Sigmoid Diverticulitis
A Systematic Review

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IMPORTANCE Diverticulitis is a common disease. Recent changes in understanding its natural history have substantially modified treatment paradigms.

OBJECTIVE To review the etiology and natural history of diverticulitis and recent changes in treatment guidelines.

EVIDENCE REVIEW We searched the MEDLINE and Cochrane databases for English-language articles pertaining to diagnosis and management of diverticulitis published between January 1, 2000, and March 31, 2013. Search terms applied to 4 thematic topics: pathophysiology, natural history, medical management, and indications for surgery. We excluded small case series and articles based on data accrued prior to 2000. We hand searched the bibliographies of included studies, yielding a total of 186 articles for full review. We graded the level of evidence and classified recommendations by size of treatment effect, according to the guidelines from the American Heart Association Task Force on Practice Guidelines.

FINDINGS Eighty articles met criteria for analysis. The pathophysiology of diverticulitis is associated with altered gut motility, increased luminal pressure, and a disordered colonic microenvironment. Several studies examined histologic commonalities with inflammatory bowel disease and irritable bowel syndrome but were focused on associative rather than causal pathways. The natural history of uncomplicated diverticulitis is often benign. For example, in a cohort study of 2366 of 3165 patients hospitalized for acute diverticulitis and followed up for 8.9 years, only 13.3% of patients had a recurrence and 3.9%, a second recurrence. In contrast to what was previously thought, the risk of septic peritonitis is reduced and not increased with each recurrence. Patient-reported outcomes studies show 20% to 35% of patients managed nonoperatively progress to chronic abdominal pain compared with 5% to 25% of patients treated operatively. Randomized trials and cohort studies have shown that antibiotics and fiber were not as beneficial as previously thought and that mesalamine might be useful. Surgical therapy for chronic disease is not always warranted.

CONCLUSIONS AND RELEVANCE Recent studies demonstrate a lesser role for aggressive antibiotic or surgical intervention for chronic or recurrent diverticulitis than was previously thought necessary.
Before effective broad-spectrum antibiotics were available, diverticulitis was a devastating disease associated with substantial morbidity and mortality. Now, most cases resolve with antibiotic therapy. Because of the fear of complications associated with perforation, if multiply recurrent disease occurs, surgical resection of the involved colon is performed. However, recent advances in the understanding of the disease’s pathophysiology and natural history have led to substantial changes in diverticulitis treatment guidelines.

Over the past decade, 4 key innovations have changed the thinking about and management of diverticulitis: complicated diverticulitis (ie, with perforation, abscess, or phlegmon) is now reliably distinguished from uncomplicated disease by computed tomography (CT); large clinical and administrative databases have facilitated more complete follow-up of large populations, resulting in changes in the understanding of the natural history of diverticulitis, clinical and behavioral risk factors for the disease, and what the indications and outcomes of its treatments are; similarities exist between the physiology and inflammatory processes for diverticulitis, irritable bowel syndrome, and inflammatory bowel disease. These insights led to new approaches to managing chronic disease and preventing recurrent diverticulitis. Surgeons now pursue less invasive intervention, increasing the use of percutaneous drainage, intraperitoneal lavage, and minimally invasive surgical techniques.

Diverticulitis treatments are rapidly evolving. This review summarizes recent medical literature describing the pathophysiology and natural history of chronic and recurrent sigmoid diverticulitis and reviews new recommendations for the medical management and indications for surgery. Four key questions are addressed: (1) What is known about the pathophysiology of diverticulitis? How do diverticula become inflamed, and what are associated risk factors? (2) How have large observational trials clarified the natural history of diverticulitis that is managed nonoperatively? (3) What are the proposed mechanisms, options, and outcomes of medical therapy for diverticulitis? and (4) What are the indications for surgical treatment of diverticulitis?

