84 Diagnosing Diverticulitis: Balancing Cost, Efficiency, and Safety. Can I Make This Diagnosis by Clinical Assessment Alone? What Is the Role of Imaging?

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Pearls and Pitfalls

- The three strongest predictors of acute diverticulitis are direct tenderness only in the left lower quadrant of abdomen, the absence of vomiting, and C-reactive protein >50 mg/L.
- The high misdiagnosis rates and reliance of CT confirmation for risk assessment, treatment, and disposition translate into low adoption of clinical decision tools and reliance on clinical diagnosis.

Diverticulitis is a common discharge diagnosis from the emergency department (ED). Analysis of the Nationwide Emergency Department Sample (NEDS), the largest publicly available emergency department all-payer database, found that diverticulitis accounted for over 360,000 ED visits in 2013, a 34% increase in visits compared to 2006 [1]. During this same time period (2006–2013), a decrease in admissions from the emergency department (from 58% to 47%), cases managed surgically (decreased by 11%), and deaths per 100,000 admitted patients (decreased by 42%) were documented [1]. In 2013, the aggregate national cost of diverticulitis-related ED visits was over $1.6 billion [1]. The magnitude and shifting management of acute diverticulitis emphasizes the need to develop a nuanced understanding of this disease to provide efficient and safe care.

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Can I Make This Diagnosis by Clinical Assessment Alone?

Accuracy of Clinical Assessment

Diverticulitis typically presents with left lower quadrant abdominal pain that may be associated with a change in bowel habits (both diarrhea and constipation are described), fever, loss of appetite, nausea, and urinary frequency due to irritation of the bladder (Table 84.1). In patients of Asian descent or those with a redundant sigmoid colon, right-sided abdominal pain may predominate [4]. On physical examination, left-sided abdominal tenderness, fever, abdominal distention, or a tender palpable mass may be present. Laboratory tests often reflect leukocytosis, an elevated CRP, or sterile pyuria [4].

The American Society of Colon and Rectal Surgeons' (ASCRS) clinical guidelines (2014) state "the diagnosis of acute diverticulitis can often be made following a focused history and physical examination, especially in patients with recurrent diverticulitis whose diagnosis has been previously confirmed" [5]. However, literature on the accuracy of clinical diagnosis alone is limited and the studies that have been published reflect high misdiagnosis rates. Early studies estimated the misdiagnosis rate to be between 34% and 67% [2]. Several studies published in the last decade confirm that the clinical diagnosis of diverticulitis has a low sensitivity rate, but higher specificity.

- Laurell et al. (2007) reported that a clinical diagnosis alone had a sensitivity of 64% but specificity of 97%, after studying 145 admitted patients with suspected diverticulitis compared to 1145 patients admitted with nonspecific abdominal pain. Malignancy, appendicitis, gynecologic etiologies, urinary tract infections, and aortic aneurysm were alternate final diagnoses [2].
- Toorenvliet et al. (2010) prospectively evaluated 802 consecutive patients with abdominal pain that presented to an emergency department. Fifty seven patients had a final diagnosis of diverticulitis. Again, clinical diagnosis alone

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Table 84.1 Diverticulitis signs and symptoms compared with nonspecific abdominal pain

Laurell et al. (2007)			Andeweg et al. (2011)	
Sign/symptom	Diverticulitis (n = 145)	NSAP (n = 1142)	Sign/symptom	Odd ratio (95% CI)
Mean age	62 years	37 years	Age 41–50	2.08 (0.85–5.11)
			Age >50	3.99 (1.99–8.03)
Previous episodes	54%	40%	One or more previous episodes	7.60 (3.72–15.52)
Duration (hours)	49 h	35 h	Duration >4 days	1.58 (0.81–3.07)
Left abdominal tenderness	37%	7%	Left lower quadrant pain	3.43 (1.98–5.92)
Right abdominal tenderness	7%	19%	Right lower quadrant pain	0.25 (0.11–0.61)
Generalized abdominal tenderness	12%	19%	Diffuse abdominal pain	1.00 (reference)
			Aggravation with movement	2.97 (1.83–4.83)
			Anorexia	0.71 (0.44–1.13)
Vomiting	14%	27%	Vomiting	0.49 (0.59–0.86)
Diarrhea	17%	14%	Diarrhea	1.35 (0.76–2.40)
Constipation	26%	12%		
Temperature	37.7	37.2	Fever >38.5	2.00 (1.06–3.78)
Rebound tenderness	45%	24%	Rebound tenderness	2.92 (1.80–4.74)
Leukocytes ($\times 10^9$/L)	12.1	10.1	WBC 10–12 ($\times 10^9$/L)	2.53 (1.32–4.85)
			WBC 10–12 ($\times 10^9$/L)	2.45 (1.26–4.76)
CRP (mg/L)	73	20	CRP > 50 mg /L	3.78 (1.92–7.43)

Adapted from Refs. [2, 3]
NSAP nonspecific abdominal pain

had a low sensitivity of 68% but high specificity of 98%. The positive predictive value (PPV) of clinical diagnosis for diverticulitis was 0.65, with a negative predictive value (NPV) of 0.98. With the addition of computed tomography (CT), the PPV increased to 0.95 and the NPV was 0.99 [6].

