

Postoperative Surveillance Adherence in Colorectal Cancer Patients at Urban Medical Centers: Is It Adequate?

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Abstract

Introduction

Colorectal cancer (CRC) is among the most frequent cancers in the United States. There are recognized guidelines for monitoring after curative CRC excision. This study looks into the rate of compliance with surveillance guidelines following CRC resection, as well as the impact of demographic characteristics.

Methods

Data was collected retrospectively including demographics, stage at diagnosis, and adherence to surveillance guidelines as recommended by the United States Multi-Society Task Force (USMSTF) guidelines for CRC patients who underwent curative surgical resection between 2005 and 2014 in two tertiary academic medical centers.

Results

A total of 124 patients were included (male, 56.5%; female, 43.5%), 109 (87.9%) were African Americans, and 70 (56.5%) had Medicare/Medicaid insurance. Overall, appropriate clinical evaluation twice per year for three years following surgery was completed in 78 patients (63%). A total of 56 patients (45%) had carcinoembryonic antigen (CEA) levels checked twice a year for three years. Surveillance colonoscopy one year postoperatively occurred in 64 (51.6%), and 37 (29.8%) had a second colonoscopy three years postoperatively. Abdomen/pelvis CT scan was obtained in 90 (72.5%) at one year postoperatively. In the entire cohort, strict adherence to post-resection surveillance only occurred in 46 (37.1%). There was no correlation between adherence to surveillance and gender ($p=0.184$), race ($p=0.118$), or insurance type ($p=0.51$).

Conclusion

Adherence to surveillance after curative CRC resection was inadequate regardless of socioeconomic status, medical insurance, or race. Measures should be taken to identify barriers and improve compliance with guidelines.

Categories: General Surgery, Gastroenterology, Oncology

Keywords: colorectal cancer (crc), colorectal surgery, gastrointestinal oncology, lower gastrointestinal or colorectal surgery, lower gastrointestinal surgery

Introduction

Colorectal cancer (CRC) is the second most common cause of cancer-related mortality in the United States [1]. In 2023, an estimated 153,020 individuals were diagnosed with CRC, with approximately 52,550 deaths attributed to the disease. CRC-related mortality has declined over the past couple of decades [1]. This is primarily due to improved early detection with screening colonoscopy, surgical advances, and also new targeted chemotherapy [1]. However, there is a documented disparity in the early detection rate and mortality of CRC that is related to ethnicity and socioeconomic and insurance status [2-4]. In general, insurance and socioeconomic status as well as race were found to have a significant impact on the screening, early detection, and mortality of CRC [4]. This could be explained by the impact of these factors on access to medical care and treatment [4].

The optimal treatment of non-metastatic CRC is curative resection followed by appropriate surveillance to detect early recurrence. There are several established surveillance guidelines following a curative surgical resection of CRC. These guidelines are defined by the United States Multi-Society Task Force (USMSTF) on CRC [5,6], which is a group of leading gastroenterologists from the American College of Gastroenterology,

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the American Gastroenterological Association, and the American Society for Gastrointestinal Endoscopy [7], who evaluate newly available literature and update guidelines for post-CRC resection follow-up.

Understanding the factors influencing surveillance adherence in patients who have undergone curative surgery is critical for optimizing outcomes. In this study, we conducted a retrospective review aiming to examine the adherence rate to post-resection surveillance guidelines of CRC cases in urban tertiary medical centers to determine the potential impact of demographic factors that are known to affect screening on the surveillance rate of these cases.

This manuscript has been previously posted as a preprint on medRxiv (<https://www.medrxiv.org/content/10.1101/2024.05.23.24307790v1>).

Materials And Methods

We conducted a retrospective study of patients who underwent curative CRC resection at two urban teaching medical centers over nine years (January 2005 through December 2014). For the purpose of the study, curative surgical resection was defined as achieving adequate clear surgical margins with lymph node harvesting according to established operative oncological principles in patients without evidence of systemic disease. Exclusion criteria include patients who did not undergo any treatment, patients who received only chemotherapy or radiation for palliative purposes, and patients who underwent palliative surgical resection. Patients who underwent neoadjuvant chemotherapy followed by curative resection were included.

Surveillance procedures were defined according to the guidelines established by the USMSTF. This included a protocol of office visits every 3-6 months for the initial three years, serum carcinoembryonic antigen (CEA) level monitoring at each follow-up during the first three years, annual computed tomography (CT) scans of the chest, abdomen, and pelvis for a minimum of the initial nine years, and a strategically timed repeat colonoscopy one-year post-operation, followed by subsequent colonoscopies every 3-5 years contingent upon findings from the initial one-year colonoscopy.

