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REVIEW ARTICLE

The health care cost of palliative care for cancer patients: a systematic review

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Abstract

Objectives Several delivery models of palliative care are currently available: hospital-based, outpatient-based, home-based, nursing home-based, and hospice-based. Weighing the differences in costs of these delivery models helps to advise on the future direction of expanding palliative care services. The objective of this review is to identify and summarize the best available evidence in the US on cost associated with palliative care for patients diagnosed with cancer.

Methods The systematic review was carried out of studies conducted in the US between 2008 and 2018, searching PubMed, Medline, the Cochrane library, CINAHL, EconLit, the Social Science Citation Index, Embase, and Science Citation Index, using the following terms: palliative, cancer, carcinoma, cost, and reimbursement.

Results The initial search identified 748 articles, of which 16 met the inclusion criteria. Eight studies (50%) were inpatient-based, four (25%) were combined outpatient/inpatient, two (12.5%) reported only on home-based palliative services, and two (12.5%) were in multiple settings. Most included studies showed that palliative care reduced the cost of health care by $1285–$20,719 for inpatient palliative care, $1000–$5198 for outpatient and inpatient combined, $4258 for home-based, and $117–$400 per day for home/hospice, combined outpatient/inpatient palliative care.

Conclusion Receiving palliative care after a cancer diagnosis was associated with lower costs for cancer patients, and remarkable differences exist in cost saving across different palliative care models.

Keywords Palliative care · Cost · Cancer · Systematic review

Introduction

Palliative care as a medical specialty focusing on care for advanced cancer patients is growing at a rapid rate in the United States [1, 2]. The American Society of Clinical Oncology (ASCO) defines advanced cancer patients as those who have distant metastases, late stage disease, life-limiting cancer, and/or prognosis of 6 to 24 months [3]. According to WHO, "Palliative care is an approach that improves the quality of life of patients and their families facing the problems associated with life-threatening illness, through the prevention and relief of suffering by means of early identification and impeccable assessment and treatment of pain and other problems, physical, psychosocial, and spiritual" [4]. Growing evidence has demonstrated the benefits of palliative care to cancer patients, including improvements in quality of life [5–11], extended survival [12–14], reduction in length of hospital stay, less inpatient admissions, and emergency department and physician office visits [8, 15–21]. Studies have also shown palliative care to be associated with

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fewer depressive symptoms [6, 22], improved physical and psychological symptoms [10, 23], improved patient satisfaction [5, 17], and provider communication [17]. When offered early, palliative care decreases end-of-life chemotherapy use and increases referral to hospice care to maximize quality of life in the last days [18, 24, 25]. In light of current evidence, the ASCO recommends that clinicians integrate palliative care services in standard oncology practice and provide dedicated palliative care services to patients with advanced cancer early in the disease course [19]. As the number of elderly patients diagnosed with advanced cancer escalates, palliative care will play an increasingly important role in cancer care.

The importance of cost analysis in cancer care is well acknowledged, yet current research on the cost associated with palliative care for patients diagnosed with cancer is limited and disparate. Some studies [26, 27] examining the cost associated with palliative care in the inpatient setting among patients diagnosed with terminal illness have indicated that palliative care may be a cost-saving practice, whereas others [20, 28] have suggested that the cost difference between the palliative care group and the control group was statistically insignificant or cost was higher for the palliative care group. Estimating the cost associated with palliative care can be challenging, especially considering various palliative care delivery models. Currently, at least five delivery models of palliative care are available for cancer patients: hospital-based, outpatient-based, home-based, nursing home-based, and hospice-based palliative care [21]. Yet to date, no study has compared the economic impact of palliative services on cancer care across various palliative care delivery models.

As the number of palliative care programs grows, weighing the differences in costs related to palliative care is needed to inform the expansion of palliative care services. We conducted a preliminary search in PubMed and Google Scholar for existing systematic reviews on the topic and no review identical to the one proposed was found. We performed a systematic review of studies published from 2000 to 2018, which measured the cost associated with palliative care in patients diagnosed with cancer to better understand palliative care costs for cancer patients and their variations by different delivery settings. We critically appraised the available evidence to determine costs associated with palliative care and costs relative to the benefits of palliative care from the perspectives of payer, provider, and their variations by delivery settings to inform decisions about implementation and delivery of palliative care.

Methods

We used the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) guidelines [29] for conducting our systematic review. The topic was registered in the PROSPERO database.

