Original Article

Impact of a Curriculum Reform in Graduate Students Self-Reported Palliative Care Competencies

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Abstract

Introduction. Expanding quality basic palliative care (PC) training for undergraduate health professionals is a key strategy to secure timely access to PC for the large population in need. However, evidence on the impact of changes in undergraduate medical curriculum in PC remains limited. This study aimed to assess the impact of expanded undergraduate PC training on students' self-perceived competencies, knowledge, and training adequacy, comparing cohorts before and after a curricular reform.

Methods. In this cross-sectional study, recently graduated medical students from two cohorts at the same university—one with limited exposure and the other with extended exposure to a PC curriculum—were invited to complete an electronic survey. The aim was to assess their perception of the PC training received during medical school, their self-assessed core competencies, and their knowledge in the field.

Results. 157 (64%) out of 244 graduates answered the survey. Students exposed to the extended PC curriculum, more frequently reported that the theoretical and practical contents received were sufficient ($P < 0.001$), had higher scores in PC knowledge assessment and, reported having significantly more skills to deliver bad news ($P = 0.01$), to evaluate physical symptoms ($P = 0.04$), spiritual symptoms ($P = 0.01$), to explain what the PC consist of ($P = 0.028$) and to evaluate emotional symptoms ($P = 0.003$).

Conclusions. Integrating and increasing exposure to PC training throughout the entire medical school curriculum enhances recently graduated medical students' perception of the adequacy of their training, strengthens their self-perceived competencies, and improves their knowledge in PC. J Pain Symptom Manage 2025;000:1−10.

Key Words

Medical school, palliative care education, Latin America

Introduction

The global need for palliative care (PC) continues to rise. The Lancet Commission on Global Access to Palliative Care and Pain Relief estimates that more than 70 million people experience serious health-related suffering (SHS) each year.[1] Nearly 90% of PC needs remain unmet, with the highest burden of unrelieved suffering found in low-income countries.[2] A key strategy to address this gap is to expand training in PC. In 2014, the World Health Assembly (WHA) Resolution 67.19 urged member states to integrate PC as an essential component of ongoing education for care pro-

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viders, including basic, intermediate, and specialized training.[3] Given the increasing global demand for PC, the WHA recommends that most of this care be delivered by general healthcare professionals equipped with basic competencies acquired during undergraduate education. Expanding high-quality PC training at the undergraduate level is therefore a critical strategy to ensure timely and equitable access to PC for the large population in need.[4]

There is evidence indicating that undergraduate medical students consider PC training essential[5,6]; however, many do not feel adequately prepared to care for patients in advanced or end-of-life stages.[7] A survey of Dutch medical students assessing their perception of PC education found that, although they acknowledged its importance, the curriculum did not cover many key aspects—reflecting their limited confidence and knowledge in the subject.[8] Therefore, evaluating the effectiveness of PC teaching methods is essential to ensure that graduating clinicians acquire the core competencies required to relieve SHS globally.

Over the past decade, undergraduate PC training has expanded steadily worldwide. In Europe, the number of countries reporting PC education in all or most medical schools increased from 30% in 2015 (13 of 43 countries) to 40% in 2025 (21 of 52 countries), according to the Atlas of Palliative Care.[9,10] In Latin America, Pastrana et al. reported that between 2012 and 2020, the proportion of medical schools offering a standalone PC course increased from 4.2% to 15.4%.[11,12] In Chile, PC education remains heterogeneous. In 2018, our team conducted a national survey of medical school directors. Among the 15 of 20 schools that responded (75% response rate), 48% reported offering PC as a compulsory subject, 12% as an elective, and 40% reported no formal PC instruction.[13] Despite these advances, PC training opportunities within undergraduate medical curricula remain limited.[14]

To date, no studies have assessed the long-term effects of a structured undergraduate curriculum reform in PC on students' knowledge and self-perceived competencies.

This study aimed to assess the impact of an expanded undergraduate PC curriculum on medical students' self-perceived competencies, knowledge, and perceived adequacy of training by comparing two cohorts—before and after the implementation of a curricular reform—in a medical school in Chile.

