

Is surgery in ulcerative colitis really decreasing, or are we just kicking the can down the road?

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Abstract

Ulcerative colitis (UC) is a chronic inflammatory bowel disease with increasing global prevalence. Colectomy remains a critical outcome, reflecting disease severity, treatment failure and long-term complications. Over the past 2 decades, the introduction of biologics, small-molecule therapies, and treat-to-target strategies has reshaped UC management and decreased the need for a colectomy. However, substantial geographical variability persists, and a therapeutic ceiling effect appears evident, with limited further reductions despite expanding therapeutic options. This review summarizes global trends in colectomy rates in UC, explores how evolving medical therapies and changing surgical indications have influenced these trends, and discusses implications for clinical practice. Future efforts should focus on optimizing early disease control, preventing long-term complications, and refining precision-based approaches to better modify disease trajectory—and consequently surgical risk—in order to break this ceiling.

Keywords Ulcerative colitis, surgery, colectomy, global

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Introduction

Ulcerative colitis (UC) is a chronic inflammatory bowel condition of unknown cause. The incidence and prevalence of UC have significantly increased in Western countries over the last decade [1]. The highest reported prevalence rates are in Europe and North America, 505/100,000 and 286/100,000,

with the average exceeding 0.3% according to a review of population-based studies [2].

UC typically presents with symptoms of rectal bleeding, diarrhea, abdominal pain and mucosal inflammation endoscopically [1]. At least 15% of patients present with acute severe ulcerative colitis (ASUC), a distinctive type, characterized by systemic inflammation and diarrhea, with each episode carrying a significant chance of surgical colectomy and mortality. The disease is assessed according to extent using the Montreal Classification [3], and severity commonly using the Simple Clinical Colitis Activity Index (SCCAI) [1], while for ASUC a disease severity stratification index, the Truelove and Witts criteria, is used to guide management [4].

Conventional therapies with aminosalicylates, immunomodulators and steroids are the mainstay of therapy [5]. However, the emergence of biologics (anti-tumor necrosis factor [TNF] medications and anti-integrins), and small molecule drugs that target different molecular pathways, has transformed clinical practice. As the armamentarium of advanced therapies continues to grow from the initial anti-TNFs and anti-integrins, several drugs have been introduced in rapid succession since 2017. These include interleukin (IL) antagonists, such as ustekinumab (IL-12/23), and risankizumab/mirikizumab (p19 IL-23), Janus kinase (JAK) inhibitors (tofacitinib, filgotinib, upadacitinib) and sphingosine-1-phosphate receptor modulators (ozanimod and etrasimod) [5]. In parallel, several initiatives, such as STRIDE-2 and SPIRIT, now define treatment targets and endpoints for trials to study and modulate the impact on disease

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progression [6,7]. Prevention of surgery and hospitalization are 2 of the medium-term therapeutic goals identified for UC [6].

With the advent of several new drugs and evolving treatment paradigms, the question arises of whether such interventions, introduced over the years, have altered the course of the disease and the trajectory to surgery. Earlier studies from the 1990s reported 10-year cumulative colectomy rates of >10%, with rates ranging between 13.7% and 28% [8-10]. A systematic review of studies published up to 2021, reported 10-year post diagnosis pooled colectomy rate estimates of 10%, suggesting a decline, with a modest rate of change relative to the expansion of therapeutic options. However, this meta-analysis does not capture the global changes in the indications for colectomy (dysplasia vs. treatment-refractory UC), or the impact of new monitoring (home calprotectin kit, patient passport, risk prognostication) and multidisciplinary (MDT) strategies (MDT care of severe UC patients), or novel therapeutic approaches (prophylactic appendectomy, use of JAK-inhibitors), on colectomy rates [11].

The aims of this review are to summarize global surgical trends; to examine how key factors—including the evolution of medical therapy and changes in surgical indications—shape these trends; and to discuss the implications for clinical practice alongside future expectations for surgery in UC.

