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Research Article

CNA Training Requirements and Resident Care Outcomes in Nursing Homes

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Abstract

Purpose of the Study: To examine the relationship between certified nursing assistant (CNA) training requirements and resident outcomes in U.S. nursing homes (NHs). The number and type of training hours vary by state since many U.S. states have chosen to require additional hours over the federal minimums, presumably to keep pace with the increasing complexity of care. Yet little is known about the impact of the type and amount of training CNAs are required to have on resident outcomes.
Design and Methods: Compiled data on 2010 state regulatory requirements for CNA training (clinical, total initial training, in-service, ratio of clinical to didactic hours) were linked to 2010 resident outcomes data from 15,508 NHs. Outcomes included the following NH Compare Quality Indicators (QIs) (Minimum Data Set 3.0): pain, antipsychotic use, falls with injury, depression, weight loss and pressure ulcers. Facility-level QIs were regressed on training indicators using generalized linear models with the Huber-White correction, to account for clustering of NHs within states. Models were stratified by facility size and adjusted for case-mix, ownership status, percentage of Medicaid-certified beds and urban-rural status.
Results: A higher ratio of clinical to didactic hours was related to better resident outcomes. NHs in states requiring clinical training hours above federal minimums (i.e., >16 hr) had significantly lower odds of adverse outcomes, particularly pain falls with injury, and depression. Total and in-service training hours also were related to outcomes.
Implications: Additional training providing clinical experiences may aid in identifying residents at risk. This study provides empirical evidence supporting the importance of increased requirements for CNA training to improve quality of care.

Keywords: Certified nursing assistant, regulation, clinical training hours, resident outcomes, quality indicator, Minimum Data Set

Purpose of the Study

Certified nurse assistants (CNAs) are direct care workers who provide 65% of the daily assistance and health-related care for residents in long-term care facilities (American Health Care Association [AHCA], 2004; Squillace et al., 2009). Because of their close relationships with patients, CNAs are relied upon in the NH setting for preliminary identification of patients at risk. For example, recognition of pain cues in cognitively impaired residents (Liu 2014) is a task delegated to CNAs by licensed nurses. Therefore, adequate training is an essential component for CNAs working in NHs.

To become certified as a CNA, U.S. federal regulations require at least 75 initial training hours with a minimum of 16 clinical hours, plus 12 annual in-service training hours (Code of Federal Regulations, 2012). Required CNA training hours vary by state, since many U.S. states have chosen to require additional hours over the federal

minimums, to keep pace with the increasing complexity of care. The Office of the Inspector General (OIG), back in 2002, identified concerns among long-term care stakeholders about federal CNA training requirements, specifically the apportioning of didactic versus clinical training hours. Of greatest concern to CNA supervisors was that 16 clinical hours was insufficient to adequately prepare new CNAs for employment in long-term care facilities (OIG, 2002). In addition, CNAs themselves desired more clinical time and felt that they were inadequately prepared for real-life resident care (Sengupta, Harris-Kojetin, & Ejaz, 2010). The high turnover of CNAs (70% of some training program graduates) has also been identified as a potential consequence of insufficient clinical training experience for CNAs (OIG, 2002).

All staff in NHs require training to maintain care quality, and training needs of CNAs should not be overlooked. Better resident outcomes, such as fewer falls and lower average medication use, have been found in NHs in states requiring CNA training and in-service hours above federal minimums (Trinkoff et al., 2013). Other studies have found that additional CNA didactic training was related to adequate care for residents with cognitive impairment or low functional activity (Fitzpatrick, & Roberts, 2004; Smith, Kerse, & Parsons, 2005). Despite these findings, little is known about the impact of hours of CNA clinical preparation on resident outcomes. This study builds on our prior work relating CNA training and certification to resident outcomes, by examining state-level clinical versus didactic training regulations with an updated analysis of total initial training and in-service hours.

