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Integration of Palliative Care and Infection Management at End-of-Life in US Nursing Homes

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Abstract

Context: Infections in nursing home (NH) residents are often terminal illnesses. Integration of palliative care (PC) and infection management (IM), is a new concept that can help reduce burdensome treatments and improve quality of care for NH residents at the end-of-life.

Objectives: To develop measures of integration, describe the integration in US NHs, and examine predictors of integration.

Methods: A nationally representative sample of NHs was surveyed. An instrument to measure integration was tested using factor analyses. Descriptive analyses were conducted of each integration factor, construct validity was examined using correlations between the integration factors and validated measures of PC and IM, and multivariable linear regression models were developed to identify NH characteristics associated with integration.

Results: 892 NH surveys were returned (49% response rate), 859 with complete data. Three integration factors were identified: Patient Involvement in Care Planning (Involvement), Formalized Advance Care Planning (Advance Care Planning), and Routine Practices of Integration (Routine Practices). The highest level of integration in NHs was reported for Involvement (mean (μ) = 73.2, Standard error (SE) = 1.57), with lower rates for Advance Care Planning and Routine Practices (respectively μ = 34.1, SE = 1.05; μ = 31.4, SE = 1.48). Each integration measure was weakly, positively associated with the PC and IM measures ($r \leq 0.25$, $P \leq 0.01$). There were few associations between NH characteristics and integration.

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Conclusion: Integration is a distinct concept that is associated but different from PC and IM. Results serve as a baseline assessment of integration in NHs. Continued refinement of the integration instrument is recommended as is studying if higher integration leads to better resident outcomes.

Keywords

Infection Management; End-of-Life; Palliative Care; Nursing Homes; Integration

There are approximately 1.4 million residents living in the more than 15,600 nursing homes (NHs) across the nation; 85% of those residents are at least 65 years of age.(1) Many residents have advanced illness, defined as having one or more conditions serious enough that general health and functioning decline, and treatments begin to lose their impact.(2) Residents with advanced illness are at the stage at which care goals enter a gray area; that is, one in which therapy is no longer effective, and the point at which palliative care (PC) may take priority. Furthermore, many of these residents die of infections. There are an estimated 1.1 to 2.7 million infections in NHs each year; furthermore, these infections are often at the end-of-life and result in death.(3–5) Elderly NH residents with advanced illness are particularly susceptible to infections due to a variety of reasons including reduced immunity. Despite the advanced illness and terminal nature of many infections in residents, antibiotics are overused in NHs.(6, 7) Antibiotic use may delay entry to hospice, reduce quality of life, prolong the dying process, and incur unnecessary costs with little or no benefit to the patient.(8) Inappropriate and/or over-use of antibiotics lead to increased incidence of multiple drug resistant organisms (MDROs) as well as *C. difficile* infections and may increase risk of transmission to others.

There is limited evidence that antibiotics provide symptom relief for patients at the end-of-life.(9) A study found that NH residents with advanced dementia who were not treated with antibiotics had greater comfort, albeit slightly shorter survival, compared with those who were treated.(10) A notable finding in this study was that the survival benefit associated with antibiotic use versus no treatment was similar regardless of the route of administration, whereas the most aggressive treatment approaches (i.e., intravenous therapy or hospitalization) were associated with the greatest discomfort.

To improve infection prevention and infection management (IM), there are national and regional initiatives in place. In 2012, the Centers for Disease Control and Prevention (CDC) launched the Long-Term Care Facility Component in the National Healthcare Safety Network (NHSN) that enables enrolled NHs to monitor infection prevention processes and track infections. In 2016, the Centers for Medicare & Medicaid Services (CMS) funded the *C. difficile* Infection Reporting and Reduction Project which promotes antibiotic stewardship in NHs through regional learning collaboratives established through the Quality Innovation Network-Quality Improvement Organizations (QIN-QIO). The most recent Conditions for Participation for Long-Term Care Facilities Final Rule by CMS require NHs to have an infection control program that includes antibiotic stewardship as well as a designated infection preventionist (Section §483.80).(11) This rule also requires each facility to provide a comprehensive person-centered care plan (Section §483.25).

