

High-Intensity End-of-Life Care Among Patients With GI Cancer in Puerto Rico: A Population-Based Study

Karen J. Ortiz-Ortiz, DrPH, MPH^{1,2}; Guillermo Tortolero-Luna, MD, PhD¹; Carlos R. Torres-Cintrón, MPH³; Diego E. Zavala-Zegarra, PhD³; Axel Gierbolini-Bermúdez, MA⁴; and María R. Ramos-Fernández, MD, MSc⁵

QUESTION ASKED: What are the predictors and patterns of high-intensity end-of-life (EoL) care among patients with GI cancer in Hispanics living in Puerto Rico?

SUMMARY ANSWER: This study confirmed that a high proportion (54.5%) of patients with GI cancer receive aggressive EoL care. Significant associations between aggressive EoL care and sex, age group, insurance, stage at diagnosis, and survival time were observed ($P < .05$).

WHAT WE DID: Using the Puerto Rico Central Cancer Registry-Health Insurance Linkage Database (PRCCR-HILD), we identified EoL care intensity indicators and examined factors associated with aggressive EoL care among Puerto Ricans diagnosed with GI cancer between 2009 and 2016.

WHAT WE FOUND: The study showed that women, patients ≥ 65 years of age, patients enrolled in Medicaid, patients dually eligible for both Medicare and Medicaid, and patients who survived > 1 year were less likely to receive aggressive EoL care. We found that 11.0% received chemotherapy in the last 14 days, 17.3% had > 1 hospitalization, 9.3% were in intensive care unit, 18.0% had > 1 emergency room visit, 39.3% died in an acute care setting, and 8.6%

received life-extending procedures. Subanalysis showed an extremely low percentage (20.3%) of patients 21-64 years of age receiving hospice care compared with other studies with similar populations.

BIAS, CONFOUNDING FACTORS: First, the use of claims data collected for reimbursement purposes has inherent limitations (eg, coding errors). Second, EoL decision-making information such as preferences or experiences related to the patient, family, and physician is unavailable. Third, we were unable to analyze hospice data from Medicare patients since the PRCCR-HILD database does not provide this information.

REAL-LIFE IMPLICATIONS: Our findings support the urgent need to improve EoL care in Puerto Rico. The PRCCR-HILD database revealed that improving the quality of life of patients with cancer and their families must be prioritized. The high proportion of aggressive care, low hospice utilization, and the low number of palliative care specialists are indicative of the poor quality of health services received by this population. This study provides insight into the complex process of EoL care and how different factors interact at different levels.

CORRESPONDING AUTHOR

Karen J. Ortiz-Ortiz, DrPH, MPH, Division of Cancer Control and Population Sciences, University of Puerto Rico Comprehensive Cancer Center, PO Box 363027, San Juan, Puerto Rico 00936-3027; e-mail: karen.ortiz@upr.edu.

ASSOCIATED CONTENT

Appendix

Author affiliations and disclosures are available with the complete article at ascopubs.org/journal/op.

Accepted on November 23, 2020 and published at ascopubs.org/journal/op on February 10, 2021; DOI <https://doi.org/10.1200/OP.20.00541>

High-Intensity End-of-Life Care Among Patients With GI Cancer in Puerto Rico: A Population-Based Study

Karen J. Ortiz-Ortiz, DrPH, MPH^{1,2}; Guillermo Tortolero-Luna, MD, PhD¹; Carlos R. Torres-Cintrón, MPH³; Diego E. Zavala-Zegarra, PhD³; Axel Gierbolini-Bermúdez, MA⁴; and María R. Ramos-Fernández, MD, MSc⁵

abstract

PURPOSE High-intensity care with undue suffering among patients with cancer at the end of life (EoL) is associated with poor quality of life. We examined the pattern and predictors of high-intensity care among patients with GI cancer in Puerto Rico.

METHODS This population-based study of data from the Puerto Rico Central Cancer Registry-Health Insurance Linkage Database examined patients with GI cancer who died between 2009 and 2017. EoL care intensity indicators include the following services in the last month before death: emergency room (ER) visits, hospitalizations, intensive care unit (ICU) admissions, life-extending procedures, death in an acute care setting, and the use of chemotherapy in the last 14 days. We used logistic regression models to examine factors associated with EoL care.

RESULTS Four thousand six hundred twenty-nine patients with GI cancer were included in the analysis. We found that 11.0% of patients received chemotherapy, 17.3% had > 1 hospitalization, 9.3% were in the ICU, 18.0% had > 1 ER visit, 39.3% died in an acute care setting, and 8.6% received life-extending procedures. A compound indicator of the aggressiveness of care showed that 54.5% of patients had at least one of the selected aggressive indicators. The multivariable model showed that female patients, patients ≥ 60 years of age, patients enrolled in Medicaid, patients dually eligible for both Medicare and Medicaid, and patients who survived > 1 year were less likely to receive aggressive EoL care.

CONCLUSION Our findings support the urgent need to improve EoL care in Puerto Rico. Further studies are warranted to fully understand EoL care in patients with cancer in Puerto Rico.

