Emergency Presentation and Short-Term Survival Among Patients With Colorectal Cancer Enrolled in the Government Health Plan of Puerto Rico

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Abstract

Objective: In this study, we examine factors associated with the use of the emergency room (ER) as an entry point into the health-care system to initiate a cancer diagnosis among Puerto Rico's Government Health Plan (GHP) patients and compare the 1-year survival of GHP patients that initiated cancer diagnosis in the emergency room (ER) presentation with those that initiated the diagnosis in a physician's office.

Methods: Data for patients with colorectal cancer (CRC) aged 50 to 64 years and diagnosed in 2012 were obtained from the Puerto Rico Central Cancer Registry and linked to the Puerto Rico Health Insurance Administration database (n = 190). Crude odds ratio, adjusted odds ratio, and their 95% confidence intervals were reported. We used the Kaplan-Meier method to generate survival curves. Multivariate Cox regression analysis was performed to evaluate the association between ER presentation and 1-year cause-specific survival.

Results: We found that 37.37% of the study population had an ER presentation. Male patients had a higher occurrence of having an ER presentation (66.20%), while 76.06% of the patients with an ER presentation were diagnosed in late stage. Emergency room presentation was a highly predictive factor for cancer mortality in the year following the diagnosis. These patients had between 3.99 to 4.24 times higher mortality risk than non-ER presentation patients ($P < .05$).

Conclusion: Late presentation for CRC diagnosis through an ER visit is a significant concern that influences negatively on the patient's outcome. Efforts at increasing primary care visits and routine screening tests among GHP beneficiaries could improve survival.

Introduction

Having the first contact with the health-care system for a cancer diagnosis through the emergency room (ER) may be indicative of scarce proper screening or a patient who waited too long before seeking health-care services. Patients presenting in ERs tend to have shortest diagnosis delays but have a more advanced disease at the time of diagnosis.[1-4] Consequently, it has been suggested that emergency presentation is an indicator of preventable diagnostic delay in colorectal cancer (CRC).[5] Diagnosis of cancer is usually performed before the patient has symptoms through the recommended screening, through an

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incidental finding or after going to the doctor with the presentation of symptoms related to cancer. Therefore, a delay in the diagnosis of cancer may occur when an individual does not attend the recommended screening tests, does not recognize a symptom of cancer, does not seek routine medical services, and when a health professional fails to detect a cancer or does not properly act to an incidental finding.[6] It has been found that CRC screening at primary care setting can significantly reduce the number of ER presentations.[7] Indeed, ER presentation has been associated with a poor 5-year survival in previous research.[8]

In Puerto Rico, the Government Health Plan (GHP) operates through a managed care delivery system since 1994. The beneficiaries are limited to the Medicaid, Medicare eligible, and medically indigent citizens with incomes below 200% of the federal poverty level. The Puerto Rico Health Insurance Administration (PRHIA) acts as the administrative body of the GHP. The objective of the GHP is to ensure access to health services for medically indigent citizens.[9] Through the GHP, primary care physicians (PCPs) assumed the responsibility for coordinating the care of more than 40% of the island's population (approximately 1.6 million).[9,10] Government health plan beneficiaries are assigned to a PCP who determines whether their health condition requires referrals to specialists, diagnostic tests, or medications. The PCP has to be within a primary medical group (PMG) and has to be in the same region as the beneficiary. Thus, the entry point to the health care system is through a PCP, who provides services as part of a PMG.

Therefore, PCPs are an important source of care for patients with cancer and may be responsible for initiating orders for screening services or care coordination. Knowing the pattern of use of the ER for diagnosing CRC and its impact on patient survival provides an understanding of the lack of use of appropriate primary care. Exploring the patient pathways to a cancer diagnosis can give us a better comprehension of what barriers affect access to cancer care among GHP enrollees.

The objectives of this study are to investigate GHP patients' individual and health-care factors associated with ER presentation and to compare the 1-year survival of these patients to those utilizing a physician office (non-ER presentation) instead of the ER.