Search strategy

A medical librarian searched the following 10 databases: PubMed (NLM), Web of Science, EbscoHost's Academic Search Premier, CINAHL, EconLit and Health Business Full Text, ProQuest's, ABI/INFORM and Dissertations and Theses Global databases, the Cochrane Library (Wiley), and ClinicalTrials.gov website. The searches were conducted October 4–15, 2018, using subject headings as well as truncated and phrase search terms in title and abstract as available for neoplasms of all histologic types at all sites, palliative care, costs, economics, claims, fees, charges, expenditures, dollars, monetary value, bills, spending, pricing, payment, budget, and United States. Subject terms were explored when applicable. The studies were limited to those published between January 2008 and July 2018, involving humans. The bibliographies of articles remaining after initial selection were screened for additional potentially suitable articles for inclusion. The bibliographies of relevant review articles were hand-searched to identify additional studies that may fit the study scope. Only publications in peer-reviewed journals were included, and all other publications such as case report, book, conference abstracts, letters, and comments were excluded. The publications resulting from comprehensive search were exported into EndNote Web, manually de-duplicated and shared with the study team. We also searched the gray literature for economic evaluations on the topic of interest using Scopus and ProQuest database to find conference abstracts, dissertations, and theses. The full search strategy is available in supplemental material.

Inclusion criteria

We used the PICO [30] framework to develop our inclusion criteria and search strategy. PICO is a mnemonic that stands for (P) population, (I) intervention, (C) context/setting, and (O) outcomes. We included all clinical studies that assessed the cost (outcome) associated with palliative care (intervention) in patients diagnosed with cancer (population) and were conducted in the US (context/setting) in our review. For the purpose of determining inclusion in the review, we operationalized palliative care as a consultation with a palliative care specialist of a palliative care team and included papers that met this operational definition of palliative care. Studies included were limited to those in the US, and studies from other developed countries were excluded because of the differences in healthcare expenditure and utilization of end-of-life care for patients diagnosed with cancer between different countries [31]. The costs had to be clearly reported in US dollars ($) to allow for comparison. For the purpose of this study, costs were defined as reimbursements paid by the insurer and adjusted hospital charges using the cost-to-charge ratio. Studies which focused solely on overall health care costs of cancer care (that is, lacking itemized costs for palliative care)

were excluded. When two or more articles reported on the same cohort, only the most recent findings were included. We limited our review to studies related to cancer diagnosis only because of the unique palliative care needs of cancer patients and differences between cost of care for cancer and non-cancer patients. We excluded studies on end-of-life care/hospice care unless the palliative care was included in the original study and the detailed costs and health care outcomes of palliative care were clearly reported. We included studies that reported palliative care cost associated with multiple diseases, if one of the diagnoses was cancer and the cost outcomes were stratified by type of disease. Included studies had to be empirical studies, in English language only, and published in the last 10 years, i.e., 2008–2018. We limited our review to the last 10 years to summarize the most recent evidence on the topic.

Study selection

Two out of three reviewers (SY, IH, JH) independently screened study titles and abstracts identified from the literature search and assessed their eligibility for inclusion in the review. The full text of studies selected from abstract review were then independently reviewed by two reviewers (SY, IH) and assessed from inclusion based on the eligibility criteria. In case of disagreements, a third reviewer (JH) assessed the abstract or full text for inclusion.

Data acquisition

We used MS-Excel to create a matrix using the PICOTTS (Population, Intervention, Comparator, Outcomes, Type, Timing, Settings) framework [32] for systematically reviewing the full texts. Two reviewers (SY, IH) independently extracted the following data for each study: author, year of publication, study design (RCT, retrospective, prospective cohort, quasi-experimental), country, year of data, study location (state, city), sample size, participants type (patients, caregiver), participant age, participant cancer type, participant cancer stage, participant race, palliative care setting (inpatient, outpatient, home, other), outcome (overall survival [OS], cancer-specific survival [CSS], quality of life [QoL], perspective (patient, provider, societal, payer), type of palliative care (consultation, radiation), timing of palliative care (early, late), comparison arm (if any), data source for costs, type of analysis for cost (nonparametric, statistical model), variable controlled for cost analysis, key results on costs, and key results on clinical outcomes. We assessed the quality of studies using evaluation criteria of 31 indicators compiled by Smith and colleagues [33]. Discrepancies among independent reviewers were resolved through discussions with senior authors. We assessed the quality of included studies using the CHEERS checklist [34] that provides consolidated assessment standards for studies reporting health economic evaluation. The results of which are reported in the Supplemental material.

Results

Literature search

The PRISMA flow chart of the search and retrieval process is shown in Fig. 1. Within databases, 1134 studies were identified (231 PubMed, 667 Web of Science, 173 CINAHL, 42 ABI/INFORM, 10 Health Business, 39 Cochrane Library, 11 ProQuest, and additional 395 from tracking backward and forward references). We removed 128 duplicate articles after merging the citations from all databases. Screening of article titles and abstracts resulted in 72 potentially eligible studies. Full texts of these studies were retrieved and reviewed for inclusion. Finally, 56 potentially eligible studies were excluded, leaving 16 studies for inclusion.