Methods

Curricular Reform at UC|Chile School of Medicine

The Pontifical Catholic University of Chile is one of the largest and most prestigious universities in the country. Its School of Medicine undertook a major curricular reform of its undergraduate medical program. This reform resulted from an extensive review of course content, teaching activities, and educational strategies. The review process incorporated internal evaluations from faculty and students, external feedback from employers and community stakeholders, an assessment of national health needs, and a comprehensive analysis of global trends in medical education.[15] As a result, a new competency-based graduate profile for physicians was developed.

Several structural and pedagogical changes followed this reform. First, the duration of the undergraduate program was reduced from 14 to 12 semesters, decreasing the number of preclinical semesters from six to five and shortening the mandatory internship from four to three semesters (Fig. 1). Second, the educational model shifted from a linear/sequential structure to a spiral curriculum, in which core content is revisited throughout the program with increasing complexity. Third, learning activities were reorganized in alignment with the newly defined competency profile. A key innovation was the formal incorporation of palliative care (PC) to integrate humanistic content, end-of-life care, communication skills, and a multidisciplinary approach—delivered throughout the curriculum by PC faculty.

The Director of the School of Medicine, together with a selected team from the Palliative Medicine Section, collaborated to design and propose the inclusion of theoretical and practical PC components across the curriculum. The process for defining and selecting these activities involved the following steps:

1) A review of the international literature on basic PC competencies for undergraduate training, including the European Association for Palliative Care (EAPC) recommendations, the Canadian undergraduate PC curriculum, and curricular models from internationally recognized universities with integrated PC programs.
2) Identification of the PC-related competencies included in the new graduate competency profile.
3) Selection of PC content and core skills relevant to the Chilean context.
4) Proposal of specific theoretical and practical learning activities to meet targeted educational objectives.
5) Review and formal approval of the proposal by the UC|Chile School of Medicine Curriculum Committee.

Descriptions of the PC curricula before and after the reform are provided in Fig. 1. Detailed listings of each class and practical activity included in each version of the curriculum are shown in Table 1.

1A – Number of dedicated hours to Palliative Care before the curricular reform was implemented (prior curriculum; cohort of 2014).

	Type of sessions	Y1 2014	Y2 2015	Y3 2016	Y4 2017	Y5 2018	Y6 2019	Y7 2020		Total
First semester	Classes				2h	2h	3h		Classes	11h
	Practical	4h							Practical	4h
Second semester	Classes				4h				Total	15h
	Practical									

1B – Number of dedicated hours to Palliative Care after the curricular reform was implemented (new curriculum; cohort of 2015).

	Type of sessions	Y1 2015	Y2 2016	Y3 2017	Y4 2018	Y5 2019	Y6 2020		Total
First semester	Classes	1h		1h			1h	Classes	20h
	Practical	4h			8h		4h	Practical	22h
Second semester	Classes			12h	3h	2h		Total	42h
	Practical				6h				

Fig. 1. Description of PC curriculums in the two cohorts of medical students. Each Fig. describes the number of hours per semester dedicated to PC. Each curriculum considers three types of courses in medical student training: preclinical courses (white), clinical courses, including clerkships (light gray) and internship courses (gray). (a) Number of dedicated hours to palliative care before the curricular reform was implemented (prior curriculum; cohort of 2014). (b) Number of dedicated hours to Palliative Care after the curricular reform was implemented (new curriculum; cohort of 2015).

In 2015, following the finalization of the new graduate competency profile, the curricular reform was officially implemented. Because the reform included a reduction in the overall duration of medical training, two cohorts of students were scheduled to graduate simultaneously in late 2020—one under the previous 14-semester curriculum with limited PC exposure, and the other under the new 12-semester curriculum with expanded PC training. This overlap created a unique opportunity to compare recent graduates' self-perceived competencies, knowledge, and perceptions related to PC under two distinct educational models.

