Palliative Care and Communication Training in Neurosurgery Residency: Results of a Trainee Survey

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OBJECTIVE: Neurosurgeons care for critically ill patients near the end of life, yet little is known about how well their training prepares them for this role. We surveyed a random sample of neurosurgery residents to describe the quantity and quality of teaching activities related to serious illness communication and palliative care, and resident attitudes and perceived preparedness to care for seriously ill patients.

METHODS: A previously validated survey instrument was adapted to reflect required communication and palliative care competencies in the 2015 the Accreditation Council for Graduate Medical Education (ACGME) Milestones for Neurological Surgery. The survey was reviewed for content validity by independent faculty neurosurgeons, piloted with graduating neurosurgical residents, and distributed online in August 2016 to neurosurgery residents in the United States using the American Association of Neurological Surgeons (AANS)/Congress of Neurological Surgeons (CNS) Joint Section on Neurotrauma and Critical Care email listserv. Multiple choice and Likert scale responses were analyzed using descriptive statistics.

RESULTS: Sixty-two responses were recorded between August 2016 and October 2016. Most respondents reported no explicit teaching on: explaining risks and benefits of intubation and ventilation (69%), formulating prognoses in neurocritical care (60%), or leading family meetings (69%). Compared to performing craniotomies, respondents had less frequent practice leading discussions about withdrawing life-sustaining treatment (61% vs. 90%, $p < 0.01$, "weekly or more frequently"), and were less often observed (18% vs. 87%, $p < 0.01$) and given feedback on their performance (11% vs. 58%, $p < 0.01$). Nearly all respondents (95%) felt "prepared to discuss withdrawing life-sustaining treatments," however half (48%) reported they "would benefit from more communication training during residency." Most (87%) reported moral distress, agreeing that they "participated in operations and worried whether surgery aligned with patient goals."

CONCLUSIONS: Residents in our sample reported limited formal training, and relatively less observation and feedback, on required ACGME competencies in palliative care and communication. Most reported preparedness in this domain, but many were receptive to more training. Better quality and more consistent palliative care education in neurosurgery residency could improve competency and help ensure that neurosurgical care aligns with patient goals. (J Surg Ed 76:1691–1702. © 2019 Association of Program Directors in Surgery. Published by Elsevier Inc. All rights reserved.)

KEY WORDS: Survey, palliative care, communication, neurosurgery, residency, education

COMPETENCIES: Interpersonal and Communication Skills, Patient Care, Professionalism, Medical Knowledge

INTRODUCTION

Neurosurgeons often care for patients with palliative care needs,[1] including effective pain and symptom management,

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clear communication about serious news and support in complex decision-making. Despite the frequency of these situations, patients and families are sometimes left wanting more comprehensive palliative care and better communication with their neurosurgeons.[2,3] Poor communication may unintentionally weigh clinical decision-making in favor of high-intensity interventions at the end of life, with little regard for patient preferences.[4] When patients are told their prognosis and have an opportunity to discuss their wishes, they are better able to clarify their treatment goals.[5–9] In neurosurgery, however, the complexity of available interventions and the inadequacy of prognostic models heighten the importance and the challenge of such communication.[1,10,11]

The Accreditation Council for Graduate Medical Education (ACGME) has created Milestones for Neurological Surgery that include a number of skills related to palliative care and communication.[12] These include "breaking bad news," "advance care planning," and "explaining the role of palliative care" (Table 1).[1] Despite this effort, a recent nationwide survey of neurosurgery program directors revealed suboptimal training of residents in these domains, highlighting the need for better palliative care curricula.[13] In other surgical fields, educators have had success using role-play and simulation techniques to teach the complex communication skills required for serious illness conversations.[14–21] Limited evidence has demonstrated the promise of such approaches in neurosurgery, including recent additions to the Neurosurgery Boot Camp course for junior residents in the United States.[13,22-25]

To date, there have been no formal assessments of how these competencies are taught at residency programs in our current training paradigm. In order to understand their educational experience, we surveyed a random sample of neurosurgery residents in the United States to describe the quantity and quality of teaching activities related to required communication and palliative care competencies, as outlined by the 2015 ACGME Milestones for Neurological Surgery. Residents were also asked about their perceived preparedness to care for seriously ill patients, as well as their attitudes about palliative and end-of-life care. Any educational gaps that this work uncovers can be used to develop educational interventions that ensure consistency throughout residency training and enhance proficiency upon graduation.

METHODS

Survey Development

Our survey was adapted from a previously validated instrument used to evaluate palliative care education in oncology.[26] It was modified to reflect neurosurgical practice based on educational competencies listed in the 2015 ACGME Milestones for Neurological Surgery.[12] Eight representative survey items were created to assess explicit teaching of palliative care and communication skills listed in Table 1. A clinical vignette was incorporated to test prognostication in neurocritical illness, and to evaluate resident experience with communication and surgical decision-making at the end of life. The entire survey was reviewed for content validity by faculty neurosurgeons at 5 academic medical centers. The survey was revised and then pilot tested with graduating neurosurgical residents. The final survey contained 43 items in seven domains: (1) respondent characteristics; (2) prior exposure to formal palliative care or serious illness communication curricula; (3) explicit teaching of ACGME competencies; (4) observation and feedback on communication skills; (5) knowledge in prognostication toward the end of life; (6) clinical experience with end-of-life decision making; and (7) attitudes about palliative and end-of-life care.