Methods

Data Source

We conducted a secondary data analysis using data from the Puerto Rico Central Cancer Registry (PRCCR) and the PRHIA. The study design and analyses can be described in 2 phases. First, the analysis of health-care factors associated with ER presentation followed a cross-sectional study design. Second, the analysis to compare survival of patients by ER presentation status (ER presentation versus non-ER presentation) followed a retrospective cohort design.

The CRC cases (diagnosed between January 1, 2012, and December 31, 2012) with an in situ and invasive CRC

diagnosis, excluding hematologic malignancies and sarcomas, between 50 and 64 years (n = 548) are included. We excluded patients younger than 50 years because screening is not recommended. To evaluate only GHP patients, we excluded patients older than 64 years because most of them have Medicare and thus have a different insurance coverage. We also excluded patients reported to the PRCCR by the death certificate or autopsy and patients with unknown method of confirmation and those with unknown stage at diagnosis (n = 35). Also, patients who had another cancer diagnosis 1 year before the CRC diagnosis were excluded (n = 12).

To identify GHP patients, we linked the PRCCR and the PRHIA databases using a probabilistic linkage algorithm with Link Plus v.2.0 software. For linkage purposes, we selected only GHP beneficiaries, excluding dual eligible beneficiaries (Medicare and Medicaid dual coverage). Patients not enrolled in the GHP for the 12 months prior to the cancer diagnosis were also excluded (n = 53).

A dichotomous variable was created to indicate whether the patient's first contact with the health-care system for a cancer diagnosis was through the ER (ER presentation vs non ER presentation). The first time the patient entered the health system was defined as the first office visit or ER visit with CRC symptoms (abdominal pain, constipation, anemia, altered bowel, weight loss, rectal bleeding, fatigue, and diarrhea) prior to CRC diagnosis. This does not imply that the patient was admitted due to a cancer diagnosis. The CRC symptoms are based on the symptoms used in other studies.[5] In the absence of this type of claims, we selected the date of the visit previous to the first gastrointestinal investigation before the CRC diagnosis. The first gastrointestinal investigation included abdominal radiological imaging, lower gastrointestinal endoscopy, and fecal occult blood test.

The primary cancer site was categorized as colon and rectum; stage at diagnosis was dichotomized using the Derived SEER Summary Stage 2000 as early stage (in situ and localized) and late stage (regional and distant). Sociodemographic characteristics such as age (grouped into 3 categories: 50-54, 5-59, and 60-64 years) and sex were considered. Marital status at diagnosis was classified as married (included common law or domestic partner) and unmarried (included single, separated, divorced, and widowed). Comorbidity was measured using the Charlson comorbidity index. This index considered 17 comorbidities and assigned a weighted score to each comorbid condition.[11] We used the algorithm developed by Quan et al[12] and a Stata module to calculate the index.[13] We classified the Charlson index score as 0, 1, and ≥2.

To evaluate health delivery system characteristics, we examined whether the type of primary care had an effect with emergency presentations among GHP patients with CRC. Patients were classified according to the type of PMG to which they belonged. Federally Qualified Health Centers (FQHC) were compared to the other PMGs (non-FQHC).

Diagnosis delay was defined as the time in days between the patient's first contact with the health-care system to the time of

Table 1. Characteristics of GHP Patients by Initial Presentation of Cancer Diagnosis, Puerto Rico 2012.

