



A Surgeon's Guide to Treating Older Patients With Colorectal Cancer

Sooyeon Kim¹ · Simon C. Lee² · Celette S. Skinner² · Cynthia J. Brown^{3,4} · Courtney J. Balentine^{1,5}

Published online: 7 February 2019

© Springer Science+Business Media, LLC, part of Springer Nature 2019

Abstract

Purpose of Review Review strategies to improve outcomes of colorectal cancer treatment in older patients.

Recent Findings Older colorectal patients face many barriers to recovery during their initial inpatient stay following surgery and after leaving the hospital. In addition to the risk of inpatient morbidity and mortality, older patients are more likely to require post-acute care services to face nutritional deficits and to experience complications of chemoradiation.

Summary In order to improve outcomes for older patients with colorectal cancer, it is important for surgeons to recognize their unique needs and to develop plans to address them. The involvement of a multi-disciplinary team with geriatric experience can guide planning for surgery, the immediate postoperative recovery, and long-term survivorship.

Keywords Colorectal cancer · Older patients · Perioperative strategies · Post-acute care needs

Introduction

According to the United States Census Bureau's 2017 National Population Projections, 20% of the population will be aged 65 years and older by 2030 [1]. As the incidence of colorectal cancer (CRC) increases with age, a growing proportion of older adult patients is expected to undergo colorectal resection. While the colorectal cancer literature has traditionally focused on short-term perioperative outcomes and cancer-related outcomes, such as overall and disease-free

survival (DFS) and overall survival (OS), there has been less discussion of other long-term outcomes that are relevant to older patients. Additional outcomes likely to be important to older patients include the use of post-acute care (skilled nursing, inpatient rehabilitation, home health), development of new comorbidity following cancer therapy, and ability to maintain independence at home. Here, we review key peri and postoperative outcomes among older adults with colorectal cancer and discuss their unique postoperative challenges beyond 30-day mortality and morbidity.

Topical Collection on *Surgery and Surgical Innovations in Colorectal Cancer*

✉ Courtney J. Balentine
courtney.balentine@utsouthwestern.edu

¹ Department of Surgery, University of Texas Southwestern Medical Center, 4500 S. Lancaster Blvd., Dallas, TX 75216, USA

² Department of Clinical Sciences, Harold C. Simmons Comprehensive Cancer Center, University of Texas Southwestern Medical Center, Dallas, TX, USA

³ Birmingham/Atlanta Veterans Affairs Geriatric Research, Education, and Clinical Care Center, University of Alabama at Birmingham, Birmingham, AL, USA

⁴ Division of Gerontology, Geriatrics, and Palliative Care, University of Alabama at Birmingham, Birmingham, AL, USA

⁵ VA North Texas Health Care System, Dallas, TX, USA

Epidemiology

Colorectal cancer is the second leading cause of cancer-related deaths and the fourth most common cancer in the USA. The estimated incidence is 140,000 cases annually, representing 8% of all cancer deaths [2, 3]. The 5-year survival rates vary by stage at diagnosis, ranging between 14% for metastatic disease to almost 90% in early stages [2, 4]. Over the last 10–20 years, CRC mortality has slowly declined, possibly due to improved screening and early detection through fecal immunochemical tests (FIT), colonoscopy, and other modalities, and also likely due to the addition of novel chemotherapeutic agents for the management of metastatic disease [2, 3, 5, 6].

While the traditional metrics for oncologic outcomes like disease-free survival are important for patients with all ages,

there is still significant room for improvement, specifically, in the care of older patients in other avenues of our health care systems. Over one third of CRC patients are aged 65 years and older, and this percentage is expected to increase as the population of the USA and other developed countries continues to age [2]. More older patients are undergoing surgery, because advances in surgical and anesthetic techniques have made it safer to operate even in the oldest patients [2, 7]. According to a recent European population study, 77–92% of patients aged greater than 80 years with stage I–III rectal cancer were offered surgery for their cancer, numbers that would have been unthinkable even 20 years ago [8]. The growing numbers of older patients able to have—and survive—surgery have created several difficulties for health care systems, because these individuals have increased risk for a complicated and prolonged postoperative recovery.

Perioperative Complications in the Older Patients

Perioperative care for older patients can be challenging even for experts and high-volume hospitals, with complication rates as high as 60% in some studies [9, 10]. Advanced age may be an independent risk factor for postoperative morbidity following colorectal surgery, and age-related comorbidities can also increase the risk of complications. Additionally, patients \geq 70 years old are twice as likely to die during the index hospitalization [9, 11].

