



Palliative care education in surgery

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Abstract: Though incorporating palliative care principles with standard medical and surgical care has been associated with multiple benefits, surgical training devotes far less time to developing skills within the palliative care domains. In this review, we sought to explore the existing literature concerning palliative care education within the context of surgical training. Current studies may be categorized under two major areas: (I) measurement of trainee exposure through needs assessments and (II) implementation of novel palliative care-based training curricula. Within the former group, a number of studies found surgical trainees having substantial exposure to seriously-ill and dying patients, yet the application of palliative care approaches was informed by informal, on-the-job experiences. Further, a number of studies found that a minority of trainees had previously been involved in some type of formalized palliative care training, and among those who did, the majority reported the quality of this training to be inferior relative to the quality of training of clinical or technical skills. Among the latter group of studies examining palliative care training curricula, multiple studies demonstrated that trainees improved significantly post-intervention with respect to palliative care skills, knowledge, attitudes, and comfort. In addition, trainees regarded palliative care skills as important for surgeons, and supported adoption of palliative care curricula within surgical training. Finally, though multiple palliative care resources currently exist for practicing surgeons and surgical trainees, most of these opportunities are optional and must be sought out by the individual surgeon. Consequently, in an effort to standardize palliative care in conjunction with surgical care, widespread adoption of palliative care curricula during residency training may prove to be most beneficial.

Keywords: Palliative care; palliative care education; surgical training; surgical residency

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Introduction

Incorporating palliative care principles with standard medical and surgical care has been associated with enhanced quality of life, improved patient and provider satisfaction, and increased patient autonomy (1). Despite many surgical procedures designed to alleviate suffering, substantial exposure to seriously-ill and dying patients, and surgeon insight into its benefits, palliative care has yet to be fully integrated into surgery. This lack of integration may have

important implications such as poorer quality of life for both patients and families, burdensome and potentially inappropriate life-sustaining treatments (2,3), higher costs of care (4,5), and worse survival (6).

Surgical training is largely focused on developing and advancing clinical practice and technical skills, with less time dedicated to nontechnical surgical aspects, such as communication, conflict resolution, and educating patients (7). Specifically, little is devoted to skills such as conveying important information and navigating difficult

patient conversations. This lack of education and training among surgeons may lead to challenges in effective communication and delivery of appropriate care (8).

Although the American College of Surgeons has endorsed the principles of palliative care since 2005, widespread implementation of palliative care education is currently lacking (9). Furthermore, although increasing numbers of medical schools and residency programs have incorporated palliative care within their curricula, the method and extent of training varies widely (8). Accordingly, we sought to explore the existing literature concerning palliative care education within the context of surgical training.

Studies of palliative care training among surgeons

The studies described in the following 2 sub-sections, *Exposure and needs assessments* and *Structured curricula*, are summarized in Table 1.

Exposure and needs assessments

Multiple studies have examined knowledge and attitudes regarding palliative care among surgeons primarily through surveys. Surgeons reported extensive experience caring for seriously-ill and dying patients, with most skills gained through on-the-job exposures. Despite having numerous experiences in discussing palliative care and engaging in surrogate decision-making, considerable deficits in formal palliative care training are reported.

One study examined attitudes and knowledge regarding palliative care among surgical residents across multiple institutions in New England (10). The majority (83%, n=116) of residents felt comfortable discussing palliative care topics with patients, though 15% (n=21) reported feeling that they were not properly trained in these areas. Moreover, although senior residents were more likely to believe that they would be adequately trained in palliative care topics during residency, a significant portion (39%, n=53) of participants felt under-trained following this period.

Bonanno *et al.* surveyed both residents and surgical faculty to measure their experience and comfort with palliative care (11). Though about half of the resident participants felt comfortable leading conversations across multiple domains, including delivering bad news (56%, n=29), discussing goals of care (60%, n=31), and leading

family meetings on comfort-focused care (52%, n=27), all resident participants (100%, n=52) expressed a desire for more training in navigating palliative care communications. Similarly, nearly all (90%, n=34) faculty participants believed that residents would benefit from more training. Over half (56%, n=29) of resident participants described the quality of palliative care training as inadequate, with the majority (85%, n=44) stating a desire to have a formal palliative care curriculum as part of their residency.

