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Impact of provider level, training and gender on the utilization of palliative care and hospice in neuro-oncology: a North-American survey

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Abstract

Specialized palliative care (PC) services have emerged to address symptoms and provide end-of-life management for patients with brain tumors. The utilization patterns of PC in neuro-oncology are unknown. A 22-question survey was distributed to participants of the society for neuro-oncology annual meeting 2012 (n = 4487). Nonparametric methods including Wilcoxon two-sample and Kruskal–Wallis tests were used to assess differences in responses. 239 (5.3 %) evaluable responses were received; 79 % of respondents were physicians, and 17 % were nurses or midlevel providers. Forty-seven percent were medical or neuro-oncologists, 31 % neurosurgeons and 11 % radiation oncologists. Forty percent had no formal training in PC, 57 % had some formal training and 3 % completed a PC fellowship. Seventy-nine percent practiced in an academic setting. Of the respondents, 57 % referred patients to PC when symptoms required treatment and 18 % at end of life. Only 51 % of all providers felt comfortable dealing with end-of-life issues and symptoms, while 33 % did not. Fifty-one percent preferred a service named “Supportive Care” rather than “Palliative Care” (MDs >midlevel providers, $p < 0.001$), and 32 % felt that patient expectations for ongoing therapy hindered their ability to make PC referrals. Female gender, formal training in neuro-oncology and PC, and medical versus surgical neuro-oncology training were significantly associated with hospice referral, comfort in dealing with end-of-life issues, and ease of access to PC services. Provider level, specialty, gender, training in PC and neuro-oncology have significant impact on the utilization of PC and hospice in neuro-oncology.

Keywords

Glioma; End-of-life; Supportive care; Palliative care; Glioblastoma

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Compliance with ethical standards

Conflict of Interest The authors have no conflicts of interest to declare.

Introduction

Palliative care (PC) is a proactive and systematic approach to managing issues that are important to patients and families affected by serious illness. The goal is to improve quality of life and symptom control and thereby reduce suffering.

Glioblastomas (GBMs) and the majority of anaplastic gliomas are treated with maximal surgical resection, followed by a combination of radiation and chemotherapy to the residual tumor and the surrounding brain tissue [1, 2]. Despite this aggressive approach, the median survival is 2–5 years for patients with anaplastic glioma and only 15 months for those with GBM [1, 3, 4]. For almost all patients with high-grade glioma, long-term survival remains elusive. Therefore quality of life has become an increasingly important outcome assessed in brain tumor clinical trials as well as in the standard care in brain tumor centers [5, 6].

While the goal of neuro-oncologists is to extend survival, PC focuses on achieving symptom control and the well-being of patients as well as addressing the psychosocial issues of the patients' families. Several aspects define the patient and family experience through the course of the disease including physical, cognitive, emotional, spiritual, sexual, social and financial domains. PC services can be utilized at any point along the disease trajectory, regardless of whether the goal of treatment is curative or palliative [7].

Patients with brain tumors have complex and changing physical and psychosocial needs along the disease trajectory, especially in the end-of-life phase [8]. PC and hospice teams with an emphasis on symptom relief and caregiver support are well positioned to respond to these needs [9]. The early integration of specialized PC into the care pathway of metastatic cancer patients has been shown to reduce symptoms [10, 11], improve caregiver burden [10] and increase survival [11, 12]. PC teams can provide early assessment and treatment of physical and psychosocial distress as well as guidance for advanced care planning. Recognizing the benefit of these services, the American Society of Clinical Oncology has endorsed the integration of PC into standard cancer care [13]. Such integration of PC into neuro-oncology practice has been previously reviewed and international patterns have been described [14], but it is unclear if specific characteristics of providers including gender, level of training and sub-specialization of providers influence patterns of perception and incorporation of PC in neuro-oncology practice in the United States. The aims of this study were to examine utilization patterns in neuro-oncology and determine the factors that might influence differences in provider behavior when approaching PC and end-of-life care for brain tumor patients.