Characteristics	ER, n (%)	Non-ER, n (%)	Total, n (%)	χ^2 P Value
Overall	71 (37.37)	119 (62.63)	190 (100.00)	-
Age group (years)				.446
50-54	11 (15.49)	27 (22.69)	38 (20.00)	
55-59	26 (36.62)	43 (36.13)	69 (36.32)	
60-64	34 (47.89)	49 (41.18)	83 (43.68)	
Sex				.019
Male	47 (66.20)	58 (48.74)	105 (55.26)	
Female	24 (33.80)	61 (51.26)	85 (44.74)	
Marital status				.389
Unmarried	38 (53.52)	56 (47.06)	94 (49.47)	
Married	33 (46.48)	63 (52.94)	96 (50.53)	
Charlson comorbidities index				.357
0	19 (26.76)	31 (26.05)	50 (26.32)	
1	15 (21.13)	36 (30.25)	51 (26.84)	
≥2	37 (52.11)	52 (43.7)	89 (46.84)	
Primary site location				.336
Colon	53 (74.65)	81 (68.07)	134 (70.53)	
Rectum	18 (25.35)	38 (31.93)	56 (29.47)	
Stage at diagnosis				.009
Early	17 (23.94)	51 (42.86)	68 (35.79)	
Late	54 (76.06)	68 (57.14)	122 (64.21)	
Type of primary center				.377
Non-FQHC	65 (91.55)	104 (87.39)	169 (88.95)	
FQHC	6 (8.45)	15 (12.61)	21 (11.05)	
Region gastroenterologist rate				.983
High rate (≥8.00)	11 (15.49)	18 (15.13)	29 (15.26)	
Medium rate (4.00-7.99)	24 (33.80)	39 (32.77)	63 (33.16)	
Low rate (0-3.99)	36 (50.70)	62 (52.10)	98 (51.58)	

Abbreviations: ER, emergency room; FQHC, Federally Qualified Health Centers; GHP, government health plan.

a cancer diagnosis. Government health plan regions were classified according to gastroenterologist supply. The PRHIA divided the island into 8 different health regions covering all 78 municipalities. The gastroenterology capacity was evaluated as the gastroenterologist's rate per 10 000 individuals for each region. Each GHP region was then categorized as having high (≥8.00), medium (4.00-7.99), and low (0-3.99) gastroenterologist's rate (per 10 000).

Statistical Methods

We used χ^2 tests to assess the difference among patient's characteristics by types of first presentation to diagnosis. Logistic regression models were used to examine the factors associated with the ER presentation. Crude odds ratio (OR), adjusted OR (aOR), and their 95% confidence intervals (CIs) were reported.

We used the Kaplan-Meier method to generate survival curves. Differences between curves were analyzed using the log-rank test. Crude and adjusted Cox regression analysis was performed to evaluate ER presentation related to 1-year cause-specific survival. The proportionality assumption was evaluated using Schoenfeld residuals. Statistical analyses were performed using Stata/SE version 13.1 statistical software (Stata Corp, LP, College Station, Texas).

Results

From a total of 548 cases of CRC who were diagnosed in Puerto Rico between the ages of 50 and 64 years in 2012, 190 patients were eligible for the study. Of these patients, 37.37% had an ER presentation. Table 1 presents the characteristics of GHP patients by initial presentation of CRC diagnosis. Male patients had a higher occurrence of having an ER presentation. Among patients with CRC with ER presentation, 66.20% were males and 76.06% were diagnosed in late stage. Regarding the symptoms presented, those who had an ER presentation 18.31% (n = 13) had rectal bleeding, 46.48% (n = 33) had abdominal pain, 9.86% (n = 7) had anemia/fatigue/weight loss, 15.49% (n = 11) had constipation/obstruction, and 9.86% (n = 7) had altered bowel/others. Related to symptoms presented, no statistical difference ($P > .05$) was observed between ER presentation patients and non-ER presentation patients (data not shown).

Table 2 presents the logistic regression models to examine the factors associated with an ER presentation. No significant interaction terms were observed ($P > .05$). In the adjusted model, compared to males, females had half the possibility of an ER presentation (aOR: 0.47, 95% CI: 0.25-0.90). Meanwhile, patients diagnosed at late stage had 2.59 times the possibility of an ER presentation compared to patients diagnosed at early stage ($P < .05$). Patients in the 60 to 64 age group had

Table 2. Multivariate Logistic Regression Models of Factors Associated With ER Presentation Among GHP Patients With Colorectal Cancer, Puerto Rico 2012.