The 2015 National Academy of Medicine publication, “Dying in America”, recommends that all NHs provide end-of-life care consistent with PC goals.(12) Implemented at the state level, the national Physician Orders for Life-Sustaining Treatment (POLST) paradigm aims to improve end-of-life advance care planning by documenting patients and families preferences for care.(13) Some state POLST forms have preferences for antibiotic usage.(14)

For many long-stay NH residents, even those with infection, the main goal of care is palliation as residents and their families’ value dignity and quality of life, not life-prolongation.(1, 15) Integration is a new concept, which we define as the merging of goals of care for PC and IM at the end-of-life. It has been recommended that PC and IM be integrated in end-of-life care by: 1) discussing decision making about IM as part of advance care planning with documented treatment preferences about antibiotic use and hospitalization due to infection; and 2) improving antibiotic stewardship protocols and incorporating resident treatment preferences.(7, 16) To date, we are aware of no measures of integration of PC with IM at end-of-life in NHs. The purposes of this nationally representative NH study were to develop measures of integration, describe the current state of integration in US NHs, and examine predictors of integration.

Methods

Sample

A cross-sectional facility level survey (available upon request) of a stratified, random sample of US NHs was conducted. NHs were identified from 2016 Certification and Survey Provider Enhanced Reporting (CASPER) data and were eligible if they were non-specialized, free-standing facilities with at least 30 beds and a CASPER assessment date of 2014 or later. Random sampling was stratified by QIN-QIO region (an equal number of NHs across each of the 14 regions), NHSN enrollment (30% of all sampled NHs were enrolled in NHSN), and participation in our previous study (988 NHs that completed surveys in 2013-2014).(17)

Data Collection

Data collection occurred from November 2017 through October 2018. Using previously successful methods, recruitment occurred in waves of 200-300 NHs each.(18) The Director of Nursing (DON) at each NH was mailed an invitation letter with instructions for survey completion. Respondents were given the option to respond via web or mail. Incentives included $25 gift cards for completed surveys and inclusion in $250 lotteries for those who returned the survey within one month. Paper-based surveys were entered into an electronic database and data quality was checked through double data entry of a random sample of 10% of the surveys. Web and paper-based survey data were combined into a single analytical dataset.

Measures

The survey included previously used items relating to characteristics of the infection control program in the facility, demographics and training of the person in charge of the program

(i.e., the infection preventionist), workforce stability and staffing, as well as measures of PC and IM practices.(17,19) Nine items of integration were also developed through review of recommended guidelines as well as adapted items from published PC and IM surveys used in NHs.(20–25) The integration items asked a series of questions on policies and procedures a NH would follow given a suspected infection in a patient considered near end-of-life (See Appendix 1). A panel of 7 experts established content validity. Cognitive interviews were conducted with 5 DONs, which resulted in refinement of some items. Two integration items were scored on a 4-point Likert scale ranging from “Rarely” to “Almost Always”; and 7 items were from vignettes describing an advanced stage Alzheimer’s patient with a suspected infection near the end-of-life. The latter were care practices or orders that would be in place scored on a 3-point Likert scale ranging from “Not at all Likely” to “Very Likely”. All integration items were coded so that higher scores represent higher integration.

The validated PC and IM measures that separately reflected best practices included 1) the End-of-Life Culture Change, a 6-item scale of PC practice in NHs;(26) 2) the Antibiotic Stewardship scale, 7-items regarding antibiotic use and stewardship;[27] and 3) and Urinary Tract Infection (UTI) Prevention, 7-items representing evidence-based practices for UTI prevention in NHs.[25] For the PC measure, consistent with Schwartz et al., we included only NHs that had at least 4 non-missing responses in our sample and imputed the one or two missing responses based on the means of the nonmissing responses by facility.(26) We then standardized the measure to range from 0 to 100, with higher scores representing greater intensity of best practices in PC. Standardized measures for Antibiotic Stewardship and UTI Prevention were calculated by summing the number of items present in each NH, dividing by the number of items possible and multiplying by 100 resulting in a range from 0 to 100 with higher scores representing greater intensity of best practices for IM.

The survey also included characteristics of the infection preventionist including education (i.e., licensed practical nurse, registered nurse, or other) and training (i.e., certification, participation in a training course, or none). Staff turnover of infection preventionists, DONs, and NH administrators was measured as the count of persons in the role in the past three years.