Survey Distribution

The survey was distributed online in August 2016 to neurosurgery residents using the AANS/CNS Joint Section on Neurotrauma and Critical Care email listserv, comprised of resident members from nearly all training programs in the United States. An email invitation was sent out with a public link to the survey for voluntary participation, containing an introduction to the research study's aims and all elements of informed consent. Three weekly reminders were sent in follow up and all responses were collected anonymously through REDCap (Research Electronic Data Capture), a secure, HIPAA compliant web-based application.[27] This research study was exempted from institutional review board approval by the Partners Human Research Committee at Brigham and Women's Hospital, Boston, MA.

Statistical Analysis

Descriptive statistics were performed for all responses (frequencies, percentages, means, medians, standard deviations, and ranges where applicable). In addition, comparative analyses between predictor and outcome variables of interest were performed utilizing Chi-square or Fischer's exact test for categorical data and a 2-sided Student's t test for continuous data, as responses appeared to be in a normative distribution. To accommodate for multiple testing, a p value of under 0.01 was considered statistically significant.

[1] Since this survey was conducted, the Milestones for Neurological Surgery were updated and consolidated. Many of competencies listed here were omitted in the latest edition. For this analysis, we will refer exclusively to the 2015 Milestones.

TABLE 1. Required Neurological Surgery Resident Competencies Corresponding to Core Palliative Care Domains (*defined by the 2015 ACGME Neurological Surgery Milestone Project*)[a]

Pain and symptom management
1. Orders positioning, analgesics, sedation, neuromuscular blockade, intravenous (IV) fluids and nutrition in critically-ill patients
2. Recognizes and initiates treatment of baclofen withdrawal or morphine overdose
3. Describes proper utilization and dosing of narcotics in children
Communication
1. Explains risks and benefits of. . . [*Neurosurgical procedures for brain and spinal cord tumors, etc.*][a]
2. Describes expected outcomes after. . . [*Surgery for brain and spinal cord tumors, etc.*][a]
3. Quantifies evidence for risk-benefit analysis during informed consent for a complex, elective neurosurgical procedure
4. Describes methods to compassionately break bad news
5. Participates in breaking bad news to a patient or family
6. Breaks bad news to a patient or family member
7. Participates in an advanced directive discussion
8. Leads and documents an advanced directive discussion
9. Explains risks and benefits of ventilator support
10. Discusses indications for and risks of endotracheal intubation/ventilation
11. Demonstrates honest and caring patient interactions; respects privacy and autonomy
12. Forms effective therapeutic bond with patients; receives praise from patients and families
Psychosocial, spiritual, and cultural aspects of care
1. Responds to patient needs that supersede self-interest
2. Mitigates impact of cultural, ethnic, or socioeconomic differences on patient care outcomes
3. Communicates effectively with patients and families from varied cultural and socioeconomic backgrounds
Terminal care and bereavement
1. Performs a brain death examination
2. Obtains confirmatory tests and makes an accurate diagnosis of brain death
3. Diagnoses brain death in infants/children
Palliative care principles and practice
1. Describes the genetics of brain tumors and genetic markers that impact prognosis
2. Adapts standard treatment plans to special circumstances (e.g., previous surgery, anticipated neurological morbidity)
3. Formulates work-up and treatment plan for a comatose patient
4. Independently formulates a treatment plan for complex patients (e.g., failure of cerebral autoregulation, multiorgan failure, non-recoverable central nervous system [CNS] injury)
5. Selects patients for operative intervention
6. Adapts standard treatment plans to special circumstances (e.g., medical comorbidity, coagulopathy)
7. Describes the role of palliative care for brain tumor patients
8. Participates in or designs physician wellness programs
9. Manages fatigue and sleep deprivation
10. Manages personal emotional, physical, and mental health
11. Demonstrates personal ownership of complications and patient outcomes
12. Leads accurate and effective discussions and morbidity and mortality conference
13. Assumes leadership responsibility for clinical care team decisions and outcomes
14. Describes basic bioethical principles
15. Identifies and manages common ethical challenges during patient care
16. Describes the ethical principles of informed consent
17. Obtains and documents informed consent
18. Obtains and documents informed consent in challenging circumstances (e.g., language or cultural barrier)

[a]These domains were defined in the literature by education-expert consensus, and all neurosurgical competencies displayed here corresponded to essential palliative care competencies as described by Schaefer et al.[44]

RESULTS

Respondent Characteristics

Seven hundred and thirty-six individuals received the public link to the survey. Sixty-two responses (8.4%) were recorded between August 2016 and October 2016. Based on a population of 736 individuals, a sample size of 62 respondents corresponds to 11.9% confidence interval for each response in the survey (using a 95% confidence level). Respondent characteristics can be found in Table 2. Residents of all postgraduate years responded to the survey, and nearly all (93.5%) were US medical graduates. Over half (54.8%) planned to pursue careers in patient care at an academic medical center. Respondents were disproportionately female; over one-third (37.1%) were women, while recent estimates indicate that women account for only 12% of neurosurgical residents.[28]

