

Title: The effect of teaching methods in palliative care education for undergraduate nursing and medical students - A systematic review

ABSTRACT

Background: Palliative care should be seen as a human right and should be integrated into the healthcare system. Adequate palliative care education is seen as a facilitator to develop the integration of palliative care.

Aims: To synthesize evidence of the effect of different teaching methods used in palliative care education to students' competences, knowledge, attitude, or skills.

Methods: Systematic review. Four databases (CINAHL, Eric, PubMed and Scopus) were searched, identifying 16 articles.

Findings: Simulations, lectures, films and a humanistic approach all had a positive effect on students' attitudes to care of a dying person. Problem-based learning, simulations and elective courses increased students' knowledge of palliative care. Game interventions in education, decreased students' fear of death and communication with dying patients and relatives became easier.

Conclusions: Education interventions had positive effects on students' attitudes and knowledge. However, there is a need for rigorous research about effective palliative care interventions using randomized designs, research about the effects of blended learning.

Key words: Education, Nursing, Medicine, Palliative care, Systematic review

Reflective questions

1. What kind of teaching methods are shown to be effective to decrease students fear to face the dying patients?
2. Are games or eLearning effective ways to learn palliative care?
3. How could we integrate effective teaching methods to the curriculum?

INTRODUCTION

The Council of Europe and World Health Organization (WHO) highlight palliative care as a human right, and that it should be integrated into every country's healthcare system. All healthcare professionals should acquire basic undergraduate palliative care education (Council of Europe 2018; World Health Organization 2014), however insufficient skills and capabilities of healthcare workers remain an important concern. Adequate education is seen as a facilitator to develop the integration of palliative care into healthcare systems. (Centeno et al. 2017). Several studies have shown that palliative care education for undergraduate nurses and medical students needs to be developed further (Bowden et al. 2013; Cavaye and Watts 2014; Malone et al. 2016; Rhodes-Kropf et al. 2005).

The European Association for Palliative Care (EAPC) has defined a list of core competencies that all health- and social care professionals involved in palliative care should possess. Palliative care competencies comprise a cluster of related knowledge, skills and attitudes that correlate with the performance of the work provided by the professionals. These competencies can be achieved through education and can be measured against accepted standards (Gamondi et al. 2013a). The core competences consist of ten competence areas (see table 1) (Gamondi et al 2013b).

In a recently published study of Paal et al (2018) palliative care clinicians and educators assessed the above mentioned EAPC palliative care competencies. The study showed that there where statistically strong overall agreement about the core competences among the clinicians and educators. It seems that these competencies have been accepted as an essential part of palliative care education (Paal et al. 2018).

Table 1. The interdisciplinary core competencies by the EAPC consensus White paper

The healthcare professional should have competency to:
- apply the core constituents of palliative care in the setting where patients and families are based
- enhance physical comfort throughout patients' disease trajectories
- meet patients' psychological needs
- meet patients' social needs
- meet patients' spiritual needs
- respond to the needs of family caregivers in relation to short-, medium- and long-term patient care goals
- respond to the challenges of clinical and ethical decision-making in palliative care
- practice comprehensive care co-ordination and interdisciplinary teamwork across all settings where palliative care is offered
- develop interpersonal and communication skills appropriate to palliative care
- practice self-awareness and undergo continuing professional development

To promote the implementation of palliative care to undergraduate education, recommendations for undergraduate palliative care medical curricula and development of palliative nursing education have been published by EAPC taskforce groups (De Vlieger 2004; Elsner et al. 2013). Education has a positive impact on the development of palliative care (Bergdahl et al. 2007; Achora and Labrague, 2019). The development and renewal of evidence and competence-based curriculum requires reviews of publications relevant to the field and critical assessment of teaching methods (McLeod & Steinert, 2015). The need to develop and renew palliative care education and curriculum is evident, therefore, it is important to

investigate the effect of teaching methods on students' competencies, knowledge, attitude or skills in palliative care.

METHODS

Search strategy

The aim was to synthesize evidence of the effect of different teaching methods used in palliative care education on students' competencies, knowledge, attitude or skills. The studies of interest in this review were experimental studies measuring the effects of the teaching interventions on students' competencies, knowledge, attitude or skills. The literature was searched electronically for relevant studies using four databases: CINAHL, Eric, PubMed and Scopus. A wide range of search terms were used, and the Boolean operators were used to combine them (Table 1). The literature search was limited to studies published from 2009 to 2018 in English, Swedish or Finnish. The review followed the Joanna Briggs Institute (JBI) guidelines (JBI 2017).

Study selection and inclusion criteria

A total of 1689 recorded studies were retrieved from the databases (Figure 1). After duplicates (n=544) had been removed, two authors (HMP and MH) independently screened the titles and abstracts of the remaining records (n=1145) for eligibility based on the inclusion and exclusion criteria (Table 2). In the case of disagreements, these were discussed by the authors to reach a consensus (JBI 2017).

Based on the titles and abstracts, 1031 records were excluded, leaving 114 records for further screening. If an article could not be accessed as full text from the databases or via the library networks of the authors' universities, it was also excluded. All potentially eligible records that

were available as full text (n=86) were then retrieved and screened again by the authors (MR, PK, independently). Based on the inclusion criteria, this resulted in a total of 18 studies for analysis.

