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Nursing Home Staff Palliative Care Knowledge and Practices: Results of a Large Survey of Frontline Workers

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Abstract

Context—Deficits in quality end-of-life care for nursing home (NH) residents are well known. Palliative care is promoted as an approach to improve quality. The Palliative Care Survey (PCS) is designed to measure NH staff palliative care knowledge and practice.

Objectives—To comparing palliative care knowledge and practices across NH staff roles using the PCS, and to examine relationships between facility characteristics and PCS scores.

Methods—The PCS was administered to frontline NH staff—certified nursing assistants (CNAs), licensed practical nurses (LPNs), registered nurses (RNs), and social workers (SWs)—in 51 facilities in 2012. Descriptive statistics were calculated by job role. Linear mixed effects models were used to identify facility and individual factors associated with palliative care practice and knowledge.

Results—The analytic sample included 1200 surveys. CNAs had significantly lower practice and knowledge scores compared to LPNs, RNs, and SWs ($P < 0.05$). LPNs had significantly lower psychological, end-of-life, and total knowledge scores than RNs ($P < 0.05$ for all). Although knowledge about physical symptoms was uniformly high, end-of-life knowledge was notably low for all staff. A one-point higher facility star rating was significantly associated with a 0.06 increase in family communication score ($P = 0.003$; 95% CI: 0.02–0.09; SE = 0.02). Higher penetration of hospice in the NH was associated with higher end-of-life knowledge ($P = 0.003$; parameter estimate = 0.006; 95% CI: 0.002–0.010; SE = 0.002). Sixty-two percent of respondents stated that, with additional training, they would be interested in being leaders in palliative care.

Conclusion—Given observed differences in palliative care practice and knowledge scores by staff training, it appears the PCS is a useful tool to assess NH staff. Low end-of-life knowledge scores represent an important target for quality improvement.

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Disclosures

The authors declare no conflicts of interest.

Keywords

Nursing home; palliative care; end of life; hospice

Introduction

Care for nursing home (NH) residents near the end of life often falls short. Treatment and monitoring for symptoms such as pain and dyspnea,^{1,2} as well as clear communication about prognosis and goals of care, are not consistent practice.³⁻⁵ Palliative care is comprehensive, interdisciplinary care that aims to relieve suffering and improve quality of life for people with advanced illness and their families.⁶ This model of care generally includes good communication with family members, streamlined provider coordination, thorough care planning and intervention, and bereavement support. Palliative care has been touted by experts as an answer to some of these NH quality concerns.⁶⁻⁸ However, formal NH palliative care programs, including specialized training of staff, are scarce.⁹

Palliative care can be delivered in the NH setting in a variety of ways. Three models that have been described include: partnerships with hospices, external palliative care teams, and facility-based teams and/or hospice units.¹⁰ In all these models, NH staff—including certified nursing assistants (CNAs), licensed practical nurses (LPNs), registered nurses (RNs) and social workers (SWs) – must be involved in developing, coordinating, and carrying out palliative care treatment plans. CNAs provide basic hands-on assistance with care of residents, including bathing, feeding and toileting. LPNs are responsible for clinical care, including passing medications and following through on medical care plans. RNs have a higher level of training than LPNs, including assessment skills. Lack of palliative care training of NH staff has been cited as a barrier to providing optimal end-of-life care to NH residents.⁷ Conversely, in NHs with a specific palliative care focus, staff engage in advance care planning, are confident in active symptom management, and provide psychosocial support for dying residents and their families.¹¹

The Palliative Care Survey (PCS) for NH staff, which measures both knowledge and practices, was developed and validated by Thompson et al.¹² A recent survey found that residents who died in facilities where the Directors of Nursing scored higher on items from the PCS had a higher likelihood of appropriate documentation of terminal status on their Minimum Data Set assessments and a lower likelihood of aggressive treatments near the end of life such as tube feeding and emergency room visits.¹³

We report here our findings from the administration of the PCS to a large sample of NH staff in 51 Indiana facilities. This was part of a larger survey that included questions about interactions with hospice, as well as open-ended prompts¹⁴ designed to measure knowledge, practice and attitudes towards both palliative care and hospice by NH staff at multiple levels. In addition to comparing palliative care knowledge and practices across staff roles, we also examined relationships between facility characteristics and PCS scores. We expected staff members with greater training, that is, RNs vs. CNAs, would have higher scores on palliative care knowledge and practice, and anticipated that facility characteristics, including overall quality rating (as measured by the Federal rating system—Nursing Home Compare

[NHC]) and hospice penetration, would be positively correlated with higher palliative care scores.

