reporting and Reduction Project is encouraging, but further work should be performed to evaluate the initiative and to identify best practices among the QIN-QIOs. The current funding period for the CDI Reporting and Reduction Project runs through fiscal year 2019, after which funding for the project is unknown.

When comparing the characteristics of NHs that were early adopters (enrolled prior to 2016) with those that were late adopters (enrolled in 2016), we found substantively important differences in their characteristics. This is likely because of the very different contextual influences during the early and late periods, the latter of which included the CDI Reporting and Reduction Project, which generated strong support for enrollment. For both early and late adopters, there was a strong relationship between facility size and NHSN adoption, with larger facilities more likely to enroll. Although the size of the facility was a consistent characteristic of NHs that joined the NHSN in both the early and late adopter time periods, being a hospital-based NH was not. Although hospital-based facilities were much more likely to enroll in both periods, the association was much stronger among early adopters than late adopters. Conversely, the direction of association for chain membership reversed from the early (less likely to enroll) to late (more likely to enroll) period. Additionally, nurse staffing predicted late adopters' enrollment status. Last, hospital-based facilities were more likely to have consistent reporting. In light of this, chain membership, size, being hospital

based, and staffing may be proxies for overall facility-level resources. Further understanding of how these characteristics influence NH adoption of the NHSN is needed.

We hypothesized that that NHs that performed better on some quality measures, particularly those related to infection prevention (eg, vaccination rates), might be more likely to enroll in the NHSN. To address this, we included pneumococcal and influenza vaccination rates. Our results, however, were inconsistent; we found that the pneumococcal vaccination rate was positively associated with both early and late NHSN adoption, but the influenza vaccination rate was not. Additionally, very few of the ADL indices were associated with enrollment status, yet the percentage of Medicare residents was positively associated with both early and late adoption. Other researchers have found that NHs with a high proportion of Medicaid patients may care for sicker residents and have less facility-level resources, so further understanding of how patient characteristics impact NHSN adoption in NHs is needed.[13]

There are limitations to this study. First, the CDC data on the consistency of NH reporting were only available through December 2015, which limited the analyses of the consistency of reporting to early enrollees. Second, we did not have facility-level data on the actual infection prevention staffing and infrastructure. Furthermore, whenever using existing administrative data sources such as CASPER, there may be errors (eg, staffing may be overreported). However, the CASPER data are collected by state survey agencies during their annual certification inspections, maintained by CMS, and used frequently in research. There is no reason to believe that any errors in CASPER data are systematically different by NH enrollment status.

CONCLUSIONS

Findings from our study suggest that the types of NHs that have enrolled in the NHSN have changed substantially since the program began, and by the end of 2016, the distribution of NHs enrolled in and reporting to the NHSN Long-term Care Facility Component are much more reflective of NHs across the country. Although caution should be used when interpreting results generated from the CDC infection data because participation by NH is voluntary, data from the later years (2016 and beyond) are much more likely to be representative of NH experiences nationwide. The improved representativeness of the participating NH may be a consequence of the CMS-funded CDI Reporting and Reduction Project. Operationalized through the 14 QIN-QIOs covering the entire country, the initiative began in 2016, which was the year that NH enrollment in the NHSN increased more than 5-fold. Further understanding of a facility's ability to enroll in and maintain reporting to the NHSN, and how this relates to infection prevention staffing and infrastructure in NHs and infection rates among NH residents, is needed.

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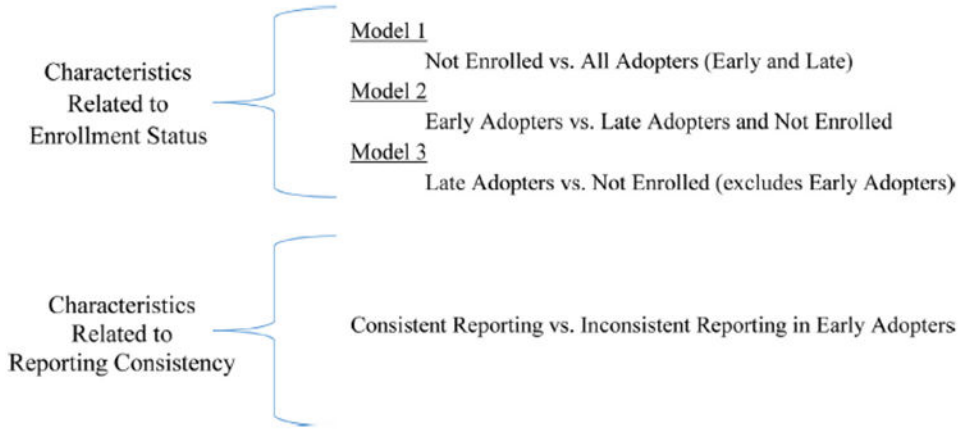

