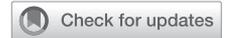


*Review Article*

# A Systematic Review of Training in Symptom Management in Palliative Care Within Postgraduate Medical Curricula



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## Abstract

**Context.** Symptom management is a priority area within palliative care core competencies for generalist providers. Although several educational initiatives exist, a comprehensive evidence synthesis on the effectiveness of symptom management training on trainees' learning and patient-reported outcomes is lacking.

**Objectives.** The objective of this study was to determine the effectiveness of training in symptom management in palliative care providers in nonpalliative specialties.

**Methods.** This is a systematic review following Best Evidence Medical Education methods from searches of MEDLINE, EMBASE, ERIC, CINAHL, PsycINFO, Cochrane database of systematic, Clinical Trials.gov, and ISRCTN databases to September 2017. Prospective controlled studies testing the impact of symptom management educational interventions on physicians in training in nonpalliative specialties were included. Data were summarized narratively, grouped by curriculum description, and effectiveness on trainees' learning or patient-reported outcomes.

**Results.** Of 5062 records identified, six studies met the inclusion criteria: two randomized controlled trials and four quasi-experimental. Pain management and use of opioids and their side effects were most frequently covered. Clinical decision support tools, Web-based teaching, palliative care rotation, and mixed educational methods were used. Most studies used self-reported, original, or modified evaluation instruments, although psychometric properties were seldom reported. Despite methodological considerations, all educational methods improved trainees' learning outcomes. However, the effects on trainees' behavior and patient-related outcomes were not evaluated.

**Conclusion.** Current educational training programs in symptom management appear to improve trainees' comfort, preparedness, and knowledge in assessing and managing patients' symptoms at the end of life. More rigorous research to evaluate the impact of this training on residents and organizational performance is now required. *J Pain Symptom Manage* 2019;57:156–170. © 2018 American Academy of Hospice and Palliative Medicine. Published by Elsevier Inc. All rights reserved.

## Key Words

*Education, end-of-life care, palliative care, trainees, symptom management*

## Introduction

According to World Health Organization, approximately 20.4 million people needed palliative care at the end of life (EoL) in 2011.<sup>1</sup> Chronic noncommunicable diseases are the major causes of death and embrace heart disease, cancer, chronic respiratory disease, HIV/AIDS, diabetes as drug-resistant tuberculosis.<sup>1</sup> Nowadays, most end-of-life care (EoLC), defined as care for patients likely to die within the

next 12 months,<sup>2</sup> is provided by “generalists” such as general practitioners and specialists in clinical areas, whose working remit is not exclusively concerned with the specialist palliative care.<sup>3</sup> A core set of interdisciplinary competencies in palliative care has been defined and established in different countries, in which symptom management is identified as one of the critical areas.<sup>4,5</sup> Basic symptom management knowledge and skills have been highlighted as areas of particular importance in the training of generalist

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palliative care providers,<sup>4,5</sup> although the management of more complicated cases, for example, refractory pain or existential distress, should ideally be led by a palliative specialist.<sup>4</sup> Several authors suggest addressing knowledge and skills with further training at the undergraduate level, and also with a collaborative networking between general practitioners and specialists on palliative care for improving patient outcomes.<sup>6,7</sup> Education is a potential key to achieve an integrated and collaborative model of care for EoLC.<sup>8</sup> Several studies have demonstrated that palliative care competencies can be adequately addressed through physician education,<sup>9–11</sup> yet studies over the last decade show persistent deficits on attitudes, knowledge, and skills through different specialties.<sup>12–15</sup> Furthermore, the prevalence of uncontrolled symptoms at EoL remains high.<sup>5,16,17</sup>

Teaching on patient-centered care is a priority at all levels of training.<sup>4</sup> Consequently, substantial efforts have been made to structure programs of education for all physicians and health professionals from different clinical backgrounds.<sup>18</sup> Despite the high heterogeneity between curriculum formats, almost all the studies show that this can lead to improvements in trainees' attitudes, knowledge and skills, and behaviors.<sup>11,19</sup> There has been an increase in palliative medicine rotations available at postgraduate level, and trainees making use of these report better quality teaching in EoLC and more preparedness to treat patients at the EoL.<sup>8,15</sup> Despite this, even after a rotation, some physicians in training felt uncomfortable providing palliative care independently. They perceived several barriers to maintaining adequate EoLC,<sup>14</sup> specifically instructional disparity and lack of expertise, leaving many physicians feeling unprepared to address dying people needs.<sup>20</sup> This reflects the importance of symptom management and the implementation of training for generalists providing palliative care. This comprehensive review aimed to identify and appraise the curriculum, evaluation instruments, and effectiveness of EoLC symptoms management training interventions for generalist palliative care providers.

## Methods

This systematic review was planned and conducted following the recommendations of the Best Evidence Medical Education (BEME) Collaboration<sup>21–23</sup> and Structured approach to the Reporting in Healthcare Education of Evidence Synthesis statement.<sup>24</sup>

### *Inclusion and Exclusion Criteria*

**Participants.** Trainee physicians at the postgraduate level, who work or would be expected to work with patients at EoL but not have and are not training for

specialist palliative care qualifications, were included. These professionals are often considered as generalist palliative care providers. Examples of potentially eligible areas trainees were working within included anesthesia, family medicine, internal medicine, cardiology, nephrology, pulmonary disease, geriatrics, gastroenterology, infectious disease, critical care medicine, neurology, pediatrics, psychiatry, radiation therapy, general surgery, surgical critical care, emergency medicine, orthopedics, obstetrics, and gynecology.

**Interventions.** Studies related to EoLC training interventions with a symptom assessment or management skill component were included. An objective and clear description of the intervention was required. Any training that addressed pain or nonpain symptoms assessment and management in EoLC was included. Although not an exhaustive list, the interventions covered could embody lectures, workshop, tutorial, feedback, seminar series, problem-based learning, small groups learning, case-based discussion, and other structured teaching sessions. Studies that only included EoLC training interventions without symptom management training, for example, communication about prognosis, as well as training interventions delivered to other health care professionals were excluded.

