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ORIGINAL RESEARCH

Palliative Care Knowledge and Self-Efficacy Among Anesthesiology Residents: A Multi-Institutional Cross-Sectional Study

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INTRODUCTION

The population of the United States is rapidly aging. By 2050, there will be a projected 88.5 million people aged 65 and older compared with 40.2 million in 2010.¹ As the population ages, more patients will require perioperative care, critical care, complex pain management, and end-of-life care. As of 2014, there were not enough specialty-trained hospice and palliative medicine (HPM) physicians to meet the palliative care (PC) needs of the population, and this shortfall will likely grow in coming years.² To meet the growing PC needs of an aging and increasingly complex patient population, more medical fields will need to be trained in and practice primary PC skills.³

PC can be defined as care that provides relief from pain and other symptoms, that supports quality of life, and that is focused on patients with serious advanced illness and their families.⁴ Through their work in complex pain management, perioperative medicine, critical care, and end-of-life care, anesthesiologists are uniquely positioned to provide primary PC skills for the benefit of their patients. Leaders in anesthesiology graduate medical education have taken notice of the need for primary PC training. PC principles are now a part of the American Board of Anesthesiology (ABA) board examination content outline,⁵ the ABA Objective Structured Clinical Examination (OSCE) content

outline,⁶ and the Accreditation Council for Graduate Medical Education (ACGME) Anesthesiology Residency Milestones and Residency Program Requirements.^{7,8} Additionally, opportunities for continued HPM education beyond residency training exist as the ABA offers a path to HPM board certification,⁹ and anesthesiology residents are eligible for HPM fellowship training.¹⁰ Whereas ABA, OSCE, and ACGME guidelines now incorporate PC principles, to our knowledge, no study has yet assessed anesthesiology resident PC knowledge nor residents' perceived self-efficacy in PC competencies.

The main objective of our study was to assess anesthesiology residents' baseline PC knowledge and their perceived self-efficacy in PC competencies. We also aimed to compare resident PC knowledge and perceived self-efficacy across postgraduate years (PGY) to assess whether the results differ as residents progress through training. We hypothesized that residents' PC knowledge and perceived self-efficacy would increase through their training. A correlation assessment between resident knowledge and perceived self-efficacy was also performed. Finally, we hope to use this data to inform further primary PC education knowledge assessment and potential training interventions for anesthesiology residents.

MATERIALS AND METHODS

Survey Development and Content

Our study builds on the work of Moyer et al, who investigated internal medicine (IM) residents' PC knowledge and perceived self-efficacy, which is defined as "task-specific self-confidence (p. 327)," using a competency-based survey.¹¹ They utilized 5 consensus PC competencies that were developed for IM and family medicine residents in a 2012 national survey of PC educational experts: pain and symptom management (PSM); communication (COMM); psychosocial, spiritual, and cultural aspects of care (PSC); terminal care and bereavement (TCB); and PC principles and practice (PCPP).¹² The Moyer et al survey comprised 2 parts: a knowledge test (KT) of multiple-choice questions developed with input from PC and medical education experts to assess PC competencies and a self-efficacy inventory (SEI) that directed residents to rate their perceived confidence level performing specific PC-related tasks using a 4-point Likert scale. Per Moyer et al, their "competency-based instrument is feasible and demonstrates promising psychometric qualities" and "the principles and much of the content of this instrument could be adapted for use in other GME specialties."¹³

We extended the work of Moyer et al

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to the sphere of anesthesiology resident training. IRB exemption was obtained from the University of North Carolina (UNC) (#23-2719) to conduct a survey of anesthesiology residents. To create a modified KT and SEI survey for anesthesiology residents, a team consisting of a PC attending who is board-certified in HPM and IM, an anesthesiology attending, and an IM resident reviewed the Anesthesiology APPLIED Exam OSCE Content Outline,⁶ the ABA Initial Certification in Anesthesiology Content Outline,⁵ the ACGME Program Requirements for Medical Education in Anesthesiology,⁸ and the ACGME Anesthesiology Milestones⁷ for PC content. Our team mapped individual questions from the original survey of Moyer et al to determine overlapping training competencies for PC and anesthesia trainees. The KT and SEI were then reviewed by an interdisciplinary expert panel that included 4 board-certified anesthesiology attendings, 2 experts in anesthesia resident education, and a board-certified HPM attending. Questions were added, removed, or modified to reflect cases and situations applicable to anesthesiology trainees while preserving core PC content. For example, new survey questions were added that covered relevant topics such as peri-procedural code status and appropriate opioid use/anticipated side effects in the setting of end-of-life care. All changes were agreed upon by consensus among the expert panel (included in Appendix A). The revised survey was then completed by 11 interdisciplinary PC providers with significant experience on the inpatient PC consult team at the primary site. This group correctly answered 90% of the KT questions (see Appendix B). Finally, a focus group comprising 6 interdisciplinary PC providers reviewed the revised survey and results upon completion by PC consult team members. Special attention was given to the items with the lowest correct response rates through post hoc item analysis to determine whether low performance reflected appropriate item difficulty rather than item flaws. For example, 1 of the questions with the lowest correct response rates was likely difficult

because it tested complex pharmacologic knowledge; however, this was judged to be appropriate for anesthesiology residents given their extensive pain management training. Minor revisions were made based on focus group feedback (Appendix B). The final survey included 15 KT questions and 26 SEI statements grouped by PC competency for analysis (Appendix A). See Figure 1 for a visual summary of the KT and SEI revision process.