Fig 1.
Dependent variables and samples in multivariate analyses.

Table 1

NH characteristics: National Healthcare Safety Network, 2012–2016

	All NHs*	Not enrolled	Enrolled†		Early enrolled‡	Late enrolled§	
NHs (N)	16,081	14,125	1,956(12.2%)		262 (13.4%)	1,694 (86.6%)	
		% of column total		*P*	% of column total		*P*
Facility characteristics							
Bed size							
<25	2.4	**2.5**	**1.7**	**.034**	**5.7**	**1.1**	<**.001**
25–49	10.1	**10.4**	**8.1**	**.002**	**15.6**	**7.0**	<**.001**
50–99	36.3	36.4	35.6	.483	**22.1**	**37.7**	<**.001**
100–199	44.9	44.8	45.4	.630	40.1	46.2	.063
200+	6.3	**5.9**	**9.2**	<**.001**	**16.4**	**8.0**	<**.001**
Ownership							
For profit	69.2	**69.7**	**65.5**	<**.001**	**38.2**%	**69.8**	<**.001**
Government	7.2	7.2	7.1	.8162	**13.0**	**6.1**	<**.001**
Not for profit	23.7	**23.1**	**27.4**	<**.001**	**48.9**	**24.1**	<**.001**
Membership in a chain	56.5	56.4	57.0	.641	**38.5**	**59.9**	<**.001**
Hospital based	5.7	**5.3**	**8.6**	<**.001**	**27.9**	**5.6**	<**.001**
		Mean (SD)		*P*	Mean (SD)		*P*
Staffing (h/resident-d)							
RN	1.035 (2.40)	1.048 (2.54)	0.942 (0.92)	.068	**1.288**(**1.18**)	**0.888** (**0.86**)	<**.001**
LPN	0.931 (1.23)	**0.946**(**1.30**)	**0.821** (**0.42**)	<**.001**	0.867 (0.6)	0.813(0.38)	.053
CNA	2.633 (2.43)	2.639 (2.56)	2.583 (1.14)	.332	**2.713** (**0.75**)	**2.563** (**1.19**)	**.047**
Quality of care measures							
Advanced directive	55.1%(0.37)	**54.8**% (**0.37**)	**57.1**% (**0.37**)	**.011**	60.2% (0.36)	56.6% (0.37)	.136
Influenza vaccination	67.4%(0.27)	**67.2**% (**0.27**)	**68.8**% (**0.31**)	**.014**	**74.3**% (**0.61**)	**67.9**% (**0.22**)	**.002**
Pneumococcal vaccination	64.7%(0.29)	**64.3**% (**0.29**)	**67.5**% (**0.32**)	<**.001**	**74.5**% (**0.55**)	**66.4**% (**0.27**)	<**.001**
Alzheimer beds	3.7% (0.11)	**3.6**% (**0.12**)	**4.2**% (**0.11**)	**.023**	4.9% (0.12)	4.1% (0.11)	.305
Hospice beds	0.1%(0.03)	0.1% (0.03)	0.1% (0.03)	.605	0.5% (0.06)	0.1% (0.02)	.075
Medication error rate	1.67% (4.71)	1.66% (4.68)	1.80% (4.94)	.198	1.47% (4.27)	1.85% (5.04)	.246
		% of column total (SD)		*P*	% of column total (SD)		*P*
Resident characteristics							

