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Predicting Costs of Care for Patients With Inflammatory Bowel Diseases

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Inflammatory bowel disease (IBD) is a heterogeneous group of chronic inflammatory disorders affecting nearly 2 million Americans.[1,2] Patients with IBD and its subgroups ulcerative colitis (UC) and Crohn's disease (CD) often experience variable disease course and unpredictable responses to treatment. Consequently, a considerable portion of IBD patients require hospitalization (24-83%) , surgery (39-82%), or aggressive medical therapy (42-62% steroids, 624% biologics) at some point in their life, resulting in a large financial burden.[3-6] Recent estimates place the total cost of CD in the United States as high at $15.5 billion[7] and UC as high as $14.9 billion[8] annually with nearly a third of costs stemming from indirect sources (e.g., missed work). A small percentage of patients contribute disproportionately to overall healthcare expenditures as the upper quartile accounts for 80% of expenses.[9-11] These patients often require repeat admissions and surgeries for refractory inflammation, complications of IBD, chronic pain, or psychosomatic issues.[12] With a healthcare system transitioning away from fee-for-service models and towards more value-based reimbursement strategies,[13] recognizing potential avenues of cost reduction and quality improvement is imperative.[14] Proactive identification and prognostic tools for high-cost IBD patients, as well as reactive "early-warning" detection systems such as remote monitoring may prevent potentially avoidable unplanned care[15,16]

Research and clinical care in IBD has been hampered by the lack of a uniform severity metric that encompasses longitudinal patterns of disease. Most disease activity measures and endoscopic scores only capture a single time point and do not account for fluctuations in disease activity. Comparing means or medians of scores across time does not accurately demonstrate the peaks and nadirs in between clinic visits, procedures, or symptom flares. Additionally, these metrics generally reflect direct results of gastrointestinal inflammation and do not incorporate noninflammatory processes and consequences of IBD (e.g.,

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autonomic dysfunction, functional abdominal pain) as well as patient disease experience (e.g., poor quality of life, depression, anxiety). Consequently, researchers have utilized measures of healthcare utilization including hospitalizations and emergency department (ED) visits as surrogate markers of disease activity. While these measures are routinely available and comparable across institutions or IBD patient populations, they do not differentiate disease severity at the individual patient level.

Our group has previously shown that financial charges originating from healthcare utilization correlate with clinical and biochemical disease activity parameters in a large, longitudinal cohort of IBD patients.[17] Fluctuation and variability in classic disease activity metrics are concurrently reflected by trends in financial expenditures. Additionally, the contribution of disease-related quality of life, mental health disorders, and opiate requirement is also mirrored by increased financial burden.

Financial charge data provide unique insight into each hospital admission. Differences in acuity, length of stay, procedures or studies performed, and inpatient medication requirements will not be reflected in hospitalization counts, but will be starkly different when analyzing charges. Thus, financial charges incurred from healthcare utilization may serve as a comprehensive disease and patient activity metric.

In this issue of *Clinical Gastroenterology and Hepatology*, Limsrivilai et al [18] utilized electronic medical record (EMR) data on a large, tertiary IBD population to determine demographic, clinical, and disease-related factors that contribute to unplanned healthcare utilization and financial charges (excluding outpatient pharmaceutical charges) in the following year. Using a study population of 1430 IBD patients followed longitudinally they created training and validation cohorts. Outcomes of interest included IBD-related hospitalization, emergency department (ED) visits, and “high charges” defined as >$30,000 in a calendar year based on this value representing the 75th percentile of charge distribution. Using multiple logistic regression, they defined several factors that were related to poor outcomes and high expenses the following year including: corticosteroid requirement, opiate prescriptions, low hemoglobin, history of psychiatric disease (depression, anxiety, or bipolar disorder), and inpatient IBD-related hospitalization in the prior year. The authors combined these factors into an “IBD Risk Model” and created a publicly available clinical decision support tool to help clinicians identify at-risk patients.

Limsrivilai and colleagues should be commended on their utilization of EMR data including financial expenditures in a large IBD population to investigate this important topic. It helps confirm previous findings and additionally provides clinicians with a tool to incorporate these findings into clinical practice.

