Surveillance and Survivorship after Treatment for Colon Cancer

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Abstract

Keywords

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Colorectal cancer is the third most common cancer diagnosed in the United States. Majority of patients have localized disease that is amenable to curative resection. Disease recurrence remains a major concern after resection. In addition, patients are at an increased risk for developing a second or metachronous colon cancer. The principal goal of surveillance following treatment of colon cancer is to improve disease-free and overall survival. Survivorship is a distinct phase following surveillance to help improve quality of life and promote longevity.

Colorectal adenocarcinoma is the second leading cause of cancer death in the United States and accounts for more than 50,000 deaths annually.^{1,2} Each year approximately 148,000 new cases of colon and rectal cancer are diagnosed in the United States. Surgical resection remains the definitive primary therapy and approximately 70 to 80% of these patients have cancers that are resected with curative intent. Therefore, approximately 110,000 patients per year are eligible for postoperative follow-up. The 5-year survival rate for patients who have undergone curative resection for localized disease (Stage I) is 90%, this decreases to around 65% when metastasis to regional lymph nodes (Stage III) is detected.² The majority of recurrences occur within the first 3 years after surgical resection of the primary tumor and around 95% in the first 5 years.^{3–5} The most common sites of recurrence are the liver, lungs, and locoregional. The main goal of surveillance is to improve overall survival by detecting recurrences in the asymptomatic stage when radical surgical treatment could still be a viable option. Other potential benefits include the identification of metachronous colorectal cancers, monitoring outcomes, psychological support, and identifying treatment complications and related medical issues. Controversies exist with regard to the diagnostic tests, the timing of these tests, and also the necessity of a follow-up. A combination of modalities is commonly used including physical examination, carcinoembryonic antigen (CEA) level, liver sonography, colonoscopy, proctosigmoidoscopy/endoanal ultrasound (rectal cancer), computed tomography (CT), magnetic resonance

imaging, positron emission tomography (PET) scan, and chest X-ray. Since more than 500,000 patients undergo postoperative follow-up after treatment for colorectal cancer in the United States, it is important to outline appropriate surveillance strategies for colon cancer surveillance.

Is Follow-Up Justified?

Historically, seven single institution, prospective, randomized trials in the literature since 1990 have compared follow-up surveillance strategies after curative surgery for colorectal adenocarcinoma.^{6–12} These studies compared surveillance in two groups of patients that had colon or rectal cancer resection. All seven trials had two types of surveillance groups: a high intensity and a low intensity (control) group. The frequency and screening tools utilized in each group varied among studies. Sample sizes ranged from 106 to 1,202 patients. Follow-up lasted for at least 5 years post resection, or until they died. The main outcome measured was overall survival. Majority of the procedures performed in both the groups were for local recurrence or metastatic disease. However, the recurrences were more likely to be found earlier or in the asymptomatic stage in the intensive follow-up group, resulting in effective salvage surgery and, therefore, better survival (►Table 1).^{13–15}

The follow-up after colorectal surgery (FACS) randomized clinical trial by Primrose et al,¹² recently published, confirmed previous data that intensive follow-up increases the

Table 1 Description of randomized trials of colorectal surveillance after treatment