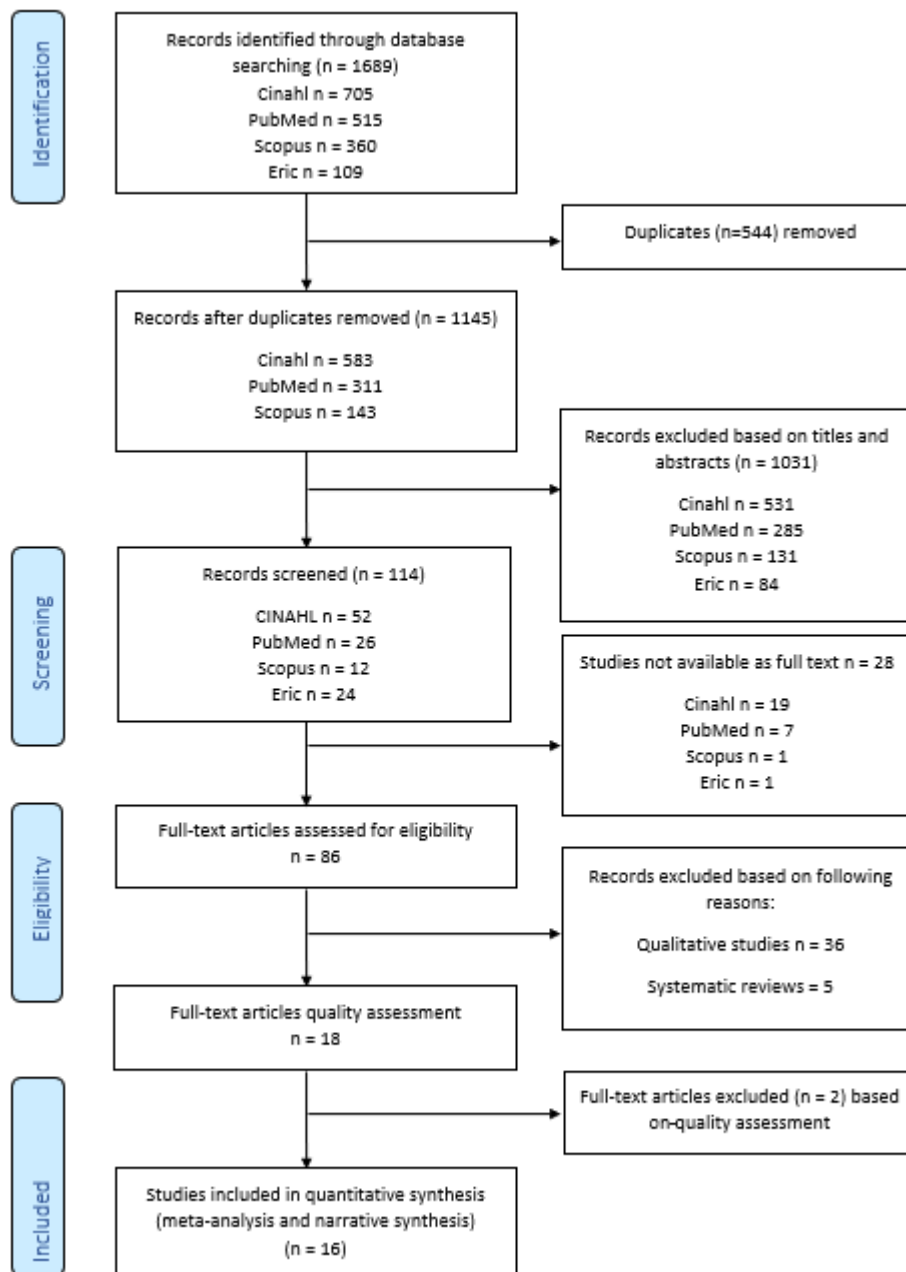


Fig 1. Study flowchart.

Table 2. Inclusion and exclusion criteria according to PICO

Inclusion criteria	Exclusion criteria
P (Population)	
Undergraduate nursing and medical students	Postgraduate nursing or medical students Other fields of healthcare students such as midwives, occupational therapists, radiation therapy students, dentists, continuing education students Specialist physicians (residents, trainees) Physician assistants
I (Intervention)	
Any intervention of teaching or learning methods in palliative care that combine guided teaching within classroom or clinical learning (short bedside teaching and prior clinical observation)	Intervention is not related to teaching methods The study evaluates the entire curriculum or the course in general The study is related to treatment of a palliative care patient not related to education Learning related exclusively to clinical training
C (Comparison)	
At least one control group or pre- and post-test measurement, and the group has a standard education	Qualitative study not measuring learning outcomes.
O (Outcome)	
Any teaching or learning outcome concerning students' palliative care competencies, knowledge, attitude or skills.	The study evaluates students' competences in general or evaluates students' skills shortages or learning needs or students' satisfaction with teaching. The effectiveness of teaching from the point of view of patients / relatives / palliative care.

Quality assessment

All the remaining studies (n=18) were then assessed for quality. Quality assessment was carried out by two authors (MR, PK) independently using the JBI Reviewer's Manual (JBI 2017), in

particular the JBI Critical Appraisal Checklist for Randomized Controlled Trials (RCT) and the JBI Critical Appraisal Checklist for Quasi-Experimental Studies (non-randomized experimental studies). The checklist for RCT studies included 13 criteria, and the checklist for quasi-experimental studies included 9 criteria. After the independently conducted assessment, if there was a disagreement, a consensus was reached by the reviewers by reading the article together and discussing the issue. Two articles were removed as a result of the quality assessment, leaving 16 studies for further analysis. A risk of bias analysis was conducted following the quality appraisal (JBI 2017), in accordance with the Cochrane handbook (Higgins and Green 2011) (Figures 2, 3).

	Random sequence generation	Allocation concealment	Blinding of participants and personnel	Blinding of outcome assessment	Incomplete outcome data	Selective reporting	Other bias
Day <i>et al.</i> (2015)	?	-	-	+	+	+	-
Green <i>et al.</i> (2011)	+	-	-	-	-	+	?




























































 Low risk of bias
  Unclear risk of bias
  High risk of bias

Fig. 2. Risk of bias in the randomized controlled trials.

