

Identification and surgical management of acute severe ulcerative colitis: A guide for general practitioners

Krishanth Naidu, Sunaina Patel,
Jonathan Hong, Kheng-Seong Ng

Background

Approximately 25% of patients with ulcerative colitis (UC) develop acute severe UC (ASUC), necessitating urgent care. General practitioners (GPs), whether based in rural or urban settings, are instrumental in detecting early warning signs, expediting emergency interventions, coordinating with medical teams, educating patients and overseeing outpatient care. This involvement ensures timely, appropriate surgical responses, especially if complications arise or medical treatments prove ineffective.

Objective

This review provides GPs with an understanding of ASUC evaluation and risk assessment, emphasising surgical management and complementing existing medical methods. The objective is to equip GPs, whether in rural or urban environments, with the knowledge and confidence to play an integral role in the treatment team.

Discussion

Identifying and diagnosing ASUC is crucial for timely emergency care. Moreover, effective ASUC management demands appropriate preoperative work-up. GPs should be adept at monitoring treatment efficacy and guiding patients through surgical aftercare. Thus, GPs should be well versed in diagnostic criteria and surgical approaches for ASUC, as well as their important role within a multidisciplinary team.

IN 2021, ulcerative colitis (UC) patients were estimated to account for 334 out of every 100,000 patients presenting to general practitioners (GPs) in Australia.¹ A severe complication, known as acute severe UC (ASUC), is seen in up to 25% of this population and requires swift and decisive emergency care to prevent further deterioration.² Recognising the clinical significance and the potential effects of ASUC on patient outcomes, the goal of this article is two-fold. First, it aims to equip both rural- and urban-based GPs to swiftly identify patients with ASUC. Second, this article underscores the importance of holistic patient management. This includes insights into in-hospital care regimens tailored for ASUC patients and postoperative considerations that can influence patient recovery and long-term outcomes.

Clinical features and risk stratification

From a surgical perspective, the Truelove and Witts severity criteria is the most sensitive and prevalently used for defining ASUC.^{3,4} A patient with ASUC typically exhibits at least six bloody motions daily and a minimum of one sign of systemic toxicity, as detailed in Table 1.⁴ Australian guidelines, based on the Montreal classification, stratify risk into mild (≤ 4 stools without blood), moderate (≥ 4 with or without blood) and severe (≥ 6 stools, with blood and signs of toxicity).⁵ However, assessment tools such as the Mayo clinic score⁶ and the Montreal classification⁷ have limited use in a surgical setting due to a paucity of validation data.^{3,8} Regardless of the chosen criteria, the classification of severity requires periodic re-evaluation.

Evaluation by the treating team

The treating team's assessment usually involves pre-treatment evaluation with biochemical and microbiological studies, diagnostic imaging, and endoscopic investigations to further define the severity and extent of the inflammation. The GP might wish to initiate investigations, where practical, particularly when specialist care is not readily available.

In addition to a routine blood panel with inflammatory markers, a blood culture should be considered in those who are febrile or display leucocytosis. A screen for opportunistic infections (ie human immunodeficiency virus, hepatitis B and C and varicella zoster), which would otherwise be masked, should be conducted in preparation for rescue pharmacotherapy (ie infliximab or cyclosporin). Typically, rescue therapy is used as a second-line treatment when intravenous steroid therapy fails to manage the disease over a span of three to five days.⁹ Serum magnesium levels and lipid profiles might also be arranged in preparation for cyclosporin treatment.¹⁰ If prior tuberculosis exposure is likely, performing an interferon-gamma release assay is recommended (eg the QuantiFERON Gold test, Cellestis/Qiagen, Carnegie, Australia), along with a chest X-ray.¹⁰ When organising these investigations, the GP should take into account both the cost of testing and the patient's immunosuppression status.

Stool testing, to exclude an infective cause, is also indicated. As shown in Figure 1, the clinician might assess for ova, cysts and parasites (OCP), viral, and bacterial infections, including *Clostridium difficile* toxin, with a stool microscopy, culture and sensitivity study.^{3,5,11} Additionally, a faecal calprotectin assay can assess disease severity; a calprotectin level >50 mcg/g might represent active inflammation.¹²

Diagnostic imaging, including abdominal radiography, is used to identify toxic megacolon. Additionally, cross-sectional

imaging, such as computed tomography (CT) or magnetic resonance imaging, is often necessary for patients who might have complications such as colonic perforation. Figure 2 provides an illustrative CT finding from an ASUC patient. For GPs with limited access to specialist input or those dealing with diagnostic ambiguity, this investigation might prove especially useful. It not only offers a direct approach to patient monitoring but also aids in risk stratification, potentially reducing specialist interventions for cases deemed low to moderate risk.