Methods

Instrument

The PCS is a validated 51-item inventory that measures NH staff engagement in palliative care practice, as well as knowledge about best practices in end-of-life care.¹² Respondents are asked to share their perceptions about quality and use of hospice in an NH (e.g., When a resident approaches death, how often are family members unhappy because they think staff do not know the plan of care?), as well as being presented with hypothetical scenarios to assess what action they would take. Vignettes are used to overcome the challenge of participants reporting what they should do as opposed to what they actually do. For example, respondents are presented with a case of a resident's condition at admission three months ago and the decline she has experienced during the past month. Follow-up questions relate to timing of discussions with family members about dying and end-of-life care practices. Thompson et al.¹² used a two-phase psychometric evaluation using individual item analysis and then measured reliability and validity of the instrument. Internal consistency reliability was assessed using Cronbach's alpha and found good reliability for the two main constructs: palliative care practice ($\alpha = 0.75$) and palliative care knowledge ($\alpha = 0.81$). Factor analysis was used as a measure of construct validity, and the authors reported adequate fit of the model to the data. They found strong correlations among the subconstructs in line with their hypothesis.

Sample and Survey Administration

Employees from 51 Indiana NHs, representing two NH chains, were asked to complete a survey about practices, knowledge, and opinions regarding palliative and hospice care in May–June 2012. Surveys were distributed to facility staff in the following roles: CNA, LPN, RN, SW, or “other.” An overall response rate of 71% was calculated based on the total number of staff given an opportunity to complete the survey. Before distributing the survey, study procedures were approved by the Institutional Review Board of Indiana University/Purdue University Indianapolis.

The survey format and administration differed between chains. The survey content and explanation of the survey purpose did not differ. Personnel in the first chain were given hard copy surveys by the research team during regularly scheduled all-staff meetings. Staff members present in the building at the time of the meeting were expected to attend; staff not on duty (i.e., night staff) were not given the opportunity to complete the survey in these buildings. A study team member described the purpose of the study and ensured confidentiality of participants' answers. A study information sheet was given to participants before receiving the survey, including a description of the voluntary nature of the survey. Employees with the second chain completed the exact same questionnaire items via Survey Monkey, an online survey tool. All employees were sent an e-mail describing the purpose and voluntary nature of the study along with the study information sheet and directions with a link to the survey. Management was not given direct access to reviewing the results of the

surveys, which was explained to participants. Corporate management of each chain received a summary report after data collection was complete. Response rates were comparable between the two chains, with averages of 71.5% and 71%.

In total, we received 1859 surveys from 52 NHs. Because our primary analysis included site-specific Online Survey, Certification, and Reporting (OSCAR) data, we excluded 344 surveys that did not provide the name of the nursing facility. We also excluded one NH (with nine responses) from which we were unable to obtain OSCAR data. A primary objective was to compare scores between various positions; therefore, we excluded 103 surveys missing this information and 197 surveys where the position answered was “other” as this category could represent a multitude of positions, including some that do not provide direct patient care. We also excluded 17 subjects who did not provide any of the practice or knowledge scores or other key covariates needed in the models. Thus, there were 1200 (64.6%) surveys available for analysis.