Miranda *et al.* surveyed neurosurgery residents to measure palliative care competencies and experience (12). The authors found that most participants did not have experience in some aspect of palliative care communications. Yet, the majority (87%, n=54) of participants demonstrated good clinical knowledge on the survey. Moreover, despite nearly all (95%, n=59) participants reporting feeling prepared to discuss end-of-life treatment, 48% (n=30) of the participants reported that they would find more communication training during residency to be beneficial. Similarly, Haglund and colleagues surveyed neurosurgery residency program directors and neurosurgery residents, and found that the majority (60%, n=52) of the program directors reported that residents were not adequately skilled in some areas of patient communication, such as delivering bad news (13). Among the resident participants, nearly half (49%, n=36) reported having no prior formal training on patient-provider communication.

Amini *et al.* surveyed 59 oncology and hepatobiliary fellows and found that nearly half (46.6%) of respondents reported not having exposure to palliative care during medical school or residency (14). However, the majority (77%) of participants reported that knowing how to care for terminal patients was an important skill. For those that had received palliative care training during fellowship, they believed the quality of palliative care training and mentorship to be inferior to training on other topics germane to surgical oncology. For example, only 31% of participants rated end-of-life training to be high quality, whereas 86% of participants rated the quality of the rest of the fellowships to be high quality. It is also worth noting that fellows reportedly perceived their faculty mentors to exhibit poorer palliative care skills when compared to their technical skills, and that faculty placed a lesser emphasis on palliative care than the fellow did. Despite these factors, the majority (84.8%) of fellows described themselves to be at least moderately prepared to deal with palliative care issues. A subsequent study of the surgical oncology and hepatobiliary program directors found that only 60% of the

Table 1 Summary of studies of palliative care training among surgeons (7,10-31)

Citation	Participant population	Institutions	Study design	Major findings
Cooper <i>et al.</i> , <i>J Surg Educ.</i> 2010 (10)	143 surgical residents	Multi-institutional; all surgical residency programs in New England	Cross-sectional study	(I) Residents felt comfortable discussing palliative care topics with patients (II) Residents felt under-trained in palliative care areas
Bonanno <i>et al.</i> , <i>Am J Surg.</i> 2019 (11)	52 residents and 38 surgical faculty	Multi-institutional; both community and university hospital settings in Oregon	Cross-sectional study	(I) Residents felt comfortable leading conversations across multiple palliative care domains (II) Faculty believed that residents would benefit from more palliative care training (III) Residents described the quality of palliative care training as inadequate (IV) Residents desire having a formal palliative care curriculum as part of their residency
Miranda <i>et al.</i> , <i>J Surg Educ.</i> 2019 (12)	62 neurosurgery residents	Multi-institutional; from nearly all training programs in US; identified via AANS/CNS Joint Section on Neurotrauma and Critical Care email listserv	Cross-sectional study	(I) Residents reported not having experience in some aspect of palliative care communications (II) Residents demonstrated good clinical knowledge within palliative care communications (III) Residents felt prepared to discuss end-of-life treatment (IV) Residents believed that more communication training during residency would be beneficial
Amini <i>et al.</i> , <i>Ann Surg Oncol.</i> 2015 (14)	59 surgical oncology and hepatobiliary surgery fellows	Multi-institutional; from 45 programs	Cross-sectional study	(I) Fellows reported not having exposure to palliative care during medical school or residency (II) Fellows believed knowing how to care for terminal patients was an important skill (III) Fellows reported the quality of palliative care training and mentorship to be inferior to training on other topics germane to surgical oncology (IV) Fellows perceived their faculty mentors to exhibit poorer palliative care skills when compared to their technical skills (V) Fellows believed themselves to be moderately prepared to deal with palliative care issues
Larrieux <i>et al.</i> , <i>Ann Surg Oncol.</i> 2015 (15)	28 program directors	Multi-institutional	Cross-sectional study	(I) Program directors found that about half of the programs incorporated formal training on palliative care topics (II) Program directors reported two main barriers to implementing palliative care training: difficulty in implementing curriculum changes and the fellows' comfort with death and caring for dying patients

Table 1 (continued)

Table 1 (continued)