Setting and Participants

The study population included anesthesia residents at 4 residency programs in the United States. PGY 1–4 participants were recruited by email. Participation was voluntary, anonymous, and not incentivized. Recruitment took place from May to June 2024 to assess knowledge at the end of the academic year. Consent for participation was included in the recruitment email. The survey was distributed across all participating institutions using the Qualtrics platform. Additional recruitment emails were sent every 2 weeks at the primary site during the recruitment period. Nonprimary site recruitment emails were sent by a participating institution faculty representative.

Data Analysis

For the 15 KT questions, responses were scored as correct or incorrect based on the answer keys. The total percentage of correct responses was then calculated for all KT questions and for each of the 5 competencies. The number of questions in each KT competency ranged from 2 to 6.

For the SEI, responses on a Likert scale (*never, sometimes, mostly, always*) were converted to numerical values ranging from 1 (*never*) to 4 (*always*). Average scores were computed for all 26 SEI questions and for questions within each of the 5 competencies. The number of questions in each SEI competency ranged from 3 to 7.

Baseline demographic characteristics, such as gender and race, were summarized for the full cohort and separately for participants from the primary site (UNC) and nonprimary institutions (3). Means with SDs were reported for normally distributed continuous variables. Medians with first quartile (Q1)

and third quartile (Q3) were reported for nonnormally continuous variables. Counts and percentages were reported for categorical variables. ANOVA was used to assess associations between continuous variables and year of residency training or institution (primary vs nonprimary). Kruskal-Wallis nonparametric tests were used for variables that were not normally distributed. Tests of normality have low power when sample size is small, so they often fail to detect nonnormality even when it exists. As a result, normality was determined by a combination of normality tests and visual inspection of histograms. Similarly, Chi-square tests were used to evaluate associations between categorical variables and these factors, with the Fisher exact test applied for associations involving year of residency training and institution. Pearson correlation coefficient was used to evaluate the association between knowledge and perceived self-efficacy. Data preparation and analyses were conducted using R (v4.4.0).

RESULTS

Two hundred thirty-five participants were invited to participate in the survey from 4 participating institutions. The participation rate was 19% (38% at the primary site and 10% across the other 3 participating institutions). Incomplete surveys were excluded from data analysis. Across all participating institutions, 46 residents completed the survey. One incomplete response was omitted, yielding 45 total surveys for review: 24 were primary site respondents, and 21 were nonprimary site respondents.

Baseline characteristics of participants are summarized in Table 1. Of note, the primary site respondents were 73% female (48% of invited participants female); however, overall study participation was 53% female. KT questions and SEI statements were grouped by consensus primary care competencies for PC including PSM, COMM, PSC, TCB, and PCPP (Appendix A).

The KT median (Q1, Q3) for correct answers out of 15 questions was 11 (10,12). The competency domain was highest for PSC with a median of 100% (100%, 100%) and lowest for PSM with median of 50%

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(0%, 50%) (Figure 2). KT performance did not improve by year of training (Table 2).

Self-efficacy by competency had a mean (SD) of 2.70 (0.41) on a 4-point Likert scale (higher score representing greater confidence). Self-efficacy was 2.82 (0.42) for PSM, 2.78 (0.47) for COMM, 2.76 (0.50) for PSC, 2.71 (0.50) for PCPP, and 2.55 (0.55) for TCB, respectively. Self-efficacy did not improve by year of training. There was a trend toward less mean self-efficacy with increased years of training (Table 3).

The correlation between overall knowledge and self-efficacy across participants at all sites was not significant ($R = .11$, $p = .500$) (Figure 3).

There were no statistically significant differences between the primary site (UNC) and nonprimary sites in survey (KT or SEI) performance overall or by competency.

DISCUSSION

Our study builds on the work of Moyer et al¹¹ to investigate PC knowledge and perceived self-efficacy among anesthesiology residents. Participants scored 72% on the KT. Moyer et al reported 73% on the IM KT survey. Among anesthesiology residents, there was considerable variability in performance across the assessed competencies. The mean self-efficacy score, a surrogate for confidence or perceived competence, for PC among anesthesiology residents was 2.82, corresponding to *sometimes-mostly* on a 4-point Likert scale (1 = *never*, 2 = *sometimes*, 3 = *mostly*, 4 = *always*). IM residents reported 2.57 on the IM SEI survey. No progression in knowledge or self-efficacy was observed across training years among anesthesiology residents. Similar survey results between anesthesiology and IM residents may support the validity of the revised survey for use among anesthesiology residents although conclusions should be interpreted cautiously given the overall low response rate.

Given extensive training in pain and symptom management in perioperative medicine, it may be surprising that PSM was the lowest scoring KT PC

competency among anesthesiology residents (with PSC being the highest). This may be explained given that the anesthesia KT questions were designed to specifically address end-of-life care, excluding or modifying questions to avoid overlap with routine pain and symptom management encountered in perioperative medicine (see Appendix A). Whereas the explanation for decreased knowledge within the competencies is outside the scope of this survey, this finding may highlight PSM for end-of-life care as an area of interest for assessment and curriculum development among anesthesiology residents.

Whereas the sample size may not be sufficient to detect statistically significant differences across years of training, it can provide useful preliminary results that reflect trends across all training levels and may inform future large-scale studies. Overall, KT and SEI performance was similar for anesthesiology residents across all years of training. There also may have been a trend toward decreased self-efficacy with additional years of training among anesthesiology residents. Moyer et al reported no change in PC KT scores but increased self-efficacy among IM residents with additional years of training.¹¹ These findings may indicate that PC knowledge and self-efficacy may be influenced by preresidency exposure/curricula.^{14–18} Additional curricular interventions may be warranted during residency training to ensure a progression of knowledge and/or self-efficacy over time preparing for board certification. Residency curriculum may allow for more specialty-focused PC knowledge compared with preresidency exposure. Moyer et al concluded, “A more focused curriculum is needed to help IM residents facilitate mastery of PC competencies by graduation.”¹¹ The same conclusion can be applicable to anesthesiology residency training. In addition, further assessment of PC exposure preresidency may yield additional insights into current resident PC knowledge.