Design and Methods

The conceptual framework guiding this research is an adaption of the Systems Engineering Initiative for Patient Safety (SEIPS) model (Carayon et al., 2006). The SEIPS model draws from Donabedian's structure-process-outcome model (Donabedian, 1972) by emphasizing linkages of work system design to resident outcomes through care processes. We hypothesized that NHs in states with more stringent CNA training regulations (i.e., more training hours; higher ratios of clinical to didactic hours) would be associated with NH QI rates that reflect better care. Therefore, NHs in states where CNA training is more extensive will have lower adverse outcome rates. Studying regulatory changes in relation to outcomes can strengthen our understanding of the importance of regulatory requirements for CNA training and the potential impact of these regulations on outcomes.

Design and Sampling

Initially, we compared state CNA training regulations from 2010 to 2004, the year for which we first analyzed CNA regulatory data. Then we linked 2010 regulatory data from all 50 U.S. states and the District of Columbia to 2010 resident outcomes data from 15,508 NHs. We excluded 165 facilities that did not provide any facility characteristics or that had missing values for all resident outcomes. The University of Maryland Baltimore Institutional Review Board approved the study protocol.

Data Sources

Nursing Home Compare

The Center for Medicare and Medicaid Services (CMS) website provides public access to data files with detailed information about every Medicare and Medicaid-certified NH in the United States. For this study, 2010 NH Compare files were used to obtain facility-level QIs and facility characteristics (CMS, 2014). Data were from the CMS Minimum Data Set (MDS) 3.0 that measured residents' physical and cognitive status, acute medical condition and behavioral and emotional status at the facility level to create a comprehensive view of care for U.S. NHs (RTI, 2014). MDS QIs are generated annually, using quarterly data on resident care outcomes and other parameters reported by NHs. Compared to MDS 2.0, MDS 3.0 has improved resident input, uses more refined measurement tools to capture clinically relevant QIs and requires 48% less time to complete (Saliba & Buchanan, 2012).

State-level CNA Regulatory Data

Several online sources were used to compile state-level 2010 CNA training regulations. Regulations were first abstracted from the Paraprofessional Healthcare Institute (PHI) 2011 and AHCA websites, with additional information obtained from the NH Regulation Plus, University of Minnesota website (AHCA, 2009; PHI, 2011; University of Minnesota, 2012). If clarification was needed, appropriate state officials were contacted by telephone; three states were contacted to verify clinical hours in effect for 2010, and 22 states were contacted about in-service hours. This approach was similar to that used previously to obtain complete state-level regulatory data (Trinkoff et al., 2013).

Measures

Resident Outcomes

Long-stay QIs were calculated as facility-level rates defined as the percentage of residents with a targeted condition or with changes to resident mobility (MDS 3.0) (CMS, 2014). QIs used in this study were as follows: percentage of residents with pain, antipsychotics, falls with injury, weight loss, and pressure ulcers with definitions shown in Table 1.

Reliability and validity of MDS QIs has been reported in previous studies. An inter-rater reliability trial reported a cumulative correlation coefficient for all diagnoses as 0.74 (Hawes et al., 1997); for pain management and pressure ulcers, inter-rater reliability was 0.75 and 0.74, respectively (Mor et al., 2011). Good agreement levels were noted

Table 1. Definition of Included CMS Long-stay Nursing Home Quality Indicators, MDS 3.0

Quality indicator	Definition
High risk pressure ulcer	Percentage of high risk residents with pressure ulcer in last 7 days
Weight loss	Percentage of residents who lose 5% or more of weight in last 30 days, and 10% or more of weight in 6 months
Falls with injury	Percentage of residents experiencing one or more falls with major injury since most recent prior assessment
Depressive symptoms	Percentage of residents who have depressive symptoms in last 14 days
Antipsychotic medication	Percentage of residents who received an antipsychotic medication in last 7 days
Pain	Percentage of residents who self-report moderate to severe pain in last 5 days

Source: CMS, MDS 3.0 Quality Measures Users' Manual (RTI, 2014).

between MDS 2.0 QIs and chart reviews (Mor, Intrator, Unruh, & Cai, 2011). Improved reliability levels were found for MDS 3.0 compared with MDS 2.0, with most MDS 3.0 variables having good to excellent inter-rater reliability (Saliba & Buchanan, 2012). A variety of outcomes have been shown to be related to NH characteristics in previous studies and support the validity of the outcomes data (Bostick, Rantz, Flesner, & Riggs, 2006; Collier & Harrington, 2008; Horn, Buerhaus, Bergstrom, & Smout, 2005).