Citation	Participant population	Institutions	Study design	Major findings
Lesnock et al., <i>Gynecol Oncol.</i> 2013 (16)	103 gynecological oncology fellows	Multi-institutional	Cross-sectional study	(I) Fellows reported limited experience caring directly for palliative patients (II) Few fellows reported being explicitly taught how to help patients and families cope, assess for depression, or how to personally cope (III) Fellows reported rarely receiving feedback from attendings on their palliative care skills (IV) Half of the fellows were not observed by an attending observe the fellow when discussing palliative care with patients (V) Fellows reported feeling it was important to know how to care for dying patients
Rajdev et al., <i>J Intensive Care Med.</i> 2020 (17)	238 physicians, nurses, and physician assistants	Single institution in New York	Cross-sectional study	(I) Participants did not feel well prepared to lead difficult conversations related to palliative care (II) Participants reported that palliative care training should be mandatory for healthcare providers
Chen et al., <i>Am J Hosp Palliat Care.</i> 2015 (18)	162 residents across medical and surgical specialties	Single institution	Cross-sectional study	(I) Surgical residents reported greater experience with end-of-life cases than anesthesia residents (II) Surgical residents reported having less experience with death and dying than internal medicine residents (III) All residents felt prepared to some extent to deal with palliative care issues
Bergman et al., <i>J Palliat Med.</i> 2015 (19)	114 medical students, surgical and medical residents and fellows, and attending physicians and surgeons	Multi-institutional	Structured educational program	(I) Participants significantly improved post-intervention in all domains of palliative care knowledge and attitudes (II) Participants younger than 30 years old, unmarried or unpartnered, and surgeons compared to their medical counterparts demonstrated the greatest post-intervention change in attitudes and knowledge
Pernar et al., <i>J Am Coll Surg.</i> 2012 (20)	22 general surgery residents	Single institution	Structured educational program	(I) Resident attitudes changed post-intervention to be more consistent with best practices, and knowledge improved significantly (II) Authors suggest that a single educational session may be adequate in better aligning surgical residents' attitudes and knowledge with accepted palliative care principles

Table 1 (continued)

Table 1 (continued)

Citation	Participant population	Institutions	Study design	Major findings
Raouf <i>et al.</i> , <i>Am J Surg.</i> 2017 (21)	40 general surgery residents	Single institution	Structured educational program	(I) Post-intervention, resident perceptions on the role and timing of palliative care in surgery improved (II) Residents felt more confident post-intervention in both discussing palliative care related topics and managing the barriers to use of palliative care
Klaristenfeld <i>et al.</i> , <i>Ann Surg Oncol.</i> 2007 (22)	47 general surgery residents	Single institution	Structured educational program	(I) Pre-intervention, residents believed that they received sufficient training during residency to approach end-of-life care issues (II) Post-intervention, residents felt adequately trained (III) Intervention significantly improved resident comfort in discussing palliative care issues with patients and families (IV) Residents believed that knowing how to manage palliative care issues was important for surgeons
Minor <i>et al.</i> , <i>Am J Surg.</i> 2009 (23)	17 residents across medical and surgical specialties	Single institution	Structured educational program	(I) Intervention significantly increased resident self-efficacy ratings in multiple domains (II) Residents, specially surgical residents, reported that intervention was important in learning to care for terminal patients
Haglund <i>et al.</i> , <i>J Surg Educ.</i> 2015 (13)	93 neurosurgery residents	Multi-institutional: 59 institutions	Structured educational program	(I) Post-intervention, residents significantly improved in multiple communication aspects (II) Residents reported having no prior structured training on patient-provider communication (III) Program directors reported that residents were not adequately skilled in some areas of communication
Bradley <i>et al.</i> , <i>Am J Surg.</i> 2010 (24)	13 surgical residents	Single institution	Structured educational program	(I) Residents considered palliative care knowledge and skills to be important for practicing surgeon (II) Residents believed the palliative care training through clinical experience was sufficient (III) Post-intervention, junior resident knowledge improved significantly (IV) Junior residents felt less comfortable than senior residents in three of the five palliative care domains (V) Authors concluded that clinical experience was a critical element of developing resident confidence and comfort with respect to palliative care delivery

Table 1 (continued)

Table 1 (continued)