Scoring

To assess staff palliative care practices, the survey included scales measuring the frequency of three practice behaviors: family communication, provider coordination, and bereavement. Individual items were scored ranging from 1 (never) to 4 (always). For these scores, if 50% or more of items were answered, the mean was calculated. A fourth palliative care practice behavior, planning/intervention, was assessed using four vignettes comprising five questions each, which had the same four-point response options. Weighted scores were assigned to each question ranging from 0 to 5, consistent with the scoring method of the survey developers.¹² If the subject answered at least one item from a vignette, the sum of the five questions was calculated and then divided by the maximum value available for that vignette. The total planning/intervention score was calculated as the mean of the four vignette scores and transformed to match the 1–4 scoring of the other practice subscales. A total palliative care practice score was calculated as the mean of the four subscales. Thus, the total score and each of the subscales ranged from 1 to 4 where higher scores indicated better palliative care practice.

The survey also included three palliative care knowledge subscales: psychological, physical, and end of life. Using scoring instructions from Thompson et al., correct responses were tallied to elicit a percentage-based score (possible range 0%–100%). A total palliative care knowledge score was calculated as the mean of the three subscales.

The survey also asked respondents: “Would you be interested in being a leader in your facility for palliative and end of life care if you had specialized training, support from administration and other staff, and the opportunity for career growth?” Answer choices were yes/no.

Facility Data

Facility level variables (e.g., number of beds, % Medicare) were obtained from the OSCAR data network for 2011,¹⁵ NH star ratings, which are a composite quality measure including regulatory survey findings and self-reported staffing and quality metrics reported on the Medicare NHC Web site, also were obtained for the quarter closest to data collection.¹⁶

NHC indicators, which are publicly reported, are designed to help consumers compare quality in NHs and to drive overall quality improvement; there is some evidence that they have been effective in this, especially in more competitive NH markets.^{17–19}

Statistical Analysis

Descriptive statistics were calculated for each position from survey responses, and by OSCAR items for all NHs. Linear mixed effects models were used to identify factors associated with the palliative care practice and knowledge total scores and subscales. For each model, if the score/subscale of interest was missing or not calculated as a result of insufficient responses, then that observation was excluded for that particular model. The scores of respondents from the same facility were expected to be correlated; thus, the facility was included in the model as a random effect. Factors included in each model were the respondent-level variables position and length of time working in NHs and site-level variables including star rating, occupancy rate, total number of beds, total nurse aides per 100 beds, whether 50% or more of the residents have dementia, and the percent of residents with pain, Medicare, Medicaid, or hospice. As star ratings reflect facility-reported nurse staffing data, we did not separately include percent of RN licensed staff and total RN + LPN FTEs in the model. For categorical variables with significant *P*-values, we calculated adjusted means and SEs for each category; *P*-values for pairwise comparisons were then calculated and adjusted using Tukey's method.

Results

The final analytic sample included 51 NHs and 1200 completed surveys. Table 1 shows the demographics of the NH staff overall and by position. The sample was predominantly white (75.4%) and female (92.8%). Across all nursing positions, most staff had either worked in NHs (not necessarily continuously in one NH) between six months and five years or more than 10 years. Very few had worked less than six months. Most SWs had worked more than five years in NHs. Most of the staff were 50 years old or younger, with 56% of CNAs being between 18 and 30 years of age.

Table 2 shows the descriptive statistics of the 51 nursing facilities. More than half (54.9%) had overall star ratings of either 4 or 5. The characteristics of NHs in the sample were similar to Indiana and U.S. NHs overall.

Table 3 shows the adjusted means for palliative care practice scores by position and length of time working in NHs. CNAs had significantly lower scores on bereavement, provider coordination, and total practice score compared with LPNs, RNs, and SWs ($P < 0.05$ for all). For family communication, CNAs had significantly lower scores only compared with SWs ($P < 0.05$). For planning/intervention, CNAs had significantly lower scores than LPNs and RNs ($P < 0.05$ for both). LPNs also had significantly lower bereavement scores than SWs ($P < 0.05$). The length of time the person had worked in NHs overall was not significantly related to palliative care practice scores, with the exception that those who had less than six months' experience had higher family communication scores compared with those with more than 10 years' experience in NHs ($P < 0.001$) and had higher total practice scores compared with those with 5–10 years of experience ($P = 0.03$). From the models examining

the associations between facility characteristics and the five practice scores, only one significant association was observed: a one-point higher facility star rating was significantly associated with a 0.06 increase in family communication score ($P = 0.003$; 95% CI: 0.02–0.09; SE = 0.02). Staff from NHs with better quality ratings were more likely to report better palliative care communication practices.

