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## Rethinking elective colectomy for diverticulitis: A strategic approach to population health

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### Abstract

Diverticulitis is one of the leading indications for elective colon resection. Surgeons are trained to offer elective operations after a few episodes of diverticulitis in order to prevent future recurrences and potential emergency. However, most emergency surgery happens during the initial presentation. After recovery from an episode, much of the subsequent management of diverticulitis occurs in the outpatient setting, rendering inpatient "episode counting" a poor measure of the severity or burden of disease. Evidence also suggests that the risk of recurrence of diverticulitis is small and similar with or without an operation. Accordingly, contemporary evaluations of the epidemiologic patterns of treatments for diverticulitis have failed to demonstrate that the substantial rise in elective surgery over the last few decades has been successful at preventing emergency surgery at a population level. Multiple professional societies are calling to "individualize" decisions for elective colectomy and there is an international

focus on "appropriate" indications for surgery. The rethinking of elective colectomy should come from a patient-centered approach that considers the risks of recurrence, quality of life, patient wishes and experiences about surgical and medical treatment options as well as operative morbidity and risks.

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**Key words:** Diverticulitis; Colectomy; Colostomy; Indications; Elective; Appropriate; Quality of life; Laparoscopy

**Core tip:** Over the last decade, the relationship between elective and emergency surgery has come into question. With most emergency resections being performed in patients without a prior hospitalization, it has become apparent that diverticulitis recurrences are a poor predictor for future emergency operation at the population level. In addition, the rate of diverticulitis recurrence appears to be small and similar for those who do and do not undergo resection. This evidence suggests a need to rethink the factors that should be considered when deciding on elective colectomy for diverticulitis.

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### INTRODUCTION

With the aging of the population, the management of diverticulitis is becoming an increasingly important problem<sup>[1-3]</sup>. In the United States alone, care related to diverticulitis results in an estimated 1.5 million inpatient days and 300000 admissions each year<sup>[1]</sup>. While 10%-20% of people admitted to the hospital for diverticulitis un-

dergo emergency resection<sup>[4,5]</sup>, regardless of whether or not patients undergo surgery during initial presentation, they remain at lifetime risk for recurrent episodes and hospitalizations. Surgeons play an integral role in counseling patients on the risks of recurrence *vs* the risks of an operation, adhering to the premise that elective, “prophylactic” colectomy can prevent future episodes of diverticulitis and emergency colostomy<sup>[6,7]</sup>. Accordingly, diverticulitis is one of the leading indications for elective colon resection<sup>[8,9]</sup>.

Over the last decade, the relationship between elective and emergency surgery has come into question. With most emergency resections being performed in patients without a prior hospitalization<sup>[4,5,10]</sup>, it has become apparent that diverticulitis recurrences are a poor predictor of need for future emergency operation at the population level. In addition, the rate of diverticulitis recurrence appears to be small and nearly identical, whether or not patients undergo resection<sup>[4,10]</sup>. Furthermore, the observed increase in the rates of elective colectomy has not correlated with decreases in emergency colectomy<sup>[11,12]</sup>.

In light of this evidence, a number of international professional societies have indicated that surgery should no longer be performed based on the number of prior episodes of diverticulitis<sup>[1,6,13,14]</sup>. What is emerging is a rethinking of the factors that should be considered when deciding about the role of elective surgery.

## RETHINKING THE RISK OF RECURRENCE

Most emergency surgery occurs during the initial presentation for diverticulitis<sup>[4,5,10]</sup> and treatment options at that time are directed towards controlling the source of infection. The more challenging clinical decision making begins after recovery from an acute episode, because all patients remain at lifetime risk for recurrence and emergency colectomy and/or colostomy. Elective colectomy has conventionally been recommended after the second episode of diverticulitis<sup>[15-17]</sup> and after the first episode in patients younger than 50<sup>[7,10,17-20]</sup>.

A number of population-level studies in the last decade, however, have shown the rates of recurrent hospitalizations for diverticulitis after non-operative management (4%-13%)<sup>[10]</sup> are similar to the rates in those who have had a colectomy (5%-11%)<sup>[4]</sup>. Additionally, even elective resection carries a 1%-3% risk of anastomotic failure requiring “rescue colostomy”<sup>[13,21]</sup>. Incorporating these risks into a modeled analysis demonstrated that delaying elective surgery until after at least episodes resulted in a lower rate of colostomy and cost savings<sup>[5]</sup>.