Table 1
Summary of the Specific Contents of Classes and Activities in Both the Prior and New Curriculum

Prior Curriculum Content: (15 Hours)	New Curriculum Content: (42 Hours)
Y1, first semester, practical, 4h: visit to hospice institution	*Y1, first semester, class, 1h*: decision making in palliative medicine *Y1, first semester, practical, 4h*: visit to hospice institution
	Y3, first semester, class, 1h: diagnosis of imminent death syndrome
	Y3, second semester, class, 12h: introduction to palliative care, assessment in palliative care, pain pathophysiology and management, treatment of nausea, treatment of dyspnea, prognostication, end of life management, palliative sedation, introduction to communication, prognostic awareness, spirituality in palliative care, hydration and nutrition during end-of-life, nursing aspects of palliative care,
Y4, first semester, class, 2h: diagnosis of imminent death syndrome	*Y4, first semester, practical, 8h*: a four-day, two-hour rotation in a palliative care service.
Y4, second semester, class, 4h: introduction to palliative care in cancer patients, pain management and nonpain symptom management.	*Y4, second semester, class, 3h*: communication and delivering bad news. *Y4, second semester, practical, 6h*: communication and delivering bad news workshop.
Y5, first semester, class, 2h: seminar in PC in the outpatient context.	*Y5, second semester, class, 2h*: seminars on pain management and on end-of-life care in the inpatient context.
Y6, first semester, class, 3 h: seminars on pain management and end-of-life care in the inpatient context.	*Y6, first semester, class, 1h*: hospice care *Y6, first semester, practical, 4h*: one day rotation in a hospice.

Y = year; h = hours.

Study Design

We carried out a cross-sectional, observational study comparing two historical cohorts of medical graduates exposed to different undergraduate curricula. A first cohort that commenced their 14-semester undergraduate program in 2014 with the "*prior curriculum*", and a second cohort that commenced their 12-semester undergraduate program in 2015 with the "*new curriculum*". Due to the shorter duration of the new program, the two cohorts graduated simultaneously, providing a unique opportunity to compare two cohorts of students exposed to different curriculum. After graduation, we performed an online survey of the two cohorts that included baseline student characteristics and three educational domains: student perception of the PC training experienced throughout the medical school program, including specific topics, a self-perception assessment of core PC competencies, and a PC knowledge exam.

Baseline characteristics included student gender and age. We specifically included a question to assess whether the students participated in other PC educational activities outside the mandatory teaching program throughout the medical school, to assess the impact of these nonmandatory activities in the assessed outcomes.

Process

All students who graduated in December 2020 received an invitation to participate anonymously in the study. The invitation was sent to the students registered email at the school of medicine administrative database between January 2021 and April 2021. The invitation included a link to complete a questionnaire to assess PC competencies and knowledge in a Google Forms document. To promote survey completion, the email included an invitation to participate in a lottery of two gift cards to purchase coffee in the university cafeteria among all students who completed the survey. Follow-up emails were submitted every three weeks for those who did not complete the survey, until the recruitment period was completed.

Survey Design

First, student perception of the PC training experienced throughout the medical school program was assessed with three questions asking about the importance of PC training in medical school, and about whether the number of PC theoretical classes and activities were sufficient. We also included 10 questions to assess whether specific PC topics were addressed adequately throughout their training. For each one of these 13 questions students completed a five-item Likert scale: totally disagree, disagree, neither agree or disagree, agree, totally agree. For analytical purposes we considered that students reported that the topics were adequately addressed if they answered agree or totally agree. The survey is described in Appendix 1.

Second, we included a questionnaire to assess students' self-perception of PC competencies, which was adapted from a survey used by Mutto et al.[16] to evaluate the impact of PC education in medical students in Argentina. The competencies assessed were selected from the European Association of PC recommendations on undergraduate basic PC skills.[17] The questionnaire included 12 items and is described in Appendix 2. Each competency was assessed asking the student to report how confident they felt using a five-item Likert scale, with each possible response having a numeric equivalent (not at all = 1, a little = 2, regular = 3, very = 4 and absolutely = 5). For analytical purposes we collapsed the five categories into three: not confident (not at all and a little), regular and confident (very and absolutely). To assess overall self-perceived competence in PC skills we created a composite score, adding the score of each question. The total score ranged from 11 to 55 points, with higher scores meaning higher self-perceived PC competencies.

In addition, 12 multiple-choice questions were asked to assess knowledge in PC. These questions were developed based on the basic knowledge that an undergraduate student is expected to have at graduation. Each question had five possible options and only one was correct. Eleven of the questions were paired with each of the competencies assessed in the self-perception survey.