A critical aspect of postoperative recovery for older patients is maintaining cognitive function and avoiding delirium. Patients who develop delirium face a twofold increased risk of death, a 2.4-fold greater risk of institutionalization, and a 12-fold increase in the risk of developing dementia after hospital discharge [12]. Several interventions have been developed to reduce rates of delirium in older patients, with varying degrees of success, but more work is needed to identify which programs are most effective in surgical patients [13–15]. Postoperative recovery is particularly difficult in older patients who have preexisting impairment in cognitive function prior to recovery. When Bail et al. [16] investigated over 157,000 older patients, among other hospital-acquired complications, dementia was the largest contributor to increased cost of hospitalization. The extra cost incurred by those with dementia alone was comparable to that of individuals having three times the admission severity score or comorbidity index.

Just as older adult patients are susceptible to delirium and cognitive decline postoperatively, they are also at elevated risk for loss of physical function and independence. Over one third of older patients demonstrate a decline in activities of daily living prior to hospital discharge [17]. These deficits are not transitory changes that are easily reversed. According to a multi-institutional study examining patients older than 60 years who underwent major abdominal surgery, at least some postoperative loss of function persisted for up to

6 months after surgery in half of all patients [18]. Additionally, when loss of physical function is not adequately addressed by post-discharge care plans, there is a 37% increase in the risk of readmission, leading to increased costs for patients and health care systems.

In addition to the increased financial burden, older patients' experience of significant postoperative complications and delays in recovery can affect their long-term survival. Older colorectal cancer patients with postoperative infections are 41% more likely to die in the 5 years after surgery than similar patients without infections [19]. It is unclear whether the difference in mortality is related to downstream complications of the infection or some other mechanism. However, it is well established that postoperative complications lead to delays in initiation of adjuvant therapy [20]. Medical oncologists are understandably reluctant to begin chemotherapy or radiation in the setting of an active infection, and adjuvant therapy is more effective when started relatively early after surgery.

Continued Care After Hospital Discharge

A higher risk of complications and functional decline make older patients considerably more likely to receive post-acute care services after major abdominal operations. The most common post-acute care modalities after surgery include home health, skilled nursing facilities, and inpatient rehabilitation [21, 22]. Up to 50% of patients age 65 and older who have abdominal surgery for cancer will use some form of post-acute care after leaving the hospital [23]. The likelihood of requiring post-acute care after surgery increases steadily with age and becomes even more probable in patients who experience postoperative complications or who have preexisting functional deficits [21, 24, 25••].

There is ongoing debate over how to best deliver post-acute care for older surgical patients and how to determine when patients are likely to benefit from care at home versus in skilled nursing or inpatient rehabilitation facilities. Some older patients are likely to benefit from time in a rehabilitation hospital or skilled nursing facility before they return home, particularly if they have significant functional deficits and lack adequate social support. However, others may derive significant benefit from being at home in a familiar environment, even with major complications or limitations in physical activity. Currently, there are no guidelines or data to help surgeons identify when patients are most likely to benefit from therapy at home versus in a skilled nursing or rehabilitation facility. The Medicare Payment Advisory Commission found that one third of all Medicare patients discharged to skilled nursing facilities or inpatient rehabilitation could have been treated at home with home health, leading to costs savings of \$10,000–\$24,000 per patient [26]. A similar study for abdominal surgery patients found even greater potential for cost savings through the use of home health services [27]. To further

complicate post-acute care decision-making, colorectal cancer patients discharged to skilled nursing facilities or inpatient rehabilitation have significantly worse survival than similar patients who go home after surgery, even after adjusting for differences in functional status and postoperative complications. Overall, 5-year survival rates were decreased by up to 30% in patients discharged to skilled nursing facilities, inpatient rehabilitation, or long-term care hospitals when compared to those discharged home [25••].

Potential for Intervention and Quality Improvement in Post-acute Care

Ongoing concerns about the quality of care in skilled nursing and other facilities have prompted the Centers for Medicare and Medicaid Services to develop a national rating system for such facilities to identify and improve outcomes [28, 29]. However, the process of choosing a post-acute care facility or home health provider may still be suboptimal, resulting in patients receiving care in facilities or by home health providers that do not address their care needs. A better understanding of how decisions about post-acute care are made could improve outcomes by matching patient needs to their post-discharge care setting.