Table 4 shows adjusted means for palliative care knowledge scores by position and length of time working in NHs. CNAs scored significantly lower on psychological, physical, end-of-life, and total knowledge compared with LPNs and RNs and lower scores than SWs in all areas except physical ($P < 0.05$ for all). LPNs had significantly lower psychological, end-of-life, and total knowledge scores than RNs ($P < 0.05$ for all). RNs had significantly higher end-of-life scores than SWs ($P < 0.05$). Although knowledge about physical symptoms was uniformly high, end-of-life knowledge was notably low for staff in all positions. Having greater than 10 years experience in NHs was significantly associated with higher total palliative care knowledge scores ($P = 0.005$).

From the models examining associations between facility characteristics and knowledge scores, the only significant finding was the association between percent receiving hospice benefit and a higher end-of-life knowledge score ($P = 0.003$; parameter estimate = 0.006; 95% CI: 0.002–0.010; SE = 0.002). A sensitivity analysis including additional detailed facility data on nurse staffing from NHC did not change the results.

Last, respondents also were asked whether they would be interested in being a leader for palliative care in their buildings with additional, specialized training; 62% ($n = 702$) of those who responded said “yes.” By discipline, 74% of SWs, 67% of RNs, 63% of LPNs, and 59% of CNAs answered “yes” to this question (no significant differences among positions; $P = 0.074$).

Discussion

In this study of frontline staff in 51 Indiana NHs, we did find that palliative care practice and knowledge scores varied by training and staff roles. Robust palliative care programs in NHs have the potential to improve care for patients, but they require knowledgeable and confident NH staff. A few points that merit further discussion include the differences in scores by staff position, the overall low end-of-life knowledge scores regardless of position, the correlation of the star rating system with palliative care practice, and the potential role of higher hospice visibility within the nursing facility on palliative care knowledge. In addition, we documented the perceived need of many NH staff members for additional training and/or leadership roles in palliative care. The need for additional competency in palliative care represents an important opportunity for improving quality in NHs.

Perhaps as expected, we found that RNs had higher total palliative care knowledge scores than both LPNs and CNAs, who have less clinical training. CNAs, who have a minimal federally mandated total training requirement of only 75 hours (in Indiana, 30 hours of classroom and 75 hours of clinical training are required),²⁰ scored lower on both palliative care knowledge and practice. The RN staffing ratio relative to both number of other nursing

staff and the number of residents has been previously reported to be correlated with quality of care in the NH.²¹ The present study provides additional evidence for the importance of RNs in regard to palliative care. Although we found that training is important to palliative care knowledge and practice, we did not find that experience in the NH was a substitute for this training. Staff with many years of experience working in NHs did not report better palliative care practices; the educational and training background for the position appears to be a stronger contributor, rather than years on the job. In terms of baseline palliative care competencies, the RN to LPN ratio may be more important to support a palliative care program, rather than the overall “nurse” staff ratio, which is often discussed as a quality metric.

In the present study, we measured end-of-life knowledge scores by assessing respondent answers to a clinical vignette and specific questions about feeding tubes, pain assessment, and pain management. Staff scored lowest on questions in this domain, representing an important potential target for improvement efforts. Interest in avoiding unnecessary hospitalizations,²² coupled with evidence that many long-stay NH residents and their families do not want aggressive care near the end of life,²³ will lead to more residents spending their last days and hours in an NH. To honor resident preferences, competency in providing end-of-life care is an increasingly requisite skill set for front-line NH staff.