Previous studies have shown that physician self-efficacy and knowledge are rarely associated.^{19–21} As anticipated, anesthesiology resident PC knowledge and self-efficacy showed no correlation among

anesthesiology residents. Similarly, Moyer et al also did not demonstrate a correlation between PC knowledge and self-efficacy among IM residents. Whereas self-efficacy has not been shown to be a measure of knowledge, it may provide useful insight into resident confidence on the subject matter potentially influencing educational interventions.

Overall survey participation in our study was low at 19% (38% at the primary site, 10% at nonprimary sites) representing a major study limitation. Moyer et al reported a 38% response rate among IM residents. Low survey participation risks introducing bias and lacking reliability to draw conclusions from the results. Low participation at the nonprimary sites may have been attributed to nonstandardized follow-up recruitment emails among the participating institutions. Despite low participation, inclusion of nonprimary sites may enhance the study’s generalizability of PC KT and SEI among anesthesiology residents, particularly given that PC KT and SEI were similar between both the primary and nonprimary sites. Also of note, the primary site respondents were 73% female (48% of invited participants female), indicated a potential source of response bias; however, overall study participation was 53% female.

There are several additional limitations in this study. Our survey did not assess whether participants had prior exposure or education in PC, which may introduce selection bias into the survey. The low number of questions within each competency on the survey may also introduce a degree of survey artifact, limiting conclusions about individual competencies. In addition, some survey questions are double or triple barreled and/or vary in technical complexity (with questions with a lower technical complexity being potentially easier to answer without specific training). These question styles or types may limit the conclusions that can be made about PC knowledge among the study population. That being said, individual questions were assessed for applicability to anesthesiology residents in assessing their PC knowledge and self-efficacy. Additional questions would have increased the time to complete

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the survey and may have adversely affected an already low overall response rate. At the primary site, female participation was overrepresented among study participants for unclear reasons, indicating a potential source of response bias at the primary site.

Future studies are warranted to assess anesthesiology resident PC knowledge. Opportunities for further categorization and understanding of PC knowledge among OSCE, board examination, and milestone assessments/examinations may yield further insights. In addition, given the limited progression of knowledge and self-efficacy observed in this survey, an assessment of prior PC exposure in medical school may be warranted to further establish where PC competencies are being instilled in anesthesiology residents. Among anesthesiology residency training programs, an assessment of current formal curriculum related to PC knowledge may also be warranted to ensure a progression of established PC competencies over time. Finally, assessment of resident perception of the need for PC knowledge among anesthesiology faculty and resident trainees may not only inform curriculum design but also be relevant to discussions about the optimal selection of rotations in the clinical base year prior to clinical anesthesia training.

CONCLUSION

There is limited understanding of anesthesiology residents' knowledge and self-efficacy in PC despite its inclusion in training milestones and competency frameworks. The anesthesiology KT and SEI yielded similar overall results as the study in IM and highlighted a potential need for education interventions to enhance PC knowledge over time during anesthesiology residency training. However, study limitations, most notably a low survey response rate, limit definitive conclusions from the survey. Future iterations of the survey should account for

residents' prior PC knowledge or exposure as well as the presence of established institutional PC curricula within anesthesiology training programs.

Acknowledgments

Our team would like to acknowledge the outstanding work of Dr Kristen Moyer and her research team whose work exploring the palliative care knowledge of IM residents served as the foundation of our study. Dr Moyer has given permission to our team to adapt the knowledge test and self-efficacy inventory that her team created.