	Confounding	Selection bias	Information bias	Reporting bias
Carman <i>et al.</i> (2016)				
Chang <i>et al.</i> (2009)				
Dobbins <i>et al.</i> (2011)				
Fluharty <i>et al.</i> (2012)				
Head <i>et al.</i> (2016)				
Jafari <i>et al.</i> (2015)				
Jo & An (2015)				
Kirkpatrick <i>et al.</i> (2019)				
Lewis <i>et al.</i> (2016)				
López Alonso <i>et al.</i> (2018)				
Moody <i>et al.</i> (2018)				
Robinson <i>et al.</i> (2016)				
Saylor <i>et al.</i> (2015)				
Schulz <i>et al.</i> (2013)				




 Low risk of bias
 Unclear risk of bias
 High risk of bias

Fig. 3. Risk of bias in the quasi-experimental studies.

Data extraction and synthesis

Three authors (MR, MH, PK) read the selected articles (n=16) independently and extracted the relevant information into a table (Table 3). The meta-analysis was conducted using MedCalc (version 19.2.1). Standardized mean differences (Cohen's d) for each study were calculated from post-intervention outcome measures, or average changes in the means and standard

deviations, when these were available. For the meta-analysis, the studies were classified into subgroups according to whether the intervention included students' attitudes, knowledge and/or skills. A standardized mean difference of 0.2 - 0.5 was considered to represent a small effect, 0.5 - 0.8 a moderate effect, and over 0.8 a large effect (Cohen 1992; Lakens 2013). A heterogeneity test was conducted to determine whether there was homogeneity between studies. As there was no homogeneity between studies ($P < 0.0001$, $I^2 > 90.2\%$), a random effect model was used (Higgins et al. 2011). As some of the studies could not be included in the statistical meta-analysis, these were analyzed using a narrative synthesis to describe the effects of teaching interventions on competencies, knowledge, attitudes or skills. A narrative synthesis analyzes the findings from multiple studies to summarize and explain the findings (Popey et al. 2006).

Table 3. Data extraction template

Author, year and country	Study aim	Method/ Design and sample	Measurement tools	Intervention	Findings: effects	Findings: limitations	Quality scores
Carman <i>et al.</i> (2016) United States	Evaluate the impact of a multidimensional end-of-life (EOL) learning bundle on nursing students' attitudes towards the care of a dying person.	A quasi-experimental approach with a pre- and post-survey, convenience sampling. Nursing students Total: n=62 Pre-test n=62 Post-test n=28	The Frommelt Attitude Toward Care of Dying (FATCOD) scale.	The learning bundle consisted of didactic content, coupled with open classroom discussion and simulation on care of the dying patient and his or her family.	The end-of-life (EOL) learning bundle significantly influenced students' attitudes towards pain management. Led to a significant decrease in negative attitudes about discussing the death or being present at the actual moment of death.	The small study sample. Because simulations were carried out at different times, it may have affected the emotional impact of the case study introduction and family conference. The unique identification number given by participants was not retained during data collection at the second time point.	7/9
Chang <i>et al.</i> (2009) Taiwan	Evaluate the effects of a multimodal teaching program on pre-clinical medical students' knowledge of palliative care and	A quasi-experimental design, pre- and post-questionnaire. Medical students. Total: n=118	The investigators constructed the instrument: demographic information about the participants, knowledge of palliative care,	A 1-week multimodal curriculum for pre-clinical medical students: formats included didactic lectures, bedside patient care, and	Significant improvement in palliative care knowledge after educational intervention. Beliefs about ethical issues, such as telling the	Participants participated voluntarily but there was no control group. For a better understanding a longitudinal study would be better.	8/9

	beliefs in ethical decision making.	Pre-test n=118 Post-test n=118	and beliefs relating to ethical decision-making.	interactive discussions.	truth and the place of care, also improved significantly.		
Day <i>et al.</i> (2015) United States	Impact of medical content taught in the form of eLearning format on the outcomes of Palliative and end-of-life (PEOL) care education for medical students.	Quasi-randomized controlled trial. Medical students. Total: n=109 Intervention group n=47, Control group n=62	The investigators constructed the instrument: 27 self-efficacy questions written with input from Palliative and end-of-life (PEOL) content experts used as pre- and post-tests.	Students were randomly assigned to web-based eDoctoring (n = 48) or small-group Doctoring (n = 71) curricula. eDoctoring showcases sequential trigger videos unveiling a clinical case, with clinical/social/ethical content, embedded question/answers, and areas for reflection.	There was no significant difference between the groups in improvement in Palliative and end-of-life (PEOL) self-efficacy or knowledge. Students and faculty ratings in the web-based and small-group curricula were similar for most goals.	The small-group setting was different. Student randomization was not based on technology fluency or viewpoints. Long-term knowledge retention was not measured, nor was there direct skills observation in the simulated or patient environment.	8/13
Dobbins <i>et al.</i> (2011) United States	Evaluate the impact of an elective nursing course on students' attitudes toward death and caring for dying patients and evaluate the effect of an end-of-life (EOL) module on the attitudes of a	Quasi-experimental study design. Nursing students. Study 1: Intervention group n= 12 Control group n= 25	An investigator-constructed demographic questionnaire, the Death Attitude Profile-Revise (DAP-R) and the Frommelt Attitude Toward	The intervention was a one-credit elective course with the content of palliative care and end-of life (EOL) care. The content of the control group included an additional 3-hour end-of-life (EOL)	The curriculum-based elective course significantly reduced death-related anxiety and improved nursing students' attitudes towards treating a dying patient. Significant changes were observed in both	The study samples were small and limited to one institution. Longitudinal studies may be better to determine the duration of effect of educational programs.	9/9