From a surgical perspective, a 'gas-less' and 'prep-less' sigmoidoscopy, a type of endoscopy commonly used in ASUC patients, aids severity assessment.¹³ It also facilitates prompt histological biopsies (eg for cytomegalovirus).¹¹ It should be performed at the earliest opportunity, with various studies demonstrating improved outcomes in ASUC patients undertaking endoscopy within 72 hours of hospitalisation.¹³

Medical management

In addition to GPs, the management of ASUC requires a multidisciplinary approach involving gastroenterologists, colorectal surgeons, stoma therapists, nutritionists and psychologists. The following section summarises important components of ASUC management, with a particular focus on surgical management. Nevertheless, it would benefit the GP involved in the care of ASUC patients to have a broad understanding of their patient's journey through secondary care.

Hydration and nutrition

Monitoring the patient's fluid status and addressing electrolyte abnormalities are essential.⁹ Maintenance of enteral feeding is preferred and should be continued whenever clinically appropriate, as it might lower the risk of complications.¹⁴ In some cases, parenteral nutrition might be required.

Medications

Initial medical management includes intravenous glucocorticoids with potential escalation to a biologic agent (usually infliximab)^{3,11,15,16} and aims to reduce colectomy rates by up to 80%.¹⁷⁻²⁰ Medications that harbour a potential risk of inducing colonic dilatation should be used cautiously (eg anticholinergics, antidiarrheals and opiates).¹¹ Antibiotic use is also a consideration; although some small cohort studies suggest potential benefits,⁹ a recent randomised trial concluded that the use of antibiotics in ASUC did not improve outcomes outside a clinical context of severe sepsis.²¹

Venous thromboembolism risk mitigation

ASUC patients have an up to eight-fold increased risk of thromboembolism because of prolonged hospitalisation, convalescence and the systemic burden of a profound inflammatory process.¹⁵ Therefore, compression stockings and chemical thromboprophylaxis with low-molecular-weight or unfractionated heparin are usually prescribed.²² Patients aged 45 years and older, who have a hospital stay of seven days or longer, and with a previous history of *C. difficile* infection upon their initial admission are identified as having an increased risk for post-discharge venous thromboembolism (VTE).^{23,24} Yet, within the Australian context, the question remains: is there a benefit to extending VTE prophylaxis for hospitalised patients upon discharge?

Surgical urgency and indications

Emergency surgery

GPs play a crucial role in identifying individuals at risk of severe and potentially fatal complications, for whom immediate surgical intervention is indicated. Such complications encompass toxic megacolon, haematochezia paired with haemodynamic

Table 1. Symptoms and signs that encompass an acute severe ulcerative colitis diagnosis according to the Truelove and Witts criteria⁴

Criteria	Definition
Bloody stools	>6 per day
Plus one of	
Tachycardia	Heart rate >90 beats/min
Pyrexia	Core temperature >37.8°C
Raised inflammatory markers	ESR >30 mm/h CRP >30 mg/L
Low haemoglobin	Hb <10.5 g/dL

CRP, C-reactive protein; ESR, erythrocyte sedimentation rate; Hb, haemoglobin.