Study characteristics

The studies included differed in study designs, study settings, study populations, and interventions (Tables 1 and 2). Of the 16 selected studies, 13 were retrospective cohort studies, two were secondary analysis of a randomized control trial, and one used prospective observational design. Most of these studies were conducted at single center, except three studies which were conducted at multiple centers. The studies covered a range of palliative care programs including inpatient, outpatient, and home-based care. All the studies had participants aged > 18 years except one study which included only children between the ages of 1 and 21 years.

Cost of palliative care

Data types and sources

To estimate the cost of palliative care, nine studies used the payer's reimbursement amount. This included five from Medicare, two from health system claims data, one from the Optum research database (included claims information from a large US health plan that offered both commercial and Medicare insurance), one from the National Inpatient Sample dataset. The remaining seven studies used data collected by health care providers in hospital systems like the electronic medical record (EMR), billing, and cost accounting databases.

Palliative care delivery models

Eight studies were based on inpatient palliative care services, four had both inpatient and outpatient palliative care services, two estimated the cost of home-/hospice-based palliative care

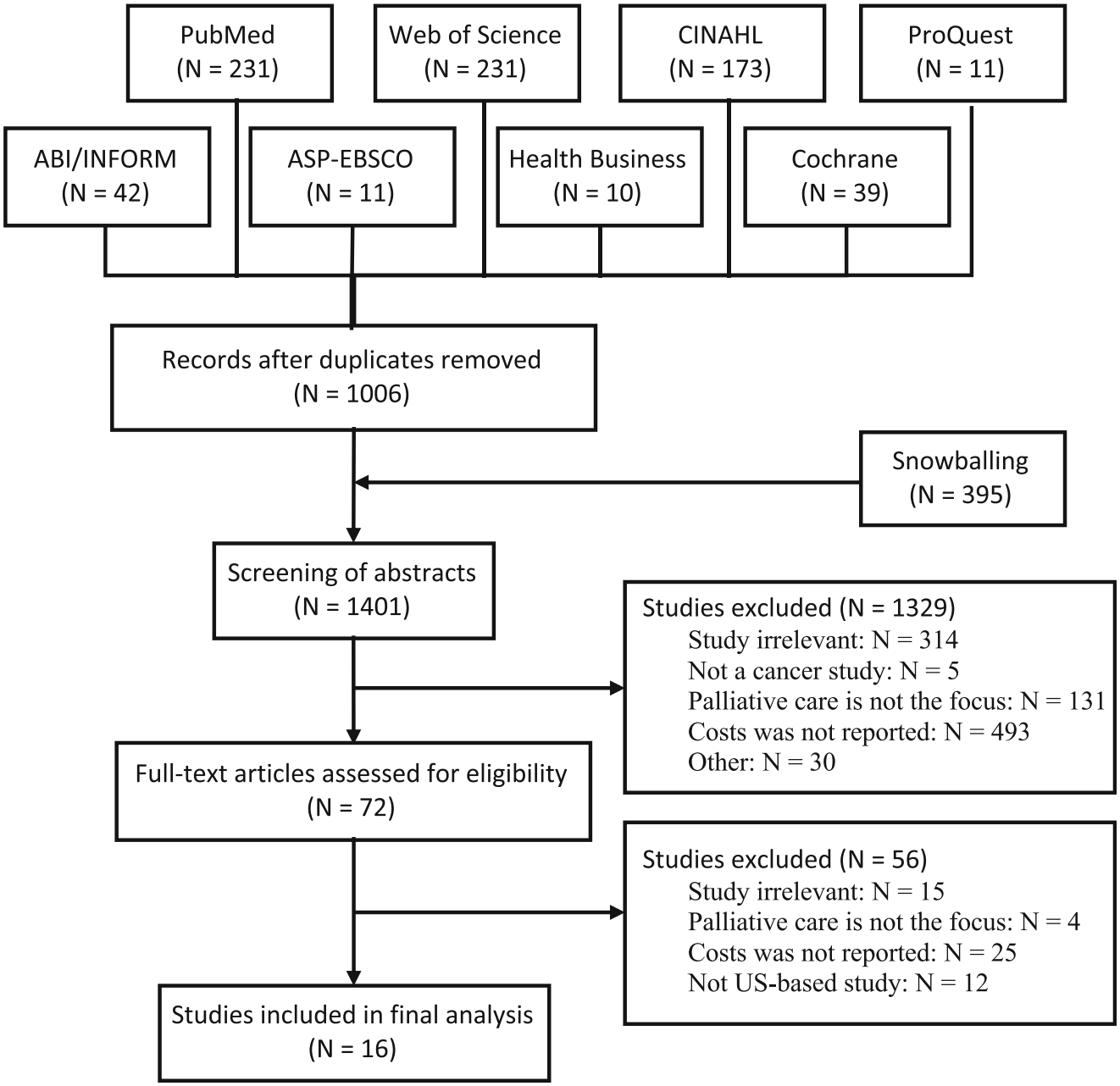

Fig. 1 Flowchart of the literature search strategy

along with inpatient and outpatient care, and two included only home-based palliative care services. Studies used various definitions of palliative care and provided limited descriptions about the components of palliative care services/program.

Healthcare cost estimates

In 13 out of the 16 studies, the cost associated with palliative care for cancer patients was found to be significantly lower than that for the comparison group [7, 9, 12, 13, 18, 24, 26, 27, 35–37, 39], while two studies reported no statistically significant differences in the cost of care [8, 20]. Only one study reported that the patients who received palliative consults incurred significantly higher cost of care in the last 30 days of life compared to patients who did not receive palliative care consults ($1436.8 vs. $1060.7) [28]. However, this difference was not observed for the cost of care incurred in the intensive care unit (ICU) in the last 30 days of life. There was substantial evidence for the positive effect of palliative care in hospitalization cost savings per patient and outpatient costs in the last month of life. Eight studies attributed the reduction in cost to the decrease in the number of admissions, ER visits, inpatient, and ICU length-of-stay in the final months of life [8, 15–21].