JCO Oncol Pract 17:e168-e177. © 2021 by American Society of Clinical Oncology

Creative Commons Attribution Non-Commercial No Derivatives 4.0 License 

BACKGROUND

High-intensity care with undue suffering at the end of life (EoL) is associated with poor quality of life and a higher economic burden. To enhance the quality of life of patients nearing death, healthcare delivery should focus on pain and symptom management instead of prolonging life.¹ Overly aggressive cancer treatment during EoL may be an indicator of poor quality of care. For example, although chemotherapy use among terminally ill patients with cancer could be beneficial in some cases, most of the time, it is highly toxic and confers no quality-of-life benefit.¹ Conversely, timely hospice care can decrease avoidable measures such as emergency room (ER) visits, hospital admissions, intensive care unit (ICU) admissions, and the use of life-extending procedures.²⁻⁴

Despite progress made toward improving the quality of EoL care in the United States, a growing body of evidence shows disparities among groups within the population.⁵ Inadequate EoL care among patients with cancer has been documented in the United States and other countries.⁶⁻¹⁴ In the United States, African American and Hispanic populations, male patients, those with low socioeconomic status, and younger patients tend to have more aggressive EoL care and less hospice care.^{5,10,15-18} Although few studies have evaluated the effect of health insurance, patients enrolled in Medicaid experience more aggressive EoL care.¹⁹

Although national patterns of aggressiveness of EoL care are well documented in the mainland United States, to the best of our knowledge, the patterns in Puerto Rico have not yet been studied. The

Author affiliations and support information (if applicable) appear at the end of this article.

Accepted on November 23, 2020 and published at ascopubs.org/journal-op on February 10, 2021; DOI <https://doi.org/10.1200/OP.20.00541>

Commonwealth of Puerto Rico is the largest US territory, with over 3.2 million people of whom 99% self-identify as Hispanic. In terms of income and poverty level, 44% of the Puerto Rican population lives below the federal poverty line (13% in the United States).²⁰ Despite unfavorable economic conditions, recent estimates indicate that only 6% do not have healthcare coverage, and approximately 50% of the population have Medicaid coverage (20% in the United States).²¹ More than four million Puerto Ricans live in the mainland United States, constituting the second-largest Hispanic population. In the last decade, migration from Puerto Rico to mainland United States increased rapidly because of the island's economic crisis and recent natural disasters.^{22,23}

In Puerto Rico, GI cancers are a major health burden. GI cancers account for 22% of all cancer diagnoses and represent 32% of all cancer deaths.²⁴ Although few studies focus on GI cancers, findings show a high-intensity EoL care among patients with these types of cancer.²⁵⁻²⁹ Patients with GI cancers tend to have severe EoL complications such as GI bleeding, obstruction, malnourishment, and unmanaged pain.^{25,30-32} The literature supports that palliative care significantly reduces high-intensity EoL care in patients with GI cancer.^{26,33}

For the first time, we examined the pattern and predictors of high-intensity care among patients with GI cancer in Puerto Rico. This population-based study analyzes a homogeneous Hispanic population that shares a cultural background and language, with high health insurance coverage, < 65 and \geq 65 years of age.

METHODS

Data Source

We used data from the Puerto Rico Central Cancer Registry-Health Insurance Linkage (PRCCR-HILD), which links health insurance claim data to patients reported to the Puerto Rico Central Cancer Registry (PRCCR). The PRCCR has been part of the National Program of Cancer Registries (NPCR) since 1997. The PRCCR uses the North American Association of Central Cancer Registries' standards for coding data with case ascertainment comparable to the US registries.²⁴

PRCCR contains demographic and clinical information for each cancer case, whereas health insurance companies supplied files on member enrollment, claims (including pharmacy), and providers. PRCCR-HILD contains information for approximately 90% of Puerto Rico's cancer cases from 2008 to 2016. The database includes beneficiaries from the principal health insurance carriers and government health plans. Claims from the health insurance databases were linked using a deterministic match similar to the one used by SEER-Medicare.³⁴ This study was approved by the Institutional Review Board of the University of Puerto Rico's Comprehensive Cancer Center (#2020-02-21).

Cohort Definition

We queried the PRCCR-HILD database for patients diagnosed with GI cancer between January 1, 2009, and December 31, 2016, as defined by the International Classification of Diseases for Oncology, 3rd edition (ICD-O-3), codes C150-C249, excluding lymphomas and sarcomas (histology codes \geq 8,800). The study cohort consisted of patients with a recorded date of death, who died of cancer between 2009 and 2017, and who were enrolled the month before death. We excluded patients with more than one cancer diagnosis, patients with stage unknown, and patients who died within 30 days of diagnosis.

Dependent Variables

Claims-based indicators of EoL cancer care intensity were selected based on the literature.^{1,11,12,35-37} We included the use of chemotherapy in the last 14 days (oral and intravenous) and the following services in the last month (30 days) before death: \geq 1 ER visit, > 1 ER visit, \geq 1 hospitalization, > 1 hospitalization, hospitalization of > 14 days, \geq 1 ICU admission, and death in an acute setting. We also included life-extending procedures (cardiopulmonary resuscitation, feeding tube placement, and insertion of a breathing tube for assisted ventilation) in the last month (30 days) before death, which are questionable for patients with advanced cancer that have a short life expectancy and therefore, such measures are unlikely to increase their survival or improve their quality of life.^{12,38}

In addition, we constructed a compound indicator of the aggressiveness of care to reflect the occurrence of at least one of the following events: chemotherapy use in the last 14 days, > 1 ER visits, > 1 hospitalization or > 14 days of hospital stay, \geq 1 ICU admission, the use of at least one life-extending procedure, and death in an acute setting. Since we did not have hospice data for Medicare patients, we restricted hospice services use (home, inpatient, or within a skilled nursing facility) to patients with private insurance and Medicaid for ages 21-64 years as recommended care.