Citation	Participant population	Institutions	Study design	Major findings
Brewster <i>et al.</i> , <i>J Surg Res.</i> 2011 (25)	30 general surgery residents	Single institution	Structured educational program	(I) Intern and senior residents exhibit similar confidence levels (II) Residents' performance on the knowledge assessment was poor (III) Authors advocate for more formal training in ethics to be incorporated into more resident curriculums
Thirunavukarasu <i>et al.</i> , <i>Am J Surg.</i> 2010 (26)	29 general surgery residents	Single institution	Structured educational program	(I) Residents reported encountering end-of-life (II) Post-intervention, resident ethics knowledge scores and confidence increased significantly (III) Residents supported including ethics sessions in future residency years
Chesney <i>et al.</i> , <i>Can J Surg.</i> 2018 (27)	18 senior general surgery residents	Single institution	Structured educational program	(I) Residents believed that having a communication tool would be useful (II) Post-intervention, residents found the "Best Case/Worst Case" framework to have multiple benefits (III) Post-intervention, residents reported using the framework in practice (IV) Residents reported that barrier to widely implementing this framework was its time-intensive nature
Kruser <i>et al.</i> , <i>J Pain Symptom Manage.</i> 2017 (28)	25 attending surgeons	Single institution	Structured educational program	(I) Post-intervention, residents reported using the "Best Case/Worst Case" framework in practice (II) Patients believed this communication tool to be beneficial
Larkin <i>et al.</i> , <i>J Am Coll Surg.</i> 2010 (7)	42 residents	Single institution	Structured educational program	(I) Post-intervention, resident empathic communication was found to significantly improve (II) Post-intervention, resident attitudes regarding teamwork and time management did not significantly change, though time management skills did improve
Parikh <i>et al.</i> , <i>J Surg Res.</i> 2015 (31)	389 third year medical students	Single institution	Structured educational program	(I) Post-intervention, medical student communication skills did not significantly change (II) Medical students reported that such training was important and beneficial (III) Medical students recommended that end-of-life care training be incorporated into clinical clerkships
Chipman <i>et al.</i> , <i>J Surg Educ.</i> 2007 (29)	8 general surgery residents	Single institution	Structured educational program	(I) Post-intervention, junior and senior residents scored equally on their examinations (II) Residents reported that they found the training to be a valuable learning experience
Falcone <i>et al.</i> , <i>J Surg Educ.</i> 2014 (30)	54 general surgery residents	Single institution	Structured educational program	(I) Post-intervention, both junior and senior residents were able to conduct difficult conversations (II) Post-intervention, senior residents tended to be less nervous than the junior residents in conducting difficult conversations

programs incorporated formal training on palliative care topics (15). Importantly, the program directors reported two main barriers to implementing palliative care training: difficulty in implementing curriculum changes and the fellows' comfort with death and caring for dying patients. In a study of gynecologic oncology fellows, 43% (n=44) participants reported limited experience caring directly for palliative patients and a minority (8%, n=8) of the participants had a structured palliative care component to their medical education (16). Despite the serious nature of the diseases the fellows frequently encountered, less than 20% of the participants were explicitly taught how to help patients and families cope, assess for depression, or how to personally cope. Further, the majority (52%, n=54) of participants had never received feedback from attendings on their palliative care skills and half of the participants (50%, n=51) never had an attending observe the fellow while the fellow discussed palliative care with patients. In spite of this, nearly all (95%, n=98) participants reported feeling it was important to know how to care for dying patients.

Across multiple providers, including physicians and surgeons, physician assistants, and nurses, a survey was deployed measuring attitudes and perceptions on palliative care topics (17). The authors found that a substantial proportion of the participants did not feel well prepared to lead difficult conversations related to palliative care. Specifically regarding when to refer patients to hospice (30%, n=71), how to respond to families who did not accept the seriousness of a patient's disease (40%, n=95), addressing religious and spiritual needs of patients and families (36.5%, n=87), and how to discuss prognosis (32.5%, n=77). The majority (82%, n=195) of participants reported that palliative care training should be mandatory for healthcare providers.

Finally, in an effort to assess differences in palliative care experiences between specialties, Chen *et al.* administered an online survey to residents across different specialties after completing an intensive care unit (ICU) rotation at a single institution (18). Although surgical residents reported greater experience with end-of-life cases than the anesthesia residents, they reported having less experience with death and dying than the internal medicine residents. Regardless of specialty, however, all residents felt prepared to some extent to deal with palliative care issues.

Structured curricula

Palliative care education programs have been implemented

in a variety of ways, with pre- and post-surveys (n=15 articles) frequently used to evaluate the effectiveness and impacts of the training. These training programs were completed by medical students (n=2 articles), surgical residents (n=13 articles), surgical fellows (n=1 article), and practicing surgeons (n=2 articles). Directors of surgical training programs (n=1 article) were also surveyed to determine the extent to which palliative care was formally taught in their programs. Duration of the programs varied from single session, hour-long workshops to longitudinal year-long programs consisting of multiple, guided sessions. Delivery of educational programs also varied, with some being conducted in person with a group of surgical trainees, while others were designed as self-administered online training modules that included a series of educational videos. These educational programs focused on different aspects of palliative and end-of-life care, such as improving knowledge and attitudes, teaching how to effectively communicate and lead difficult discussions, and teaching surgical ethics.

Bergman *et al.* implemented a brief, self-directed, online palliative care learning module to medical students, surgical and medical residents and fellows, and attending physicians and surgeons (19). Participants completed assessments before and after the intervention to gauge their attitudes (e.g., "*How important do you feel it is for you to address end-of-life goals at each oncology clinic visit?*") and knowledge (e.g., "*What proportion of individuals dying of cancer enroll in hospice prior to death?*") regarding palliative care. A comparison of the pre- and post-intervention knowledge assessments revealed that following the training module, subjects significantly improved in all domains of palliative care knowledge and attitudes. Moreover, an analysis of the pre- and post-intervention scores revealed that participants younger than 30 years old, unmarried or unpartnered, and surgeons compared to their medical counterparts demonstrated the greatest change in attitudes and knowledge.

Following a two-hour palliative care workshop among general surgery residents (n=22), Pernar and colleagues found that post-intervention, participant attitudes changed to be more consistent with best practices, and knowledge improved significantly (20). Due to the success of their educational program, the authors suggested that a single educational session may be adequate in better aligning surgical residents' attitudes and knowledge with accepted palliative care principles. Raoof *et al.* implemented a half-day palliative care training intervention among general surgery

residents (21). Post-intervention, participant perceptions on the role and timing of palliative care in surgery improved, with over 80% of the participants reporting that they felt more confident in both discussing palliative care related topics and managing the barriers to use of palliative care. Similarly, Klaristenfeld *et al.* implemented a three-session palliative care training curriculum to general surgery residents (22). Prior to the curriculum, a minority (9%, $n=3$) of participants believed that they received sufficient training during residency to approach end-of-life care issues. Following completion of the palliative care curriculum, the majority (74%, $n=32$) of participants felt adequately trained. Similarly, the curriculum significantly improved participant comfort in discussing palliative care issues with patients and families (57% pretest *vs.* 80% immediately posttest *vs.* 84% three-months posttest). Further, all participants believed that knowing how to manage palliative care issues was important for surgeons. Minor *et al.* implemented a palliative care curriculum to junior [postgraduate years (PGY) 2 and 3] residents during their ICU rotations to measure self-efficacy in providing palliative care (23). The curriculum significantly increased participant self-efficacy ratings in multiple domains, including pain management and communicator knowledge, and that participants felt less guilty when faced with a patient death. Moreover, the participants reported that this rotation was important in learning to care for terminal patients, and surgical residents specifically valued this rotation. Finally, following a 2-hour seminar of patient-provider communication among neurosurgery residents, Haglund and colleagues found that participants significantly improved in multiple communication aspects, such as in listening, clearly explaining, and asking open-ended questions (13).

In one study, Bradley and colleagues compared attitudes of junior surgical residents (PGY 2) undergoing a palliative care intervention to senior surgical residents (PGY 5) who did not receive the intervention (24). The training intervention delivered six hours of dedicated palliative care instruction over the course of two and a half days, which included how to navigate patient conversations through peer interaction and role-play. Approximately half (57%, $n=4$) of the intervention group and the majority (83%, $n=5$) of the control group reported considering palliative care knowledge and skills to be important for practicing surgeons. Moreover, about half of the participants in both the intervention group (57%, $n=4$) and the control group (50%, $n=3$) reported that the palliative care training through clinical experience was sufficient. Additionally, they

found that though the intervention significantly improved the knowledge of the junior residents, there was no significant difference between the test scores of the junior and senior resident groups. Finally, although the two groups scored similarly on knowledge assessments, the junior group felt less comfortable than the senior group in three of the five palliative care domains (e.g., control group in managing pain, breaking bad news, and addressing ethical issues), though both groups felt equally comfortable in the remaining two palliative care domains (e.g., managing non-pain related symptoms and terminal care). The authors concluded that although structured curricula may be beneficial in developing foundational palliative care skills, clinical experience was a critical element of developing resident confidence and comfort with respect to palliative care delivery.

Brewster *et al.* implemented a two-part surgical ethics workshop to general surgery residents where participants first completed an assessment, and then returned for a debriefing to discuss the commonly missed questions (25). Through a closer analysis of participant performance on each individual question, they found intern and senior residents to exhibit similar confidence levels. Additionally, they found the participants' performance on the knowledge assessment to be poor, with more senior residents scoring significantly lower than interns. The authors surmised that this lack of surgical ethics knowledge was due to the residency curriculum not sufficiently preparing trainees with the skills needed to navigate ethical issues. Consequently, the authors advocated for more formal training in ethics to be incorporated into more resident curriculums. Thirunavukarasu *et al.* implemented a four hour-long, surgical ethics education seminar among general surgery residents (26). All participants (100%, $n=20$ pretest) reported encountering end-of-life issues at least once every rotation. For the majority of participants, the ethics knowledge score and confidence in dealing with surgical ethics related issues, including end-of-life care, increased significantly post-intervention. Moreover, an overwhelming majority (92%, $n=23$ posttest) of participants suggested that similar ethics sessions should be used in future residency years.

Other studies focused on fortifying communication skills among surgical residents. Two studies examined the use of a two-hour training session on how to use the “*Best Case/Worst Case*” communication framework to communicate and personalize surgical decisions with patients and their families. Chesney and colleagues administered their

training session to senior general surgery residents, and found that the majority (83%, n=15) of participants believed that having a communication tool would be useful (27). Following completion of the training, participants found this framework to have multiple benefits, including that it was indeed useful and increased their knowledge and confidence when communicating with patients with poor prognoses and presenting with surgical emergencies. Post-intervention, nearly all (94%, n=17) participants reported using the framework at least once while in practice, though they also described the time-intensive nature of the framework to be a barrier to widespread implementation. Kruser *et al.* examined the impact of the “Best Case/Worst Case” training session among practicing surgeons at a single institution (28). Three months after the intervention, the majority (71%, n=17) of participants reported regularly adopting the tool in their practice, and recommended it to others, highlighting its ease of use. The authors also interviewed the patients and families of the surgeons who used this communication tool, and found that they too believed that the communication tool was beneficial as it enhanced clarity and helped them make decisions. In another study by Chipman and colleagues, a simulation-based, one-hour end-of-life family communication training session using paid actors was developed (29). Post-intervention, the authors found that PGY 2 and PGY 4 residents scored equally on their examinations, and the participants reported that they found the training to be a valuable learning experience. The authors cautioned that standardized actor training be done prior to using this model however. Finally, Falcone and colleagues examined the use of a two-part communication skills training to general surgery residents (30). Junior residents (PGY 1-2) were trained on how to deliver difficult news and how to discuss operative risks and benefits, while senior residents (PGY 3 and above) were trained on how to discuss goals of care and how to transition to comfort care. Although both junior and senior residents were able to conduct difficult conversations, senior residents tended to be less nervous than the junior residents in conducting such conversations.

As part of a longitudinal curriculum, Larkin *et al.* implemented a 2-year resident curriculum focused on developing human factors among surgical residents (7). Human factors, or nontechnical surgical aspects, encompasses emotions, empathy, caring, time management, stress management, team working, conflict resolution, communication, collaboration, and educating patients. Following implementation of the curriculum, resident

empathic communication was found to significantly improve as evidenced by resident responses to video vignettes of common communication scenarios. Although the emotional aspects of caring for patients improved following the training, no significant changes were found with regard to teamwork attitudes. Moreover, although participant attitudes about the need for improving time management skills did not change significantly, the majority of participants (67%, n=18) did report improving these specific skills following the intervention.

Finally, medical students rotating on surgery services, may benefit from formal palliative care training. Parikh *et al.* incorporated end-of-life care training into the 8-week surgery clerkship among third-year medical students (31). This training was designed to improve communication skills, physician trust, and empathy. Following completion of the clerkship, though communication skills did not significantly change, participants reported that such training during the third-year clerkship was important, as it proactively prepared them to be skilled and compassionate physicians through providing them with realistic experiences of caring for and communicating with patients. The overwhelming majority (91.3%, n=355) of the participants recommended that end-of-life care training be incorporated into clinical clerkships.

Existing resources

Presently, a variety of opportunities spanning a range of delivery methods exist for practicing surgeons as well as surgical trainees to increase palliative care knowledge and skills, many of which have been previously outlined (8,32,33). The following existing resources are summarized in Table 2.

The American College of Surgeons (ACS) provides a published guide, thoroughly outlining how to utilize palliative care skills within the context of surgery (34). Specifically, the guide covers a broad range of surgeon-centered and patient-centered topics, including how to avoid burnout and guilt, how to deliver bad news, and how to manage specific symptoms with medications. This 278-page printable guide is available free of charge online.

The Palliative Care Network of Wisconsin (PCNOW), formerly known as the End of Life Physician Education Resource Center (EPEC), provides a compilation of palliative care educational materials using multiple formats, including written articles, videos, lecture presentations, knowledge tests, and a list of structured training programs

Table 2 Summary of existing resources

Resource	Mode of delivery	Duration	Highlights
American College of Surgeons Surgical Palliative Care: A Resident's Guide. https://www.facs.org/-/media/files/education/palliativecare/surgicalpalliativecareresidents.ashx . Accessed September 29, 2020.	Online reading guide	N/A	(i) Outlines how to utilize palliative care skills within the context of surgery (ii) Covers both surgeon-centered and patient-centered topics
Education. Palliative Care Network of Wisconsin. https://www.mypcnw.org/resources/education/ . Published June 27, 2019. Accessed September 29, 2020.	Online compilation of palliative care educational materials	Self-directed	(i) Uses multiple formats, including written articles, videos, and lecture presentations (ii) Covers over 400 topics in brief, one to two page articles (iii) Provides a self-directed written core curriculum
Stanford Faculty Development Center for Medical Teachers. End-of-Life Care Online Curriculum. Stanford Faculty Development Center for Medical Teachers. https://med.stanford.edu/sfdc/additional_programs/eol_care/eol_online_curriculum.html . Accessed September 29, 2020.	Short-term online curriculum	Self-directed	(i) Adapted from a facilitator-directed course (ii) Provides downloadable lectures, notes, tutorials, and a handbook (iii) Allows the learner to complete curriculum at own pace
EPEC: Education in Palliative and End-of-Life Care. Center for Bioethics and Medical Humanities: Feinberg School of Medicine: Northwestern University. https://www.bioethics.northwestern.edu/programs/epec/ . Accessed September 29, 2020.	Short-term online curriculum	Sixteen one-hour modules	(i) Utilizes didactic sessions, video presentations, interactive discussions, and practice exercises (ii) Teaches fundamental palliative care skills
Palliative Care Education and Practice (PCEP). Harvard Medical School Center for Palliative Care. https://pallcare.hms.harvard.edu/courses/pcep . Accessed September 29, 2020.	Short-term in-person curriculum	Two six-day in-person workshops occurring over the course of six months	(i) Available to practicing physicians (ii) Centered around intensive and experiential learning
VitalTalk. https://www.vitaltalk.org/ . Published April 24, 2020. Accessed September 29, 2020.	Short-term curriculum	Ranges from self-directed eight-week-long online courses to three-day in-person training workshops	(i) Offers both in-person and online short-term training (ii) Focuses on palliative care communication skills
Palliative Care Graduate Program. University of Colorado: Anschutz Medical Campus. http://www.ucdenver.edu/academics/colleges/Graduate-School/academic-programs/Palliative-Care/Pages/home.aspx . Accessed September 29, 2020.	Long-term curriculum	24 months for MSPC; two semesters for Graduate Certificate	(i) Offers a 36-credit Master of Science in Palliative Care (MSPC) (ii) Offers a 12-credit Interprofessional Graduate Certificate in Palliative Care (iii) Includes targeted training in communication skills and in pain and symptom management
Graduate Certificate in Palliative Care. University of Washington: Cambia Palliative Care Center of Excellence. http://uwpcoc.org/ . Accessed September 29, 2020.	Long-term curriculum	9 months	(i) 15-credit curriculum (ii) Employs VitalTalk training (iii) Focuses on developing communication skills and interprofessional team training
University of Maryland Graduate School. Online Master of Science and Graduate Certificates in Palliative Care - University of Maryland Graduate School. https://graduate.umaryland.edu/palliative/ . Accessed September 29, 2020.	Long-term curriculum	Five semesters for Master's	(i) Offers a 30-credit Master of Science in Palliative Care (ii) Offers five graduate certificates that focus on palliative care domains (iii) All programs can be completed online

offered by other organizations (35). The brief, yet evidence-based reading materials cover over 400 topics, ranging from how to moderate an end-of-life family conference to how to grieve. The website also provides a self-directed written core curriculum which organizes topics by palliative care domains and the specialties they best address.

Several institutions offer short-term online curriculums that utilize training modules to increase palliative care understanding among physicians. Stanford University's Faculty Development Center for Medical Teachers has developed an "End-of-Life Online Curriculum", which was adapted from a facilitator-directed course (36). The free online version encompasses downloadable lectures with guided notes, tutorials, and a handbook. Similar to the PCNOW curriculum, it allows the learner to complete the curriculum at their own pace. Likewise, Northwestern University's Education in Palliative and End-of-Life Care (EPEC) has developed an online core curriculum that utilizes didactic sessions, video presentations, interactive discussions, and practice exercises to teach fundamental palliative care skills in communication, ethical decision-making, psychosocial considerations, and symptom management over the course of sixteen one-hour modules (37).

Other organizations provide abbreviated, in-person palliative care training curricula. For example, Harvard Medical School's Center for Palliative Care has developed a program called the Palliative Care Education and Practice (PCEP) (38). This course is available to practicing physicians and takes place in two in-person segments; the first is a six-day training centered around intensive learning followed six months later by another six-day training based on experiential learning. VitalTalk is an option that offers both in-person and online short-term training, ranging from self-directed eight-week-long online courses to three-day in-person training workshops (39).

Long-term, dedicated online palliative care master's programs and graduate-level certification programs, tailored towards both practicing physicians and physicians in training also exist. For example, the University of Colorado-Denver offers a 36-credit Master of Science in Palliative Care (MSPC) that can be completed in 24 months, as well as a 12-credit Interprofessional Graduate Certificate in Palliative Care which can be completed in two semesters (40). Both programs are designed to train medical professionals to become Palliative Care Community Specialists through targeted training in communication skills and in pain and symptom management. Further, the University of Washington's Cambia Palliative

Care Center of Excellence offers a 15-credit Graduate Certificate in Palliative Care that can be completed in nine months by medical professionals belonging to multiple interprofessional specialties (41). This program employs VitalTalk training and focuses on developing communication skills, interprofessional team training, and program sustainability in palliative care programs. The University of Maryland offers a 30-credit Master of Science in Palliative Care that can be completed in five semesters by interprofessional medical providers (42). This program is unique in that it is designed to be completed completely online. This institution also offers five graduate certificates that focus on palliative care domains: Principles and Practice of Hospice and Palliative Care, Clinical Aspects of Hospice and Palliative Care, Leadership and Administration on Hospice and Palliative Care, Psychosocial/Spiritual Aspects of Hospice and Palliative Care, and Aging and Applied Thanatology. Finally, a growing number of medical institutions across the nation now offer palliative care fellowships, which provide practicing surgeons and physicians the opportunity to strengthen their palliative care skills and knowledge through primary experience.

Opportunities for improvement

Though the wide range of opportunities for surgeons to expand their palliative care skills and knowledge is increasing, extensive training and education may be impractical to practicing surgeons with demanding clinical practices and surgical trainees who must focus their education on developing their clinical and technical skills. The studies described in this article highlight that surgeons lack exposure to formal training in palliative care (12,14,16,18), despite the widespread belief that palliative care skills and knowledge are valuable (14,16,22-24,31). The impact of the lack of formal structured palliative care training is demonstrated both by lack of surgeon knowledge in palliative care domains (19,20,24-26), and the lack of comfort in dealing with end-of-life care issues and challenging family dynamics among others (22,24). This underscores the need to adopt palliative care curricula into standard training in an effort to provide all surgeons with equal opportunity to develop their palliative care skills and knowledge.

Moreover, though some surgical residency programs do currently incorporate a palliative care or ethics component to their curricula, the quality of such education is perceived to be considerably inferior to the quality of technical skills

training (11,14). Many trainees attribute this to their faculty mentors, describing how faculty allocate less attention and emphasis on developing palliative care skills, seldom model palliative skills and knowledge as frequently or as thoroughly as technical surgical skills and knowledge, and rarely provide trainees with direct feedback on trainee performance within the palliative care domains (11,14). Consequently, not only must palliative care curriculum be established across surgical residency programs, but the quality and rigor of this training and mentorship must be developed to match that of other aspects of surgical training.

Future directions

Palliative care underuse in surgical settings may lead to unfavorable outcomes such as poorer quality of life for patients and families, burdensome and potentially inappropriate life-sustaining treatments (2,3), higher costs of care (4,5), and even decreased survival (6). Incorporation of palliative care approaches may mitigate these unwanted outcomes and improve the quality of care delivered. To promote such integration, professional organizations such as the ACS may help to promote establishing standards of care in surgery and to encourage formal, structured palliative care curricula, which can be widely adopted across surgical residencies. We recognize that there are limitations to this approach, however, including the heterogeneity of training programs and practice settings, which may not allow a single curriculum to comprehensively address all pertinent concerns. Despite this, developing and supporting a training framework may foster desirable change as well as encourage individual residency programs to continue to adopt palliative care principles that best meet their unique needs. Until such care curricula are standardized and widely adopted, however, surgical residency programs must take steps to care for surgical patients, including (I) leveraging existing resources (e.g., *Surgical Palliative Care* and *Palliative Surgery*, the ACS *Surgical Palliative Care: A Resident's guide*, local experts, online training) and (II) supporting mentorship that intentionally incorporates palliative care principles, supplementing the knowledge and technical skills developed during training (33).

Conclusions

Surgical residency programs are increasingly employing palliative care curricula to provide much-needed training

in this often overlooked aspect of care. However, in order to fully integrate this to surgical care, widespread adoption and improvement in the quality of palliative care training is needed. Though resources currently exist for surgeons to independently develop palliative care expertise post-training, few surgeons are likely to engage in time-intensive additional training further enforcing the need to incorporate quality palliative care curricula into standard training. Such training will ensure consistent and adequate exposure and opportunities in non-technical skill development for all surgeons. Establishment and wide-adoption of a standard palliative care surgical residency curriculum and leveraging intentional mentorship would inform effective utilization of palliative care in surgical settings, ultimately benefitting the patient and patient outcomes.

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