Characteristics	Univariate OR (95% CI)	P	Multivariate aOR (95% CI)	P
Age group				
50-54	1.00 (reference)		1.00 (reference)	
55-59	1.48 (0.63, 3.48)	.365	1.84 (0.74, 4.61)	.190
60-64	1.70 (0.75, 3.89)	.207	2.13 (0.86, 5.28)	.101
Sex				
Male	1.00 (reference)		1.00 (reference)	
Female	0.49 (0.26, 0.89)	.020	0.47 (0.25, 0.90)	.023
Marital status				
Unmarried	1.00 (reference)		1.00 (reference)	
Married	0.77 (0.43, 1.39)	.389	0.69 (0.37, 1.31)	.260
Charlson comorbidity index				
0	1.00 (reference)		1.00 (reference)	
1	0.68 (0.30, 1.56)	.362	0.61 (0.25, 1.49)	.278
≥2	1.16 (0.57, 2.36)	.680	1.16 (0.53, 2.54)	.706
Primary site location				
Colon	1.00 (reference)		1.00 (reference)	
Rectum	0.72 (0.37, 1.40)	.337	0.88 (0.43, 1.77)	.712
Stage at diagnosis				
Early	1.00 (reference)		1.00 (reference)	
Late	2.38 (1.24, 4.59)	.009	2.59 (1.29, 5.22)	.008
Type of primary center				
Non-FQHC	1.00 (reference)		1.00 (reference)	
FQHC	0.64 (0.24, 1.73)	.380	0.71 (0.24, 2.05)	.535
Region gastroenterologist rate (per 10 000)				
High rate (≥8.00)	1.00 (reference)		1.00 (reference)	
Medium rate (4.00-7.99)	1.01 (0.41, 2.49)	.988	1.08 (0.41, 2.83)	.883
Low rate (0-3.99)	0.95 (0.40, 2.23)	.907	0.95 (0.37, 2.39)	.907

Abbreviations: aOR, adjusted odds ratio; CI, confidence interval; ER, emergency room; FQHC, Federally Qualified Health Centers; GHP, government health plan; OR, odds ratio.

2.13 times the possibility of an ER presentation compared to patients in the 50 to 54 age group, with marginal statistical significance ($P = .10$). No significant differences were found in other variables analyzed ($P > .05$).

To assess variations between groups in the health-care delivery system variables, we used a multilevel generalized linear mixed-effects model to determine the potential effects of the health system variables on ER presentation. The multilevel models proved to have no significant effect ($P > .05$; data not shown).

Survival Analysis

One-year survival of GHP patients with CRC was 86.24%. However, when stratified by ER presentation, 1-year survival was 93.25% for non-ER presentation patients and 74.38% for ER presentation patients. Figure 1 shows cancer-specific survival in GHP patients by initial presentation of cancer diagnosis. According to the log-rank test, the experience of survival of the ER presentation group was statistically different from the non-ER presentation group ($P < .05$).
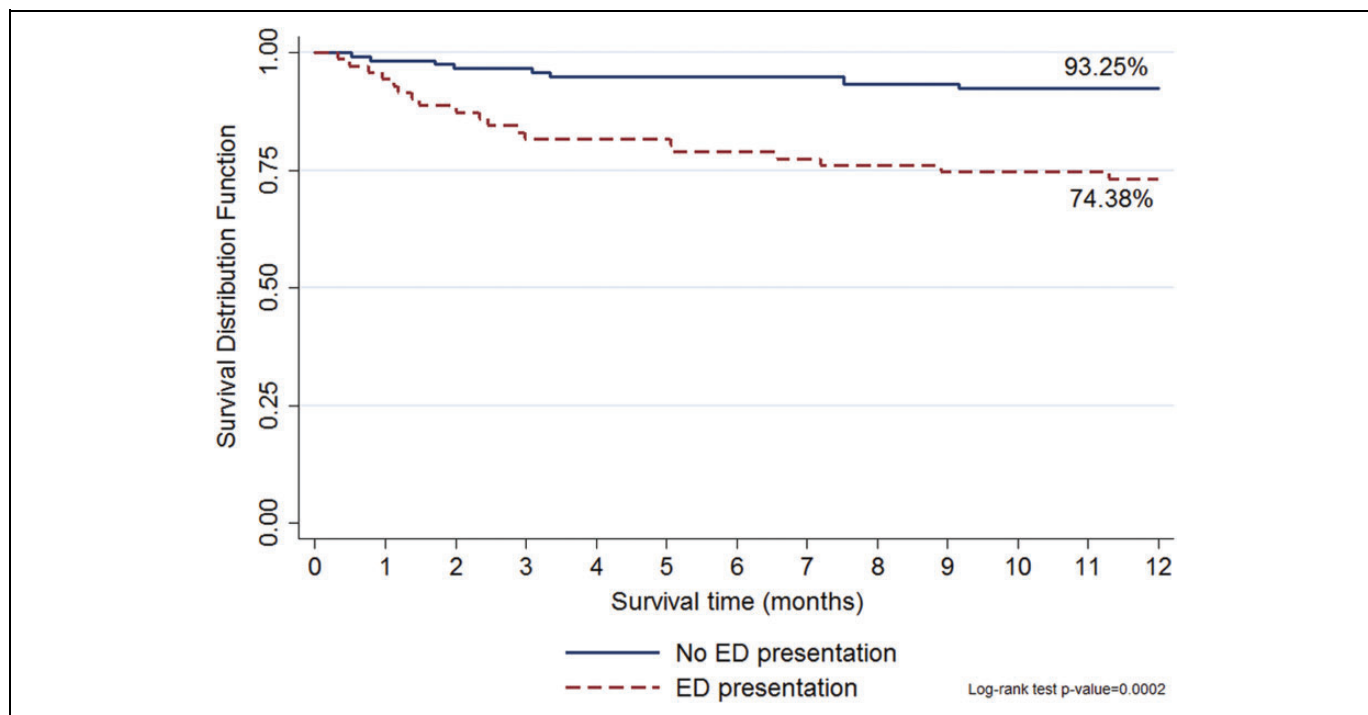
The hazard ratios for survival after diagnosis for patients with ER presentation are shown in Figure 2. In the unadjusted model (model 1), ER presentation patients had 4.24 times