The survey was linked to the most recent CASPER data and September 2018 Nursing Home Compare Five-Star Quality Rating System data. CASPER is a comprehensive source of NH facility level information. NH characteristics derived from CASPER included bed size, percent occupancy, payer mix, staffing, ownership (i.e., for profit, government, nonprofit), region (i.e., Midwest, Northeast, South, West), setting (i.e., Metropolitan, Rural Remote, Rural Adjacent), multi-facility organization and regulatory compliance (i.e., infection control and quality of care deficiency citations in the past year) collected by surveyors during the inspection of NHs required for CMS certification. Staffing measures derived from CASPER included hours worked per resident day (HRD) for nursing staff and an indicator for high social worker hours per resident data based on the top quartile across all NHs. Nursing Home Compare Five Star Rating was used to assess overall nursing home quality. (27)

Statistical Analyses

Survey respondents and non-respondents were compared on the NH characteristics using χ^2, Fisher's exact, t, or Wilcoxon-Mann-Whitney tests as appropriate. Weights to adjust for differential probabilities of inclusion and participation in the study were constructed based on the sampling strata and non-response predictors, including ownership type (i.e., for-profit, non-profit, government) and urban rural indicators (i.e., metropolitan, rural adjacent, rural remote). Weighted descriptive statistics, population mean intensity scores (μ) and standard errors (SE) were computed.

To evaluate the underlying constructs of the 9 newly developed items measuring integration, we performed factor analysis using Promax (oblique) rotation and compared 1-, 2-, and 3-factor solutions. Then, similar to our PC and IM measures, for each identified integration factor, an intensity score was calculated as the number of items that received the highest possible response divided by the number of questions in each index and multiplied by 100. Each integration factor, therefore, represents a normalized intensity percentage ranging from 0 to 100, with a higher score representing greater integration. We computed Cronbach alphas as a measure of internal consistency.

Construct validity of the integration factors were examined using Pearson correlations between each integration factor and the PC and IM measures. Separate weighted multivariable linear regression models were estimated to evaluate the association between each of the integration measures and NH characteristics, IP characteristics and staff turnover. All statistical analyses were conducted using SAS 9.4 (SAS Institute Incorporated, North Carolina, USA).

Results

We sampled 1820 NHs, and 892 surveys were returned (39.7% through mail and 60.3% through web) for a 49% response rate. Due to missing data in key variables, our final sample included 859 NHs. Sample characteristics stratified by respondents and non-respondents are shown in Table 1. Responding NHs were relatively smaller ($p = 0.01$), had a greater percentage of Medicare residents ($p = 0.02$), were less likely to be for-profit ($p < 0.01$) and part of a multi-facility organization ($p = 0.02$) than nonrespondents. Respondents were also more likely to be located in the Midwest or Northeast regions of the US ($p = 0.02$) as well in rural remote or rural adjacent areas ($p < 0.01$). There were no differences between respondents and non-respondents in overall quality rating, occupancy, staffing levels or in having received an infection control or quality of care citation in the past year.

From the principal component factor analysis, we selected the 3-factor solution because 1) it had significantly better fit than the 1- and 2-factor solution, and 2) it provided excellent fit to the data, $\chi^2=8.12$, $p = .78$, Comparative Fit Index = 1.00, Root Mean Square Error of Approximation = .00. The three factors identified are described in Table 2 including the percentage of responses in the "Almost Always" or "Very Likely" response categories as well as the Cronbach's α, μ and SE for each measure. Based on the items included, we labeled the integration measures as follows: 1) Patient/caregiver Involvement in Care Planning (Involvement), 2-items; 2) Formalized Advance Care Planning in Place (Advance

Care Planning), 5-items; and 3) Routine Practices of Integration (Routine Practices), 2-items.