	All NHs*	Not enrolled	Enrolled†		Early enrolled‡	Late enrolled§	
Payer source (primary)							
Medicare	15.3 (0.16)	**15.2 (0.16)**	**15.9(0.15)**	**.039**	**20.6 (0.22)**	**15.2(0.14)**	**<.001**
Other	26.6 (0.20)	26.7 (0.20)	26.0(0.17)	.118	25.9 (0.16)	26.0(0.17)	.968
Medicaid	58.1 (0.25)	58.1 (0.25)	58.1 (0.22)	.959	53.4(0.26)	58.8 (0.21)	**<.001**
		Mean (SD)		*P*	Mean (SD)		*P*
Activities of daily living‖							
Bathing index	1.278 (0.24)	1.278(0.25)	1.282 (0.22)	.487	1.275 (0.25)	1.283 (0.22)	.585
Dressing index	1.087 (0.2)	1.086 (0.20)	1.092 (0.18)	.229	1.091 (0.18)	1.092 (0.18)	.920
Transferring index	1.040 (0.21)	**1.038 (0.22)**	**1.056 (0.18)**	**<.001**	1.073 (0.18)	1.053 (0.18)	.094
Toileting index	1.083 (0.22)	**1.082 (0.22)**	**1.095 (0.19)**	**.012**	1.102 (0.20)	1.094(0.19)	.528
Eating index	0.673 (0.33)	0.674(0.33)	0.670 (0.32)	.656	0.643 (0.34)	0.675 (0.32)	.139

NOTE. Bolded values indicate significance at $\alpha < .05$.

CNA, certified nursing assistant; *LPN*, licensed practical or vocational nurse; *NHs*, nursing homes; *RN*, registered nurse.

*All NHs in the United States, as identified in the Certification and Survey Provider Enhanced Reporting dataset (from 2012–2017).

†All enrollment is defined as enrolled in the National Healthcare Safety Network from 2012–2016 (n = 1,956).

‡Early enrollment is defined as enrolled NHs from 2012–2015 (n = 262).

§Late enrollment is defined as enrolled in 2016 (n = 1,694).

‖Mean score of residents' adequacy of performance for 6 different functions (scores of 4 or less indicate functional impairment).

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Table 2

Multivariate logistic regression results: NH enrollment in the National Healthcare Safety Network by time of enrollment, 2012–2016

	Model 1 all enrollment†		Model 2 early enrollment‡		Model 3 late enrollment§	
NHs (N) *	16,081		16,081		15,819	
	OR (SE)	***P***	**OR (SE)**	***P***	**OR (SE)**	***P***
Facility characteristics						
Bed size						
<25	**0.27 (0.06)**	**<.001**	**0.28 (0.11)**	**0.002**	**0.25 (0.07)**	**<.001**
25–49	**0.37 (0.05)**	**<.001**	**0.48 (0.13)**	**0.006**	**0.36 (0.05)**	**<.001**
50–99	**0.57 (0.06)**	**<.001**	**0.35 (0.08)**	**<0.001**	**0.61 (0.07)**	**<.001**
100–199	**0.67 (0.06)**	**<.001**	**0.60 (0.13)**	**0.015**	**0.69 (0.07)**	**<.001**
200+			Referent			
Ownership						
For profit	**0.85 (0.05)**	**.009**	**0.42 (0.07)**	**<0.001**	0.95 (0.07)	.458
Government	0.88 (0.09)	.220	0.83 (0.18)	0.400	0.90(0.11)	.407
Not for profit			Referent			
Membership in a chain	**1.13(0.06)**	**.023**	**0.69 (0.10)**	**0.011**	**1.20 (0.07)**	**.001**
Hospital based	**2.18(0.24)**	**<.001**	**4.93 (0.95)**	**<0.001**	**1.54 (0.21)**	**.001**
Staffing (h/resident-d)						
RN	0.94 (0.03)	.072	0.99 (0.06)	0.919	**0.92 (0.04)**	**.044**
LPN	**0.82 (0.05)**	**<.001**	0.98 (0.10)	0.812	**0.79 (0.05)**	**<.001**
CNA	1.03(0.02)	.115	0.98 (0.06)	0.775	**1.04 (0.02)**	**.042**
Quality of care measures						
Advanced directive	1.03 (0.07)	.692	1.09(0.21)	0.654	1.02(0.08)	.778
Influenza vaccination	1.03 (0.11)	.797	1.15(0.26)	0.521	0.99 (0.12)	.909
Pneumococcal vaccination	**1.42(0.14)**	**<.001**	**1.51 (0.31)**	**0.048**	**1.41 (0.14)**	**<.001**
Alzheimer beds	1.36(0.31)	.178	2.41 (1.38)	0.125	1.23 (0.30)	.390
Hospice beds	1.34(1.08)	.714	**14.69(16.86)**	0.019	0.66 (0.74)	.712
Medication error rate	1.00 (0.01)	.423	1.00(0.01)	0.912	1.00(0.01)	.465
Resident characteristics						