References

1. Bureau of the Census. Projections of the population by age and sex for the United States: 2010 to 2050. 2008. Available at: [census.gov/prod/2010pubs/p25-1138.pdf](https://www.census.gov/prod/2010pubs/p25-1138.pdf). Accessed February 20, 2015.
2. Lupu D, Quigley L, Mehfood N, Salsberg ES. The growing demand for hospice and palliative medicine physicians: will the supply keep up? *J Pain Symptom Manage*. 2018;55(4):1216-23.
3. Quill TE, Abernethy AP. Generalist plus specialist palliative care—creating a more sustainable model. *N Engl J Med*. 2013;368(13):1173-5.
4. Committee on Approaching Death: Addressing Key End of Life Issues; Institute of Medicine. *Dying in America: Improving Quality and Honoring Individual Preferences Near the End of Life*. Washington, DC: National Academies Press; 2015
5. The American Board of Anesthesiology. Initial certification in anesthesiology content outline. theaba.org/wp-content/uploads/2023/01/Initial_Certification_Content_Outline-4.pdf.sss. Accessed December 13, 2024.
6. The American Board of Anesthesiology. APPLIED exam objective structured clinical examination (OSCE) content outline. theaba.org/wp-content/uploads/2022/12/OSCE_Content_Outline.pdf. Accessed December 13, 2024.
7. The Accreditation Council for Graduate Medical Education. Anesthesiology milestones. acgme.org/Portals/0/PDFs/Milestones/AnesthesiologyMilestones2.0.pdf?ver=2020-12-02-125500-287. Accessed December 13, 2024.
8. Accreditation Council for Graduate Medical Education. ACGME program requirements for graduate medical education in anesthesiology 2023. acgme.org/globalassets/pfassets/programrequirements/040_anesthesiology_2023.pdf. Accessed December 13, 2024.
9. The American Board of Anesthesiology. Hospice and palliative medicine. theaba.org/subspecialty-exam-type/hospice-and-palliative-medicine-exam. Accessed December 13, 2024.
10. ACGME-accredited hospice and palliative medicine fellowship program applicant FAQs. aahpm.org/wp-content/uploads/2024/03/ACGME_HPM_Fellowship_Applicant_FAQ_12.pdf. Accessed December 13, 2024.
11. Moyer KM, Ellman MS, Encandela J, Morrison LJ. Are internal medicine residents meeting the bar? comparing resident knowledge and self-efficacy to published palliative care competencies. *Am J Hosp Palliat Care*. 2021;38(4):326-31.
12. Schaefer KG, Chittenden EH, Sullivan AM, et al. Raising the bar for the care of seriously ill patients: results of a national survey to define essential palliative care competencies for medical students and residents. *Acad Med*. 2014;89(7):1024-31.
13. Moyer KM, Morrison LJ, Encandela J, et al. A new competency-based instrument to assess resident knowledge and self-efficacy in primary palliative care. *Am J Hosp Palliat Care*. 2020;37(2):117-22.
14. Head BA, Schapmire TJ, Earnshaw L, et al. Improving medical graduates' training in palliative care: advancing education and practice. *Adv Med Educ Pract*. 2016;7:99-113.
15. Case AA, Orrange SM, Weissman DE. Palliative medicine physician education in the United States: a historical review. *J Palliat Med*. 2013;16(3):230-6.
16. Bickel-Swenson D. End-of-life training in U.S. medical schools: a systematic literature review. *J Palliat Med*. 2007;10(1):229-35.
17. Dickinson GE. Thirty-five years of end-of-life issues in US medical schools. *Am J Hosp Palliat Care*. 2011;28(6):412-7.
18. Jacobowski N, Mulder J. Palliative care education during medical school: a national survey of medical school deans and graduating students. *J Pain Symptom Manage*. 2010;39(2):335.
19. Kazior MR, Chen F, Isaak R, et al. Perception precedes reality: a simulation and procedural bootcamp improves residents' comfort with transitioning to clinical anesthesiology training. *Cureus*. 2022;14(1):e21706.
20. Xu X, Ruan X, Yu C, et al. Differences between resident self-assessments and faculty-assessments on anesthesiology milestones and associated factors: a cross-sectional study. *BMC Med Educ*. 2024;24(1):551.
21. Davis DA, Mazmanian PE, Fordis M, et al. Accuracy of physician self-assessment compared with observed measures of competence: a systematic review. *JAMA*. 2006;296(9):1094-102.

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Abstract

Background: Anesthesiology residents have palliative care (PC) training needs given their role in perioperative medicine. Whereas anesthesiology residency programs have PC training requirements in both curricular guidelines and board certification content, little is known about the PC knowledge of anesthesiology residents. This study aimed to assess anesthesiology residents' baseline PC knowledge and perceived self-efficacy.

Methods: Anesthesiology residents across 4 institutions completed a knowledge test (KT) and a self-efficacy inventory (SEI). The KT and SEI assessed 5 PC domains: pain and symptom management (PSM); communication (COMM); psychosocial, spiritual, and cultural aspects of care (PSC); terminal care and bereavement (TCB); and PC principles and practice (PCPP). Descriptive statistics were generated to assess overall resident scores and statistical tests (ANOVA for normally distributed outcomes and Kruskal-Wallis nonparametric test for nonnormal outcomes) were used to compare the scores by residency year of training.

Results: On the KT, residents had the highest scores in the PSC domain, with a median (Q1, Q3) of 100% (100%, 100%), and the lowest scores in PSM, with a median (Q1,Q3) of 50% (0%, 50%). On the SEI, scored on a 4-point Likert scale, residents had the highest perceived self-efficacy in PSM (2.82 ± 0.42) and lowest in TCB (2.55 ± 0.55). Neither KT ($p = .571$) nor SEI scores ($p = .203$) increased with additional training with the lowest knowledge and perceived scores in the final year of training.

Conclusions: This study provides exploratory insights into PC education among anesthesiology residents. By examining both resident competency and confidence, we hope to inform future educational assessment of knowledge and interventions to better prepare anesthesiology residents to incorporate PC principles into patient care.

Keywords: Palliative care education, palliative care competencies, anesthesiology, resident education, resident knowledge

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Figures

Figure 1. KT and SEI Revision Process.