Data collection included patient demographics, oncological data, operative details, and postoperative surveillance. Data was presented as numbers, percentages, and ratios as appropriate. Numerical variables were analyzed with t-test or ANOVA and categorical variables with Pearson's chi-squared or Fisher's exact test as appropriate. Regression analysis was applied to determine independent predictors of outcome. In all analyses, a p-value of ≤ 0.05 was considered statistically significant. All statistical analyses were conducted utilizing IBM SPSS Statistics for Windows, Version 25.0 (Released 2017; IBM Corp., Armonk, New York, United States). Ethical approval for this study was obtained from the Institutional Review Board of Wayne State University in Detroit, Michigan (approval number: 100716M1EV).

Results

The initial search in hospital records, employing the keywords "colon cancer", "colorectal cancer", and "rectal cancer", yielded a cohort of 698 patients. Out of these patients, 574 were excluded according to our exclusion criteria resulting in a final cohort of 124 patients who underwent curative surgical resection (Figure 1). A thorough evaluation of medical records, office visits, CT imaging, CEA levels, and colonoscopy was conducted. Follow-up and surveillance data were collected in accordance with the standards set by the USMSTF.

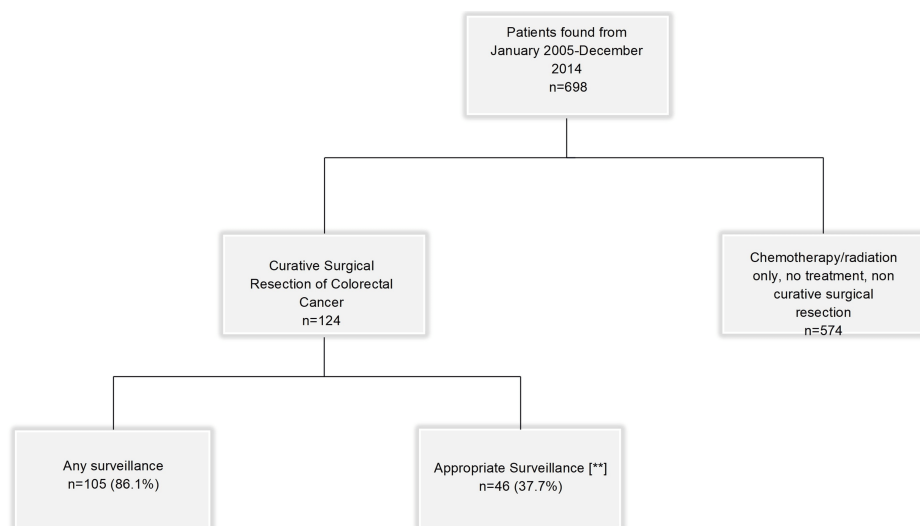


FIGURE 1: Model for patient selection of curative surgical resection

**.: per the United States Multi-Society Task Force guidelines

The final study group consisted of 54 female patients (43.5%) and 70 male patients (56.5%), with 32.2% greater than 65 years of age. Consistent with our medical center demographics, the racial distribution was as follows: 109 (84.7%) African American, 12 (9.7%) White, and seven (5.6%) other races. Regarding insurance, 70 patients (56.5%) had Medicare/Medicaid insurance, 36 (29%) had private insurance, and 18 (14.5%) did not have insurance. At the time of diagnosis, 10 (8%) had stage IV, 51 (41%) had stage III, 48 (39%) had stage II, 14 (11%) had stage I, and only one patient (0.8%) had stage 0 (carcinoma in situ). The demographic features, insurance status, and cancer stage at the time of diagnosis are shown in Table 1. As shown, neither gender ($p=0.746$; degree of freedom (df)=4), race ($p=0.122$; df=8), nor insurance status ($p=0.472$; df=8) emerged as a predictor of the stage of cancer at the time of diagnosis.