Study	N	Control (minimal)	Study arm (intensive)
Ohlsson	107	FOB every 3 months for 2 years, then yearly, and return for symptoms	Clinical assessment, blood CEA, liver enzyme, CXR, FOB, and rigid sigmoidoscopy every 3 months for 2 years, then every 6 months; flexible endoscopy for control of anastomosis at 9, 21, and 42 months. Complete colonoscopy at 3, 15, 30, and 60 months; CT pelvis at 3, 6, 12, 18, and 24 months.
Makela	106	Clinical assessment, blood counts, CEA, CXR, and FOB every 3 months for 2 years, then every 6 months for the next 3 years; rigid sigmoidoscopy for rectosigmoid tumors at each visit and yearly BE for all patients.	Clinical assessment, blood counts, CEA, CXR, and FOB as in control. Colonoscopy at 3 months if not performed preoperatively and then yearly for all patients. Flexible sigmoidoscopy for rectosigmoid tumors every 3 months, liver ultrasound every 6 months, and yearly CT of liver.
Kjeldsen	597	Clinical assessment, blood hemoglobin, ESR, liver enzymes, CXR, FOB, and colonoscopy (if incomplete, double contrast BE) at 5, 10, and 15 years.	Same tests as in control, but tests were conducted every 6 months for 3 years and then at 4, 5, 7.5, 10, 12.5, and 15 years.
Schoemaker	325	Clinical assessment, blood counts, CEA, liver enzymes, and FOB every 3 months for 2 years, then every 6 months for 5 years; CXR, CT liver, and colonoscopy at 5 years.	Clinical assessment, blood counts, CEA, liver enzymes, and FOB as in control. CXR, liver CT, and colonoscopy annually. Isolated increase in CEA levels did not trigger further investigations.
Pietra	207	Clinical assessment, CEA, and liver ultrasound every 6 months for one year, then yearly; CXR and colonoscopy yearly.	Clinical assessment, CEA, and liver ultrasound as in control, but tests were conducted every 3 months for 2 years, then every 6 months for 3 years, and yearly thereafter. In addition, CXR, abdominal CT, and colonoscopy yearly.
Secco	145	Patients to call the surgical team every 6 months. Clinical assessment by family physician at least once a year or when symptoms were noticed.	High-risk patients: Clinical assessment and CEA every 3 months for 2 years, every 4 months in the 3rd year, and every 6 months in the 4th and 5th year. Abdominal and pelvic ultrasound performed every 6 months the first 3 years and yearly in years 4 and 5. Rigid sigmoidoscopy and CXR yearly for patients with rectal cancer. Low-risk patients: Clinical assessment and CEA every 6 months for 2 years, then yearly; abdominal and pelvic ultrasound every 6 months for 2 years, then once a year. Rigid sigmoidoscopy for rectal cancer yearly twice, then every 2 years and CXR yearly.
Primrose (FACS trial)	1,202	No scheduled follow-up except a single CT scan of the chest, abdomen, and pelvis at 12–18 months. Colonoscopy at trial entry and at 5 years (end of trial).	CEA follow-up group: CEA every 3 months for 2 years, then every 6 months for 3 years, with a single chest, abdomen, and pelvis CT scan at 12–18 months. CT follow-up group: CT of the chest, abdomen, and pelvis every 6 months for 2 years, then annually for 3 years. CEA and CT follow-up group: Both blood CEA and CT as above.

Abbreviations: BE, barium enema; CEA, carcinoembryonic antigen; CT, computed tomography; CXR, chest X-ray; ESR, erythrocyte sedimentation rate; FACS, follow-up after colorectal surgery; FOB, fecal occult blood.

likelihood of detecting early recurrences that can be treated with curative intent. Two-thirds of the recurrences (130 out of 199 patients) were detected by scheduled follow-up surveillance. The rest of the recurrences were interval cases presenting symptomatically. Surgical treatment of recurrence with curative intent was higher in intense follow-up group (21.3% in intense follow-up group vs. 2.3% in minimal follow-up group). The absolute difference in rate of detection of treatable recurrence was around 8% in the intensive follow-up group compared with the minimal follow-up group. There were no recurrences treatable with curative intent detected in the minimal follow-up group.