	similar group of students.	Study 2: Intervention group n=16 Control group n=22	Care of Dying (FATCOD).	module on a medical-surgical course.	intervention and control groups.		
Fluharty <i>et al.</i> (2012) United States	Evaluate the end-of-life (EOL) simulation and its effects on student learning outcomes.	A quasi-experimental study. A convenience sample of associate degree, traditional baccalaureate and accelerated baccalaureate nursing students. Total: n=329	An instrument developed by the consortium faculty on the basis of content and guidelines for professional nurses. Satisfaction with the instructional method was measured by a 5-item instrument and a 5-point Likert-scale.	An end-of-life (EOL) simulation for undergraduate students in order to reinforce nursing care of the dying patient in the medical-surgical curricula. The simulation included a recorded standardized main lecture before the simulation and the simulation	A significant increase in knowledge, regardless of role played in the scenario, high levels of self-confidence, self-reported communication skills, and satisfaction with the pedagogical approach.	Design did not provide data on the separate contributions of the simulation and the main lecture in increasing knowledge. The communication tool made it impossible to determine whether the simulation improved communication skills or merely improved students' perceptions of their skills. The reliability and validity of several of the measurement tools had not been established beforehand.	6/9
Green <i>et al.</i> (2011) United States	Evaluate the effectiveness of a computer program as an educational tool for medical	A prospective, randomized controlled design, pre-and post-questionnaires.	Students' knowledge was assessed using a 17-item true/false and multiple-	Students used either a computer-based decision aid or a state-specific advance care	The computer-based program was significantly better than standard advance care planning	Results describe one cohort of medical students at a single academic medical center. Selection of	7/13

	students in advanced care planning education.	Second-year medical students. Total: n=121 Intervention group n=60 Control group n=61	choice test. Students' skills were measured with a self-assessment instrument (5-point-scale). Patients' evaluation of the students' performance was assessed using a 12-item instrument.	planning package to facilitate a discussion about end-of-life (EOL) wishes and to help their patient complete an advance directive.	materials in virtually all measured parameters.	patients was not random and the study was not blinded.	
Head <i>et al.</i> (2016) United States	Report the impact of mandatory palliative-focused education on the outcomes of multidisciplinary students in the oncology curriculum.	A pre-post mixed-methods design. Nursing and medical students. Both pre- and post-measures. Total: n=209	The End-of-Life Professional Caregiver Survey (EPCS). The Self-Efficacy for Interprofessional Experiential Learning Scale (SEIEL).	Interdisciplinary curriculum team-based palliative care in oncology that was mandatory for medical, nursing, social work, and chaplaincy students.	Students appreciated the experiential aspects of the curriculum most, especially the ability to utilize a palliative team at work and practice team-based skills with other students.	It is not known what impact the curriculum will have on actual practice subsequent to graduation.	8/9
Jafari <i>et al.</i> (2015) Iran	Assess nursing students' attitudes towards dying patients and the impact of education on their attitudes.	A quasi-experimental one-group pre-test/post-test design. Final year nursing students.	A demographics questionnaire and the Frommelt Attitude Toward Care of Dying (FATCOD) scale.	The educational material consisted of a 4-hour lecture, film, and a group discussion of the concepts: death and	Education greatly improved the students' attitudes towards care of a dying patient because they did not feel that they had been	A convenience sample and possible selection bias. The use of self-reporting questionnaires may have	7/9

		Total: n=30		dying, beliefs and feelings about end-of-life (EOL) care, physiological and psychological needs, symptom relief for the patient, and care of the patient's family.	adequately educated about this during the previous 4 years of nursing education.	led to an overestimation of some of the findings.	
Jo & An (2015) Korea	Evaluate the effects of the humanities end-of-life (EOL) care course on nursing students' attitudes to death, death anxiety and communication skills.	A nonequivalent control group design. Nursing students from two universities. Total: n = 39 Control group n = 20 Experimental group n = 19	A 20-item questionnaire that assessed people's attitudes toward death, Death Anxiety Scale (DAS) and the Communication Assessment Tool (CAT).	The experimental group was taught using the humanistic approach in their "humanistic end-of-life (EOL) care course" (2 credits), which took place for two hours a week for 16 weeks.	Attitudes to death, and self-reported communication skills were found to have improved in the experimental group.	A small sample size and the absence of randomization. Did not assess nursing students' actual communication skills.	8/9
Kirkpatrick <i>et al.</i> (2019) United States	Find out the relationship between previous palliative care nursing experience, knowledge, self-awareness, and performance from nursing students during end-of-life (EOL) simulation.	A quasi-experimental pre-test/post-test design. Senior nursing students. Total: n=75 Intervention group	The Frommelt Attitudes Toward Care of the Dying, Form B (FATCOD-B). The Palliative Care Quiz for Nursing (PCQN). Modified version of the Creighton Competency	A simulation with a 45-min pre-briefing to highlight palliative care principles and to prepare students for the death of the patient. The simulation included four 20-min phases and at the end a 45-	After the simulation, the students had a high level of self-awareness, knowledge and performance regardless of previous end-of-life experience.	The small number (n=5) of students with no previous end-of-life (EOL) experience. The sample recruited demonstrated high competence across Creighton Competency Evaluation Instrument-Palliative Care (CCEI-PC)	8/9

