

# Trends in palliative care and life-sustaining procedure provision for patients with cervical cancer in the United States

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DOI: [10.31083/j.ejgo4206161](https://doi.org/10.31083/j.ejgo4206161)

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Submitted: 16 September 2021 Revised: 9 October 2021 Accepted: 14 October 2021 Published: 15 December 2021

**Objective:** This study aimed to identify trends in palliative care (PC) and life-sustaining procedures (LSP) provision and factors related to palliative care provision in patients with cervical cancer in the United States (US). **Methods:** This serial and cross-sectional study was based on the National Inpatient Sample dataset from 2008 to 2017. The compound annual growth rate (CAGR) was adopted for calculating annual change of PC and LSP. Multivariate logistic regression analyses were used to investigate factors related to PC. **Results:** The rate of PC consultation in patients with cervical cancer in the US increased steadily from 2.5% in 2008 to 12.8% in 2017 with the CAGR reaching 17.9% ( $p$  for trend  $< 0.001$ ). The annual change in the percentage of LSP was not statistically significant in the entire cervical cancer cohort (CAGR = 1.2%,  $p = 0.623$ ); however, a decreasing tendency was observed over time in the subgroups receiving PC (odds ratio, [95% confidence interval] = 0.95, [0.91–0.99]). Blacks, Hispanics, and Asian/Pacific Islanders were all more likely to receive PC than Caucasians. Patients with Medicaid as the primary payer less frequently received PC consultation than those with Medicare as the primary payer. In addition, the likelihood of undergoing LSPs increased with the severity of the disease. **Conclusion:** The rate of PC consultation in patients with cervical cancer in the US, although low, is increasing continuously. From a humanitarian perspective, increasing the rate of PC consultation in the treatment trajectory of cervical cancer is important.

## Keywords

Palliative care; Uterine cervical neoplasms; Medicaid; National inpatient sample

## 1. Introduction

The incidence of cervical cancer has rapidly decreased with the introduction of cervical cytology. In the United States (US), although the incidence of cervical cancer is continuously declining, approximately 13,800 new cases and

4290 deaths have been reported per year [1, 2]. Recently, a number of women have been benefiting from cervical cancer preventive measures due to the introduction of a HPV vaccine, a cervical cancer screening program, and advanced treatment [3]. Nevertheless, when preventive measures and adequate treatment have not been provided, patients have still suffered from cervical cancer [4]. The individual's economic status, race, and insurance type influence the receipt of preventive care and adequate treatment [5]. The five-year survival rate in patients with cervical cancer is relatively high in the early International Federation of Gynecology and Obstetrics (Federation Internationale de Gynecologie et d'Obstetrique, FIGO) stages, but five-year survival is poor in the advanced FIGO stages [6]. When cervical cancer is diagnosed at an early stage, the five-year survival rate was approximately 92% [7]. However, the five-year survival rate was approximately 58% when there was invasion into the surrounding tissue or organs, and the rate dropped to 17% in patients with distant metastasis. Recurrences generally have a low response rate to systemic therapy due to the absence of available effective systemic treatments, resulting in a high mortality rate [8, 9].

Palliative care (PC) is an interdisciplinary approach that improves the quality of life for patients and their families facing life-threatening and incurable diseases. The goal of PC is to alleviate physical, psychological, and spiritual suffering [10]. PC enhances communication, symptom control, patient satisfaction, resource utilization, and quality of life. Although the goal of PC is not to extend life, cancer patients with PC survived longer without less aggressive end-of-life interventions compared to patients with standard intensive care [11]. Moreover, introduction of PC reduced mortality

rates and shortened the length of stay in the intensive care unit for end-of-life cancer patients [12].

Although the World Health Organization (WHO) recommended early introduction of PC to cancer patients at any stages, the recommendation required time for broad acceptance [13]. In the US, establishment of a relatively well-established palliative care system, however, remains a problem due to imbalances in service provision and differences in hospital characteristics [14]. Most patients have experienced avoidable symptoms, particularly at the end of life. Patients' preferences were often discordant with aggressive care at the end of life. Despite our best efforts, about a third of cervical cancer patients in developed countries succumb to the complications of cervical cancer. One cause of this hurdle is the lack of communication between the patient, family, and medical staff [15]. Most patients do not want to talk to their physicians about end-of-life care [16]. Also, most oncologists put off discussion of life expectancy until treatment options have been exhausted.