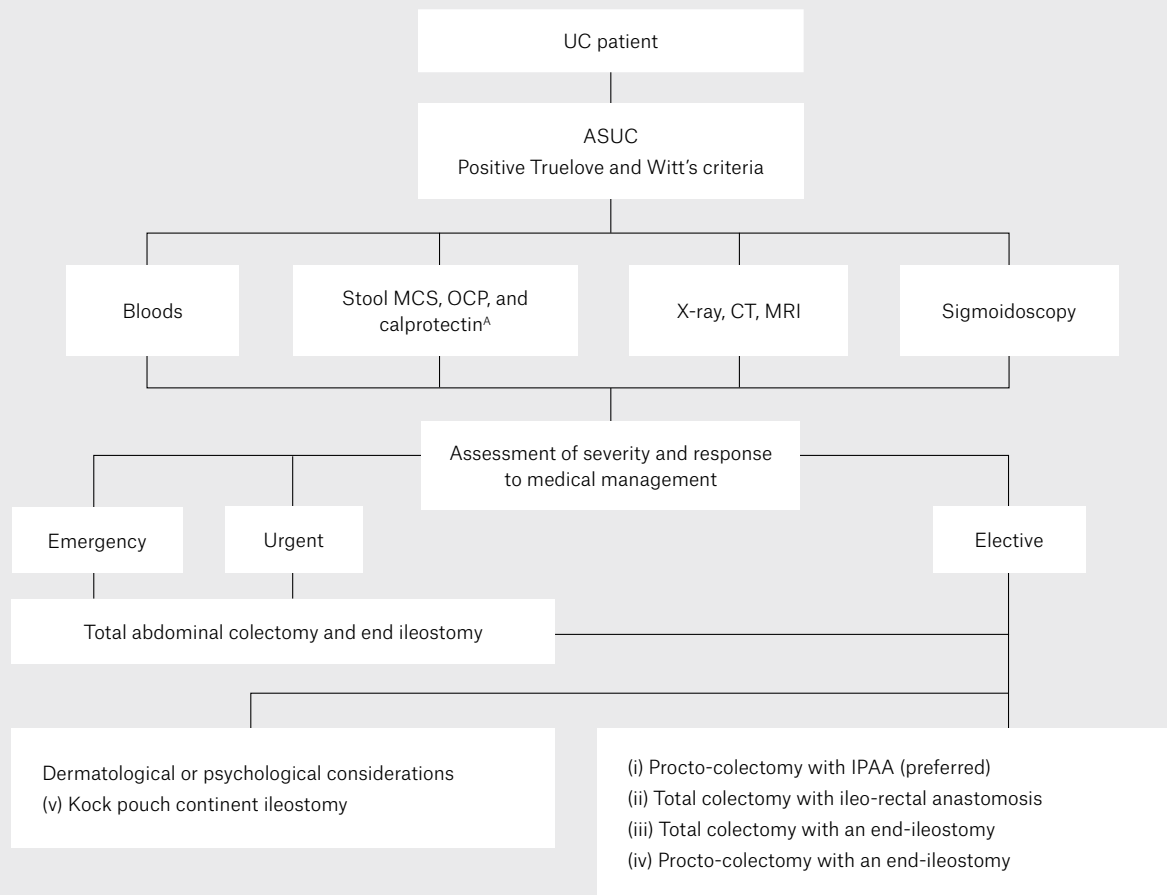


Figure 1. Management algorithm for patients presenting with acute severe ulcerative colitis.

^APathogens tested for include *Salmonella*, *Shigella*, *Campylobacter*, *Yersinia species*, *Escherichia coli*, *Giardia*, *Amoebic* infections and *Clostridium difficile* toxin^{3,9,10}

ASUC, acute severe ulcerative colitis; CT, computed tomography; IPAA, ileal pouch-anal anastomosis; MCS, microscopy, culture and sensitivity; MRI, magnetic resonance imaging; OCP, ova, cysts and parasites; UC, ulcerative colitis.

instability, and perforation. If a patient does not fit these emergent criteria, they can be further assessed and categorised into either urgent or elective surgical categories.

Urgent surgery

In ASUC patients who do not qualify for emergency surgery but need intervention during their initial hospital stay, urgent surgery is often warranted. This is especially the case for those with acute fulminant colitis (AFC) that is refractory to medical treatment.¹⁶ Symptoms of AFC include persistent bleeding, frequent bowel movements and systemic toxicity indicators such as fever.²⁵ The Travis criteria can help

predict surgical need, particularly if a patient has more than eight daily stools or three to eight stools with a C-reactive protein level above 45mg/L after three days on steroids.²⁶

Elective surgery

ASUC patients who remain ambulatory and are managed in a GP setting might still require elective surgery.²⁷ Common indications include the inability to wean off steroids or the presence of dysplasia.

Types of surgical intervention

Figure 1 highlights the types of surgical intervention offered to patients in emergency,

urgent and elective surgery settings, whereas Figure 3 illustrates the procedural options for ASUC patients.

Urgent and emergency patients typically undergo a total abdominal colectomy and end ileostomy. In contrast, elective patients are often presented with restorative techniques, most commonly an ileal pouch anal anastomosis. The decision of which procedure is performed hinges on the patient's medical comorbidities, anal sphincter function, aspiration to optimise fecundity, capability to manage a stoma, extent of lingering disease and specific colitis diagnosis (ie UC versus Crohn's or indeterminate colitis).²⁷ Table 2 summarises how these unique scenarios can influence the choice of surgery.