Follow-Up Intervals

Follow-up interval is controversial. None of the randomized trials analyzed in several meta-analyses had homogeneous follow-up strategies (► **Table 2**). Despite the fact that we do not have data to recommend tests or frequency of visits, one can draw conclusions based on some facts.¹ Recurrence is most common in the first 2 to 3 years after surgery. One meta-analysis,¹⁶ that included nonrandomized trials, suggested better results with follow-up every 4 months during the first 2 years. Another study¹⁷ showed that follow-up beyond 5 years is not effective as recurrence is not common. Based on Makela et al and Kjeldsen et al, 16 to 66% were symptomatic at the time of disease recurrence diagnosis. Only 1.7 to 7% of all the symptomatic patients have resectable disease.^{3,8,18} Therefore, intensive follow-up should aim to identify patients with recurrent disease in the asymptomatic group. Routine follow-up, can ensure that adequate surveillance, provide reassurance, counselling (advice screening for family members) and provide psychological support to the patient. Because symptoms of disease recurrence are nonspecific and the patient may not be aware of them, frequent follow-ups can help the physician identify this subset of patients in the early stages. The results from the FACS trial¹² confirm the importance of frequent follow-up surveillance post treatment of colon cancer regardless of the stage.

Physical Examination

Routine physical examination is not useful in identifying recurrences.^{6–11,18} Between 0 and 6% of the asymptomatic patients are found to have recurrence on examination. Physical examination is useful in identifying a second neoplasm (breast, prostate, and thyroid), side effects of treatment (patient receiving adjuvant chemotherapy), and offers a psychological benefit.^{19,20} As a result, physical examination should be a part of the surveillance.

Serum Hemoglobin, Fecal Occult Blood, Liver Function Tests

Serum hemoglobin and liver function tests (LFTs) are poor tests for the identification of recurrent disease. Less than 1% of the recurrences are identified by either test.^{1,3,6,21} Kjeldsen et al obtained serum hemoglobin in both intense and minimal

follow-up groups at different intervals and did not find an overall survival benefit between the two groups. Likewise, a randomized control trial did not show a survival benefit when LFTs were used for intense follow-up.⁶ On the other hand, fecal occult blood testing has been shown to detect local recurrences as well as metachronous cancers. Fecal occult blood testing is positive in 10 to 30% of the local recurrences and metachronous lesions.^{22–24}

Carcinoembryonic Antigen

Preoperatively, CEA levels serve as a prognostic factor in predicting outcome of colorectal cancers. A CEA level more than 30 ng/mL was associated with 22 months median survival compared with 34.8 months when the level was less than 30 ng/mL.^{25,26} Several studies showed that a postoperative CEA level > 5 ng/mL has a positive predictive value of 70 to 80% of recurrent disease.¹ An elevated CEA level is one of the first indicators of recurrent disease (38–66%). It is a very cost-effective test in colorectal cancer surveillance.¹³ Its sensitivity varies depending on the site of disease recurrence (78% for liver metastases, 45% for local recurrences, and 42% for lung metastases).²⁷ Renehan et al in a meta-analysis showed a reduction in mortality by 9 to 13% with the use of CEA in postoperative surveillance.^{13–15} An elevated CEA level should prompt a more extensive workup to look for metastases before the consideration of any surgical approach.^{28,29}

The recent FACS randomized clinical trial by Primrose et al¹² provided an increased rate of surgical treatment of recurrence with curative intent compared with minimal follow-up (odds ratio = 3 [95% confidence interval {CI}, 1.2–7.3]). CEA was measured every 3 months for 2 years, then every 6 months for 3 years. A single CT scan of the chest, abdomen, and pelvis was obtained at 12 to 18 months. The cut-off CEA level that prompted further workup was 7 µg/L or more than baseline level at the time of entry into the trial. A recent study by Litvak et al showed that CEA levels can be falsely elevated in patients who underwent colorectal cancer resection. False-positive results in the range of 5 to 15 ng/mL are common and confirmation of CEA elevation may be appropriate before initiating a comprehensive recurrence workup.³⁰