In 2015, the Society of Gynecologic Oncology released a position statement regarding the introduction of PC in basic gynecological cancer treatment settings [17]. Approximately six years later, evaluation of the trends of PC provision for patients with cervical cancer is necessary. Therefore, we aimed to identify the trends in PC and LSP provision and to identify factors leading to PC provision in patients with cervical cancer in the US.

## 2. Materials and methods

### 2.1 Data source and patient cohort

In this serial and cross-sectional study we analyzed data from the National Inpatient Sample (NIS), a product of the Healthcare Cost and Utilization Project (HCUP) sponsored by the Agency for Healthcare Research and Quality [18]. This dataset is large and publicly available; this US database, consists of information on all-payer inpatient care of more than 7 million hospital stays.

Our analysis included the NIS dataset from 2008 to 2017. We applied survey weights and adjustments to provide the annual national population estimates. Our population of interest comprised adult patients more than 18 years old who had been diagnosed with cervical cancer. Patients with cervical cancer as the principal diagnosis and who were admitted to receive PC were identified using the International Classification of Diseases, Ninth and Tenth Revision, Clinical Modification (ICD-9-CM and ICD-10-CM) codes for cervical cancer (**Supplementary Table 1**). Data regarding these patient characteristics were evaluated: age, race (White, Black, Hispanic, Asian/Pacific Islander, and Native Americans/Others), payer source (private insurance, Medicare, Medicaid, and uninsured), number of comorbidity diagnoses, severity of illness based on the all-patient refined diagnosis-related group (APR-DRG), and median household income estimated from zip code information. Medicaid is a federal or state-funded program that covers health care for low-income individuals

and families while Medicare covers the elderly and disabilities. APR-DRG is a classification system of subdividing patients using the reason of admission, the severity of illness, and risk of mortality. Furthermore, data on these hospital characteristics were evaluated: regional information, location, teaching status, and bed size.

Anonymized and de-identified information for participants in the NIS database was used for all analyses; therefore, institutional review board approval was waived by the University of Nevada, Las Vegas.

### 2.2 Variables of interest

The main outcomes were the proportion of patients with cervical cancer who received PC consultation and underwent LSP by year. Patients with PC were defined as having had an "encounter for PC" (V66.7; ICD-9-CM, Z51.5; ICD-10-CM) and/or "other specified counseling" (V65.49; ICD-9-CM, Z71.89; ICD-10-CM). Life-sustaining procedures were defined as intubation, mechanical ventilation, non-invasive ventilation, infusion of vasopressor or intravascular pressure measurement, enteral or parenteral infusion of concentrated nutrition, cardiopulmonary resuscitation, blood transfusion, and hemodialysis (**Supplementary Table 1**).

### 2.3 Statistical analysis

We used the compound annual growth rate (CAGR) to quantify PC and LSP trends, and its statistical significance was tested using the trend regression analysis. CAGR is the mean annual growth rate of an investment over a certain period. Multivariable logistic regression analysis was performed to find factors associated with PC consultation and factors associated with LSP in patients with cervical cancer who had PC. All analyses were performed using SAS statistical software version 9.4 (SAS Institute Inc, Cary, NC, USA). All reported *p* values were 2-tailed, and a *p* value < 0.05 was considered statistically significant.

## 3. Results

### 3.1 Descriptive data analysis of patients and associated factors

Table 1 shows the characteristics of 52,124 patients who were admitted with a principal diagnosis of cervical cancer. The average patient age was 52.4 years with a standard deviation (SD) of 14.7 years. The most common age groups were the 40s and 50s (24.8% and 24.1%, respectively). The primary payer for 34.0%, 31.8%, and 24.4% of patients was Medicaid, private insurance, and Medicare, respectively. Additionally, 7.5% of patients received PC consultation, and 5.8% of patients underwent LSP. The hospitals admitting patients with cervical cancer were most often those with large numbers of beds located in rural areas of the Midwest region.

