UCLA
UCLA Previously Published Works

Title

Association between physicians' geriatric training and patterns of end-of-life care delivered to persons with dementia.

Permalink

https://escholarship.org/uc/item/4wc3957f

Authors

Gotanda, Hiroshi
Zhang, Jessica J
Reuben, David B
et al.

Publication Date

2023-07-01

DOI

10.1111/jgs.18510

Copyright Information

Peer reviewed

Check for updates

CLINICAL INVESTIGATION

Association between physicians' geriatric training and patterns of end-of-life care delivered to persons with dementia

Hiroshi Gotanda MD, PhD[1] | Jessica J. Zhang MD[2] | David B. Reuben MD[3] | Anne M. Walling MD, PhD[4,5] | Haiyong Xu PhD[4] | Anupam B. Jena MD, PhD[6,7] | Nate Gross MD, MBA[8] | Yusuke Tsugawa MD, PhD[4,9]

[1]Division of General Internal Medicine, Cedars-Sinai Medical Center, Los Angeles, California, USA

[2]Department of Medicine, David Geffen School of Medicine at UCLA, Los Angeles, California, USA

[3]Multicampus Program in Geriatric Medicine and Gerontology, David Geffen School of Medicine at UCLA, Los Angeles, California, USA

[4]Division of General Internal Medicine and Health Services Research, David Geffen School of Medicine at UCLA, Los Angeles, California, USA

[5]Greater Los Angeles Veterans Affairs Healthcare System, David Geffen School of Medicine at UCLA, Los Angeles, California, USA

[6]Department of Health Care Policy, Harvard Medical School, Boston, Massachusetts, USA

[7]Department of Medicine, Massachusetts General Hospital, Boston, Massachusetts, USA

[8]Doximity, San Francisco, California, USA

[9]Department of Health Policy and Management, UCLA Fielding School of Public Health, Los Angeles, California, USA

Correspondence
Hiroshi Gotanda, Division of General Internal Medicine, Cedars-Sinai Medical Center, 8700 Beverly Boulevard, Los Angeles, CA 90048, USA.
Email: hiroshi.gotanda@cshs.org

Abstract

Background: Geriatric training is designed to prepare physicians to meet the complex needs of older adults, including persons with dementia at the end-of-life (EOL) stage. We sought to compare patterns of EOL care delivered to persons with dementia between physicians with versus without geriatric training.

Methods: We conducted a cross-sectional study of a 20% random sample of fee-for-service Medicare beneficiaries with dementia who died in 2016–2018 ($n = 99,631$). We attributed beneficiaries to a physician who had the largest number of primary care visits during the last 6 months of life and determined whether the physician was trained in geriatrics. Our outcome measures included: (i) advance care planning (ACP) and palliative care (e.g., ACP, hospice enrollment in the last 90 days of life), and (ii) high-intensity EOL care (e.g., emergency department visits or hospital admissions in the last 30 days of life).

Results: Beneficiaries with dementia under the care of physicians with geriatric training had a higher proportion of ACP (adjusted proportion, 15.8% vs. 13.0%; $p < 0.001$ after accounting for multiple comparisons), palliative care counseling (22.4% vs. 20.9%; $p = 0.01$), and hospice enrollment (63.7% vs. 60.6%; $p < 0.001$). Geriatric training was also associated with a lower proportion of emergency department visits (55.1% vs. 59.1%; $p < 0.001$), hospital admissions (48.8% vs. 52.3%; $p < 0.001$), ICU admissions (24.9% vs. 27.4%; $p < 0.001$), use of mechanical ventilation (11.2% vs. 13.0%; $p < 0.001$), and use of cardiopulmonary resuscitation (2.1% vs. 2.4%; $p = 0.03$) in the last 30 days of life. There was no evidence that the placement of feeding tubes differed between the two groups.

Conclusions: Physicians' geriatric training was associated with the receipt of more ACP and palliative care and less intensive EOL care among persons with

dementia. Provision of geriatric training for physicians may have the potential to improve the quality of EOL care delivered to persons with dementia.

INTRODUCTION

Dementia is a progressive, life-limiting illness with significant morbidity and mortality. The expected number of persons with Alzheimer's disease is projected to more than double from 6.5 million to 12.7 million by 2050,[1] and is currently the sixth-leading cause of death among adults.[2] Persons with dementia experience significant cognitive decline and often receive suboptimal care that may not align with their preferences and goals of care at the end of life (EOL).[3–6]

Prior studies indicate wide variations in how physicians treat their patients, and subspecialty training has the potential to improve the quality of care individual physicians provide.[7–11] There are currently 24 subspecialty (fellowship) training programs in Internal and Family Medicine.[12,13] Among them, subspecialty training in geriatric medicine is designed to prepare physicians to meet the complex care needs of older adults, including persons with dementia at the last stage of their lives.[14] Studies have suggested that physicians with formal geriatric training provide a better quality of care for older adults for some inpatient (e.g., early physical therapy, less benzodiazepine use) and outpatient (e.g., fewer emergency department visits and hospitalizations) quality indicators.[15–17] However, little is known as to the association between physicians' geriatric training and patterns of EOL care delivered to persons with dementia. Given the projected increase in persons with dementia and concerns about the quality of EOL care received by persons with dementia, it may be useful to understand whether patterns of EOL care differ between physicians with versus without formal geriatric training.