NH Compare suppresses values for long-stay measures in a NH when the denominator is less than 30. For a NH with suppressed values, this could mean that the QI rate was very low and/or that the home was small and therefore did not have enough residents to reach that denominator. QI rates for NHs with suppressed values were imputed following the imputation rule developed by Brown University (D. Tyler, personal communication, June 5, 2012). The numerator was set at 5 and the denominator was calculated using bed size multiplied by occupancy rate. After imputation, the percentage of NHs with missing QIs was less than 5%. Each QI was then dichotomized such that NHs exceeding the 75th percentile for each QI were considered to be lower quality compared with those with rates at or below the 75th percentile.

State Regulations

State-level CNA training hour requirements were coded for clinical, in-service, and total initial training hours dichotomized as follows: 0 = required hours at federal minimums; 1 = required hours exceeding federal minimums. Thus, clinical hours were coded as 0 = 16 hr, 1 > 16 hr; in-service as 0 = 12 hr, 1 > 12 hr; and total initial training hours as 0 = 75 hr, 1 > 75 hr. The ratio of clinical to didactic hours was created as follows: for each state, the actual clinical hours required were divided by didactic hours (obtained by total initial hours minus required clinical hours) to form a ratio.

Facility Characteristics

Facility Characteristics included facility size categorized by number of beds (<50, 50–99, 100–199, ≥200 beds), case-mix, ownership status (for-profit vs. not-for-profit), percentage of Medicaid-certified beds and urban-rural status. Case-mix was adjusted using expected staffing—a measure of facility case-mix defined as expected number of hours of care provided on average to each resident each day (CMS, 2014). Expected staffing was drawn from the CMS Nursing Home Compare website (CMS, 2014) and was designed to be used as a proxy for case-mix (Cowles, 2014).

Analysis

Descriptive statistics were used to estimate frequencies and percentages for the study variables. Each facility-level QI was regressed using generalized linear models with the Huber-White correction to account for clustering of NHs within states. Additional analyses were stratified by NH size due to a significant interaction effect of NH size and training hours on QI rates. Models examined associations of state-level training hour regulations (i.e., clinical hours, in-service hours, total initial training hours, and ratio of clinical to didactic hours) on resident outcomes (QIs) with and without adjustment for case-mix, ownership status, percentage of Medicaid-certified beds, and urban-rural status.

Results

Changes in CNA Training Hours

The distribution of required CNA training hours by state and NHs in the United States in 2004 and 2010 is presented in Table 2. The proportion of states requiring extra initial training hours beyond federal minimums increased to 61% in 2010 from 53% in 2004. For clinical training hours, in 2010 one-third of states had regulations requiring the 16-hr federal minimum. The other 31 states and District of Columbia required more clinical training hours—ranging from 20 (Rhode Island) to 100 hr (California and Missouri). Mandatory in-service training hours were unchanged from 2004; only three states (California, Florida, and Nevada) required more than the federal minimum. The proportion of states requiring extra initial training or in-service hours also increased slightly in 2010 to 29% from 24% in 2004 (Supplementary Appendix 1).

Because more states in 2010 required additional training hours compared with 2004, we also investigated how this translated down to actual NHs within states. Slightly more than half of all U.S. NHs (59%) were required to employ CNAs with training hours over federal minimums; clinical and in-service training hour requirements did not vary across facility size (Figure 1). There was no statistical

Table 2. Frequency and Proportion of States and Nursing Homes in U.S. 2004 Versus 2010 by Required Training Hours