Exposure to Palliative Care and Communication Training

The majority of residents (95.2%) had a palliative care service available at their institutions and collaborated monthly or more frequently in clinical care (92%). Only 4.8% completed a rotation in palliative care. Nearly half (40.3%) had no prior serious illness communication training. Methods of instruction for serious illness communication included: required lectures (33.9%) or small group skills sessions (22.6%), elective communication training (16.1%) and workshops at the Society of Neurological Surgeons (SNS) Boot Camp (33.9%),

TABLE 2. Respondent Characteristics

Gender	Male	39 (62.9%)
	Female	23 (37.1%)
Race/Ethnicity	Hispanic	3 (4.8%)
	Caucasian	42 (67.7%)
	African-American	3 (4.8%)
	Asian	11 (17.7%)
	American Indian	0
	Other	5 (8.1%)
Age	Median (years)	31
Marital status	Married	37 (59.7%)
	Never married	22 (35.5%)
	Separated	1 (1.6%)
	Omitted	3 (4.8%)
Religion	Catholic	16 (25.8%)
	Protestant	11 (17.7%)
	Hindu	5 (8.1%)
	Jewish	2 (3.2%)
	Muslim	3 (4.8%)
	No affiliation	20 (32.3%)
	Other	4 (6.5%)
	Omitted	1 (1.6%)
Postgraduate year	1	1 (1.6%)
	2	7 (11.3%)
	3	9 (14.5%)
	4	19 (30.6%)
	5	10 (16.2%)
	6	7 (11.3%)
	7+	9 (14.5%)
Training	US medical graduate	58 (93.5%)
	Foreign medical graduate	4 (6.5%)
	Any training outside the US	5 (8.1%)
Career goals	Primarily basic science research	0
	Primarily clinical research	2 (3.2%)
	Primarily patient care at an academic institution	34 (54.8%)
	Primarily patient care in the community	15 (24.2%)
	Equal time performing research and patient care	10 (16.1%)
	Other	1 (1.6%)

Curriculum, Observation, and Feedback

Most residents reported no explicit teaching on 7 of 8 survey items representing ACGME Milestones on palliative care and communication, such as "explaining risks and benefits of intubation and mechanical ventilation" (69%) and "communicating to a surrogate or family member that a patient is dying" (55%) (Fig. 1). However, neurosurgery residents regularly perform clinical work that requires palliative care and communication skills. Around 87% of residents reported that they led discussions about withholding or withdrawing life-sustaining treatment monthly or more frequently. We compared responses to how residents are trained to perform a craniotomy, a common procedural skill in neurosurgery. Residents had less frequent practice leading discussions about withdrawing life-sustaining treatment (61% vs. 90%, $p < 0.01$, "weekly or more frequently"), and were less often observed (18% vs. 87%, $p < 0.01$) or given feedback on their performance (11% vs. 58%, $p < 0.01$) (Fig. 2).

Clinical Knowledge and Experience

Residents were then presented with a clinical scenario in which the benefit of a neurosurgical intervention was uncertain, in terms of survival, function, and quality of life (Fig. 3). Almost all residents (98%) correctly identified that the most likely outcome for this patient *without* surgery would be death in the hospital, within a few days. Most (87%) correctly answered that the most likely outcome for this patient *with* surgery would be death in a nursing home, within the next 6 months.

Residents were then asked to recall a recent case that resembled the one in Fig. 3 (i.e., the patient faced a similar prognosis and the benefit of a neurosurgical intervention was uncertain). On average, residents rated the quality of care their patient received as 8 out of 10. When asked if that care reflected the patient's goals, 58% answered "Yes", 11% answered "No", and 31% answered "I don't know". Approximately 44% stated that a recommendation for surgery was made in their case, including 53% of residents who responded "I don't know" regarding goal-consistent care.

Residents were then asked to rate on a Likert scale how comfortable they would personally feel recommending and/or performing surgery on their patient, regardless of the decision made. 50% expressed some degree of discomfort (Fig. 3). Table 3 lists the considerations that affected resident discomfort with the decision to perform surgery.