To address this knowledge gap, we analyzed the nationally representative data of Medicare beneficiaries and examined the association between geriatric training and patterns of EOL care among persons with dementia using a broad range of measures. We defined geriatric training as a self-reported specialty of geriatric medicine and/or board certification in geriatric medicine. We also investigated whether physicians with more clinical experience with dementia patients provide different patterns of EOL care in dementia to understand the mechanism of the association between geriatric training and patterns of EOL care.

Key points

- Medicare fee-for-service decedents with dementia under the care of physicians with geriatric training received more advance care planning and palliative care compared to those under the care of physicians without geriatric training.
- Physicians' geriatric training was also associated with less aggressive end-of-life care among decedents with dementia (e.g., emergency department visits, hospital admissions, intensive care unit admissions in the last 30 days of life).

Why does this paper matter?

Provision of geriatric training for physicians may have the potential to improve the quality of end-of-life care delivered to persons with dementia.

METHODS

Data source and study participants

We linked three databases: (1) 20% of Medicare claims data 2016–2018, (2) long-term care Minimum Data Set (MDS) 3.0 2016–2018, (3) Medicare Data on Provider Practice and Specialty (MD-PPAS) data, and (4) Doximity data. The Medicare claims data provide beneficiary characteristics including age, verified death dates (available for more than 99% of decedent beneficiaries), monthly fee-for-service coverage status, and indicators for chronic conditions based on definitions by the Chronic Condition Data Warehouse, including dementia (i.e., Alzheimer's Disease and Related Disorders or Senile Dementia).[18] The MDS is the dataset of a federally mandated clinical assessment of all residents in Medicare- or Medicaid-certified nursing homes, and we used MDS to identify long-term nursing home residents. The MD-PPAS data includes physician characteristics, such as gender, specialty, and location. Specialty in the MD-PASS data is extracted from the

FIGURE 1 Study participant flowchart. FFS, fee-for-service; MDS, Minimum Data Set.
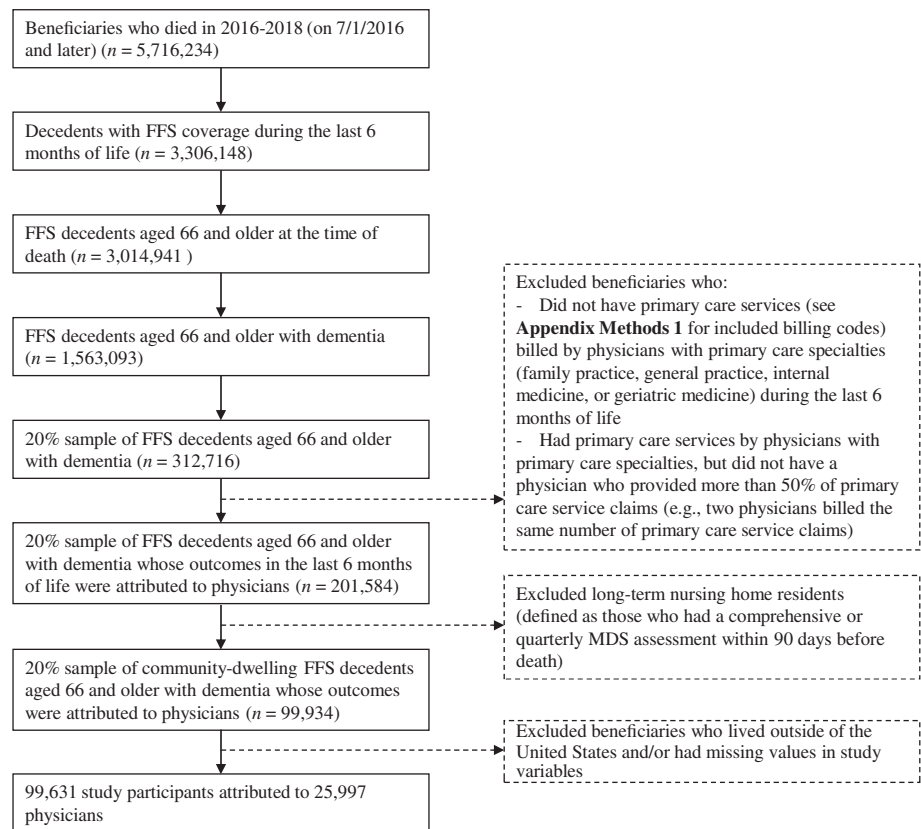
self-reported specialty information in the Provider Enrollment and Chain/Ownership System (PECOS), the national enrollment system for Medicare clinicians and suppliers.[19] Doximity is a company providing online professional networking services for US physicians, and it provides data on physician characteristics for both registered members of the service and non-registered physicians through multiple sources and data partnerships including the American Board of Medical Specialties.[20,21]

We first identified beneficiaries 66 years and older with dementia who died in 2016–2018 with fee-for-service coverage during the last 6 months of life. We then attributed each beneficiary's outcome to a physician who provided more than 50% of primary care service evaluation-and-management (E&M) claims in the last 6 months of life (hospice billing codes are not included; see Supplementary Table S1 for included billing codes). A similar approach has been used in prior research as well as in the Medicare Accountable Care Organization program to attribute beneficiaries to physicians or health systems.[22–24] We restricted physicians to those with primary care specialties based on the practitioner taxonomy codes in the MD-PPAS (family practice, general practice, internal medicine, or geriatric medicine).[25] We excluded beneficiaries (1) who died before July 1, 2016, because we used the information during the last

6 months of life to attribute beneficiaries to physicians; (2) who were long-term nursing home residents (defined as those who had a comprehensive or quarterly MDS assessment within 90 days before death[26]) because end-of-life care significantly differs by nursing home status[27]; (3) whose outcomes were unable to be attributed to a physician (e.g., a beneficiary did not receive primary care services during the last 6 months of life); or (4) who have missing data on important variables. See Figure 1 for the study participant flow chart.

