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Outpatient Diverticulitis: Mild or Myth?

Erin S. O'Connor, MD MSPH¹, Maureen A. Smith, MD PhD MPH^{1,2,3}, and Charles P. Heise, MD, FACS¹

¹Department of Surgery, University of Wisconsin School of Medicine and Public Health, Madison, Wisconsin

²Department of Population Health Sciences, University of Wisconsin School of Medicine and Public Health, Madison, Wisconsin

³Department of Family Medicine, University of Wisconsin School of Medicine and Public Health, Madison, Wisconsin

Abstract

Background—Diverticulitis is considered common in the outpatient population, with mild variants of described diagnostic criteria: left lower quadrant pain, fever, and leukocytosis. Here, expected criteria utilization among outpatients with a possible diagnosis of diverticulitis is assessed.

Study Design—Primary care acute clinic visits in 2008 for diverticulitis (ICD-9 562.11/562.13) or left lower quadrant pain (789.04) were identified among patients 40 years old. Encounters were reviewed through structured manual chart abstraction, and evaluated for diagnostic accuracy compared to expected criteria. Analysis included inter-rater reliability (kappa tests) and descriptive frequencies by diagnosis code and diverticulitis rating (χ^2 -tests).

Results—376 acute visits were identified with codes for diverticulitis (n=97) or left lower quadrant pain (n=279). High inter-rater reliability was demonstrated for key clinical variables (kappa=0.84–1.0). Left lower quadrant pain was reported in >75% of patients, while temperature and white blood cell count data were frequently unavailable. Lack of these expected criteria resulted in low diagnostic accuracy ratings ("No/Unlikely" – 53.6% diverticulitis, 88.2% left lower quadrant pain, p<0.001).

Conclusions—This investigation raises concern for low accuracy in the outpatient diagnosis of diverticulitis due to inconsistent use of expected criteria, suggesting a smaller population with true diverticulitis than previously anticipated, or lack of criteria applicability in this setting.

Keywords

Diverticulitis; Outpatients; Diagnostic Techniques and Procedures

INTRODUCTION

Diverticulosis contributes significantly to the disease burden of older Americans, affecting 37–45% of individuals over age 40, as well as two-thirds of those over age 80 [1–3]. From historical estimates, we anticipate that 10–25% of these will develop diverticulitis [2, 4, 5]. Patients with diverticulitis present within a broad spectrum, ranging from simple

Address Correspondence to: Charles P. Heise MD, K4/734 Clinical Science Center, 600 Highland Avenue, Madison, WI 53792-3236, Tel: (608) 263-2521; Fax: (608) 263-7652; heise@surgery.wisc.edu.

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inflammation which responds to oral antibiotics, to complicated disease including abscess, fistula formation, peritonitis, or obstruction, which may require hospitalization, percutaneous drainage, or urgent surgical intervention. The economic impact of diverticulitis episodes requiring inpatient treatment is significant, with system costs ranging from \$3,500–12,800 per admission, depending on the feasibility of medical management or the need for surgery (colectomy and/or colostomy) [6].

Diverticulitis has been classically described using three clinical criteria: left lower quadrant abdominal pain, fever, and leukocytosis. Practice guidelines from societies for primary care, gastroenterology, and general surgery support the use of antibiotic therapy in the outpatient setting in stable patients with these symptoms, and recommend abdominal imaging to help confirm uncertain diagnoses [7–9]. In our previous work, we demonstrated that, as classically thought, diverticulitis is commonly seen in the outpatient setting (more than 2,500 outpatient encounters for diverticulitis identified in a five-year period) [10]. However, we noted that most patients bearing that diagnosis lack fever or leukocytosis, and only a minority (14%) undergo abdominal cross-sectional imaging, raising some questions about the accuracy of the diverticulitis diagnosis.