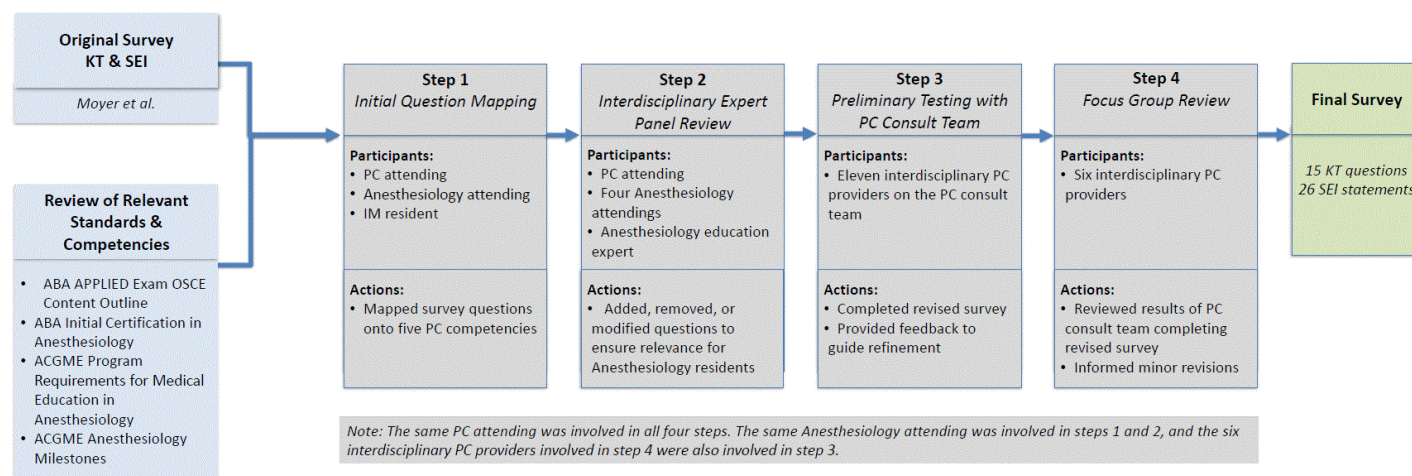
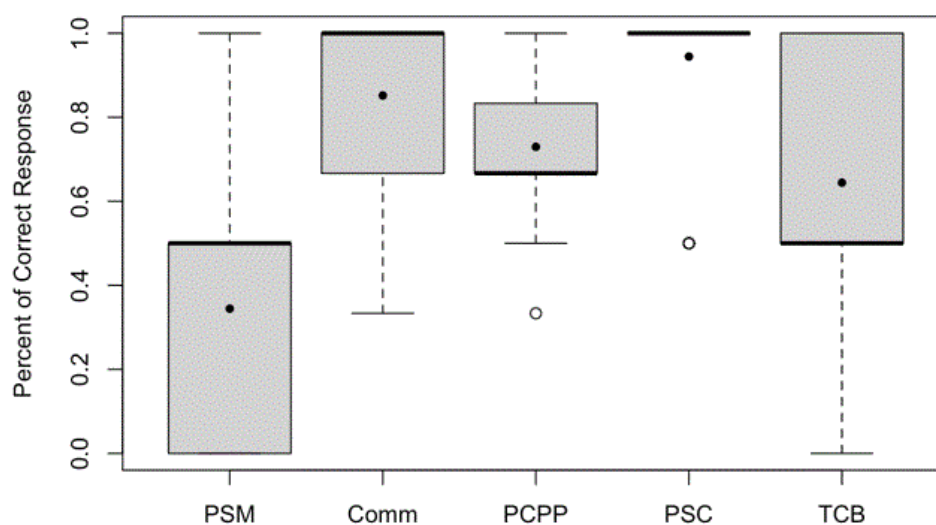


Figure 2. KT by Competency.



Horizontal line indicates median and dot indicates mean

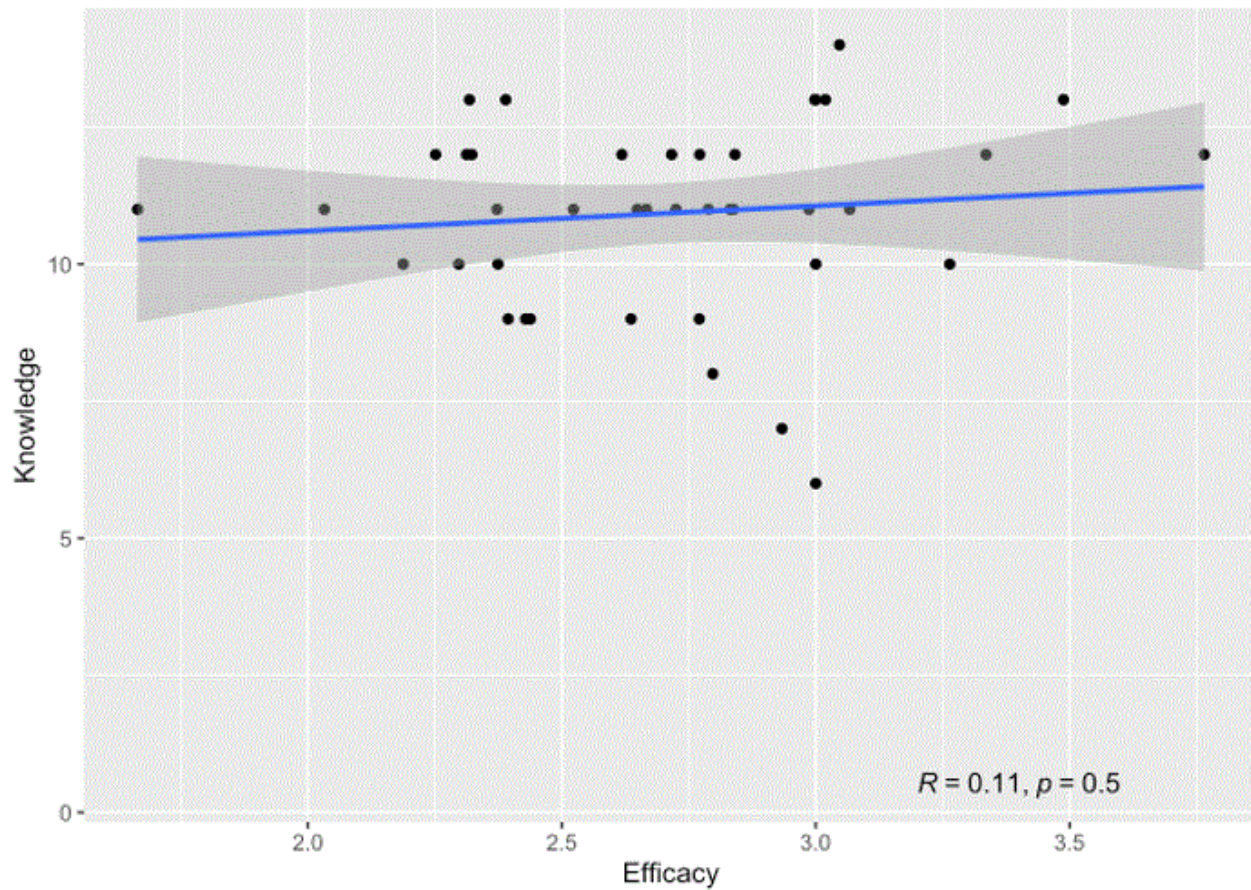
PSM = Pain and Symptom Management
Comm = Communication
PCPP = Palliative Care Principles and Practice
PSC = Psychosocial, Spiritual, and Cultural Aspects of Care
TCB = Terminal Care and Bereavement

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Figures

Figure 3. KT and SEI Association.