Clinicians also need tools to accurately determine post-hospital care needs of older patients having colorectal cancer surgery. Several studies indicate that physicians do a poor job of identifying when older patients have care needs that persist after hospital discharge [30–33]. As many as 93% of older CRC patients are discharged with unmet care needs, including functional deficits, a lack of social and emotional support, and insufficient economic resources to manage recovery. Failure to address these needs can contribute to long-term functional decline and hospital readmissions [34]. A literature review of discharge barriers in older adults with dementia identified four main issues: distributed responsibility and limited support among health professionals; risk-focused decisions that lead to overuse of inappropriate resources, including skilled nursing facilities; poor support and communication for the primary caregiver; and varying family support, competence, or interest that may conflict with the patient's best interests [35].

As evidenced by the aforementioned literature review, half of the issues arise from mismanaging expectations: patients and families are not being adequately prepared for the life changes stemming from colorectal cancer surgery [35]. Up to 60% of patients with newly diagnosed cancer reported that they were not appropriately informed about their treatment, lifestyle after treatment, and changes in social functioning [36]. In a Canadian survey, recurring narratives after hospital discharge included uncertainty around discharge plans and surprise regarding residual effects of the illness [37]. A similar study in Sweden demonstrated similar findings after colorectal surgery: confusion about the division of responsibility

between primary and specialist care, inadequate information on self-care, and disappointment regarding rehabilitation as it frequently lacks structure and individual adaptation [38]. When patients and families do not know what to expect from surgery and care plans, it becomes harder for them to plan for future care needs and to make informed decisions about their operations.

However, a well-integrated and multi-disciplinary team can help address these discharge barriers and frustrations in order to meet the needs of older CRC patients. Many studies have used different protocols to address this conundrum in older patients [13–15]. While future studies are needed to identify the most effective approach, a systematic, bundled, multi-disciplinary care implemented since the day of admission is likely more successful than an ad hoc evaluation at the time of discharge. Such a protocol would include multiple professionals: social workers and case managers can conduct formal assessments of discharge needs and identify resources for post-discharge care for patients and family. Using a facility rating system and soliciting feedback from patients after discharge could improve this process. Physical and occupational therapists can evaluate the patients' functional deficits and help determine the appropriate level of care to target those deficits. Dieticians may not only adjust nutritional content to optimize healing, but also reinforce diet education specific to CRC patients with ostomies. Ostomy and wound care nurses can teach patients and families the intricacies of ostomy care and surgical wound management. Survivor group volunteers can provide emotional and psychological support as well as better portray the life after surgery and hospital discharge. The clinical expertise of geriatricians and geriatric-trained nurses should not be underestimated as well. Such a specialty team can champion provider education and support so that other disciplines also become better equipped to care for older patients.

Ostomies and Nutrition

Older patients with CRC frequently manage ostomies after surgery. Not surprisingly, ostomies are associated with unexpected readmission due to dehydration and acute kidney injury (AKI), which may progress to severe chronic kidney disease (CKD). According to a retrospective study of 600 colorectal patients, an ileostomy increased the risk of AKI-related readmission by 10-fold [39]. Additionally, patients were four times more likely to progress to severe CKD with an ileostomy. These risks are even higher among older patients as they commonly have a blunted thirst response and a diminished physiologic reserve [40, 41].

Living with an ostomy also leads to certain dietary changes that can impair health and exacerbate malnutrition. Up to 20% of patients with an ileostomy report food avoidance due to appliance leakage and cite vegetables and fruits as the worst

offenders [42]. This is especially problematic in older cancer patients because anorexia and cachexia are common and are compounded by polypharmacy and chemotherapy [43]. Additionally, older cancer patients and their caregivers may actually perceive weight loss as beneficial or healthy rather than being related to the cancer or its treatments [44]. Consequently, they may be less likely to report a decreased dietary intake to their physicians [44]. Poor nutrition is associated with a significantly greater risk of hospitalization and mortality, highlighting the importance of addressing this problem [45].

Psychological and social stigma associated with an ostomy may also create self-imposed isolation and undermine social support networks. Embarrassment with appliance leakage, difficulty adjusting to a new body image, and unmatched expectations after surgery all contribute to increasing social isolation at times when older cancer survivors need social support the most [46]. While ostomies are often meant to be temporary with plans for reversal after adequate healing, approximately one in three rectal cancer patients older than 70 years will retain their diverting ileostomy permanently after anterior resection [47].