Postoperative complications

GPs have several factors to consider in the postoperative phase. They should conduct regular follow-ups to monitor wound healing, assess bowel function and identify potential complications. They should ensure that patients receive adequate nutritional sustenance for recovery while also adhering to any dietary guidelines or restrictions.

GPs should have an understanding of postoperative complications that can arise, including bowel obstruction, stricture of the anal canal or anastomosis, pelvic sepsis,

pouch failure and faecal incontinence. Indeed, the GP might be the first clinician a patient presents to with postoperative complaints. Furthermore, issues relating to the development of dysplasia or cancer in the pouch, sexual dysfunction and fertility also demand a GP’s awareness and proactive management.^{27,28}

For rural GPs, having this knowledge is particularly advantageous. It allows for early identification and management of complications, empowers handover of care by the GP and provides guidance as to which

patients require timely care in areas where specialised medical resources might be limited.

Surgical complications

Depending on the specific type of surgery the patient has undergone, various surgical complications might be encountered. GPs might identify an anastomotic stricture, occurring in 4–16% of cases, during a per rectal examination. This condition, presenting with difficulty in stool passage or obstipation, might necessitate trans-anal or endoscopic dilatation and, in certain instances, reoperation.^{28–30} If a patient exhibits symptoms of bowel obstruction (2–4%), GPs should prioritise cross-sectional imaging and promptly refer to the surgical team.²⁸ GPs should be vigilant for signs of pelvic sepsis and pouch failure, found in 8.5–9.5% of patients.³¹ Immediate referral to the emergency department is vital for patients showing infective symptoms, heightened faecal frequency (ie more than four to six bowel motions a day), loose stools or symptoms of obstruction. Additionally, the potential for dysplasia or cancer in the remaining rectum (if present), anal transitional zone or ileal pouch underscores the need for GP referral for endoscopic surveillance.^{32–34}

Urogenital complications

Faecal incontinence and overnight incontinence are common symptoms in

Table 2. Surgical indications in various special circumstances

Special circumstance	Recommended treatment
Medically comorbid	Proctocolectomy with end ileostomy as low complication and reduced operating time
Risk of faecal incontinence due to impaired anal sphincter function	Proctocolectomy with end ileostomy Consideration of ileorectal anastomosis if significant quality of life expected with stoma
Preserving fertility and sexual function	Total colectomy with ileorectal anastomosis or IPAA after family is complete
Indeterminate colitis (10–15% of patients) ¹⁹	Complex – some might perform total colectomy and ileorectal anastomosis
Crohn’s colitis	Segmental colectomy, total colectomy with ileorectal anastomosis, total proctocolectomy with end ileostomy, and proctectomy

IPAA, ileal pouch anal anastomosis.