Stage	0	I	II	III	IV	
n (%)	1 (0.8%)	14 (11%)	48 (39%)	51 (41%)	10 (8%)	
Gender, n (%)						
Male 70 (56.5%)	0 (0)	8 (11)	28 (40)	27 (39)	7 (10)	0.746¥
Female 54 (43.5%)	1 (2)	6 (11)	20 (37)	24 (44)	3 (6)	
Race, n (%)						
White 12 (12.1%)	0 (0)	0 (0)	7 (58)	4 (33)	4 (33)	0.122¥
African American 105 (84.7%)	1 (1)	13 (12)	39 (37)	46 (44)	6 (6)	
Other 4 (3.2%)	0 (0)	1 (25)	2 (50)	1 (25)	0 (0)	
Insurance, n (%)						
Private 36 (29%)	0 (0)	3 (8)	17 (47)	12 (33)	4 (11)	0.472¥
Medicare/Medicaid 70 (56.5%)	1 (1)	7 (10)	27 (39)	31 (44)	4 (6)	
None 18 (14.5)	0 (0)	4 (22)	4 (22)	8 (44)	2 (11)	

TABLE 1: Relation between patient characteristics and colorectal cancer stage at the time of diagnosis

¥: Fisher's exact test

The relationship between demographics and adherence to postoperative surveillance in all patients is shown

in Table 2. Overall, 105 patients (86%) underwent some form of surveillance, while only 46 (37.7%) adhered to the "appropriate surveillance" criteria outlined by the USMSTF. Overall, female patients received a higher percentage of some element to surveillance (49, 91%) compared to male patients. In addition, 21 (39%) female patients adhered to the standard of strict surveillance compared to male patients (25, 36%). The gender difference ($p=0.184$; $df=1$) in receiving any measure of surveillance or adherence to strict surveillance criteria did not reach statistical significance. Neither was there any statistically significant difference in adherence to surveillance based on race ($p=0.118$; $df=2$), insurance status ($p=0.513$; $df=2$), or stage at the time of diagnosis (Table 2).

	Any surveillance	P-value	Appropriate surveillance	P-value
Gender, n (%)				
Male	56 (80)	0.184	25 (36)	0.81
Female	49 (91)		21 (39)	
Race, n (%)				
White	12 (100)	0.118	7 (48)	0.201¥
African American	92 (88)		39 (37)	
Other	2 (50)		0 (0)	
Insurance, n (%)				
Private	32 (89)	0.513	15 (42)	0.811
Medicare/Medicaid	59 (84)		24 (34)	
None	14 (78)		7 (39)	
Stage, n (%)				
0	1 (100)	0.129	0 (0)	0.819¥
I	9 (64)		5 (36)	
II	42 (88)		16 (33)	
III	45 (88)		22 (43)	
IV	8 (80)		3 (30)	

TABLE 2: Patients' characteristics comparing any surveillance vs. appropriate surveillance**

¥: Fisher's exact test; **: per the United States Multi-Society Task Force guidelines

Sub-analysis was performed to determine the adherence to specific surveillance measures individually. A total of 78 patients (62.9%) underwent office clinical evaluation by their physician twice a year for three years post-surgery. Colonoscopy was performed one year postoperatively in 64 patients (51.6%), and only 37 (29.8%) of these patients had a second colonoscopy at three years postoperatively. CEA levels were checked twice annually for three years according to surveillance guidelines in 56 (45.1%) only. However, abdomen/pelvis CT scan was obtained in 90 patients (72.58%) at one year postoperatively.

Discussion

We conducted a retrospective review aiming to assess the adherence rate to post-resection surveillance guidelines of CRC cases in two urban tertiary teaching medical centers and to evaluate the impact of demographics on strict compliance with guidelines. Our hypothesis was that the rate of adherence to guidelines was negatively influenced by certain patient demographics. In this study, we found the following: (a) there is a low overall adherence rate to strict surveillance guidelines in patients who underwent curative CRC resection, (b) this low adherence rate was not significantly impacted by insurance status, race, or gender, and (c) these demographic features had no significant impact on the stage of cancer at the time of diagnosis.

After curative resection, recurrent disease arises in 30-50% of cases, with the highest rate occurring within the first two years [8]. The yearly incidence of recurrent disease after curative resection is approximately

9.9% at one year, 26.2% at three years, and 31.5% at five years [8]. Hence, the guidelines advocate for an intensive follow-up program after primary surgical CRC treatment in the initial three-year period. The USMSTF has established surveillance guidelines after curative CRC resection [9].

Post-treatment surveillance is an essential component of the CRC survivorship plan, yet adherence to recommended guidelines among CRC survivors fell short of optimal levels. Challenges to surveillance include various factors such as limited access to healthcare, financial and psychological barriers, patient comorbidities, awareness and education gaps, and communication issues among healthcare providers [10].