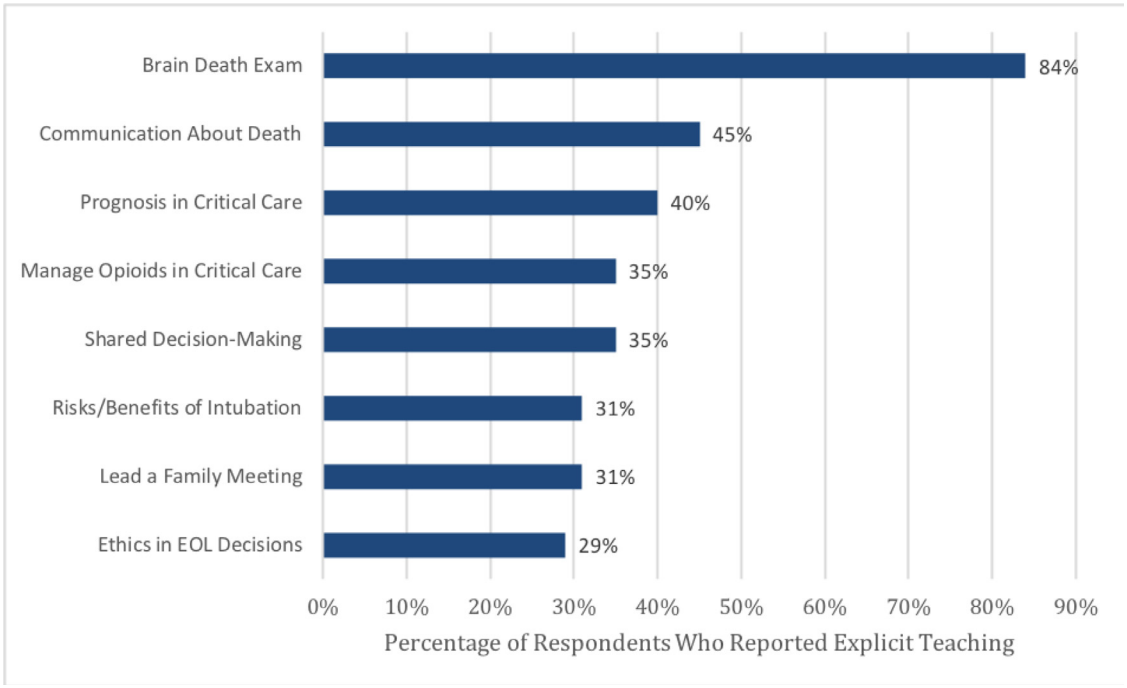


FIGURE. 1. Clinical training in palliative care and serious illness communication competencies.

Residents were asked to answer the following question: "In your residency, have you been *explicitly taught* the following things (as opposed to learning on your own)?" The percentage that answered "yes" for each of the following competencies is displayed here: perform a brain death exam, communicate to a surrogate or family member that a patient is dying, formulate prognoses in neurocritical care, manage opioid medications in critically ill patients, engage in shared decision-making, explain the risks and benefits of intubation and mechanical ventilation, lead a family meeting, and utilize ethical frameworks in end-of-life care.

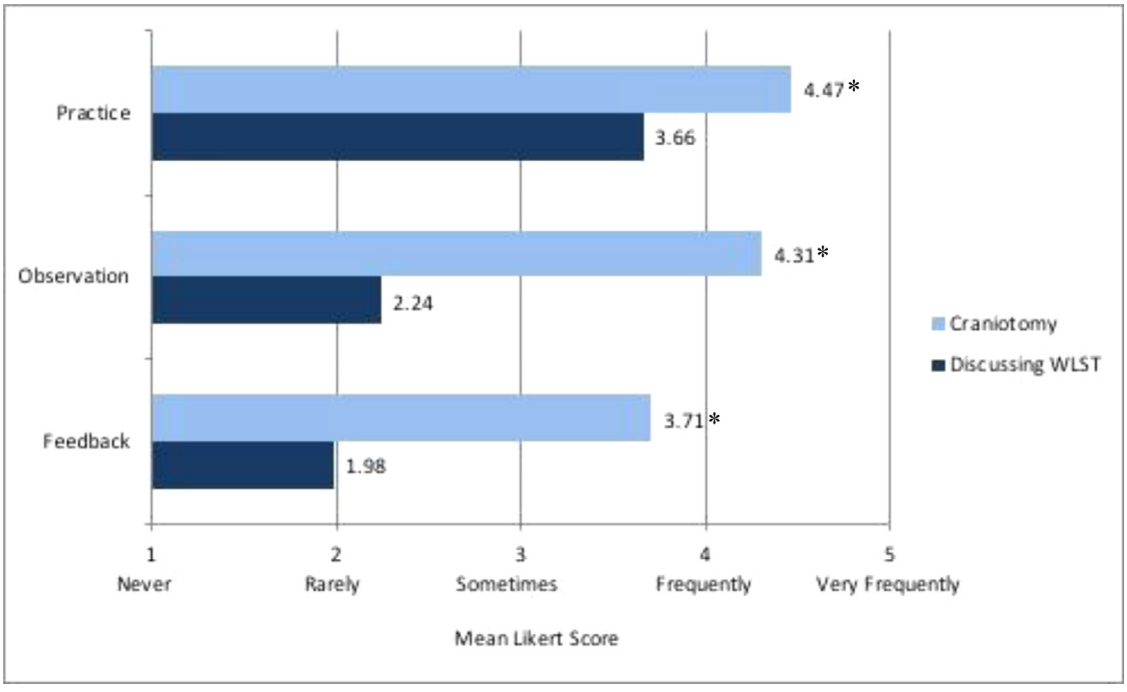
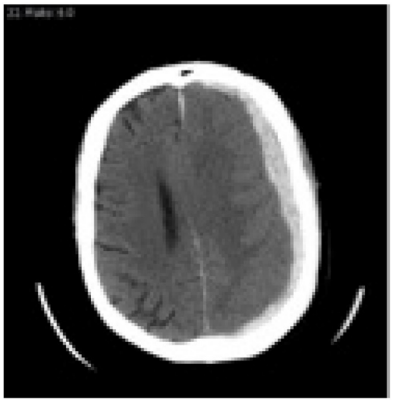


FIGURE. 2. Comparing resident education in palliative care vs. neurosurgical procedures.