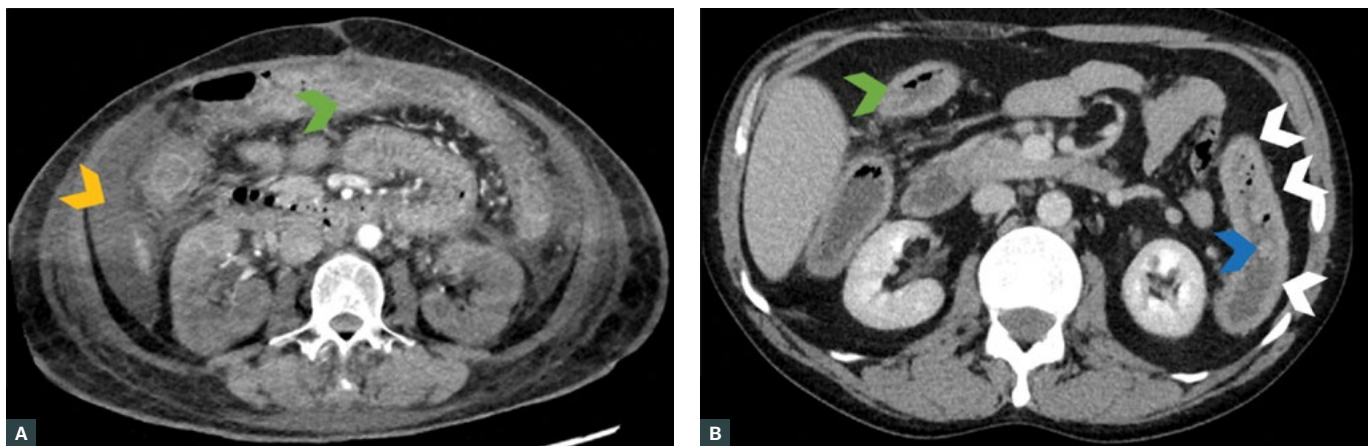


Figure 2. A and B. Axial computed tomography images of acute severe ulcerative colitis patients requiring an operation. These images highlight bowel wall thickening (green arrowhead), loss of haustral markings (white arrowheads), pseudopolyp extending into the lumen (blue arrowhead) and free intraperitoneal fluid (orange arrowhead).

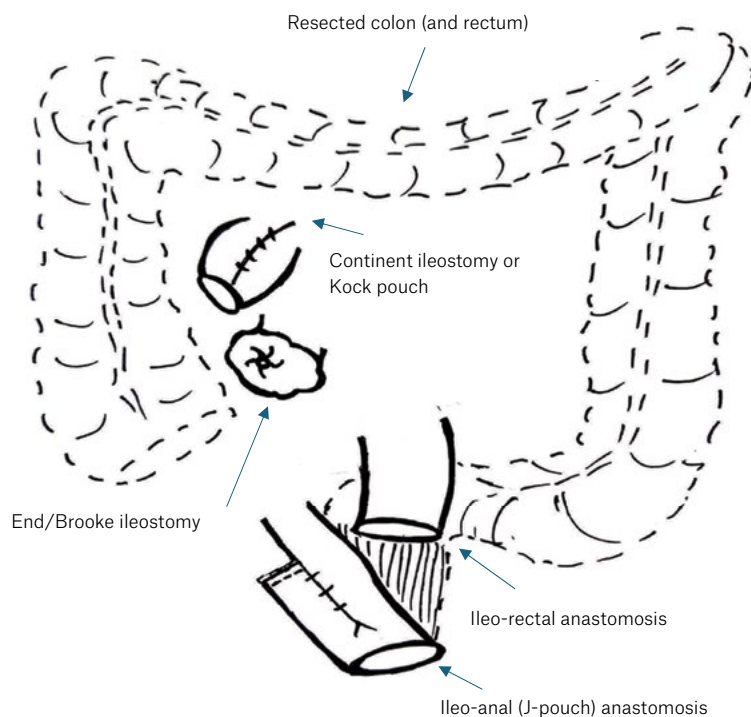


Figure 3. Original diagrammatic representation of surgical options for acute severe ulcerative colitis patients.

patients who have undergone pouch surgery (53–76%), with patients presenting with an average of six daily stools or an overnight stool.³⁵ For male patients, sexual dysfunction might manifest as impotence (1.5%) or retrograde ejaculation (4%).³⁶ In female patients, while some might temporarily grapple with dyspareunia (7%), their frequency of intercourse and capacity to achieve orgasm usually remain unchanged.²⁷ GPs should be aware that in the context of fertility, approximately 88% of female patients who have undergone a surgical intervention and hoping to conceive have successfully given birth.³⁷ However, guidance on the optimal mode of delivery continues to be a subject of discussion and study.^{38,39}

Allied health

Stomal therapist

A poorly positioned stoma can adversely affect the patient's quality of life, but a skilled stomal therapist can employ a range

of troubleshooting techniques to mitigate such issues. This process not only improves surgical precision but also cultivates a meaningful rapport between the therapist and the patient, fostering trust and facilitating better outpatient care.

Psychological support

GPs should recognise their pivotal role in providing psychological support and counselling in these patients. Given the disease's chronic trajectory, its toll on quality of life and the looming possibility of surgical intervention, many patients suffer mood disturbance and require a GP's holistic and continuous care. Addressing psychological factors can also aid in patients' overall capacity to manage complex treatment regimens.

Conclusion

The role of a GP in managing ASUC encompasses early identification of affected patients and ensuring their swift transition

to emergency care. Furthermore, diligent postoperative follow-ups are essential, empowering GPs to detect patients susceptible to urogenital, psychological or surgical complications. GPs are pivotal in orchestrating comprehensive care in collaboration with allied health professionals. By deepening their understanding of ASUC's signs, symptoms and management protocols, GPs can markedly enhance the prognosis for this vulnerable group of patients and ensure timely intervention.