A scatter plot of average efficacy (1-4 Likert scale on SEI) and Knowledge (# correct out of 15 on KT)

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Tables

Table 1. Baseline Demographics and Characteristics

	UNC (n = 24) (%)	Other (n = 21) (%)	Overall (n = 45) (%)	P-value
Gender				
Female	17 (71)	7 (33)	24 (53)	.0174
Male	7 (29)	14 (66)	21 (46)	
Race				
Asian or Pacific Islander	4 (16)	2 (9)	6 (13)	.678
Black or African American	3 (12)	1 (4)	4 (8)	
Hispanic or Latino	1 (4)	2 (9)	3 (6)	
Multiracial or biracial	1 (4)	0 (0)	1 (2)	
White or Caucasian	15 (62)	16 (76)	31 (68)	
Year of residency				
PGY-1	6 (25)	4 (19)	10 (22)	.342
CA1	6 (25)	7 (33)	13 (28)	
CA2	8 (33)	3 (14)	11 (24)	
CA3	4 (16)	7 (33)	11 (24)	

Abbreviations: CA, categorical year; PGY, postgraduate year.

Table 2. KT Results

	PGY-1 (n = 10)	CA1 (n = 13)	CA2 (n = 11)	CA3 (n = 11)	Overall (n = 45)	P-value
KT number correct out of 15 Questions						
Median [Q1, Q3]	11.0 [9.50, 12.0]	11.0 [11.0, 12.0]	11.0 [10.0, 12.5]	10.0 [9.50, 11.5]	11.0 [10.0, 12.0]	.571

Abbreviations: KT, knowledge test; Q1, first quartile; Q3, third quartile.

Kruskal-Wallis nonparametric tests were used for nonnormally distributed variables, and *p*-value along with median [Q1, Q3] are reported.

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Tables

Table 3. *SEI Results*

	PGY-1 (n = 6)	CA1 (n = 6)	CA2 (n = 8)	CA3 (n = 4)	Overall (n = 24)	P-value
SEI All ^a						
Mean (SD)	2.80 (0.333)	2.75 (0.401)	2.79 (0.335)	2.45 (0.499)	2.70 (0.406)	.203
Missing (%)	0 (0)	0 (0)	2 (18.2)	2 (18.2)	4 (8.9)	

SEI= Self-Efficacy Inventory; Q1: First Quartile; Q3: Third Quartile

ANOVA test was used for normally distributed variables, and *p*-value along with mean (SD) are reported.

^aScores are based on 4-point Likert scale (1–4).

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Appendices

Appendix A: Revisions to Moyer et al KT and SEI

Changes to the original Moyer et al KT are noted below. Deletions are noted with strikethrough text. Our additions are noted below the strikethrough text. Domain is noted at the beginning of each question.

KT:

1. PCPP- Mr. W is a 75 yo man with stage 4 non-small cell cancer of the lung with metastases to his ribs and spine is admitted to the hospital with atrial fibrillation with rapid ventricular response. He is scheduled to undergo ablation of his atrial fibrillation later that day which will require general anesthesia and mechanical ventilation. He has a signed DNR form in his chart. Which of the following is true regarding his peri-procedural code status?
 - a. All patients undergoing general anesthesia should be full code as the likelihood of surviving cardiac arrest is higher during the peri-procedural period
 - b. Mr. W's DNR code status should be continued during the procedure as he has clearly expressed his wishes on the matter and they should not be questioned
 - c. You and Mr. W should discuss options for peri-procedural code status in the context of his medical history and values to determine the best option for him
 - d. If his code status is changed to full code for the procedure, it should remain full code until discharge from the hospital
2. PCPP- You are caring for Ms. S, a 62 yo woman with a history of COPD admitted with COVID- 19 pneumonia complicated by ARDS and severe hypoxic respiratory failure. She was intubated and started on ECMO 8 days ago and remains full code. Over the past 24 hours, her status has deteriorated to the point that she is now on maximal ventilator settings and rapidly increasing vasopressor requirements. Ms. S's family has consistently shared how they would not want to continue her on life-prolonging interventions if there was not a path to survival. You feel that she will likely die in the coming hours and that she no longer has any chance of recovery. After sharing these updates with the family and presenting options of continued maximal medical therapy vs comfort-focused care to family, how should you proceed?
 - a. Ask Ms. S's family how they would like to proceed
 - b. Make a recommendation to transition to comfort-focused care with discontinuation of life-prolonging technologies to allow a natural death