Independent Variables

Sociodemographic variables at death were sex, age group (< 60, 60-69, 70-79, and \geq 80 years), and marital status (married or not married). Clinical variables were primary site and stage at diagnosis. We also included health insurance type (private, Medicaid, Medicare, or dually eligible for both Medicare and Medicaid [Medicare/Medicaid]), year of death (2009-2011, 2012-2014, and 2015-2017), and time from cancer diagnosis to death (\leq 12 months or > 12 months).

Statistical Analyses

We used descriptive statistics and frequency analyses to describe the study population and the variables of interest. We used logistic regression models to examine factors

associated with EoL care. Results are presented as odds ratios (ORs) with 95% confidence intervals (CIs). All *P* values reported are from two-sided tests. The likelihood ratio test was used to assess the significance of the interaction terms. Statistical analyses were performed using Stata/SE version 15.1 statistical software (Stata Corp, LP, College Station, TX).

RESULTS

Cohort Characteristics

A total of 4,629 patients with GI cancer met the inclusion criteria and were included in the analyses. [Appendix Table A1](#) (online only) presents the characteristics of the study population. Nearly half of the eligible patients were \geq 70 years of age (48.7%), 57.4% were male, and 42.6% died during the period 2012-2014. 13.0% of patients were enrolled in private insurance, 32.7% in Medicaid, 26.1% in Medicare, and 28.2% in Medicare/Medicaid. In terms of the stage at diagnosis, most patients with GI cancer were diagnosed at a distant stage (38.3%), whereas 24.7% were at a localized stage.

EoL Care Indicators

[Table 1](#) shows the indicators of EoL intensity cancer care during the last month of life. We found that 18.7% were hospitalized $>$ 14 days, 17.3% were hospitalized more than once, and 9.3% were in the ICU. The proportion of patients who had at least one ER visit was 46.9%, whereas 18.0% had $>$ 1 ER visit. Overall, 1,820 patients (39.3%) died in an acute care setting, whereas 396 patients (8.6%) received life-extending procedures and 11% received chemotherapy within 14 days of death. Concerning the aggressiveness of care compound indicator, 2,524 (54.5%) patients had at least one of the aggressive indicators.

The association between aggressive EoL care and patient characteristics is shown in [Table 2](#). The bivariate analysis shows associations between aggressive EoL care and sex, age group, insurance, stage at diagnosis, and survival time ($P < .05$). Analysis stratified by age showed that 64.9% of patients $<$ 60 years of age had a higher proportion of aggressive EoL care, whereas 41.0% of patients \geq 80 years of age experienced aggressive EoL care. When we examined the time from cancer diagnosis to death, 57.9% of patients who survived \leq 12 months underwent aggressive EoL care, compared with 49.5% in the group of patients who survived for over 1 year ($P < .0001$).

Multivariable Analyses

[Table 3](#) shows the unadjusted and adjusted regression model estimates for aggressive EoL care. The likelihood ratio statistical test did not show significant interaction terms ($P > .05$). The multivariable model showed that female patients were less likely to receive aggressive EoL care than male ones (adjusted odds ratio [AOR] 0.82; 95% CI, 0.73 to 0.92; $P = .001$) and patients \geq 60 years of age

were less likely to have aggressive EoL care than patients $<$ 60 years of age ($P < .01$). In addition, aggressive EoL care was less likely in patients enrolled in Medicaid (AOR 0.72; 95% CI, 0.59 to 0.88; $P = .001$) and Medicare/Medicaid (AOR 0.72; 95% CI, 0.58 to 0.89; $P = .002$) compared with patients enrolled in private insurance. Finally, patients who survived $>$ 12 months were less likely to receive aggressive EoL care than patients who survived \leq 12 months (AOR 0.66; 95% CI, 0.58 to 0.75; $P < .001$).

In the hospice use subanalysis for privately insured and Medicaid patients 21 to 64 years of age, 293 (20.3%) received hospice services in the last month of life. Of those enrolled in hospice, 11.6% were enrolled within the last three days before death and 34.5% within seven days before death (data not shown). The use of aggressive EoL care within the last month of life was lower (30.7%) among patients receiving hospice care than those without (73.3%). Patients not receiving hospice care in the last month of life were 6.3-times (AOR 6.33; 95% CI, 4.75 to 8.43; $P < .001$) more likely to receive aggressive EoL care than those receiving hospice care (data not shown). We found significant differences between aggressive EoL care and the duration of hospice care ($P < .001$). Aggressive EoL care was observed in 73.5% of patients enrolled within the last three days before death, 31.5% of those enrolled within 3 to 30 days before death, and 11.1% of patients enrolled more than 30 days before death (data not shown).