Key points

- ASUC is a complication experienced by 25% of patients with UC.
- GPs play a crucial role in identifying and promptly referring patients with this complication, collaborating with the treating team, educating the patient and coordinating postoperative care.
- Serial examination and assessment of vital signs, laboratory tests, and monitoring of stool frequency and consistency are essential to evaluate severity and treatment response.
- GPs might facilitate surgical referral in patients who fail medical management or experience complications.
- Surgical intervention can be classified as emergency, urgent or elective depending on the severity of presentation.

Authors

Krishanth Naidu MS, FRACS, Colorectal Research Fellow, Colorectal Surgery Unit, Concord Hospital, Sydney, NSW; Colorectal Research Fellow, Concord Institute of Academic Surgery, Concord Hospital, Sydney, NSW; Clinical Lecturer, University of Sydney, Concord Clinical School, Clinical Sciences Building, Concord Hospital, Sydney, NSW

Sunaina Patel MChD, FRACGP, General Practitioner, Rochedale Family Practice, Brisbane, Qld

Jonathan Hong MS, FRACS, Colorectal Surgeon, Central Clinical School, Faculty of Medicine and Health, University of Sydney, Sydney, NSW; Associate Professor of Surgical Education, RPA Institute of Academic Surgery, Royal Prince Alfred Hospital, Sydney, NSW

Kheng-Seong Ng MBIostat, PhD, FRACS, Colorectal Surgeon, Colorectal Surgery Unit, Concord Hospital, Sydney, NSW; Senior Lecturer, Concord Institute of Academic Surgery, Concord Hospital, Sydney, NSW; Senior Lecturer, University of Sydney, Concord Clinical School, Clinical Sciences Building, Concord Hospital, Sydney, NSW

Competing interests: None.

Funding: KN is supported by funding from the Eric Bishop Research Scholarship (Royal Australasian College of Surgeons) and by a Medtronic Colorectal

Research Fellowship (Colorectal Surgical Society of Australia and New Zealand). JH is an advisor for the DSMB for the PRIORITY Trial and is on the Supervisor Central Hub Board of training for general surgery. K-SN is supported by a University of Sydney Senior Lecturer Fellowship.

Provenance and peer review: Not commissioned, externally peer reviewed.

Correspondence to:

k.s.ng@sydney.edu.au

Acknowledgement

The authors acknowledge Dr Kimberley Golding for assistance in reviewing the manuscript.