Methods

The questionnaire used for this study was an ad hoc instrument designed to assess the utilization patterns of PC and hospice in the neuro-oncology community and approved by the institutional review board at Henry Ford Hospital. The survey was developed by the investigators after extensive analysis and a comprehensive literature review of supportive care needs and end-of-life symptom management of brain tumor patients [8]. Special attention was given to the perception of PC in the oncology community [15, 16]. The

specific questions were generated to address the most common aspects of perception and practice of PC by review and consensus among the authors and an external expert in PC leading to a 22-question survey utilized in this study. Questions assessed demographics as well as approach and utilization patterns of PC and hospice (Tables 1, 2). Statements regarding end-of-life issues, PC, access to PC professionals and referral patterns were assessed using a 5-point Likert scale ranging from “strongly disagree” to “strongly agree.”

In collaboration with the society for neuro-oncology (SNO), the questionnaire was distributed electronically utilizing an online survey site (www.surveymonkey.com). A single electronic invitation was sent to everyone who submitted an abstract to the 2012 SNO meeting (n: 5400). Additional paper copies of the survey were distributed at the annual SNO meeting quality of life session. As participants who had responded to the electronic version could not be prevented from receiving a hard copy at the meeting, all respondents were explicitly asked to complete the survey once only. No incentives were offered for answering the survey. Practice setting was categorized as “Academic” (national cancer institute designated, non-designated academic) or “All Other Hospitals” (non-academic hospital-based, group or solo practice).

Statistical methods

Demographic differences in responses to the PC questions were assessed using nonparametric methods including the Wilcoxon two sample and Kruskal–Wallis tests. These methods take into account the ordinal scales used for the PC questions. The participant characteristics considered were type of provider, gender, specialty, number of patients with brain tumors treated, years in practice, practice setting and geographic locations. In addition, the survey also ascertained the extent of formal training during neuro-oncology or medical oncology fellowship or nursing training (i.e., no formal training, CME lectures/conferences, formal rotation during residency/fellowship, 6 months of formal training), or formal training in PC.

All testing was done at the 0.05 level. SAS version 9.2 was used for all statistical analyses, and statistical significance was set at 0.05 for all comparisons.

Results

Characteristics of respondents

We received a total of 239 responses to our survey (78 % electronically submitted). Of the respondents, 59 % were female and 79 % were physicians (Table 1).

Response pattern by type of provider

Response patterns were analyzed based on type of provider training comparing responses of physicians (MD, DO) with those of midlevel providers (RN, NP and PhD) (Table 2). Significant differences were noted in the responses based on practitioner type in several aspects of the survey. Only 20 % of the physicians agreed or strongly agreed with utilizing PC professionals at time of diagnosis for high-grade tumors, while 44 % of all other providers gave this response ($p < 0.001$). Two thirds (66 %) of physicians agreed or strongly

agreed that their patients had easy referral access to inpatient PC services whereas only 36 % of the midlevel providers agreed with this statement ($p < 0.001$). In response to ease of access to hospice, 74 % of physicians agreed or strongly agreed with this statement, while only 40 % of midlevel providers gave this response. Of note, 48 % of midlevel providers disagreed or strongly disagreed with this statement ($p = 0.001$). Fifty-eight percent of physicians preferred having a service named “supportive care” rather than “palliative care” compared to 26 % of all midlevel providers ($p < 0.001$).

The midlevel provider group was heavily skewed towards female gender in this survey; to ensure that differences in response patterns were not driven solely by underlying gender-based differences in perceptions, the responses of all female providers were analyzed independently. The differences in responses to the queries between physician and midlevel providers remained statistically significant demonstrating that they were truly due to the different provider roles and not based on gender.

Response pattern by gender

We analyzed whether there were significant differences in patterns of referral to PC and hospice based on the gender of the respondent. Given that a substantial proportion of respondents among the midlevel providers were female (88 %) we focused only on the physician subset in our gender based analysis. Female physicians agreed much more frequently to refer patients to PC than their male colleagues; 47 % of the female physicians referred the majority of their patients at any time during the course of disease to PC, while only 28 % of their male colleagues reported doing so ($p = 0.020$). This gender-based split was even more significant regarding hospice referral for end-of-life care. Female physicians responded as referring the majority of their patients 74 % of the time, whereas male physicians did so only 44 % of the time ($p < 0.001$). Notably, these differences were not found when we looked at provider type or a purely female group in separate analyses and therefore appear to be driven truly by gender.