Residents were asked, on average, how often they performed or participated in craniotomies, and how often they led discussions about withdrawing or withholding life-sustaining treatment (WLST) with a patient or family in the ICU. Residents were also asked how often they performed these tasks while being observed by an attending, and how often they received feedback on their technique. Residents answered on a Likert scale from 1 to 5 as follows: (1) Never, (2) Rarely (a few times per year), (3) Sometimes (monthly), (4) Frequently (almost every week), (5) Very Frequently (a few times per week). Comparative results (mean Likert score) are displayed here.

*All p values < 0.01.



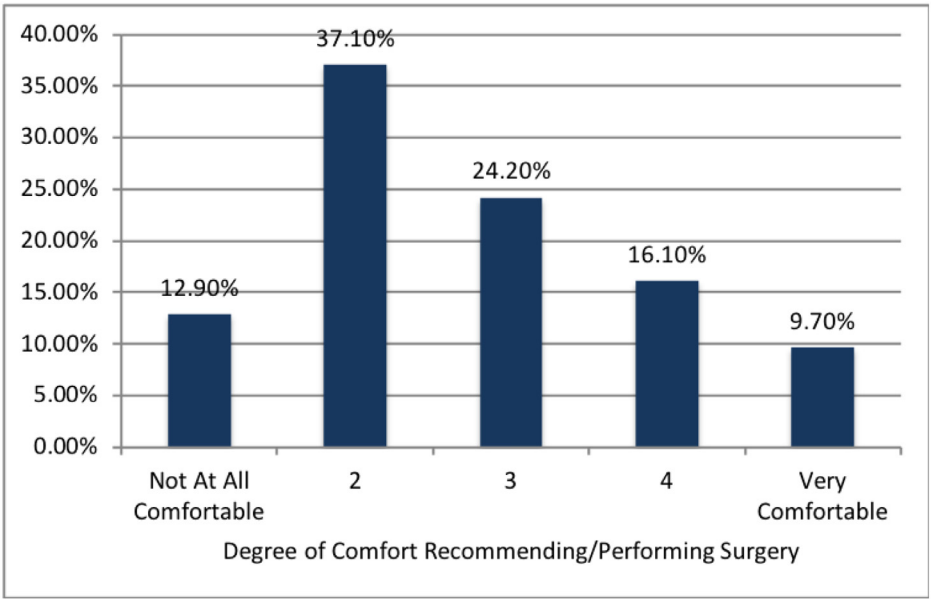


FIGURE 3. Clinical vignette.

We all have participated in the emergent care of a patient and questioned whether a neurosurgical intervention would markedly change the outcome, in terms of survival, function, or quality of life.

The following scenario is drawn from experience with such clinical dilemmas: "A frail man with mild dementia in his late 80s, was found down in his nursing home, and now presents obtunded with right-sided hemiparesis. Imaging revealed an acute subdural hematoma with midline shift (see below). He was taking lifelong anticoagulation medication for recurrent deep venous thrombosis. On examination, his GCS was 4 with pupillary changes."

Residents were asked to recall a patient they cared for who resembled the one in the vignette above.

Regardless of whether a decision for surgery was made in their case, residents were asked how comfortable they personally would have felt recommending and/or performing surgery on their patient, on a Likert scale from 1–5. Results are displayed in the figure above, from "Not At All Comfortable" to "Very Comfortable." 50% expressed some degree of discomfort.

Attitudes

Almost all residents (95%) answered that they felt prepared to discuss withdrawing or withholding life-sustaining treatment in the ICU. Most (84%) understood that palliative care can be administered concurrently with life-prolonging treatments, and over three-quarters (77%) disagreed with the idea that physicians must be emotionally uninvolved in order to provide the best end-of-life care. Nearly half (48%) stated that they would benefit from more communication training in residency. The breakdown of responses to this question by postgraduate year can be seen in Table 4.

Around 63% of residents agreed that they experienced instances of moral distress in residency. Moreover, 87% agreed that they had participated in operations and worried whether surgery aligned with patient values or goals. Residents were given the option to provide open-ended responses about instances of moral distress, along with any suggestions on how to improve end-of-life care in neurosurgery. Table 5 lists representative themes that emerged from these comments and corresponding resident responses.

