



The Immediate, Hospital-Level Impact of Stay-at-Home Order on Diverticulitis Burden

Celine Soriano¹ · Jennifer A. Kaplan^{1,2} · Joanna K. Law^{2,3} · Barbara L. Williams⁴ · C. Craig Blackmore⁴ · Vlad V. Simianu^{1,2} 

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Introduction

Diverticulitis is prevalent in the USA, with nearly 300,000 admissions, 1.5 million days of care, and \$2 billion in costs annually across acute episodes, recurrences, or complications.^{1,2} The COVID-19 pandemic has affected healthcare utilization broadly^{3,4} and may have impacted patients with diverticulitis through “stay-at-home” orders or provider availability. To date, the short-term impact of the COVID-19 pandemic across the spectrum of diverticular disease has not been described.

Methods

Consecutive patients who presented to Virginia Mason Medical Center with a diagnosis of diverticulitis between January 1, 2018, and June 12, 2020, were identified. For each patient, burden of disease was quantified in two different ways: by counting encounters in the healthcare system and by estimating “episodes” of diverticulitis. ICD10 codes (Appendix) were used to define diverticulitis-related encounters (outpatient, inpatient, including operations and percutaneous drainage, or

emergency department (ED)) and complications (perforation, abscess). Episodes were defined by the highest intensity visit (inpatient highest, outpatient lowest) in a 14-day time period. Care occurring greater than 42 days later was considered a separate episode.

In Washington State, a state of emergency was proclaimed on February 28 and non-essential travel and non-emergent medical care prohibited on March 25. Health care restrictions were eased on May 18.

We characterized hospital-level burden of diverticulitis before and after COVID-19 “stay-at-home” orders on March 1, 2020. Data are compared using *t* tests and the chi-square (STATA MP 16.0, College Station, TX).

Results

There were 946 episodes of diverticulitis among 728 unique patients (mean age 63 years, 43% male). Sixteen percent ($n = 153$) were for complicated disease, and 8% ($n = 73$) required surgical intervention. With “stay-at-home” orders, there was a decrease in diverticulitis episodes from 34 to 20/month ($p = 0.004$). Episodes reached a low of 10/month in April 2020 before increasing following the easing of restrictions on May 18, 2020 (Fig. 1). Complicated episodes did not change, 16% (142/885) to 20% (12/61), $p = 0.46$.

Prior to March 1, 2020, there was a mean 46 encounters/month, decreasing to 26 ($p = 0.003$), and reaching a low of 11 encounters in April 2020. The distribution prior to March 1 was 61% outpatient (733/1198), 25% inpatient (303/1198), and 14% ED (162/1198). After, encounters shifted to fewer outpatient at 51% (39/77) and increased inpatient 29% (22/77) and ED 21% (16/77) ($p = 0.043$). There was a similar shift by episode burden (Table 1).

✉ Vlad V. Simianu
val.simianu@virginiamason.org

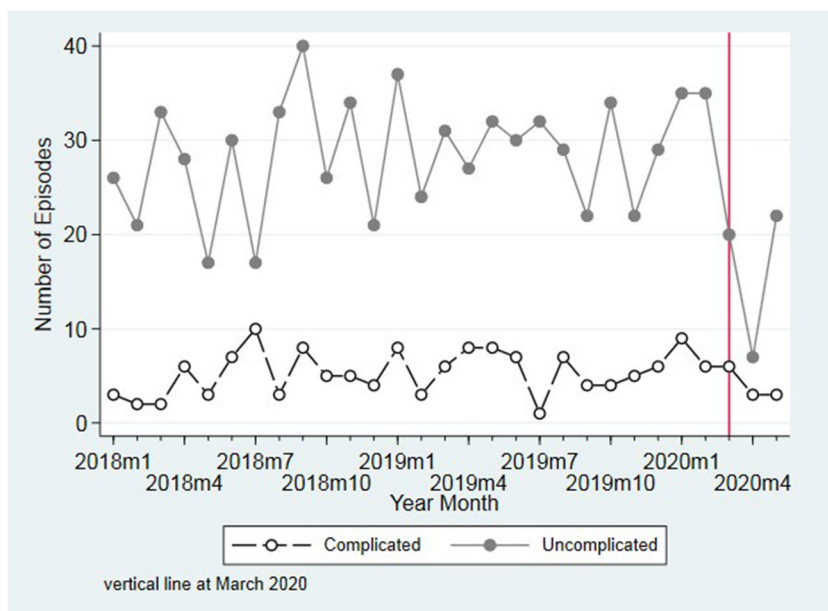
¹ Department of Surgery, Virginia Mason Medical Center, Seattle, WA, USA