NHC star ratings are a composite measure, which include surveyor findings, reported staffing levels, and clinical quality indicators. The rating system has been challenged because of concerns that the measure may not accurately reflect or promote quality care delivery.²⁴ Star ratings of facilities in this study were positively correlated with family communication scores. This finding lends some support to the association of star ratings with a key staff practice, communication around palliative care, which is relevant to resident- and family-centered care. However, further evidence is needed to understand this relationship, such as direct measurement of key resident-centered outcomes. The Centers for Medicare and Medicaid Services are actively revising the star rating system to include new measures, such as rehospitalization rates.²⁵

A higher number of residents receiving hospice in the nursing facility was associated with higher end-of-life knowledge scores. The increased visibility of hospice might help NH staff view this service as more accepted. In turn, NH staff, given their many interactions with residents and families, may serve as important gatekeepers for hospice referrals when they view the service as an important component of high quality care.²⁶ NH staff who are more knowledgeable regarding end-of-life care may be more likely to recognize when a patient is eligible for hospice and may be more likely to help initiate a hospice referral. Thus, this association may mean that staff attuned to end-of-life care needs drive higher hospice referrals or that the presence of hospice providers in the facility provide opportunities for NH staff to learn about end-of-life care. NHs with higher hospice market penetration have been found to provide higher quality end-of-life care to all patients; some have hypothesized that this is a result of diffusion of knowledge from hospice providers.²⁷

More than half of all staff in our sample indicated an interest in leadership and additional training in palliative care in their facilities. NH staff with an understanding and appreciation

of the role of palliative care will be able to facilitate interfaces with external palliative care consultants or hospice. Facility-based palliative care teams, however, may provide the most consistent day-to-day access to these services for NH residents. The large number of NH staff interested in further training in palliative care may demonstrate a recognition of needed additional skill sets to care for this population.

There are some limitations to this study. Although large and inclusive of both rural and urban NHs, this is a one-state sample of two NH chains (~10% of the state's NHs), which limits generalizability. Furthermore, there was a lack of gender and ethnic diversity, although the demographics are reflective of NH staff in this state. The survey method did not allow for follow-up questions, which would be possible in an interview or focus group format. Furthermore, we could not assess for nonresponse bias. While none of the NHs included have a formalized palliative care program, specific prior training in palliative care of the NH staff was not assessed.

Given our observed differences in palliative care practice and knowledge scores by staff training, it appears the PCS is a useful tool to assess palliative care knowledge and practices among NH staff. Our study provides further validation of an assessment tool for frontline workers in a setting where there is a high level of unmet palliative care needs. In this large sample of rural and urban NH staff, targets for quality improvement, notably in end-of-life knowledge, were identified. Further areas of research could include the impact of specialized palliative care training on NH staff practices and knowledge, as well as on patient- and family-centered outcomes. A recent Institute of Medicine^{28,29} report highlighted the fragmentation of care of frail patients who move across settings and called for health systems to incentivize comprehensive palliative care. To achieve this vision, continued development of tools to measure palliative care practices and competency are needed in multiple settings, as is investment in specialized workforce training. An inadequate workforce lacking palliative care expertise has been cited as one of the greatest barriers to access to palliative care.³⁰ Our finding that most staff would welcome further palliative care training bolsters the case that health systems should invest in the development of workers to cultivate this expertise.

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Table 1

Nursing Home Staff Characteristics by Job Role (%)

Respondents	Total, % <i>n</i> = 1200	CNAs, % <i>n</i> = 579	LPNs, % <i>n</i> = 404	RNs, % <i>n</i> = 180	SWs, % <i>n</i> = 37
Age					
18–30	37.4	56.3	20.5	17.8	21.6
31–50	43.7	32.5	54.7	52.2	56.8
51	18.4	11.1	24.3	28.3	21.6
Unknown	0.5	0.2	0.5	1.7	0.0
Gender					
Female	92.8	92.6	92.3	94.4	91.9
Male	6.7	6.9	6.7	5.6	8.1
Missing	0.6	0.5	1.0	0.0	0.0
Race/ethnicity					
White	75.4	67.9	78.0	92.2	83.8
Black	18.3	24.4	15.8	6.1	10.8
Hispanic	2.0	2.9	1.7	0.0	0.0
Other	3.1	3.6	3.0	1.1	5.4
Missing	1.2	1.2	1.5	0.6	0.0
Length worked in NHs					
<6 months	10.5	16.4	3.2	9.4	2.7
6 months— 5 years	38.5	46.6	28.7	37.8	21.6
5–10 years	18.5	14.0	23.0	18.3	40.5
>10 years	32.5	23.0	45.0	34.4	35.1