TABLE 3. Factors Affecting Resident Discomfort with Emergency Surgery Decision-Making

Legal (e.g. medico-legal concerns)	19 (30.6%)
Professional (e.g. expectations from other providers to perform an intervention)	29 (46.8%)
Family (e.g. surrogate pressure for or against surgery)	47 (75.8%)
Patient (e.g. advance directive expressing patient wishes)	33 (53.2%)
Emotional (e.g. sentiments from providers or family affecting decision-making)	23 (37.1%)
Ethical (e.g. a feeling of moral responsibility)	41 (66.1%)
None of the above	1 (1.6%)

TABLE 4. "Do you think you would benefit from more communication training in your residency?"

Postgraduate Year	No	Yes
1	1	0
2	2	5
3	3	6
4	13	6
5	5	5
6	4	3
7+	4	5

TABLE 5. Sources of Moral Distress and Suggestions for Improvement

Sources of Moral Distress **Theme**	**Resident Responses**
Defaulting to aggressive intervention; uncertainty in prognostication	It is an open secret that we frequently intervene on patients with minimal chances of full or even moderate recovery. The case example provided here illustrates this dilemma- without indications from the family that the patient would not have wanted surgery, it is more than likely we would intervene. And to what end is that beneficial to that patient, their family, our health system?
	Fewer people will question you if you do surgery, so surgery is the 'safe' answer. A lot of neurosurgeons operate on the assumption that operating on 10 people is worth saving the 1 out of 10 people who do well after sustaining such an injury.
	There have been some instances during residency where I have felt we would not provide the patient a decent quality of life by operating, yet we did anyways (young patient, no family/no idea of patient wishes etc.). My experience in how 'correct' I was at predicting the outcome has been ~ 50/50 (a few times I was correct and the patient did horrible/died but a few other times I was wrong and the patient did fine).
	There are times when aggressive measures are taken on patients and the patient and family are not fully informed of the risks or an incomplete inquiry into the patient's wishes was made.
	Life saving measures were taken with little chance of patient returning to their acceptable quality of life
	We sometimes perform futile interventions or perform life prolonging interventions that do not lead to a quality of life that most people would find acceptable.
Disagreement with clinical choices of superiors; powerlessness	Generally the Chiefs and attending physicians don't like to deal with withdrawal of care issues, so they leave it to the residents to have these discussions with the family, but they tell the residents what outcome they want (WOC, DNI, DNR, etc.). Sometimes the attendings aren't tuned to all the facts of the case, but they ask for a certain outcome, so one feels pressured to achieve that outcome even if it does not seem optimal for the patient. In general the attitude of our program regarding having to talk with families about end of life issues is to get someone else or some other service to do it.
	The attending pushed for surgery while I was of the view that this was not along patient's and his family's wishes, if the prognosis was better explained to them
	There are certain attendings in the program that have no training in palliative care. We are extensions of their wishes and policies, so my personal feelings conflict with their directions.
	I generally feel that my stance on major operations at the end of life that are unlikely to improve quality of life is more conservative and I would not offer surgery unless the patients' baseline functional status is high and they have few comorbidities.
	There are expectations and you are required to meet them no matter what they are or you are penalized severely.
	I've been involved in a variety of elective and emergent surgical cases I didn't agree with but were decided upon by the attending. I have tried to justify this by appreciating that my knowledge gaps/lack of experience may prevent me from arriving at the same decision. However certain times I feel strongly that my concerns are valid. Certain actions have occurred during surgery in which I felt the patient was being harmed unnecessarily, yet I could not do anything about it as a resident (the faculty was performing the harmful action or choosing to perform what I would consider sham spine surgeries). In these instances, I immediately spoke up to the attending in a politely respectful inquiring manner, then took my concerns up the chain, where they were addressed immediately.
	Attendings operating on patients who wanted to withdraw care.
	[Choosing to perform] craniotomy for tumor resection in high grade tumor versus needle biopsy [to confirm diagnosis]
Disagreement with family wishes	We are constantly pressured by grieving family members to perform treatments that are largely futile, either to elderly patients with numerous comorbidities or young patients who've sustained severe traumatic injuries. Again and again I'm told 'he/she would want everything done' if it will give them 'a chance.' In this situation, I try to reiterate that a chance of saving one's body is different from providing a meaningful quality of life in which a patient can recognize and understand love, and respond to family members and the environment in a meaningful way.
	Have performed operations in older individuals similar to the one shown after discussing prognosis with family, only to have family say they still want everything done.
	Patient's family (number of members) indicated that they knew the patient would choose comfort care in the situation they were in. The patient had discussed such situations with their family prior to admitting illness. Family wanted surgery, gave consent for surgery and continued

(*continued*)

TABLE 5 (*continued*)