**Study Design.** Studies were included if effectiveness of the training intervention was tested in randomized controlled trials (RCTs) and quasi-experimental studies with pretest and post-test or interrupted time series. In nonrandomized trials, historical, geographical, or matched control groups were required. Review articles were excluded because mismatching interventions, outcomes, and incorrect population characteristics have been reported in several systematic reviews.<sup>25</sup> There was no exclusion on the basis on language or year of publication.

### *Outcomes*

This review was based on the Kirkpatrick's model for evaluating educational outcomes ([Supplementary Table S1](#)).<sup>21</sup> Reactions, learning, and behavior as primary outcomes were chosen as the most common learning outcomes evaluated in an educational training. This model was further adapted for this review to include, at the fourth level, patient outcomes or satisfaction with clinical practice as an indicator of care quality.<sup>26</sup> Eligible studies should have undertaken assessments via self-, physician-, patient-, or family-assessed instruments; multiple-choice examination; objective structured clinical examination; standardized patient; mini-clinical evaluation exercise; standardized oral examination; written assessment; or global rating scale.<sup>27</sup> Unclear or nonvalidated instruments were not excluded because few

standardized outcome measures exist for evaluating palliative care in medical trainees, and moreover, these had been adjusted according to the objectives of each study.<sup>28</sup>

### Information Sources

The following databases were searched for all available years until 30 September 2017: ERIC; MEDLINE; EMBASE; CINAHL via EBSCOhost; PsycINFO via Ovid; Cochrane Database of Systematic Reviews; and the World Health Organization international Clinical Trials registered. After retrieval of all full-text articles, first author conducted a hand searching, from 1 October to 30 November 2017, through the references of four systematic reviews about postgraduate training, and competencies in end of life were scanned<sup>11,19,29,30</sup> as three other key publications.<sup>4,20,31</sup> Where searches found published abstracts but no subsequent full report(s), authors were contacted to obtain full text.

### Search

Free-text terms for searching titles, abstracts, and key words were combined with database-specific subject headings following the structure of [end of life] AND [symptoms management] AND [training]. See [Supplementary Figure S1](#) for an example search strategy for MEDLINE.

### Study Selection

After removal of all duplicates, studies were evaluated in stepwise procedure for inclusion in the review. All titles identified in the search were screened for eligibility. For those titles considered potentially eligible, the abstracts were screened by the first author using the inclusion criteria specified previously. Study selection process was described in a trial flow diagram, as outlined by the Preferred Reporting Items for Systematic Reviews and Meta-Analysis statement ([Fig. 1](#)).<sup>32</sup>

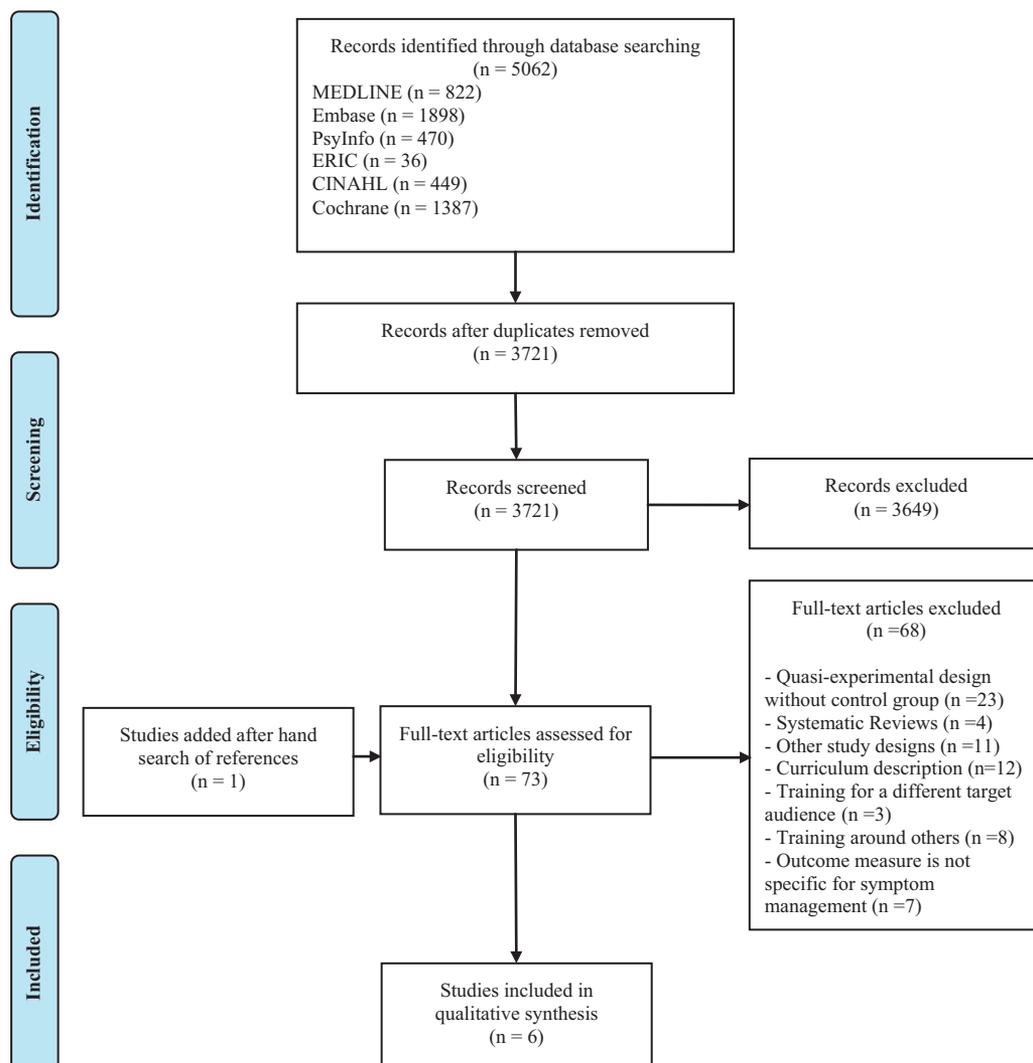


Fig. 1. PRISMA flowchart. PRISMA = Preferred Reporting Items for Systematic Reviews and Meta-Analysis.