Methods

Data Sources

We performed a systematic review of the MEDLINE and Cochrane databases, using separate search terms for each of the 4 key questions (eAppendix in the Supplement), for articles published between January 1, 2000, and March 31, 2013. Broad search terms for question 1 included (pathophysiology or etiology or pathogenesis) and diverticulitis; for question 2, broad search terms were (natural history or outcome) and diverticulitis; for questions 3 and 4, broad search terms were (chronic or acute or smoldering or recurrent) and diverticulitis and (management or treatment). Searches were limited to English language articles published since 2000 that addressed diverticulitis in adult humans. All articles were then combined into a single list, and duplicates were excluded, resulting in 1383 abstracts and articles for review.

Study Selection

We reviewed abstracts and excluded commentary or opinion pieces, review articles that reported data present in other included references, articles based on data accrued before 2000, and articles containing primary data duplicated in another included article. In the case of duplicate presentation of data, we selected articles with the most recent analyses. We excluded small case series with fewer than 30 patients, except for the search of articles for question 1 regarding pathophysiology. We supplemented our automated search by manually searching additional references from the bibliographies of included studies, yielding a total of 186 articles for full review.

Data Extraction

Studies selected for inclusion were reviewed according to guidelines from the Strengthening the Reporting of Observational Studies in Epidemiology. We graded the level of evidence and classified recommendations by size of treatment effect, according to the guidelines from the American Heart Association Task Force on Practice Guidelines. We compared the resulting recommendations with those of the most comprehensive recent clinical practice guidelines on management of diverticulitis.

Results

Eighty articles were selected from the 186 reviewed. Articles were excluded if there was an absence of data regarding the topic of interest, if the majority of data accrued prior to 2000, and if it was a small case series. Articles were organized into 4 categories consistent with the study questions and summarized below.

Pathophysiology and Risk Factors

Twenty-five articles fulfilled criteria and were included in this review of the pathophysiology of diverticulitis. Although *colonic diverticum* refers specifically to a thin-walled outpouching of the mucosa and serosa, absent the muscularis, and *diverticulosis* refers to the presence of many diverticula, *diverticulitis* is distinguished by the presence of inflammation. If untreated, diverticular inflammation may resolve, become chronic, or progress, leading to bacterial translocation or even perforation of the colon wall at the inflamed site.

The prevailing explanation for colonic diverticula formation postulates that altered bowel motility leading to increased intraluminal pressure causes mucosal outpouching adjacent to the vasa recta. Whether diverticula, once formed, can spontaneously resolve is unknown. The mechanism by which asymptomatic diverticula become inflamed and perforate (diverticulitis) is still under investigation but is plausibly associated with altered gut motility and increased pressure combined with a deranged colonic microbiome. In recent series, when ex vivo colonic tissue from patients with diverticulitis was exposed to chemicals that contract or relax smooth muscle, the response was significantly abnormal with increased hypercontractility and lower maximum relaxation responses. These findings are consistent with neuropeptide abnormalities and the altered histologic appearance of muscle and nerves in the bowel wall of patients with diverticulitis compared with healthy patients. For example, reduced serotonin transporter expression and fewer interstitial cells of Cajal were found among patients with diverticulitis but not among those with normal colons or with noninfamed diverticula. Moreover, patients who ingest calcium channel blockers, which reduce smooth muscle contractility, appear to have a re-
duced risk of perforated diverticulitis compared with patients who do not take calcium blockers.13

Recurrent or chronic diverticulitis displays chemical and histological similarities to inflammatory bowel disease and irritable bowel syndrome.14,15 These diagnoses may be concurrent, sequential, or entirely separate. Although the mechanisms of inflammation are unknown, higher levels of histamine, tumor necrosis factor α (TNF-α), and matrix metalloproteinases have been identified in colonic biopsies from patients with irritable bowel syndrome, inflammatory bowel disease, and diverticulitis.16-18 Other common evidence of chronic inflammation includes the presence of granulomas and infiltrating lymphocytes. Ultimately, however, there were minimal mechanistic data to support or refute a common or related path- 

way and key distinguishing features of each persist. For example, a hallmark of irritable bowel syndrome is relief of crampy pain upon defection; inflammatory bowel disease is characterized by mucosal injury frequently resulting in bloody diarrhea; diverticulitis is by definition associated with diverticula.