	2004				2010			
	State (n = 49)[a]		Nursing home (n = 16,125)		State (n = 51)		Nursing home (n = 15,508)	
Total initial training								
Greater than 75 hr	26	(53.1)[b]	8,300	(51.5)	31	(60.7)	9,426	(58.6)
75 hr (minimum requirement)	23	(46.9)	7,825	(48.5)	20	(39.3)	6,664	(41.4)
In-service training (annual)								
Greater than 12 hr	3	(6.1)	2,125	(13.2)	3	(5.9)	2,002	(12.4)
12 hr (minimum requirement)	46	(93.9)	14,000	(86.8)	48	(94.1)	14,088	(87.6)
Requirement for initial and in-service training								
>75 total initial training hours and >12 hr annual in-service	3	(6.1)	2,082	(12.9)	3	(5.8)	1,966	(12.2)
>75 total initial training hours or >12 hr annual in-service	24	(49.0)	6,261	(38.8)	29	(56.8)	7,511	(46.7)
75 total initial training hours and 12 hr annual in-service training (federal minimum)	22	(44.9)	7,782	(48.3)	19	(37.3)	6,613	(41.1)

[a]District of Columbia and Alaska were excluded from the analysis in 2004. [b]Values in parentheses are percentages.

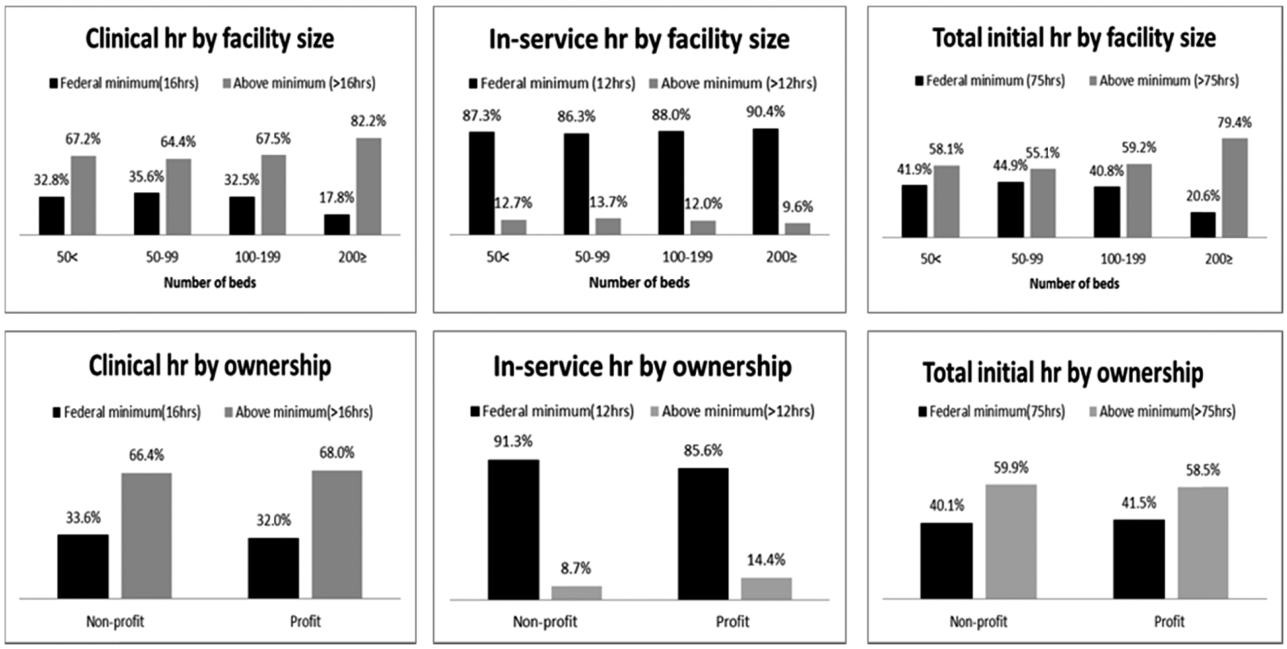

Figure 1. Proportion of U.S. nursing homes operating under their state training hour requirements by facility size and ownership, 2010 (n = 15,508).

variation in total initial training hours across facility size. The only training difference by ownership status was a smaller proportion of not-for-profit NHs offering additional in-service training compared with for-profit NHs (8.7% vs. 14.4%, p = .013).