	Model 1 all enrollment†		Model 2 early enrollment‡		Model 3 late enrollment§	
Payer source (primary)						
Medicare	**1.80(0.32)**	**.001**	**3.41 (1.31)**	**0.001**	**1.52 (0.31)**	**.037**
Other	0.76(0.11)	.065	0.92 (0.35)	0.830	0.78 (0.12)	.111
Medicaid	Referent					
Activities of daily living‖						
Bathing index	1.15 (0.17)	.328	1.70(0.66)	0.175	1.07(0.17)	.684
Dressing index	0.75 (0.19)	.259	**0.26 (0.17)**	**0.042**	0.91 (0.25)	.739
Transferring index	**1.74 (0.45)**	**.033**	3.96 (2.79)	0.050	1.60(0.44)	.091
Toileting index	1.17(0.33)	.568	1.12(0.84)	0.876	1.21 (0.36)	.518
Eating index	0.84 (0.08)	.064	0.77 (0.20)	0.302	0.85 (0.09)	.111

NOTE. Bolded values indicate significance at $\alpha < .05$.

CNA, certified nursing assistant; *LPN*, licensed practical or vocational nurse; *NH*, nursing home; *OR*, odds ratio; *RN*, registered nurse; *SE*, standard error.

*Numbers represent U.S. NHs in the Certification and Survey Provider Enhanced Reporting dataset from 2012–2017.

†All enrollment is defined as enrolled in NHSN from 2012–2016 (n = 1,956).

‡Early enrollment is defined as enrolled NHs from 2012–2015 (n = 262).

§Late enrollment is defined as enrolled in 2016 (n = 1,694).

‖Mean score of residents' adequacy of performance for 6 different functions (scores of 4 or less indicate functional impairment); QIN-QIO region was controlled for.

Table 3

Characteristics of NHs with consistent reporting: results of Multivariate logistic regression

NHs (N)	**257***	
	OR (SE)	*P*
Facility characteristics		
Bed size		
<25	0.70 (0.70)	.720
25–49	**0.23 (0.17)**	**.040**
50–99	0.52 (0.32)	.290
100–199	0.50 (0.24)	.150
Ownership		
For profit	0.89 (0.40)	.800
Government	0.95 (0.53)	.930
Membership in a chain	0.83 (0.33)	.630
Hospital based	**5.98 (2.83)**	**<.001**
Staffing (h/resident-d)		
RN	0.99 (0.21)	.970
LPN	1.70 (0.57)	.110
CNA	1.01 (0.12)	.910
Quality of care measures		
Advanced directive	0.58 (0.33)	.340
Influenza vaccination	0.53 (0.49)	.490
Pneumococcal vaccination	**6.82 (6.46)**	**.040**
Alzheimer beds	1.37 (2.34)	.850
Hospice beds	0.24 (2.26)	.880
Medication error rate	1.01 (0.06)	.880
Resident characteristics		
Payer source (primary)		
Medicare	1.76 (2.08)	.630
Other	9.24 (10.47)	.050
Activities of daily living		
Bathing index	**0.09 (0.10)**	**.030**
Dressing index	4.87 (9.24)	.400
Transferring index	11.99 (22.98)	.200
Toileting index	0.37 (0.73)	.610
Eating index	0.73 (0.48)	.630

NOTE. Bolded values indicate significance at $\alpha < .05$.

CNA, certified nursing assistant; *LPN*, licensed practical or vocational nurse; *NH*, nursing home; *OR*, odds ratio; *RN*, registered nurse; *SE*, standard error.

*Consistent reporting was defined as at least 9 months of complete data (both numerator and denominator) reported in the year. The sample is limited to those NHs that enrolled in the National Healthcare Safety Network early (prior to 2016) because of data availability.