Lifestyle risk factors such as diet, smoking, and medication use have long been considered important in the etiology of diverticular disease. A prospective UK population-based cohort study found a relative risk of 0.69 (95% CI, 0.55–0.86) of diverticular disease among vegetarians compared with meat eaters.19 The relationship between dietary fiber and diverticula is not clear, however. A large cohort study of patients undergoing colonoscopy found that those who reported the highest fiber intake were at highest risk of diverticulosis.20 A longitudinal survey of 47,228 health professionals recently reported that incident diverticulitis was not associated with nut, corn, or popcorn ingestion and that increased nut intake was associated with lower risk of diverticulitis.21 Smoking and obe-

sity have been linked to diverticulitis and to complicated diverticuli-tis in several large cohort studies,22-26 whereas increased physical activity is associated with decreased risk.27,28 Nonsteroidal anti-

inflammatory drugs, opioids, and corticosteroids have been con-

vincingly associated with increased risk of perforated diverticulitis.29-32 A unifying hypothesis to integrate these diverse lifestyle effects and their contribution to pathophysiology has not been advanced.

Natural History
We defined the natural history of diverticulitis as the longitudinal outcomes for patients whose disease was managed nonoperatively. Six articles fulfilled criteria and were reviewed. Most of the data regarding natural history were focused on nonoperative outcomes and specifically on risk of recurrence, that is, subsequent acute diverticuli-tis after an asymptomatic interval, rather than on chronic disease in which there is no asymptomatic interval.

Risk of Recurrence
Two large multicenter studies33,34 confirmed that recurrence is rare and is a relatively benign process for the substantial majority of patients. Broderick-Villa et al35 reported on 2366 of 3165 patients (75%) hospitalized with acute diverticulitis and treated nonoperatively in the Kaiser Permanente system. Eighty-six percent of those patients required no further inpatient care for diverticulitis over the 8.9 years of follow-up. Recurrence occurred in only 13.3% of patients and only 3.9% had a second recurrence. No patient with a second re-

currence required an operation, and repeat recurrences plateaued after 4 episodes. Although the risk for a second recurrence in-

creased to 29% among those with a first recurrence, the authors con-

cluded that recurrence overall is rare and therefore does not war-

rant elective colectomy.

Binda et al33 obtained complete follow-up for 320 patients treated with antibiotics in 17 Italian hospitals after admission for acute diverticulitis. Over a mean period of 10.7 years, 61% of patients re-

quired no further inpatient care. Twenty-two percent of patients had persistent or recurrent symptoms requiring hospitalization, and 17% had a recurrent episode resulting in an emergency operation. In adjusted analyses, the risk of recurrence was greatest among pa-

tients younger than 50 years and among those with at least 3 previous episodes. The authors noted that unlike other studies of recurrence, episodes were not clustered into the first 2 years or even the first 5 years following the index diagnosis.

Complications of Diverticulitis
A large population-based study linked primary care and hospital-

based data to examine patterns of morbidity associated with com-

plicated diverticulitis among 2950 patients hospitalized in the United Kingdom.35 Seventy-two percent of patients had no antecedent ep-

isodes of diverticulitis, and 2 or more prior episodes were not asso-

ciated with abscess or stricture formation, although they were asso-

ciated with increased risk of fistula. Although most serious complications of diverticulitis were linked to the first episode, not to recurrence, they were consequential. Compared with age- and sex-matched cases in the general population, patients with perforation or abscess had 4.5-fold increased risk of death in the ensuing year.

Shifting Morphology
Morphologic characteristics of recurrent diverticulitis may differ considerably from the first episode. A single institution study36 of 60 patients with recurrent disease after initial medical management of uncomplicated diverticulitis compared CT scans from the index and second admission. At the time of recurrence, 6 patients (10%) had complicated diverticulitis and 3 underwent an urgent Hartmann procedure. Among the 54 patients with a CT-defined recurrence that was uncomplicated, 19 (35%) had a morphologically distinct recurrence of diverticulitis at an average of 8 cm from the previous site.