Sources of Moral Distress **Theme**	**Resident Responses**
	aggressive care, my attending proceeded with the family's request, not acting in alignment of the patients previously voiced well known wishes. I felt it was wrong. I questioned the ethics in this type of situation from my seniors and never really got an answer..... Often families want intervention even when we know them to be painful and futile. The main thing I considered was whether I was performing an intervention that was actually helping this gentleman. In real life, I would have a conversation with family discussing risks/benefits/expectations. If they decided that his interests were to have everything done, given the low chance of any decent prognosis, then I would feel better about doing what this patient/family would want. However, my overall sentiment is that I'm ultimately acting in a way (if I operate) that would prolong suffering with the knowledge of inevitable decline. I struggle about this.
Conflicts of interest	CT done; Subdural noted; Craniotomy for subdural done as emergency; no consent discussion; Decompressive craniectomy performed; 40% complication rate ensues; Hospital administration THRILLED by the billing.
Lack of experience or training	Residents often responsible for end of life talks that they are not ready to have due to sheer lack of experience.
Suggestions for Improvement **Theme**	**Resident Responses**
Formal palliative care and communication training	I think we do this on a daily basis and assist families in their decisions about end-of-life care especially with devastating neurological injuries. There are shades of grey but I have found that as long as the communication between family members and the healthcare team is open, often times, decisions can be made together. A long-time mentor used to tell me, though, that no matter how neutral we try to be, as neurosurgeons, it is our duty to sway their decision one way or another because we are the ones with the knowledge about prognosis. Having a strong palliative care team has definitely been very beneficial to us at my home institute as they have the time to sit and discuss with families about their loved ones and what they would wish. I think a 1−2 day course for those involved with trauma/critical care or even neuro-oncology may be useful additional training. Including a session at both the PGY-1 and PGY-2 boot camps with be extremely useful for the new residents to become comfortable discussing life-altering issues with families and assisting them in making decisions. Formal training would be helpful for trainees Incorporate more into SNS boot camp, at least yearly small group discussions I consider myself lucky to have gone to a medical school that had a very intense focus on palliative care during our third and four years. I have been able to carry that training into my neurosurgery years, but feel that none of that has been formally enhanced during residency. Explicit training definitely required; perception of 'weakness' among attendings and trainees if help solicited on these issues; assumption that junior residents are capable of having effective discussions on these topics (almost never true) Integrate training openly and not administered by the program where it can be rubber stamped. It would be great to have some formal training on decision-making of these topics and on leading family/patient discussions. Allow palliative care fellowship
More supervision and feedback	Make it mandatory for interns to have end of life talks with an attending physician (or chief resident) on a variety of patient's (for example, patients who are nearly brain dead to patients with a higher GCS score but other co-morbidities that make a functional recovery less likely) Open discussions with attendings before family talks. Majority of family talks are left on residents without input from attending or attending ever seeing patient I learned how to discuss these tough topics during my ICU rotations and my rotation with the weekly changing staff (watching/listening to how the staff did things as they saw consults with me). Most of the feedback I've gotten has been from ICU attendings, not neurosurgery attendings so encouraging residents to learn from them would probably be more beneficial.
Better advance care planning	Continue to push for primary care physicians to encourage patients to define their end of life care goals. Often the families are unable to make a decision for fear of making the wrong choice for their loved one. If the patient has already made it clear that they would not want futile surgery or futile ventilation or artificial nutrition, it makes that decision easier for the family

(*continued*)

TABLE 5 (*continued*)

Suggestions for Improvement **Theme**	**Resident Responses**
Improved frameworks for decision-making; culture change	Yes. Increase patient and family responsibilities. Have primary care provider discuss goals prior to injury with entire family present. The framework for management decisions toward end-of-life care needs to better reflect realistic outcomes for patients, communicated better to their family. Neurosurgeons need to feel more comfortable telling families that the chances of a reasonable quality of life of are very low or nonexistent. As a resident, even in senior years, there is fear of doing this due to a medicolegal environment where the attending neurosurgeon may be hesitant to withhold surgery. Use, publication, and dissemination of scores to predict outcome, such as the ICH-score are very helpful, albeit not perfect, in helping families understand and informing families about likely outcomes. This is especially true for young residents with less experience and helps inform them when talking to families. Educate the general public to the facts, particularly the 'substantially worse outcomes' associated with decompressive craniectomies. Stop all the manufacturer supported promotion of unproven cranial trauma treatments at national neurosurgical meetings. Many neurosurgical illnesses result in the patient's eventual death, sometimes quickly sometimes after a prolonged treatment course. The neurosurgeon should continue to be involved and admit these patients as they present. There may no longer be a role for surgery but our job does not end with the removal of the surgical gown. We have developed trust and a relationship with the patient and their family and should be present at end of life to answer questions, facilitate palliative care involvement and ensure the patient and family have all the resources they require.

DISCUSSION

This study is the first formal assessment of palliative care education for neurosurgery residents. Palliative care and communication are recognized as critical elements of neurosurgical practice, with 39 relevant competencies included in the 2015 ACGME Milestones for Neurosurgery (Table 1). Despite the recognized importance of palliative care skills by the ACGME, our survey demonstrated substantial shortcomings in the educational exposure of neurosurgical residents to both palliative care and serious illness communication skills training.

Most residents had significant exposure to care of dying patients, but few had formal teaching on required clinical care competencies in this domain. Outside of declaring brain death, fewer than half of respondents reported formal training on key palliative care competencies, such as formulating prognoses in neurocritical illness and leading family meetings. Given that some of the residents were early in their training (PGY4 or below), there is considerable opportunity for them to learn about these topics prior to graduating, although by the end of PGY3 most residents have already been exposed to most formal curricular activities. The gaps noted here across multiple domains suggest there is an opportunity to enhance formal, required education on key palliative care topics in many neurosurgical training programs.