### Data Extraction and Management

A first data extraction was performed following BEME Collaboration recommendations<sup>33</sup> using digital extraction form. Pilot assessment and data extraction were completed by the first author. Revised data sheet was assessed and agreed by a second independent author. Any divergences were resolved via discussion between whole authors until consensus has been achieved.

### Quality Assessment

The quality of the studies included was assessed using the Buckley's quality indicators.<sup>34</sup> This tool was chosen since it has been applicable across a wide-ranging of educational intervention studies. Furthermore, it has been previously applied in BEME systematic reviews enabling comparison with other educational reviews.<sup>34,35</sup> Tool items consider the study research question, subjects, data collection methods, completeness of the data, control for confounding, analysis of the results, conclusion, reproducibility, prospective design, ethical issues, and triangulation. Cochrane tools for evaluating RCT<sup>36</sup> and ROBINS-I<sup>37</sup> for nonrandomized studies were used to assess the risk of bias. A global rating was determined, and higher quality studies were considered when these met  $\geq 7$  out of 11 indicators. We also added one more option to the "yes" or "no" response to make the process of judgment more explicit. This included "unclear" when author's information was insufficient to make a judgment or when the question was addressed partially. Two authors independently graded quality, and divergences were discussed until consensus was reached.

### Analyses

Meta-regression analyses at study level were planned to determine which training and evaluation characteristics explained variations in effectiveness of the programs.<sup>38,39</sup> However, meta-regression was not possible because of the small number of studies. Therefore, methodological differences were taken into consideration to inform a qualitative analysis of content.<sup>40</sup> Study variables were tabulated for a visual comparison, with available data on the general study (e.g., author, year of publication), study design, target-audience, content related to symptoms, evaluation methods and instruments, key findings, learning impact and authors' conclusions (see Table 1).

## Results

### Study Selection and Characteristics

Our search identified 5062 references from electronic databases. Seventy-three full-text articles were

examined and five were found to be eligible. One further study was added after hand searching of reference lists from four systematic reviews<sup>11,19,29,30</sup> and three key publications<sup>4,20,31</sup> (Fig. 1). The six included studies were published between 2004 and 2016, and all were conducted in North America<sup>41-46</sup> (Table 1). All were prospective studies; four were pretest and post-test with a control group, including only post-test comparison or only pretest comparison related to the control group.<sup>41,42,45,46</sup> Two studies were randomized controlled trials, including one parallel<sup>43</sup> and one cluster design.<sup>44</sup>

Studies were performed within several specialties and included a total of 415 participants from internal medicine,<sup>43,45,46</sup> pediatrics,<sup>41</sup> general surgery,<sup>42</sup> family medicine,<sup>44</sup> radiation oncology,<sup>44</sup> neurology,<sup>44</sup> psychiatry,<sup>41,44</sup> and pathology<sup>44</sup> (Table 2). Overall, the percentage of participants per year of training across studies was 51% postgraduate in Year 1 (PGY1),<sup>43-46</sup> 25% PGY2,<sup>41,42,44-46</sup> 22% PGY3-4,<sup>44-46</sup> and 2% PGY5.<sup>42</sup> The pretest responder rate ranged between 71% and 100%, and the post-test from 42% to 100%.<sup>41,43-46</sup>

### Methodological Quality of Included Studies

Global rating following the Buckley's quality indicators ranged from 5<sup>41,42</sup> to 6<sup>43-46</sup> out of 11 indicators. All studies had methodological weaknesses according to the criteria set out in the Cochrane Handbook for RCTs and NRSI (Supplementary Table S2 and S3). A summary of the critique is presented in Table 2. High risk of bias was found in all the studies included.<sup>41-46</sup> Major issues related to the lack of a control group and confounding in the design and analysis, especially around cointerventions, contamination, and baseline characteristics of the study subjects, including prior palliative care experience and year of training. Characteristics between responders and nonresponders to the evaluation instrument also limited our analysis. This issue was intrinsic to the voluntary and anonymous nature of assessment, which is difficult to address. An obligatory test could have reduced participation of trainees in the studies.

### Curriculum Description

*Modes of Delivery, Duration, and Training Content.* A wide variety of interventions were used, including clinical decision support tools such as pocket cards<sup>41,44</sup> and integrated pathways,<sup>45</sup> Web-based teaching,<sup>43</sup> palliative care rotation,<sup>46</sup> and mixed educational methods.<sup>42</sup> Intervention duration ranged from three days<sup>42</sup> to one academic year.<sup>41</sup> See further details in Table 1.

Five training interventions were palliative/EoLC courses with a symptom management component,<sup>41-43,45,46</sup> and one intervention focused