Prevention of inpatient events with appropriate outpatient management, including timing of elective colectomy, is the goal for optimizing patient care. Unfortunately, the majority of literature examining recurrence, need for surgical intervention, and timing of elective colectomy is based exclusively on inpatient data, with little evidence informing the management of outpatients [11–15]. Our limited knowledge of the current and optimal care patterns for outpatients presenting with diverticulitis likely stems from the sheer difficulty of capturing these patients for investigation. It is generally presumed that the symptom spectrum in outpatients is milder, and therefore may blend into a background of other outpatient etiologies for abdominal pain. Abdominal imaging and other objective data, including laboratory studies, might differentiate these alternative diagnoses, but are infrequently used for diagnostic verification in outpatient populations [10]. Furthermore, prior evidence examining the variable accuracy of International Classification of Disease (ICD)-9 diagnosis codes for other diseases also raises concern about our ability to rely on these codes as the sole identifier of appropriate patients for investigation [16]. All of this demonstrates the difficulty in identifying this population for useful study.

Following we describe the clinical features of patients labeled with the ICD-9 diagnosis codes for diverticulitis and left lower quadrant pain in the outpatient setting, as determined from the electronic medical record (EMR). Given the expected mild nature of the presenting symptoms, we hypothesized that patients with true diverticulitis might reasonably be labeled with either diagnostic code by their provider, and that expected diagnostic criteria might be differentially present among these two groups of patients. The goal of this study is to meticulously examine the utilization of expected diagnostic criteria by primary care providers among outpatients with possible diverticulitis and assess the appropriateness of the diagnostic label.

METHODS

Data Sources

Eligible patient records were identified from the EMR of the primary care clinics affiliated with a large Midwestern academic medical center. Implementation of the outpatient EMR began in 2003, with nearly complete capture of demographic data, clinical documentation, radiologic images, and laboratory results achieved by 2008. Study protocol approval was obtained from the University of Wisconsin Institutional Review Board with a waiver of consent.

Patient Selection

All patients with at least one outpatient Evaluation/Management (E/M)-coded encounter in the year 2008 with a billing diagnostic code for diverticulitis (ICD-9 code 562.11 or 562.13) or left lower quadrant pain (789.04) were eligible for study inclusion. These encounters were required to take place at a primary care clinic, including clinics such as family practice, internal medicine, pediatrics, and gerontology. Sub-specialty clinic visits, including gastroenterology, were excluded. Patients were included if they were alive as of 12/31/2008, and if they were at least 40 years old as of 1/1/2008.

For all encounters meeting criteria for study inclusion, several patient- and encounter-level data elements were extracted from the EMR, including medical record number, date of birth, gender, race, ethnicity, encounter date, and performing provider identification number. Serum white blood cell count, temperature, and appropriate reference ranges were recorded if available within 24 hours of the encounter date.

Manual Chart Abstraction

The first chronological encounter for each unique patient was selected for manual EMR chart review. Initial review of the encounter by the primary abstractor (EO) identified those visits which comprised follow-up visits from prior emergency room, clinic, or telephone encounters. As the goal of this study was to capture clinical elements unique to the first encounter for an episode of presumed diverticulitis, these follow-up visits were discarded, and the abstraction effort focused on the remaining primary acute visits.

The primary abstractor recorded several clinical variables from the selected encounter, including socio-demographic characteristics, chief complaint, presence and location of patient-reported abdominal pain, changes in bowel or urinary habits, subjective fever/chills, history/characteristics of similar episodes, past medical and surgical history, vital signs (temperature, heart rate), abdominal exam findings, rectal/pelvic exam findings, white blood cell count, urinalysis, provider differential diagnosis, prescription of antibiotics, radiologic studies ordered, and imaging results if obtained within 30 days of the encounter. After reviewing the available data, the abstractor rated the likelihood of this encounter representing a true diagnosis of diverticulitis using a 3-point Likert scale (No/Unlikely, Possible, Likely/Yes). The abstractor was blinded to the encounter diagnosis code (diverticulitis vs. left lower quadrant pain) while making this judgment.

The 18-page form used to define the in-depth abstraction process was created by the authors based on clinical expertise and literature review, and was revised through a double-abstraction validation process using the first 20 abstracted charts. A random 10% sample of all charts was reviewed by a second abstractor (CH) for determination of inter-rater reliability.

Dataset Creation

Data collected through manual chart abstraction was then merged with the patient record data from the original EMR extraction, and subsequently de-identified to create an analysis dataset. For variables available from both sources, such as patient date of birth, the two source variables were systematically compared, and one master variable chosen for use in further analysis.