Perioperative Strategies to Improve Outcomes in the Older Patients

Enhanced Recovery After Surgery (ERAS) programs have become increasingly popular at high-volume colorectal surgery centers and represent a major paradigm shift in the management of patients of all ages. ERAS programs take many forms, but the basic elements include early mobilization, enteral feeding without waiting for either flatus or bowel movements, and multi-modal anesthesia and pain control. The ERAS approach contrasts with traditional surgical teaching that enteral feeding should not commence until there is “evidence of bowel function.” Such accelerated nutritional support seems promising as postoperative nutritional deficits tend to affect older patients more than their younger counterparts [45].

ERAS protocols also emphasize non-opioid methods of pain control to limit the known effects of opioids on gastrointestinal motility. A multi-modal approach to pain control has been recommended by the American College of Surgeons and the American Geriatrics Society to minimize opioid exposure, and a focus on early ambulation is helpful to reduce deconditioning and prevent functional decline [48]. Facilities that implement ERAS programs have consistently demonstrated fewer major postoperative complications, decreased mortality, and shorter length of hospital stay among older and younger patients having colorectal surgery [49–50].

The choice of surgical technique is also likely to influence postoperative recovery. Laparoscopic surgery should, in theory, offer several advantages for older patients because smaller

incisions can potentially reduce pain that could limit mobility. Some evidence suggests perioperative complications are reduced among older patients undergoing laparoscopic compared to open surgery [10, 51]. In a multi-center, case-control study, over 400 patients aged 80 years or older underwent laparoscopic versus open colorectal surgery [51]. Overall, postoperative morbidity was significantly reduced in laparoscopic cases, including decreased incidence of delirium, pneumonia, and organ space surgical site infection. Although operative time was significantly longer in the laparoscopic group, estimated blood loss was significantly less. Oncologic outcomes in the two groups were equivalent, with no difference in the number of resected lymph nodes or margin status.

Neoadjuvant and Adjuvant Therapy in the Older Patients

Surgery is the primary treatment for colon and rectal cancer, but older patients with advanced disease will typically receive adjuvant chemotherapy and/or radiation to supplement the resection. Both chemotherapy and radiation carry distinct risks that can significantly affect quality of life for older patients. Rectal cancer patients aged 70 or older sustained more cardiac complications and complication-related deaths from neoadjuvant and adjuvant chemoradiation than their younger counterparts [52]. The risks of developing complications from adjuvant therapy are influenced by patients’ comorbidity burden and age. Because age is associated with a greater likelihood of comorbidity, older patients represent a high-risk group for therapeutic complications [52].

The effects of chemotherapy and radiation are not limited to their interactions with existing comorbidities but can also lead to the development of new medical problems. According to a study of older colorectal cancer survivors using the SEER-Medicare database, the 10-year risk of developing new-onset cardiovascular disease or congestive heart failure is increased by more than 30% in survivors compared to controls [53••]. Older patients with preexisting diabetes and hypertension were at even higher risk for developing new comorbidity. The choice of chemotherapy agents can somewhat modify this risk, but all treatments were associated with a greater risk of new comorbidity, which leads to increased healthcare costs and diminished quality of life.

However, just as age alone ought not prevent the discussion of surgical resection, neoadjuvant and adjuvant therapies should also be a viable option to the CRC patients of all ages. Unfortunately, in practice, despite the demonstrated oncologic efficacy of chemotherapy and radiation in all age groups, older patients are far less likely to receive either [54–56]. Therefore, in order to better assess frailty and offer maximum survival benefits to colorectal patients, the International Society of

Geriatric Oncology (SIOG) recommends performing a geriatric assessment in all eligible patients [57].

Recommendations

The surgical and medical management of older patients with colorectal cancer is complex and demands more time and planning than when treating younger and healthier individuals. Based on the issues identified above, we have several recommendations for surgeons managing these patients:

1. It is worthwhile to dedicate more time to discussing outcomes and planning for postoperative recovery, including prolonged recovery time with increased risk of complications, the potential need for post-acute care services, and lifestyle modification including ostomy care. There are several established methods for assessing preoperative risk: Comprehensive Geriatric Assessment, Barber questionnaire, Fried Frailty Criteria, and the Preoperative Assessment of Cancer in the Elderly [58]. Each of these instruments provides an objective assessment that can help assess the likelihood that older patients will need additional care after surgery. It is pivotal to bring family members to this discussion.
2. Not all patients stand to benefit from surgery. As such, organizing a goals-of-care discussion that weighs the risks and benefits of an operation and matches patients' values and preferences is prudent. For some patients, opting out of surgery is equally reasonable when the downstream effects of surgery may impair quality of life to the same—or even greater—extent as the cancer itself.
3. During the inpatient stay, early involvement of case managers, social workers, therapists, dieticians, and geriatric specialists can assist with early identification of new care needs. A systematic multi-disciplinary approach to discharge planning is likely to be more effective than an ad hoc evaluation at the time of discharge.
4. Even if the hospital does not have a formal ERAS program in place, adoption of ERAS principles can accelerate recovery and improve outcomes. Additionally, creation of an Acute Care for Elders unit or equivalent strategy can help optimize recovery.
5. Preventing and managing delirium are critical to minimize cognitive decline after surgery. There are numerous validated instruments to screen for delirium, and evidence-based strategies for delirium prevention and management can profoundly affect the course of postoperative recovery [48].
6. Although surgeons are not typically involved in the selection of neo or adjuvant therapy, surgeons can help patients understand what their therapy will entail and prompt them to discuss the full health effects of chemotherapy and radiation with their medical oncologists.

7. Every older patient with an ostomy needs thorough teaching, preferably with their caregivers. This may seem obvious, but the significant number of older patients readmitted due to ostomy complications argues that surgeons have underperformed in this critical area. An ostomy and wound care nurse can help with the process. Former-patient volunteers can also help patients cope with postoperative changes and expectations.

Conclusion

When treating colorectal cancer in older patients, surgical and medical specialists need to widen their focus beyond the immediate effects of surgery and chemoradiation. Taking time to discuss and plan for the full scope of cancer therapy will not only lead to more informed patients but is also likely to improve outcomes for patients, their caregivers, and our health system.

Acknowledgments Simon C. Lee is supported by the National Cancer Institute (grant no. R01CA203856).

Compliance with Ethical Standards

Conflict of Interest The authors declare that they have no conflict of interest.

Human and Animal Rights and Informed Consent This article does not contain any studies with human or animal subjects performed by any of the authors.

Publisher's Note Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

References

Papers of particular interest, published recently, have been highlighted as:

•• Of major importance

1. United States Census Bureau (2018) Methodology, assumptions, and inputs for the 2017 national population projections. Accessed 09/16/2018.
2. Noone AM, Howlander N, Krapcho M, Miller D, Brest A, Yu M, et al. SEER cancer statistics review, 1975–2015, National Cancer Institute. Bethesda, MD, https://seer.cancer.gov/csr/1975_2015/, based on November 2017 SEER data submission, posted to the SEER web site, 2018.
3. Siegel RL, Miller KD, Jemal A. Cancer statistics, 2018. *CA Cancer J Clin.* 2018;68(1):7–30.
4. Haggard FA, Boushey RP. Colorectal cancer epidemiology: incidence, mortality, survival, and risk factors. *Clin Colon Rectal Surg.* 2009;22(4):191–7.