		n=42, Control group n=33	Evaluation Instrument (CCEI).	min debriefing session		domains, so it may not be representative of most senior-level Bachelor of Science in Nursing (BSN) students. There was no control group or a multi-site study for outcome comparisons.	
Lewis <i>et al.</i> (2016) UK	Assess the impact of simulated intervention on attitudes of undergraduate nursing and medical students towards care of the dying patient.	A pilot quasi-experimental, pre-test/post-test design without a control group. Undergraduate nursing and medical students. Total: n=19	The Frommelt Attitudes Toward Care of the Dying, Form B (FATCOD-B).	Students participated in a simulation session, intended to reflect the challenges of providing end-of-life (EOL) care to terminally ill patients and their families.	Simulated end-of-life (EOL) care interventions were found to have a positive effect on the attitudes of undergraduate nursing and medical students in end-of-life (EOL) care.	A small pilot study. It was not possible to look at differences in attitudes between the two professions because socio-demographic data was not collected. There was no control group. Students may have had an interest in end-of-life (EOL) care or simulation learning. Four of the Frommelt Attitudes Toward Care of the Dying (FATCOD) items contained double negatives.	7/9
López Alonso <i>et</i>	Evaluate the impact of games-based intervention on the outcomes of nursing	Quasi-experimental study, pre-test/post-test design.	The Collett-Lester Fear of Death	A game-based intervention held as practical sessions of two hours per game	The students' showed good acceptance of the games. There was an increase in the	Not all statistical analyses could be carried out, so some variables had to be	8/9

<i>al. (2018)</i> Spain	students in palliative care scores on the Collett-Lester Fear of Death Scale (CLFDS).	Nursing students. Pre-test n = 100 Post-test n= 111	Scale (CLFDS) instrument.	per group, for a total of 8 hours during the 7-week course.	students' value of palliative care as a subject, a decrease in the fear of talking about death and an increase in discussions about death with the families.	investigated in greater depth.	
Moody <i>et al. (2018)</i> United States	Examine the effectiveness of the Pediatric Palliative Care- Problem-Based Learning (PPC-PBL) module for third-year medical students and the pediatric faculty's declarative knowledge, attitudes, perceived exposure, and self-assessed competence in relation to Pediatric Palliative Care (PPC) objectives.	A prospective cohort study using a convenience sample. Third-year medical students. n=81 completed baseline questionnaires n=108 completed questionnaires following the Pediatric Palliative Care- Problem-Based Learning (PPC-PBL) sessions.	Kirkpatrick's Hierarchy of Outcomes Measure.	Firstly, students identified domains of palliative care for a child with refractory leukemia and presented at a follow-up session. Secondly, students were expected to develop a care plan demonstrating the three Pediatric Palliative Care (PPC) objectives.	Students' declarative knowledge, perceived exposure, and self-assessed competency improved significantly after the Pediatric Palliative Care- Problem-Based Learning (PPC-PBL).	No objective data regarding medical students' Problem-Based Learning (PBL) performance. Changes in scores for each individual were not determined. There was no testing at any other time points, so it was not possible to assess whether the effects of the intervention persisted over time. One knowledge item could not possibly capture all aspects of a specific learning objective. A small sample size.	6/9
Robinson <i>et al. (2016)</i>	Examine senior-level nursing students' knowledge and	A non-experimental,	The Palliative Care Quiz for Nursing (PCQN) and the Frommelt	Students in group 1 completed a palliative care course that included	There were significant differences in attitudes towards end-of-life (EOL) care between	Students should also be included from various degree programs. This study design limits	6/9

United States	attitudes about end-of-life (EOL) care in a Bachelor of Science in Nursing (BSN) program after completing a palliative care course following the End-of-Life Nursing Education Consortium (ELNEC) model.	causal comparative research design. Nursing students. Total: =74 Group 1 n = 23 Group 2 n = 51	Attitudes Toward Care of the Dying (FATCOD) scales.	observation of interdisciplinary teams, guest speakers and face-to-face meetings. Students in group 2 did not participate in the elective course.	senior-level Bachelor of Science in Nursing (BSN) students who completed a palliative care course.	randomization and control of extraneous variables. Pre-tests were not performed. Elective course students self-registered for this course, indicating a potential bias toward palliative care.	
Saylor <i>et al.</i> (2015) United States	Measure the results of self-efficacy, attitudes of physician-nurse collaboration, and interprofessional competences in the simulation of palliative care.	A quasi-experimental pre-test/post-test study. Participants were randomly divided into 2 teams based on level of experience and availability. Nursing and medical students. Total: n=104	The General Self Efficacy Scale (GES). The Jefferson Scale of Attitudes Toward Physician-Nurse Collaboration (JSAPNC).	The intervention was an interdisciplinary simulation using standardized patients. The objectives of the simulation were to encourage interdisciplinary work to achieve the best outcome for the patient and family.	A significant improvement compared with previous measures. Interprofessional competency scores varied by profession and evaluator.	A small sample size and some missing and incomplete data. Only 1 institution and 1 simulation were studied. Data on the level of education of the nurse interns was not collected. Differences in the level of proficiency of the evaluators.	7/9
Schulz <i>et al.</i> (2013) Germany	An evidence-based approach to develop Undergraduate Palliative Care Education (UPCE) curricula and	A prospective, controlled, quasi-experimental retrospective-pre-, post-study design. Medical students.	The self-efficacy concept of Bandura measurement (based on the revised Collet-	The manualized Undergraduate Palliative Care Education (UPCE) curriculum was used as an intervention.	Three constructs (willingness to accompany a dying patient, self-estimation of competence in communication, self-	There was no blinding, and randomization or matching was not possible. Could not exclude selection bias. A small sample size.	8/9

examination of changes in medical students' self-perceived ability to treat palliative care patients and their families.	Total: n= 87 Intervention group n=43, Control group n=44	Lester-Fear-of-Death-Scale (CLFDS) and the instrument of the "Program in Palliative Care Education and Practice" (PCEP) at Harvard Medical School).	Teaching domains: (1) communication and interaction, (2) patient assessment and management, (3) inter-professionalism, and (4) systemic aspects. Total of 31 teaching sessions (TU = 45 min).	estimation of knowledge and skills) showed statistically significant developments after the intervention.
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RESULTS