Response pattern by specialty

There were several significant differences in how specialists in neurology and medical oncology perceive PC and hospice compared with neurosurgical providers (Table 3). While 77 % of neurology/medical oncology providers responded that they refer the majority (>50 %) of all patients to hospice, only 27 % of all neurosurgery providers reported the same ($p < 0.001$). Similarly, 61 % of all neurology/medical oncology providers agreed/strongly agreed that they felt comfortable dealing with end-of-life issues, whereas 33 % of all neurosurgery practitioners reported the same ($p < 0.001$). Regarding the statement that patients have easy referral access to outpatient PC services, 63 % of all neurology and medical oncology providers agreed/strongly agreed, while only 52 % of all neurosurgery providers responded similarly ($p = 0.031$). Seventy-two percent of all neurologists/medical oncologists agreed/strongly agreed that their patients had easy access to hospice, while only 59 % of all neurosurgeons agreed/strongly agreed with that contention ($p = 0.005$).

Response differences between the specialties of neurology and medical oncology versus radiation oncology were only significant for the percentage of all patients referred to hospice. While 50 % of all radiation oncology providers reported referring <50 % of their patients to hospice, 77 % of all neurology/medical oncology practitioners indicated referring >51 % of all patients ($p = 0.001$).

Provider training and impact on care

Training in neuro-oncology as well as in PC appeared to significantly influence providers' decision making. We differentiated between providers with no training, those who had taken limited courses and those with formal training in neuro-oncology or PC. Formal training could have taken place during residency, fellowship, or in general having had more than 6 months training.

The more neuro-oncology training providers received, the more patients they referred to hospice and the more they thought patients had easier access to hospice. Sixty-two percent of all physicians and midlevel providers with formal training referred >50 % of their patients to hospice compared to 52 % associated with training via educational courses and only 34 % with no training in neuro-oncology ($p = 0.012$). Of the most highly trained group, 73 % thought that their patients had easy access to hospice while this was only the case in 60 and 61 % of providers with course training or no training, respectively ($p = 0.031$).

Significantly different approaches in the use of PC and hospice care for brain tumor patients were observed when provider had no training in PC or if they had taken some courses or had more extensive formal training in residency or fellowship. Seventy percent of providers with the highest level of training in PC referred >50 % of their patients to hospice for end-of-life care. Participants with training through courses referred 60 % and only 45 % of providers without formal training had a referral rate of >50 % ($p = 0.001$). Providers with formal training in PC agreed/strongly agreed 64 % of the time with feeling comfortable dealing with end-of-life issues; this level of comfort was expressed by only 52 % of course-trained individuals. Among providers without formal training, 45 % stated that they would not feel comfortable dealing with this situation ($p = 0.022$). Notably, 68 % of the providers with formal training in PC agreed/strongly agreed with the statement of utilizing palliative medicine professionals when patients develop an increased symptom burden while only 53 % of course-trained individuals and 46 % of individuals without any training in PC responded the same way ($p = 0.027$).

When asked if the term "supportive care" was preferred over "palliative care," 66 % of all providers with the most PC training agreed/strongly agreed, while a significantly lower rate of course trained or non-trained practitioners agreed with the term (49 and 47 % respectively; $p = 0.015$).

Impact of patient volume

We assessed the impact of the volume of patients seen in the respondents' practices on the survey responses (<5 vs 5–15 vs >15 patients per week). Providers seeing >15 brain tumor patients per week, reported a significantly higher percentage of hospice referrals for end-of-

life care when compared with providers seeing <5 patients per week (67 versus 38 % respectively referring >50 % of all patients; $p < 0.001$).

However when asked about utilizing palliative medicine professionals at time of diagnosis for high-grade tumors, respondents seeing the most patients (>15 per week) less frequently agreed with referring patients to early on compared with those seeing the fewest (<5 per week) (19 versus 31 %; $p = 0.042$).