CNA Training Hours and Resident Care Outcomes

Table 3 presents associations between each QI and required clinical hours, ratio of clinical to didactic hours, in-service hours, and total initial training hours stratified by NH size and adjusted for case mix, ownership, percentage of Medicaid-certified beds, and urban-rural status. We hypothesized that as required training hours increased, QI rates would decrease. Therefore, relationships with an estimated odds ratio (OR) below 1.0 would support this hypothesis. As the significance of the estimates changed little after adjustment, we therefore only presented the adjusted findings.

Clinical Training Hours

In general, we detected a pattern that NHs in states requiring more clinical training had better QIs than NHs in states

Table 3. Association Between CNA Training Hours and QI Rates (>75th percentile) in U.S. Nursing Homes, Stratified by Bed Size, After Adjustment[a] (*N* = 15,508)

	Pain (>75th percentile)		Antipsychotic use (>75th percentile)		Falls with injury (>75th percentile)		Depression (>75th percentile)		Weight loss (>75th percentile)		Pressure ulcer (>75th percentile)	
	OR	(95% CI)	OR	(95% CI)	OR	(95% CI)	OR	(95% CI)	OR	(95% CI)	OR	(95% CI)
Clinical training hours (>16 hr vs. 16 hr)												
<50 beds	0.63	(0.32, 1.24)	0.97	(0.66, 1.44)	0.88	(0.62, 1.25)	0.62*	(0.40, 0.97)	0.78	(0.58, 1.03)	1.33	(0.45, 3.93)
50–99 beds	0.61*	(0.50, 0.75)	0.84	(0.57, 1.26)	0.71*	(0.54, 0.95)	0.65	(0.38, 1.14)	0.84	(0.67, 1.04)	1.04	(0.79, 1.38)
100–199 beds	0.73	(0.52, 1.03)	1.10	(0.67, 1.79)	0.93	(0.70, 1.24)	0.78	(0.49, 1.26)	0.86	(0.70, 1.06)	1.15	(0.89, 1.49)
≥200 beds	0.35*	(0.19, 0.63)	1.08	(0.61, 1.91)	0.84	(0.54, 1.31)	0.71	(0.44, 1.14)	0.64	(0.41, 1.01)	1.36	(0.76, 2.41)
Ratio (clinical/didactic)												
<50 beds	0.59*	(0.36, 0.98)	0.81*	(0.66, 0.99)	0.82	(0.59, 1.14)	0.47*	(0.37, 0.61)	0.88	(0.59, 1.30)	1.21	(0.73, 2.02)
50–99 beds	0.82*	(0.68, 0.98)	0.82	(0.64, 1.06)	0.68	(0.43, 1.06)	0.59*	(0.38, 0.92)	0.81*	(0.67, 0.98)	1.07	(0.93, 1.23)
100–199 beds	0.87	(0.70, 1.08)	0.90	(0.60, 1.36)	0.81	(0.56, 1.18)	0.71*	(0.50, 1.00)	0.87	(0.69, 1.09)	1.03	(0.88, 1.20)
≥200 beds	0.87	(0.47, 1.61)	0.94	(0.65, 1.35)	0.78	(0.47, 1.30)	0.50*	(0.30, 0.84)	0.91	(0.55, 1.52)	0.71	(0.47, 1.09)
In-service training hours (>12 hr vs. 12 hr)												
<50 beds	0.11*	(0.05, 0.23)	0.60*	(0.42, 0.84)	0.43*	(0.31, 0.59)	0.34*	(0.20, 0.59)	0.34*	(0.26, 0.45)	1.56	(0.75, 3.24)
50–99 beds	0.68*	(0.51, 0.90)	0.69	(0.46, 1.04)	0.34*	(0.18, 0.63)	0.26*	(0.17, 0.40)	0.58*	(0.48, 0.71)	1.32*	(1.14, 1.53)
100–199 beds	0.84	(0.67, 1.04)	0.79	(0.39, 1.60)	0.54	(0.27, 1.07)	0.40*	(0.29, 0.55)	0.81	(0.50, 1.31)	1.00	(0.80, 1.26)
≥200 beds	0.86	(0.48, 1.56)	1.76	(0.53, 5.82)	0.46*	(0.24, 0.88)	0.26*	(0.18, 0.36)	0.74	(0.38, 1.47)	0.61*	(0.40, 0.96)
Total initial training hours (>75 hr vs. 75 hr)												
<50 beds	0.52	(0.25, 1.09)	0.92	(0.60, 1.42)	0.82	(0.56, 1.20)	0.55*	(0.36, 0.85)	0.81	(0.59, 1.11)	1.43	(0.49, 4.15)
50–99 beds	0.73*	(0.57, 0.94)	0.76	(0.52, 1.12)	0.68*	(0.50, 0.92)	0.65	(0.39, 1.09)	0.96	(0.75, 1.22)	1.15	(0.90, 1.47)
100–199 beds	0.80	(0.59, 1.08)	0.79	(0.48, 1.30)	0.83	(0.64, 1.08)	0.72	(0.48, 1.08)	0.97	(0.77, 1.23)	1.23	(0.97, 1.57)
≥200 beds	0.34*	(0.20, 0.59)	0.80	(0.43, 1.49)	0.77	(0.47, 1.25)	0.79	(0.50, 1.23)	0.69	(0.44, 1.08)	1.81*	(1.11, 2.93)