Table 1 Characterization of studies

Ref no.	Study	Study design	Cancer type	Stage of disease	Age of participants	Setting	Source of data
[28]	Bhulani et al. 2018	Retrospective cohort	Pancreatic	All stages	65+	Population based	Claims database (SEER Medicare)
[24]	Blackhall et al. 2016	Retrospective cohort	Lung, head and neck, colorectal, breast, gynecologic	Stage IV or advanced cancer	All ages	Single institution, rural, general hospital,	Clinical database
[35]	Cassel et al. 2016	Retrospective cohort	All cancer	Advanced cancer	65+	Single institution, general hospital	Claims and clinical database
[18]	Cassel et al. 2010	Retrospective cohort	All cancer	Advanced cancer	28 to 100 years	Single institution, rural, general hospital	Clinical database
[36]	Chang et al. 2018	Retrospective cohort	All cancer	Stage IV or advanced cancer with distant metastasis	18 to 95 years	Single institution, general hospital	Clinical database
[8]	Colligan et al. 2017	Retrospective cohort	Breast cancer, lung cancer, colorectal cancer, lymphoma, male or female genitourinary cancers, head and neck cancers	Advanced cancer	65 to 74 years	Multiple institution, cancer centers	Claims database
[12]	Greer et al. 2016	Secondary analysis of RCT	Lung cancer	Advanced cancer with metastases	65 or older	Single institution, cancer center	Clinical database
[13]	Henk et al. 2013	Retrospective cohort	Renal cancer	Advanced cancer with metastases	20 years or older	Single institution	Claims database
[9]	Lowery et al. 2013	Secondary analysis of RCT	Ovarian cancer	Advanced cancer, recurrent	65 or older	Single institution	Claims database
[27]	May et al. 2015	Prospective, cohort study	Metastatic solid tumor, CNS malignancy, head, neck, pancreatic cancer, metastatic melanoma, transplant-ineligible lymphoma, multiple myeloma	Advanced cancer	18 or older	Multiple institution, general hospitals and cancer centers	Clinical database
[37]	McCarthy et al. 2015	Retrospective cohort	All cancer	Advanced cancer	18 or older	Multiple institution, general hospitals	Claims database
[38]	Morrison et al. 2008	Retrospective cohort	All cancer	Advanced cancer	10 to 106 years	Multiple institution	Clinical database
[39]	Mulvey et al. 2015	Retrospective cohort	Head and neck cancer	Advanced cancer. Incurable	18 or older	Population based	National Inpatient Sample
[20]	Postier et al. 2014	Retrospective cohort, pre- and post-program intervention	All cancer	Advanced cancer	Up to 21 years	Single institution	Clinical database
[26]	Ruck et al. 2018	Retrospective cohort	Melanoma, breast, colon, gynecologic, prostate, head/neck, urinary tract, non-colon GI, lung, brain, bone/soft tissue, endocrine, nonlung thoracic	Advanced cancer	18 or older	Population based	National Inpatient Sample