Study characteristics

This systematic review retrieved 16 original studies published between 2009 and 2018. Of the 16 studies, 10 were conducted in the USA (Carman et al. 2016; Day et al. 2015; Dobbins 2011; Fluharty et al. 2012; Green et al. 2011; Head et al. 2016; Kirkpatrick et al. 2019; Moody et al. 2018; Robinson et al. 2016; Saylor et al. 2016) and the rest of studies were conducted in Germany (Schulz et al. 2013), Spain (López Alonso et al. 2018), the United Kingdom (Lewis et al. 2018), Korea (Jo & An 2015), Iran (Jafari et al. 2015) and Taiwan (Chang et al. 2009). The participants were undergraduate nursing students (Carman et al. 2016; Fluharty et al. 2012; Jafari et al. 2015; Jo et al. 2015; Kirkpatrick et al. 2019; López Alonso et al. 2018; Robinson et al. 2016; Saylor et al. 2016), medical students (Chang et al. 2009; Day et al. 2015; Dobbins 2011; Green et al. 2011; Head et al. 2016; Moody et al. 2008; Schulz et al. 2013) or both nursing and medical students (Lewis et al. 2016). The total number of participants varied from 19 to 329 (Table 3). The instruments used in the studies are presented in Table 3.

The studies measured the effect of the teaching methods on attitudes to care of a dying person and death (Carman et al. 2016; Dobbins 2011; Jafari 2015; Jo & An 2015; Lewis et al. 2016), attitudes and competences towards palliative care (Chang 2009). The studies focused also on the effects of the teaching methods on competencies of symptom control and enhancing physical comfort (Carman et al. 2015; Jafari et al. 2015; Kirkpatrick et al. 2019; Robinson et al. 2016), responding to the patients' psychological and social needs (Day et al. 2015; Green et al. 2011; Robinson et al. 2016) and meeting the needs of family caregivers (Saylor et al. 2015; Kirkpatrick et al. 2019).

Effects on competence in ethical decision and clinical or ethical decision making (Chang 2009, Schulz et al. 2013; Jo & An 2015) were measured. The effects of education on competencies of advanced care planning were also studied (Green et al. 2011). The effect on communication skills (Jo & An 2015; Fluharty et al. 2012, Lopez Alonso et al. 2018), interdisciplinary competence or team-based skills (Head et al. 2016; Saylor et al. 2015) and self-awareness (Fluharty et al. 2012; Kirkpatrick et al. 2019) were measured. The aims also included assessing the impact of teaching palliative care in an eLearning format (Day et al. 2015) and using a computer program as an educational tool (Green et al. 2011).

Results of the meta-analysis

Seven studies (Carman et al. 2016; Dobbins 2011; Jafari et al. 2015; Jo & An 2015; Kirkpatrick et al. 2015; Lewis et al. 2016; Robinson et al. 2016) reported the effects of teaching interventions on students' attitudes towards death and caring for a dying person and his or her family (Figure 4). In those studies, the teaching methods used were simulations (Carman et al. 2016; Kirkpatrick et al. 2015; Lewis et al. 2016), lectures, films and group discussions (Jafari et al. 2015), humanistic nursing educational pedagogies (Jo & An 2015), observing interdisciplinary teams working in palliative care (Robinson et al. 2016), and using a combination of presentations, visits to hospitals and funeral homes and a film (Dobbins 2011). The studies included had a high heterogeneity (I^2 92.0%, $P=0.00$) and random model was used for the analysis. The results of the meta-analysis showed that diverse types of palliative care education interventions can (SMD=-0.86, 95% CI -1.65 -0.08, $P=0.03$) improve students' attitudes towards death and caring for a dying person (Figure 4). However, there are only few numbers of studies, so the significance should be interpreted cautiously.