Chronic Pain
Nelson et al37 analyzed a cohort of 99 patients with complicated di-

verticulitis whose care was managed nonoperatively with fol-

low-up over 76 months. Forty-six patients had recurrent disease and 20 underwent an elective resection more than 6 months after the initial episode. Unlike Binda et al, the authors found no difference between recurrence or need for emergency operation based on age. Although about half of the patients had recurrent or chronic dis-

ease, none died of complications of diverticulitis. Similarly, a lon-

gitudinal survey of 124 patients with diverticular disease who were managed medically over 7 years reported that 34% continued to experience abdominal pain for 3.5 days per month. Odds of chronic pain were increased 4-fold among those who had been previously diagnosed with diverticulitis.38

Until recently, recommendations for management and preven-

tion of diverticulitis were well-established. Patients with perfora-

tion, abscess, fistula, or stricture were managed definitively with an
urgent or elective sigmoid colon resection. Those with uncomplicated disease were managed with antibiotics and bowel rest. In the event of a recurrence or failure to resolve, patients were scheduled for an elective sigmoid colectomy. The rationale for elective surgery was largely preventive, based on concerns that recurrence would result in progressively increased risk of sepsis or the need for a colostomy. More recently, emerging medical therapies are under investigation as a potentially lower-risk means of prevention.

## Emerging Medical Therapies

The goals of medical therapy for diverticulitis are to decrease inflammation acutely, to prevent recurrence, and to manage chronic symptoms. With the advantage of more current pathophysiologic data and large database-derived studies of natural history, new medical approaches toward these goals have been proposed. A total of 14 articles on existent or emerging medical therapies met criteria for review (Table 1); however, the quality of most available evidence was poor (level B or C) and only 1 article met level A criteria.

### Fiber

The traditional approach to prevention of recurrence of diverticulitis has been to increase dietary or supplemental fiber. Ünlü et al recently published a systematic review of the evidence supporting this longstanding recommendation. The authors found 4 studies on treatment and no studies on prevention of recurrence that met inclusion criteria. One randomized trial showed no treatment effect of fiber ingestion on resolution of symptoms, whereas the other 3 studies did show a significant treatment advantage with fiber ingestion. The authors concluded that recommendations for ingestion of dietary fiber are based on inconsistent level 2 and level 3 evidence. None of the studies examined met criteria for inclusion in our study because the data were collected prior to 2000. A systematic review of 4 trials of fiber vs rifaximin plus fiber found that the combined therapy was slightly but significantly more effective in obtaining symptom relief and preventing complications at 1 year. Two of the 4 studies were based on data from prior to 2000, the third was not explicitly about diverticulitis, and the fourth did not state what years data were collected.

### Antibiotic Therapy

A major change in the approach to the management of acute uncomplicated diverticulitis is the progressively reduced use of antibiotics. Specifically, prospective randomized and open trials have shown no advantage of intravenous over oral antibiotics, and there-
fore have recommended outpatient management. In addition, more recent data indicate equivalent efficacy of a 4-day vs 7-day course of an appropriately broad-spectrum antibiotic. This study recommended short-course therapy with ertapenem but rifaximin has also been favored for chronic or recurrent diverticulitis due to limited gut absorption and low cost. A Cochrane review of antibiotic use in acute uncomplicated diverticulitis found that, in spite of published guidelines, the best available data do not support use of antibiotics. A more inclusive systematic review and a retrospective cohort study have also found that antibiotic use has no effect on complications, need for surgery, or recurrence rate. Thus, newer data support a noninterventional policy for treatment of uncomplicated diverticulitis.