Global trends in colectomy rates

Worldwide colectomy rates vary across time periods and countries: however, most countries broadly suggest a modest downward trend for UC [11]. These trends are summarized in Fig. 1 and Supplementary Table 1. Tsai *et al*, in their meta-analysis, included 26 studies with UC patients between 1962

and 2016. The calculated 10-year global cumulative risk of colectomy was 13.3%, with a 5-year risk of 8.8% and a 1-year risk of 4%. A significant decline was calculated for UC patients in the 21st century, with a 10-year cumulative risk of 9.6%, a 5-year risk of 7% and a 1-year risk of 2.8% ($P<0.05$) [12].

However, a discrepancy was noted in colectomy rates between countries, probably related to the study design, the time of observation and the adoption of biologics in clinical practice. Country-specific, population-based studies from Europe have generally demonstrated a decline in colectomy rates, although the magnitude of this reduction varies according to the study period examined, which determines whether 5- or 10-year post-diagnosis surgical outcomes are reported. For 10-year colectomy studies, cases had to be registered in 2014-15 at the latest, and many studies of later cohorts have only reported 5-year rates. In recent pan-European studies, the cumulative 10-year colectomy risk (1991-2003) was 8.7% (781 UC patients from 9 European centers), which decreased significantly to 6% for patients studied between 2010-2020 (816 patients from 21 European centers) [13,14].

In Scotland, when colectomy rates were compared across 2 cohorts (2005-2009 and 2010-2014), a drop in colectomy rate from 12.3% to 9.2% at 5 years post diagnosis was observed [15].

These results are in line with similar data from Danish and Swedish studies, as detailed below. In Sweden, colectomy rates have declined over time, with Leijonmark *et al* initially reporting a decrease of 30.6% over the period 1955-1984 [8]. A later national cohort study by Eriksson *et al* estimated a 10-year cumulative risk of 13.5% for patients diagnosed 1963-2015; when stratified by era, the rate was found to progressively decline from 20.7% (1963-1975) to 12.9% (1976-1990) and 12.3% (1991-2005). Five-year colectomy rates fell from 20% in 1990 to 5% in 2014 [8,16].