Statistical Analysis

Descriptive statistics were used to summarize collected data. Sample size, mean, and standard deviation (SD) were reported for continuous normally distributed variables. For categorical and binary variables, frequencies and percentages were reported. We performed a univariate analysis, exploring the association between exposure to the new curriculum and each of the three educational domains including student perception of the PC training experienced throughout the medical school program, self-perception assessment of core PC competencies, and a PC knowledge exam. The main association of interest was the relationship between exposure to the new curriculum with the self-perceived PC competency total score.

We then performed a sensitivity analysis, excluding the students who voluntarily participated in nonmandatory PC educational activities, as the inclusion of this group of students could interfere in the impact assessment of the new curriculum in students' self-perceived PC competencies and knowledge. In fact, students who participated in nonmandatory educational activities might have a special interest in the field which may affect the main association of interest.

Finally, we performed a multivariate analysis using linear regression, using the self-perceived PC competency total score as the dependent variable with exposure to the new curriculum as an independent variable, adjusted for other covariates. All analyses were carried out using a standard software package (Stata, version 16.1; StataCorp).

Ethical Considerations

All procedures of this study were approved by the local Ethics Committee (Comité Ético Científico – Facultad de Medicina, Pontificia Universidad Católica de Chile, Protocol Number 201104002) and were conducted in accordance with the principles embodied in the Declaration of Helsinki. All participants provided informed consent through the online survey. Data confidentiality was maintained throughout the study. Only trained personnel in maintaining confidentiality and the Primary Investigator had access to study records.

Results

One hundred and fifty-seven (64%) out of 244 graduates completed the survey. Sixty-nine out of 103 (67%) and 88 out of 141 (62%) graduates completed the survey from the prior and the new curriculum cohorts, respectively. Demographic characteristics are described in Table 2. Thirty-three students (21%) participated in nonmandatory PC educational activities, with a higher proportion of participation among students from the prior curriculum program (30% vs 14%, $P = 0.01$). The types of nonmandatory PC educational activities in which they participated are described in Table 2.

All but one student considered important to include PC as a key component of the undergraduate curriculum. Twenty-five percent and 12% of students agreed that the number of PC theoretical classes and PC practical activities were adequate, respectively. Students exposed to the new curriculum reported statistically significant higher proportion of agreement regarding the adequacy of the number of theoretical classes and practical activities, compared to the students exposed to the prior curriculum (Table 2). Students in the new curriculum reported significantly higher perception that the topics described were adequately addressed throughout medical school, with differences in 7 of the 10 items evaluated (Table 3).

Regarding self-perception of PC competencies, more than half of the graduates from both cohorts reported feeling average or very confident in the different evaluated domains (Table 4). The mean (SD) composite score assessing overall self-perceived competence in PC skills was similar in the prior and new curriculum (32.8(7.6) vs. 34.1(5.7), $P = 0.22$). However, when comparing the composite score excluding

Table 2
Baseline Characteristics and Perception of PC Training

	Total Sample N = 157 N (%)	Prior Curriculum N = 69 N (%)	New Curriculum N = 88 N (%)	*P*
Female	80 (51%)	34 (49%)	46 (52%)	.71
Age (mean; SD)	25 (1.4)	26 (0.1)	25 (0.2)	**.02**
Student participation in nonmandatory Palliative Care educational activities	33 (21)	21 (30)	12 (14)	**.01**
Nonmandatory PC educational activities				
Elective course in same institution	11 (7)	8 (12)	3 (3)	**.05**
Elective course in other institutions	9 (6)	5 (7)	5 (5)	.47
Elective internships	12 (8)	9 (13)	3 (3)	**.02**
Other	6 (4)	4 (6)	2 (2)	.25
It is important to include PC in undergraduate medical education				
Totally disagree	1 (1)	0 (0)	1 (1)	.65
Disagree	0 (0)	0 (0)	0 (0)	
Nor agree or disagree	0 (0)	0 (0)	0 (0)	
Agree	17 (11)	7 (10)	10 (11)	
Totally agree	139 (89)	62 (90)	77 (88)	
The number of PC theoretical classes you had were adequate				**< .001**
Totally disagree	20 (13)	17 (25)	3 (3)	
Disagree	73 (47)	34 (49)	39 (44)	
Nor agree or disagree	26 (17)	8 (12)	18 (21)	
Agree	37 (24)	10 (15)	27 (31)	
Totally agree	1 (1)	0 (0)	1 (1)	
The number of PC practical activities you had were adequate				**< .001**
Totally disagree	48 (31)	34 (49)	14 (16)	
Disagree	72 (46)	29 (42)	43 (49)	
Nor agree or disagree	18 (11)	2 (3)	16 (18)	
Agree	18 (11)	4 (6)	14 (16)	
Totally agree	1 (1)	0 (0)	1 (1)	

[+]chi-square; *t-test.
Bold values indicate p-value < 0.05.