**Probiotics**

The rationale for use of probiotics in diverticular disease is based on the theory that a deranged colonic microenvironment, including abnormal gut flora, precipitates chronic inflammation and recurrent disease. One study of probiotics met inclusion criteria. The authors randomized 83 consecutive patients, whose index episode was resolved after treatment with rifaximin or ciprofloxacin, to receive an oral polybacterial lysate suspension or placebo twice daily for 2 weeks every month within 3 months after an acute attack. Complete follow-up data were available for 76 patients. The probiotic group reported significantly less abdominal pain, bloating, and fever, but there was no significant difference in recurrence rates (2 of 41 vs 5 of 35).

**Anti-inflammatory Medication**

A recent appreciation of chronic mucosal inflammation has sparked interest in alterations of the colonic microenvironment and the potential for use of anti-inflammatory medication. A head-to-head comparison of anti-inflammatory treatment using mesalamine vs antibiotic therapy with rifaximin demonstrated significantly reduced symptoms after 6 to 12 months of high-dose cyclic mesalamine. A nonrandomized comparison of rifaximin and mesalazine vs rifaximin alone showed 3% recurrence in the combined medication group and 13% recurrence in the rifaximin alone group over 1 year. A cohort study from the same authors showed that combined mesalamine and rifaximin followed by mesalamine alone led to resolution of symptoms for nearly all patients but recurrent disease among 2% at 8 weeks. The duration of follow-up for this study was notably short; most studies of recurrence require a minimum asymptomatic period of 3 to 6 months from the time of the index diagnosis before the next symptom onset.

**Current Indications for Surgical Treatment**

Surgery for acute diverticulitis is indicated for patients who present with sepsis and diffuse peritonitis and for patients whose condition did not improve with medical therapy, percutaneous drainage, or both. Surgical options include simple colostomy formation in the setting of profound inflammation, traditional sigmoid resection with colostomy (Hartmann procedure), and sigmoid resection with a primary colocolonic or colorectal anastomosis with or without a diverting loop ileostomy. Based on selection criteria, we identified 35 relevant articles describing indications for surgical therapy (in the Supplement). Most articles met only level B or C criteria and none met level A criteria, thereby limiting the conclusions that can be drawn.

**Urgent Setting**

In 2 cohort studies, the presence of complicated diverticulitis, abscess, free intraperitoneal air on computed tomography alone, or all 3 did not mandate an urgent operation among hemodynamically stable patients. Still, up to 25% of patients with evidence of abscess, perforation, or both underwent surgery during the acute...
Elective surgery after successful nonoperative management of an episode of complicated diverticulitis was often recommended due to rates of recurrence, hospital readmission, and need for elective resection as high as 50 to 70%, especially among those with a pelvic or paracolic abscess that required percutaneous drainage.59 However, few of these patients needed an emergency operation.37,62

Preoperative Colonoscopy
Elective evaluation of patients who recovered from an episode of acute diverticulitis was controversial. Some authors advocated colonoscopy to confirm the diagnosis and exclude malignancy.53,64 Others reported no increased detection of advanced neoplasia in patients with a typical presentation of acute diverticulitis.65-68

### Table 2. Level of Recommendation for Systematic Review of Recent Literature Compared to Current Practice Guidelines for Prevention of Recurrent Sigmoid Diverticulitis