Table 1 (continued)

Ref no.	Study	Study design	Cancer type	Stage of disease	Age of participants	Setting	Source of data
[7]	Scibetta et al. 2016	Retrospective cohort	Breast cancer, Gastrointestinal cancer, genitourinary cancer, other	Advanced cancer, died of cancer	22 to 101 years	Comprehensive cancer center	Claims and administrative data

Abbreviations: *PC* palliative care, *UC* usual care, *SEER* Surveillance Epidemiology and End Results, *CNS* central nervous system, *GI* gastrointestinal, *RCT* randomized control trail

Inpatient cost

The inpatient cost savings ranged from $1285–$28,270 [9, 26]. Lowery and colleagues reported cost savings of $1285 per patient associated with early palliative care compared to routine care. According to their study, early palliative care also had an incremental cost-effectiveness ratio of $50,000/QALY (quality-adjusted life year) [9]. Ruck and colleagues reported a statistically significant lower median cost of hospitalization for patients who received inpatient palliative care compared to those who did not receive palliative care ($36,857 vs. $65,127) for all cancer types with the exception of male genitourinary cancer [26]. Only two studies reported no statistically significant difference in hospitalization costs for palliative care patients [8, 20]. Colligan and colleagues reported that cost did not decrease significantly for patients receiving palliative care relative to the comparison group. The authors explained this could be due to the small sample size, as they observed increasingly lower costs per patient in the last 30, 90, and 180 days of life [8].

Outpatient cost

Only two studies reported outpatient cost savings separately from inpatient cost savings [7, 24]. The outpatient savings were in the range of $1000 to $1491 [7, 24]. In the study conducted by Blackhall and colleagues, the cost of care for the palliative care group was significantly lower than that of the control group in the last month of life ($1000 vs. $2000) [24]. Scibetta and colleagues reported an average direct outpatient cost of $11,549 for the last 6 months of life in patients who received early palliative care, which was lower than $13,040 in patients who received late palliative care [7].

Outpatient and inpatient cost

Four studies incorporated both inpatient and outpatient services in their palliative care programs. Three of the four studies reported a reduction in both outpatient costs and inpatient costs. The total cost savings achieved ranged from $1000 to $5198 [7, 13, 24].

Ancillary cost

Two studies reported a significant reduction in laboratory costs associated with palliative care use regardless of the timing of palliative care [27, 38]. The magnitude of this difference was greater for palliative care consults that occurred within 2 days of admission [27] and for patients who were discharged alive [38]. Both studies also found a significant reduction in pharmacy costs following palliative care consultation.

Table 2 Summary of studies Included in the review

Ref no.	Study	Cost perspective	Sample size	Palliative care setting	Palliative care timing	Palliative care intervention	Key cost findings	Key health outcomes
[28]	Bhulani et al. 2018	Payer	PC ($n = 3166$) UC ($n = 50,9$-64)	Inpatient and outpatient	PC started 30 days before death	Palliative care consults	Higher cost of care in ER in last 30 days for PC ($1436) than UC ($1060) No difference in cost of ICU care in the last 30 days	The mean ER visits in the last 30 days of life were significantly higher for patients who received PC versus those who did not. The length of ICU stay for PC patients was lower than those without. There was no difference in the number of ICU admissions between the two groups
[24]	Blackhall et al. 2016	Provider	PC ($n = 178$) UC ($n = 198$)	Inpatient and outpatient	PC started at the time of enrollment	Palliative care consults, hospice care	30 days prior to deathLower outpatient cost for PC (~$1000) than UC ($2000)Inpatient cost saving for PC in last one month ($4000)	PC patients were less likely to be admitted to the hospital in the last month of life. PC patients were also much less likely to die in the hospital
[35]	Cassel et al. 2016	Provider	PC ($n = 37$) UC ($n = 111$)	Home	PC started at the time of enrollment	Palliative care consults, caregiver support, advance healthcare planning, symptom management, patient and family education, psychosocial and spiritual support	Net savings per participant per month for PC patients were $4258 for cancer in total hospital cost	The percentage of participants hospitalized, and the number of hospital days were lower for PC than for UC group. The percentage being admitted in the final 30 days of life, using the intensive care unit in the final 30 days of life, and dying in the hospital were lower for PC than the UC group
[18]	Cassel et al. 2010	Provider	PC ($n = 91$)	Inpatient, outpatient, home	PC started 2 to 3 days after hospitalization	Palliative care consults	Hospital charges per patient for PC reduced by about $400 per day	Referrals to home hospice increased. PC patients were in the hospital for an average of 5–6 days
[36]	Chang et al. 2018	Provider	PC ($n = 105$) UC ($n = 76$)	Inpatient	PC started anytime during hospitalization	Palliative care consults, palliative radiation therapy	Average savings of $20,719 in total hospitalization costs for PC patients	Palliative radiation therapy regimens were associated with a 7-day decrease in median course duration
[8]	Colligan et al. 2017	Payer	PC ($n = 60$) UC ($n = 60$)	Inpatient	PC started at the time of enrollment	Advanced palliative care services	No statistically significant difference in total cost between PC and UC but increasingly lower per participant costs in the last 30, 90, and 180 days of life, for PC group	PC participants had a low overall rate of chemotherapy use
[12]	Greer et al. 2016	Provider	EPC ($n = 68$) UC ($n = 70$)	Inpatient, outpatient, home	EPC started within 3 weeks of diagnosis of advanced cancer	Palliative care consults	Early PC was associated with a lower mean total cost per day of $117 ($p = 0.13$) compared to UC	Patients assigned to PC experienced better quality of life than the usual care group. Fewer patients in the PC group experienced depressive symptoms. Median survival was longer among patient in the PC group.