Statistical Analysis

Inter-rater reliability for representative variables within the 10% doubly-abstracted subset was determined using the kappa statistic. The patient- and encounter-related characteristics and distribution of expected diagnostic criteria were described by encounter diagnosis code

and abstractor diverticulitis rating, and univariate statistical differences evaluated using χ^2 tests for categorical variables. Analyses were performed using SAS 8.02 (SAS Institute, Cary, NC) and STATA 10.0 software (STATA, College Station, TX). All tests of significance used 2-sided p-values at the 0.05 level.

RESULTS

Inter-rater Reliability

Using a 10% random chart sample reviewed by both abstractors (n=46), we determined the inter-rater reliability for several clinical variables, including left lower quadrant (LLQ) abdominal tenderness, temperature range, white blood cell count range, and abstractor's judgment of the appropriate diagnosis for the evaluated encounter (Table 1). We noted strong agreement between the two abstractors, as evidenced by kappa values ranging from 0.84–1.0, indicating that data collection was accurate and reproducible between the two abstractors.

Patient Sample

We identified 503 unique patient encounters with a code for diverticulitis (n=191) or LLQ pain (n=312). Of these, 376 encounters represented the initial acute presentation (n=97 diverticulitis code, n=279 LLQ pain code), and comprised our analysis group.

Demographics & Clinical Features

Patients with acute visits coded for diverticulitis were significantly older than those with visits coded for LLQ pain (61 vs. 56 years, $p<0.01$), and were more frequently female (Table 2), consistent with studies among patients in emergency department settings [17, 18]. Abdominal pain was reported by 83% of patients in both groups, most frequently LLQ or left-sided. While the majority of patients coded with LLQ pain presented with less than 24 hours of pain, those coded with diverticulitis tended to present within 1 week of pain onset. Subjective fever/chills were more often reported by those with a diverticulitis diagnosis code (28% vs. 9%, $p<0.01$), as were prior similar episodes and history of diverticular disease. On physical exam, presence of LLQ/left-sided tenderness did not distinguish between the encounter diagnosis codes (72% diverticulitis code vs. 67% LLQ pain code). White blood cell count was only available for 40% of the diverticulitis code group and 53% of the LLQ pain code group, and was most often within normal limits for patients in both groups when obtained.

The assessment and plan section of the progress note was reviewed in order to determine the provider's stated diagnosis for the encounter. In many situations, a differential diagnosis, or list of multiple possible diagnoses was given, which often included diverticulitis (87% diverticulitis code group, 34% LLQ pain code group). Antibiotics were prescribed in 83% of those in the diverticulitis code group, compared to 26% with a LLQ pain diagnosis code ($p<0.01$). None of the patients identified in this study underwent an operation or other procedure within 24 hours of the encounter. An abdominal/pelvic computed tomography (CT) scan was obtained in 11% of patients with the diverticulitis code, compared to 29% of those with the left lower quadrant pain code ($p<0.01$). A minority (less than one-third) of these scans demonstrated evidence consistent with diverticulitis (i.e., sigmoid wall thickening, abscess, extraluminal air, inflammatory stranding).

Abstractor Rating

The abstractor rating of the accuracy of the diverticulitis diagnosis is presented in Table 3, with "No/Unlikely/Possible" generally indicating an encounter with 0–1 expected diagnostic criteria and "Likely/Yes" those with 2–3 criteria. The majority of encounters in both

diagnosis groups were rated “No.” For those in the diverticulitis code group, this indicates that the abstractors disagreed with the providers’ diagnostic label of diverticulitis in 54% of cases. In contrast, abstractors more often agreed that the providers’ diagnosis of LLQ pain was appropriate, and that a diagnosis of diverticulitis was not missed, for those patients in the LLQ pain code group (89%).

Expected Diagnostic Criteria

We examined the distribution of expected diagnostic criteria (LLQ pain, fever, and leukocytosis) by diagnosis code and diverticulitis rating (Table 3). Importantly, more than 75% of the encounters were missing data for at least one of the diagnostic criteria. The presence of fever did not discriminate between the rating categories, as it was nearly always absent. However, those who were rated “Likely/Yes” were more likely to have LLQ pain and leukocytosis, and less likely to have missing data across the 3 classic diagnostic criteria, a pattern that was consistent across both code groups.