5. Citarda F, Tomaselli G, Capocaccia R, Barcherini S, Crespi M, Italian Multicentre Study Group. Efficacy in standard clinical practice of colonoscopic polypectomy in reducing colorectal cancer incidence. *Gut*. 2001;48:812–5.
6. United States Preventive Services Task Force, Bibbins-Domingo K, Grossman DC, Curry SJ, Davidson KW, Epling JW Jr, et al. Screening for colorectal cancer: US preventive services task force recommendation statement. *JAMA*. 2016;315(23):2564–75.
7. National Comprehensive Cancer Network (NCCN). NCCN clinical practice guidelines in oncology. Colon cancer version 3.2018. 2018 Aug 7; National Comprehensive Cancer Network.
8. Claassen YHM, Vermeer NCA, Iversen LH, van Eycken E, Guren MG, Mroczkowski P, et al. Treatment and survival of rectal cancer patients over the age of 80 years: a EURECCA international comparison. *Br J Cancer*. 2018;119:517–22. <https://doi.org/10.1038/s41416-018-0215-6>.
9. Alves A, Panis Y, Mathieu P, Manton G, Kwiatkowski F, Slim K. Association Française de Chirurgie. Postoperative mortality and morbidity in French patients undergoing colorectal surgery results of a prospective multicenter study. *Arch Surg*. 2005;140(3):278–83.
10. Kristjansson SR, Nesbakken A, Jordhøy MS, Skovlund E, Audisio RA, Johannessen HO, et al. Comprehensive geriatric assessment can predict complications in elderly patients after elective surgery for colorectal cancer: a prospective observational cohort study. *Crit Rev Oncol Hematol*. 2010;76(3):208–17.
11. Baré M, Mora L, Torà N, Gil MJ, Barrio I, Collera P, et al. CCR-CARESS score for predicting operative mortality in patients with colorectal cancer. *Br J Surg*. 2018;105:1853–61.
12. Witlox J, Eurelings LM, de Jonghe JM, Kalisvaart KJ, Eikelenboom P, van Gool WA. Delirium in elderly patients and the risk of postdischarge mortality, institutionalization, and dementia: a meta-analysis. *JAMA*. 2010;304(4):443–51.
13. Chen CC, Li HC, Liang JT, Lai IR, Purnomo JD, Yang YT, et al. Effect of a modified hospital elder life program on delirium and length of hospital stay in patients undergoing abdominal surgery: a cluster randomized clinical trial. *JAMA Surgery*. 2017;152(9):827–34.
14. Landefeld CS, Palmer RM, Kresevic DM, Fortinsky RH, Kowal J. A randomized trial of care in a hospital medical unit especially designed to improve the functional outcomes of acutely ill older patients. *N Engl J Med*. 1995;332(20):1338–44.
15. Flood KL, MacLennan PA, McGrew D, Green D, Dodd C, Brown CJ. Effects of an acute care for elders unit on costs and 30-day readmissions. *JAMA Intern Med*. 2013;173(11):981–7.
16. Bail K, Draper B, Berry H, Karmel R, Goss J. Predicting excess cost for older inpatients with clinical complexity: a retrospective cohort study examining cognition, comorbidities and complications. *PLoS One*. 2018;13(2):e0193319.
17. Covinsky KE, Palmer RM, Fortinsky RH, Counsell SR, Stewart AL, Kresevic D, et al. Loss of independence in activities of daily living in older adults hospitalized with medical illnesses: increased vulnerability with age. *J Am Geriatr Soc*. 2003;51(4):451–8.
18. Lawrence VA, Hazuda HP, Cornell JE, Pederson T, Bradshaw PT, Mulrow CD, et al. Functional independence after major abdominal surgery in the elderly. *J Am Coll Surg*. 2004;199(5):762–72.
19. Artinyan A, Orcutt ST, Anaya DA, Richardson P, Chen GJ, Berger DH. Infectious postoperative complications decrease long-term survival in patients undergoing curative surgery for colorectal cancer: a study of 12,075 patients. *Ann Surg*. 2015;261(3):497–505.
20. Tevis SE, Kohlhofer BM, Stringfield S, Foley EF, Harms BA, Heise CP, et al. Postoperative complications in patients with rectal cancer are associated with delays in chemotherapy that lead to worse disease-free and overall survival. *Dis Colon Rectum*. 2013;56(12):1339–48.