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Current Evidence Review and Guidelines</th>
<th>Recommendation^b Level</th>
<th>Recommendation^b Class</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recovered From 1 or More Uncomplicated Episode</td>
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<tr>
<td>Fiber supplementation</td>
<td>C IIa</td>
<td></td>
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<tr>
<td>Evidence review</td>
<td>Not addressed</td>
<td></td>
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<tr>
<td>Practice guidelines^c</td>
<td>Long-term fiber supplementation may prevent recurrence (ASCRS)</td>
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<tr>
<td>Antibiotic use</td>
<td>A III</td>
<td></td>
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<tr>
<td>Evidence review</td>
<td>For acute uncomplicated diverticulitis, a Cochrane review,42,51 a systematic review,44 and a retrospective cohort study46 do not support use of antibiotics for prevention of recurrence</td>
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<tr>
<td>Practice guidelines^c</td>
<td>Not addressed</td>
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<tr>
<td>Probiotics</td>
<td>C IIb</td>
<td></td>
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<tr>
<td>Evidence review</td>
<td>A trial of 83 patients randomized to receive oral polybacterial lysate vs placebo reported no significant difference in recurrence rates (P = .2 using χ² comparison of proportions)45</td>
<td></td>
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<tr>
<td>Practice guidelines^c</td>
<td>Not addressed</td>
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<tr>
<td>Mesalamine</td>
<td>B IIa</td>
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<tr>
<td>Evidence review</td>
<td>Small uncontrolled trials indicate approximately 3% recurrence rate over 1 y with use of combined mesalamine and rifaximin77</td>
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</tr>
<tr>
<td>Practice guidelines^c</td>
<td>Not addressed</td>
<td></td>
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<tr>
<td>Avoiding nuts and seeds</td>
<td>A III</td>
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<tr>
<td>Evidence review</td>
<td>A survey of 47,228 health professionals reported that incident diverticulitis was not associated with nut, corn, or popcorn ingestion and that increased nut intake was associated with lower risk of diverticulitis78</td>
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<tr>
<td>Practice guidelines^c</td>
<td>Not addressed</td>
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<tr>
<td>Surgical resection</td>
<td>B IIb</td>
<td></td>
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<tr>
<td>Evidence review</td>
<td>Several cohort studies compared recurrence among patients who treated operatively vs nonoperatively. They noted that a complicated recurrence occurred in fewer than 5% of patients treated nonoperatively;62,65-73 the occurrence of multiple subsequent episodes did not increase the risk of major complications of diverticulitis;74, and complicated diverticulitis most commonly occurred during the first episode rather than during recurrent episodes.75-78 Taken together, these data support a real but limited role for surgery in preventing recurrence of diverticulitis</td>
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<tr>
<td>Practice guidelines^c</td>
<td>The decision to recommend elective sigmoid colectomy after recovery from acute diverticulitis should be made on a case-by-case basis (ASCRS)</td>
<td>B I</td>
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<tr>
<td>Indications for surgery most frequently reported include: ≥2 episodes of diverticulitis severe enough to cause hospitalization and any episode of diverticulitis associated with contrast leakage, obstructive symptoms, or an inability to differentiate between diverticulitis and cancer (WGO)</td>
<td>C IIb</td>
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<tr>
<td>Elective sigmoid resection may not be necessary after any specific number of episodes of uncomplicated diverticulitis or with any definite age thresholds (SSAT)</td>
<td>C IIb</td>
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<tr>
<td>Recurrent diverticulitis is rare after surgery (1%-10%) (WGO)</td>
<td>C IIb</td>
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<td>Extraluminal air, contrast or abscess is a predictor of an adverse natural history and may be helpful in determining the need for surgery (ASCRS)</td>
<td>C IIb</td>
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(continued)

dex hospitalization.58-60 Elective surgery after successful nonoperative management of an episode of complicated diverticulitis was often recommended due to rates of recurrence, hospital readmission, and need for elective resection as high as 50 to 70%, especially among those with a pelvic or paracolic abscess that required percutaneous drainage.59 However, few of these patients needed an emergency operation.37,62

### Recurrent Diverticulitis
Among studies comparing surgical with nonsurgical management, several important considerations challenged routine elective surgical therapy for recurrent or chronic diverticulitis. First, complicated recurrence after recovery from an uncomplicated episode of diverticulitis occurred in fewer than 5% of patients whose care was managed nonoperatively.62,69-73 Second, the occurrence of multiple sub-
Sigmoid diverticulitis is an increasingly common and costly disease endemic in industrialized nations. Between 1998 and 2005, US hospital admissions for diverticulitis increased by 26% and elective operations by 29%. As incidence rates are increasing, the understanding and management of sigmoid diverticulitis is evolving. Collectively, several recent studies indicate a pathogenetic role for inflammation in diverticulitis that may be similar to that of irritable bowel syndrome, inflammatory bowel disease, or both, based on common histologic findings such as granulomas, infiltrating lymphocytes, TNF-α, histamine, and matrix metalloproteinases. However, studies of the etiology and pathophysiology of diverticulitis were limited by a focus on associative rather than causal pathways. Similarly, while lifestyle alterations were often recommended in response to the first incidence of diverticulitis, we found no studies testing the effect of lifestyle modifications on the disease course.