Note: CI = confidence interval; OR = odds ratio.

[a]Models adjusted for case-mix, ownership status, percentage of Medicaid-certified beds and urban-rural status; reference categories for all of the quality indicators: <75th percentile.

*$p < .05$.

where only the federal minimums were required (Table 3). NHs in states requiring additional clinical training hours were less likely to have a high percentage (i.e., >75th percentile) of residents with pain (50–99 beds: OR = 0.61, 95% confidence interval [CI] = 0.50, 0.75; ≥200 beds: OR = 0.35, 95% CI = 0.19, 0.63), falls with injury (50–99 beds: OR = 0.71, 95% CI = 0.54, 0.95), and depression (<50 beds: OR = 0.62, 95% CI = 0.40, 0.97) after controlling for case-mix, ownership, percentage of Medicaid-certified beds, and urban-rural status, compared to NHs in states with the federal minimum requirements.

Ratio of Clinical to Didactic Hours

The ratio of clinical hours divided by didactic hours had a significant negative association with the QIs, especially among all NHs for rates of depression. In other words, as clinical hours as a proportion of total training hours increased, there was a significant decrease in odds of NHs having residents with depression, regardless of NH size. Pain, antipsychotic medication use, and weight loss were similarly related, especially in smaller NHs: pain (<50 beds: OR = 0.59, 95% CI = 0.36, 0.98, 50–99 beds: OR = 0.82, 95% CI = 0.68, 0.98), antipsychotic medication use (<50 beds: OR = 0.81, 95% CI = 0.66, 0.99), and weight loss (50–99 beds: OR = 0.81, 95% CI = 0.67, 0.98).

In-service Training

NHs located in states with additional in-service training hours were less likely to have residents with higher QI rates compared with states requiring the federal minimums. Increased in-service hours were associated with lower odds of falls with injury and depression regardless of facility size. Associations between higher in-service training requirements and lower rates of pain, antipsychotic use, and weight loss were significant for smaller NHs. Pressure ulcers showed a mixed association with in-service training hours, depending on facility size (Table 3).

Total Initial Training Hours

After adjustment for case mix, ownership status, percentage of Medicaid-certified beds, and urban-rural status, in general, NHs in states requiring more training had better rates of QIs than NHs in states requiring only federal minimums (Table 3). This association was statistically significant for three QIs: pain (50–99 beds: OR = 0.73, 95% CI = 0.57, 0.94; ≥200 beds: OR = 0.34, 95% CI = 0.20, 0.59), falls with injury (50–99 beds: OR = 0.68, 95% CI = 0.50, 0.92) and depression (<50 beds: OR = 0.55, 95% CI = 0.36, 0.85). Whereas pressure ulcers showed the opposite pattern: NHs in states requiring more total initial training hours than federal minimums had higher odds of pressure ulcers (OR = 1.81, 95% CI = 1.11, 2.93).