21. Balentine CJ, Naik AD, Berger DH, Chen H, Anaya DA, Kennedy GD. Postacute care after major abdominal surgery in elderly patients: intersection of age, functional status, and postoperative complications. *JAMA Surg*. 2016;151(8):759–66.
22. Bailey EA, Hoffman RL, Wirtalla C, Karakousis G, Kelz RR. Development and validation of a prediction model for patients discharged to post-acute care after colorectal cancer surgery. *Surgery*. 2017;161(4):1049–57.
23. Sacks GD, Lawson EH, Dawes AJ, Gibbons MM, Zingmond DS, Ko CY. Which patients require more care after hospital discharge? An analysis of post-acute care use among elderly patients undergoing elective surgery. *J Am Coll Surg*. 2015;220(6):1113–1121.e2. <https://doi.org/10.1016/j.jamcollsurg.2015.02.029>.
24. Balentine CJ, Mason MC, Richardson PJ, Kougiyas P, Bakaeen F, Naik AD, et al. Variation in postacute care utilization after complex surgery. *J Surg Res*. 2018;230:61–70. <https://doi.org/10.1016/j.jss.2018.04.052>.
25. Balentine CJ, Richardson PA, Mason MC, Naik AD, Berger DH, Anaya DA. Postacute care and recovery after cancer surgery: still a long way to go. *Ann Surg*. 2017;265(5):993–9 **These papers highlight the fact that, in addition to the risk of inpatient morbidity and mortality, older colorectal patients face unique challenges, including increased use of post-acute care services and complications of chemoradiation.**
26. Gage B, Morley M, Smith L, Ingber MJ, Deutsch A, Kline T, et al. Post-acute care payment reform demonstration: final report. Centers for Medicare & Medicaid Services 2012. Accessed 10/28/2018.
27. Balentine CJ, Levenson G, Vanness DJ, Knight S, Turan J, Brown CJ, et al. Selecting post-acute care settings after abdominal surgery: are we getting it right? *Am J Surg* 2017.
28. Baier RR, Wysocki A, Gravenstein S, Cooper E, Mor V, Clark M. A qualitative study of choosing home health care after hospitalization: the unintended consequences of ‘patient choice’ requirements. *J Gen Intern Med*. 2015;30(5):634–40.
29. Medicare.gov. Home health compare. Available at: <http://www.medicare.gov/homehealthcompare/search.html>. Accessed 25 Aug 2018.
30. Bowles KH, Foust JB, Naylor MD. Hospital discharge referral decision making: a multidisciplinary perspective. *Appl Nurs Res*. 2003;16(3):134–43.
31. Bowles KH, Hanlon A, Holland D, Potashnik SL, Topaz M. Impact of discharge planning decision support on time to readmission among older adult medical patients. *Prof Case Manag*. 2014;19(1):29–38.
32. Bowles KH, Holmes JH, Ratcliffe SJ, Liberatore M, Nydick R, Naylor MD. Factors identified by experts to support decision making for post acute referral. *Nurs Res*. 2009;58(2):115–22.
33. Bowles KH, McCorkle R, Nuamah IF. Homecare referrals and 12-week outcomes following surgery for cancer. *Oncol Nurs Forum*. 2008;35(3):377–83.
34. Puts MT, Papoutsis A, Springall E, Tourangeau AE. A systematic review of unmet needs of newly diagnosed older cancer patients undergoing active cancer treatment. *Support Care Cancer*. 2012;20(7):1377–94.
35. Stockwell-Smith MW, Marshall AP, Argo A, Brown L, Howe S, et al. Hospital discharge processes involving older adults living with dementia: an integrated literature review. *J Clin Nurs*. 2018;27(5–6):e712–25. <https://doi.org/10.1111/jocn.14144>.
36. Hawkins NA, Pollack LA, Leadbetter S, Steele WR, Carroll J, Dolan JG, et al. Informational needs of patients and perceived adequacy of information available before and after treatment of cancer. *J Psychosoc Oncol*. 2008;26(2):1–16.
37. Wong C, Hogan D. Care transitions: using narratives to assess continuity of care provided to older patients after hospital discharge. *Can Geriatr J*. 2016;19(3):97–102.
38. Samuelsson KS, Egenvall M, Klarin I, Lökk J, Gunnarsson U, Iwarzon M. The older patient’s experience of the healthcare chain and information when undergoing colorectal cancer surgery