Table 2 (continued)

Ref no.	Study	Cost perspective	Sample size	Palliative care setting	Palliative care timing	Palliative care intervention	Key cost findings	Key health outcomes
[13]	Henk et al. 2013	Payer	BSC A ($n = 186$) BSC B ($n = 88$)	Inpatient and Outpatient	After one or two lines of therapy	Survival and best supportive care (BSC)	Per Patient Per Month (PPPM) cost averaged $14,621 during the first LOT and $10,151 during BSC A following completion of one LOT. PPPM costs averaged $16,957 during the second LOT and $10,566 during BSC following completion of two LOTs	Not reported
[9]	Lowery et al. 2013	Payer	EPC($n = 77$) UC ($n = 74$)	Inpatient	EPC started at the time of diagnosis of advanced cancer	Palliative care consults	Early referral to PC was associated with a cost savings of $1285 per patient over UC	No clinical benefit other than QOL (no change in chemotherapy administration, hospitalizations or ED visits) for the PC group over UC
[27]	May et al. 2015	Provider	EPC ($n = 256$) UC ($n = 713$)	Inpatient	EPC started within 20 days of admission	Palliative care consults	PC interventions within at least 6 days of admission had an estimated cost-saving effect of $1312 compared with UC, and intervention within 2 days had an estimated cost-saving effect of $2280	Reduced LOS and reduced intensity of hospital stay for PC patients
[37]	McCarthy et al. 2015	Provider	PC ($n = 2392$) UC ($n = 36,0$-58)	Inpatient	PC started anytime during hospitalization; results stratified by timing (1–2,3-4,5-6,7-9,10–14-,50 or more days)	Palliative care consults	Overall cost savings from PC of $3647 per patient for those discharged alive and $7126 for those dying in the hospital. PC within 10 days of hospitalization exhibited average savings of $2696 patients among discharged alive and $9689 among patients who died	Not reported
[38]	Morrison et al. 2008	Provider	Discharged alive PC ($n = 2630$) UC ($n = 18,4$-27) Died in the hospital PC ($n = 2278$) UC ($n = 2124$)	Inpatient	PC started anytime during hospitalization	Palliative care consults	Palliative care patients discharged alive had an adjusted net savings of $1696 in direct costs per admission and $279 in direct costs per day. Palliative care patients who died had an adjusted net savings of $4908 in direct costs per admission and $374 in direct costs per day	Not reported
[39]	Mulvey et al.	Provider	PC ($n = 4029$)	Inpatient	PC started anytime during hospitalization	Palliative care consults		Not reported

Table 2 (continued)

Ref no.	Study	Cost perspective	Sample size	Palliative care setting	Palliative care timing	Palliative care intervention	Key cost findings	Key health outcomes
	2015		UC ($n = 76$,4-85)				Total cost of hospital charges for PC patients was $3395 lower than UC patients	
[20]	Postier et al. 2014	Provider	PC ($n = 200$) UC ($n = 225$)	Home	PC started at the time of enrollment	Palliative care consults, hospice care	Total charges did not differ significantly between the two groups	Cancer patients with the least amount of PC/hospice exposure experienced a decrease in number of admissions
[26]	Ruck et al. 2018	Provider	PC ($n = 20$,6-15) UC ($n = 124$,-186)	Inpatient	PC started anytime during hospitalization	Palliative procedures: pleural catheter, percutaneous endoscopic gastrostomy tube	The median (IQR) cost was $36,857 for patients who received PC, versus $65,127 for those who did not	PC was associated with significantly higher in-hospital mortality, particularly deaths in the first days of the hospitalization.
[7]	Scibetta et al. 2016	Provider	EPC ($n = 93$) UC ($n = 204$)	Inpatient and Outpatient	EPC started more than 90 days prior to death	Palliative care consults	The average direct cost of inpatient medical care in the last 6 months of life was lower for Early PC compared to Late PC ($19,067 vs $25,754)	Early PC group had improved performance on end-of-life quality measures. Patients who received early PC had a lower rate of inpatient admissions and ICU use, fewer instances of ED visits in the last 30 days of life, a lower rate of inpatient death, and fewer deaths within 3 days of hospital discharge. 30-day mortality rates were lower in the early PC group compared to late PC patients. Rates of 30-day readmission did not differ between early PC and late PC patients

