Journal of Community Hospital Internal Medicine Perspectives

Volume 14 | Issue 6 Article 4

2024

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Recommended Citation

Haddadin, Rakahn; Brockway, Matthew; Shah, Pinak; Hansen, Reed; Stone, Christian; and Shetty, Kartika (2024) "Decreased Duration of Hospital Stays in Uncomplicated Diverticulitis with Initiation of Enteral Feeds within 24 Hours," *Journal of Community Hospital Internal Medicine Perspectives*: Vol. 14: Iss. 6, Article 4.
DOI: 10.55729/2000-9666.1409
Available at: https://scholarlycommons.gbmc.org/jchimp/vol14/iss6/4

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RESEARCH ARTICLE

Decreased Duration of Hospital Stays in Uncomplicated Diverticulitis With Initiation of Enteral Feeds Within 24 Hours

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Abstract

Diverticulitis is a complication of a mostly benign condition called diverticulosis. Diverticulitis is a common illness that medical staff see in emergency departments and hospital inpatient services. The thought process behind this study was looking at the treatment of other diseases like pancreatitis or other critical illnesses and the data supporting timing of feeds. Our study concludes that starting a diet within 24 h of uncomplicated diverticulitis is associated with reduced length of stay without increasing readmission rates and mortality.

Keywords: Diverticulitis, Gastroenterology, Pancreatitis, Diverticulosis

1. Introduction

Diverticulitis is a complication of a mostly benign condition called diverticulosis. Diverticulosis develops when the colonic wall forms herniations in two of its three layers (mucosa and submucosa) or all three layers (mucosa, submucosa, muscularis layers).[1] Depending on the layers involved, this creates a false or true diverticulum. These diverticula classically form at the vasa recta where the blood vessels that supply the mucosa and submucosa enter. Diverticulosis is mostly found in the colon but can form anywhere in the GI tract.[1,2] The pathophysiology of diverticulosis is not fully understood, but it is suspected to be from chronic constipation, elevated intraluminal pressures, and colonic hypertrophy.[3] Diverticulosis becomes diverticulitis when the diverticula become inflamed. This is thought to be secondary to obstruction, stasis, micro perforations, ischemia, and changes in the gut microbiome. Sequela of these processes can lead to peritonitis, bowel hemorrhage/perforation, and abscess formation.[1]

Diverticulitis is a common illness that medical staff see in emergency departments and hospital inpatient services. In the United States, diverticulitis causes about 2.9 million visits annually (2.7 million outpatient and 200,000 inpatient) causing a financial burden greater than 2 billion dollars per year.[4] One study showed that in California between 1998 and 2006, the number of patients admitted for diverticulitis or sequela of diverticulitis increased by 25% and 70% in younger populations, persons less than 45 years old.[5] Another study echoed these findings using data from the National Inpatient Sample (NIS) database showing between 1998 and 2005 an increased incidence of diverticulitis with the highest increase being in younger populations.[6] The increasing incidence has been thought to be from increasing rates of obesity; however, studies now show visceral fat is a higher predictor than subcutaneous fat in the development of diverticulitis.[7]

The American College of Gastroenterology recommends treating patients with diverticulitis with antibiotics and a liquid or light diet.[8] An expert

Received 9 April 2024; revised 1 August 2024; accepted 16 August 2024.
Available online 2 November 2024

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https://doi.org/10.55729/2000-9666.1409

review echoes initiating a clear liquid diet in acute uncomplicated diverticulitis and tailoring antibiotics for those with comorbidities or immunosuppression.[9] The thought behind restricting a patient's diet is the possibility of obstruction and/or perforation of the colon with diet initiation.[10] There has been little research about starting unrestricted diets in hospitalized patients. In a prospective study, 86 patients with uncomplicated diverticulitis were allowed to have an unrestricted diet. Out of the 86 patients, 8% developed complications including recurrence, readmission, or the need for surgery.[11] However, this study was small and did not have a control group to compare results with.[11] After reviewing the literature, we could not find any study that shows data on timing for feeds.

Due to the demands that diverticulitis brings (increasing health costs, hospital visits, the increasing incidence in younger populations, and the growing elderly population), this study was created to see if starting a diet earlier in uncomplicated diverticulitis has any impact on length of stay or readmission rates. Comorbidities are key predictors of length of stay, cost, readmission, and mortality.[12] Hypertension (53.2%), diabetes (26.4%), and chronic respiratory (lung) disease (20.5%) were the most common comorbidities associated with inpatient stays.[13] Kidney disease and failure was a leading comorbidity for general medical and surgical stays. Kidney disease and failure was a comorbid diagnosis for 22.8% of general medical stays and 14.5 percent of surgical stays.[13] In our study, diabetes, hypertension, chronic kidney disease were the conditions used in the regression analysis to be held constant as they have impact on our outcomes studied.

2. Methods

This retrospective study used data collected from the HCA Healthcare system database. This spanned across all HCA Healthcare facilities. Inclusion criteria was patients with an age of 18 years or older with uncomplicated diverticulitis as a primary diagnosis. The ICD 10 codes used were K57.92 diverticulitis of intestine, part unspecified, without perforation or abscess, without bleeding; and K57.32 diverticulitis of large intestine without perforation or abscess without bleeding. Patients were excluded if they had bowel surgery during hospital stay, colon cancer and inflammatory bowel disease (See Supplemental table 1 for list of exclusions). Patients were then divided into time from admission to diet order; <24 Hours, 24–48 Hours, >48 Hours.

2.1. Outcomes

Outcomes measured were length of stay, 30-day readmission (any diagnosis for readmission), and mortality.

2.2. Statistical analysis

The Chi–Square test was used to evaluate the association between sex of the patient and time to diet order placed, diabetes and time to diet order placed, hypertension and time to diet order placed, chronic kidney disease and time to diet order placed. The Fisher's exact test was used to evaluate the association between mortality and time to diet order placed. An ANOVA analysis was used to evaluate the difference in means for length of stay. A logistic regression was used to compare readmission in different patient groups based on time to diet order from admission. Readmissions could have stemmed from any condition and did not have to be a gastrointestinal issue. In the logistic regression model age, sex, race, ethnicity, diabetes, hypertension and CKD were held constant. A linear Regression model was also used to compare length of stay in different patient groups based on time to diet order from admission. Similar variables as above were held constant for the linear regression model. A p-value of <0.05 was considered significant.

3. Results

3331 encounters were found with the initial inclusion diagnosis codes. After applications of exclusions and removing patients with missing data, there were 2815 unique patients left and included in the study (Table 1). There were 2227 (79.11%) patients whose diet order were placed less than 24 h after admission, 400 (14.21%) patients with diet orders placed 24–48 h after admission, and 188 (6.68%) patients with diet orders placed greater than 48 h after admission (Table 2). The mean age of

Table 1. Demographics.

Variable	Frequency = N (%)
Female Sex:	1729 (61.42%)
Male Sex:	1086 (38.58%)
Race: White	1939 (68.88%)
Race: Black	160 (5.68%)
Race: Other	716 (25.44%)
Ethnicity: Hispanic or Latino	623 (22.13%)
Diabetes Mellitus (DM)	646 (22.95%)
Hypertension (HTN)	1313 (46.64%)
Chronic Kidney Disease (CKD)	272 (9.66%)
Diet Order: <24 Hours	2227 (79.11%)
Diet Order: 24–48 Hours	400 (14.21%)
Diet Order: >48 Hours	188 (6.68%)

Table 2. Groups according to the time a diet order was placed from admission.

Time – Diet order placed from Admission.	<24 Hours N = 2227	24-48 Hours N = 400	>48 Hours N = 188
Mortality	13 (0.58%)	1 (0.25%)	0 (0.00%).
Readmission	487 (21.87%)	80 (20.00%)	46 (24.47%)
Length of Stay (Days)	Mean = 3.84 SD = 3.003	Mean = 3.51 SD = 3.17	Mean = 5.19 SD = 3.25

sample population was 63.30 years (SD = 15.76). Fourteen patients (0.5%) died. 613 patients (21.78%) of the sample size had readmission. Mean length of stay for the entire sample was 3.67 (SD = 3.18) days. In our study, we had a total of 73 ICU patients: 58 (2% of total) in group 1 (diet order started <24 h), 9 (2% of total) in group 2 (diet started 24–48 h), and 6 (3% of total) in group 3 (diet started >48 h) (see Table 2).

3.1. Length of stay

An ANOVA was used to evaluate the difference in mean of length of stay between the diet groups. Patients with a diet started greater than 48 h after admission stayed 1.68 days longer than patients with a diet started within 24 h from time of admission (p < 0.0001, 95%CI [1.12–2.24]). Patients with a diet started greater than 48 h after admission stayed 1.35 days longer than patients with a diet started within 24–48 h from admission (p-value <0.0001, 95% CI [0.70–2.01]). Length of stay difference between groups of diet started between 24 and 48 h and <24 h was 0.32 days (95% CI [−0.07–0.72]) which was not statistically significant.

The linear regression model used to evaluate length of stay differences. Among patients with diverticulitis, length of stay was 0.48 days longer among patients with a diet started between 24 and 48 h after admission compared to patients with a diet started within 24 h from time of admission, controlling for age, sex, race, ethnicity, diabetes, hypertension, and CKD (p = 0.0045, 95%CI [0.15–0.82]). In addition, length of stay was 1.85 days longer among patients with diet started greater than 48 h after admission compared to patients with diet started within 24 h from time of admission, controlling for age, sex, race, ethnicity, diabetes, hypertension, and CKD (p < 0.0001, 95%CI [1.38–2.32]) (Table 3). Other variables associated with increase in length of stay were age, diabetes, hypertension, CKD. Sex, race, ethnicity were not associated with increase in length of stay.

3.2. Readmission

A logistic regression model was used to calculate odds ratio for readmission. Among patients with diverticulitis, timing of diet was not significantly associated with all-cause 30-day readmission, controlling for age, sex, race, ethnicity, diabetes, hypertension, and CKD (Table 4). Variables associated with readmission were age and CKD. Among patients with diverticulitis, the odds of all-cause 30-day readmission was 1.01 times more likely for every 1-year increase in age, while controlling for age, sex, race, ethnicity, diabetes, hypertension, and CKD (p = 0.0008, 95% CI [1.01–1.02]).

3.3. Mortality

Mortality of the sample size was only 0.5% (14 patients out of 2815). Using the Fisher's exact test there were no significant association between all-cause mortality and time to diet order from admission (p = 0.673).

Table 3. Linear regression model analysis evaluating length of stay.

Variables	Estimate length of stay difference (In days)	Standard error	95% Confidence interval	p-value
24-48 Hours compared to <24 Hours[a]	0.48	0.17	0.15–0.81	0.005
>48 Hours compared to <24 Hours[a]	1.84	0.23	1.38–2.31	<0.0001
Age[b]	0.01	0.004	0.01–0.02	<0.0001
DM[c]	0.29	0.14	0.01–0.58	0.04
HTN[d]	0.27	0.12	0.02–0.53	0.03
CKD[e]	0.87	0.22	0.43–1.30	<0.0001

[a] Time when diet order placed from admission.
[b] Increase in Age is associated with increase in length of stay.
[c] Comparison between patients with DM and no DM.
[d] Comparison between patients with HTN and no HTN.
[e] Comparison between patients with CKD and no CKD.

Table 4. 30 day all-cause readmission.

Variable	OR (CI = 95% Confidence interval)	p-value
24-48 Hours–<24 Hours[a]	0.953 (95% CI [0.72–1.24])	0.72
>48 Hours–<24 Hours[a]	1.25 (95% CI [0.87–1.77])	0.21
DM	0.961 (95% CI [0.76–1.2])	0.72
CKD	1.625 (95% CI [1.18–2.22])	0.0025

OR = Odds Ratio, DM = Diabetes Mellitus, CKD = Chronic kidney Disease.
[a] Timing when diet order was placed from admission.

4. Discussion

Many physicians combat balancing hospital costs and medical necessity in everyday practice. With diverticular disease being the fifth most costly gastroenterology illness,[14] it is essential to find more cost-efficient treatments to provide better patient care with a lower financial burden. Currently, the medical community has shifted many cases of uncomplicated diverticulitis to the outpatient setting with antibiotics being currently debated.[15] However, there are still many cases that come into the emergency room and hospital. Current data shows there are growing numbers of diverticular disease visits to the ED, but fewer patients are being admitted to the hospital and needing to undergo surgery.[16]

The thought process behind this study was looking at the treatment of other diseases like pancreatitis or other critical illnesses and the data supporting timing of feeds. The American College of Gastroenterology and supporting studies show that early enteral feeds in patients with pancreatitis prevent intestinal mucosal atrophy thus decreasing the chance for bacterial translocation.[17,18] This study concluded patients that were hospitalized with uncomplicated diverticulitis have an associated shorter hospital stay if enteral feeds are started within 48 h. This data shows, like pancreatitis, that patients have better outcomes when enteral feeds are started early.

There were 34,011,386 admissions in US hospitals in 2022.[19] Average length of stay in 2019 was 6.2 days.[20] Emergency department crowding, ward strain, and ICU strain are all associated with worse outcomes.[21–25] Delayed discharges are associated with an increased risk of mortality, hospital-acquired infections, mental ill health, loss in economic productivity and income, and reductions in patients' mobility and activities of daily living.[26,27]

Decreasing hospital stays, will not only help patients financially but also combat issues patients face when coming to the emergency department. Lack of hospital beds appears to be a fundamental cause of ED overcrowding.[16] Methods for reducing hospital length of stay are vital due to the recent pandemic and its devastating effects on the healthcare system in the United States and the rest of the world.

The strengths of this study is that it is a multicenter study that utilized a large sample size, and we controlled for possible confounding variables that might affect length of stay. There are limitations of the study including it being retrospective and the study patients were grouped according to when the diet order was placed. Due to this, there could be an overlap between when the diet was started compared to when the order was placed. Another limitation is physicians may hold diets on patient's that have more severe diverticulitis which is based off of their clinical symptoms. In addition, other limitations include needing to compare patients that had a diagnosis of sepsis versus severe sepsis versus septic shock on admission. Lastly, we were unable to gather information on hospital outcomes in patients with chronic respiratory (lung) disease, this can be looked at in future studies. Criteria to help evaluate severity including temperature, heart rate, respiratory rate, white blood cell count, sepsis, and intensive care unit stay were not able to be used in the analysis.

Future prospective studies are needed to further validate the results of our study. Further retrospective studies can be performed to investigate whether there is a difference in hospital outcomes when looking at uncomplicated diverticulitis in the short segment versus the long segment of the colon.

5. Conclusion

Our study concludes that starting a diet within 24 h of uncomplicated diverticulitis is associated with reduced length of stay without increasing readmission rates and all-cause mortality.

Ethics information

We certify that this manuscript represents an accurate account of the research conducted and discusses its significance objectively. This work is original and has not been submitted elsewhere. All sources and prior work are appropriately cited, and the manuscript is not under consideration by any other journal. The corresponding author confirms that all contributors who meet the criteria for authorship are listed and have approved the final

manuscript. Contributors not meeting authorship criteria are acknowledged appropriately.

Funding

This research was supported (in whole or in part) by HCA Healthcare and/or an HCA Healthcare affiliated entity. The views expressed in this publication represent those of the author(s) and do not necessarily represent the official views of HCA Healthcare or any of its affiliated entities.

Conflict of interest

There are no conflict of interest to report.

Supplementary material

Supplemental Table 1

Exclusion criteria
Patients who had laparoscopy, PROCEDURE CODE 0WJG4ZZ, Disease code S53.31
Patients who had exploratory laparotomy, PROCEDURE CODE 0DJW0ZZ
Malignant neoplasm of colon − C18
Inflammatory bowel disease − K50, K51.

References

1. Tursi A, Scarpignato C, Strate LL, et al. Colonic diverticular disease [published correction appears in Nat Rev Dis Primers. 2020 Apr 29;6(1):35] [published correction appears in Nat Rev Dis Primers. 2020 Jun 17;6(1):50]. *Nat Rev Dis Prim*. 2020;6(1):20. Published 2020 Mar 26. https://doi.org/10.1038/s41572-020-0153-5.
2. Carr S, Velasco AL. Colon diverticulitis. In: *StatPearls*. Treasure Island (FL): StatPearls Publishing; November 18, 2022.
3. Hanna MH, Kaiser AM. Update on the management of sigmoid diverticulitis. *World J Gastroenterol*. 2021;27(9):760−781. https://doi.org/10.3748/wjg.v27.i9.760.
4. Strate LL, Morris AM. Epidemiology, pathophysiology, and treatment of diverticulitis. *Gastroenterology*. 2019;156(5):1282−1298.e1. https://doi.org/10.1053/j.gastro.2018.12.033.
5. Etzioni DA, Cannom RR, Ault GT, Beart RW, Kaiser AM. Diverticulitis in California from 1995 to 2006: increased rates of treatment for younger patients. *Am Surg*. 2009;75(10):981−985. https://doi.org/10.1177/000313480907501026.
6. Nguyen GC, Sam J, Anand N. Epidemiological trends and geographic variation in hospital admissions for diverticulitis in the United States. *World J Gastroenterol*. 2011 Mar 28;17(12):1600−1605. https://doi.org/10.3748/wjg.v17.i12.1600. PMID: 21472127; PMCID: PMC3070132.
7. Lee TH, Setty PT, Parthasarathy G, et al. Aging, obesity, and the incidence of diverticulitis: a population-based study. *Mayo Clin Proc*. 2018;93(9):1256−1265. https://doi.org/10.1016/j.mayocp.2018.03.005.
8. DeBanto J. Diverticulosis and diverticulitis. American College of Gastroenterology. https://gi.org/topics/diverticulosis-and-diverticulitis/. Published August 4, 2022. Accessed September 1, 2022.
9. Peery AF, Shaukat A, Strate LL. AGA clinical practice update on medical management of colonic diverticulitis: expert review. *Gastroenterology*. 2021;160(3):906−911.e1. https://doi.org/10.1053/j.gastro.2020.09.059.
10. Peery AF. Management of colonic diverticulitis. *BMJ*. 2021;372:n72. Published 2021 Mar 24. https://doi.org/10.1136/bmj.n72.
11. Stam MA, Draaisma WA, van de Wall BJ, Bolkenstein HE, Consten EC, Broeders IA. An unrestricted diet for uncomplicated diverticulitis is safe: results of a prospective diverticulitis diet study. *Colorectal Dis*. 2017;19(4):372−377. https://doi.org/10.1111/codi.1350.
12. Moore BJ, White S, Washington R, Coenen N, Elixhauser A. Identifying increased risk of readmission and in-hospital mortality using hospital administrative data: the AHRQ elixhauser comorbidity index. *Med Care*. 2017;55(7):698−705. https://doi.org/10.1097/MLR.0000000000000735.
13. Owens PL, Liang L, Barrett ML, et al. Comorbidities associated with adult inpatient stays, 2019. 2022 Dec 15. In: *Healthcare cost and utilization project (HCUP) statistical briefs [Internet]*. Rockville (MD): Agency for Healthcare Research and Quality (US); 2006 Feb. Statistical Brief #303. Available from: https://www.ncbi.nlm.nih.gov/books/NBK588380/.
14. Sandler RS, Everhart JE, Donowitz M, et al. The burden of selected digestive diseases in the United States. *Gastroenterology*. 2002;122(5):1500−1511. https://doi.org/10.1053/gast.2002.32978.
15. Severi C, Carabotti M, Cicenia A, Pallotta L, Annibale B. Recent advances in understanding and managing diverticulitis. *F1000Res*. 2018;7. F1000 Faculty Rev-971. Published 2018 Jun 29. https://doi.org/10.12688/f1000research.14299.1.
16. Bollom A, Austrie J, Hirsch W, et al. Emergency department burden of diverticulitis in the USA, 2006-2013. *Dig Dis Sci*. 2017;62(10):2694−2703. https://doi.org/10.1007/s10620-017-4525-y.
17. Tenner Scott, Baillie John, DeWitt John, Vege Santhi Swaroop. American college of gastroenterology guideline: management of acute pancreatitis. *Am J Gastroenterol*. September 2013;108(9):1400−1415. https://doi.org/10.1038/ajg.2013.218.
18. Petrov MS, Kukosh MV, Emelyanov NV. *Dig Surg*. 2006;23(5):336−345. https://doi.org/10.1159/000097949.
19. Savioli G, Ceresa IF, Gri N, et al. Emergency department overcrowding: understanding the factors to find corresponding solutions. *J Personalized Med*. 2022;12(2):279. Published 2022 Feb 14. https://doi.org/10.3390/jpm12020279.
20. https://www.aha.org/statistics/fast-facts-us-hospitals - Accessed May 24, 2023.
21. https://www.cdc.gov/nchs/hus/topics/hospitalization.htm - Accessed May 24, 2023.
22. Gabler NB, Ratcliffe SJ, Wagner J, et al. Mortality among patients admitted to strained intensive care units. *Am J Respir Crit Care Med*. 2013 Oct 1;188(7):800−806. https://doi.org/10.1164/rccm.201304-0622OC. PMID: 23992449; PMCID: PMC3826272.
23. Kohn R, Harhay MO, Weissman GE, et al. Ward capacity strain: a novel predictor of delays in intensive care unit survivor throughput. *Ann Am Thorac Soc*. 2019 Mar;16(3):387−390. https://doi.org/10.1513/AnnalsATS.201809-621RL. PMID: 30407847; PMCID: PMC6394118.
24. Kohn R, Harhay MO, Weissman GE, et al. Ward capacity strain: a novel predictor of delays in intensive care unit survivor throughput. *Ann Am Thorac Soc*. 2019 Mar;16(3):387−390. https://doi.org/10.1513/AnnalsATS.201809-621RL. PMID: 30407847; PMCID: PMC6394118.
25. Sun BC, Hsia RY, Weiss RE, et al. Effect of emergency department crowding on outcomes of admitted patients. *Ann Emerg Med*. 2013 Jun;61(6):605−611.e6. https://doi.org/10.1016/j.annemergmed.2012.10.026. Epub 2012 Dec 6. PMID: 23218508; PMCID: PMC3690784.
26. Singer AJ, Thode Jr HC, Viccellio P, Pines JM. The association between length of emergency department boarding and mortality. *Acad Emerg Med*. 2011 Dec;18(12):1324−1329. https://doi.org/10.1111/j.1553-2712.2011.01236.x. PMID: 22168198.
27. Rojas-García A, Turner S, Pizzo E, Hudson E, Thomas J, Raine R. Impact and experiences of delayed discharge: a mixed-studies systematic review. *Health Expect*. 2018 Feb;21(1):41−56. https://doi.org/10.1111/hex.12619. Epub 2017 Sep 12. PMID: 28898930; PMCID: PMC5750749.