higher mortality risk than non-ER presentation patients ($P < .05$). When we evaluated the other 2 adjusted models, we found similar results than the unadjusted model. Model 2 was adjusted for the individual characteristics. Meanwhile, model 3 was adjusted for both the individual and health system characteristics.

Discussion

This study found that 37.37% of the study population had an ER presentation as their first contact with the health-care system for a cancer diagnosis; this is higher than other similar studies[2,14,15] where ER presentation was around 23% to 26%. Patients who had an ER presentation were more likely to be male and in the oldest group of age (60-64 years). This suggests that intervention focused on males and older people could reduce the ER presentation and improve the patient's survival.

In addition, the experience of survival for the ER presentation group was statistically different from the non-ER presentation group. Consistent with others analyses,[2,5,8] ER presentation was a highly predictive factor of cancer mortality in the year following the CRC diagnosis. Likewise, ER presentation was strongly associated with 1-year excess mortality even after adjusting for the considered confounders.

Figure 1. Cancer-specific survival in government health plan (GHP) patients by initial presentation of cancer diagnosis, Puerto Rico 2012.
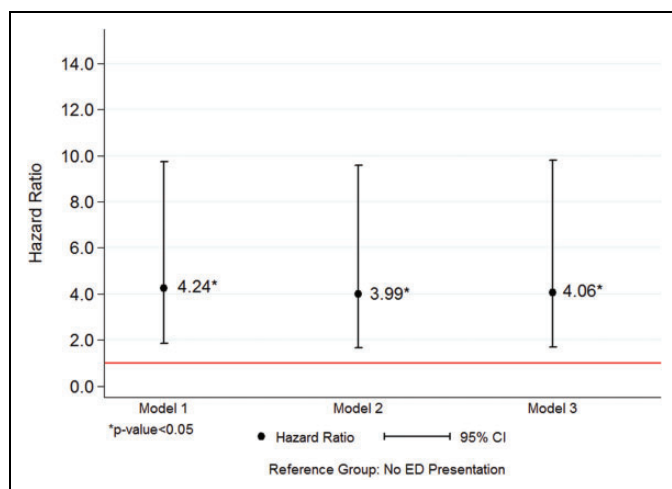
Figure 2. Hazard ratios with 95% confidence intervals (CIs) for survival after 1 year of colorectal cancer diagnosis for government health plan (GHP) patients with emergency room (ER) presentation, Puerto Rico 2012. Model 1: unadjusted model. Model 2: adjusted for sex and age, marital status, comorbidities, primary site location, and stage at diagnosis. Model 3: adjusted for sex, age, marital status, comorbidities, primary site location, stage at diagnosis and type of primary center, and region gastroenterologist rate.