- Andweg et al. (2011) evaluated 1290 hospitalized patients who presented with abdominal pain during a 4-year period. Of the 287 patients with suspected diverticulitis on initial evaluation, 124 patients (43%) had CT-confirmed diverticulitis and 163 patients (57%) had another final diagnosis [3].

Can a Clinical Decision Rule for Diverticulitis Help Me Confirm the Diagnosis and Safely Disposition Patients?

Several clinical decision rules have been described to help clinicians clinically diagnose acute diverticulitis.

Andweg et al. identified seven independent predictors of acute diverticulitis. These predictors included (1) age greater than 50 years, (2) a prior episode of diverticulitis, (3) left lower quadrant abdominal pain, (4) left lower quadrant abdominal tenderness, (5) worsening of symptoms with movement, (6) CRP > 50 mg/L, and (7) the absence of vomiting (Table 84.1). While independently they were not able to accurately predict acute diverticulitis, in combination, these seven predictors demonstrated an accuracy rate of 86% (84% after internal validation) [3].

Lameris et al. developed a clinical decision rule utilizing the three strongest predictors of acute diverticulitis: direct tenderness only in the left lower quadrant of abdomen, the absence of vomiting, and C-reactive protein >50 mg/L. In a prospective study of 1021 patients with acute abdominal pain in the emergency department, 112 patients were diagnosed with diverticulitis. Of those 112 patients, the combination of all 3 predictors were found in 24% of patients and correlated with a 97% likelihood of diverticulitis diagnosis. "Of the 96 patients without all 3 features, 45 (47%) did not have diverticulitis" [7].

While these clinical predictors likely account for the high specificity of clinical assessment in the diagnosis of acute diverticulitis, the high misdiagnosis rates and reliance of CT confirmation for risk assessment, treatment, and disposition translate into low adoption of these decision tools.

What Is the Role of Imaging?

Imaging is a useful tool for risk stratification, treatment, and disposition of diverticulitis patients. Computed tomography (CT), ultrasound, and magnetic resonance imaging (MRI) can all diagnose diverticulitis but do not provide identical information [8, 9]. The diagnosis of acute diverticulitis can be accomplished by colonoscopy, but due to the risk of perforation in acute episodes, it is not recommended. Furthermore, colonoscopy cannot identify abscesses or extensive areas of pericolic stranding and inflammation, decreasing the ability to risk stratify patients [8, 9].

Computed Tomography (CT)

CT is easy to obtain and provides important information not obtained with other imaging modalities, including the degree and location of inflammation, abscess formation, and micro-/macro-perforations [8, 9]. Regardless of contrast strategy, CT remains highly accurate in diagnosis acute diverticulitis. In one study, the sensitivity and specificity of CT for diverticulitis were 97% and 98%, respectively [10]. This is consistent with CT's overall accuracy rate of 99% [11]. The American College of Radiology Appropriateness Criteria recommends CT abdomen and pelvis with IV contrast but adds the caveat "oral and/or colonic contrast may be helpful for bowel luminal visualization" [11]. However, a retrospective review found no significant difference in the ability to diagnosis acute intraabdominal processes with contrast versus non-contrast CT imaging. This included acute diverticulitis. The most common contrast strategy is IV contrast alone as it may help identify diverticulitis complications better than non-contrast studies [12]. Low-dose radiation strategies have been explored and have documented sensitivities and specificities similar to standard-dose CT imaging, but more research would be needed before broad adoption as other diagnoses are often considered when imaging patients with suspected diverticulitis [11].

Ultrasonography

Ultrasonography is accurate in diagnosing diverticulitis in a subset of patients but provides less information regarding complications of diverticulitis. Overall, graded compression sonography has a reported sensitivity between 77% and 98% and a specificity between 80% and 99% [11]. In a meta-analysis comparing ultrasonography to computed tomography to diagnose diverticulitis, ultrasound had a combined sensitivity and specificity of 92% and 90%, respectively, versus 94% and 99% for CT [13]. However, ultrasound identified an alternate diagnosis in 33–78% of cases, while CT identified alternate diagnosis in 50–100% cases [13].

Magnetic Resonance Imaging

MRI provides similar information to CT and provides great detail of the soft tissue structures involved in diverticulitis but is time-consuming. Patients with specific pacemakers and metal implants will not be able to complete this study [4]. Studies suggest that MRI has sensitivities of 86–94% and specificities of 88–92% in patients with left lower quadrant abdominal pain being evaluated for diverticulitis [11].

Suggested Resources

- FOAMcast, episode 45 – Diverticulitis, foamcast.org/2016/03/04/episode-45-diverticulitis/.
- McNamara, M. and Panel of Gastrointestinal Imaging (2014). ACR appropriateness criteria. [online] American College of Radiology. Available at: https://www.acr.org/Clinical-Resources/ACR-Appropriateness-Criteria. Accessed 20 Jan 2018.

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