The relationship between elective and emergency surgery also needs to be better understood. Across Washington State, our group has tracked age- and sex-adjusted rates of hospitalization and colectomy for diverticulitis since the 1980s<sup>[12]</sup>. Our review of the over 84000 patients hospitalized for diverticulitis between 1987 and 2012 demonstrated that the age- and sex- adjusted rates (adjusted to the 2000 census population of the state) for

elective colectomy nearly tripled, rising from 7.9 to 17.2 per 100000 people<sup>[22]</sup>. This rise, which was most pronounced in the early 2000s, has not been accompanied by decreases in emergency surgery (which rose from 7.1 to 10.2 per 100000 people), percutaneous interventions (from 0.1 to 3.7 per 100000) or emergency admissions for diverticulitis (from 34.0 to 85.0 per 100000). Given that 80%-90% of emergency surgery happens at the first episode of diverticulitis, these findings suggests that the practice of routine elective colectomy does not prevent future emergency surgery at a population level.

In studies of patients with diverticulitis, the most common outcomes assessed are hospitalizations for recurrent disease and whether or not patients had an emergency operation or a colostomy. Focusing only on hospitalized diverticulitis has limited assessments about current practice patterns because in the last 2 decades there has been an important shift towards outpatient management of recurrent disease<sup>[1,4,20]</sup>. Diverticulitis is now one of the leading reasons for outpatient visits related to the gastrointestinal (GI) tract<sup>[2]</sup> and outpatient management is 3 times more common than inpatient care<sup>[23]</sup>. Researchers may have not previously evaluated outpatient care for diverticulitis because outpatient information is not as readily available as inpatient data and because of concerns about coding accuracy when using outpatient diagnostic codes<sup>[23]</sup>, such as co-existence of diverticulitis or its symptoms with other outpatient GI conditions like irritable bowel syndrome. While including unconfirmed cases of diverticulitis may lack specificity, a counting approach that captures presumed episodes of outpatient diverticulitis is consistent with the way clinicians and patients both experience and “count” recurrences.

## RETHINKING SEVERITY OF DIVERTICULITIS

The historic recommendation for early resection in young patients<sup>[7,18,24]</sup> was based not only on the time at risk for recurrence, but also the belief that presentation at a young age indicated a more virulent disease and an increased likelihood for more severe recurrences<sup>[10,15,19,20]</sup>. This “more virulent” nature of diverticulitis in young patients is has been contested by newer evidence<sup>[20,25-27]</sup>, but it appears that younger patients in the last decade are undergoing resection for diverticulitis more often than older patients<sup>[28,29]</sup>. Whether this stems from a greater relative impact of diverticulitis on the quality of life (QoL) of younger patients or whether decisions are based on younger patients’ comparatively good health remains to be determined. However, this issue has become more relevant in the last 2 decades with reported rates of diverticulitis rising significantly in the young<sup>[19,28-30]</sup>.

Severity of diverticulitis and complicated diverticulitis are problematic to measure with administrative databases, as diagnostic and billing codes for abscess, peritonitis and perforation are often secondary and inconsistently recorded. Increasing outpatient manage-

ment suggests those requiring inpatient hospitalizations today are “sicker” than they were in the past<sup>[1,4,20]</sup>. However, studies looking at complicated diverticular disease in hospitalized populations have found relative stability of patients with “complicated” diverticulitis<sup>[5,31,32]</sup>. Additionally, the proportion of emergency admissions having surgery, perhaps the ultimate measure of disease severity, appears to be decreasing at a population-level<sup>[11,30,32,33]</sup>. Unfortunately, even this measure can be misleading—while the proportion of admitted patients having surgery may be decreasing, the overall rate (or incidence) of surgery can still be increasing. This is attributable to the overall increased number of patients admitted for diverticulitis, even after adjustment for age and sex<sup>[5,11,12]</sup>. A number of plausible explanations exist for the decreasing proportion requiring emergency surgery, including increased percutaneous interventions<sup>[12,32]</sup>, more refined classification of abscesses and contained perforations with improved imaging<sup>[33]</sup>, and a shift to delayed elective surgery<sup>[4]</sup>. However, the inconsistent definition of diverticulitis severity makes it a difficult metric to track and justify as an indication for elective colectomy at a population level.