DISCUSSION

This study confirms the high proportion (54.3%) of patients with GI cancer who receive high-intensity care at EoL. Compared to the study by Merchant et al²⁵ on patients with GI cancer, we found higher rates of aggressive EoL care among Puerto Rican patients, particularly in ER visit (46.9% v 45.9%), \geq 1 hospitalization (62.0 v 49.3%), \geq 1 ICU admission (9.3% v 6.3%), and chemotherapy use in the last 14 days before death (11.0% v 8.2%). Nonetheless, we found a lower proportion of patients dying in an acute setting (39.3% v 44.6%). We also found a higher proportion of patients using high-intensity care in terms of chemotherapy, hospitalizations, and ER visits than other studies.^{11,12,19,25,39,40}

These findings suggest that many patients with cancer in Puerto Rico could have inadequate management of symptoms and higher emotional distress at the EoL. Although further research is needed to better understand the EoL decision-making process, the high-intensity care observed could be the result, in part, of lower hospice care use. The subanalysis showed a concerning low percentage (20.3%) of patients 21-64 years of age receiving hospice care compared with other studies on similar populations where hospice care use was between 24% and 39%.^{10,41,42} In addition, the local context could explain these patterns.

TABLE 1. High-Intensity Care Indicators at EoL

Indicator	Yes		No	
	Freq.	Row %	Freq.	Row %
Chemotherapy (last 14 days)	510	11.0	4,119	89.0
≥ 1 hospitalization	2,872	62.0	1,757	38.0
> 1 hospitalization	801	17.3	3,828	82.7
> 14 LOS	865	18.7	3,764	81.3
ICU admission	431	9.3	4,198	90.7
≥ 1 ER visit	2,173	46.9	2,456	53.1
> 1 ER visit	835	18.0	3,794	82.0
Death in an acute care setting	1,820	39.3	2,809	60.7
Life-extending procedures	396	8.6	4,233	91.5
Aggressive EoL indicator	2,524	54.5	2,105	45.5

Abbreviations: EoL, end of life; ER, emergency room; ICU, intensive care unit; LOS, length of stay.

Puerto Rico is essentially a Hispanic population with a high poverty rate level, with high insurance coverage, but with a specialist physician's shortages crisis, mainly in palliative medicine. Cultural values could greatly influence the higher use of aggressive care and the low rates of hospice use among Hispanics,⁴³ including living as long as possible, being family-centered, not talking directly about EoL care, secrecy about prognosis, and religion and faith systems that could influence hospice decisions and experiences among the Hispanic population.^{5,16,43,44} The shortage of physicians specializing in palliative care could be a critical factor influencing the higher use of aggressive care and the low rates of hospice. In Puerto Rico, approximately 20 physicians specialize in adult palliative care.⁴⁵ Furthermore, a survey among Puerto Rico emergency physicians found a high percentage reported a lack of training in palliative care (40%) and access to palliative care specialists (81%).⁴⁶

When we assess the factors associated with high-intensity care, consistent with previous studies,^{6,11,13,17,28,29,39,47} we found that female patients were less likely to receive high-intensity care than their male counterparts. These patterns could be related to the fact that males are less likely to be in hospices, have early hospice enrollment, and receive palliative care.^{13,28,29} Furthermore, several studies evaluating sex-based differences in EoL care agree that provider communication is an important factor.⁴⁷⁻⁴⁹ Patients who had EoL discussions had less healthcare expenditures, less use of intensive care interventions, and less physical distress.⁵⁰ Female patients reported significantly more EoL discussions with healthcare professionals and had a more accurate awareness of their medical condition than men.⁴⁷⁻⁴⁹

We observed that increased age decreased the odds of receiving aggressive EoL care. Traditionally, younger age is one of the stronger predictors associated with aggressive EoL care.^{6,7,17,28,39,51,52} This could be

attributable to the differences in patient's preferences or physician behaviors.⁵ One explanation related to patient's preferences is that to live longer and avoid pain to their families, younger patients are more likely to allow aggressive EoL care.⁵³ Physicians tend to provide more life-prolonging treatments to younger patients than older ones, suggesting that they are more motivated to save the lives of younger patients.⁵⁴

We found that Medicaid and Medicare/Medicaid patients were less likely to receive aggressive EoL care than patients enrolled in private insurance. However, Guadagnolo et al¹⁹ reported higher use of aggressive EoL care among Medicaid and Medicare/Medicaid patients compared with Medicare beneficiaries. The Medicaid program in Puerto Rico is delivered as a managed care plan model with a capitated structure; however, most private insurance is delivered through a fee-for-service model. Patients in a managed care model with a capitation structure could have less incentive to receive higher-intensity EoL care than those with a fee-for-service plan.⁵⁵ Further studies are required to determine whether insurance structure and incentives contribute to these patterns.

Our study found differences in EoL care patterns between patients surviving ≤ 12 months and patients surviving > 12 months after their cancer diagnosis. Patients who died soon after their diagnosis have more high-intensity EoL care than those who live longer.^{6,19,28,29,52,56} This pattern could be related to the lack of advance care planning discussions in patients with shorter survival.⁵² Patients with longer survival tend to have earlier EoL care discussions.⁵⁷ Patients who died soon after their diagnosis were more engaged in their cancer treatment processes than those with longer survival.⁵⁶ Another possible explanation is that patients who survive longer were more likely to enroll in hospice.^{19,52} Patients enrolled in hospice have less aggressive EoL care than those who did not.^{2,4,58} Indeed,

TABLE 2. Association Between Aggressiveness of EoL Care and Patient Characteristics