Lung Imaging Studies

Lung metastases occur in approximately 25% of the patients with resected colorectal cancer and more commonly with rectal cancer.¹⁵ The role of chest radiography (CXR) in surveillance has received a moderate amount of attention in the literature. Some trials have suggested a 0.9 to 1.9% detection of resectable disease in patients followed with CXR alone.¹ Detection rates can be higher with rectal cancer patients, where lung metastases are more common.³¹ Older randomized trials did not show a difference in diagnosis of resectable pulmonary metastases and survival between intensive follow-up and minimal follow-up groups using CXR alone. With the widespread use of CT scan in intensive follow-up, a CT scan of the chest is usually obtained in

Table 2 National comprehensive cancer network

	Stage I disease	Stage II/III disease	Stage IV disease (1)
Physical examination	No	Every 3–6 months for 2 years, then every 6 months for a total of 5 years.	Every 3–6 months for 2 years, then every 6 months for a total of 5 years.
CEA testing	No	Baseline level, then every 3–6 months for 2 years, then every 6 months for a total of 5 years.	Baseline level, then every 3–6 months for 2 years, then every 6 months for a total of 5 years.
Colonoscopy	At 3–6 months post resection if not done preoperatively in case of obstructing lesion. Otherwise, at ~1 year post resection. Repeat colonoscopy at 3 years, then every 5 years thereafter unless an advanced adenoma (1) is found (2).	At 3–6 months post resection if not done preoperatively in case of obstructing lesion. Otherwise, at ~1 year post resection. Repeat colonoscopy at 3 years, then every 5 years thereafter unless an advanced adenoma (2) is found (3).	At 3–6 months post resection if not done preoperatively in case of obstructing lesion. Otherwise, at ~1 year post resection. Repeat colonoscopy at 3 years, then every 5 years thereafter unless an advanced adenoma (2) is found (3).
CT abdomen and pelvis	No	Annually for up to 5 years (4).	Every 3–6 months in the first 2 years, then every 6–12 months for a total of 5 years.
CT chest	No	Annually for up to 5 years (4).	Every 3–6 months in the first 2 years, then every 6–12 months for a total of 5 years.
PET/CT	No	Routine use for monitoring of disease recurrence not recommended.	Routine use for monitoring of disease recurrence not recommended.

Abbreviations: CEA, carcinoembryonic antigen; CT, computed tomography; PET, positron emission tomography.

Notes: (1) With no evidence of disease post resection and adjuvant chemotherapy.

(2) Advanced adenoma: villous polyp, polyp > 1 cm, or high-grade dysplasia.

(3) Colonoscopy should be repeated in 1 year.

(4) Stage II and III disease with high risk of recurrence.

addition to the abdomen and pelvis. In the FACS trial, the randomized group to the CT follow-up had a CT chest, abdomen, and pelvis every 6 months for 2 years, then yearly for 3 years. Metastases to liver and/or lung detection were combined, and an overall surgical treatment with curative intent was higher in the intensive follow-up CT scan group (odds ratio = 3.6 [95% CI, 1.5–8.7]) compared with minimal follow-up (no scheduled follow-up except a single CT scan of the chest, abdomen, and pelvis at 12–18 months if requested at study entry by the hospital clinician).

Hepatic Imaging Studies

The main goal of imaging in follow-up is early detection of liver metastases in the asymptomatic stage. Depending on the number of lesions and their location, these patients can be treated surgically (resection or radiofrequency ablation) or with chemotherapy. The 5-year survival for these recurrences, when treated, is between 20 and 40%.³² Figueredo et al, in their analysis, showed that CT scan is more sensitive than ultrasound (US) in detecting liver metastases.¹⁵ One study showed the sensitivity of CT in detecting asymptomatic liver metastases to be 0.67, compared with 0.43 for US and 0.33 for CEA. The addition of CEA to CT or US increased sensitivity. However, this study did not address which method was better in identifying resectable liver disease.³³ Other authors reported an increased detection of asymptomatic liver metastasis by CT, but did not find an increase in curative resection or in 5-year survival.³⁴ The FACS trial supports the intensive use of CT in follow-up with an 8% rate of surgical treatment with curative intent compared with 2.3% in the minimal follow-up group. Importantly, in this trial, CEA had a similar value when used alone for surveillance (6.7%), but there was no added benefit in the combined CEA + CT group (6.6%). There was no mortality benefit to regular follow-up with CEA, CT, or CEA + CT when compared with minimal follow-up group (death rate, 18.2 vs. 15.9%). The authors did not find a large survival benefit in the intense follow-up group compared with the minimal follow-up group, but they attributed it to the sample size. CEA surveillance alone seems to be more cost-effective than CT. The use of PET-CT to monitor disease recurrence remains controversial and has not been well studied in the literature.