Looking at the final IBD Risk Model, one can interpret the variables as stemming from several overarching parameters driving healthcare utilization in IBD. First, severe inflammatory activity as indicated by corticosteroid use and anemia denotes a group of patients that require aggressive medical therapy and potentially costly biologic therapy, which would have driven expenditures even higher if biologic charges were included. This is

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in line with prior studies demonstrating the association of severe disease with cost of care. [7,19,20]

Second, the use of opiate agents suggests an element of untreated or intolerance of pain, but may also indicate chemical abuse and/or dependence. One study suggested that within 10 years of diagnosis, 5% of IBD patients require long-term opiates.[21] IBD patients requiring opiates have lower quality of life [22], overlapping functional gastrointestinal disorders[23], increased disability rates[24], and possible presence of narcotic bowel[25]. Most importantly, IBD patients requiring opiates are at increased risk of postoperative complications[26] and even death [21]. Identification of and intervention to this at-risk population is key not only to reducing costs, but preventing negative outcomes.

Lastly, the coexistence of mental health disorders such as depression or anxiety with chronic illness weakens a patient's ability to cope with disease, impair medication adherence and care plans, and increase the risk of poor outcomes.[27-29]. On top of this, medical therapy aimed at the inflammatory process such as corticosteroids can exacerbate underlying psychological conditions. It is thus crucial that we identify patients with pre-existing or increased risk of psychological and behavioral conditions and provide appropriate treatment as an opportunity to prevent costly care.

However, the study by Limsrivilai et al. should be interpreted in context. It was performed at a highly specialized, tertiary care referral center with an IBD patient population that is not likely to be representative of other centers or settings. Nearly 40% of their patients were on corticosteroids, 45% biologic agents, and 40% opiate medications at baseline suggestive of a severely ill patient cohort. Important demographic and clinical factors were not examined including race, education level, employment status, insurance type, disease behavior and characteristics, and comorbid medical conditions, which have been previously linked to healthcare spending in IBD.[11,19,30-33] Lastly, the utilization and financial charges are not equivocal with cost, because charges are institution specific, exorbitantly inflated compared to reimbursed or bottom-line costs, and do not include all expenses such as outpatient pharmaceutical expenditures. Thus, the study population, financial data, and study-specific cutpoints are neither all-inclusive nor generalizable. Consequently, the IBD Risk Model may be missing important characteristics that contribute to cost of care.

In conclusion, the effort by Limsrivilai et al. is laudable for utilizing readily-available EMR data to explore factors in early identification and prediction of costly IBD patients using healthcare financial charges. With the widespread use of electronic health records and integrated medical systems, access to clinical and financial charge data is becoming increasingly available. Distilling these data into meaningful patterns and predictive ability will help develop "warning systems" to aid in clinical care. The clinical decision support tool developed by Limsrivilai et al. is a step towards predicting future cost of care, identification of at-risk patients, and targeted multifaceted interventions to drive down the cost of IBD care.