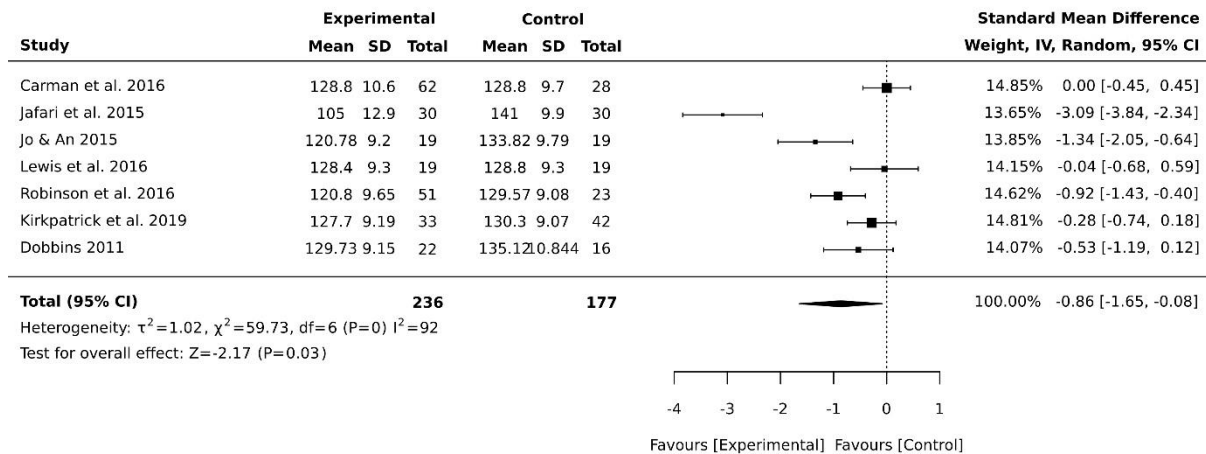


Fig. 4. Effect of teaching interventions on students' attitudes

Teaching interventions (lectures, films and group work about dying) improved students' attitudes significantly about the care of dying patients (mean score 3.5 ± 0.43 vs 4.7 ± 0.33 , $p < 0.001$) (Jafari et al. 2015). Use of a learning bundle including didactic content coupled with open classroom discussions and simulations, decreased students' negative attitudes about discussing death ($p < 0.03$) and being present at the moment of death ($p < 0.04$) (Carman et al. 2015). Simulations decreased students' fears of causing addiction to the patients when providing adequate pharmacological care during the dying process ($p < 0.01$) (Carman et al. 2015). Furthermore, the study of Dobbins (2011) demonstrated that contact teaching with discussions had a positive impact on nursing students' attitudes toward death and care of the dying patient, with the total FATCOD increasing from a pre-intervention mean of 126.75 to a post-intervention mean of 137.50 ($p < 0.05$).

Results of the narrative synthesis

In the narrative synthesis five themes were formulated: The effect of multidimensional interventions; The effect of elective courses; The effect of simulation; The effect of web-based and gaming interventions; The effect of interdisciplinary and problem-based education

Multidimensional interventions were shown to be *effective* for students' learning outcomes. Education interventions which consisted of a variety of teaching methods such as contact teaching and films (Jafari et al. 2015), didactic lectures, bedside patient care and interactive discussions (Chang et al. 2005) or using lectures, interactive discussions, patient exposure and role-play (Schulz et al. 2013) were effective. The students' attitudes changed towards the preferred goals in the care of dying patients (Jafari et al. 2015). Medical students demonstrated a significant improvement in knowledge (a pre-test score of 9.97 vs a post-test of 12.73; $p<0.001$) (Chang et al. 2005) and self-estimation of knowledge skills in palliative care improved from a mean value of 8.30 to 13.20 (SD 2.11/2.17; $p=0.001$). The students' "willingness to accompany dying patients" improved from a mean value of 21.40 to 37.30 (SD 6.82/6.65; $p<0.001$) and "competence in communication with dying patients and their relatives" increased significantly ($p=0.001$) (Schulz et al. 2013).

The participation in an *elective palliative care course* increased students' knowledge of palliative care, as measured by the PCQN score (12.17 ± 1.82 vs 10.02 ± 2.74 ; $p=0.001$) (Robinson et al. 2016). The students reported that they had not received enough education about caring for dying patients and only a few students had had previous experience with dying patients during their clinical practice before they participated in the educational intervention (Jafari et al. 2015). Moreover, students' fear of death (DAP-R subscale) decreased significantly when participating in an elective course ($p<0.005$) (Dobbins, 2011).

Simulations affected on the students' competencies. Both attitude towards care of dying patients and knowledge of palliative care improved according when simulations were used. Students demonstrated increased knowledge, self-awareness and quality performance after simulation of palliative nursing care, regardless of whether or not they had had previous end-

of-life experience (Kirkpatrick et al. 2019). Fluharty's study (2012) demonstrated that end-of-life simulations enhanced nursing students' knowledge: the mean score on the 10-item-instrument "Knowledge Related to End-of-Life Care" improved from 7.98 ± 1.48 to 9.15 ± 1.12 ($p=0.000$). Simulations also allowed nursing students to reach a good level of self-confidence in caring for a dying patient ($M=6.86 \pm 0.61$).

Interprofessional simulations improved students' self-efficacy. The GES improved from an overall mean of 2.64 (CI 2.60-2.74) to a mean of 3.01 (CI 2.94-3.10), $p=0.001$. This intervention also improved attitudes towards physician-nurse collaboration ($p=0.008$) (Saylor et al.2016).

The effect of web-based and gaming methods in palliative care education were also assessed. When using a palliative care game as a teaching intervention, students' fear of death decreased from a mean of 1.91 ± 0.996 to 1.65 ± 0.759 , on a scale from 1 to 5. A game-based teaching intervention also enhanced care and emotional preparedness, from 54% to 67% and 49% to 54%, respectively (Lopez Alonso 2018). Both web-based and small-group interactive curricula (Day et al. 2015; Green et al. 2011) improved medical students' self-efficacy in diagnostic and treatment skills, patient communication and prognosis skills, and social impact and self-care skills ($p<0.001$) and knowledge. Although small-group students were more likely to feel that the intervention helped them refine their interviewing skills compared with students in the eLearning group ($p<0.0001$) (Day et al. 2015).

In Green et al.'s study (2011), the use of a computer-based decision aid was found to be an effective method for teaching medical students how to discuss advance care planning with cancer patients. This learning tool increased students' knowledge ($p<0.01$), confidence in

helping patients with advance care planning ($p<0.01$) and knowledge of what matters to patients (4.4 vs 4.1 $p=0.05$, where 1=less knowledgeable, 5=more knowledgeable). Moreover, the students' global satisfaction with the advance care planning method was enhanced. The students' performance was rated by patients, and in the Decision Aid Group the patients were more satisfied with several aspects of the students' performance and the advance care planning method ($p<0.01$).