Colonoscopy

Surveillance colonoscopies are primarily done to detect and remove metachronous polyps and cancers. The secondary goal is to identify local recurrences at the anastomosis (2–4% in colon cancer vs. 3–30% in rectal cancer) at a stage that can allow curative resection.^{35,36} In the absence of an obstructing lesion, all patients diagnosed with colorectal cancer should have a preoperative colonoscopic clearance of their colon. Patients who develop sporadic colorectal cancer are at an increased risk of developing a second primary tumor by a factor of 1.5 to 3 compared with the general population. Therefore, frequent colonoscopic surveillance is recommended.³⁷ As per the National Comprehensive Cancer Net-

work (NCCN), colonoscopy should be repeated 1 year after surgery. Endoscopic surveillance is recommended every 3 to 5 years in this subset of patients.³² On the other hand, the effectiveness of this surveillance is not without controversy as some authors of randomized trials reported low yield from frequent bowel surveillance.¹⁷ Surveillance is increased in patients with hereditary colorectal cancer and polyposis syndromes: every 1 to 2 years for Lynch syndrome, starting at the age of 25 to 30 years or 2 to 5 years before the earliest colon cancer if it is diagnosed before the age of 25 years, and every 12 months for familial adenomatous polyposis (FAP) beginning at the age of 10 to 15 years (NCCN).

Guidelines and Recommendations

Currently, recommendations for colon cancer surveillance post-curative surgery and after completion of adjuvant chemotherapy are based on analysis from randomized trials showing 80% of the recurrences occurring in the first 3 years postsurgical resection and another study showing 95% recurrence in the first 5 years.^{3–5} Despite the low level of evidence and the absence of large survival benefit over symptom-based approach, several randomized studies and meta-analyses demonstrated that intensive follow-up strategies have increased rates of detecting resectable local or metastatic disease.^{6–15} Several controversies exist with regard to the optimal strategy for surveillance and the guidelines are based on consensus. Varied follow-up guidelines from American and European Societies, such as the NCCN, American Society of Clinical Oncology (ASCO), and European Society of Medical Oncology (ESMO) exist. However, all agree on the need to detect metachronous cancers and polyps with preoperative colonoscopy followed by a colonoscopy at 1-year post-resection, then every 3 to 5 years. For patients with Lynch syndrome, the panel recommends an annual colonoscopy.

Based on the most current NCCN guidelines, for patients with stage I disease, the panel agrees that a less intensive follow-up strategy is needed because of the low risk of recurrence and the potential harm associated with intensive surveillance (radiation exposure from repeated CT scans and psychological stress from false-positive results). Therefore, the panel recommends a colonoscopy at 1 year for these patients. A repeat colonoscopy is recommended at 3 years and then every 5 years, unless an advanced adenoma (villous polyp, polyp > 1 cm, or high-grade dysplasia) is found. In this case, colonoscopy should be repeated in 1 year. For patients with stage II, III, or IV disease who have undergone curative resection and treatment, the panel favors a more intensive surveillance strategy (►Table 2).