Geriatric training and experience in dementia care

Our primary exposure variable was a binary indicator of whether a physician to whom a beneficiary's outcomes were attributed had geriatric medicine training. We defined geriatrics-trained physicians as (1) those with a self-reported specialty of geriatric medicine in the MD-PPAS data and/or (2) those with board certification in geriatric medicine (both active and inactive) through the American Board of Internal Medicine (ABIM) based on the Doximity data. Some physicians were certified in geriatrics without undergoing geriatrics fellowship training during the so-called "grandfather period" (1988–1994)[28]; therefore, we conducted a sensitivity analysis by restricting

TABLE 1 Physician and beneficiary characteristics by physicians' geriatric training status.

Characteristics	Physicians with geriatric training	Physicians without geriatric training	p-Value
Physicians	n = 1546	n = 24,451	
Age, mean (SD), years	55.2 (10.8)	53.3 (10.6)	<0.001
Years of clinical experience, mean (SD), years	29.0 (10.9)	26.1 (10.9)	<0.001
Female, No. (%)	577 (37.3)	6807 (27.8)	<0.001
Proportion of beneficiaries with dementia under care, mean % (SD)	37.2 (21.5)	18.2 (16.0)	<0.001
Beneficiaries	n = 8340	n = 91,291	
Year of death, No. (%)			0.48
Died in 2016 (July 1, 2016, or later)	1691 (20.3)	18,097 (19.8)	
Died in 2017	3332 (40.0)	36,998 (40.5)	
Died in 2018	3317 (39.8)	36,196 (39.7)	
Age, mean (SD), years	87.1 (7.7)	85.3 (8.0)	<0.001
Female, No. (%)	5005 (60.0)	52,345 (57.3)	<0.001
Race/ethnicity, No. (%)			<0.001
Non-Hispanic White	7125 (85.4)	76,613 (83.9)	
Non-Hispanic Black	636 (7.6)	6998 (7.7)	
Hispanic	304 (3.7)	4440 (4.9)	
Other	275 (3.3)	3240 (3.6)	
Medicaid coverage, No. (%)	1038 (12.4)	13,128 (14.4)	<0.001
Zip-code level annual household income, mean (SD), $	78,761 (33,063)	68,240 (28,647)	<0.001
Selected coexisting conditions, No. (%)			
Congestive heart failure	4145 (49.7)	48,015 (52.6)	<0.001
Chronic obstructive pulmonary disease	2049 (24.6)	26,851 (29.4)	<0.001
Chronic kidney disease	4742 (56.9)	56,615 (62.0)	<0.001
Diabetes	2733 (32.8)	35,453 (38.8)	<0.001
Cancer	1269 (15.2)	14,910 (16.3)	0.008

Note: Data are for decedents 66 years and older with dementia from 20% of Medicare claims data 2016–2018.

our sample to those who completed residency after this period (see Statistical analysis section for more details).

Our secondary exposure variable was physicians' experience in dementia care. We categorized physicians into quartiles based on the proportion of beneficiaries with dementia under care and included it as an ordinal variable for quartiles.

Patterns of end-of-life care

We examined patterns of EOL care among persons with dementia in two areas: (1) advance care planning (ACP) and palliative care, and (2) high-intensity EOL care, using Medicare fee-for-service claims data. We measured

advance care planning and palliative care using three measures: (i) receipt of advance care planning, (ii) receipt of palliative care counseling, and (iii) hospice enrollment in the last 90 days of life (see Supplementary Table S2 for specific Current Procedural Terminology [CPT] codes and International Classification of Disease [ICD]-10 codes used to define these study outcomes). We examined high-intensity EOL care by whether a beneficiary received any of the following six healthcare services in the last 30 days of life: (i) emergency department visits, (ii) hospital admissions, (iii) intensive care unit (ICU) admissions, (iv) mechanical ventilation, (v) cardiopulmonary resuscitation (and/or defibrillation), or (vi) placement of feeding tubes (see Supplementary Table S2 for included CPT codes and ICD-10 codes).

Adjustment variables

We adjusted for multiple beneficiary characteristics: age at the time of death (continuous), sex, race and ethnicity (non-Hispanic White, non-Hispanic Black, Hispanic, or Other), coexisting conditions (dummy variables for 25 Chronic Condition Data Warehouse chronic conditions—excluding two dementia-related conditions), median annual household income estimated from residential zip codes (categorized into quintiles), and Medicaid coverage. We also adjusted for fixed effects for year of death and Hospital Service Areas (HSAs) to account for secular trends and geographic variation (effectively comparing physicians with and without geriatric training practicing in the same year and HSA). We also included physician sex and years of clinical experience (1–10, 11–20, 21–30, or ≥31 years) based on MD-PASS data as adjustment variables. We estimated years of clinical experience by subtracting 3 years (the duration of Internal and Family Medicine Residency programs) from years since graduation from medical school.

Statistical analysis

First, we examined the association between physicians' geriatric training and each measure for patterns of EOL care in dementia by fitting multivariable linear regression models adjusting for beneficiary and physician characteristics as well as year of death and HSA fixed effects. The unit of analysis was beneficiary, and we clustered standard errors at the physician level to account for potential correlation among beneficiaries cared for by the same physician. We also used the Benjamini–Hochberg method to account for the multiple comparisons across outcomes, and report both unadjusted and adjusted p-values (an adjusted p-value of less than 0.05 was considered statistically significant).[29,30] We used linear regression models for the interpretability of the regression coefficients (i.e., linear probability models).[31]

Second, to examine whether physicians' experience in dementia care is associated with patterns of EOL care in dementia, we fit multivariable linear regression models similar to the main analysis but including an ordinal variable for quartiles for the proportion of beneficiaries with dementia under care, instead of the indicator for physicians' geriatric training status, to evaluate the trend across quartiles.