Interdisciplinary and problem-based education were shown to be effective. An interdisciplinary educational intervention for nursing and medical students enhanced their comfort with palliative care according to the EPCS scale and subscales, with a post-test score ≥ 3.60 on a scale from 0 to 4 (a mean change score of 0.99 ± 0.68 for nursing students and 1.15 ± 0.60 for medical students). Students made significant improvements after the intervention related to palliative care knowledge and skills and showed a readiness for interprofessional education. Qualitative feedback revealed that students appreciated the opportunity to observe palliative teams at work and practice team-based skills with other learners (Head et al. 2015). Problem-based learning in pediatric palliative care increased medical students' knowledge of the subject and self-assessed competency ($p=0.002$ and $p<0.001$) (Moody et al. 2018).

DISCUSSION

The aim of this review was to synthesize the evidence of the effects of different teaching methods used in palliative care education on students' competencies, knowledge, attitude, or skills. The interest was towards undergraduate nursing and medical students since it is shown that in order to develop and provide quality palliative care, competent nurses and physicians are needed and the education should be developed (Centeno et al. 2017; Connor 2014). This

review presents an overview of published results of effective teaching interventions in palliative care for nursing and medical undergraduate students.

This review shows that a wide range of different educational interventions had positive effects on students' attitudes and knowledge of palliative care and end-of-life care.

Furthermore, in addition to traditional face-to-face teaching, the use of educational technology seemed to be effective in learning palliative care. Use of computer-based decision aid Green et al. (2011) and educational games (López Alonso et al. 2018) were effective. Also web-based education was effective, although students who participated small group – teaching in classroom felt more likely that the education was beneficial to achieve their learning goals (Day et al. 2015). Also, previous studies address that gamification in nursing (Roche et al 2018) or medical (van Ooik et al. 2019) education could be useful and that e-learning can be at least as effective as other teaching methods in medical (Maertens et al. 2016) or nursing (McCutcheon et al. 2014) education.

Blended learning is a pedagogical approach where new online modalities are integrated along the traditional face-to-face education (Vallee et al 2020, McConville & Lane 2006). In this review none of the studies defined their approaches as blended learning, even though many interventions included multidimensional education (Schulz et al. 2013, Jafari et al. 2015, Chang et al. 2005). Recently published studies of Vallee (2020) and Berga et al. (2020) address that blended learning may have positive impact on nursing and medical students' learning outcomes. Therefore, assessing the effect of blended learning in palliative care is recommended.

In this review, the measured effects of the interventions on students' competences addressed most of the competence areas in the EAPC consensus White Paper (Gamondi et al 2013b). However, we did not find any studies evaluating the effect of different teaching interventions on developing students' spiritual competence.

Palliative care is an interdisciplinary approach (Radbruch & Payne 2009). In this review, the students brought out that they appreciated the opportunity to take part in an interdisciplinary education (Head et al. 2015). The EAPC recommendations of palliative medical curriculum and palliative nursing education highlight the development of the interdisciplinarity as an essential content in the palliative care education (De Vlieger 2004; Elsner et al. 2013). In conclusion, when using effective teaching methods, it is possible to improve students' learning outcomes in palliative care. This can lead to better quality in palliative care practices since it is shown that education may also improve to adapt patient centered care in general (Crawford & Zambrano 2015).

Strengths and limitations of this study

The strengths of this systematic review are that systematic selection process was undertaken independently by two reviewers to minimize subjective selection bias, guidelines (JBI) were followed for conducting the systematic review and PICO questions were used to clarify the search and research question. The data search was conducted with an information specialist (JBI 2017) and the literature search is described in the Figure 1, in order to allow readers to follow the process. This review assessed the methodological quality of the studies following JBI Critical Appraisal Checklist for Randomized Controlled Trials (RCT) and the JBI Critical Appraisal Checklist for Quasi-Experimental Studies (non-randomized experimental studies)

to avoid systematic bias and two investigators carried out quality assessment. The quality of the studies were good.

There were some limitations in this study. Firstly, articles written in other languages than English, Swedish or Finnish were excluded, so some relevant studies may have been left out. Secondly, due to our choice to include articles published after 2009 there is a possibility that previous studies would have brought further understanding. Thirdly, articles that were not available as full text from the library databases and via the library networks were excluded, which may have left out some relevant studies.

Conclusions

A wide range of different educational interventions has positive effects on students' attitudes, knowledge and skills of palliative care and end-of-life care. Students appreciated the opportunity to receive an interdisciplinary education. Web-based teaching and gaming were also effective in learning palliative care. However, there is a need for more rigorous research about effective educational interventions using a randomized design. In addition, the impact of blended learning approaches and teaching interventions on students' spiritual competence and long-term effects of education should be studied further.

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Supplementary material. Database search terms.

Database	Search terms
PubMed	<p>palliative care end of life care hospice care terminal care nursing student* medical student* medicine student* physician student* Students, Medical Students, Nursing Education, Medical, Undergraduate Education, Nursing, Baccalaureate Education, Nursing, Diploma Programs</p>
CINAHL	<p>palliative care end of life care hospice care terminal care nursing student* medic* student* physician student* Terminal care Students, Nursing, Baccalaureate Students, Medical Students, Nursing, Diploma Programs Students, Nursing, Practical</p>

	Students, Post-RN
	Education, Nursing, Baccalaureate
	Education, Medical
	Education, Post-RN
	Education, Nursing, Diploma Programs
	Education, Nursing, Practical
	Education, Nursing, Research-Based
Scopus	palliative care
	end of life care
	hospice care
	terminal care
	medic* student*
	nursing student*
	physician student*
	education*
Eric	teaching
	palliative care
	end of life care
	hospice care
	terminal care
	medic* student*
	nursing student*
	physician student*
	education*
	teaching