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Appendices

- c. Consult palliative care to elicit Ms. S's goals and values from her family and to advise you on how to proceed
 - d. Given that Ms. S initially expressed her desire and consent for intubation/ECMO, continue with maximal medical therapy
3. COMM- A 72 yo man with metastatic gastric cancer and ongoing rapid weight loss is spending ~75% of his time in bed or lying down. He has just been told no additional cancer treatments will be of benefit and asks you "how much time do you think I have left?" The best approach would be to say:
- a. "Only God can determine how long someone has to live."
 - b. "Prognoses are notoriously difficult, so I really can't give you a reliable estimate."
 - c. "I believe time is short, only a few weeks to a few months."
 - d. "I think you should plan for 6 weeks."
4. PCPP- A patient you've been caring for over a number of weeks seems to be declining in front of you and may even die in the next few weeks. You're quite close to this patient and are finding this hard. Which of the following situations seems like the least appropriate expression of emotion in your role?
- a. You tear up, and your voice quivers some as you're speaking to the patient, but you smile through it and squeeze the patient's hand
 - b. You feel sad in the room while visiting the patient and discussing details with the family, and then you spend 5 minutes alone in an office crying heavily afterward
 - c. You feel sad and emotional in the room while visiting the patient but gently smile through the encounter; afterward, you journal for 15 minutes about your feelings and the events and meaning
 - d. You begin to cry openly in the patient's room during your visit, and the patient's family has you sit down so they can comfort you
5. PSC- A terminally ill woman is very religious. She asks a physician who has different religious beliefs to pray with her. Which is the most appropriate physician response?
- a. Find a chaplain to pray with her

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- b. Ask other team members to pray with her
 - c. Participate to whatever degree he/she is comfortable as the patient prays
 - d. State that physicians are not supposed to pray with patients
-
- 6. PSM- All of the following are true about the use of opioid medications near the end of life except:
 - a. Appropriately dosed opioids are unlikely to cause respiratory depression
 - b. The side effect of constipation is not a concern near end of life and therefore oral bowel regimens and suppositories are not needed
 - c. Opioids are first line therapies for management of air hunger in dying patients
 - d. Opioid infusions should only be ordered for patients who demonstrate significant pain or dyspnea and require large doses of IV opioids

 - 7. TCB- Mr. P is a 78 year old man with advanced pulmonary fibrosis who was transitioned to comfort care and compassionately extubated three days ago. He is unresponsive and his life expectancy is estimated to be days. His wife shares that he appears dehydrated and is concerned about dehydration causing discomfort. She wonders if fluids should be started. The most appropriate response should be:
 - a. Begin IV hydration therapy to alleviate his discomfort
 - b. Ask the RN to give fluids by mouth
 - c. Reassure his wife that dehydration is an expected aspect of the dying process and will not cause him discomfort
 - d. Place a nasogastric tube for enteral hydration

 - 8. PSC- The son of a hospitalized elderly Korean man with stage 4 pancreatic cancer tells you not to talk to his father about the diagnosis or prognosis. He says it is Korean tradition that medical information be communicated to the children of elderly people and they will decide what information to pass onto their father. What is the most appropriate way to handle this situation?
 - a. Respect this reported cultural norm and communicate diagnosis and prognosis with the patient's son

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- b. Explain to the son that legally and ethically you are required to communicate directly all information with the patient and proceed to do so
- c. Ask a colleague of Korean descent if what the son is telling you is consistent with tradition and if so, honor this request
- d. Explain to the son that you need to discuss with his father what his preferences are for receiving information about his condition and care

9. COMM- When a patient or family member openly expresses sadness or anger in your presence, the most appropriate immediate response is to:

- a. Excuse yourself and leave the room
- b. Change the topic of discussion
- c. Name the emotion and join the patient or family member in expressing it
- d. Actively listen with calm, silence and presence

10. COMM- When conducting a goals of care discussion with a seriously ill patient who has full decision-making capacity, the most appropriate initial step in the discussion is to:

- a. Determine if the patient has completed a living will
- b. Ask what the patient understands about his/her illness or current medical condition
- c. Explain your recommendations for treatment
- d. Ask if the patient has ever expressed their wishes about care at the end of life to their loved ones

11. PCPP- Which of the following is true regarding eligibility for enrollment in the Medicare Hospice Benefit?

- a. The Benefit requires a survival prognosis of 3 months or less
- b. The Benefit excludes curative treatment of terminal disease
- c. The patient must agree not to return to the hospital for acute care
- d. A “Do Not Resuscitate Order” is required

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12. TCB- Which of the following statements is true regarding medical decision-making capacity?

- a. A major psychiatric diagnosis does not prevent one from having capacity to make medical decisions
- b. A patient found to have delirium based on CAM-ICU evaluation indicates that a patient lacks decision-making capacity.
- c. Lack of medical decision-making capacity and court-determined incompetence are equivalent medico-legal terms
- d. Declining a recommended potentially life-saving treatment indicates that the patient does not have decision making capacity

13. PCPP- A 92 year old woman with advanced dementia who is enrolled in home hospice falls and is brought to the emergency room for further evaluation and acute pain management. Prior to her fall, she was ambulatory with a walker. She is found to have a fracture of her right hip. Which of the following is true?

- a. She is not eligible to proceed with hip fracture given that she is enrolled in hospice
- b. Surgical repair would lead to increased levels of pain over time
- c. Her estimated length of life is the same with or without surgical repair of her hip fracture
- d. She can temporarily disenroll from hospice to proceed with hip fracture repair

14. PSM- A 72 year old woman with history of lung transplant complicated by graft versus host disease has been transitioned to comfort care and is in the last days of life. She has CKD stage IV. She has developed involuntary jerking of her extremities which seems to be distressing to her and her family. She is being treated with a hydromorphone infusion for management of her pain and dyspnea. All of the following would be options to manage her involuntary jerking except:

- a. Transition from the hydromorphone infusion to a morphine infusion
- b. Transition from the hydromorphone infusion to scheduled methadone given through her PEG tube
- c. Transition from the hydromorphone infusion to a fentanyl infusion