Table 3
Student Perception Regarding Whether the Described Topics Were Addressed Adequately Throughout Medical School Training

PC Topics	All Students N = 157		
	Prior Curriculum N = 69 N (%)	New Curriculum N = 88 N (%)	*P*
Assessment and treatment of pain	31 (45)	56 (64)	**.019**
Assessment and treatment on other physical symptoms	23 (33)	50 (56)	**.003**
Screening of spiritual symptoms	4 (6)	20 (23)	**.003**
Assessment of psychological symptoms	16 (23)	32 (36)	.08
Communication skills to approach patients and families	22 (32)	64 (73)	**<.001**
Assessment and treatment of patients during end-of-life	18 (26)	39 (44)	**.018**
Support during bereavement	10 (14)	30 (34)	**.005**
Limitation of therapeutic effort and proportionality	34 (49)	53 (60)	.17
Hydration and nutrition	14 (20)	18 (20)	.98
Nursing care	31 (45)	56 (64)	**.019**

Bold values indicate p-value < 0.05.

students who had extracurricular nonmandatory PC training a statistically significant difference was found (30.7(7.1) vs. 33.7(5.6), $P = 0.01$)., When analyzing the specific self-perceived competencies, there were differences among students exposed or not exposed to the new curriculum. Students exposed to the new curriculum reported having significantly more skills to deliver bad news (p 0.01), to assess physical symptoms ($P = 0.04$) and to assess spiritual symptoms (p 0.01). This difference increases if we exclude students who had PC educational activities outside the regular (nonmandatory) curriculum. Significant differences in self-perception of competencies regarding the skills to explain what the PC consist of (p 0.028) and to evaluate emotional symptoms ($P = 0.003$) were found.

When evaluating the knowledge of both groups we also found statistically significant differences, with higher scores in knowledge among students with the new curriculum ($P < 0.01$) (Table 5).

Discussion

This study demonstrates that the extensive integration of palliative care (PC) training into an undergraduate medical curriculum enhances students' perception of the adequacy of their training, strengthens their self-perceived competencies, and improves their knowledge in the field. Although improvement in overall self-perceived competencies was not observed when comparing students exposed and unexposed to the new curriculum, an improvement was observed when excluding those who had received extracurricular PC training. These findings suggest that the observed improvements are attributable to the curricular reform itself rather than to differences in participation in additional educational activities. It is important to note that significant differences were identified only in some of the assessed competencies, which may be partially explained by the limited PC training included in the prior curriculum. Larger differences might have been observed if the comparison had been made against a curriculum with no PC content at all.

Students exposed to the new curriculum also reported a higher level of agreement regarding the adequacy of exposure to various PC topics, confirming their awareness of increased engagement in PC-related learning activities. Nevertheless, several key areas—such as spiritual symptom screening, psychological assessment, bereavement support strategies, and hydration and nutrition during the end of life—were still perceived by many students as insufficiently addressed. The incorporation of additional training strategies, such as guided clinical observation with PC teams or longer rotations with direct patient care, may enhance students' opportunities to observe and develop these competencies in real-life settings.

Although the increase in knowledge scores between the cohorts —from 10 to 11 out of 12 correct answers —was statistically significant, the difference was small and both cohorts had a high rate of correct responses. These finding could be explained by several reasons. First, they suggest that students in both curricula received a similar number and type of theoretical PC sessions addressing the core aspects of the field. Second, the number of questions was small, decreasing the ability of the test to discriminate between groups. Finally, it is possible that students used web-based or other sources to help answer the questions, although this is unlikely because the assessment was anonymous

Table 4
Comparison of Self-Reported Confidence in PC Competencies Between the Old and the New Curriculum