## RETHINKING THE THRESHOLD TO OPERATE

One hypothesis to explain the disconnect between elective and emergency surgery for diverticulitis is that the adoption of laparoscopy is responsible for the dramatic rise in surgery, rather than changes in the incidence or severity of the disease<sup>[30]</sup>. Laparoscopic techniques for colorectal surgery were introduced in the early 1990s<sup>[34]</sup>. However, it was not until the early 2000s that training programs began incorporating it and several randomized trials of laparoscopy for colon cancer were published<sup>[35,36]</sup>. Population-level studies have ascribed the growth of elective surgery during this period to the availability and adoption of laparoscopy by the colorectal community<sup>[11,12,28,30]</sup>, similar to what occurred with the introduction of laparoscopic gall bladder surgery in the late 1980s<sup>[37,38]</sup>.

Laparoscopic colectomy improves outcomes through lower morbidity, fewer complications and quicker discharge from the hospital<sup>[36,39]</sup>, and has been recommended as the approach of choice for elective resection for diverticulitis<sup>[1]</sup>. Use of laparoscopic colon surgery (LCS) is increasing with some studies estimating that approximately half of elective colectomies for diverticulitis are currently performed laparoscopically<sup>[30,31,40]</sup>, especially among younger patients<sup>[11,28]</sup>. However, it appears that that countries with greater use of laparoscopy have higher rates of elective surgery for diverticulitis<sup>[40,41]</sup>, and some “early adopters” of laparoscopy also had a dramatic rise in right-sided resections for diverticulitis, a previously an uncommon procedure<sup>[42]</sup>. While none of these studies can absolutely causally attribute the rise in surgery to laparoscopy, the evidence has reinforced speculation that the threshold for surgeons to recommend, and for

patients to undergo, elective surgery has been lowered by the availability of LCS.

## RETHINKING INDICATIONS FOR ELECTIVE SURGERY

The evolution of evidence around diverticulitis over the last decade has put a new emphasis on defining “appropriateness” metrics for elective surgery for this disease. Indeed, with an international focus on cost of healthcare and estimates that 1 in 3 healthcare dollars is spent on care that doesn’t appear to add value<sup>[43,44]</sup>, there has been increasing interest in establishing appropriateness criteria for many surgical procedures<sup>[45-49]</sup>. The production of such guidelines and criteria by both professional societies and insurance companies<sup>[50-54]</sup> have had mixed effects in reducing rates of procedures that do not meet the designated criteria. For many surgical diseases, including diverticulitis, assessing compliance with these recommendations has been problematic because detailed information about the indications for surgery is lacking from existing registries.

Increasingly guidelines have recommended individualizing the decision for elective colectomy<sup>[1,13,14]</sup>. However, it remains to be determined which discrete measures of patient experience should be used to assess whether a resection is appropriate. Surgeons often report that their patients may not meet the professional recommendations but have reasonable indications for elective colectomy such as anxiety related to the possibility of an emergency, fear of travel, uncertainty about insurance and childcare coverage, intolerance of oral antibiotics or lingering symptoms and impaired QoL.

QoL impact appears to be driven by symptoms as well as the fear of recurrence, uncertainty about travel, concerns about chronic antibiotic use and lost productivity related to time away from work. These are factors that may also be particularly relevant among younger patients. Evidence for these “non-clinical” impacts of diverticulitis is found on social media websites for patients with diverticulitis (<http://diverticulitis.supportgroups.com>, <http://www.dailystrength.org>). Patients on these sites commonly report lingering symptoms after recovery from an episode of diverticulitis as one of the drivers for elective surgery. Recurrent symptoms include fevers, chills, decreased appetite, abdominal bloating and changes in bowel habits. These have been variously referred to in the literature as “smoldering”, “residual”, or “ongoing, symptomatic uncomplicated diverticular disease”<sup>[55]</sup>. Unfortunately, there is no generally accepted taxonomy for this and considerable overlap in symptoms with other conditions<sup>[56,57]</sup>. Attempts to quantify the drivers of impaired QoL have been limited to small cohorts and suffer from response rates as low as 50%<sup>[4,58]</sup>. Accounting for these symptoms is problematic without the use of standard evaluations that have not been a part of most prior studies. To address this issue, patient-centered outcomes research is needed to assess competing patient experi-

ences with and without surgery.

## CONCLUSION

Contemporary evaluations of the epidemiologic patterns of diverticulitis and treatments for diverticulitis suggest a disconnect between the use of elective colectomy for prevention of emergency surgery at a population level. Recommending elective surgery based on the number of prior episodes is no longer supported. Rather, a patient-centered approach to counseling for elective colectomy should consider the risks of recurrence, QoL burden, patient wishes and experiences about surgical and medical treatment options and operative morbidity and risks. To guide decision making, studies incorporating this spectrum of relevant metrics should be performed and incorporated into new guidelines aimed at accomplishing more appropriate care.

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