Table 1  
Characteristics of Included Studies

Author, Year, Country	Design	Participants ( <i>n</i> ) and Setting	Intervention and Length	Evaluation Method and Instruments	Key Findings (Relative to Control)	Learning Outcome According to Kirkpatrick's Model	Authors' Conclusion
Barnett et al, 2016, USA	Pre-post test with control group	Pediatrics trainees in PGY 2, 3, and 4 ( <i>n</i> = 71); hospital	16-page set of laminated, spiral-bound cards together with a digital copy for smartphones; four conference lectures on pain management, communication of bad news and prognosis, the dying process, and end-of-life symptoms; three self-directed case studies during a one-week palliative care rotation. Delivered across one academic year (PGY 2)	Survey of self-reported comfort, five-point Likert scale (1 = least comfortable, 5 = most comfortable) Questionnaire of knowledge; true/false statements; and MCQ	Significant difference (post-test): total comfort in pain and symptom domain ( $P = 0.02$ ); providing pain control ( $P = 0.03$ ); providing care for nausea ( $P = 0.02$ ); managing agitation and delirium ( $P = 0.02$ ); recognizing signs of impending death ( $P = 0.03$ ). Knowledge on fentanyl dosing ( $P = 0.03$ ); suctioning for end-of-life secretions ( $P = 0.03$ ); treatment for hyperactive delirium ( $P = 0.03$ ). No significance difference (post-test): Comfort on providing bowel and bladder care ( $P = 0.09$ ); managing respiratory symptoms ( $P = 0.08$ ). Knowledge on total pain score ( $P = 0.66$ ) and total other symptom score ( $P = 0.55$ ).	Reaction (1), attitudes (2A), knowledge (2B)	"This longitudinal curriculum ... proved to be popular, feasible, and effective at improving comfort with basic palliative care principles."

Bradley et al, 2009, USA	Pre-post test with control group	General and plastic surgery trainees in PGY 2 and 5 ( <i>n</i> = 13); University Department	<p>Taught sessions: critical appraisal of literature; review of two journal articles with faculty-moderated discussion; faculty-moderated discussions with resident interaction and role-play; chaplaincy guest; institutional ethics committee; quiz bowl-style review of palliative care core content; discussion of palliative care concepts covered and curriculum design</p> <p>Delivered over six hours across 2.5 days (PGY 2)</p>	<p>Survey of residents' perception, four-point scales (1 = strongly agree, 4 = strongly disagree)</p> <p>Questionnaire of knowledge, 18 MCQs</p>	<p>No significant differences (post-test IG vs. pretest CG):</p> <p>Comfort scores managing nonpain symptoms (<i>P</i> = 0.063).</p> <p>Significant decrease (post-test IG vs. pretest CG):</p> <p>Comfort scores on managing pain (<i>P</i> &lt; 0.0001).</p> <p>Unknown significant differences: knowledge scores on (post-tests): symptom management domain</p>	Attitudes (2A), knowledge (2B)	<p>“After participating in a palliative care curriculum, they have simulated skills that are similar to chief residents. However, self-confidence is lower among junior residents despite undergoing a palliative care curriculum.”</p>
Claxton and Arnold, 2011, USA	Randomized controlled trial	Internal medicine trainees ( <i>n</i> = 82); hospital	<p>Weekly e-mail containing two “fast facts and concepts”: a one-page, practical, peer-reviewed, evidence-based summaries of key palliative care topics (pain management, symptom management, communication, end-of-life decision making, professionalism).</p> <p>Delivered over 32 weeks</p>	<p>Survey of preparedness; four-point Likert scale (“not prepared at all” to “very prepared”)</p> <p>Questionnaire of knowledge; 24 MCQs</p>	<p>Significant improvements:</p> <p>Change in preparedness scores on converting between opioids (<i>P</i> = 0.04); starting a patient-controlled analgesia device (<i>P</i> = 0.02); differentiating between somatic, visceral, and neuropathic pain (<i>P</i> = 0.01); treating nausea and vomiting (<i>P</i> = 0.02).</p> <p>Change in knowledge scores on pain management domain (<i>P</i> &lt; 0.05); appropriate route</p>	Attitudes (2A), knowledge (2B)	<p>“... an educational intervention that increases intern medical knowledge and self-reported preparedness in symptom management skills, but not preparedness in communication skills or satisfaction with palliative care education.”</p>

(Continued)

Table 1  
Continued

Author, Year, Country	Design	Participants ( <i>n</i> ) and Setting	Intervention and Length	Evaluation Method and Instruments	Key Findings (Relative to Control)	Learning Outcome According to Kirkpatrick's Model	Authors' Conclusion
Mikhael et al, 2008 Canada	Cluster randomized controlled trial	Multiple specialties trainees: internal medicine, surgery, family medicine, radiation oncology, neurology, psychiatry, and pathology, all PGY ( <i>n</i> = 136); hospitals	Pocket reference including information about pain and symptom control; one to two didactic end-of-life teaching sessions per month normally given as part of the rotation CG: didactic sessions only. Delivered over one to two months	Focus group, survey of comfort; five-point Likert scale (1 = very uncomfortable, 5 = very comfortable), questionnaire of knowledge; five MCQs	for administration of opioids ( $P = 0.02$ ); risks and benefits of methadone ( $P = 0.02$ ); treating symptoms at end of life ( $P = 0.02$ ). No significant difference: Change in knowledge on delirium management ( $P > 0.05$ ). Significant improvement: Change in comfort scores overall ( $P = 0.01$ ) and assessing a patient's pain level ( $P = 0.02$ ). Change in knowledge scores overall ( $P < 0.05$ ) and dose-equivalence oral and parenteral morphine ( $P < 0.01$ ). No significant differences: Change in comfort scores on dosing morphine for severe pain ( $P = 0.06$ ); treating nausea at the end of life ( $P = 0.06$ ); treating agitation at the end of life ( $P = 0.39$ ). Change in knowledge scores	Reaction (1), attitudes (2A), knowledge (2B)	"Our pocket card is a feasible, economical, and educational intervention that improves resident comfort level and knowledge in delivering end-of-life care on CTUs."