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References

1. Kappelman MD, Moore KR, Allen JK, Cook SF. Recent trends in the prevalence of Crohn's disease and ulcerative colitis in a commercially insured US population. Dig Dis Sci. 2013; 58:519–25. DOI: 10.1007/s10620-012-2371-5 [PubMed: 22926499]
2. Molodecky NA, Soon IS, Rabi DM, Ghali WA, Ferris M, Chernoff G, et al. Increasing incidence and prevalence of the inflammatory bowel diseases with time, based on systematic review. Gastroenterology. 2012; 142:46–54.e42. quiz e30. DOI: 10.1053/j.gastro.2011.10.001 [PubMed: 22001864]
3. Cohen RD, Larson LR, Roth JM, Becker RV, Mummert LL. The cost of hospitalization in Crohn's disease. Am J Gastroenterol. 2000; 95:524–30. DOI: 10.1111/j.1572-0241.2000.01779.x. [PubMed: 10685762]
4. Silverstein MD, Loftus EV, Sandborn WJ, Tremaine WJ, Feagan BG, Nietert PJ, et al. Clinical course and costs of care for Crohn's disease: Markov model analysis of a population-based cohort. Gastroenterology. 1999; 117:49–57. [PubMed: 10381909]
5. Bernstein CN, Loftus EV, Ng SC, Lakatos PL, Moum B. Epidemiology and Natural History Task Force of the International Organization for the Study of Inflammatory Bowel Disease (IOIBD). Hospitalisations and surgery in Crohn's disease. Gut. 2012; 61:622–9. DOI: 10.1136/gutjnl-2011-301397 [PubMed: 22267595]
6. Vester-Andersen MK, Prosberg MV, Jess T, Andersson M, Bengtsson BG, Blixt T, et al. Disease course and surgery rates in inflammatory bowel disease: a population-based, 7-year follow-up study in the era of immunomodulating therapy. Am J Gastroenterol. 2014; 109:705–14. DOI: 10.1038/ajg.2014.45 [PubMed: 24642581]
7. Yu AP, Cabanilla LA, Wu EQ, Mulani PM, Chao J. The costs of Crohn's disease in the United States and other Western countries: a systematic review. Curr Med Res Opin. 2008; 24:319–28. DOI: 10.1185/030079908X260790 [PubMed: 18067689]
8. Cohen RD, Yu AP, Wu EQ, Xie J, Mulani PM, Chao J. Systematic review: the costs of ulcerative colitis in Western countries. Aliment Pharmacol Ther. 2010; 31:693–707. DOI: 10.1111/j.1365-2036.2010.04234.x [PubMed: 20064142]
9. Hay JW, Hay AR. Inflammatory bowel disease: costs-of-illness. J Clin Gastroenterol. 1992; 14:309–17. [PubMed: 1607607]
10. Feagan BG, Vreeland MG, Larson LR, Bala MV. Annual cost of care for Crohn's disease: a payor perspective. Am J Gastroenterol. 2000; 95:1955–60. DOI: 10.1111/j.1572-0241.2000.02261.x [PubMed: 10950042]
11. Park KT, Colletti RB, Rubin DT, Sharma BK, Thompson A, Krueger A. Health Insurance Paid Costs and Drivers of Costs for Patients With Crohn's Disease in the United States. Am J Gastroenterol. 2016; 111:15–23. DOI: 10.1038/ajg.2015.207 [PubMed: 26195179]
12. Click BH, Gajendran M, Rivers CR, Hashash JG, Dunn MA, Barrie A, et al. Sa1144 Association Between Surgical Anastomotic Technique and Postoperative Healthcare Financial Burden in Patients With Crohn's Disease: A Longterm, Prospective Study. Gastroenterology. 2015; 148:S-239.doi: 10.1016/S0016-5085(15)30784-8
13. Patel K, Presser E, George M, McClellan M. Shifting Away From Fee-For-Service: Alternative Approaches to Payment in Gastroenterology. Clin Gastroenterol Hepatol. 2016; 14:497–506. DOI: 10.1016/j.cgh.2015.06.025 [PubMed: 26122765]
14. Camilleri M, Katzka DA. Enhancing High Value Care in Gastroenterology Practice. Clin Gastroenterol Hepatol. 2016; 14:1376–84. DOI: 10.1016/j.cgh.2016.05.022 [PubMed: 27215366]
15. Riaz MS, Atreja A. Personalized Technologies in Chronic Gastrointestinal Disorders: Self-monitoring and Remote Sensor Technologies. Clin Gastroenterol Hepatol. 2016; 14:1697–705. DOI: 10.1016/j.cgh.2016.05.009 [PubMed: 27189911]

