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The primary aim of *World Journal of Gastrointestinal Surgery* (*WJGS, World J Gastrointest Surg*) is to provide scholars and readers from various fields of gastrointestinal surgery with a platform to publish high-quality basic and clinical research articles and communicate their research findings online.

WJGS mainly publishes articles reporting research results and findings obtained in the field of gastrointestinal surgery and covering a wide range of topics including biliary tract surgical procedures, biliopancreatic diversion, colectomy, esophagectomy, esophagostomy, pancreas transplantation, and pancreatectomy, etc.

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Advancing perioperative optimization in Crohn's disease surgery with machine learning predictions

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Abstract

This editorial offers commentary on the article which aimed to forecast the likelihood of short-term major postoperative complications (Clavien-Dindo grade \geq III), including anastomotic fistula, intra-abdominal sepsis, bleeding, and intestinal obstruction within 30 days, as well as prolonged hospital stays following ileocecal resection in patients with Crohn's disease (CD). This prediction relied on a machine learning (ML) model trained on a cohort that integrated a nomogram predictive model derived from logistic regression analysis and a random forest (RF) model. Both the nomogram and RF showed good performance, with the RF model demonstrating superior predictive ability. Key variables identified as potentially critical include a preoperative CD activity index \geq 220, low preoperative serum albumin levels, and prolonged operation duration. Applying ML approaches to predict surgical recurrence have the potential to enhance patient risk stratification and facilitate the development of preoperative optimization strategies, ultimately aiming to improve post-surgical outcomes. However, there is still room for improvement, particularly by the inclusion of additional relevant clinical parameters, consideration of medical therapies, and potentially integrating molecular biomarkers in future research efforts.

Key Words: Crohn's disease; Surgery; Postoperative complications; Ileocecal resection; Machine learning

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Core Tip: Preoperative optimization for patients with Crohn's disease presents numerous challenges. Traditional research methods are insufficient to address the expanding array of questions in this field. Hence, there is a growing need to explore and develop new tools grounded in advanced technologies, such as computer simulation models and artificial intelligence. Employing machine learning approaches can significantly enhance patient risk stratification and the formulation of preoperative optimization strategies, ultimately aiming to improve post-surgical outcomes.

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INTRODUCTION

A substantial portion of Crohn's disease (CD) patients still undergo surgery over their lifetime despite advancements in medical therapies. Managing CD patients undergoing surgery is complex and necessitates integrated care with multidisciplinary approaches to improve clinical outcomes[1,2].

MAIN TEXT

Wang *et al*[3] were the first to utilize a machine learning (ML) model trained on a cohort, integrating a nomogram predictive model from logistic regression analysis and a random forest (RF) model. This model aimed to predict the probability of short-term major postoperative complications (Clavien-Dindo \geq III) encompassing anastomotic fistula, intra-abdominal sepsis complications, bleeding, and intestinal obstruction within 30 days and prolonged hospital stays following ileocecal resection in patients with CD.

A total of 259 patients were randomly assigned to either a training or validation cohort. Logistic regression and RF models were developed using the training cohort, while the performance of these models was evaluated using the validation cohort. Overall, 5.0% of patients experienced major complications within 30 days after surgery. Key factors influencing these complications in both models included a CD activity index \geq 220, longer operation times, and lower preoperative albumin levels. While independent risk factors significantly associated with a longer postoperative hospital stay included lower preoperative hemoglobin levels, emergency surgery, laparotomy approach, and longer operation duration.

In the landscape of cutting-edge medicine and advanced methodologies, this paper presents an innovative approach to post-operative complications. ML algorithms are pivotal in constructing predictive models that mitigate risk factors, assisting clinical decision-makers and improving patient outcomes. The study's findings can guide patient and surgeon preparation for surgery and postoperative recovery. Indeed, emphasizing preoperative optimization is crucial for identifying high-risk patients and providing personalized perioperative management to enhance outcomes.

Nevertheless, the current study did not provide any substantial advancements or novel insights into the field. Yet, there are several points that deserve attention. The authors mainly focused on the assessment of nutritional status. However, the assessment of muscle mass, strength and function, key components of sarcopenia, is now included in the optimal perioperative care roadmap for inflammatory bowel disease (IBD) and should be considered in ML prediction models[4].

Notably, sarcopenia and malnutrition have been associated with increased hospitalizations, disease flares, the need for surgery, and postoperative complications in patients with IBD[5,6].

Furthermore, hypoalbuminemia is commonly used as an indicator for malnutrition, although it does not accurately reflect total body protein or muscle mass. Hence, it should not be solely relied upon as a marker of nutritional status. Preoperative hypoalbuminemia may also suggest systemic inflammation, given that both albumin and prealbumin levels decrease as part of the acute-phase response during inflammation[7]. However, supplementation of albumin remains fundamental.

Another aspect worthy of consideration and further exploration is the use of medical treatment prior to surgery. Indeed, most IBD patients undergoing surgery receive concomitant treatment with medications such as steroids, immunomodulators and biologics. Biologic agents and immune modulators may be continued, but steroids should be withdrawn or tapered to the minimum required dose[4]. Corticosteroids remain the most significant and modifiable risk factor associated with postoperative infection and complications[4,8,9]. Patients who received corticosteroids before surgery showed a 3.7-fold increase in the likelihood of experiencing any postoperative complications and a 5.5-fold increase in the likelihood of developing major infectious complications[10,11]. Similarly, the preoperative use of oral antibiotics should be considered. Recently, the rate of septic intra-abdominal complications was significantly reduced by pre-operative mechanical bowel preparation combined with pre-operative oral antibiotics (paromomycin and metronidazole) on the day before surgery[12]. Nonetheless, prolonged use of antibiotics raises the risk of *Clostridium difficile* infection or the development of antibiotic resistance[13]. However, in the near future, the integration of medications into ML prediction models should be considered in predicting CD surgery complications.

CONCLUSION

In conclusion, preoperative optimization for patients with CD still presents numerous challenges. Traditional research methods fall short in addressing the expanding array of questions in this field. Integrating ML artificial intelligence models will significantly enhance patient risk stratification and the development of personalized preoperative optimization strategies.

FOOTNOTES

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