### 3.2 Temporal trends in PC and LSP

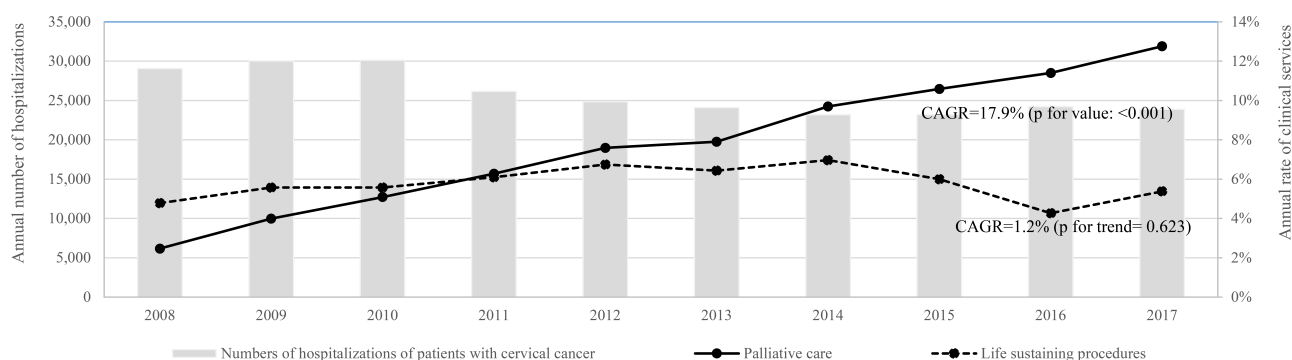
The rate of PC consultation steadily increased from 2008 to 2017 (Fig. 1). However, the number of LSP performed did not vary much over time. From 2008 to 2017, the compound annual growth rate (CAGR) of PC consultation and LSP were 17.9% (*p* < 0.01) and 1.2% (*p* < 0.62), respectively. The dis-

**Table 1. Characteristics of patients with cervical cancer and hospitals.**

Year	2008–2017	2008	2011	2014	2017
n	52,124	6030	5442	4637	4774
Weighted N (national estimate)	258,818	29,068	26,178	23,185	23,869
Socio-demographics					
Age, mean (std)	52.4 (14.7)	51.6 (14.8)	52.9 (14.8)	53.1 (14.7)	53.3 (15.1)
Age group (years)					
<30	4.2	5.1	3.9	4.0	4.3
30–39	16.2	17.0	15.0	15.7	16.0
40–49	24.8	25.8	25.8	22.9	21.6
50–59	24.1	23.9	23.5	25.1	23.7
60–69	17.0	15.4	17.0	18.2	19.3
70–79	8.9	7.7	9.5	8.9	10.0
≥80	4.8	5.1	5.3	5.2	5.1
Race					
White	56.8	60.9	54.6	59.2	55.5
Black	19.3	16.9	21.0	17.6	19.7
Hispanic	16.2	15.2	17.4	15.7	16.7
Asian/Pacific Islander	3.6	3.5	3.5	3.5	3.2
Native Americans/others	0.6	0.6	0.4	0.7	0.4
Payer source					
Medicare	24.4	21.2	24.6	26.6	29.2
Medicaid	34.0	29.2	34.3	35.6	34.9
Private insurance	31.8	38.9	30.7	29.6	28.6
Uninsured	5.8	5.5	5.4	4.8	4.5
No charge	0.9	1.1	1.1	0.9	0.5
Other	0.9	1.1	1.1	0.9	0.5
Median household incomes by zip code					
76th to 100th percentile	35.7	35.0	34.6	35.2	36.7
51th to 75th percentile	25.5	26.0	24.1	26.7	25.8
26th to 50th percentile	22.2	22.8	22.5	21.6	21.9
0th to 25th percentile	16.7	16.3	18.9	16.5	15.6
Hospitalization					
Palliative care consultation	7.5	2.4	6.3	9.7	12.7
Life-sustaining procedures	5.8	4.7	6.1	6.9	5.3
Intubation	1.6	1.1	1.5	2.0	1.8
LOS (days), mean (std)	5.3 (6.5)	5.1 (6.0)	5.2 (6.3)	5.6 (6.7)	5.6 (6.7)
In-hospital death	3.3	3.1	3.4	3.4	3.7
Hospital characteristics					
Bed size of hospitals					
Small	10.1	8.4	7.1	12.2	11.7
Medium	22.4	21.0	20.1	25.2	25.6
Large	67.5	70.6	72.8	62.6	62.7
Location & teaching hospital					
Urban non-teaching	5.9	6.5	7.2	5.0	4.7
Urban teaching	22.9	26.1	28.6	18.0	16.5
Rural	71.2	67.4	64.2	77.0	78.8
Region					
Northeast	19.8	18.1	19.6	19.3	16.5
Midwest	42.5	47.2	43.7	42.7	74.1
South	19.5	17.8	19.5	19.2	4.7
West	18.2	16.9	17.2	18.8	4.7