Statistical analyses were conducted using SAS version 9.4 and Stata/MP 16.1. The institutional review boards at the University of California, Los Angeles reviewed the study and waived informed consent.
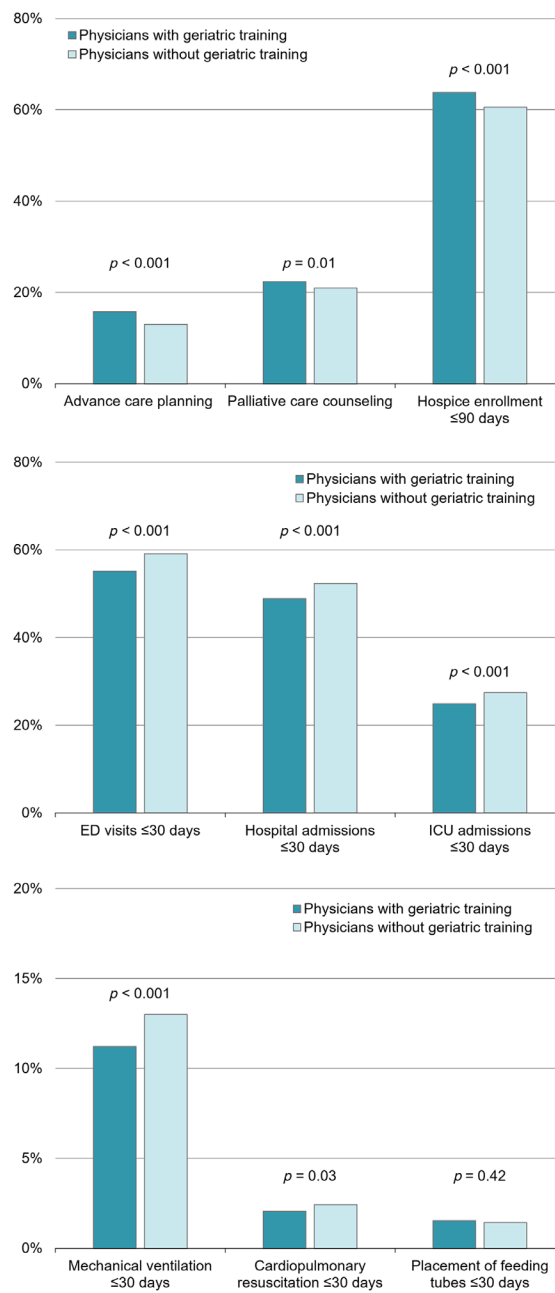
FIGURE 2 Association between physicians' geriatric training status and patterns of end-of-life care. Bars indicate the adjusted percentages of decedents 66 years and older with dementia who experienced each outcome by physicians' geriatric training status based on 20% of Medicare claims data 2016–2018. We fit linear regression models adjusted for the characteristics of beneficiaries (age, sex, race and ethnicity, 25 coexisting conditions, zip-code level median annual household income, and Medicaid coverage) and physicians (sex and years of clinical experience). We also include fixed effects for year of death and Hospital Service Areas in the models. See the main text for the algorithm to attribute each beneficiary's outcomes to physicians and the definition of physicians' geriatric training. p-Values are adjusted with the Benjamini–Hochberg method to account for the multiple comparisons across outcomes (an adjusted p-value of less than 0.05 is considered statistically significant). ED, emergency department; ICU, intensive care unit.

TABLE 2 Association between the proportion of beneficiaries with dementia under care (quartiles) and patterns of end-of-life care.

Outcome	Adjusted value, %				
	Highest quartile	**Third quartile**	**Second quartile**	**Lowest quartile**	***p*-for-trend**
Receipt of advance care planning and palliative care					
Palliative care counseling	20.9	20.0	20.7	21.2	0.51
Advance care planning	15.0	11.9	11.8	11.8	<0.001
Hospice enrollment during the last 90 days	63.7	58.3	57.4	57.1	<0.001
Receipt of high-intensity end-of-life care					
Use of mechanical ventilation in the last 30 days of life	11.0	13.4	14.3	14.3	<0.001
Use of cardiopulmonary resuscitation and/or defibrillation in the last 30 days of life	2.0	2.6	2.6	2.8	<0.001
Placement of feeding tubes in the last 30 days of life	1.4	1.3	1.5	1.5	0.18
Emergency department visits in the last 30 days of life	52.3	60.4	62.4	63.0	<0.001
Hospital admissions in the last 30 days of life	47.4	53.7	55.8	57.1	<0.001
ICU admissions in the last 30 days of life	24.0	27.4	29.0	29.7	<0.001

Note: We categorized physicians into quartiles based on the proportion of beneficiaries with dementia under care and included it as an ordinal variable for quartile, instead of the indicator for physicians' geriatric training status, in the multivariable linear regression models similar to the main analysis. See the main text for more details.

Abbreviation: ICU, intensive care unit.