PC Competencies	All Students N = 157			All Students Excluding Those Who Participated in Nonmandatory PC Educational Activities (Outside the Regular Curriculum) N = 124		
	Prior Curriculum N = 69 N (%)	New Curriculum N = 88 N (%)	*P*	Prior Curriculum N = 48 N (%)	New Curriculum N = 76 N (%)	*P*
Delivering bad news			**.01**			**.002**
Not confident	18 (26)	9 (10)		16 (33)	7 (9)	
Regular	32 (46)	39 (44)		20 (42)	35 (46)	
Confident	19 (28)	40 (46)		12 (25)	34 (45)	
Explaining PC			.07			**.028**
Not confident	9 (13)	10 (11)		8 (17)	8 (11)	
Regular	22 (32)	15 (17)		18 (38)	15 (20)	
Confident	38 (55)	63 (72)		22 (46)	53 (70)	
Withdrawing or withholding treatment			.85			.79
Not confident	17 (25)	19 (22)		14 (30)	18 (24)	
Regular	27 (39)	38 (43)		19 (40)	38 (42)	
Confident	25 (36)	31 (35)		31 (32)	26 (34)	
Assessing physical symptoms			**.04**			**.001**
Not confident	10 (14)	3 (3)		10 (21)	1 (1)	
Regular	24 (35)	35 (40)		16 (33)	30 (39)	
Confident	35 (51)	50 (57)		22 (46)	45 (59)	
Assessing emotional symptoms			.13			**.003**
Not confident	15 (22)	9 (10)		14 (29)	5 (7)	
Regular	21 (30)	33 (38)		14 (29)	32 (42)	
Confident	33 (48)	46 (52)		20 (42)	39 (51)	
Assessing spiritual symptoms			**.01**			**.017**
Not confident	33 (48)	31 (35)		26 (54)	28 (37)	
Regular	15 (22)	40 (46)		10 (21)	35 (46)	
Confident	21 (30)	17 (19)		12 (25)	13 (17)	
Prescribing an analgesic treatment			.74			.24
Not confident	14 (20)	22 (25)		13 (27)	21 (28)	
Regular	35 (51)	40 (45)		27 (56)	33 (43)	
Confident	20 (29)	26 (30)		8 (17)	22 (29)	
Treating physical symptoms			.98			.25
Not confident	15 (22)	18 (20)		14 (29)	16 (21)	
Regular	29 (42)	37 (42)		24 (50)	34 (45)	
Confident	25 (36)	33 (38)		10 (21)	26 (34)	
Providing support during bereavement			.29			.34
	28 (41)	26 (30)		21 (44)	24 (32)	
Not confident	26 (38)	43 (49)		17 (35)	36 (47)	
Regular	15 (22)	19 (22)		10 (21)	16 (21)	
Confident						
Providing end-of-life care			.55			.18
Not confident	32 (46)	36 (41)		29 (60)	33 (43)	
Regular	27 (39)	42 (48)		16 (33)	35 (46)	
Confident	10 (14)	10 (11)		3 (6)	8 (11)	
Recommending about nutrition and hydration			.56			.57
	41 (59)	46 (52)		31 (65)	42 (55)	
Not confident	21 (30)	34 (39)		14 (29)	29 (38)	
Regular	7 (10)	8 (9)		3 (6)	5 (7)	
Confident						

For analysis we collapsed the 5 categories into 3: Not confident (not at all and a little), regular and confident (very and absolutely). We performed a sensitivity analysis, excluding students who had nonmandatory PC educational activities (outside the regular curriculum).
Bold values indicate p-value < 0.05.

and evaluative. In any case, the assessment was able to detect a small but significant increase in PC knowledge, supporting the positive impact of the new curriculum.

Our findings also show that students from both cohorts considered PC training to be of great importance. This aligns with a previous study in which students who participated in an elective PC course reported overwhelmingly positive experiences.[18] Students described being surprised by the course's humanistic and holistic nature, its relevance to all patients, and its contribution to their development as more empathetic and prepared physicians. The fact that 30% of students from the older curriculum sought extracurricular PC education further highlights the value they place on acquiring such competencies.