Influence of time in practice

The number of years in practice (<5 vs 5–15 vs >15 years) did not appear to influence practice patterns, with the exception that those participants with the most experience (>15 years of practice) agreed with assessing symptom burden and quality of life significantly more often on a routine basis (75 %) when compared to those with the least experience (<5 years of practice, only 54 %; $p = 0.010$).

Impact of practice setting

There was no significant deviation in practice patterns between academic and non-academic centers with the exception that academic practices had less agreement with the statement that palliative medicine professionals were utilized at the time of diagnosis of high-grade tumors compared to non-academic practices (22 versus 39 %; $p = 0.006$).

Discussion

This is the first study to assess practice patterns of PC utilization in neuro-oncology in North America. Our study shows unique provider differences in PC and hospice utilization based on provider level, specialization, gender and training. Especially training in PC correlated with improved utilization of PC and hospice services as well as an increased comfort level when dealing with end of life issues.

There are several limitations to this study related to the nature of the data collection. The response rate to the survey was modest. The attendees of the SNO meeting who received the survey invitation included many basic scientists and non-clinician researchers. SNO policies precluded us from tracking individual participants, sending repeat invitations, or incentivizing participation. There has been a shift towards assessing survey response rate by the potential for non-respondent bias, and whether the response population is representative of the population of interest [17], which is likely in our survey. While participants of the survey represent only a subset of all SNO participants; we believe that the respondents likely represent a larger proportion of clinical practitioners and overall the response rate is similar to other surveys exploring practice patterns in the field of neuro-oncology [18, 19]. Also, this study examines the opinions and perceptions of neuro-oncology providers rather than their actual practice pattern. Despite these limitations, this survey allows us to make several important observations about the perception and utilization of PC and hospice that may be relevant beyond the neuro-oncology community.

To our knowledge, this is the first study that looks at the different approaches and opinions towards PC and hospice among physicians and non-physician clinical providers. The study demonstrates that physicians have clearly different perceptions about the utilization and access to PC compared with midlevel providers. Physicians rate the ease of access to inpatient PC and hospice services significantly higher and more frequently perceive that their programs function well in assessing symptom burden and quality of life compared with midlevel providers. Such differences could potentially be explained by the different roles by these providers in patient care. Midlevel providers are known to play an important role in supporting patients and their families, optimizing symptom control and initiating PC and transition to hospice [20]. Nurses act often as a liaison between patients and their physicians and therefore are in a preferred position to manage the high levels of psychosocial and medical support that are necessary to bring about effective transitions to hospice [21]. Training pathways may also play a role: Providers with more training in neuro-oncology and PC reported referring significantly more patients to PC as well as hospice. Further, providers with more training in PC reported feeling more comfortable dealing with end-of-life issues. However, only 51 % of all practitioners in our study felt comfortable dealing with end-of-life issues and one third (32 %) did not feel prepared to deal with this inevitable part of neuro-oncological care. Neurosurgical providers were especially uncertain how to deal with end-of-life issues: Forty-five percent reported that they were uncomfortable dealing with end-of-life issues without the assistance of a PC consult. This result might reflect the multidisciplinary practice pattern in North America, where most neurosurgeons see patients for surgical decision making but care is otherwise directed by -oncologists. Similar findings have been described for surgical oncologists in a Canadian study as well [22].

In addition, the amount of training in neuro-oncology or PC and hospice medicine correlated with reported increase in levels of utilization of PC services and hospice referrals. Lack of knowledge and education of health care providers as well as a lack of standardized referral criteria to PC and hospice have been described as barriers to access and referral to PC in the past [23]. Increasing training in PC might be a first step to address this issue. It has been shown that oncologists who completed a rotation in PC during their residency were twice as likely to refer early to a specialized PC service [22]. Provider with the most training in PC preferred the term “supportive care” by a wide margin over “palliative care”. While it has been shown in prior studies that changing the name from “palliative care” to “supportive care” can have extensive impact on the referral patterns [15, 16], it remains to be investigated how this perception is influenced by provider training.