Okon et al, 2004, USA	Pre-post test with control group	Internal medicine trainees in PGY 1, 2, and 3 ( $n = 54$ ); hospital	Experiential learning intervention "PEACE" covering physical symptoms, emotive and cognitive symptoms, autonomy and agency, communication, economic, and transcendancy, offered during an integrated end-of-life clinical pathway, including a 32-page comprehensive daily progress form. Delivered over four weeks (PGY 1)	Survey; five-point Likert scale (1 = strongly disagree to 5 = strongly agree), questionnaire of knowledge; 16 MCQs	on adjuvant medication for treating neuropathic pain; first-line drugs for opioid-induced nausea; composition of Tylenol; and breakthrough (PRN) doses of oral opiates ( $P > 0.05$ ). Significant improvement: Change in total knowledge score ( $P < 0.001$ )	Attitudes (2A), knowledge and skills (2B)	"A time-effective, practice-based strategy led to a significant improvement in knowledge of end-of-life care ... Factual knowledge improved slightly with standard, preintervention training and experience."
Olden et al, 2009, USA	Pre-post test with control group	Internal medicine trainees in PGY 1, 2, and 3 ( $n = 59$ ); hospital	Two-week rotation in a busy inpatient; palliative care consult service; attendance at the weekly interdisciplinary group meeting and palliative care conferences; free copy of the Primer of Palliative Care &	Questionnaire of knowledge; 36 questions	Unclear significant differences: Nonpain symptom management scores PGY2 > PGY1 > PGY3	Knowledge and skills (2B)	"Palliative care knowledge, as tested by objective examination, improves during internal medicine residency at our institution and specifically over the course of a required, two-week palliative care rotation."

(Continued)

Table 1  
Continued

Author, Year, Country	Design	Participants ( <i>n</i> ) and Setting	Intervention and Length	Evaluation Method and Instruments	Key Findings (Relative to Control)	Learning Outcome According to Kirkpatrick's Model	Authors' Conclusion
			workbook. Delivered over two weeks (PGY 2)				

PGY = Postgraduate year; IG = intervention group; CG = control group; MCQ = multiple-choice question.

\*Common pretest score. Both post-tests, from the intervention group and the control group, were compared with a common pretest.

Table 2  
Methodological Quality of Included Studies

Author, Year	Research Question	Study Subjects	Data Collection Methods	Completeness of Data	Risk of Bias Assessment (Cochrane Tool) <sup>a</sup>	Analysis of Results	Conclusions	Reproducibility	Prospective	Ethical Issues	Triangulation	Global Rating
Barnett et al, 2016	Yes	Yes	Unclear	No	Serious	Unclear	Unclear	Yes	Yes	Yes	No	5
Bradley et al, 2009	Yes	Unclear	Unclear	Yes	Serious	Unclear	Unclear	Yes	Yes	Yes	No	5
Claxton and Arnold, 2011	Yes	Unclear	Unclear	Yes	High	Yes	Unclear	Yes	Yes	Yes	No	6
Mikhael et al, 2008	Yes	Unclear	No	Yes	High	No	Unclear	Yes	Yes	Yes	Yes	6
Okon et al, 2004	Yes	Yes	Unclear	Yes	Serious	Unclear	Unclear	Yes	Yes	Yes	No	6
Olden et al, 2009	Yes	Unclear	Yes	Yes	Serious	Unclear	Unclear	Yes	Yes	Yes	No	6

Response to each category: yes (clearly stated), no (not stated), or unclear (answer partially the question or not explicit). Global rating: number of questions answered with a "yes." High-quality studies are considered as those that meet a minimum of seven of the 11 indicators.

<sup>a</sup>Risk of bias: "high risk of bias" will be considered as "no," and "low or moderate risk of bias" as "yes" using Cochrane tools for evaluating risk of bias in randomized controlled trials. Serious or critical risk of bias will be considered as "no," and "low or moderate risk of bias" as "yes" using ROBINS-1 for nonrandomized studies of intervention.

Table 3

**Summary of Content in Pain and Symptom Management**

Pain management <sup>41-46</sup>	Fundamentals of pain management <sup>41</sup>
	Common pediatric pain medications <sup>41</sup>
	Opioids types and dosage <sup>41,43,44</sup>
	Dose conversion <sup>41,43,44,46</sup>
	Choosing an opioid <sup>41,43</sup>
	Breakthrough dosing <sup>41,43,44</sup>
	Patient-controlled analgesia <sup>41,43</sup>
	Opioids adverse effects <sup>41,43,44</sup>
	Opioids use in renal failure <sup>43</sup>
	Analgesics order <sup>43</sup>
	Fentanyl patch <sup>41,44</sup>
	Methadone <sup>43</sup>
	Lidocaine patch <sup>43</sup>
	Neuropathic pain management <sup>41,43,44</sup>
	Bisphosphonates for bone pain <sup>43</sup>
Adjuvant therapies for pain <sup>41</sup>	
Pain assessment <sup>41,43</sup>	Needs of symptoms assessment <sup>45</sup>
	Pain assessment in the cognitive impairment <sup>43</sup>
Nonpain symptoms management <sup>41-46</sup>	Needs of symptoms assessment <sup>45</sup>
	Nausea and vomiting <sup>41,43-45</sup>
	Appetite loss <sup>45</sup>
	Dry mouth <sup>45</sup>
	Constipation <sup>41,43,44</sup>
	Diarrhea <sup>43,45</sup>
	Bowel and upper gastrointestinal obstruction <sup>43</sup>
	Delirium/agitation <sup>41,43</sup>
	Energy loss <sup>45</sup>
	Dyspnea <sup>41,45</sup>
	Opioids and nonopioids for cough <sup>43,45</sup>
	Urinary retention <sup>41</sup>
	Incontinence <sup>45</sup>
	Pruritus <sup>41,45</sup>
	Sores/ulceration <sup>45</sup>
Hypercalcemia of malignancy <sup>43</sup>	
Syndrome of imminent death <sup>43</sup>	
Terminal secretions <sup>41,43</sup>	
Palliative sedation <sup>43,44</sup>	
Side effects of treatment <sup>45</sup>	

only on pain and nonpain symptom management.<sup>44</sup> Content is summarized in Table 3. Educational interventions also covered additional domains of EoLC, including emotive and cognitive symptoms,<sup>45</sup> communication of bad news<sup>41-43,46</sup> and prognosis,<sup>41,46</sup> advance care planning,<sup>43</sup> autonomy,<sup>45</sup> dying process,<sup>41</sup> ethical issues,<sup>42,46</sup> jeopardy (risk of harm),<sup>42</sup> family support,<sup>42</sup> spirituality,<sup>42</sup> professionalism,<sup>43,46</sup> and economic<sup>45</sup> (Supplementary Table S4).