DISCUSSION

Diverticulitis is classically described along a spectrum of presentations, yet there is currently a lack of rigorous investigation in outpatients who are thought to present with a less severe form of this disease. While practice guidelines present the standard diagnostic criteria of left lower quadrant abdominal pain, fever, and leukocytosis, there has been little attempt to determine whether these features are actually used by providers to define a mild case of diverticulitis [7–9]. The present analysis uniquely examines outpatients with a possible diagnosis of diverticulitis, and demonstrates that many of them (>75%) lack one or more of these expected diagnostic criteria. As has been demonstrated for other diagnostic codes, this result indicates that the diverticulitis diagnostic code is applied independently of the expected diagnostic criteria in the outpatient setting, calling into question the accuracy of the diagnosis [16]. Consequently, the outpatient population with diverticulitis as it is currently defined may be much smaller than previously perceived.

In order to maximize our capture of patients with a possible diagnosis of diverticulitis, we chose to select patients with the encounter diagnosis code for LLQ pain in addition to those with the diverticulitis code, hypothesizing that some providers might elect to use a less specific code in these presumably mild presentations. The absence of expected diagnostic criteria seen in patients with the diverticulitis code was also observed among those with the more general label of “LLQ pain.” Given the multiple diagnostic possibilities incorporated in this code, this may reflect appropriate diagnostic labeling by providers, as corroborated by our conclusion that a diverticulitis label was more correct in only 5% of these cases. However, the use of antibiotics among one-quarter of patients coded with LLQ pain suggests that a diagnosis of diverticulitis or other infectious etiology may be entertained in some cases, although perhaps with some hesitancy.

Our results raise initial concern that the entity of outpatient diverticulitis is much rarer than previously expected. However, despite a frequent lack of laboratory data and other elements of the classic diagnostic criteria, most patients labeled with diverticulitis (>80%) are still treated with antibiotics, raising questions about additional clinical factors which may contribute to providers’ implied diagnostic confidence. Perhaps the recommended diagnostic criteria do not apply to an outpatient population who may manifest an even milder form of the disease process than was originally perceived. In this setting, a different set of clinical elements may be required to make this diagnosis accurately, in order to justify the treatment decisions currently implemented by practitioners, including the decision to refer a patient for surgical consideration after multiple episodes of “uncomplicated diverticulitis”. Surgeons and primary care providers rely on the accuracy of diagnostic labels to facilitate good

communication about the patient's need for surgical intervention. The present findings thus hold significant importance for both parties in this diagnostic and management dilemma.

Some may interpret the practice patterns exposed in this analysis as inappropriate, resulting in over-labeling of outpatients presenting with a range of complaints with a common diagnosis of diverticulitis. In the clinical arena, the implications of over-diagnosis can be variable. Although it is unlikely to negatively affect the patient's short-term outcome, it does result in a diagnostic label that is likely to be utilized repeatedly in future visits, potentially without further work-up. The questionable accuracy of the diagnosis will likely translate into repeated and possibly excessive antibiotic use. Regardless, the fact that none of these cases went on to require early emergent procedures or other operative interventions may attest to the benefits of overly aggressive intervention. Future analyses which improve our understanding of the rates of recurrence and complication in this population will enhance our ability to judge the risk of over-treatment against any possible benefit with regards to time, cost, and patient morbidity.

The present study examined patients and providers within a single academic medical center and its associated clinics, which may limit the generalizability of its findings to other patient populations. The frequency of missing data elements, particularly WBC count and temperature, are a potential limitation in interpreting our results. However, prior analysis of the electronic medical record in our system suggests these are "true missings," i.e., data elements not ordered or obtained by the practitioner, rather than an error in information retrieval. Our conclusions presume that practitioners did not systematically neglect to order laboratory tests or record clinical data in patients more likely to have abnormal results. The accuracy of the diverticulitis diagnosis was rated by a single abstractor, who generally required the presence of at least 2 of the three expected diagnostic criteria in order to achieve a "Likely/Yes" rating. It is not known whether this decision rule in fact selects the "true" diverticulitis cases, as it is unique to the present analysis, and may be biased by the surgical background of the two abstractors. In addition, a rating of "Possible" was given to another third of these patients who were lacking even more diagnostic evidence, yet retained some possibility of a diverticulitis diagnosis. Given the recommendations presented in practice guidelines from multiple disciplines, we believe this strategy is likely to exclude few "true" cases.