Despite much discussion about the early integration of PC into the oncology pathway, only 14 % of all providers in our study acknowledged referring patients to PC at time of diagnosis or recurrence, while 57 % indicated referring patients at the moment of symptom onset requiring palliation. This finding is consistent with several other studies that have shown that oncologists continue to refer patients at onset of symptoms rather than closer to diagnosis [22, 24, 25]. Our study demonstrates that substantial differences in the deployment of PC services, and provision of end-of-life care and symptom management exist in the neuro-oncology community, and are associated with differences in provider level, training, specialization, and gender.

Improved delivery of PC services may be achieved by recognizing these differences, targeting educational efforts, establishing neuro-oncology care teams with greater diversity with respect to these characteristics, and, ultimately, by developing detailed symptom management and end-of-life practice guidelines.

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Table 1**Demographics**

Variable	Response	All responders (N = 239)
In what function do you practice neuro-oncology?	Physicians	189 (79 %)
	Registered nurses	13 (5 %)
	Nurse practitioners	27 (11 %)
	PhD	10 (4 %)
Gender	Male	142 (59 %)
	Female	97 (41 %)
What is your specialty?	Neurology	61 (26 %)
	Medical oncology	49 (21 %)
	Neurosurgery	75 (31 %)
	Radiation oncology	26 (11 %)
	Other	28 (12 %)
Have you received any formal training in neuro-oncology?	No formal specialty training	23 (10 %)
	Attendance to courses, CME lectures or conferences	82 (34 %)
	Formal rotation during residency, fellowship or training	46 (19 %)
	6 months or more of formal training in neurologic oncology	88 (37 %)
Have you received any formal training in palliative care?	No formal specialty training	94 (39 %)
	Attendance to courses, CME lectures or conferences	101 (42 %)
	Formal rotation during residency, fellowship or training	37 (15 %)
	6 months or more of formal training in palliative care	7 (3 %)
How many patients with brain tumors do you see per week?	< 1	7 (3 %)
	1–5	66 (28 %)
	5–15	84 (35 %)
	> 15	82 (34 %)
I've been practicing independently in my field for:	< 5 years	84 (35 %)
	5–10 years	40 (17 %)
	10–15 years	39 (16 %)
	> 15 years	75 (32 %)
In which setting do you practice?	National Cancer Institute designated Cancer Center	108 (45 %)
	Non-designated cancer center—academic	78 (33 %)
	Non-academic hospital-based	34 (14 %)
	Group or solo practice	19 (8 %)
Where do you practice	North East USA	52 (22 %)
	South East USA	16 (7 %)
	Mid-West USA	41 (17 %)
	North-West USA	10 (4 %)
	South-West USA	50 (21 %)
	Europe	31 (13 %)
	Asia	9 (4 %)

Variable	Response	All responders (N = 239)
How was survey completed?	Other	30 (12 %)
	Online survey	186 (78 %)
	Conference	53 (22 %)