The evidence supporting the effectiveness of educational interventions in undergraduate PC training is still scarce. A systematic review that included 19 studies

Table 5
Proportion of Students Who Correctly Answered Each Theoretical Question Assessing Different PC Topics

Topics	All Students N = 157			All Students Excluding Those Who Participated in Nonmandatory PC Educational Activities (Outside the Regular Curriculum) N = 124		
	Prior Curriculum N = 69 N (%)	New Curriculum N = 88 N (%)	*P*	Prior Curriculum N = 48 N (%)	New Curriculum N = 76 N (%)	*P*
Communication tools	63 (91)	88 (100)	**.005**	42 (88)	76 (100)	**.002**
Definition of PC	69 (100)	88 (100)	-	48 (100)	76 (100)	-
Ethical principles for decision making	66 (96)	83 (94)	.71	47 (98)	72 (95)	.38
Relevance of symptom assessment in PC	58 (84)	74 (84)	.99	41 (85)	65 (86)	.99
Diagnosis of adjustment disorder	53 (77)	75 (85)	.18	35 (73)	65 (86)	.08
How to provide spiritual support	63 (91)	82 (93)	.66	43 (90)	72 (95)	.28
Opioid use in renal failure	57 (83)	82 (93)	**.039**	39 (81)	71 (93)	**.037**
Dyspnea management	65 (94)	86 (98)	.25	45 (94)	75 (99)	.13
Risk factors for complicated grief	66 (96)	88 (100)	.083	46 (96)	76 (100)	.15
Diagnosis of imminent death	33 (48)	73 (83)	**< .01**	18 (38)	66 (87)	**< .01**
Treating thirst during EOL	69 (100)	88 (100)	-	48 (100)	76 (100)	-
Use of subcutaneous route	66 (96)	84 (95)	.95	45 (94)	72 (95)	.82
# of correct questions (mean; standard deviation)	10.6 (.1)	11.3 (.1)	**< .01**	10.4 (.2)	11.3 (.1)	**< .01**

We performed a sensitivity analysis, excluding students who had nonmandatory PC educational activities (outside the regular curriculum).
Bold values indicate p-value < 0.05.

from five countries (USA, Australia, Germany, Canada, and China including Taiwan), with a total of 3253 participants, concluded that PC education improves medical students' knowledge.[19] However, no single teaching method proved superior, and no consensus emerged on the "best way" to teach PC. Most assessments relied on prepost intervention designs with immediate posttraining evaluations, offering little insight into long-term outcomes. Another review that qualitatively explored the influence of PC education on professional development found that such experiences foster patient-centered skills including communication, empathy, respect, holistic care, and self-awareness.[20]

Few studies have explored the long-term impact of integrating PC into the general medical curriculum. Ellmann et al.[21] reported on the implementation of a four-year longitudinal end-of-life (EOL) care curriculum using a variety of teaching methods focused on experiential learning and skill-building activities, including student self-reflection. Their mixed-methods evaluation—including written reflections, graduation surveys, and OSCEs—showed significant improvements in students' perception of training adequacy in EOL and PC. However, the study had limitations, including lack of reporting on response rates and limited comparison of OSCE results. Gerlach et al.[22] evaluated the impact of a mandatory PC course on graduates' self-perceived competencies and found that many still felt underprepared in several PC domains. A third study conducted at a single Finnish university by Letho et al. described how PC knowledge improved progressively over the course of undergraduate medical education and highlighted the positive impact of an optional PC course. Nonetheless, that study lacked a comparison group to assess the long-term impact of PC education on students' knowledge or self-perceived competencies.[23]

Multiple organizations and publications have issued recommendations to guide the development of undergraduate PC curricula.[24] For instance, the European Association for Palliative Care (EAPC) recommends allocating 40 hours of PC instruction across different years of medical school, covering domains such as PC definitions, pain, neuropsychological symptoms, symptom management, ethics and law, caregiver perspectives, and communication skills. It also emphasizes the inclusion of both theoretical and practical components and a wide range of educational strategies to foster integration of the discipline. The results of this study support the effectiveness of implementing a longitudinal PC curriculum in line with EAPC guidance in improving students' knowledge and self-perceived competencies.[10]

In addition to evaluating the impact of the curricular reform, our team identified several lessons that facilitated the expanded inclusion of PC in the broader reform process. First, the establishment of a core group of PC clinicians committed to teaching was instrumental in initiating dialogue with institutional leadership. Second, the curricular reform itself provided a timely contextual opportunity to discuss the relevance and benefits of expanding PC training. Third, the active involvement of stakeholders and decision-makers who recognized PC's contribution to humanistic and compassionate medical practice was key to successfully integrating it throughout the curriculum. These lessons

are consistent with those reported by international initiatives aimed at expanding PC training in undergraduate medical education.[25]

This study has several strengths. It allowed for a quasi-experimental comparison between two cohorts exposed to different curricula within the same institution and graduating in the same year. The response rate was relatively high, supporting the representativeness of the findings. Multiple outcome measures—perceptions, competencies, and knowledge—showed consistent improvements. Moreover, findings remained robust even when controlling for participation in extracurricular PC activities.