In this study, only 38% of patients received strict surveillance measures as outlined by USMSTF. Similarly, a low rate of adherence to these guidelines has been found by Cooper et al. in a study of 9,426 patients who reported only 17.1% had appropriate surveillance [11]. In another study by Sisler et al., just 12.3% out of 250 patients received the recommended surveillance measures according to guidelines [12]. These low rates could be influenced by various barriers that could be related to the patient or the provider [13]. Patients undergoing uncomfortable bowel preparation for colonoscopy and a lack of a designated responsible provider for conducting surveillance investigations among multiple healthcare providers were some of the identified factors impacting CRC survivor care [14]. Interventions to address and eliminate these and other surveillance barriers should be implemented to improve compliance. A comprehensive approach including patient education about its importance, implementation of patient support programs, addressing logistical barriers, training healthcare providers about guidelines and follow-up procedures, promoting clear communication among providers, and defining their roles in care plans [10] is key to enhancing adherence for CRC survivors.

An important finding in our study is the lack of significant influence of demographic factors, namely, the type of insurance, race, patient's gender, or the stage of cancer at the time of diagnosis on the post-resection surveillance in our cohort. These findings align with the previous results of Mohy-ud-din et al., who found in a cohort of 80 patients that factors like age, gender, race, stage at diagnosis, and insurance status did not predict adherence to surveillance colonoscopy guidelines [13]. According to a study by Cooper et al., which involved 9,426 patients from the Medicare cancer database, adherence to guidelines was found to be associated with younger individuals, the White race, advanced-stage cancers (cancers that have spread to adjacent organs or regional lymph nodes), and poorly differentiated tumors [11]. The study also showed variations in adherence rates based on geographical differences, which suggested that healthcare system and provider factors might have influenced the findings. Our study, on the other hand, included patients with varying insurance statuses, from the same geographic region who received treatment in the same clinical tertiary center. This consistency in location and provider-related factors enabled us to better assess how patient-specific elements affect adherence to guidelines.

Predicting the survival rate of CRC is significantly determined by the stage at diagnosis, with the five-year relative survival rate varying from 91% for localized disease to 14% for advanced disease [1]. The stage of CRC might be affected by screening practice and its utilization by the community, recognition of symptoms at presentation, and biological tumor growth variability [1]. Despite certain demographics that may influence the CRC incidence, it did not show a predictive value for the stage of CRC at the time of diagnosis in our cohort who underwent curative resection. This could be attributed to the homogeneity of patient characteristics, consistency in local healthcare practice, and uniform receipt of surgical treatment across all demographic groups in the study.

While there is no particular targeted intervention aimed at enhancing adherence to the surveillance recommended by clinical practice societies, different interventions have been explored. For instance, sending a mail reminder to the primary physician [15] and implementing nurse coordinator supervision [16] both have been shown to significantly enhance the adherence rate. Conversely, employing paper-based education approaches to the patients and providers did not yield success [17]. Another proposal was using electronic reminders followed by phone calls from staff members to encourage compliance [13], which appears promising, but further clinical research is required to validate the theory. In the future, additional data such as distance from the hospital and other socioeconomic factors may help improve insight into patient surveillance following CRC resection.

Our study has certain limitations. As a retrospective study, a portion of our dataset was excluded due to a lack of known outcomes for patients, typically due to undocumented follow-ups. The majority of our cohort were African Americans, and the predominant type of insurance was Medicare/Medicaid which may limit the generalizability of our findings. However, at the same time, it may have provided valuable insight into these specific groups of patients. In addition, although our sample size only included 124 patients, 57% comprised men and 44% were women which is fairly representative of CRC within the general population. However, the small sample size may have contributed to the discrepancy between our findings and those of previous reports. Larger cohort studies may eliminate this discrepancy in future studies.

Conclusions

Our study findings demonstrated the current adherence rate to strict surveillance guidelines of CRC patients after curative resections is unacceptably low regardless of the patient's demographic factors. This finding is

worrisome given the evidence emphasizing the critical role of adequate surveillance practices following colorectal surgery in improving the survival of CRC patients. Therefore, future research with a larger sample for recognizing and addressing barriers to surveillance is critical to improve compliance with guidelines and overall survival.

Additional Information

Author Contributions

All authors have reviewed the final version to be published and agreed to be accountable for all aspects of the work.

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Disclosures

Human subjects: Consent for treatment and open access publication was obtained or waived by all participants in this study. Institutional Review Board of Wayne State University issued approval 100716M1EV. **Animal subjects:** All authors have confirmed that this study did not involve animal subjects or tissue. **Conflicts of interest:** In compliance with the ICMJE uniform disclosure form, all authors declare the following: **Payment/services info:** All authors have declared that no financial support was received from any organization for the submitted work. **Financial relationships:** All authors have declared that they have no financial relationships at present or within the previous three years with any organizations that might have an interest in the submitted work. **Other relationships:** All authors have declared that there are no other relationships or activities that could appear to have influenced the submitted work.

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