The risk of recurrence among patients with uncomplicated diverticulitis was approximately 13% to 36% and the risk of future emergency surgery was approximately 4% to 7%. Therefore, the available data do not support a routine policy of prophylactic sigmoidectomy on clinical grounds alone (Figure). In addition, given the possibility of shifting morphology, a prophylactic resection may not be necessary after any specific number of episodes of uncomplicated diverticulitis or with any definitive age thresholds (SSAT).

**Discussion**

Sigmoid diverticulitis is an increasingly common and costly disease endemic in industrialized nations. Between 1998 and 2005, US hospital admissions for diverticulitis increased by 26% and elective operations by 29%. As incidence rates are increasing, the understanding and management of sigmoid diverticulitis is evolving. Collectively, several recent studies indicate a pathogenetic role for inflammation in diverticulitis that may be similar to that of irritable bowel syndrome, inflammatory bowel disease, or both, based on common histologic findings such as granulomas, infiltrating lymphocytes, TNF-α, histamine, and matrix metalloproteinases. However, studies of the etiology and pathophysiology of diverticulitis were limited by a focus on associative rather than causal pathways. Similarly, while lifestyle alterations were often recommended in response to the first incidence of diverticulitis, we found no studies testing the effect of lifestyle modifications on the disease course.

The risk of recurrence among patients with uncomplicated diverticulitis was approximately 13% to 36% and the risk of future emergency surgery was approximately 4% to 7%. Therefore, the available data do not support a routine policy of prophylactic sigmoidectomy on clinical grounds alone (Figure). In addition, given the possibility of shifting morphology, a prophylactic resection may not be necessary after any specific number of episodes of uncomplicated diverticulitis or with any definitive age thresholds (SSAT).
actually miss the site of future inflammation, although these data should be confirmed in a larger cohort. Recent data also suggest that combination medical therapy, particularly rifaximin and mesalamine, may contribute to reduced symptoms in chronic disease. Further investigation into commonalities with irritable bowel syndrome and inflammatory bowel disease may provide insight and more opportunities for crossover of medical therapies.

Whether and when to perform elective surgery for chronic or recurrent episodes of uncomplicated diverticulitis remain controversial topics. The traditional recommendation for surgical resection after 2 such episodes was based on outdated evidence suggesting that the success of nonoperative treatment diminished with each subsequent recurrence. Patients were told that an elective operation would permit primary anastomosis, whereas a potential emergency would necessitate fecal diversion with a colostomy. This recommendation has been challenged by more recent natural history information and recent studies of operative vs nonoperative management.

The current clinical practice guidelines were largely written for a surgical audience and may be oriented toward the patient population seen by surgeons (Table 2 and Table 3). However, no corresponding clinical practice guideline specifically targets primary care clinicians who encounter a different spectrum of disease in the primary care setting. Despite current clinical guidelines, we found minimal data to support the prevention of recurrence with fiber ingestion. We found that immunocompromised patients did not have a higher risk of mortality with recurrence. Nor did elective surgery always prevent recurrence or treat chronic disease. Up to 25% of pa-

### Table 3. Level of Recommendation for Systematic Review of Recent Literature vs Current Practice Guidelines for Management of Chronic Sigmoid Diverticulitis