Note: data are presented as percentages unless otherwise indicated.

LOS, length of stay; std, standard deviation.



**Fig. 1. Trends in palliative care and life-sustaining procedures in patients with cervical cancer.** CAGR, compound annual growth rate.

tribution of each procedure was not indicated separately because the number of procedures performed was insufficient to measure change over time.

### 3.3 Factors associated with PC consultation and LSP

Table 2 presents the results of multivariable regression analysis associated with PC consultation in all patients with cervical cancer ( $n = 52,124$ ). Over time, the rate of PC consultation increased (odds ratio [OR] = 1.10, 95% confidence interval [CI] = 1.09–1.11,  $p < 0.0001$ ). Blacks, Hispanics, and Asian/Pacific Islanders were more likely to receive PC consultation than Whites (OR = 1.13, 1.16, and 1.38, respectively). Patients with Medicaid as the primary payer were less likely to receive PC consultation than people with Medicare as the primary payer (OR = 0.84, 95% CI = 0.76–0.93). In addition, the likelihood of receiving PC consultation increased with the severity of the disease based on the APR-DRG (OR = 1.30 and 1.10, respectively). The OR for PC increased with the number of comorbidity diagnoses (OR = 1.10, 95% CI = 1.09–1.10) and was significantly higher in patients who died in hospital (OR = 7.19, 95% CI = 6.42–8.04).

Table 3 shows the factors related to LSP in patients with cervical cancer receiving PC. Contrary to PC consultation, the possibility of performing LSP decreased over time (OR = 0.95, 95% CI = 0.91–0.99). In addition, the likelihood of undergoing LSP increased with the severity of the disease and the number of diagnoses (OR = 4.02 and 1.05, respectively).

## 4. Discussion

The rate of PC consultation in patients with cervical cancer in the US increased steadily, from 2.5% in 2008 to 12.8% in 2017, with the CAGR reaching 17.9%. Among patients with cervical cancer receiving PC consultation, the proportion of those receiving LSP decreased significantly each year (OR = 0.95, 95% CI = 0.91–0.99). Moreover, Blacks, Hispanics, and Asian/Pacific Islanders were more likely to receive PC than Whites. Patients with Medicaid as the primary payer less frequently received PC consultation than those with Medicare as the primary payer.

PC is a fundamental area that must be considered to prepare for “Well-Dying” in terminally ill patients with cancer. According to the World Health Organization (WHO) definition, PC is an approach that improves the quality of life of patients and their families facing the problems associated with life-threatening illness. PC prevents and relieves suffering by means of early identification, assessment, and treatment of pain and other physical, psychosocial, and spiritual problems [19]. Since this definition was established, the number of cancer centers with PC programs in the US has increased substantially [20]; however, the number of patients receiving PC consultation remains small. Our study substantiates this. To facilitate PC consultation by gynecological oncologists, the perceptions that PC consultation means giving up on patients, needs to be changed. Many healthcare providers and stakeholders retain those perceptions. PC consultation in patients with malignant tumors improves the quality of life of patients and their families when facing problems associated with the life-threatening disease. PC programs provide management for the reduction of pain and other distressing symptoms with the intention of neither hastening or delaying death [19]. PC should be provided in conjunction with the main treatment to help better manage physical and psychological conditions of patients and their families. PC has been provided to hospitalized patients with cervical and other cancers as well as non-cancer patients [21–24].

Cervical cancer was associated with socioeconomic position and demographic determinants [25]. In recent decades, preventive strategies, including screening and HPV vaccination, have played an important role in reducing cervical cancer incidence [26]. However, there are still sociodemographic imbalance in cervical cancer incidence and mortality [27]. Lack of access to healthcare screening among high risk, medically underserved women attributed to delay decreased incidence of cervical cancer [27]. Therefore, this difference would lead to higher rates of diagnosis at a more advanced stage in disadvantaged women who are ethnic minorities and have low socioeconomic status.

**Table 2. Factors associated with palliative care consultation in patients with cervical cancer (n = 52,124).**

Independent variable	Odds ratio	95% confidence interval	p-value
Year	1.10	1.09–1.11	<0.0001
Age groups (years)	1.01	0.98–1.03	0.7352
Race			
White (reference)	1.00		
Black	1.13	1.04–1.24	0.0056
Hispanic	1.16	1.05–1.28	0.0048
Asian/Pacific Islander	1.38	1.15–1.65	0.0006
Other	1.13	0.94–1.35	0.1914
Primary payer			
Medicare (reference)	1.00		
Medicaid	0.84	0.76–0.93	0.0014
Private insurance	0.99	0.91–1.08	0.8551
Uninsured	1.06	0.90–1.25	0.4808
No charge	0.37	0.20–0.68	0.0017
Other	1.80	1.50–2.15	<0.0001
Severity of illness: APR-DRG	1.30	1.23–1.37	<0.0001
NDX	1.10	1.09–1.10	<0.0001
Died in hospital	7.19	6.42–8.04	<0.0001

APR-DRG, all-patient refined-diagnosis-related group; NDX, number of comorbidity diagnoses.

**Table 3. Factors associated with life-sustaining procedures in patients with cervical cancer receiving palliative care consultations (n = 3894).**

Independent variable	Odds ratio	95% confidence interval	p-value
Year	0.95	0.91–0.99	0.0307
Age groups (years)	0.94	0.86–1.04	0.2543
Race			
White (reference)			
Black	1.02	0.75–1.37	0.8988
Hispanic	0.76	0.53–1.10	0.1543
Asian/Pacific Islander	1.28	0.76–2.16	0.3502
Native Americans/others	1.42	0.81–2.47	0.2175
Primary payer			
Private insurance (reference)			
Medicare	0.96	0.69–1.36	0.8574
Medicaid	0.92	0.68–1.25	0.6263
Uninsured	0.78	0.42–1.45	0.4413
No charge	4.40	0.88–21.98	0.0705
Other	0.88	0.46–1.69	0.7119
Severity of illness: APR-DRG	4.02	3.21–5.02	<0.0001
NDX	1.05	1.03–1.08	<0.0001
Died in hospitals	2.59	2.02–3.32	<0.0001

APR-DRG, all-patient refined-diagnosis-related group; NDX, number of comorbidity diagnoses.

In Korean culture, relationships within a family are more important than in Western countries, and these relationships can be the source of problems [28]. In 2019, a social controversy arose in South Korea over which LSP should be included in PC with the implementation of the “Well-Dying Act” [29]. This was a pilot program launched by the gov-

ernment to aid in PC and life-sustaining treatment decision-making. The pilot program in which adults, those over the age of 19 years, could refuse unnecessary life-sustaining medical care in cases of terminal illness lasted approximately one year. Over 45,000 patients refused unnecessary life-sustaining medical procedures. In South Korea, although



the use of hospice PC facilities for terminal cancer patients has been steadily increasing, the knowledge and perception scores of these facilities is still low [30]. Therefore, only approximately 13.8% patients receive PC before death [31].