Sensitivity analyses

First, we conducted a sensitivity analysis by restricting our sample to those who were not enrolled in hospice 30 days before their deaths, because hospice enrollees might have been cared for by a hospice medical director with a geriatrics background in addition to a physician whom a beneficiary is attributed to. Second, we excluded physicians who graduated from medical schools before 1992 (i.e., completed Internal or Family Medicine residency before 1995) from the analysis, because this group might have been certified in geriatrics without undergoing geriatrics fellowship training during the grandfather period (1988–1994) and different from those who underwent geriatrics fellowship training.[28] Lastly, we included time from dementia diagnosis to death (categories of <4 years, 4–6 years, or ≥6 years[32]) as an additional adjustment variable in the models as a proxy for the severity of dementia, because the severity of dementia can affect the association between physicians' geriatric training and patterns of EOL care.

RESULTS

Physician and beneficiary characteristics

We included 99,631 beneficiaries with dementia who died in 2016–2018 (see Figure 1 for the study participant flow chart). Among them, 8340 (8.4%) beneficiaries were attributed to physicians with geriatric training (*n* = 1546), and 91,291 (96.2%) were attributed to physicians without geriatric training (*n* = 24,451). Physicians with geriatric training were younger, more likely to be female, and had less clinical experience (Table 1). Beneficiaries under the care of physicians with geriatric training were more likely to be old, female, non-Hispanic White, living in zip codes with higher median household incomes, and have fewer coexisting conditions, compared to those under the care of physicians without geriatric training (Table 1).

Physicians' geriatric training and patterns of EOL care

We found that beneficiaries with dementia under the care of physicians with geriatric training had a higher proportion of advance care planning (adjusted proportion, 15.8% vs. 13.0%, adjusted difference, 2.8 percentage points [pp, 95% CI, 1.7–3.9]), palliative care counseling (22.4% vs. 20.9%, 1.4 pp [0.3–2.5]), and hospice enrollment in the last 90 days of life (63.7% vs. 60.6%, 3.2 pp [2.0–4.3]) compared to those under the care of physicians without geriatric training (Figure 2 and Supplementary Table S3). We also found that physicians' geriatric training was associated with fewer beneficiaries with dementia having emergency department visits (55.1% vs. 59.1%, −4.0 pp [−5.1 to −2.8]), hospital admissions (48.8% vs. 52.3%, −3.5 pp [−4.6 to −2.4]), ICU admissions (24.9% vs. 27.4%, −2.5 pp

TABLE 3 Association between physicians' geriatric training status and high-intensity end-of-life care among non-hospice enrollees.

Outcome	Adjusted proportion, %		Adjusted difference, percentage points (95% CI)	*p*-Value
	Physicians with geriatric training	Physicians without geriatric training		
Emergency department visits in the last 30 days of life	47.5	51.5	−4.0 [−5.5, −2.4]	<0.001
Hospital admissions in the last 30 days of life	41.9	45.2	−3.3 [−4.8, −1.8]	<0.001
ICU admissions in the last 30 days of life	23.8	26.8	−2.9 [−4.2, −1.7]	<0.001
Mechanical ventilation in the last 30 days of life	14.0	16.4	−2.4 [−3.5, −1.4]	<0.001
Cardiopulmonary resuscitation in the last 30 days of life	3.2	3.8	−0.7 [−1.2, −0.1]	0.02
Placement of feeding tubes in the last 30 days of life	1.9	1.5	+0.4 [−0.0, +0.9]	0.06

Note: Using decedents 66 years and older with dementia who were not enrolled in hospice 30 days before their deaths from 20% of Medicare claims data 2016–2018, we fit linear regression models adjusted for the characteristics of beneficiaries (age, sex, race and ethnicity, 25 coexisting conditions, zip-code level median annual household income, and Medicaid coverage) and physicians (sex and years of clinical experience). We also include fixed effects for year of death and Hospital Service Areas. See the main text for more details.
Abbreviation: ICU, intensive care unit.

[−3.5 to −1.6]), and use of mechanical ventilation (11.2% vs. 13.0%, −1.8 pp [−2.5 to −1.1]), and use of cardiopulmonary resuscitation (2.1% vs. 2.4%; −0.4 pp [−0.7 to −0.0]) in the last 30 days of life. There was no evidence that placement of feeding tubes differed between the two groups.

Clinical experience in dementia care and patterns of EOL care

We found that beneficiaries under the care of physicians with more experience in dementia care (i.e., a higher proportion of beneficiaries with dementia under care) had a higher proportion of advance care planning and hospice enrollment in the last 90 days of life (both *p*-for-trend <0.001) (Table 2). We also found that beneficiaries under the care of physicians with more experience in dementia care had a lower proportion of emergency department visits, hospital admissions, ICU admissions, use of mechanical ventilation (*p*-for-trend <0.02), and use of cardiopulmonary resuscitation (all *p*-for-trend <0.001 unless otherwise noted) in the last 30 days of life.

Sensitivity analyses

Our sensitivity analyses by restricting our sample to non-hospice enrollees (Table 3), by excluding physicians who might have been certified in geriatrics without having geriatrics fellowship training (Supplementary Table S4), and by including time from dementia diagnosis to death as an additional adjustment variable (Supplementary Table S5) yielded similar results to the main analysis.

DISCUSSION

Using nationally representative data on Medicare fee-for-service beneficiaries with dementia, we found that persons with dementia who were cared for by physicians with geriatric training received less intensive EOL care, including ED visits, hospital admissions, ICU admissions, and mechanical ventilation and more hospice use compared to those without geriatric training. This less intensive EOL care may be representative of care that was more in line with patient preferences according to previous studies.[6,33–35] Our data support this in that patients cared for by a physician with geriatric training were more likely to have opportunities to express their preferences with their team as evidenced by more frequent use of advance care planning and palliative care counseling. Our findings should be informative for policymakers, educators, and patients because they suggest the potential positive effects of physicians' geriatric training to change the patterns of EOL care delivered to persons with dementia. While the observed differences between the two groups may seem modest (2–4 percentage points), these differences are arguably meaningful as our data suggest that more than 800,000 persons die with dementia every year in the United States.

Geriatric training programs grew considerably after 1978 when the Institute of Medicine (IOM) called for

improvements in physicians' geriatric education and training.[36] However, subsequent IOM reports in 1993 and 2010 and other institutes raised concerns about persistent shortages of healthcare workers qualified to care for the rapidly growing aging population.[36–40] A recent qualitative study described challenges for clinicians conducting ACP with persons with dementia, highlighting the need for geriatric training.[41] Despite the perceived need, the Accreditation Council for Graduate Medical Education (ACGME) has reduced the geriatric education requirements for Internal Medicine residents from at least 4 weeks of dedicated geriatric experiences to an undefined clinical exposure in geriatric medicine in 2022.[42,43] Given our findings, providing more geriatric training during or after residency (e.g., through a creative curriculum,[44] and a Continuing Medical Education requirement[45]) or increasing (both financial and nonfinancial) incentives for physicians to undergo a formal geriatric fellowship program has the potential to improve the quality of EOL care delivered to persons with dementia. Our finding of the dose–response association between the proportion of patients with dementia under care and patterns of EOL care additionally supports the potential benefits of training and exposure.

We observed no evidence that the placement of feeding tubes in the last 30 days of life differs between beneficiaries with dementia under the care of physicians with versus without geriatric training. This may be because the current guidelines provide sufficient guidance and have been successful in influencing physicians' practice patterns for these healthcare services regarding when these invasive measures align with patients' care preferences (e.g., Choosing Wisely[46]).

Our study builds upon previous work that examined the association between physicians' geriatric training and the quality of care. One study in a tertiary care hospital found that geriatrician-hospitalists provided earlier physical therapy, shorter duration of indwelling bladder catheters, and less frequent use of benzodiazepines or anticholinergics for hospitalized older adults, compared to hospitalists without geriatric training.[16] Another study conducted at three primary care clinics of an academic medical center also showed that geriatricians were more likely to avoid potentially inappropriate medications and screen for geriatric syndromes compared to generalists.[15] Similarly, a case–control study at a single medical center in Taiwan found that patients who received care at a geriatric outpatient clinic had fewer emergency department visits and hospitalizations compared to those at a non-geriatric outpatient clinic.[17] However, these studies did not examine patterns of EOL care for persons living with dementia. We provide new evidence on the association between geriatric training and a wide range of EOL care

measures for persons with dementia using a US nationally representative sample.

Our study has limitations. First, a diagnosis of dementia was determined by the Chronic Condition Data Warehouse algorithm and therefore may be susceptible to misclassification, although prior studies have shown a high accuracy in identifying dementia using this approach.[47–49] Similarly, because our outcomes relied on claims data, they can be influenced by the coding practice. For example, the low prevalence of ACP we observed is likely due to the low uptake of ACP billing codes that were newly implemented in 2016. Second, we were unable to determine the severity of dementia, although our sensitivity analysis by including time from dementia diagnosis to death as an additional adjustment variable as a proxy for the severity of dementia yielded similar findings. Third, our physician attribution algorithm may lead to incorrect attributions for some beneficiaries. Similarly, because our Doximity data did not contain information from the American Board of Family Medicine (ABFM), which provides board certification in geriatric medicine along with the ABIM, we may have misclassification of geriatric training. However, we additionally used the MD-PPAS data to supplement the Doximity data, and this potential misclassification should lead to conservative estimates. Fourth, it is possible that unobserved factors are confounding the association between physicians' geriatric training and the patterns of EOL care in dementia. For example, patients and their caregivers who prefer less intensive EOL care might seek care from a geriatrician, rather than a general practitioner. Fifth, our study was not able to determine whether high-intensity EOL care was or was not concordant with patients' goals. While previous studies have suggested that persons with dementia and their caregivers may desire less aggressive care as their disease progresses,[6,33–35] high-intensity EOL care might have been appropriate for some patients. Lastly, our findings may not be generalizable to other populations, such as younger populations and Medicare Advantage enrollees.

In summary, using a national dataset of decedents with dementia, we found that those cared for by physicians with geriatric training received more advance care planning and palliative care and less intensive EOL care. Our findings suggest that interventions for physicians without formal geriatric training who care for persons with dementia might need to be considered, if evidence emerges that short-duration training is effective in improving the quality of EOL care.

AUTHOR CONTRIBUTIONS

Study concept and design, interpretation of data, and preparation of the manuscript: Hiroshi Gotanda

and Yusuke Tsugawa. Interpretation of data and preparation of the manuscript: Jessica J. Zhang. Interpretation of data and revision of the manuscript critically for important intellectual content: David B Reuben and Anne M Walling. Acquisition of data, analysis of data, and revision of the manuscript critically for important intellectual content: Haiyong Xu. Acquisition of data and revision of the manuscript critically for important intellectual content: Anupam B. Jena and Nate Gross.

CONFLICT OF INTEREST STATEMENT

The authors declare no conflicts of interest.

REFERENCES

1. Alzheimer's Association. *2022 Alzheimer's Disease Facts and Figures*. 2022. Accessed December 14, 2022. https://www.alz.org/media/Documents/alzheimers-facts-and-figures.pdf

2. Xu J, Murphy SL, Kochanek KD, Arias E. *Mortality in the United States, 2018*. 2020. Accessed April 16, 2022. https://www.cdc.gov/nchs/products/databriefs/db355.htm

3. Mitchell SL, Morris JN, Park PS, Fries BE. Terminal care for persons with advanced dementia in the nursing home and home care settings. *J Palliat Med*. 2004;7(6):808-816.

4. Cai S, Gozalo PL, Mitchell SL, et al. Do patients with advanced cognitive impairment admitted to hospitals with higher rates of feeding tube insertion have improved survival? *J Pain Symptom Manage*. 2013;45(3):524-533.

5. Mitchell SL, Kiely DK, Hamel MB. Dying with advanced dementia in the nursing home. *Arch Intern Med*. 2004;164(3):321-326.

6. Mitchell SL, Teno JM, Kiely DK, et al. The clinical course of advanced dementia. *N Engl J Med*. 2009;361(16):1529-1538.

7. Kelly WF, Eliasson AH, Stocker DJ, Hnatiuk OW. Do specialists differ on do-not-resuscitate decisions? *Chest*. 2002;121(3):957-963.

8. Liu TW, Chen JS, Wang HM, Wu SC, Hung YN, Tang ST. Quality of end-of-life care between medical oncologists and other physician specialists for Taiwanese cancer decedents, 2001–2006. *Oncologist*. 2009;14(12):1232-1241.

9. Brims FJ, Kilminster S, Thomas LM. Resuscitation decisions among hospital physicians and intensivists. *Clin Med (Lond)*. 2009;9(1):16-20.

10. Teno J, Meltzer DO, Mitchell SL, Fulton AT, Gozalo P, Mor V. Type of attending physician influenced feeding tube insertions for hospitalized elderly people with severe dementia. *Health Aff (Millwood)*. 2014;33(4):675-682.

11. Ankuda CK, Mitchell SL, Gozalo P, Mor V, Meltzer D, Teno JM. Association of physician specialty with hospice referral for hospitalized nursing home patients with advanced dementia. *J Am Geriatr Soc*. 2017;65(8):1784-1788.

12. Accreditation Council for Graduate Medical Education. *Internal Medicine*. Accessed February 6, 2023. https://www.acgme.org/specialties/internal-medicine/overview/

13. Accreditation Council for Graduate Medical Education. *Family Medicine*. Accessed February 6, 2023. https://www.acgme.org/specialties/family-medicine/overview/

14. Accreditation Council for Graduate Medical Education. *ACGME Program Requirements for Graduate Medical Education in Geriatric Medicine*. 2022. Accessed January 31, 2023. https://www.acgme.org/globalassets/pfassets/programrequirements/125_geriatricmedicine_2022.pdf

15. Phelan EA, Genshaft S, Williams B, LoGerfo JP, Wagner EH. A comparison of how generalists and fellowship-trained geriatricians provide "geriatric" care. *J Am Geriatr Soc*. 2008;56(10):1807-1811.

16. Sinvani L, Carney M, Kozikowski A, et al. The role of geriatrician-hospitalists in the care of older adults: a retrospective cohort study. *Arch Gerontol Geriatr*. 2018;77:31-37.

17. Wei YJ, Hsieh CF, Huang YT, Huang MS, Fang TJ. The influence of integrated geriatric outpatient clinics on the health care utilization of older people. *BMC Geriatr*. 2020;20(1):379.

18. Centers for Medicare and Medicaid Services. *Chronic Conditions Data Warehouse Condition Categories*. 2019. Accessed December 14, 2022. https://www2.ccwdata.org/web/guest/condition-categories

19. Centers for Medicare & Medicaid Services. *Medicare Data on Provider Practice and Specialty (MD-PPAS) User Documentation*. 2021. Accessed March 23, 2022. https://resdac.org/sites/datadocumentation.resdac.org/files/MDPPAS%20User%20Documentation%20-%20Version%202.4.pdf

20. Jena AB, Khullar D, Ho O, Olenski AR, Blumenthal DM. Sex differences in academic rank in US medical schools in 2014. *JAMA*. 2015;314(11):1149-1158.

21. Tsugawa Y, Jena AB, Figueroa JF, Orav EJ, Blumenthal DM, Jha AK. Comparison of hospital mortality and readmission rates for Medicare patients treated by male vs female physicians. *JAMA Intern Med*. 2017;177(2):206-213.

22. Centers for Medicare & Medicaid Services. *Medicare Shared Savings Program SHARED SAVINGS AND LOSSES AND ASSIGNMENT METHODOLOGY Specifications*. 2018. Accessed March 15, 2022. https://www.cms.gov/Medicare/Medicare-Fee-for-Service-Payment/sharedsavingsprogram/Downloads/Shared-Savings-Losses-Assignment-Spec-V6.pdf

23. McWilliams JM, Hatfield LA, Chernew ME, Landon BE, Schwartz AL. Early performance of accountable care organizations in Medicare. *N Engl J Med*. 2016;374(24):2357-2366.

24. McWilliams JM, Hatfield LA, Landon BE, Hamed P, Chernew ME. Medicare spending after 3 years of the Medicare shared savings program. *N Engl J Med*. 2018;379(12):1139-1149.

25. Chronic Conditions Warehouse. *Medicare Data on Provider Practice and Specialty (MD-PPAS) User Guide*. 2022. Accessed January 31, 2023. https://www2.ccwdata.org/documents/10280/19002246/mdppas-methodology.pdf

26. Hunnicutt JN, Tjia J, Lapane KL. Hospice use and pain management in elderly nursing home residents with cancer. *J Pain Symptom Manage*. 2017;53(3):561-570.

27. Nicholas LH, Bynum JP, Iwashyna TJ, Weir DR, Langa KM. Advance directives and nursing home stays associated with less aggressive end-of-life care for patients with severe dementia. *Health Aff (Millwood)*. 2014;33(4):667-674.

28. Kane RL. The future history of geriatrics: geriatrics at the crossroads. *J Gerontol A Biol Sci Med Sci*. 2002;57(12):M803-M805.

29. Benjamini Y, Hochberg Y. Controlling the false discovery rate: a practical and powerful approach to multiple testing. *J R Stat Soc B*. 1995;57(1):289-300.

30. Glickman ME, Rao SR, Schultz MR. False discovery rate control is a recommended alternative to Bonferroni-type adjustments in health studies. *J Clin Epidemiol*. 2014;67(8):850-857.

31. Hellevik O. Linear versus logistic regression when the dependent variable is a dichotomy. *Qual Quant*. 2009;43(1):59-74.

32. Brück CC, Wolters FJ, Ikram MA, de Kok I. Heterogeneity in reports of dementia disease duration and severity: a review of the literature. *J Alzheimers Dis*. 2021;84(4):1515-1522.

33. Mitchell SL, Palmer JA, Volandes AE, Hanson LC, Habtemariam D, Shaffer ML. Level of care preferences among nursing home residents with advanced dementia. *J Pain Symptom Manage*. 2017;54(3):340-345.

34. Volandes AE, Paasche-Orlow MK, Barry MJ, et al. Video decision support tool for advance care planning in dementia: randomised controlled trial. *BMJ*. 2009;338:b2159.

35. Givens JL, Sudore RL, Marshall GA, Dufour AB, Kopits I, Mitchell SL. Advance care planning in community-dwelling patients with dementia. *J Pain Symptom Manage*. 2018;55(4):1105-1112.

36. Institute of Medicine. *Aging and Medical Education*. National Academy Press; 1978.

37. Boyle P. *Prescription for America's Elder Boom: Every Doctor Learns Geriatrics*. 2021. Accessed May 15, 2022. https://www.aamc.org/news-insights/prescription-america-s-elder-boom-every-doctor-learns-geriatrics

38. Institute of Medicine. *Training Physicians to Care for Older Americans: Progress, Obstacles, and Future Directions*. National Academies Press; 1993.

39. Span P. *Older People Need Geriatricians. Where Will They Come From?* 2020. Accessed May 15, 2022. https://www.nytimes.com/2020/01/03/health/geriatricians-shortage.html

40. U.S. Department of Health and Human Services. *National and Regional Projections of Supply and Demand for Geriatricians: 2013–2025*. 2017. Accessed January 31, 2023. https://bhw.hrsa.gov/sites/default/files/bureau-health-workforce/data-research/geriatrics-report-51817.pdf

41. Tjia J, D'Arcangelo N, Carlston D, et al. US clinicians' perspectives on advance care planning for persons with dementia: a qualitative study. *J Am Geriatr Soc*. 2023;71(5):1473-1484. doi:10.1111/jgs.18197

42. Rentsch S, Vitale CA, Zietlow K. Prioritizing geriatrics in medical education improves care for all. *Med Educ Online*. 2022;27(1):2105549.

43. Accreditation Council for Graduate Medical Education. *ACGME Program Requirements for Graduate Medical Education in Internal Medicine*. 2022. Accessed January 31, 2023. https://www.acgme.org/globalassets/pfassets/programrequirements/140_internalmedicine_2022v4.pdf

44. Chao SH, Kwok JY, Ubani BN, Rogers REP, Stark RL. Teaching medicine interns minimum geriatrics competencies within a "4 + 2" schedule. *J Am Geriatr Soc*. 2022;70(1):251-258.

45. Commonwealth of Massachusetts. *Renewal Requirement for Alzheimer's Disease Continuing Medical Education (CME)*. 2023. Accessed February 2, 2023. https://www.mass.gov/service-details/renewal-requirement-for-alzheimers-disease-continuing-medical-education-cme

46. American Geriatrics Society. *American Geriatrics Society: Ten Things Clinicians and Patients Should Question*. 2021. Accessed February 2, 2023. https://www.choosingwisely.org/societies/american-geriatrics-society/

47. Taylor DH Jr, Fillenbaum GG, Ezell ME. The accuracy of Medicare claims data in identifying Alzheimer's disease. *J Clin Epidemiol*. 2002;55(9):929-937.

48. Taylor DH Jr, Ostbye T, Langa KM, Weir D, Plassman BL. The accuracy of Medicare claims as an epidemiological tool: the case of dementia revisited. *J Alzheimers Dis*. 2009;17(4):807-815.

49. Chen Y, Tysinger B, Crimmins E, Zissimopoulos JM. Analysis of dementia in the US population using Medicare claims: insights from linked survey and administrative claims data. *Alzheimers Dement (N Y)*. 2019;5:197-207.

SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

Supplementary Table S1. Primary care service billing codes included in the beneficiary attribution algorithm.

Supplementary Table S2. Current Procedural Terminology (CPT) codes and International Classification of Disease (ICD)-10 codes used to define study outcomes.

Supplementary Table S3. Association between physicians' geriatric training status and patterns of end-of-life care.

Supplementary Table S4. Sensitivity analysis by excluding physicians who might have been certified in geriatrics without having geriatrics fellowship training.

Supplementary Table S5. Sensitivity analysis by including time from dementia diagnosis to death as an additional adjustment variable.