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16. Ramos-Rivers C, Regueiro M, Vargas EJ, Szigethy E, Schoen RE, Dunn M, et al. Association between telephone activity and features of patients with inflammatory bowel disease. Clin Gastroenterol Hepatol. 2014; 12:986–94. e1. DOI: 10.1016/j.cgh.2013.11.015 [PubMed: 24262938]
17. Jiang J, Click B, Anderson AM, Koutroubakis IE, Rivers CR, Hashash JG, et al. Group-Based Trajectory Modeling of Healthcare Financial Charges in Inflammatory Bowel Disease: A Comprehensive Phenotype. Clin Transl Gastroenterol. 2016; 7:e181.doi: 10.1038/ctg.2016.39 [PubMed: 27415619]
18. Limsrivilai J, Stidham RW, Govani SM, Waljee AK, Huang W, Higgins PD. Factors that Predict High Health Care Utilization and Costs for Patients With Inflammatory Bowel Diseases. Clin Gastroenterol Hepatol. 2016; doi: 10.1016/j.cgh.2016.09.012
19. Click B, Ramos Rivers C, Koutroubakis IE, Babichenko D, Anderson AM, Hashash JG, et al. Demographic and Clinical Predictors of High Healthcare Use in Patients with Inflammatory Bowel Disease. Inflamm Bowel Dis. 2016; 22:1442–9. DOI: 10.1097/MIB.0000000000000763 [PubMed: 26950309]
20. Van der Valk ME, Mangen MJ, Severs M, van der Have M, Dijkstra G, van Bodegraven AA, et al. Evolution of Costs of Inflammatory Bowel Disease over Two Years of Follow-Up. PLoS ONE. 2016; 11:e0142481.doi: 10.1371/journal.pone.0142481 [PubMed: 27099937]
21. Targownik LE, Nugent Z, Singh H, Bugden S, Bernstein CN. The prevalence and predictors of opioid use in inflammatory bowel disease: a population-based analysis. Am J Gastroenterol. 2014; 109:1613–20. DOI: 10.1038/ajg.2014.230 [PubMed: 25178702]
22. Sanford D, Thornley P, Teriaky A, Chande N, Gregor J. Opioid use is associated with decreased quality of life in patients with Crohn's disease. Saudi J Gastroenterol. 2014; 20:182–7. DOI: 10.4103/1319-3767.133020 [PubMed: 24976282]
23. Crocker JA, Yu H, Conaway M, Tuskey AG, Behm BW. Narcotic use and misuse in Crohn's disease. Inflamm Bowel Dis. 2014; 20:2234–8. DOI: 10.1097/MIB.0000000000000194 [PubMed: 25208105]
24. Cross RK, Wilson KT, Binion DG. Narcotic use in patients with Crohn's disease. Am J Gastroenterol. 2005; 100:2225–9. DOI: 10.1111/j.1572-0241.2005.00256.x [PubMed: 16181373]
25. Drossman D, Szigethy E. The narcotic bowel syndrome: a recent update. The American Journal of Gastroenterology Supplements. 2014; 2:22–30. DOI: 10.1038/ajgsup.2014.6 [PubMed: 25207609]
26. Hirsch A, Yarur AJ, Dezheng H, Rodriquez D, Krugliak Cleveland N, Ali T, et al. Penetrating Disease, Narcotic Use, and Loop Ostomy Are Associated with Ostomy and IBD-related Complications After Ostomy Surgery in Crohn's Disease Patients. J Gastrointest Surg. 2015; 19:1852–61. DOI: 10.1007/s11605-015-2908-y [PubMed: 26264361]
27. Ananthakrishnan AN, Gainer VS, Perez RG, Cai T, Cheng SC, Savova G, et al. Psychiatric comorbidity is associated with increased risk of surgery in Crohn's disease. Aliment Pharmacol Ther. 2013; 37:445–54. DOI: 10.1111/apt.12195 [PubMed: 23289600]
28. Faust AH, Halpern LF, Danoff-Burg S, Cross RK. Psychosocial factors contributing to inflammatory bowel disease activity and health-related quality of life. Gastroenterol Hepatol (N Y). 2012; 8:173–81. [PubMed: 22675279]
29. Gandhi S, Jedel S, Hood MM, Mutlu E, Swanson G, Keshavarzian A. The relationship between coping, health competence and patient participation among patients with inactive inflammatory bowel disease. J Crohns Colitis. 2014; 8:401–8. DOI: 10.1016/j.crohns.2013.10.005 [PubMed: 24230968]
30. Kappelman MD, Porter CQ, Galanko JA, Rifas-Shiman SL, Ollendorf DA, Sandler RS, et al. Utilization of healthcare resources by U.S. children and adults with inflammatory bowel disease. Inflamm Bowel Dis. 2011; 17:62–8. DOI: 10.1002/ibd.21371 [PubMed: 20564532]
31. Kaufman S, Ali N, DeFiglio V, Craig K, Brenner J. Early efforts to target and enroll high-risk diabetic patients into urban community-based programs. Health Promot Pract. 2014; 15:62S–70S. DOI: 10.1177/1524839914535776 [PubMed: 25359251]
32. Nguyen GC, Chong CA, Chong RY. National estimates of the burden of inflammatory bowel disease among racial and ethnic groups in the United States. J Crohns Colitis. 2014; 8:288–95. DOI: 10.1016/j.crohns.2013.09.001 [PubMed: 24074875]

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33. Román AL, Muñoz F. Comorbidity in inflammatory bowel disease. World J Gastroenterol. 2011; 17:2723–33. DOI: 10.3748/wjg.v17.i22.2723 [PubMed: 21734780]