Cancer treatment could be divided into oncological treatments aimed at extending life expectancy or inhibiting cancer growth, and symptom-centered treatments focused on maintaining or improving quality of life. The well-balanced application of cancer therapy and PC is useful and can reduce the use of aggressive therapy [32]. Controlling symptoms associated cancer include chemotherapy, radiotherapy, or blood transfusions, which are applied in symptomatic anemia, symptomatic bone metastasis, or uncontrolled tumor bleeding [33]. Nevertheless, the utilization of cancer therapy should be carefully considered, especially during the late in life, to prevent deterioration in quality of life and excessive therapy. It is often difficult to provide PC or add cancer therapy to patients with severe terminal stage disease. However, the omission of LSP is not the best way to identify patients who benefit from a PC [34].

In a recent study on the timing of PC consultation, 80% patients received PC consultation 60 days before their death with a median of 13 days [35]. However, unlike our study, the target patients were not cancer patients. The target patients had other serious illnesses. These illnesses were defined as conditions with an elevated risk of mortality, with burdensome symptoms, or requiring hospitalization. Similar to our study, the target patients of that study were those within 2.25 years from hospitalization to death. Earlier implementation of PC consultation, in which patients at the end of their lives and their families discuss decisions to be made, can reduce unnecessary procedures and allow patients and their families to organize their lives.

The proportion of those receiving PC has significantly increased, particularly among those who died in hospital. These findings suggest that the upward trends of PC use in cervical cancer patients is mostly due to patients at higher risk of in-hospital death. There are some explanations for these trends. US hospitals proactively offered PC programs to help hospitalists transition from life-sustaining treatment to PC with ease through skilled communication and discharge planning. This avoids problems associated with differences between hospital performance and reimbursement through the hospital value-based purchasing (VBP) program [36]. The hospital VBP program under the Patient Protection and Affordable Care Act (PPACA) highlights the patient and family experience and efficiency of care among Medicare beneficiaries [37].

Since our study was a retrospective study using large-scale medical records of the HCUP, bias is possible. Because of the prevalence of cervical cancer, our study showed that PC was more received in non-Whites than in Whites. Nevertheless, the utilization of PC was found to be higher among Medicare payers than by Medicaid payers with relatively lower SES, which may have been influenced by other confound-

ing factors. In addition to the primary payer or race, the area of residence or the education level could also have an effect, but these data could not be assessed [38]. In addition, this study analyzed eight LSP (intubation, mechanical ventilation, non-invasive ventilation, infusion of vasopressor or intravascular pressure measurement, enteral or parenteral infusion of concentrated nutrition, cardiopulmonary resuscitation, blood transfusion, and hemodialysis). As the number of each procedure performed in the cervical cancer cohort was too small for statistical significance, LSP were treated as only one variable in analyses. Another potential limitation that may occur because of the claim-based secondary data being used is the definition of PC. This definition may be inconsistent. Also, the absence of information about the stage of cervical cancer was not adjusted for.

## 5. Conclusions

The rate of PC consultation in patients with cervical cancer in the United States, despite remaining low, is increasing continuously. From the patient-centered care perspective that PC provides an option for patients, increasing the offering and availability of PC consultation for cervical cancer patients is important.

## Author contributions

KJM, YTO, and JS conceived and designed the research study. DL and JS acquainted the data. HTK, EF, and JWY analysed and interpreted the data. KJM, YTO, and HTK drafted the manuscript. EF, JWY, ZM, DL, and JS did critical revision. EF, JWY, and ZM did statistical analysis. ZM, DL, and JS supervised the manuscript. All authors read and approved the final manuscript.

## Ethics approval and consent to participate

Anonymized and de-identified information for participants in the NIS database was used for all analyses; therefore, institutional review board approval was waived by the University of Nevada, Las Vegas.

## Acknowledgment

eWorldEditing ([www.eWorldEditing.com](http://www.eWorldEditing.com)) edited the language of this article.

## Funding

This research received no external funding.

## Conflict of interest

The authors declare no conflict of interest.

## Supplementary material

Supplementary material associated with this article can be found, in the online version, at <https://ejgo.imrpress.com/EN/10.31083/j.ejgo4206161>.

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