However, this study also has limitations. First, it was conducted at a single academic institution, limiting the generalizability of the findings. Second, knowledge was assessed using only one question per domain, restricting the ability to explore depth in specific content areas. Third, the study assessed only students' self-perceived competencies, without objective evaluation of practical skills. Thus, it remains unclear whether these self-perceived competencies will translate into clinical behaviors or improved patient care. As others have noted, the inclusion of PC in medical education currently has only indirect evidence of benefit for patient outcomes.[25] Nonetheless, improved self-perception and knowledge represent critical early steps toward behavioral change. Future longitudinal or controlled studies are needed to determine whether enhanced undergraduate PC training leads to improvements in clinical performance and patient outcomes.

Conclusion

This study demonstrates that the extensive integration with increased hours of teaching of palliative care (PC) into the undergraduate medical curriculum significantly improves students' perceptions of the adequacy of their training, enhances their self-reported competencies, and increases their knowledge in PC. The results support the effectiveness of implementing a curriculum aligned with the European Association for Palliative Care (EAPC) recommendations. Additionally, this experience highlights key lessons that enabled the successful and sustained incorporation of PC education as part of a broader medical school curricular reform.

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The authors declare no conflicts of interest.

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Appendix 1 Assessment of Undergraduate Palliative Care Education

Students were asked to respond to the following questions regarding their undergraduate education in Palliative Care (PC), using a five-point Likert scale:

	Strongly 1 Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
I believe it is important to include palliative care in undergraduate medical education.					
I consider the number of theoretical PC classes received during undergraduate training to be sufficient.					
I consider the number of practical PC activities received during undergraduate training to be sufficient.					

Specific Topics Addressed in the Undergraduate Curriculum:

Please indicate your level of agreement with the statement: "This topic was adequately addressed during my undergraduate education".

	Strongly Disagree	Disagree	Neither Agree Nor Disagree	Agree	Strongly Agree
Assessment and management of pain in patients with advanced illness.					
Assessment and management of other physical symptoms in patients with advanced illness.					
Assessment of spiritual symptoms in patients with advanced illness.					
Assessment of emotional symptoms in patients with advanced illness.					
Communication skills for addressing patients and families facing advanced illness.					
Assessment and care of patients at the end of life.					
Support for grieving individuals.					
Therapeutic proportionality and appropriateness of treatment goals.					
Hydration and nutrition in patients with advanced illness.					
Nursing care for patients with advanced illness.					

Appendix 2 Self-Perception of Palliative Care Competencies

Students were asked to assess their self-confidence regarding the following palliative care (PC) skills, based on the instruction:

"Please indicate how confident you feel in performing the following tasks."

	Not confident at all	Slightly confident	Moderately confident	Very confident	Completely confident
How confident do you feel in delivering bad news?					
How confident do you feel in explaining to patients what palliative care involves?					
How confident do you feel in suggesting withholding or withdrawing a treatment when it is disproportionate to the patient's condition?					
How confident do you feel in identifying physical symptoms, such as pain, nausea, or dyspnea, in patients with advanced illness?					
How confident do you feel in identifying emotional symptoms, such as anxiety or depression, in patients with advanced illness?					
How confident do you feel in identifying spiritual symptoms in patients with advanced illness?					
How confident do you feel in prescribing an analgesic regimen for a patient with advanced illness who is experiencing pain?					
How confident do you feel in treating physical symptoms, such as nausea or dyspnea, in patients with advanced illness?					
How confident do you feel in supporting a family through the grieving process?					
How confident do you feel in managing a patient at the end of life?					
How confident do you feel in making recommendations regarding nutrition and hydration for patients with advanced illness?					
How confident do you feel in making nursing care recommendations, such as placing a subcutaneous line, for bedridden patients with advanced illness at home?					