Implications

This study presents new empirical findings stressing the importance of clinical training hours by examining their relationship to resident care outcomes. We found that NHs in states requiring additional clinical training hours above the federal minimum (i.e., >16 hr) had significantly lower odds of adverse resident outcomes, particularly pain, falls with injury, and depression. Furthermore, a higher ratio of clinical to didactic hours was also related to better resident outcomes. This study also extends and affirms our previous work on CNA requirements for total initial training and in-service training hours (Trinkoff et al., 2013). However for our current study, we used more recent data with adjustment for case-mix, ownership, percentage of Medicaid, and urban-rural status yielding improved though still comparable estimates.

The strong association between in-service training hours and all of the included QIs is also notable in our study though only a few states now require this, suggesting that ongoing training is critical to maintain the quality of care in NHs. Our findings regarding clinical hours also are worthy of additional discussion.

Clinical experiences have been a mainstay of nursing education, both in clinical settings and more recently in simulation, and greater clinical competence in nursing has been associated with greater clinical experience (Takase, 2013). Additional clinical experience has also been associated with observed competence and improved attitudes toward end-of-life care, which includes pain identification by nursing students (Chow, Wong, Chan, & Chung, 2014). Although similar research on CNA clinical education is not available, our findings that NHs with better resident outcomes were more likely to be located in states requiring increased clinical education hours are not surprising. Pain and depression identification in long-term care settings, especially among demented patients, is of continuing concern (Ersek, Polissar, & Neradilek, 2011; Swafford, Miller, Tsai, Herr, & Ersek, 2009). Consideration of increasing the clinical hours in CNA training programs could be an important step in addressing this complex problem.

The finding of increased pressure ulcers associated with increased total initial training hours was opposite to the hypothesized result, whereas for in-service hours, significant findings were conflicted (i.e., they occurred in both directions). Pressure ulcer QIs are based on their identification at any stage, including those that are just developing. Identification of pressure ulcer risk and development are important skills for CNAs to learn (Dellefield & Magnabosco, 2014). More research is needed to examine this finding and to assess whether CNAs with increased training hours might be identifying ulcers at earlier (and more treatable) stages compared with other CNAs.

Several limitations should be acknowledged when interpreting study results. First, this study used a cross-sectional design; therefore, causal relationships among variables cannot be confirmed. Second, imputation of suppressed values in NH Compare could have biased the estimates, though imputation was performed to reduce selection bias from exclusion of NHs with suppressed QIs. NHs with

suppressed QIs had fewer QI cases due to smaller size and/or due to better care quality. However, there is still a possibility of misclassification bias due to the imputation strategy. To minimize this potential bias, we examined the interaction effect of training hours and facility size on QI rates. As a significant interaction was found, we generated all estimates stratified by facility size. In addition, there is the possibility that one or more uncontrolled state-level variables could contribute to the reported findings. We acknowledge that there may be state-level variation that is uncontrolled after inclusion of variables such as case-mix, ownership, proportion of Medicaid and urban-rural status. Nonetheless, the purpose of our study was to examine differences in state-level training regulations as a possible source of between-state variation, allowing us to consider regulation as part of the variation among states.

We have presented evidence supporting that increased CNA clinical, in-service and total initial training hour requirements over federal minimums were related to NH QI rates reflecting better care quality. As the need for additional CNAs develops, due to increased numbers of elderly requiring care, it will also be important to examine what training content is actually desired by CNAs, and how additional training could affect CNA job satisfaction and turnover. A previous study of CNA training and job satisfaction found that CNAs with additional training in dementia care and work life skills (e.g., resolving conflicts and problem solving) were more satisfied with their jobs (Han et al., 2014). Meanwhile, efforts by stakeholders and policy makers to view additional CNA training hours as a potential means to improve care seem warranted.

Supplementary Material

Please visit the article online at http://gerontologist.oxfordjournals.org/ to view supplementary material.

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