All respondents were able to recall patients that they personally cared for who faced life-or-death situations and required a conversation about risks and benefits of a neurosurgical intervention. However, most residents received limited observation and feedback on their communication skills at the bedside. Residents were asked to compare their training experience with neurosurgical procedures (craniotomy) and palliative care skills (discussing withdrawal of life-sustaining treatment). While residents must perform both frequently, observation and feedback was common for craniotomy, but rare for end-of-life discussions. These results are notable, given the longstanding tradition of observation, direct feedback and deliberate practice in surgical education.[29-31] In recent years, teaching in surgery has moved away from "see one, do one, teach one" to a model that emphasizes self-reflection and simulation.[32] Many curricula now include "non-technical skills" necessary for better teamwork and intraoperative communication.[33,34] Such curricular structure could easily be extended to include training in palliative care and patient-centered communication skills.

The clinical vignette included in our survey allowed for indirect assessment of competency in surgical decision-making toward the end of life. Effective shared decision-making in this scenario requires surgeons to: (1) estimate prognosis, (2) elicit patient understanding and goals, and (3) make a patient-centered recommendation.[35,36] We chose an index case which residents of all levels are likely be exposed to on a frequent basis, namely subdural hematomas in elderly patients, which result in a high degree of morbidity and mortality in the postoperative setting.[37,38] Most residents (98%) correctly identified the high risk of death and disability associated with surgery for patients they recalled in such scenarios, suggesting a high level of prognostic accuracy for this case. On the other hand,

over 40% reported either uncertainty about their patients' goals, or concern that care delivered did not meet patients' stated goals. Residents recalled that surgery had been recommended in over 50% of the cases in which they did not know their patients' goals. Overall, over 40% responded that their patients received emergent operations despite the high risk of postoperative morbidity and mortality. These responses appear to be consistent with current default care practices toward the end of life. Without effective exploration of patient preferences, life-prolonging care is often prioritized by physicians irrespective of quality of life considerations.[7,39] Our results suggest that neurosurgery residents are able to accurately estimate prognosis toward the end of life but require further instruction in eliciting patient goals and making recommendations that reflect those goals.

Most residents in our sample responded that they felt prepared to have end-of-life discussions in the ICU. Perhaps, like other medical trainees, neurosurgery residents "don't know what they don't know," and their perceived competence exceeds their behavioral competence.[40] Despite reporting preparedness, nearly half felt they would benefit from more communication training, indicating receptiveness to learning in this domain. These responses highlight a real opportunity for attending neurosurgeons to offer their perspective and explicate their approach to discussions in which patients or families are asked to consider a high-risk intervention or withdraw life-sustaining treatment. Just as in the operating room, such a mentored approach may improve transmission of knowledge and experience, and help trainees prioritize communication as a skill to be honed.[41]

Finally, half of respondents reported discomfort in recommending surgery when the benefit of a neurosurgical intervention was unclear. The majority also reported moral distress, agreeing that they participated in operations they worried were not aligned with patient goals. Trainees may experience moral distress when they are involved in patient care that they feel contradicts their personal or professional beliefs, or when they feel they are unable pursue an ethically appropriate course of action.[42,43] Residents in our sample cited several systemic problems that contributed to moral distress, including the absence of advance directives, discordance between family and personal views, and uncertainty in prognostication. While these may be difficult to address, other sources of distress may be more amenable to educational interventions. Residents described inadequate informed consent related to poor communication training, and limited opportunities to debrief cases or voice concerns about surgical decision-making with superiors. Suggestions for improvement included more formal practice at the SNS Boot Camp, and more opportunities for observation and feedback at home residency programs.

There are several limitations to this study. Our low response rate raises the possibility of bias. It is possible that residents who chose to answer our survey had an interest in palliative care or communication training. If true, these results may in fact overestimate the quality and quantity of palliative care training in neurosurgery. Many residents also had additional years of training left, which may include further exposure to palliative care education, although most formal didactics are introduced by PGY3. Our small sample size may limit the ability to generalize our findings to all neurosurgery programs. Similarly, we are in no way equating residents' perception of care with the actual quality of care delivered in specific cases, but instead highlighting the perspective of trainees who responded to this survey.

In conclusion, neurosurgery residents in our sample reported limited formal training on required ACGME competencies in palliative care and communication. Compared to other essential procedural skills, they received less observation and feedback on critical palliative care skills. While most residents demonstrated a high degree of prognostic accuracy in a commonly encountered end-of-life scenario, many also reported concern that clinical care delivered may not have aligned with patients' goals. These results highlight an opportunity to improve palliative care and communication training in neurosurgery residency, which many residents were open to. Better quality and more consistent palliative care education in neurosurgery residency could improve competency and help ensure that neurosurgical care aligns with patients' goals.

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SUPPLEMENTARY INFORMATION

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