CNAs = certified nursing assistants; LPNs = licensed practical nurses; RNs = registered nurses; SWs = social workers; NHs = nursing homes.

Table 2

Descriptive Statistics of the OSCAR Data for the 51 Nursing Home Facilities: Indiana and National Comparisons

Characteristics	Study Facilities		
	Mean (SD); Range	All Indiana Facilities	U.S. Facilities
% Reporting moderate pain	6.0 (4.3); 0.0–18.5	10.5 (7.8)	10.7 (8.2)
Occupancy rate (%)	78.5 (18.9)	78.8 (16.1)	82.5 (15.4)
Total beds in facility	109.3 (36.7); 44–185	97.9 (46.4); 13–334	106.5 (62.7); 1–1389
% Medicaid	66.7 (13.5); 0.0–89.6	59.9 (23.1); 0–100	59.9 (23.6); 0–100
% Medicare	15.3 (8.0); 0.0–44.3	18.1 (16.2); 0–100	15.8 (16.2); 0–100
% Receiving hospice benefit	4.1 (3.2); 0.0–14.0	4.8 (5.1); 0–50	4.9 (5.5); 0–97.1
Total RN + LPN FTES/100 beds (adjusted)	20.9 (4.7); 9.2–34.2	19.8 (8.7); 1.4–80.4	21.4 (33.4); 0–3029
Total nurse aide FTES/100 beds (adjusted)	29.0 (11.3); 6.9–58.0	29.5 (14.5); 1.3–108	36.3 (21.4); 0–1192.5
% RN of licensed staff	29.2 (12.2); 4.7–61.5	28.4 (14.3); 0–100	33.5 (20.1); 0–100
Star rating, <i>n</i> (%)			
1	5 (9.8)	70 (13.8)	2326 (14.9)
2	6 (11.8)	105 (20.7)	3118 (19.9)
3	12 (23.5)	108 (21.3)	3261 (20.9)
4	17 (33.3)	139 (27.4)	4258 (27.3)
5	11 (21.6)	79 (15.6)	2516 (16.1)
% Reporting 50% dementia, <i>n</i> (%)	34 (66.7)	50 (50)	47 (50)

RN = registered nurse; LPN = licensed practical nurse; FTES = full-time equivalent staff

Table 3

Adjusted Means and SEs for Position and Time Worked in NHs From Random Effects Models on Palliative Care Practice Total Scores and Subscales (Range 1–4)

Characteristics	Bereavement	Provider Coordination	Family Communication	Planning/Intervention	Total Practice
<i>N</i>	1193	1140	1168	1138	1200
Position					
CNA (1)	2.30 (0.03)	2.72 (0.03)	3.09 (0.03)	2.47 (0.04)	2.64 (0.02)
LPN (2)	2.41 (0.03)	3.06 (0.04)	3.16 (0.03)	2.72 (0.05)	2.83 (0.02)
RN (3)	2.51 (0.04)	2.98 (0.05)	3.17 (0.04)	2.76 (0.07)	2.84 (0.03)
SW (4)	2.65 (0.09)	3.23 (0.11)	3.33 (0.09)	2.78 (0.14)	2.98 (0.07)
<i>P</i> -value	<0.0001 ^{a,b,c,d}	<0.0001 ^{a,b,c}	0.0220 ^c	<0.0001 ^{a,b}	<0.0001 ^{a,b,c}
Time worked in NHs					
<6 months (1)	2.55 (0.06)	3.07 (0.07)	3.33 (0.06)	2.72 (0.09)	2.90 (0.04)
6 months–5 years (2)	2.43 (0.04)	2.97 (0.04)	3.22 (0.04)	2.68 (0.05)	2.82 (0.03)
5–10 years (3)	2.41 (0.04)	2.99 (0.05)	3.03 (0.04)	2.65 (0.06)	2.76 (0.03)
>10 years (4)	2.47 (0.04)	2.96 (0.05)	3.17 (0.04)	2.67 (0.06)	2.82 (0.03)
<i>P</i> -value	0.0727	0.4276	<0.0001 ^{b,c,e,f}	0.9183	0.0322 ^b