The ASCO Clinical Practice Guidelines Committee endorsed the surveillance strategies recommended by the Cancer Care Ontario (CCO).³⁸ These only differ slightly from the NCCN guidelines. The ASCO/CCO recommends an annual chest, abdomen, and pelvis CT for 3 years total in patients with stage II or III disease (as opposed to 5 years total by the NCCN guidelines). ►Table 3 demonstrates a comparison between the surveillance guidelines

Table 3 Surveillance guidelines comparison

	NCCN	ESMO
History and physical examination	Every 3–6 months for the first 2 years, then every 6 months for up to 5 years	Every 3–6 months for the first 3 years, then every 6–12 months for up to 5 years [II, B]
CEA testing	Every 3–6 months for the first 2 years, then every 6 months for up to 5 years	Every 3–6 months for the first 3 years, then every 6–12 months for up to 5 years [II, B]
Colonoscopy	At 1 year after resection, then at 3 years, then every 5 years thereafter	At 1 year after resection and every 3–5 years thereafter [III, B]
CT chest, abdomen, and pelvis	Annually for up to 5 years	Every 6–12 months for the first 3 years [II, B]
CEUS	No	Could substitute abdominal CT scan [III, C]

Abbreviations: CEA, carcinoembryonic antigen; CEUS, contrast enhancement ultrasound scan; CT, computed tomography; ESMO, European Society of Medical Oncology; NCCN, National Comprehensive Cancer Network.

recommended by the NCCN and ESMO for patients with high recurrence risk.

Survivorship

With significant improvement in cancer prevention, screening, and treatment, colon cancer is becoming a curable disease. The population of survivors in the United States is estimated to be around 11 million and increasing.³⁹ The potential long-term side effects associated with the treatment and its impact on quality of life in cancer-free patients is of great importance. Therefore, there is an increased awareness among clinicians that optimal cancer survivorship involves more than surveillance. The Institute of Medicine established that cancer survivorship is a distinct phase of cancer care. The main elements of this survivorship plan are to prevent recurrent and new cancers, detect the late sequelae of cancer treatment and intervene as needed, assess psychosocial issues, and health promotion.⁴⁰

Quality of life, including physical, functional, psychological, and social functioning, has been studied in the literature among all cancer survivors, specifically among colorectal cancer survivors. Including rectal cancer survivors with colon cancer survivors may have affected the overall results, as the former has, in general, poorer outcome. Most reports of cancer survivors when age-matched with healthy individuals demonstrated poorer quality of life in the cancer group.⁴¹ Colorectal cancer survivors were found to have more physical limitations in daily activities, higher unemployment rates, and poorer psychological and mental issues.⁴² Among colorectal cancer survivors, older patients (older than 65 years), patients with comorbid conditions and advanced stages of disease had poorer outcome as well. Cross-sectional studies demonstrate a lower quality of life within the initial 3 years of diagnosis compared to the favorable quality of life in the subsequent 3 years.⁴³ As far as emotional status is concerned, depressive symptoms in colorectal cancer survivors, in general, improved over the course of the years after treatment. This was not true for survivors with more daily physical activity limitations. Patients with restricted physical activity and social functioning tended to express more depressive

symptomatology than survivors who had limited social activity.⁴⁴ Anxiety was present in all colorectal cancer survivors, including fear of recurrence or new cancer diagnosis, leading to increased evaluations for clinical depression. Pain was another issue and did not improve with time. Therefore, screening for psychological distress, depression, fatigue, and pain is warranted in all colorectal cancer survivors to help improve their quality of life after treatment.⁴³