Despite our anticipation that patients with outpatient diverticulitis might be found among those with a diagnostic code for either diverticulitis or LLQ pain, we found that only a small proportion of patients in either group had clinical data sufficient to convince the abstractor of the diverticulitis diagnosis. Without these classic diagnostic criteria (fever, leukocytosis, LLQ pain), abdominal imaging may play an important role in differentiating diverticulitis from other causes of abdominal pain such as irritable bowel syndrome [19, 20]. Despite this presumption, a minority of patients in our investigation had an abdominal/pelvic CT scan within 30 days of the studied encounter, with fewer than one-third of these scans demonstrating findings consistent with the diagnosis of diverticulitis. Future work will aim to examine the combinations of clinical features, imaging findings, and diagnosis codes which will most reliably select an accurate cohort of diverticulitis outpatients to address remaining questions concerning natural history, recurrence, complications, and optimal management.

CONCLUSION

Outpatients often lack the accepted objective data essential to verify the diagnosis of diverticulitis, yet are frequently labeled as such and treated with antibiotics. The presented data would suggest that the outpatient population with true diverticulitis is either much

smaller than previously suggested, perhaps even non-existent, or that the classic diagnostic criteria are not applicable to outpatients who may manifest a milder form of the disease. Future work should consider the accuracy of these accepted criteria in correctly identifying outpatient diverticulitis and verify the frequency of this presumably common clinical entity.

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Table 1Inter-Rater Reliability^a

Variable	Agreement	Kappa	Standard Error	p-value
LLQ pain (Yes vs. No)	93.5%	0.88	0.12	<0.01
LLQ tenderness (Yes vs. No)	97.8%	0.96	0.12	<0.01
Temperature (Low vs. Normal vs. High)	100.0%	1.00	0.15	<0.01
WBC count (Low vs. Normal vs. High)	97.8%	0.96	0.12	<0.01
Diagnosis rating for diverticulitis (Likely/Yes vs. No/Unlikely/Possible)	95.7%	0.84	0.13	<0.01

LLQ, left lower quadrant; WBC, white blood cell

^aComparisons limited to “acute visits” in the 10% random sample selected for double abstraction. Missing values are included in the n for each variable.

Table 2

Descriptive Frequencies by ICD-9 Code

Characteristic	ICD-9 Code 562.11/562.13 Diverticulitis (n=97)	ICD-9 Code 789.04 Left Lower Quadrant Pain (n=279)	p-value
Age, mean (SD)	61.1 (12.0)	56.4 (12.8)	<0.01
Gender, % male	44.3	64.5	<0.01
Race, %			0.70
White	94.9	93.2	
Black	0.0	1.8	
Asian	2.1	1.4	
American Indian/Alaskan Native	1.0	0.7	
Other/Unknown/Refuse to answer	2.1	2.9	
History of Present Illness			
Current abdominal pain, %	82.5	83.5	0.81
Abdominal pain location, %			0.25
LLQ/Left-sided	66.0	73.1	
Generalized/Other	16.5	10.4	
No pain	17.5	16.5	
Abdominal pain time course, %			0.05
Acute (< 24 hours)	8.3	65.0	
Subacute (< 1 week)	38.1	26.2	
Chronic (>1 week)	24.7	38.4	
No pain/Missing	28.9	29.0	
Change in bowel habits, %	39.2	30.8	0.13
Change in bowel habits (type), %			
Constipation	7.9	10.9	0.26
Frequency	3.7	3.2	0.78
Diarrhea	11.5	13.8	0.46
Blood in stools	2.1	6.1	0.04
Change in urinary habits, %	8.3	7.9	0.91
Change in urinary habits (type), %			
Dysuria	0.5	1.3	0.41
Hematuria	1.1	1.0	0.93
Pneumaturia	0.0	0.0	n/a
Frequency	1.6	4.2	0.11
Urgency	2.1	1.3	0.16
Fever/chills, %	27.8	8.6	<0.01
Prior episodes, %	45.4	23.3	<0.01
Number prior episodes, mean (SD)	1.5 (1.0)	1.35 (0.8)	0.55
Past Medical History			
Diverticulosis, %	55.7	16.5	<0.01