The Involvement and Advance Care Planning measures were internally consistent (Cronbach's α's ≥ 0.70). Routine Practice had a lower internal consistency. For Involvement, most respondents (70.81%) indicated their NH almost always considered residents' goals of care in managing suspected infections and included residents and proxies in decision making. The weighted intensity mean was high ($\mu = 73.17$, SE = 1.57) indicating that on average, 73% of NHs responded "almost always" to the Patient Involvement measure. There was more variation in the Advance Care Planning items ranging from 7.14% of respondents indicating they were very likely to have a Do Not Administer Antibiotics order and 57.35% of respondents having a Do Not Resuscitate order. About a third of respondents indicated that residents in their NH were very likely to have the Routine Practices items. The weighted intensity means for Advance Care Planning and Routine Practices were low ($\mu = 34.1$, SE = 1.05; $\mu = 31.37$, SE = 1.48, respectively).

Table 3 presents the PC and IM indices and the measures included in each. PC had the highest intensity of practices (μ=76.61, SE=0.72) followed by the IM indices of Antibiotic Stewardship and UTI Prevention (μ=65.81, SE=0.90 and μ=55.70, SE= 0.76, respectively). More than 50% of NHs reported that they "almost always" discussed residents' spiritual needs, documented end-of-life care plans, sent sympathy cards to significant others, and provided emotional support to roommates and friends after resident death. Fewer NHs honored resident deaths in a public way (36% reporting that they "rarely" or "sometimes" did this) and 46% of NHs "rarely" or "sometimes" honored the resident's body. In regard to Antibiotic Stewardship practices, the majority (>50%) of NHs had 6 of the 7 policies in place; however, only 19% restricted the use of specific antibiotics. The prevalence of UTI Prevention practices was more varied ranging from 13% using condom catheters for men instead of indwelling catheters to 97% of NHs providing staff education of perineal care.

Table 4 presents the results of the construct validity analyses, the Pearson correlation coefficients of the PC and IM indices with the integration measures. All pairwise correlations were weakly and positively associated (all $p < 0.01$). PC and Antibiotic Stewardship were the most correlated with Involvement ($r = 0.23$ and 0.25, respectively) and Advanced Care Planning ($r=0.18$ and 0.17, respectively) as compared to UTI Prevention ($r = 0.17$ for Involvement and $r= 0.15$ for Advance Care Planning. PC, Antibiotic Stewardship and UTI Prevention were similarly correlated with Routine Practices ($r= 0.11$ to 0.12).

Table 5 presents results of the multivariate regressions examining the integration measures as a function of NH characteristics. Relatively few NH characteristics predicted integration. Being part of a multi-chain organization was negatively associated with Involvement ($p = 0.01$). NHs that had a higher proportion of Medicaid residents ($p = 0.03$), were located in the South ($p=0.02$) and had a registered nurse in charge of infection control ($p = 0.01$) were more likely to have lower scores of Advance Care Planning. Higher scores in Routine Care Practices were associated with a higher CMS Five-Star Overall Rating ($p = 0.02$), high staffing of social workers ($p = 0.01$), and greater turnover of IPs ($p < 0.01$). NHs in the Midwest were also more likely to have higher Routine Practice scores ($p = 0.03$).

Discussion

Integration of PC and IM at the end-of-life in NHs is a new concept that hasn't been previously measured. This nationally representative study is the first to develop a measure of the concept of integration, psychometrically test its properties and describe the state of integration at the end-of-life in US NHs. Three factors were identified: Involvement, Advance Care Planning and Routine Practice. The Involvement and Advance Care Planning factors were internally consistent, the Routine Practice factor had less internal consistency. All 3 factors were weakly and positively associated with validated measures of PC and IM, which supports the construct validity of our new integration measure. Measurement of integration is important as national and regional initiatives are attempting to improve PC and IM in NHs.(28–30)

We found wide variation of integration in NHs. While the majority of NHs involve patients and caregivers in care planning, fewer facilities report having integrated formalized Advance Care Planning and even fewer have integrated Routine Practices for dying patients. The relatively low prevalence of integrating PC and IM in Advance Care Planning at the end-of-life is surprising given the national focus on advance directives and increased implementation of POLST across the nation; in a recent review of POLST state forms, over 70% (n = 32) included antibiotic preferences.(17) However, it is worth mentioning that Oregon, where POLST was first developed, removed the section about antibiotics preferences based on findings that there were little differences in antibiotic usage whether or not a POLST form was available.(31,32) Furthermore, researchers examined NH residents' POLST orders and found the highest discordance with antibiotics.(33) Better understanding is needed on how to integrate PC and IM including preferences about antibiotic usage as well as increase clinician and public knowledge of appropriate antibiotic utilization.

Relatively few NH characteristics were independently associated with each integration factor and many characteristics varied across the regression models suggesting that variation in levels of integration across NHs is idiosyncratic, or that we have yet to understand what drives integration of PC and IM. Alternatively, the quality metrics (e.g., CMS Five Star Rating) may not adequately measure quality of care at the end-of-life.(27) More research into this area is needed. We did find that higher levels of social workers were associated with greater Routine Practices scores as was greater turnover of infection preventionists. In previous research, higher levels of staffing has been found to be associated with higher quality of care.(34–36) Specific to infection prevention and control, infection preventionist training and lower turnover in leadership positions are associated with increased presence of recommended IM processes.(17, 19, 37) The association of increased turnover of infection preventionists with Routine Practices may be due to NHs gearing up for the changes in the Conditions of Participation.(11)

This study has limitations. Although the sample size exceeded or was similar to other surveys of programs in NHs, the respondents differed from non-respondents in certain characteristics.(17) However, population weights were developed and used to enable national generalizability. There may be high desirability bias in the responses we did receive as a result of recent regulations.(11) The survey was cross-sectional in design, which did not

allow us to determine if there is a temporal association between having more evidence-based PC and IM policies in place and integration. We surveyed the DON and responses may have differed had we surveyed other NH staff. However, in previous research, clinical staff have identified the DON as the best person to provide an accurate account of a facility's end-of-life care.(38)

Despite these limitations, our findings provide important implications for the integration of PC and IM in NHs. With the recent regulation for NHs to have antibiotic stewardship programs and a focus on improving PC, the results of this study serve as a baseline assessment of the integration of PC and IM in NHs. There is a continued need to monitor this integration and develop strategies to help NHs develop best practices. Furthermore, future research should examine if integration of PC and IM leads to better resident outcomes.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Table 1.

Nursing home characteristics by respondents and non-respondents.

	All n = 1787	Non-respondents n = 928	Respondents n = 859	p value
CMS Five-Star Overall Rating, mean (SD)	3.39 (1.37)	3.35 (1.37)	3.43 (1.37)	0.15
Facility bed size, mean (SD)	115.66 (65.32)	117.77 (62.77)	113.39 (67.93)	0.01
Percent occupancy, mean (SD)	80.03 (16.10)	80.42 (15.54)	79.61 (16.68)	0.57
% Payer, mean (SD)				
Medicare residents	13.64 (12.23)	14.20 (12.53)	13.04 (11.89)	0.02
Medicaid residents	59.22 (22.31)	59.92 (22.34)	58.46 (22.26)	0.13
Resident Care Hours by Staff, mean (SD)				
CNA HRD	2.51 (0.82)	2.50 (0.92)	2.53 (0.69)	0.13
LPN HRD	0.83 (0.43)	0.84 (0.39)	0.82 (0.47)	0.07
RN HRD	0.83 (0.54)	0.83 (0.58)	0.83 (0.49)	0.38
High staffing of social workers, %	25.93	23.81	26.14	0.26
Ownership, %				
For profit	67.62	72.41	62.43	<0.01
Government	7.06	5.60	8.63	
Nonprofit	25.32	21.98	28.94	
Region, %				
Midwest	30.25	28.13	32.56	0.02
Northeast	20.00	18.53	21.59	
South	29.64	32.00	27.07	
West	20.11	21.34	18.79	
Setting, %				
Metropolitan	71.26	74.46	67.79	<0.01
Rural Remote	16.58	15.73	17.50	
Rural Adjacent	12.16	9.81	14.70	
Multi-facility organization, %	57.69	60.34	54.96	0.02
Infection control citation in past year, %	38.61	39.76	37.46	0.32
Quality of care citation in past year, %	64.75	66.59	62.89	0.10

Abbreviations: CMS, Centers for Medicare and Medicaid Services; CNA, certified nursing assistant; LPN, licensed practical nurse; RN, registered nurse.

Table 2.

Prevalence of Integration of Palliative Care and Infection Management Policies among US NHs (unweighted n=859, weighted n=14,828).

	Weighted %	Intensity Index		
		Cronbach's α	Weighted μ	SE
1. Patient/Caregiver Involvement in Care Planning [1]		0.70	73.17	1.57
Consider residents' goals of care in managing suspected infections near the end-of-life.	70.81			
Include residents and resident proxies in treatment decisions for suspected infections near the end-of-life.	76.01			
2. Formalized Advance Care Planning [2]		0.72	34.11	1.05
Ms. Davis would already have a "Do Not Resuscitate" order	57.35			
Ms. Davis would already have a "Do Not Hospitalize" order	23.98			
Ms. Davis would already have a "Do Not Administer Antibiotics" order	7.14			
Ms. Davis would already have a orders reflecting "Palliative/Comfort Measures" only	26.85			
A proxy for Ms. Davis would be asked how to manage the suspected infection	55.91			
3. Routine Practices of Integration [2]		0.63	31.37	1.48
A straight catheter would be used to collect a urine sample*	30.77			
Ms. Davis would be treated with antibiotics*	32.39			

Note:

*These questions were reversed coded so that a positive response was a higher value.

[1]Policies were considered present if answered as "Almost Always" on Likert scale.

[2]Both the Formalized Advance Care Planning and Routine Practices of Integration items came from a vignette stating, "Ms. Davis has been in your facility for 4 months. On admission, she was ambulatory and needed total assistance with feeding. She was admitted with advanced heart disease, osteoporosis, a right hip fracture, and Alzheimer's. She takes oxycodone 10 mg every 6 hours for pain. In the past month, you notice she is eating less, has lost 10 pounds, and coughs when drinking. Ms. Davis no longer recognizes her family." The Formalized Advance Care Planning items also stated "Over the past 24 hours, Ms. Davis developed a fever, cough, and shortness of breath and the clinical exam suggested an aspiration pneumonia. In your facility, how likely is it that…". The Routine Practices of Integration also stated, "Over the past 24 hours, Ms. Davis appears more confused and her family mentions to the nurse that her urine looks dark and asks if she has a urinary tract infection. She has not developed a fever. In your facility, how likely is it that…". All policies were considered present if answered as "Very Likely" on Likert scale.

Table 3.

Survey Items for Palliative Care and Infection Management

Palliative Care (PC)	**Weighted μ**	**SE**	**Range**
End-of-Life Culture Change Scale	**76.61**	**0.72**	**7.78-100**
How often does your facility:	*% Rarely/ Sometimes*	*% Often*	*% Almost Always*
1. Discuss a resident's spiritual needs at care planning conferences when the resident has a terminal illness?	11.46	17.09	71.45
2. Document in the care plan what is important to the individual, such as the presence of family or religious or cultural practices?	9.14	17.66	73.20
3. Honor in some public way (either at the facility or in the community) a resident who has died?	36.11	17.33	46.55
4. Honor the resident's body in some manner upon its removal from the facility?	46.30	11.17	42.53
5. Send a sympathy card to family members or significant others after a resident has died?	19.17	14.08	66.74
6. Follow up with roommate(s) or friend(s) in the facility to provide emotional support after a resident has died?	14.02	22.66	63.31
Infection Management (IM)	**Weighted μ**	**SE**	**Range**
Antibiotic Stewardship Policies	**65.81**	**0.90**	**0-100**
Which of the following policies or programs are in place at your facility?	*% Present*		
1. Collect data on antibiotic use	91.74		
2. Use antibiotic prescribing guidelines or therapeutic formularies	65.39		
3. Restrict use of specific antibiotics	18.97		
4. Communicate antibiotic use information when residents are transferred	81.20		
5. Review cases to assess appropriateness of antibiotic administration and/or indication	69.16		
6. Provide feedback to clinicians on antibiotic use and prescribing	71.20		
7. Provide education resources for improving antibiotic use	63.01		
	Weighted μ	**SE**	**Range**
Urinary Tract Infection Prevention Policies	**55.70**	**0.76**	**0-100**
Which of the following policies does your facility have in place related to prevention of urinary tract infections?	*% Present*		
1. Hydration protocols	77.50		
2. Staff education on perineal care	97.71		
3. Urinary catheter reminder/stop-order or nurse-initiated urinary catheter discontinuation	65.92		
4. Leg bag cleaning policy	45.34		
5. Condom catheters used instead of indwelling catheters for men	12.63		
6. Catheters replaced & specimens collected prior to antimicrobial therapy for symptomatic infection of residents with indwelling catheters	60.90		
7. Portable bladder ultrasound scanner for determining post void residual	29.87		

Table 4.

Pearson correlations between measures of palliative care and infection management with integration.

	Integration of Palliative Care and Infection Management					
	Patient Involvement		*Advance Care Planning*		*Routine Practices*	
	r	**p value**	**r**	**p value**	**r**	**p value**
Palliative Care	0.23	<.01	0.18	<.01	0.12	<.01
Antibiotic Stewardship	0.25	<.01	0.17	<.01	0.12	<.01
UTI Prevention Policies	0.17	<.01	0.15	<.01	0.11	<.01

Table 5.

Nursing home characteristics and associations with integration of infection management and palliative care.

	Patient Involvement		*Advance Care Planning*		*Routine Practices*	
	β	**p value**	**β**	**p value**	**β**	**p value**
CMS Five-Star Overall Rating	0.62	0.63	1.08	0.20	2.74	**0.02**
Facility bed size	−0.03	0.27	−0.02	0.19	−0.01	0.57
Percent occupancy	0.11	0.28	−0.02	0.79	−0.18	0.06
% Payer						
Medicare residents	−0.01	0.96	−0.21	0.07	−0.21	0.12
Medicaid residents	−0.08	0.41	−0.12	**0.03**	0.02	0.82
Other residents	Ref		Ref		Ref	
Resident Care Hours by Staff						
CNA HRD	−0.44	0.73	0.67	0.48	1.62	0.12
LPN HRD	−0.46	0.90	0.47	0.82	−2.26	0.42
RN HRD	0.44	0.76	−1.46	0.26	−1.60	0.23
High staffing of social workers	−2.21	0.57	3.32	0.21	9.29	**0.01**
Ownership						
For profit	−4.29	0.28	−1.87	0.46	−2.27	0.52
Government	5.27	0.38	−6.95	0.08	−7.06	0.25
Nonprofit	Ref		Ref		Ref	
Region						
Midwest	0.53	0.92	−5.39	0.18	4.79	0.36
Northeast	3.81	0.53	−1.38	0.75	12.87	**0.03**
South	3.90	0.47	−9.61	**0.02**	−3.89	0.46
West	Ref		Ref		Ref	
Setting						
Metropolitan	4.85	0.22	2.72	0.26	0.45	0.90
Rural Remote	1.03	0.89	1.94	0.65	5.08	0.46
Rural Adjacent	Ref		Ref		Ref	
Multi-facility organization	−9.57	**0.01**	−1.31	0.54	−1.18	0.70
Infection control citation in past year	−2.50	0.46	−0.90	0.69	0.88	0.77
Quality of care citation in past year	1.09	0.75	0.61	0.79	0.66	0.84
IP Education						
LPN	−1.63	0.71	0.51	0.86	−0.17	0.97
RN	−2.01	0.92	−23.20	**0.01**	−12.61	0.25
Other	Ref		Ref		Ref	
IP Training						
Certified in Infection Control (CIC)	−0.52	0.94	6.96	0.13	7.33	0.27
State or local training course with certificate	−4.49	0.35	1.33	0.69	1.91	0.69

	Patient Involvement		*Advance Care Planning*		*Routine Practices*	
	β	**p value**	**β**	**p value**	**β**	**p value**
National or local training course offered by a professional society	−4.59	0.39	1.37	0.69	3.83	0.45
Other	3.76	0.48	4.81	0.26	−3.41	0.55
No specific infection control training	−8.32	0.10	0.57	0.87	−5.33	0.29
Staff turnover						
IPs in past 3 years	−1.01	0.24	−0.39	0.52	2.23	**<.01**
DONs in past 3 years	−0.98	0.44	−0.92	0.27	−1.48	0.17
Administrators in past 3 years	0.89	0.30	−0.39	0.59	−1.16	0.13

*All models include all variables in the table. Bolded results are statistically significant. Abbreviations: CNA, certified nursing assistant; DON, Director of Nursing; HRD, hours per resident day; IP, infection preventionist; LPN, licensed practical nurse; RN, registered nurse.