Characteristic	EoL Aggressive Care ^a				P	Sig
	Yes		No			
	Freq.	Row %	Freq.	Row %		
Sex					< .0001	***
Male	1,523	57.3	1,135	42.7		
Female	1,001	50.8	970	49.2		
Age group at death					< .0001	***
< 60	691	64.9	374	35.1		
60-69	774	59.1	536	40.9		
70-79	690	51.0	663	49.0		
≥ 80	369	41.0	532	59.1		
Year of death					.794	
2009-2011	593	55.0	485	45.0		
2012-2014	1,065	54.0	909	46.1		
2015-2017	866	54.9	711	45.1		
Insurance					< .0001	***
Private	384	63.7	219	36.3		
Medicaid	862	56.9	653	43.1		
Medicare/Medicaid	636	48.8	667	51.2		
Medicare	642	53.2	566	46.9		
Stage at diagnosis					.426	
Localized	612	53.6	530	46.4		
Regional	925	53.9	791	46.1		
Distant	987	55.7	784	44.3		
Survival time					< .0001	***
≤ 12 mo	1,600	57.9	1,163	42.1		
> 12 mo	924	49.5	942	50.5		

Abbreviations: EoL, end of life; ER, emergency room; ICU, intensive care unit.

* $P < .1$, ** $P < .05$, *** $P < .01$.

^aEoL aggressive care included at least one of the following: use of chemotherapy in the last 14 days or in the last month of life, > 1 ER visits, > 1 hospitalization, or > 14 days of length of stay, at least one ICU admission, use of at least one of life-extending procedures, and death in acute setting.

subanalysis results showed a higher proportion of patients receiving hospice care among patients who survived > 12 months than those who survived ≤ 12 months.

The present study has some limitations. First, the use of claims data collected for reimbursement purposes has inherent limitations. For example, it could be subject to coding errors. Second, EoL decision-making information such as preferences or experiences related to the patient, family, and physician is unavailable. Third, we could not analyze hospice data from Medicare patients since the PRCCR-HILD database does not include this information. Nevertheless, we analyzed the use of hospice care among patients with private insurance and Medicaid. Another possible limitation is that the study population only included patients with GI cancer, limiting the generalizability of the results to other types of cancer. Finally, comparisons with

other studies must be made with caution since many definitions and different population characteristics exist across studies. Nonetheless, this population-based study allowed us to examine the patterns of EoL care for patients with cancer in Puerto Rico, a Hispanic population with a high poverty rate. In addition, this study evaluated different types of health insurance, not only Medicare and Medicaid, and also a population younger than 65 years of age.

In conclusion, this study uncovered a significant gap in providing adequate care delivery in this phase of cancer care. It is well known that patients who receive EoL high-intensive care are more likely to have a poor quality of life and undergo avoidable suffering. Analogously, patients who receive hospice care, palliative care, and have discussions related to advanced planning tend to improve the quality of life at EoL. Nevertheless, the concept

TABLE 3. Predictors of Aggressiveness of EoL Care

Characteristic	Unadjusted Model				Adjusted Model			
	OR	95% CI	P	Sig	AOR	95% CI	P	Sig
Sex								
Male	1.00	—	—	—	1.00	—	—	—
Female	0.77	0.68 to 0.87	< .0001	***	0.82	0.73 to 0.92	.001	***
Age group at death								
< 60	1.00	—	—	—	1.00	—	—	—
60-69	0.78	0.66 to 0.92	.004	***	0.77	0.65 to 0.92	.004	***
70-79	0.56	0.48 to 0.66	< .0001	***	0.54	0.45 to 0.66	< .0001	***
≥ 80	0.38	0.31 to 0.45	< .0001	***	0.36	0.29 to 0.44	< .0001	***
Year of death								
2009-2011	1.00	—	—	—	1.00	—	—	—
2012-2014	0.96	0.83 to 1.11	.575	—	1.09	0.93 to 1.28	.270	—
2015-2017	1.00	0.85 to 1.16	.962	—	1.17	0.99 to 1.38	.060	*
Insurance								
Private	1.00	—	—	—	1.00	—	—	—
Medicaid	0.75	0.62 to 0.92	.004	***	0.72	0.59 to 0.88	.001	***
Medicare/Medicaid	0.54	0.45 to 0.66	< .0001	***	0.72	0.58 to 0.89	.002	***
Medicare	0.65	0.53 to 0.79	< .0001	***	0.87	0.70 to 1.08	.219	—
Stage at diagnosis								
Localized	1.00	—	—	—	1.00	—	—	—
Regional	1.01	0.87 to 1.18	.869	—	0.97	0.83 to 1.13	.692	—
Distant	1.09	0.94 to 1.27	.257	—	0.89	0.76 to 1.04	.137	—
Survival time								
≤ 12 mo	1.00	—	—	—	1.00	—	—	—
> 12 mo	0.71	0.63 to 0.80	< .0001	***	0.66	0.58 to 0.75	< .0001	***

Abbreviations: AOR, adjusted odds ratio; EoL, end of life; OR, odds ratio.

* $P < .1$, ** $P < .05$, *** $P < .01$.

of death brings with it personal views, religious beliefs, sociocultural perceptions, and legal challenges, especially among the Hispanic population. For healthcare providers, EoL care is a complex process where physicians rely on estimates based on their patient's prognosis and may fail to realize the exact time frame in which EoL is approaching.⁶

The high proportion of patients with aggressive EoL care and low hospice use suggests that patients with cancer in Puerto Rico have more unmet needs, inadequate pain management, and lower quality of life at EoL. This scenario

underscores the need to promote tailored interventions focused on increasing hospice care in this population. It is crucial to assess the personal, family, community, provider, and health system factors that facilitate or hinder the best quality of care at EoL to improve patients' experiences near death. Initiatives to increase the number of palliative medicine specialists and improve palliative care training among healthcare providers can improve EoL care in this population. Further studies are warranted to understand EoL care in patients with cancer among Puerto Rico's Hispanic population.

AFFILIATIONS

¹Division of Cancer Control and Population Sciences, University of Puerto Rico Comprehensive Cancer Center, San Juan, Puerto Rico

²Department of Health Services Administration, Graduate School of Public Health, Medical Sciences Campus, University of Puerto Rico, San Juan, Puerto Rico

³Puerto Rico Central Cancer Registry, University of Puerto Rico, Comprehensive Cancer Center, San Juan, Puerto Rico

⁴Department of Social Science, Graduate School of Public Health, Medical Sciences Campus, University of Puerto Rico, San Juan, Puerto Rico

⁵Department of Emergency Medicine, School of Medicine, Medical Sciences Campus, University of Puerto Rico, San Juan, Puerto Rico

CORRESPONDING AUTHOR

Karen J. Ortiz-Ortiz, DrPH, MPH, Division of Cancer Control and Population Sciences, University of Puerto Rico Comprehensive Cancer Center, PO Box 363027, San Juan, Puerto Rico 00936-3027; e-mail: karen.ortiz@upr.edu.

SUPPORT

This study was funded by a federal grant from the Puerto Rico NCI Community Oncology Research Program Minority/Underserved-Cancer Care Delivery Research (award number 5UG1CA189862) and by the National Program of Cancer Registries (NPCR) of the Centers of Disease Control and Prevention (CDC) (award number: NU58DP006318) to the Puerto Rico Central Cancer Registry (PRCCR).

AUTHORS' DISCLOSURES OF POTENTIAL CONFLICTS OF INTEREST

Disclosures provided by the authors are available with this article at DOI <https://doi.org/10.1200/OP.20.00541>.

AUTHOR CONTRIBUTIONS

Conception and design: Karen J. Ortiz-Ortiz, Guillermo Tortolero-Luna, María R. Ramos-Fernández

Financial support: Karen J. Ortiz-Ortiz, Guillermo Tortolero-Luna

Administrative support: Karen J. Ortiz-Ortiz, Diego E. Zavala-Zegarra

Provision of study materials or patients: Karen J. Ortiz-Ortiz, Diego E. Zavala-Zegarra

Collection and assembly of data: Karen J. Ortiz-Ortiz, Axel Gierbolini-Bermúdez

Data analysis and interpretation: Karen J. Ortiz-Ortiz, Guillermo Tortolero-Luna, Carlos R. Torres-Cintrón, Diego E. Zavala-Zegarra, Axel Gierbolini-Bermúdez, María R. Ramos-Fernández

Manuscript writing: All authors

Final approval of manuscript: All authors

Accountable for all aspects of the work: All authors

REFERENCES

- National Quality Forum: Palliative and End-of-Life Care 2015-2016. Washington, DC, 2016. https://www.qualityforum.org/Publications/2016/12/Palliative_and_End-of-Life_Care_2015-2016.aspx
- Obermeyer Z, Makar M, Abujaber S, et al: Association Between the Medicare Hospice Benefit and Health Care Utilization and Costs for Patients With Poor-Prognosis Cancer. *JAMA* 312:1888, 2014
- Breitkopf CR, Stephens EK, Jatoti A: Hospice in end-of-life patients with cancer: Does it lead to changes in nonhospice health care utilization after stopping cancer treatment? *Am J Hosp Palliat Care* 31:392-395, 2014
- Bergman J, Saigal CS, Lorenz KA, et al: Hospice use and high-intensity care in men dying of prostate cancer. *Arch Intern Med* 171:204-210, 2011
- Institute of Medicine: Dying in America. Washington, DC, National Academies Press, 2015
- Earle CC, Landrum MB, Souza JM, et al: Aggressiveness of cancer care near the end of life: Is it a quality-of-care issue? *J Clin Oncol* 26:3860-3866, 2008
- Barbera L, Seow H, Sutradhar R, et al: Quality of end-of-life cancer care in Canada: A retrospective four-province study using administrative health care data. *Curr Oncol* 22:341-355, 2015
- DeCaria K, Dudgeon D, Green E, et al: Acute care hospitalization near the end of life for cancer patients who die in hospital in Canada. *Curr Oncol* 24:256-261, 2017
- Taylor JS, Rajan SS, Zhang N, et al: End-of-life racial and ethnic disparities among patients with ovarian cancer. *J Clin Oncol* 35:1829-1835, 2017
- Mack JW, Chen K, Boscoe FP, et al: Underuse of hospice care by medicaid-insured patients with stage IV lung cancer in New York and California. *J Clin Oncol* 31:2569-2579, 2013
- McDermott CL, Fedorenko C, Kreizenbeck K, et al: End-of-life services among patients with cancer: Evidence from cancer registry records linked with commercial health insurance claims. *J Oncol Pract* 13:e889-e899, 2017
- Morden NE, Chang CH, Jacobson JO, et al: End-of-life care for medicare beneficiaries with cancer is highly intensive overall and varies widely. *Health Aff (Millwood)* 31:786-796, 2012
- Bhulani N, Gupta A, Gao A, et al: Palliative care and end-of-life health care utilization in elderly patients with pancreatic cancer. *J Gastrointest Oncol* 9:495-502, 2018
- Walsh B, Laudicella M: Disparities in cancer care and costs at the end of life: Evidence from England's National Health Service. *Health Aff* 36:1218-1226, 2017
- Karanth S, Rajan SS, Revere FL, et al: Factors affecting racial disparities in end-of-life care costs among lung cancer patients: A SEER-medicare-based study. *Am J Clin Oncol* 42:143-153, 2019
- Evans BC, Ume E: Psychosocial, cultural, and spiritual health disparities in end-of-life and palliative care: Where we are and where we need to go. *Nurs Outlook* 60:370-375, 2012
- Earle CC, Neville BA, Landrum MB, et al: Trends in the aggressiveness of cancer care near the end of life. *J Clin Oncol* 22:315-321, 2004
- Muni S, Engelberg RA, Treece PD, et al: The influence of race/ethnicity and socioeconomic status on end-of-life care in the ICU. *Chest* 139:1025-1033, 2011
- Guadagnolo BA, Liao K-P, Giordano SH, et al: Variation in intensity and costs of care by payer and race for patients dying of cancer in Texas: An analysis of registry-linked medicaid, medicare, and dually eligible claims data. *Med Care* 53:591-598, 2015
- US Census Bureau: American Community Survey 5-Year Estimates, 2015-2019, Washington, DC, US Census Bureau, 2020
- Kaiser Family Foundation: Puerto Rico: Fast Facts. KFF, 2017. <https://www.kff.org/racial-equity-and-health-policy/fact-sheet/puerto-rico-fast-facts/>
- Pew Research Center: Puerto Rico Population Near 40-Year Low in 2018 After Hurricanes. Pew Research Center, 2019. <https://www.pewresearch.org/fact-tank/2019/07/26/puerto-rico-population-2018/>
- US Census Bureau: More Puerto Ricans Move to Mainland United States, Poverty Declines, 2019. <https://www.census.gov/library/stories/2019/09/puerto-rico-outmigration-increases-poverty-declines.html>
- Torres-Cintrón C, Alvarado-Ortiz M, Román-Ruiz Y, et al: Cancer in Puerto Rico, 2012-2016. San Juan, PR, Puerto Rico Central Cancer Registry
- Merchant SJ, Lajkosz K, Brogly SB, et al: The final 30 days of life: A study of patients with gastrointestinal cancer in Ontario, Canada. *J Palliat Care* 32:92-100, 2017
- Merchant SJ, Brogly SB, Goldie C, et al: Palliative care is associated with reduced aggressive end-of-life care in patients with gastrointestinal cancer. *Ann Surg Oncol* 25:1478-1487, 2018

27. Tanguy-Melac A, Aguade AS, Fagot-Campagna A, et al: Management and intensity of medical end-of-life care in people with colorectal cancer during the year before their death in 2015: A French national observational study. *Cancer Med* 8:6671-6683, 2019
28. Nipp RD, Tramontano AC, Kong CY, et al: Patterns and predictors of end-of-life care in older patients with pancreatic cancer. *Cancer Med* 7:6401-6410, 2018
29. Tramontano AC, Nipp R, Kong CY, et al: Hospice use and end-of-life care among older patients with esophageal cancer. *Heal Sci Rep* 1:e76, 2018
30. Gao W, Gulliford M, Bennett MI, et al: Managing cancer pain at the end of life with multiple strong opioids: A population-based retrospective cohort study in primary care. *PLoS One* 9:e79266, 2014
31. Merchant SJ, Brogly SB, Booth CM, et al: Management of cancer-associated intestinal obstruction in the final year of life. *J Palliat Care* 35:84-92, 2020
32. Arends J, Bachmann P, Baracos V, et al: ESPEN guidelines on nutrition in cancer patients. *Clin Nutr* 36:11-48, 2017
33. Temel JS, Greer JA, El-Jawahri A, et al: Effects of early integrated palliative care in patients with lung and GI cancer: A randomized clinical trial. *J Clin Oncol* 35:834-841, 2017
34. Potosky AL, Riley GF, Lubitz JD, et al: Potential for cancer related health services research using a linked medicare-tumor registry database. *Med Care* 31:732-748, 1993
35. Earle CC, Neville BA, Landrum MB, et al: Evaluating claims-based indicators of the intensity of end-of-life cancer care. *Int J Qual Heal Care* 17:505-509, 2005
36. Karanth S, Rajan SS, Sharma G, et al: Racial-ethnic disparities in end-of-life care quality among lung cancer patients: A SEER-medicare-based study. *J Thorac Oncol* 13:1083-1093, 2018
37. Earle CC, Park ER, Lai B, et al: Identifying potential indicators of the quality of end-of-life cancer care from administrative data. *J Clin Oncol* 21:1133-1138, 2003
38. Astrow AB, Sood JR, Nolan MT, et al: Decision-making in patients with advanced cancer compared with amyotrophic lateral sclerosis. *J Med Ethics* 34:664-668, 2008
39. Miesfeldt S, Murray K, Lucas L, et al: Association of age, gender, and race with intensity of end-of-life care for medicare beneficiaries with cancer. *J Palliat Med* 15:548-554, 2012
40. Margolis B, Chen L, Accordino MK, et al: Trends in end-of-life care and health care spending in women with uterine cancer. *Am J Obstet Gynecol* 217:434.e1-434.e10, 2017
41. McDermott CL, Bansal A, Ramsey SD, et al: Depression and health care utilization at end of life among older adults with advanced non-small-cell lung cancer. *J Pain Symptom Manage* 56:699-708.e1, 2018
42. Yang A, Goldin D, Nova J, et al: Racial disparities in health care utilization at the end of life among New Jersey medicaid beneficiaries with advanced cancer. *JCO Oncol Pract* 16:e538-e548, 2020
43. Del Gaudio F, Hichenberg S, Eisenberg M, et al: Latino values in the context of palliative care: Illustrative cases from the family focused grief therapy trial. *Am J Hosp Palliat Med* 30:271-278, 2013
44. Cruz-Oliver DM, Talamantes M, Sanchez-Reilly S: What evidence is available on end-of-life (EOL) care and Latino elders? A literature review. *Am J Hosp Palliat Med* 31:87-97, 2014
45. NPPES NPI Registry, <https://npiregistry.cms.hhs.gov/>
46. Fernando Soto MR: Physician attitudes on the provision of palliative care in Puerto Rican emergency departments. *J Palliat Care Med* 5:1-5, 2014
47. Seifart C, Riera Knorrnschild J, Hofmann M, et al: Let us talk about death: Gender effects in cancer patients' preferences for end-of-life discussions. *Support Care Cancer* 28:4667-4675, 2020
48. Sharma RK, Prigerson HG, Penedo FJ, et al: Male-female patient differences in the association between end-of-life discussions and receipt of intensive care near death. *Cancer* 121:2814-2820, 2015
49. Fletcher K, Prigerson HG, Paulk E, et al: Gender differences in the evolution of illness understanding among patients with advanced cancer. *J Support Oncol* 11:126-132, 2013
50. Zhang B, Wright AA, Huskamp HA, et al: Health care costs in the last week of life associations with end-of-life conversations. *Arch Intern Med* 169:480-488, 2009
51. Li Z, Pan Z, Zhang L, et al: End-of-life cost and its determinants for cancer patients in urban China: A population-based retrospective study. *BMJ Open* 9:e026309, 2019
52. Accordino MK, Wright JD, Vasan S, et al: Association between survival time with metastatic breast cancer and aggressive end-of-life care. *Breast Cancer Res Treat* 166:549-558, 2017
53. Mack JW, Chen K, Boscoe FP, et al: High intensity of end-of-life care among adolescent and young adult cancer patients in the New York State medicaid program. *Med Care* 53:1018-1026, 2015
54. Van Den Block L, Deschepper R, Bossuyt N, et al: Care for patients in the last months of life: The Belgian sentinel network monitoring end-of-life care study. *Arch Intern Med* 168:1747-1754, 2008
55. Stevenson DG, Ayanian JZ, Zaslavsky AM, et al: Service use at the end-of-life in medicare advantage versus traditional medicare. *Med Care* 51:931-937, 2013
56. Tangka FKL, Subramanian S, Sabatino SA, et al: End-of-life medical costs of medicaid cancer patients. *Health Serv Res* 50:690-709, 2015
57. Mack JW, Cronin A, Taback N, et al: End-of-life care discussions among patients with advanced cancer: A cohort study. *Ann Intern Med* 156:204-210, 2012
58. Kelley AS, Deb P, Du Q, et al: Hospice enrollment saves money for medicare and improves care quality across a number of different lengths-of-stay. *Health Aff (Millwood)* 32:552-561, 2013



AUTHORS' DISCLOSURES OF POTENTIAL CONFLICTS OF INTEREST

High-Intensity End-of-Life Care Among Patients With GI Cancer in Puerto Rico: A Population-Based Study

The following represents disclosure information provided by authors of this manuscript. All relationships are considered compensated unless otherwise noted. Relationships are self-held unless noted. I = Immediate Family Member, Inst = My Institution. Relationships may not relate to the subject matter of this manuscript. For more information about ASCO's conflict of interest policy, please refer to www.asco.org/rwc or ascopubs.org/op/authors/author-center.

Open Payments is a public database containing information reported by companies about payments made to US-licensed physicians ([Open Payments](#)).

Karen J. Ortiz-Ortiz
Research Funding: AbbVie

Guillermo Tortolero-Luna
Research Funding: AbbVie

Carlos R. Torres-Cintrón
Research Funding: AbbVie

No other potential conflicts of interest were reported.

APPENDIX

TABLE A1. Cohort Characteristics

Characteristic	Freq.	Percent
Sex		
Male	2,658	57.4
Female	1,971	42.6
Age group at death		
< 60	1,065	23.0
60-69	1,310	28.3
70-79	1,353	29.2
≥ 80	901	19.5
Year of death		
2009-2011	1,078	23.3
2012-2014	1,974	42.6
2015-2017	1,577	34.1
Insurance		
Private	603	13.0
Medicaid	1,515	32.7
Medicare/Medicaid	1,303	28.2
Medicare	1,208	26.1
Stage at diagnosis		
Localized	1,142	24.7
Regional	1,716	37.1
Distant	1,771	38.3
Survival time		
≤ 12 mo	2,763	59.7
> 12 mo	1,866	40.3