References

- Busingye D, Pollack A, Chidwick K. Prevalence of inflammatory bowel disease in the Australian general practice population: A cross-sectional study. *PLoS One* 2021;16(5):e0252458. doi: 10.1371/journal.pone.0252458.
- Jain S, Kedia S, Bopanna S, et al. Left-sided colitis and extensive colitis have similar colectomy rates after index episode of acute severe colitis: A long-term follow-up study. *JGH Open* 2017;1(4):134–39. doi: 10.1002/jgh3.12023.
- Nakase H. Acute severe ulcerative colitis: Optimal strategies for drug therapy. *Gut Liver* 2023;17(1):49–57. doi: 10.5009/gnl220017.
- Truelove SC, Witts LJ. Cortisone in ulcerative colitis: Final report on a therapeutic trial. *BMJ* 1955;2(4947):1041–48. doi: 10.1136/bmj.2.4947.1041.
- Andrews JB, Lawrence I, Leong R, Moore G. Clinician's guide to ulcerative colitis (UC) management. *Clinical Insights*; 16–17 March 2013; Sydney.
- Schroeder KW, Tremaine WJ, Ilstrup DM. Coated oral 5-aminosalicylic acid therapy for mildly to moderately active ulcerative colitis. A randomized study. *N Engl J Med* 1987;317(26):1625–29. doi: 10.1056/NEJM198712243172603.
- Silverberg MS, Satsangi J, Ahmad T, et al. Toward an integrated clinical, molecular and serological classification of inflammatory bowel disease: Report of a Working Party of the 2005 Montreal World Congress of Gastroenterology. *Can J Gastroenterol* 2005;19 Suppl A:5A–36A. doi: 10.1155/2005/269076.
- Hindryckx P, Jairath V, D'Haens G. Acute severe ulcerative colitis: From pathophysiology to clinical management. *Nat Rev Gastroenterol Hepatol* 2016;13(11):654–64. doi: 10.1038/nrgastro.2016.116.
- Gastroenterological Society of Australia (GESA). Clinical update for general practitioners and physicians: Inflammatory bowel disease. Melbourne, Vic: GESA, 2018. Available at <http://nla.gov.au/nla.obj-2712116930> [Accessed 17 October 2023].
- Chen JH, Andrews JM, Kariyawasam V, et al; IBD Sydney Organisation and the Australian Inflammatory Bowel Diseases Consensus Working Group. Review article: Acute severe ulcerative colitis – Evidence-based consensus statements. *Aliment Pharmacol Ther* 2016;44(2):127–44. doi: 10.1111/apt.13670.
- Conley TE, Fiske J, Subramanian S. How to manage: Acute severe colitis. *Frontline Gastroenterol* 2021;13(1):64–72. doi: 10.1136/flgastro-2020-101710.
- Menees SB, Powell C, Kurlander J, Goel A, Chey WD. A meta-analysis of the utility of C-reactive protein, erythrocyte sedimentation rate, fecal calprotectin, and fecal lactoferrin to exclude inflammatory bowel disease in adults with IBS. *Am J Gastroenterol* 2015;110(3):444–54. doi: 10.1038/ajg.2015.6.
- Obi K, Hinton A, Sobotka L, et al. Early sigmoidoscopy or colonoscopy is associated with improved hospital outcomes in ulcerative colitis-related hospitalization. *Clin Transl Gastroenterol* 2016;7(12):e203. doi: 10.1038/ctg.2016.61.
- González-Huix F, Fernández-Bañares F, Esteve-Comas M, et al. Enteral versus parenteral nutrition as adjunct therapy in acute ulcerative colitis. *Am J Gastroenterol* 1993;88(2):227–32.
- Nguyen GC, Bernstein CN, Bitton A, et al. Consensus statements on the risk, prevention, and treatment of venous thromboembolism in inflammatory bowel disease: Canadian Association of Gastroenterology. *Gastroenterology* 2014;146(3):835–848.e6. doi: 10.1053/j.gastro.2014.01.042.
- Cohen RD, Stein AC. Management of moderate to severe ulcerative colitis in adults. *UpToDate*, 2023. Available at www.uptodate.com/contents/management-of-moderate-to-severe-ulcerative-colitis-in-adults?search=management%20of%20moderate%20to%20severe%20ulcerative%20colitis%20in%20adults&source=search_result&selectedTitle=1-150&usage_type=default&display_rank=1 [Accessed 14 August 2023].
- Festa S, Scribano ML, Pugliese D, et al. Long-term outcomes of acute severe ulcerative colitis in the rescue therapy era: A multicentre cohort study. *United European Gastroenterol J* 2021;9(4):507–16. doi: 10.1177/2050640620977405.
- Turner D, Walsh CM, Steinhart AH, Griffiths AM. Response to corticosteroids in severe ulcerative colitis: A systematic review of the literature and a meta-regression. *Clin Gastroenterol Hepatol* 2007;5(1):103–10. doi: 10.1016/j.cgh.2006.09.033.
- Viscido A, Papi C, Latella G, Frieri G. Has infliximab influenced the course and prognosis of acute severe ulcerative colitis? *Biologics* 2019;13:23–31. doi: 10.2147/BTT.S179006.