Similar to others studies,[2,8,14-16] ER presentation patients were more likely to have advanced stage. These findings shed a light on the consistent results of a more advanced disease[1-4] in patients with ER presentation. Having their first contact with the health-care system for a cancer diagnosis through the ER may be indicative of deficient use of appropriate primary care among GHP beneficiaries. Studies have shown that lack of visits to primary care is one of the most important factor that increases the risk of an ER presentation.[17,18] The results indicate that timely PCPs visits may have not occurred. As well, it may be indicative of patient delay that is defined as the interval of time in which a patient becomes aware of symptoms before seeking medical care.[6] This is relevant since studies have found that greater utilization of primary care before cancer diagnosis improves health outcomes.[19-22] Another factor to consider ER presentation with advance cancer would be whether these patients have tumors that are more aggressive. Further studies are warranted to gain additional knowledge on the ER presentation outcomes and predictors.

This study has several limitations. The study sample size was limited since only 2012 data were available for analysis. Nevertheless, this is a population-based sample that included all GHP patients in Puerto Rico within the study period who met the inclusions criteria. Also, we were not able to obtain the CRC screening patterns before the cancer diagnosis, as only 1 year of data were available. In addition, claims data were used to estimate a patient's first contact with the health-care system. Claims data are made for the purpose of reimbursement, not for research. However, linkage between the PRHIA and the PRCCR databases allowed us to validate the quality of the claims data. Furthermore, we were unable to include variables related to tumor aggressiveness to determine how these may influence ER presentation.

A number of future research opportunities result from this study in order to clarify and expand on the current findings. In terms of treatment type, we didn't evaluate it since the health plan is the same for all, having the same resources, and the

treatments were similar. Although we assume that patients enrolled in the GHP have similar treatments available to them once diagnosed, it may be important to evaluate treatment patterns in future studies. Future research includes extending the study period and to include other clinical and health system variables in the analyses. This will allows us to perform other research studies, and future research studies should further evaluate other methods as the propensity score match in order to assess more information about the net influence of ER presentation versus non-ER presentation. These future studies should also evaluate primary care and screening patterns before the cancer diagnosis.

Conclusion

Late presentation for CRC diagnosis through an ER visit is a significant concern for the GHP and influences negatively on the patient's outcome. Investigating the pathway of any clinical interaction occurring prior to the ER presentation will be helpful in order to understand this issue.[23] Similarly, to assess the patient's experience can help eliminate barriers in health service access.

Scholefield and colleagues[7] found that screening for CRC can significantly reduce the number of ER presentations. Government health plan provides preventive services, like colorectal screening tests without cost sharing, but the use of CRC screening in Puerto Rico is very low. In Puerto Rico during 2012, the prevalence of adults aged 50 to 59 years and 60 to 64 years who had ever had a sigmoidoscopy or colonoscopy was 34.1% and 51.5%, respectively,[24] below the goal established by Healthy People 2020 (70.5%). Therefore, making the screening tests accessible must be accompanied by an increased awareness for patients of the relevance of performing these tests. Most of the studies are done with secondary databases not capturing the patient's experience; therefore, studies that take into account the patient's experience are necessary to better understand the interplay factors that affect the patient's screening behavior and other health outcomes.

If cancer screening and adequate treatment are available through GHP, why are they not being utilized in a timely manner? Although more research is needed to understand this fact, improving the continuity of care and the communication between physicians and GHP patients is important for increasing the likelihood of CRC screening. The GHP of Puerto Rico should focus attention on not only improving access to CRC screening but also changing attitudes about the importance of screening. We can conclude that providing coverage of cancer screening alone has not been sufficient to remove barriers to health care among the GHP population. These findings can be fundamental to implementing effective policies that can reduce inequity and improve the efficiency of the GHP.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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