Characteristic	ICD-9 Code 562.11/562.13 Diverticulitis (n=97)	ICD-9 Code 789.04 Left Lower Quadrant Pain (n=279)	p-value
Diverticulitis, %	46.4	5.7	<0.01
Other GI disease, %	38.1	39.8	0.78
Past Surgical History			
Rectal resection, %	0.0	0.0	
Colon resection, %	12.4	2.5	<0.01
Colon resection location, %			<0.01
Left/Sigmoid	9.3	1.4	
Any other location	0.0	0.4	
No colon resection	2.1	0.4	
Missing	88.7	97.9	
Other abdominal operation, %	44.3	50.9	0.27
Physical Exam			
Temperature, mean Fahrenheit (SD)	97.9 (0.65)	98.0 (0.65)	0.44
Temperature range			0.36
Low	0.0	0.4	
Normal	51.6	41.9	
High	0.0	0.4	
Missing	48.5	57.4	
Abdominal tenderness, %	81.4	70.6	0.04
Abdominal tenderness location, %			0.01
LLQ/Left-sided	72.2	67.4	
Generalized/Other	9.3	3.2	
No tenderness	18.6	29.4	
Rebound/guarding, %	4.1	2.9	0.54
Rectal exam, %	20.6	24.0	0.50
Any rectal exam findings, %	0.0	1.8	0.18
Assessment & Plan			
Provider diagnosis = diverticulitis, %	86.6	34.1	<0.01
Antibiotics prescribed, %	82.5	25.8	<0.01
Antibiotics prescribed (type), %			<0.01
Cipro, Metro, or both	54.6	17.2	
Other	27.8	8.2	
No antibiotics	17.5	74.6	
Laboratory Studies			
WBC count, mean (SD)	8.4 (2.6)	7.4 (2.4)	0.02
WBC count range, %			0.01
Low	0.0	1.1	
Normal	30.9	47.7	
High	9.3	4.3	
Missing	59.8	47.0	

Characteristic	ICD-9 Code 562.11/562.13 Diverticulitis (n=97)	ICD-9 Code 789.04 Left Lower Quadrant Pain (n=279)	p-value
Imaging			
CT abdomen/pelvis obtained within 30 days, %	11.3	28.7	<0.01
Evidence of diverticulitis, % of CT scans obtained	36.4	13.8	0.15

ICD, International Classification of Disease; SD, standard deviation; LLQ, left lower quadrant; Cipro, ciprofloxacin; Metro, metronidazole; WBC, white blood cell; CT, computed tomography

Table 3

Presence of Expected Diagnostic Criteria by Diagnosis Code and Diverticulitis Rating

Diverticulitis Rating	ICD-9 Code 562.11/562.13 Diverticulitis (n=97)		ICD-9 Code 789.04 Left Lower Quadrant Pain (n=279)	
	No/Unlikely/ Possible (n=84)	Likely/Yes (n=13) p-value	No/Unlikely/ Possible (n=210)	Likely/Yes (n=20) p-value
Abdominal pain location, %		0.09		0.07
LLQ/Left-sided	61.9	92.3	71.7	100.0
Generalized/Other	17.9	7.7	10.9	0.0
No tenderness	20.2	0.0	17.4	0.0
Temperature range, %		0.05		<0.01
Low	0.0	0.0	0.0	7.1
Normal	47.6	76.9	40.4	71.4
High	0.0	0.0	0.4	0.0
Missing	52.4	23.1	59.3	21.4
WBC count range, %		<0.01		<0.01
Low	0.0	0.0	1.1	0.0
Normal	32.1	23.1	48.3	35.7
High	2.4	53.9	1.9	50.0
Missing	65.5	23.1	48.7	14.3

ICD, International Classification of Disease; LLQ, left lower quadrant; WBC, white blood cell