- Choy MC, Seah D, Faleck DM, et al. Systematic review and meta-analysis: Optimal salvage therapy in acute severe ulcerative colitis. *Inflamm Bowel Dis* 2019;25(7):1169–86. doi: 10.1093/ibd/izy383.
- Mishra S, Mandavdhare HS, Singh H, et al. Adjuvant use of combination of antibiotics in acute severe ulcerative colitis: A placebo controlled randomized trial. *Expert Rev Anti Infect Ther* 2021;19(7):949–55. doi: 10.1080/14787210.2021.1856656.
- Lamb CA, Kennedy NA, Raine T, et al; IBD Guidelines eDelphi Consensus Group. British Society of Gastroenterology consensus guidelines on the management of inflammatory bowel disease in adults. *Gut* 2019;68 Suppl 3:s1–106. doi: 10.1136/gutjnl-2019-318484.
- McCurdy JD, Israel A, Hasan M, et al. A clinical predictive model for post-hospitalisation venous thromboembolism in patients with inflammatory bowel disease. *Aliment Pharmacol Ther* 2019;49(12):1493–501. doi: 10.1111/apt.15286.
- Faye AS, Hung KW, Cheng K, et al. Minor hematochezia decreases use of venous thromboembolism prophylaxis in patients with inflammatory bowel disease. *Inflamm Bowel Dis* 2020;26(9):1394–400. doi: 10.1093/ibd/izz269.
- Ordás I, Eckmann L, Talamini M, Baumgart DC, Sandborn WJ. Ulcerative colitis. *Lancet* 2012;380(9853):1606–19. doi: 10.1016/S0140-6736(12)60150-0.
- Travis SP, Farrant JM, Ricketts C, et al. Predicting outcome in severe ulcerative colitis. *Gut* 1996;38(6):905–10. doi: 10.1136/gut.38.6.905.
- Fleshner PR, Schoetz DJ. Surgical management of ulcerative colitis. In: Wolff BG et al, editors. *The ASCRS textbook of colon and rectal surgery*. New York, NY: Springer, 2007, p. 567–83.
- Frizelle F, Burt MJ. Surgical management of ulcerative colitis. In: Holzheimer RG, Mannick JA, editors. *Surgical treatment: Evidence-based and problem-oriented*. Munich: Zuckschwerdt, 2001. Available at www.ncbi.nlm.nih.gov/books/NBK6931/ [Accessed 13 February 2024].
- Prudhomme M, Dozois RR, Godlewski G, Mathison S, Fabbro-Peray P. Anal canal strictures after ileal pouch-anal anastomosis. *Dis Colon Rectum* 2003;46(1):20–23. doi: 10.1007/s10350-004-6491-7.
- Shen B, Lian L, Kiran RP, et al. Efficacy and safety of endoscopic treatment of ileal pouch strictures. *Inflamm Bowel Dis* 2011;17(12):2527–35. doi: 10.1002/ibd.21644.
- Kiely JM, Fazio VW, Remzi FH, Shen B, Kiran RP. Pelvic sepsis after IPAA adversely affects function of the pouch and quality of life. *Dis Colon Rectum* 2012;55(4):387–92. doi: 10.1097/DCR.0b013e318246418e.
- Kariv R, Remzi FH, Lian L, et al. Preoperative colorectal neoplasia increases risk for pouch neoplasia in patients with restorative proctocolectomy. *Gastroenterology* 2010;139(3):806–12, 12 e1–2. doi: 10.1053/j.gastro.2010.05.085.
- Ishii H, Hata K, Kishikawa J, et al. Incidence of neoplasias and effectiveness of postoperative surveillance endoscopy for patients with ulcerative colitis: Comparison of ileorectal anastomosis and ileal pouch-anal anastomosis. *World J Surg Oncol* 2016;14(1):75. doi: 10.1186/s12957-016-0833-5.
- da Luz Moreira A, Kiran RP, Lavery I. Clinical outcomes of ileorectal anastomosis for ulcerative colitis. *Br J Surg* 2010;97(1):65–69. doi: 10.1002/bjs.6809.
- Michelassi F, Lee J, Rubin M, et al. Long-term functional results after ileal pouch anal restorative proctocolectomy for ulcerative colitis: A prospective observational study. *Ann Surg* 2003;238(3):433–45. doi: 10.1097/01.sla.0000086658.60555.ea.
- Cornish JA, Tan E, Teare J, et al. The effect of restorative proctocolectomy on sexual function, urinary function, fertility, pregnancy and delivery: A systematic review. *Dis Colon Rectum* 2007;50(8):1128–38. doi: 10.1007/s10350-007-0240-7.
- Potter DD, Moir CR, Day CN, Harmsen WS, Pemberton JH. Fertility and sexual function in women following pediatric ileal pouch-anal anastomosis. *J Pediatr Surg* 2020;55(1):59–62. doi: 10.1016/j.jpedsurg.2019.09.051.
- Remzi FH, Gorgun E, Bast J, et al. Vaginal delivery after ileal pouch-anal anastomosis: A word of caution. *Dis Colon Rectum* 2005;48(9):1691–99. doi: 10.1007/s10350-005-0124-7.
- Juhász ES, Fozard B, Dozois RR, Ilstrup DM, Nelson H. Ileal pouch-anal anastomosis function following childbirth. An extended evaluation. *Dis Colon Rectum* 1995;38(2):159–65. doi: 10.1007/BF02052444.

correspondence ajgp@racgp.org.au