Table 2

Responses and differences between physicians and other providers

Variable	Response	All responders (N = 239)	Physicians (N = 189)	Midlevel provider (N = 50)	p value
I refer patients to palliative care/symptom management (PC/SM) at the moment of	Diagnosis	10 (4 %)	8 (4 %)	2 (4 %)	0.416
	Recurrent disease	23 (10 %)	17 (9 %)	6 (12 %)	
	End of Life	42 (18 %)	37 (20 %)	5 (10 %)	
	Onset of symptoms requiring palliation	137 (57 %)	107 (57 %)	30 (60 %)	
	Other	27 (11 %)	20 (11 %)	7 (14 %)	
What percentage of all your patients is referred to PC/SM at any time during the course of the disease?	0 %	3 (1 %)	3 (2 %)	0 (0 %)	0.870
	1–25 %	106 (45 %)	82 (43 %)	24 (49 %)	
	26–50 %	50 (21 %)	40 (21 %)	10 (20 %)	
	51–75 %	40 (17 %)	35 (19 %)	5 (10 %)	
	76–100 %	39 (16 %)	29 (15 %)	10 (20 %)	
What percentage of all your patients is referred to hospice for end of life care?	0 %	8 (3 %)	8 (4 %)	0 (0 %)	0.062
	1–25 %	68 (29 %)	57 (30 %)	11 (23 %)	
	26–50 %	29 (12 %)	24 (13 %)	5 (10 %)	
	51–75 %	41 (17 %)	32 (17 %)	9 (19 %)	
	76–100 %	91 (38 %)	68 (36 %)	23 (48 %)	
I feel comfortable dealing with end of life issues and symptoms related to disease and therapy without the need for a formal palliative care support service	Strongly agree	43 (18 %)	36 (19 %)	7 (14 %)	0.870
	Agree	79 (33 %)	61 (32 %)	18 (36 %)	
	Neutral	39 (16 %)	30 (16 %)	9 (18 %)	
	Disagree	65 (27 %)	50 (26 %)	15 (30 %)	
	Strongly disagree	13 (5 %)	12 (6 %)	1 (2 %)	0.034
Our program assesses symptom burden and quality of life on a routine basis	Strongly agree	56 (24 %)	46 (24 %)	10 (20 %)	
	Agree	97 (41 %)	81 (43 %)	16 (33 %)	
	Neutral	35 (15 %)	29 (15 %)	6 (12 %)	
	Disagree	36 (15 %)	28 (15 %)	8 (16 %)	
	Strongly disagree	14 (6 %)	5 (3 %)	9 (18 %)	
Our program routinely utilizes palliative medicine professionals at the time of first diagnosis for our high grade primary brain tumor patients (WHO grade III and IV)	Strongly agree	20 (8 %)	10 (5 %)	10 (20 %)	<0.001
	Agree	40 (17 %)	28 (15 %)	12 (24 %)	

Variable	Response	All responders (N = 239)	Physicians (N = 189)	Midlevel provider (N = 50)	p value
Our program routinely utilizes palliative medicine professionals when our high grade primary brain tumor patients (WHO grade III and IV) develop an increased symptom burden	Neutral	37 (16 %)	29 (16 %)	8 (16 %)	0.614
	Disagree	95 (40 %)	79 (42 %)	16 (33 %)	
	Strongly disagree	44 (19 %)	41 (22 %)	3 (6 %)	
	Strongly agree	33 (14 %)	28 (15 %)	5 (10 %)	
	Agree	92 (39 %)	73 (39 %)	19 (39 %)	
My patients have easy referral access to INPATIENT palliative care services	Neutral	40 (17 %)	30 (16 %)	10 (20 %)	<0.001
	Disagree	61 (26 %)	48 (25 %)	13 (27 %)	
	Strongly disagree	12 (5 %)	10 (5 %)	2 (4 %)	
	Strongly agree	65 (27 %)	59 (31 %)	6 (12 %)	
	Agree	78 (33 %)	66 (35 %)	12 (24 %)	
My patients have easy referral access to OUTPATIENT palliative care services	Neutral	33 (14 %)	25 (13 %)	8 (16 %)	0.063
	Disagree	41 (17 %)	27 (14 %)	14 (29 %)	
	Strongly disagree	21 (9 %)	12 (6 %)	9 (18 %)	
	Strongly agree	50 (21 %)	44 (23 %)	6 (12 %)	
	Agree	93 (39 %)	73 (39 %)	20 (41 %)	
My patients have easy access to hospice services	Neutral	41 (17 %)	35 (19 %)	6 (12 %)	<0.001
	Disagree	39 (16 %)	25 (13 %)	14 (29 %)	
	Strongly disagree	15 (6 %)	12 (6 %)	3 (6 %)	
	Strongly agree	75 (32 %)	66 (35 %)	9 (18 %)	
	Agree	85 (36 %)	74 (39 %)	11 (22 %)	
Patients' expectations for ongoing therapies hinder my ability to offer palliative medicine referral	Neutral	20 (8 %)	15 (8 %)	5 (10 %)	0.055
	Disagree	35 (15 %)	23 (12 %)	12 (24 %)	
	Strongly disagree	23 (10 %)	11 (6 %)	12 (24 %)	
	Strongly agree	7 (3 %)	5 (3 %)	2 (4 %)	
	Agree	70 (30 %)	50 (27 %)	20 (42 %)	
As a brain tumor specialist, I would prefer a service called "Supportive Care" rather than "Palliative Care"	Neutral	63 (27 %)	53 (28 %)	10 (21 %)	<0.001
	Disagree	77 (33 %)	63 (34 %)	14 (29 %)	
	Strongly disagree	19 (8 %)	17 (9 %)	2 (4 %)	
	Strongly agree	40 (17 %)	36 (19 %)	4 (8 %)	
	Agree	82 (34 %)	73 (39 %)	9 (18 %)	