NHs = nursing homes; CNAs = certified nursing assistants; LPNs = licensed practical nurses; RNs = registered nurses; SWs = social workers.

Note: Covariates included in each model were the site-level effects of star rating, % of subjects with pain, occupancy rate, total number of beds, % Medicare, % Medicaid, % hospice, % with 50% dementia, and total nurse aides per 100 beds. Nursing facility was the random effect. For all scores, the scale ranged from 1 to 4 where higher scores indicated better palliative care practice.

^aTukey-adjusted *P*-value for 1 vs. 2 0.05.

^bTukey-adjusted *P*-value for 1 vs. 3 0.05.

^cTukey-adjusted *P*-value for 1 vs. 4 0.05.

^dTukey-adjusted *P*-value for 2 vs. 4 0.05.

^eTukey-adjusted *P*-value for 2 vs. 3 0.05.

^fTukey-adjusted *P*-value for 3 vs. 4 0.05.

Table 4

Adjusted Means and SEs for Position and Time Worked in NHs From Random Effects Models on Palliative Care Knowledge Total Scores and Subscales (%)

Characteristics	Psychological	Physical	End of Life	Total Knowledge
<i>N</i>	1132	1147	1122	1177
Position				
CNA (1)	62.2 (1.8)	93.0 (0.6)	43.8 (0.8)	66.7 (0.9)
LPN (2)	74.8 (2.2)	96.6 (0.7)	57.5 (1.0)	76.5 (1.0)
RN (3)	86.4 (2.9)	97.5 (0.1)	62.5 (1.3)	82.3 (1.3)
SW (4)	85.3 (6.5)	98.0 (2.1)	54.7 (2.8)	80.0 (2.7)
<i>P</i> -value	<0.0001 ^{a,b,c,d}	<0.0001 ^{a,b}	<0.0001 ^{a,b,c,d,e}	<0.0001 ^{a,b,c,d}
Time worked in NH				
<6 months (1)	72.1 (3.9)	96.5 (1.3)	52.7 (1.7)	73.9 (1.7)
6 months–5 years (2)	73.7 (2.5)	96.8 (0.8)	54.4 (1.1)	75.1 (1.1)
5–10 years (3)	81.3 (2.9)	96.1 (0.9)	54.5 (1.3)	77.9 (1.3)
>10 years (4)	81.6 (2.5)	95.8 (0.8)	56.8 (1.1)	78.6 (1.1)
<i>P</i> -value	0.0064 ^f	0.7166	0.0792	0.0047 ^{c,f}

NHs = nursing homes; CNAs = certified nursing assistants; LPNs = licensed practical nurses; RNs = registered nurses; SWs = social workers.

Note: Covariates included in each model were the site-level effects of star rating, % of subjects with pain, occupancy rate, total number of beds, % Medicare, % Medicaid, % hospice, % with 50% dementia, and total nurse aides per 100 beds. Nursing facility was random effect.

^aTukey-adjusted *P*-value for 1 vs. 2 0.05.

^bTukey-adjusted *P*-value for 1 vs. 3 0.05.

^cTukey-adjusted *P*-value for 1 vs. 4 0.05.

^dTukey-adjusted *P*-value for 2 vs. 3 0.05.

^eTukey-adjusted *P*-value for 3 vs. 4 0.05.

^fTukey-adjusted *P*-value for 2 vs. 4 0.05.