**Evaluation Instruments.** Methods of data collection included focus group,<sup>44</sup> and survey questionnaires.<sup>41-46</sup> Surveys questionnaires were self-reported and collected anonymously, except for in two studies.<sup>42,46</sup> Surveys within four studies examined trainees' reactions<sup>41</sup> and attitudes toward pain and symptom management.<sup>41-45</sup> A "comfort" section presented in one survey had been validated in previous work.<sup>41</sup> Surveys of attitudes were designed for specific use in three studies,<sup>42-44</sup> and instruments' validity and reliability were not described. Questionnaires were

delivered to assess trainees' knowledge about pain and nonpain management. Only one of the studies used a tool identified in previous studies with explicit references without changes on the original instrument.<sup>46</sup> Nevertheless, amendments on original questionnaires were made in three studies, and their validations were not described.<sup>41,42,45</sup> It was only possible to access one full instrument with the original version.<sup>45</sup> From the questionnaires, most of the multiple-choice questions evaluated knowledge at the level of "know" rather than "know how" using "context poor" questions,<sup>41,44,45</sup> with limited transferability to complex clinical problems.<sup>27</sup> The period between pretest and post-test assessment ranged from three days<sup>42</sup> to one academic year,<sup>41</sup> and no study made repeated postintervention assessments. All except one study<sup>42</sup> used the same instrument in both the pretraining and post-training assessments.<sup>41,43-46</sup>

**Effectiveness on Trainees' Learning Outcomes.** All educational outcomes evaluated in these studies were in the first<sup>41,44</sup> and second levels<sup>41-46</sup> of the Kirkpatrick model. In two studies, outcomes were related to participants' views on the learning experience and teaching methods (first level).<sup>41,44</sup> Four studies measured attitudes (second level A).<sup>41-44</sup> Two RCTs examined change in attitudes or perceptions of trainees' comfort and preparedness before and after the intervention and were compared with the control group.<sup>43,44</sup> Two studies evaluated changes in attitudes in the intervention group, but these results were compared only with the post-test of the control group.<sup>41,42</sup> All studies aimed to improve trainees' knowledge (second level B) of concepts and principles. Evaluation of thinking and problem solving within the questionnaires was less evident than evaluation of knowledge. All the studies evaluated learning outcome before and after the intervention compared with pretest and post-test in the control group in RCTs,<sup>43,44</sup> and with the pretest or post-test in NRSI.<sup>41,42,45,46</sup>

At the first outcome level, trainees' evaluation of the overall curriculum was consistently rated as good or excellent in the usefulness of cards around pain and symptom management.<sup>41</sup> In another study, overall trainees' reactions were also positive around having the card at the point of care, the extensiveness of the card, dosages section, and improving confidence.<sup>44</sup> In this study, 90% of physicians in training used the card, the majority between 1 and 2 times per week, and 10% used it more than five times per week.<sup>44</sup>

In relation to the second outcome level, educational interventions tended to improve trainees' attitudes and knowledge. Clinical decision support tools showed significant improvement in overall comfort

levels.<sup>41,44</sup> However, trainees' attitudes were only reported at the baseline in the use of an integrated clinical pathway; therefore, it is not possible to evaluate trainees' comfort with the change in knowledge.<sup>45</sup> Web-based teaching also improved significantly some of the items evaluating the level of preparedness in the intervention group compared to the control group.<sup>43</sup> On the other hand, in a mixed educational intervention, junior doctors reported less or equal comfort in managing pain and nonpain symptoms after the intervention compared to senior trainees.<sup>42</sup> Overall knowledge around symptom management domain improved using clinical support tools, Web-based teaching, and palliative care rotation.<sup>43-46</sup> Furthermore, in the Internet-based intervention, a dose-response was demonstrated with a significant increase in knowledge for those who read 10 or more e-mails compared to those who read less than 10 e-mails.<sup>43</sup> However, total knowledge scores in pain and nonpain domain were nonsignificant in two studies when they were compared to more senior residents<sup>41,42</sup> though some items reached significant difference using a pocket card set.<sup>41</sup>

*Effectiveness on Patient or Family-Related Outcomes.* None of the studies included patient or family-related outcomes in their goals.

## Discussion

This systematic review focused on medical postgraduate training interventions designed to improve learning outcomes on symptom management in generalist providers of palliative care. Pain management and nonpain symptom management training interventions were identified. In pain management interventions, the use of opioids and their side effects were main themes covered in training. A wide variety of interventions were used to evaluate trainees' learning outcomes suggesting improvements in trainees' reactions, attitudes, and knowledge and skills following training programs. By contrast, the effects on trainees' behavior, the sustainability of learning, and patient-related outcomes were not examined at all. The shortage of controlled study designs in training programs is consistent with the findings reported by a BEME systematic review around teaching effectiveness in medical education generally.<sup>47</sup>

In relation to the different learning strategies studied, pocket cards were a feasible and effective strategy to improve trainees' comfort and knowledge around symptom control in different specialties, including in long-term interventions one of six to 12 months.<sup>41,44,48</sup> These results are consistent with recent research that used a pocket reference card for improving care for

children at the EoL.<sup>48</sup> Web-based strategies could also be effective and address time restrictions that exist nowadays for trainees and faculty.<sup>43</sup> Our findings are supported by studies using similar resources.<sup>49,50</sup> However, Internet-based learning has been associated with positive changes in medical knowledge, but more controversial effects into changes in practice.<sup>51</sup> Order sets also suggested positive changes on trainees' knowledge regarding assessment and management of pain and nonpain symptoms.<sup>45</sup> We found that palliative care hospital wards or hospice rotations could improve trainees' knowledge on symptom management.<sup>46</sup> These results are supported by other studies including internal medicine, family medicine, and psychiatry residencies.<sup>52-55</sup> The ideal length of rotations to improve learning is unclear, with literature suggesting between one week<sup>52</sup> and 6 months.<sup>55</sup> The dedicated time in the specialty is probably of most relevance, although this strategy requires a well-coordinated schedule taking into account other parallel rotations, and sometimes, extra-hours work for trainees and faculty.<sup>56</sup>