Abbreviations: *PC* palliative care, *UC* usual care, *EPC* early palliative care, *ICU* intensive care unit, *LOS* length of stay, *ED* emergency department, *LOT* line of treatment, *BSC* basic supportive care

Payer and provider cost

All studies but one [20] that estimated cost savings from the provider perspective showed statistically significant savings associated with palliative care, ranging from $1312 to $20,719 [7, 12, 18, 24, 27, 35–37]. Of the studies that reported findings from a payer perspective, four out of six studies reported statistically significant cost savings in the range of $1285 to $28,270 [9, 13, 26, 39]. One of the remaining two studies found the differences in cost following palliative care was not statistically significant [8]. Only one study reported a significantly higher cost associated with palliative care [28].

Home/hospice, inpatient, and outpatient

Two studies reported findings from a comprehensive palliative care program in which the services included home/hospice, as well as outpatient and inpatient palliative care services. Both studies that included all three modalities in their palliative care program reported a reduction in hospital charges ranging from $117 to $400 per day [12, 18]. Greer et al. found that early palliative care group was associated with a cost-effectiveness ratio of $41,938/life year saved as compared to the standard care group [12].

Home-based

Out of the 16 studies, one study measured the cost of a home-based palliative care program. The net saving of palliative care use was $4258 per participant per month in total hospital cost. There was no significant difference in non-hospital costs [35].

Timing of palliative care

Twelve studies focused on the cost differences between providing palliative care and usual care [8, 13, 18, 20, 24, 26, 28, 35–37, 39], while the other four studies focused on the cost differences between early and late palliative care [7, 9, 12, 27]. The definition of early palliative care was inconsistent across the studies. Lowery and colleagues defined early palliative care as outpatient palliative care that was initiated at the time of diagnosis. They reported savings of $1285 attributable to early palliative care compared to routine care [9]. Greer et al. reported cost savings of $2527 for patients who underwent early palliative care as compared with those who did not [12]. In their study sample, patient assigned to the early palliative care group met with a palliative care physician or advance practice nurse within 3 weeks of enrollment. May et al. reported cost reductions of 14% and 24% among those who received early palliative care consultations, i.e., within 6 days and 2 days, respectively, of admissions as compared to the no-intervention group [27]. Scibetta et al. defined early palliative care users as patients who received outpatient palliative care at least 90 days prior to death and found the cost was $5198 lower than those who used palliative care late—within the last 90 days of life [7].

Type of cancer

Cancer type was specified in 10 studies. Six studies restricted their analyses to only one cancer type and the remaining four studies included patients diagnosed with multiple cancer types. Studies that analyzed the costs for only one cancer type included pancreatic cancer, bone cancer, lung cancer, renal cancer, ovarian cancer, and head and neck cancer. Studies that analyzed the costs for multiple cancer types included breast, lung, colorectal, head or neck, gastrointestinal, thoracic, male and female genitourinary, brain, endocrine, bone, pancreatic, laryngeal, throat, nasopharyngeal, esophageal, gastric, gallbladder, bile duct, liver, hepatic, ovarian, kidney, endometrial, uterine, cervical, prostate cancers, lymphoma, melanoma, multiple myeloma, mesothelioma, and glioblastoma multiform.

Health care outcomes

The health care outcomes measured in the studies were the number of hospitalizations, length of hospitalizations, number of ICU admissions, length of stay in the ICU, rate of chemotherapy use, quality of life, ED visits, mortality, and 30-day readmission rates. Use of palliative care was found to be associated with improvements in the quality of life [6–9, 12], similar or extended survival [6, 12, 13], fewer patients with depressive symptoms [6, 12], reduction in length of hospital stay, less inpatient admissions, and less number of emergency department and physician office visits [8, 15–21]. It is important to note that none of the studies reported any adverse effects of palliative care on clinical outcomes.