- according to the enhanced recovery after surgery concept. *J Clin Nurs*. 2018;27(7–8):e1580–8. <https://doi.org/10.1111/jocn.14328>.
39. Li L, Lau KS, Ramanathan V, Orcutt ST, Sansgiry S, Albo D, et al. Ileostomy creation in colorectal cancer surgery: risk of acute kidney injury and chronic kidney disease. *J Surg Res*. 2017;210:204–12. <https://doi.org/10.1016/j.jss.2016.11.039>.
 40. Hooper L, Bunn D, Jimoh FO, Fairweather-Tait SJ. Water-loss dehydration and aging. *Mech Ageing Dev*. 2014;136–137:50–8. <https://doi.org/10.1016/j.mad.2013.11.009>.
 41. Marshall KA, Burson R, Gall K, Saunders MM. Hospital admissions for malnutrition and dehydration in patients with dementia. *Home Healthcare Now*. 2016;34(1):32–7.
 42. de Oliveira AL, Boroni Moreira AP, Pereira Netto M, Gonçalves Leite IC. A cross-sectional study of nutritional status, diet, and dietary restrictions among persons with an ileostomy or colostomy. *Ostomy Wound Manage*. 2018;64(5):18–29.
 43. Landi F, Picca A, Calvani R, Marzetti E. Anorexia of aging: assessment and management. *Clin Geriatr Med*. 2017;33(3):315–23. <https://doi.org/10.1016/j.cger.2017.02.004>.
 44. Locher JL, Robinson CO, Bailey FA, Carroll WR, Heimburger DC, Magnuson JS, et al. The contribution of social factors to undereating in older adults with cancer. *J Support Oncol*. 2009;7(5):168–73.
 45. Buys DR, Roth DL, Ritchie CS, Sawyer P, Allman RM, Funkhouser EM. Nutritional risk and body mass index predict hospitalization, nursing home admissions, and mortality in community-dwelling older adults: results from the UAB study of aging with 8.5 years of follow-up. *J Gerontol A Biol Sci Med Sci*. 2014;69(9):1146–53. <https://doi.org/10.1093/geron/glu024>.
 46. Danielsen AK, Soerensen EE, Burcharth K, Rosenberg J. Learning to live with a permanent intestinal ostomy: impact on everyday life and educational needs. *J Wound Ostomy Continence Nurs*. 2013;40(4):407–12.
 47. David GG, Slavin JP, Willmott S, Corless DJ, Khan AU, Selvasekar CR. Loop ileostomy following anterior resection: is it really temporary? *Color Dis*. 2010;12:428–32.
 48. Optimal perioperative management of the geriatric patient: best practices guidelines from ACS NSQIP/American Geriatrics Society. Available at: https://www.facs.org/~media/files/quality_programs/geriatric/acs. Accessed 12/18/2017.
 49. Tejedor P, Pastor C, Gonzalez-Ayora S, Ortega-Lopez M, Guadalajara H, Garcia-Olmo D. Short-term outcomes and benefits of ERAS program in elderly patients undergoing colorectal surgery: a case-matched study compared to conventional care. *Int J Color Dis*. 2018;33(9):1251–8.
 50. Stone AB, Yuan CT, Rosen MA, Grant MC, Benishek LE, Hanahan E, et al. Barriers to and facilitators of implementing enhanced recovery pathways using an implementation framework: a systematic review. *JAMA Surg*. 2018;153(3):270–9. <https://doi.org/10.1001/jamasurg.2017.5565>.
 51. Hinoi T, Kawaguchi Y, Hattori M, Okajima M, Ohdan H, Yamamoto S, et al. Laparoscopic versus open surgery for colorectal cancer in elderly patients: a multicenter matched case-control study. *Ann Surg Oncol*. 2015;22(6):2040–50.
 52. Shahir MA, Lemmens VE, van de Poll-Franse LV, Voogd AC, Martijn H, Janssen-Heijnen ML. Elderly patients with rectal cancer have a higher risk of treatment-related complications and a poorer prognosis than younger patients: a population-based study. *Eur J Cancer*. 2006;42(17):3015–21.
 53. •• Kenzik KM, Balentine C, Richman J, Kilgore M, Bhatia S, Williams GR. New-onset cardiovascular morbidity in older adults with stage I to III colorectal cancer. *J Clin Oncol*. 2018;36(6):609–16 **These papers highlight the fact that, in addition to the risk of inpatient morbidity and mortality, older colorectal patients face unique challenges, including increased use of post-acute care services and complications of chemoradiation.**
 54. Abraham A, Habermann EB, Rothenberger DA, Kwaan M, Weinberg AD, Parsons HM, et al. Adjuvant chemotherapy for stage III colon cancer in the oldest old: results beyond clinical guidelines. *Cancer*. 2013;119(2):395–403.
 55. van Erming FN, Bernards N, Creemers GJ, Vreugdenhil A, Lensen CIPA, Lemmens VEPP. Administration of adjuvant oxaliplatin to patients with stage III colon cancer is affected by age and hospital. *Acta Oncol*. 2014;53(7):975–80.
 56. Gagliardi G, Pucciarelli S, Asteria CR, Infantino A, Romano G, Cola B, et al. A nationwide audit of the use of radiotherapy for rectal cancer in Italy. *Tech Coloproctol*. 2010;14(3):229–35.
 57. Papamichael D, Audisio RA, Glimelius B, de Gramont A, Glynne-Jones R, Haller D, et al. Treatment of colorectal cancer in older patients: International Society of Geriatric Oncology (SIOG) consensus recommendations 2013. *Ann Oncol*. 2015;26(3):463–76.
 58. participants PACE, Audisio RA, Pope D, Ramesh HS, Gennari R, van Leeuwen BL, et al. Shall we operate? Preoperative assessment in elderly cancer patients (PACE) can help. A SIOG surgical ask force prospective study. *Crit Rev Oncol Hematol*. 2008;65(2):156–63.