² Digestive Disease Institute, Virginia Mason Medical Center, Seattle, WA, USA

³ Department of Medicine, Virginia Mason Medical Center, Seattle, WA, USA

⁴ Center for Health Care Improvement Science, Virginia Mason Medical Center, Seattle, WA, USA

Fig. 1 Number of diverticulitis episodes with and without complication by month, January 2018–May 2020



Discussion

COVID-19 “stay-at-home orders” were associated with decreased burden of diverticulitis as measured by both encounters and “episodes” of disease. While patients who delay presentation for diverticulitis may plausibly develop more severe or complicated disease, this time-course is not well understood. Population-based studies have suggested a disconnect between uncomplicated and complicated disease—where the number of acute episodes does not correlate with the frequency of complicated disease and increasing elective surgery for uncomplicated disease does not reduce emergency complications.^{5,6}

The “natural experiment” of the pandemic on diverticulitis resulted in limited care through social restrictions or health care access, highlighting the gap in our understanding of the diverticulitis disease spectrum. Within a month of the restrictions, there was a more than 3-fold decrease in the monthly

episode count (primarily uncomplicated disease), without a coinciding change in complicated cases. The shift from outpatient care (presumably because of decreased clinic access) suggests that the drivers of healthcare utilization in patients with uncomplicated diverticulitis (such as thresholds to seek care) remain poorly understood.

The study is limited to a single institution, which impacts generalizability. Additionally, our numbers may be too small for clinically significant changes. To detect a change from 15 to 20% in complicated disease (90% power, 5% alpha), it would have required a group of approximately 2500 patients. To address generalizability, power, and other important changes of the pandemic on diverticulitis, multi-center collaborations are underway.

Author Contributions Study concept and design: Simianu, Blackmore, Williams

Acquisition, analysis, or interpretation of data: All authors

Drafting of the manuscript: All authors

Critical revision of the manuscript for important intellectual content: All authors

Statistical analysis: Blackmore, Williams

Administrative, technical, or material support: Soriano, Blackmore, Williams, Simianu

Study supervision: Simianu.

Table 1 Shifts in care before and after COVID-19 “stay-at-home orders.” The shift from outpatient to emergency department (ED) and inpatient was significant for episodes of diverticulitis ($p = 0.023$)

	Episodes, $N = 946$	
	Before March 1 N (%)	March 1 and after N (%)
Inpatient	226 (26)	19 (31)
Emergency department	150 (17)	16 (26)
Outpatient	509 (58)	26 (43)
Total	885	61

Data Availability Dr. Simianu had full access to all of the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.

Compliance with Ethical Standards

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

Appendix. Diverticulitis ICD10 codes

K57.2 Diverticulitis of large intestine with perforation and abscess.

K57.20 without bleeding.

K57.21 with bleeding.

K57.32 Diverticulitis of large intestine without perforation or abscess without bleeding.

K57.33 Diverticulitis of large intestine without perforation or abscess with bleeding.

K57.4 Diverticulitis of both small and large intestine with perforation and abscess.

K57.40 without bleeding.

K57.41 with bleeding.

K57.52 Diverticulitis of both small and large intestine without perforation or abscess without bleeding.

K57.53 Diverticulitis of both small and large intestine without perforation or abscess with bleeding.

K57.8 Diverticulitis of intestine, part unspecified, with perforation and abscess.

K57.80 without bleeding.

K57.81 with bleeding.

K57.92 Diverticulitis of intestine, part unspecified, without perforation or abscess without bleeding.

K57.93 Diverticulitis of intestine, part unspecified, without perforation or abscess with bleeding.

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