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Variable	Response	All responders (N = 239)	Physicians (N = 189)	Midlevel provider (N = 50)	p value
	Neutral	53 (22 %)	37 (20 %)	16 (32 %)	
	Disagree	49 (21 %)	34 (18 %)	15 (30 %)	
	Strongly disagree	15 (6 %)	9 (5 %)	6 (12 %)	

All bold results reached the statistical significance level of 0.05

Table 3

Summary of predictors of palliative care and hospice utilization

Demographic group	PC/Hospice characteristic	Effect ^b	p value
Physicians versus midlevel providers ^a	Utilizing PC at initial diagnosis	Agree (20 vs. 44 %)	<0.001
Physicians versus midlevel providers ^a	Easy access to in-patient PC services	Agree (66 vs. 36 %)	<0.001
Physicians versus midlevel providers ^a	Easy access to Hospice services	Agree (74 vs. 40 %)	<0.001
Physicians versus midlevel providers ^a	Prefer “supportive care” over “palliative care”	Agree (58 vs. 26 %)	<0.001
Physicians versus midlevel providers	Routinely assess symptom burden and QOL	Agree (67 vs. 53 %)	0.034
Female versus male physicians	Refer the majority of patients to PC/SM	Agree (47 vs. 28 %)	0.02
Female versus male physicians	Refer the majority of patients to hospice at end-of-life	Agree (73 vs. 44 %)	<0.001
Neurology/oncology versus neurosurgery	Refer the majority of patients to hospice at end-of-life	Agree (77 vs. 27 %)	<0.001
Neurology/oncology versus neurosurgery	Comfortable dealing with end-of-life issues	Agree (61 vs. 33 %)	<0.001
Neurology/oncology versus neurosurgery	Easy access to out-patient PC services	Agree (63 vs. 52 %)	0.031
Neurology/oncology versus neurosurgery	Easy access to hospice	Agree (72 vs. 59 %)	0.005
Neurology/oncology versus radiation oncology	Refer the majority of patients to hospice at end-of-life	Agree (77 vs. 50 %)	0.001
Formal training in neuro-oncology versus none	Refer the majority of patients to hospice at end-of-life	Agree (62 vs. 52 %)	0.012
Formal training in neuro-oncology versus none	Easy access to hospice	Agree (73 vs. 60 %)	0.031
Formal training in PC versus none	Refer majority of patients to hospice at end-of-life	Agree (70 vs. 45 %)	0.001
Formal training in PC versus none	Comfortable dealing with end-of-life issues	Agree (64 vs. 45 %)	0.022
Formal training in PC versus none	Utilizing PC professionals when patients develop increased symptom burden	Agree (68 vs. 53 %)	0.027
Formal training in PC versus none	Prefer “supportive care” over “palliative care”	Agree (66 vs. 47 %)	0.015
> 15 patients/week versus <5 patients/week	Refer majority of patients to hospice at end-of-life	Agree (67 vs. 38 %)	<0.001
> 15 patients/week versus <5 patients/week	Utilizing PC at initial diagnosis	Agree (19 vs. 31 %)	0.042
> 15 years of practice versus <5 years of practice	Routinely assess symptom burden and QOL	Agree (75 vs. 54 %)	0.010
Academic versus non-academic practice	Utilizing PC at initial diagnosis	Agree (22 vs. 39 %)	0.006

^aDifferences remain statistically significant when only female providers were analyzed^bAgree = agree + strongly agree