Discussion

Our systematic review aimed to identify cost associated with palliative care for patients diagnosed with cancer in different delivery settings in the US. Overall, most studies found that there were cost savings associated with palliative care program for patients suffering from advanced cancer. Similarly, this review found that palliative care in all delivery settings lead to reduced healthcare utilization and thus reduced cost. Our findings align with previous reviews of economic impact of palliative care, suggesting that palliative care is associated with reduced healthcare cost and improved care for patients with serious illness [21]. However, a few studies reviewed here reported that palliative care was not associated with reduced healthcare utilization or cost. This inconsistency in our findings can be explained in many possible ways [28]. First,

for the studied cohort, one-third of the palliative care consults happened in the last week of life. Other studies that reported economic benefit associated with palliative care stressed on the timing of palliative care. Early palliative care interventions were found to be associated with more cost savings than late palliative care interventions [7, 9, 12, 27]. Moreover, their analysis suggested that sicker patients were getting the referrals and also very late in the disease course which may have limited the impact of palliative care cost-benefit.

Our systematic review found several gaps in the available literature. First, none of the studies compared the costs and clinical outcomes of palliative care across multiple palliative care delivery models, reflecting that the cost and clinical effectiveness of alternative delivery methods of palliative care have not been studied well. Further, many studies had limited sample size and were limited to a single institution, which resulted in findings which were not statistically significant or had wide confidence intervals [8, 36].

Although most of these studies reported that palliative care in cancer patients provides cost savings to the payers and providers, direct comparison of cost associated with palliative care across studies is problematic due to differences in cancer types, palliative care services, and reimbursement rates for palliative care by payers. There were also considerable inconsistencies in terms of start time and duration of palliative care services as well as in the type of palliative care offered. The palliative care services in some studies were limited to outpatient or inpatient consultation, and in others, they also included caregiver support, advanced health planning, patient and family education, psychosocial and spiritual support, pain and non-pain symptom management, and palliative radiotherapy.

Data on the cost associated with palliative care to the patient and caregiver are still needed. None of the studies in our review provide any findings on the cost of care to the patient, family, or caregiver: all costs were estimated from either the payer's or provider's perspective. Future studies need to widen the perspective on examining the cost associated with palliative care to incorporate costs related to patient, family, caregiver, and society, such as out-of-pocket expenditure, opportunity cost of time, and travel cost. Nijboer and colleagues found that finances were one of the five dimensions of care giving in palliative care, citing a negative effect on the caregiver experience in end-stage cancer patients [40]. Without taking into account all other costs, the true magnitude of cost savings from palliative care programs may be underestimated.

Studying the costs of palliative care in isolation without considering quality of care will render the findings less meaningful. Many of the studies included in this review demonstrated the impact of palliative care on clinical outcomes, and none reported any negative impact. The health care outcomes commonly measured in these studies were the number of hospitalizations, length of hospitalizations, number of ICU admissions, length of stay in the ICU, rate of chemotherapy use, quality of life, ED visits, mortality, and 30-day readmissions. Patients in the palliative care group were less likely to be admitted to the hospital in the last month of life [7, 24, 35], had shorter lengths of hospitalizations [27, 28, 35, 36], and had a lower in-hospital mortality rates [7, 24, 35]. Palliative care patients also had higher odds of receiving hospice referral [18, 24] and better quality of life when compared to the control group [7, 9] though similar survival rates [13].

Our systematic review has several limitations. First, most of the studies were observational studies and do not provide evidence for a strong causal inference about the cost-saving effect of palliative care for patients diagnosed with cancer. Second, there were heterogeneities in the way costs measures were analyzed in the studies, rendering it impractical to derive an average effect size. Because of which, we qualitatively summarized the findings of the studies included in this review. Third, we gathered evidence related to costs associated with palliative care for cancer patients in the context of US healthcare and the findings may not be valid for other countries. Fourth, we excluded studies that did not report detailed costs of palliative care including how the costs were estimated. We feel the study with a sole number of costs of palliative care with no other details provides limited value to link the expenses and outcomes. Our study aimed to include economic outcomes of comprehensive palliative care services given to cancer patients; therefore, the literature reporting only single intervention, such as using radiation therapy to manage the cancer pain, was not included.

Conclusion

In summary, our study found an association between palliative care in cancer patients and lower health care costs. However, remarkable differences in cost exist in hospital-based and outpatient-based delivery models for palliative care. The cost savings of the other palliative care delivery models are still largely unknown. Given the current paucity of studies producing comparable conclusions, it is difficult to present any evidence on which palliative care delivery model represents the most cost-effective means of delivering palliative care.

Compliance with ethical standards

Conflict of interest The authors declare no conflicts of interest.

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