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Current Evidence Review and Guidelines</th>
<th>Recommendationb</th>
<th>Level</th>
<th>Class</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fiber supplementation</td>
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<tr>
<td>Evidence review</td>
<td>A systematic review of fiber vs rifaximin + fiber found that the combined therapy was significantly more effective in obtaining symptom relief at 1 y; Use of fiber was not compared with nonuse.</td>
<td>C</td>
<td>IIb</td>
<td></td>
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<tr>
<td>Practice guidelines</td>
<td>Not addressed</td>
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<tr>
<td>Antibiotic use</td>
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<tr>
<td>Evidence review</td>
<td>One study found 90% resolution of symptoms among patients using rifaximin over 1 y; Use of rifaximin alone was not compared with nonuse.</td>
<td>C</td>
<td>IIb</td>
<td></td>
</tr>
<tr>
<td>Practice guidelines</td>
<td>Not addressed</td>
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<tr>
<td>Probiotics</td>
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<tr>
<td>Evidence review</td>
<td>A trial of 83 patients randomized to receive oral polybacterial lysate vs placebo reported significantly less abdominal pain, bloating, and fever.</td>
<td>B</td>
<td>IIa</td>
<td></td>
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<tr>
<td>Practice guidelines</td>
<td>Not addressed</td>
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<tr>
<td>Mesalamine</td>
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<tr>
<td>Evidence review</td>
<td>A randomized comparison of mesalamine vs rifaximin demonstrated significantly reduced symptoms after 6-12 mo of high-dose cyclic mesalamine.</td>
<td>B</td>
<td>IIa</td>
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<tr>
<td>Practice guidelines</td>
<td>Not addressed</td>
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<tr>
<td>Confirmation of diagnosis</td>
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<tr>
<td>Evidence review</td>
<td>Most cohort studies reported no benefit of colonoscopy among patients following acute diverticulitis; however, several large cohort studies reported a 2%-3% incidence of cancer and up to 26% incidence of adenoma.</td>
<td>C</td>
<td>Ia</td>
<td></td>
</tr>
<tr>
<td>Practice guidelinesc</td>
<td>Colonoscopy (or contrast enema + sigmoidoscopy) should be uniformly recommended after recovery from acute diverticulitis (ASCRS)</td>
<td>C</td>
<td>I</td>
<td></td>
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<td></td>
<td>Care must be taken to exclude other diagnoses (IBS, ischemic colitis) (WGO)</td>
<td>C</td>
<td>Ia</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Colonoscopy or barium enema is indicated 6-8 wk following hospital discharge to document the extent of diverticula and exclude cancer (SSAT)</td>
<td>C</td>
<td>I</td>
<td></td>
</tr>
<tr>
<td>Elective Surgical Resection</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Evidence review</td>
<td>No study prospectively compared resection to nonresection for chronic diverticulitis. However, several cohort studies examined aspects of chronic disease. Specifically, 5%-25% of postoperative patients had recurrent or unresolved abdominal symptoms.</td>
<td>C</td>
<td>IIb</td>
<td></td>
</tr>
<tr>
<td>Practice guidelinesc</td>
<td>The decision to recommend surgery should be influenced by whether there are persistent symptoms after the acute episode (ASCRS)</td>
<td>C</td>
<td>I</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sigmoid resection provides complete resolution of smoldering diverticulitis in 70% of cases (WGO)</td>
<td>C</td>
<td>IIa</td>
<td></td>
</tr>
</tbody>
</table>

Abbreviations: ASCRS, American Society of Colon and Rectal Surgeons; IBS, irritable bowel syndrome; SSAT, Society for Surgery of the Alimentary Tract; WGO, World Gastroenterology Organization.

* Level of recommendations are based on Gibbons et al. The current practice guidelines are based on Rafferty et al., SSAT practice guidelines, and the WGO practice guidelines.

+ For the definition of the levels of evidence and class, see the Table 1 footnotes.

* ASCRS represents 2006; SSAT, 2007; and WGO, 2007 practice guidelines.

Administrative, technical, or material support: All authors.

Conclusions

In summary, although decision making should be based on individual clinical characteristics and patient preferences, the current data support a substantially reduced role for aggressive antibiotic and surgical intervention in recurrent and chronic diverticulitis.

REFERENCES


45. Hall JM, Roberts PL, Ricciardi R, et al. Long-term follow-up after an initial episode of diverticulitis: