Superiority Complex: Do Teaching Hospitals Provide Inferior Care for IBD Patients?

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As healthcare costs related to inflammatory bowel diseases (IBDs) rise, there is an increasing need to identify hospital characteristics that promote cost-effective care while minimizing adverse outcomes for this complex population. Although hospital teaching status is one characteristic that has been associated with higher overall inpatient costs [1], recent data suggest a mortality benefit for all-cause hospitalizations at these centers [1, 2]. Differences in inpatient IBD outcomes in academic versus nonacademic centers have also been assessed and notable for greater disease complexity and severity among patients receiving care at academic medical centers but similar adjusted length of stay, cost, readmission rates, and in-hospital mortality rates [3]. A summary of studies that have evaluated the association between hospital teaching status and hospitalization outcomes for IBD or other gastrointestinal conditions is presented in Table 1.

In this issue of *Digestive Diseases and Sciences*, Sharma et al. [4] assessed differences in mortality, length of stay, cost, and other outcomes for IBD hospitalizations by hospital teaching status using a large administrative database. Though they found no difference in overall mortality for IBD, they noted higher mortality rates for ulcerative colitis in teaching hospitals. Teaching hospitals also had greater adjusted costs, charges, and length of stay compared with their nonteaching counterparts.

To assess hospitalization outcomes, Sharma and colleagues [4] analyzed the National Inpatient Sample (NIS), a large nationwide database consisting of patient-level discharge data. The sample of nearly 200,000 patients with IBD facilitates the assessment of several outcomes of interest to IBD care. Use of only the 2016 and 2017 samples provides the most recent data available, avoiding variable definition errors related to ICD coding changes that occurred prior to 2016. The authors also adjusted for appropriate available confounders in the NIS for their multivariable models. Nevertheless, certain aspects of the study design limit the conclusions that can be drawn. Due to their inclusion of only patients with IBD as a primary diagnosis, the authors have underestimated the total inpatient IBD population. Providers may code an IBD complication such as small bowel obstruction as the primary diagnosis, with ulcerative colitis or Crohn's disease as the secondary diagnosis. The inclusion criteria therefore introduce selection bias by excluding many individuals admitted (and coded) primarily for an IBD complication.

There are a number of limitations to the NIS that must also be considered when assessing IBD-specific outcomes. The NIS includes common comorbidities, but does not provide data related to IBD severity or complexity, such as prior abdominal surgeries, exposure to biologic agents, inpatient administration of biologic agents, or IBD duration. While some information regarding disease phenotype may be present in ICD-10 diagnosis codes, these are subject to potential coding errors. Since understanding IBD severity is essential to any analysis of this complex population, these factors should be accounted for in multivariable models that assess IBD-specific outcomes.

The NIS definition of teaching hospitals is also problematic and may not be the most relevant to IBD care. To be categorized as a teaching hospital in the NIS, only one Accreditation Council for Graduate Medical Education (ACGME)-approved residency program is required [5]. Teaching hospitals with a small number of residency

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Table 1 Studies that have evaluated the association between hospital teaching status and hospitalization outcomes for inflammatory bowel diseases or other gastrointestinal conditions

References	Conditions assessed	Classification of hospitals	Data source	Outcomes
Mitic et al. [6]	Crohn's disease Ulcerative colitis	Urban teaching Urban nonteaching Rural	Nationwide Readmission Database 2013, <i>n</i> = 55,942	1. Higher adjusted odds of 30-day readmission for CD in urban teaching hospitals compared to urban nonteaching hospitals 2. Similar adjusted odds of 30-day readmission for UC in teaching and nonteaching hospitals.
Sohn et al. [7] *	Crohn's disease Ulcerative colitis	Teaching Nonteaching	National Inpatient Sample 2013, sample size not reported	1. Teaching hospitals had greater adjusted length of stay and total charges for IBD admissions compared to nonteaching hospitals 2. Teaching hospitals had lower unadjusted odds of mortality for IBD admissions compared to nonteaching hospitals.
Patel et al. [8] *	Crohn's disease Ulcerative colitis	Teaching Nonteaching	National Inpatient Sample 2008–2014, <i>n</i> = 622,444	1. Higher unadjusted costs for IBD admissions in teaching hospitals compared to nonteaching hospitals. 2. Similar unadjusted length of stay for IBD admission in teaching hospitals compared to nonteaching hospitals.
Berry et al. [9] *	<i>Clostridioides difficile</i> infection	Urban teaching Urban nonteaching Rural	National Inpatient Sample 2016, <i>n</i> = 19,580	1. Higher adjusted length of stay for <i>C. diff</i> admissions at urban teaching hospitals compared to rural hospitals 2. Higher adjusted charges for <i>C. diff</i> admissions at urban teaching hospitals compared to rural hospitals. 3. Similar adjusted odds of mortality for <i>C. diff</i> admissions between teaching and nonteaching hospitals.
Dalal et al. [3]	Crohn's disease Ulcerative colitis	Major teaching Minor teaching Nonteaching	Vizient database 2014–2018, <i>n</i> = 92,561	1. Higher adjusted odds of 30-day readmission for UC in major teaching hospitals compared to nonteaching hospitals 2. Similar adjusted mean length of stay, direct cost, odds of 30-day readmission (CD only), and odds of in-hospital mortality between hospital groups
Khalid et al. [10]	Inpatient colonoscopy (any diagnosis)	Urban teaching Urban nonteaching Rural	National Inpatient Sample 2012–2014, <i>n</i> = 1,273,042	1. Higher adjusted odds of colonic perforation in teaching hospitals compared to nonteaching hospitals.
Sharma et al. [4]	Crohn's disease Ulcerative colitis	Teaching Nonteaching	National Inpatient Sample 2016–2017, <i>n</i> = 189,950	1. Higher adjusted mean length of stay, charges, and costs for both conditions in teaching hospitals compared to nonteaching hospitals 2. Higher adjusted odds of in-hospital mortality for ulcerative colitis (but not Crohn's disease) in teaching hospitals compared to nonteaching hospitals

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programs may be less likely to have the specialist IBD care available needed to favorably impact outcomes. Assessment of hospitals by the availability of specialist IBD physicians, surgeons, and highly experienced radiologists and pathologists would be more helpful in order to inform IBD patients where they should obtain their inpatient care.

Though prior research has identified higher unadjusted costs for IBD hospitalizations and greater unadjusted mortality for UC hospitalizations [3], adjusting for metrics of disease severity eliminated these perceived differences, suggesting that differential outcomes are driven by the differential disease complexity of the IBD populations in academic versus nonacademic centers. In contrast, Sharma and colleagues [4] noted a higher adjusted odds of mortality for UC in teaching hospitals. While they controlled for demographics and comorbidities, the authors could not adjust for markers of UC severity that could confer a higher baseline risk of mortality. They acknowledge that higher inpatient mortality among patients with UC could be a consequence of the higher rates of inpatient colectomy at teaching hospitals and the likelihood of interhospital transfer of complex patients from nonacademic to academic centers. Although the NIS does not allow for identification of interhospital transfers, early inpatient colectomy and parenteral nutrition, which could serve as surrogates of baseline IBD severity, could have been included as covariates in the mortality analysis for patients with UC in order to help explain this discrepancy.

Similarly, the higher costs and length of stay at teaching hospitals identified in this study are likely due to differences in baseline IBD complexity. While a subgroup analysis of complicated IBD still demonstrated significantly higher adjusted costs at teaching hospitals, the ICD-10 coding on admission that defines this subgroup does not take into account patients' IBD history. Many patients with complicated IBD were also likely excluded due to the inclusion criteria as previously stated. Furthermore, the possibility of interhospital transfer due to patient complexity likely affects these outcomes.

IBD complexity and severity must be considered when comparing outcomes between patient populations where the magnitude of such characteristics may differ. Future studies which are able to account for patient-level metrics of IBD severity are needed to better understand the reasons for potential differences in hospitalization outcomes. Cost effectiveness could be compared among teaching hospitals with specialized IBD physicians and surgeons, teaching hospitals without specialized IBD providers, and nonteaching hospitals. A more granular understanding of hospital characteristics that influence IBD-specific outcomes will help determine the optimal setting for patients with IBD who require inpatient care.

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Compliance with ethical standards

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References

1. White C, Reschovsky JD, Bond AM. Understanding differences between high- and low-price hospitals: implications for efforts to rein in costs. *Health Aff (Millwood)*. 2014;33:324–331.
2. Burke LG, Frakt AB, Khullar D, et al. Association between teaching status and mortality in US hospitals. *JAMA*. 2017;317:2105–2113.
3. Dalal RS, Vajravelu RK, Lewis JD, et al. Hospitalization outcomes for inflammatory bowel disease in teaching vs nonteaching hospitals. *Inflamm Bowel Dis*. 2019. <https://doi.org/10.1093/ibd/izz089>.
4. Sharma SWS, Mehta TI, et al. Role of hospital teaching status on outcomes of patients with inflammatory bowel disease: a nationwide analysis. *Dig Dis Sci*. (Epub ahead of print). <https://doi.org/10.1007/s10620-020-06497-8>.
5. HCUP NIS Description of Data Elements. Healthcare cost and utilization project (HCUP). Rockville, MD: Agency for Healthcare Research and Quality, 2008. https://www.hcup-us.ahrq.gov/db/vars/hosp_teach/nisnote.jsp.
6. Micic D, Gaetano JN, Rubin JN, et al. Factors associated with readmission to the hospital within 30 days in patients with inflammatory bowel disease. *PLoS ONE*. 2017;12:e0182900.
7. Sohn P, Perimbeti S, Diez-Roux A, et al. A National study on inflammatory bowel disease admissions: teaching versus nonteaching outcomes and resource utilization. In American College of Gastroenterology Annual Meeting, Orlando, FL, Am J Gastroenterol, 2017.
8. Patel K, Patel P, Yang GH, et al. Hospital Teaching Status on Healthcare Expenditure Amongst Patients Admitted for Inflammatory Bowel Disease in the U.S., In American College of Gastroenterology Annual Meeting, San Antonio, TX, Am J Gastroenterol, 2019.
9. Berry DB, Abougergi MS, Khan A, et al. Impact of hospital size and teaching status on patients with clostridium difficile colitis treatment outcomes. In American College of Gastroenterology Annual Meeting, San Antonio, TX, Am J Gastroenterol, 2019.
10. Khalid M, Gayam V, Yeddi A, et al. The impact of hospital teaching status on colonoscopy perforation risk: a national inpatient sample study. *Gastroenterol Res*. 2020;13:19–24.

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