Despite possible benefits of simulation training,<sup>57,58</sup> this strategy was not found in any studies of this review. For instance, one recent controlled study compared simulation training to didactic education on communication skills and difficult discussions, but with some contents on symptom management, in pediatric fellows.<sup>59</sup> This study suggested that simulation training could improve self-efficacy, but not knowledge compared with didactic education, and most frequent practice is needed to maintain positive changes over time.<sup>59</sup> Although we could not determine the most effective training method, our findings highlight the need to tailor methodologies on the environment, context, and resources of each specialty.

A variety of symptom management evaluation tools were identified in this review, both qualitative and quantitative.<sup>60</sup> Most survey questionnaires, which evaluated attitudes and knowledge, were modified from previously published instruments or were often created for specific use in the studies. Most of the studies used the same instruments with only a short period between pretest and post-test, with a high risk that observed improvements being due to recall. These findings were consistent with the analysis of three systematic reviews.<sup>28,30,61</sup> A short length of time between tests could be inadequate to measure changes, for example, in knowledge, and give a false impression of ineffective results when actually could improve another learning outcome over time as behaviors.<sup>62</sup> This finding highlights the need for a more rigorous evaluation of psychometric properties and design to administer a tool that can capture a "genuine" change in the educational outcome measured. Furthermore, most instruments were self-

assessed. Physician self-assessment studies have found a lack of congruence between self-assessment and external observation in clinical skills.<sup>63</sup> The greatest differences between self-assessed and external observed skills are found among physicians with the highest levels of reported confidence and the lowest levels of (externally observed) skill. This finding is independent of the level of training, specialty, or the domain of self-assessment.<sup>64</sup> This disparity highlighted the crucial need for more patient or family-related outcomes in medical education.<sup>63</sup>

In addition to the instruments used in studies, trainees' prior palliative care experience and year of training are important confounders. First, prior palliative care experience has been associated with less anxiety and more EOL care knowledge.<sup>65</sup> It was also associated with both higher baseline scores and post-test scores, suggesting that previous training in EOL care plays a critical role in physician knowledge and attitudes.<sup>65</sup> Second, the year of training has been suggested to be a predictor of post-test knowledge scores.<sup>65</sup> Our systematic review showed contradictory evidence around self-reported comfort or preparedness in managing different symptoms and year of training. Although most of the trainees reported an increase in preparedness after the intervention, these were not necessarily significant compared with the control group. Senior residents tend to feel more confident in their level of comfort and preparedness for managing symptoms, despite no differences in knowledge scores compared to junior doctors.<sup>42</sup> The same results were seen in other studies comparing training in neurology residents with faculty members.<sup>66</sup> Measurements of attitudes alone seem to be insufficient in evaluating the true level of the trainee competence.<sup>30</sup>

We could not identify controlled prospective studies to examine the correlation between attitudes and knowledge and change in behaviors. From the literature, cohort studies exploring the transference of knowledge on symptom management and skills into the workplace are equivocal.<sup>62,67</sup> A few studies have evaluated the sustainability of improvements in physicians' practices or patient outcomes after a pain or nonpain symptom management curriculum, and evidence is doubtful.<sup>68,69</sup> For instance, an observational study showed the durability of effects on attitudes and knowledge after the fourth and 12th months of a taught cancer pain management program for physicians, nurses, and pharmacists.<sup>68</sup> However, another study reported that residents' ability to convert oral and intravenous formulations of opioids was not retained knowledge after 6 months of a protected block curriculum for emergency medicine trainees.<sup>69</sup> This review recognizes an enormous lack of evidence for evaluating if educational interventions directly support patients and families' needs at the end of life.

Our review has strengths and limitations. BEME Collaboration guidance was followed throughout the preparation of this review to enhance the quality of medical education systematic reviews.<sup>21</sup> We followed an orderly process from the development of the protocol to the final review. The search was not limited by language, year of publication, or geographical location. Included studies were however all conducted in developed countries with national palliative care programs and frameworks of EOL care competencies for nonpalliative specialties. Our findings are therefore not generalizable for countries and hospitals where palliative medicine is not well integrated in primary, secondary, or tertiary levels, and few palliative care providers exist yet. Use of recommended tools such as the BEME data sheet and quality indicator tools helped to capture the major factors relevant to educational research appraisal. Therefore, findings from this review will be comparable with other medical education reviews. Furthermore, risk of bias was assessed using the tools recommended by the Cochrane Collaboration, which allowed a more rigorous process in the methodological appraisal.

Our findings have implications for research. We identified different educational methods that can be implemented in settings with a well-integrated palliative care team across different specialties, and the main symptom management topics relevant to most medical specialties. Both findings can contribute to the academy development and improve postgraduate curriculums in managing symptoms. We also uncover factors that appear to influence residents' educational outcomes, for example prior exposure to EOL training, which may help identify residents most likely to benefit from training in EOL symptom management. This review identified the need for more rigorous research designs in this field, including the use of psychometrically sound evaluation instruments to uncover changes in trainees' learning outcomes. Inclusion of additional methods such as objective structured clinical examination, standardized patient, mini-clinical evaluation exercise, patient or family assessment could extend the impact on symptom management evaluation of the educational interventions on the "shows how" and "does" competencies of the Miller's pyramid.<sup>27</sup> Focus groups and interviews can provide detailed views from trainees, and findings can be triangulated.<sup>60</sup> Qualitative methodologies allow for triangulation of data and to capture the complexity of the educational interventions.<sup>47</sup> More studies are needed in settings where palliative care is still not integrated in routine practice to evaluate the feasibility of educational curriculums in these scenarios. Finally, further research should evaluate the impact of symptom management training on physicians and organizational performance, and on the

experience, quality of life, and satisfaction of patients and relatives. It is essential to determine if medical education is achieving the major goal of palliative care, relieving the suffering of patients at the EOL.

### Conclusion

Preparation of the generalist to provide EoLC has never been more important, with an increasing number of people dying particularly with noncancer disease associated with frailty and multimorbidity. Nevertheless, this review found few controlled studies examining the effectiveness of symptom management training for physician generalist providers of palliative care. Current evidence suggests that such training can improve trainees' attitudes and knowledge. However, the transferability of this learning to the workplace, and the impact on patient-reported outcomes, is understudied. Our review also highlights the enormous need for more robust evidence and validated outcome measures to establish educational approaches in palliative and end-of-life care more generally.

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*Appendix*

*Table S1*  
**Kirkpatrick Model for Evaluating Educational Outcomes**

Level 1	Reaction	Participants' views on the learning experience, its organization, presentation, content, teaching methods, and quality of instruction
Level 2A	Learning Change in attitudes	Changes in the attitudes or perceptions among participant groups toward teaching and learning
Level 2B	Learning Modification of knowledge or skills	For knowledge, this relates to the acquisition of concepts, procedures, and principles; For skills, this relates to the acquisition of thinking/problem-solving, psychomotor, and social skills
Level 3	Behavior Change in behaviors	Transference of learning to the workplace or willingness of learners to apply new knowledge and skills
Level 4A	Results Change in the system/organizational practice	Widespread changes in the organization, attributable to the educational program
Level 4B	Results Change among the participants, students, residents, or colleagues	Improvement in student or resident learning/performance as a direct result of the educational intervention

*Table S2*  
**Risk of Bias of Randomized Controlled Trials (RCTs)**

Author, Year of Publication	Random Sequence Generation	Allocation Concealment	Blinding of Participants and Personnel	Blinding of Outcome Assessment	Incomplete Outcome Data	Selective Reporting	Other: Contamination Bias	Risk of Bias
Claxton and Arnold, 2011	Unclear	Unclear	High	Low	Unclear	Low	Unclear	High
Mikhael et al, 2008	Unclear	Low	High	Low	Low	Low	Unclear	High

*Table S3*  
**Risk of Bias of Nonrandomized Studies of Interventions (ROBINS-I)**

First Author, Year of Publication	Bias Due to Confounding	Bias in Selection of Participants Into the Study	Bias in Classification of Interventions	Bias Due to Deviations From Intended Interventions	Bias Due to Missing Data	Bias in Measurement of Outcomes	Bias in Selection of the Reported Result	Risk of Bias
Barnett et al, 2016	Moderate	Moderate	Low to moderate	Low to moderate	Serious	Low	Low to moderate	Serious
Bradley et al, 2009	Moderate to serious	Moderate	Low	Moderate	Low	Low	Low to moderate	Serious
Okon et al, 2004	Moderate to serious	Moderate	Low to moderate	Low to moderate	Low	Low	Moderate	Serious
Olden et al, 2009	Moderate to serious	Unclear	Low	Moderate	Low	Low	Low to moderate	Serious

*Table S4*  
**Content of Training Interventions Beyond Symptom Management**

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Communication of bad news and prognosis: children and families<sup>41-43,46</sup>  
Communication<sup>43,45,46</sup>  
End-of-life decision making<sup>43</sup>  
Autonomy<sup>45</sup>  
Emotive and cognitive symptoms<sup>45</sup>  
Patient and family support, spirituality, family presence at resuscitation<sup>42</sup>  
Ethical issues and interaction with palliative care in the surgical intensive care unit<sup>42</sup>  
Prognosis<sup>41,46</sup>  
Risks and benefits of aggressive treatment<sup>46</sup>  
Do not resuscitation<sup>46</sup>  
Sedation management<sup>44</sup>  
Dying process<sup>41</sup>  
Grief<sup>45</sup>  
Professionalism<sup>43,46</sup>  
Terminal care and hospice systems<sup>42,46</sup>  
Psychosocial issues<sup>41</sup>  
Economic<sup>45</sup>

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1. exp Palliative Care/
- 2 palliat\*.mp.
- 3 exp Terminal Care/
- 4 terminal\*.mp.
- 5 exp Hospices/
- 6 hospice\*.mp.
- 7 end of life.mp.
- 8 end-of-life.mp.
- 9 eol care.mp.
- 10 exp Palliative Medicine/
- 11 end stage\*.mp.
- 12 end-stage.mp.
- 13 dying.mp.
- 14 advanced disease.mp.
- 15 advanced cancer.mp.
- 16 advanced illness.mp.
- 17 limited life span\*.mp.
- 18 1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9 or 10 or 11 or 12 or 13 or 14 or 15 or 16 or 17. ti, ab, kw
- 19 exp Educational Measurement/
- 20 educat\*.mp.
- 21 exp Education, Medical/
- 22 training.mp.
- 23 train\*.mp.
- 24 exp Teaching/
- 25 exp Program Evaluation/
- 26 course\*.mp.
- 27 workshop.mp.
- 28 exp Clinical Competence/
- 29 19 or 20 or 21 or 22 or 23 or 24 or 25 or 26 or 27 or 28 . ti, ab, kw
- 30 resident\*.mp.
- 31 trainee\*.mp.
- 32 fellow\*.mp.
- 33 30 or 31 or 32. . ti, ab, kw
- 34 medic\*.mp.
- 35 33 and 34. . ti, ab, kw
- 36 18 and 29 and 35. . ti, ab, kw

Fig. S1. Example search strategy (MEDLINE).