As far as long-term and late effects of treatment of colorectal cancer are concerned, the most common symptoms reported in the literature are oxaliplatin-induced peripheral neuropathy,⁴⁵ bowel dysfunction, abdominal pain, fatigue, insomnia, pelvic pain, urinary dysfunction, and sexual dysfunction.⁴³ Chronic diarrhea has been reported in 13 to 50% of the patients up to 10 years after treatment (more commonly in rectal cancer).⁴⁶ Diarrhea has been associated with poorer quality of life. Constipation has also been reported. Treatment for bowel problems includes antidiarrheal medications, bulk-forming agents, diet modifications, elimination of certain foods (fats, oils, meat, and milk products), laxatives in cases of constipation, and probiotic supplements which have had limited benefit. Peripheral neuropathy has been managed by limiting doses to prevent further toxicity, nonsteroidal anti-inflammatory medications, opioids, or pain management and neurology referral.⁴⁵

Evidence with regard to lifestyle modifications, such as smoking cessation, regular exercise, maintaining healthy body mass index (BMI), and changes in diet, improved overall outcomes and quality of life after treatment for colorectal cancer.⁴⁷ In the CALBG 89803 adjuvant chemotherapy trial, a prospective observational study for patients with stage III colon cancer, daily physical activity was associated with a significant reduction in cancer recurrence and overall mortality. Patients who engaged in at least 18 MET (Metabolic Equivalent of Task = rate of energy consumption during a specific physical activity) hours per week of activity had 47% improvement in disease-free survival compared with inactive patients. The Women's Health Initiative study, a prospective cohort study, showed that recreational physical activity (before and after colorectal cancer diagnosis) was associated with lower cancer-specific mortality and all-cause mortality

(recreational physical activity level of > 9 MET hours/week before colorectal cancer diagnosis had 32% lower risk of death from colorectal cancer and a 37% lower risk of death from any cause compared with women reporting no physical activity). In a study of a large cohort of men with stage I through stage III colorectal cancer, more physical activity was associated with lower risk of colorectal cancer-specific and overall mortality.^{47–49} The NSABP (National Surgical Adjuvant Breast and Bowel Project) trial, a retrospective study of patients with stage II and III colon cancer, showed that BMI of 35 kg/m² or greater had an increased risk of disease recurrence and death. A pre-diagnosis BMI (≥ 35 kg/m²) was found to have a prognostic impact on outcomes in patients with stage II and III colorectal cancer undergoing adjuvant chemotherapy (ACCENT). Another recent study found that pre-diagnosis obesity was associated with higher all-cause and colorectal cancer-specific mortality. This was not true for post-diagnosis obesity. Data from the Cancer Prevention Study II Nutrition Cohort show that red and processed meat intake was associated with a higher risk of colorectal cancer-specific mortality in survivors of nonmetastatic colorectal cancer. The CALGB 89803 trial found an increased risk of recurrence and mortality in patients with stage III disease who consumed glycemic-rich diets. A diet rich in fruits, vegetables, poultry, fish, whole grain, and poor in red meat and concentrated sweets was associated with better outcomes with regard to cancer recurrence or death.^{50–64}

Another important aspect of survivorship care is health promotion. Evidence suggests that noncancer comorbidities have a negative impact on overall quality of life and long-term survival when compared with the cancer diagnosis itself.⁴³ Shifting the care from surveillance to management of comorbid conditions and implementation of preventive care measures should be considered for colorectal cancer survivors. The NCCN panel recommends transfer of care to the primary care physician (PCP) with written instructions regarding cancer surveillance (if PCP will be assuming cancer surveillance responsibilities), summary of treatment received, description of potential late and long-term effects of treatment, necessary lifestyle modifications, and preventive care measures.⁶⁵ Some studies report an improved preventive care and cancer surveillance plans when both, a primary care physician and an oncologist, are involved in the survivorship-care model.⁶⁶

Conclusion

Surveillance following colorectal cancer treatment is essential to ensure early detection of cancer recurrence. Survivorship should be considered as a distinct phase of colorectal cancer treatment where a multimodality approach is used to improve the quality of life and disease-free survival and decrease overall mortality. The use of a survivorship-care plan and coordination of care is essential to promoting longevity.

Conflict of Interest

The authors declare no conflict of interest and no financial support in the preparation of this article.

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