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- d. Continue her hydromorphone infusion and add scheduled benzodiazepines to her symptom management regimen
15. PCPP- A 52 year old man is admitted to the surgical ICU following a motor vehicle collision. He is intubated, sedated, and unable to communicate. You are tasked with determining his healthcare decision-maker. He has never filled out a living will or designed a healthcare power of attorney. He is legally married though has been separated from his spouse for the past 10 years during which time they have not communicated with each other. He has three adult children and no living parents. He lives with his brother who tells you that he is closest with the patient and should be the one to make medical decisions. What is the correct order of healthcare decision-maker for this patient?
- a. Brother, adult children, spouse
 - b. Spouse, adult children, brother
 - c. Spouse, brother, adult children
 - d. Adult children, spouse, brother

Following completion of the KT by the interdisciplinary PC focus group, question 15 was revised as the answer is based on state-dependent laws. Below is the final revised version of Question 15 included in the KT:

15. PCPP- Mr. K A 52-year-old man is admitted to the surgical ICU following a motor vehicle collision. He is intubated, sedated, and unable to communicate. He has a legally valid Health Care Power of Attorney (HCPOA) document on file in his electronic medical record from 8 years ago designating his wife as his medical decision-maker. You learn from the patient's brother that Mr. K is now separated from his wife and while they are still legally married, they have not spoken in five years. The brother is Mr. K's only living blood relative and tells you he should be Mr. K's health care decision-maker. Which of the following is true?
- a. Mr. K's wife is required to be his health care decision-maker based on the HCPOA form whether she wants to or not
 - b. Mr. K's wife should be contacted and has the right to either be his decision-maker or defer to Mr. K's brother
 - c. Mr. K's brother should be his health care decision-maker given Mr. K's separation from his wife

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d. Mr. K's HCPOA form is not valid given that it is more than 5 years old

SEI:

Deletions to the original Moyer et al SEI are noted below with strikethrough text. Our team did not add any new items to the SEI. Domain is noted at the beginning of each question.

16. In providing clinically appropriate care for patients with serious illness, please rate how frequently you are able to effectively:

<u>Competency Statement</u>	<u>Never</u>	<u>Sometimes</u>	<u>Mostly</u>	<u>Always</u>
PCPP- Define and explain the philosophy and roles of palliative care and hospice	☐	☐	☐	☐
TCB- Describe and apply ethical and legal principles that inform decision making concerning the right to forgo or withdraw life-sustaining treatment	☐	☐	☐	☐
TCB- Describe and apply ethical and legal principles that inform decision making concerning decision making capacity and substituted judgment	☐	☐	☐	☐
TCB- Identify and manage common signs and symptoms at the end of life	☐	☐	☐	☐
PSC- Evaluate psychological distress in individual patients and families	☐	☐	☐	☐
PSC- Provide support for individual patients and families who are experiencing psychological distress	☐	☐	☐	☐
PCPP- Acknowledge team distress when caring for dying patients and their families				

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PSM- Assess and diagnose delirium and provide appropriate initial treatment and referral	☐	☐	☐	☐
PSC- Identify patients' and families' cultural beliefs and practices related to serious illness and end-of-life care, and integrate these into the care plan	☐	☐	☐	☐

17. In providing clinically appropriate care for patients with serious illnesses, please rate how frequently you feel confident:

<u>Competency Statement</u>	<u>Never</u>	<u>Sometimes</u>	<u>Mostly</u>	<u>Always</u>
PSM- Using non-pharmacological interventions for pain	☐	☐	☐	☐
PSM- Applying the principles of equianalgesic dosing of opioids	☐	☐	☐	☐
PSM- Describing common side effects of opioids	☐	☐	☐	☐
PSM- Describing that appropriate use of opioids rarely leads to respiratory depression or addiction when treating cancer related pain	☐	☐	☐	☐
PCPP- Appropriately referring patients for palliative care and hospice (when and how)	☐	☐	☐	☐
TCB- Performing a death pronouncement	☐	☐	☐	☐

18. In providing clinically appropriate care for patients with serious illnesses, please rate how frequently you are comfortable:

<u>Competency Statement</u>	<u>Never</u>	<u>Sometimes</u>	<u>Mostly</u>	<u>Always</u>
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COMM- Exploring a patient's and family's understanding of illness	☐	☐	☐	☐
COMM- Exploring a patient's and family's concerns, goals and values	☐	☐	☐	☐
COMM- Communicating in an effective and patient-centered manner when giving bad news	☐	☐	☐	☐
COMM- Communicating in an effective manner when giving patient-centered prognostic information	☐	☐	☐	☐
COMM- Discussing resuscitation preferences	☐	☐	☐	☐
COMM- Coaching patients through the dying process	☐	☐	☐	☐
TCB- Notifying a family of the death of a family member and providing support	☐	☐	☐	☐
TCB- Communicating with family about a request for autopsy	☐	☐	☐	☐
PCPP- Reflecting on my own emotional reactions to caring for patients with serious and terminal illness	☐	☐	☐	☐
PCPP- Modeling for others self-reflection on my emotional reactions to caring for patients with serious and terminal illness	☐	☐	☐	☐
COMM- Exploring strong emotions in patients and families facing serious illness	☐	☐	☐	☐

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Appendix B: Results of PC Team Completion of KT

KT Question	# correct (out 11 responders)	% correct
1	11	100
2	10	91
3	11	100
4	10	91
5	10	91
6	9	82
7	11	100
8	11	100
9	9	8
10	11	100
11	11	100
12	7	64
13	10	91
14	7	64
15	10	91

Average score = 89.7%

11/15 correct	1 of 11 people
12/15 correct	1 of 11 people
13/15 correct	4 of 11 people
14/15 correct	2 of 11 people
15/15 correct	3 of 1 people