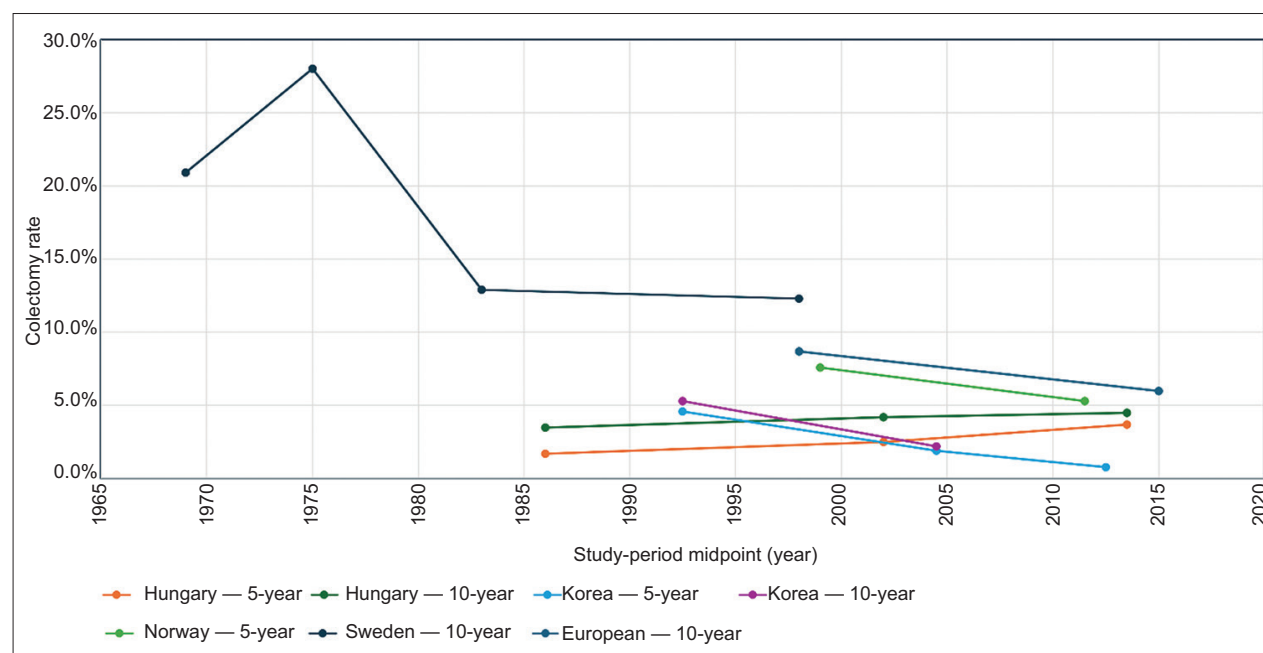


Figure 1 Five- vs. 10-year trends in colectomy rate by country

In Denmark there was a variability in colectomy rates. Older studies suggested that the 10-year cumulative colectomy risk decreased from 23-24% between 1960-1978 and 1962-1987 to 13.7% between 1973-1993 [17-20]. The 7-year risk decreased from 11.7% in the 1979-1986 cohort, to 7.5% in the later cohort between 2003 and 2011 ($P<0.001$) [21]. The annual colectomy risk decreased from 9.6% (1973-1993) to 3.2-6% in patients studied after 2003 [10,19,22].

In Norway, the 5-yearly colectomy rates were as low as 5.3% between 2005-2009 [23]. This was significantly better compared with a previous calculated cumulative risk of 7.6% from the IBSEN cohort, studying patients between 1990-1993 [24].

In Canada, Targovnik *et al*, in a bimodal study comparing 5-year periods, identified a decline in 10-year colectomy rates over time, from 12.2% between 1987-1991 to 9.3% between 1997-2001 [25]. Similarly, the 5-year colectomy rates declined from 8.7% in patients diagnosed between 1987 and 1994 to 5.8% for those diagnosed between 2002 and 2008. Khalil *et al* found that colectomy rates decreased from 11.8% in the pre-biologic era (1998-2004) to 9.5% in the post-biologic era (2005-2011) [26]. Kaplan *et al* reported a significant decline of 7.4% in the average annual colectomy rate between 1997 and 2009 [27].

In the United States, data from a large retrospective study of 58,681 UC patients between 2002-2013 showed a 2-yearly rate of 2.5%, despite infliximab introduction [28]. Several Asian studies also suggest a reduction in colectomy rates over the years, with the key difference of inexplicably much lower rates compared with Western countries [29]. In the SK-IBD cohort, cumulative 10-year colectomy rates decreased from 5.3% between 1986-1999 to 2.2% between 2000-2009 [30]. Cumulative 5-year colectomy rates also reduced from 4.6% to 1.9% for these time periods, with a further decrease to 0.8% between 2010-2015 [31].

When interpreting colectomy trends, it is important to recognize that the evidence base comprises studies of varying methodological quality. Population-based cohorts provide the most robust estimates, as they capture the full spectrum of disease severity, whereas referral-center cohorts often over-represent complex or treatment-refractory cases, which may inflate colectomy rates. This heterogeneity in study design contributes to variability in reported colectomy rates and underscores the need for cautious interpretation. Despite these limitations, an overall decline in colectomy rates has been observed since the introduction of biologics, and a therapeutic ceiling now appears to have emerged, with no further meaningful reduction even as the use of advanced therapies continues to expand in clinical practice [32].

Indications for surgery: elective vs. emergency

Some of the variations in colectomy rates may be due to a shift in the indication for surgery. Elective surgery is likely for refractory disease or cancer/dysplasia, whereas emergency surgery is lifesaving in the setting of ASUC [33]. Emerging biologics and small-molecule drugs are now more likely to shift

the paradigm from emergency to elective colectomy [34], while JAK inhibitors showed early promising results in ASUC [35]. Several studies have examined emergency colectomy rates nationwide.

In England, the rate of emergency colectomy between 2005 and 2013 has witnessed a steady decline from a crude rate of 9.4% to 7.3% [36], while others suggested a decline in colectomy during the acute admission from 8.7% in 2007 to 6.2% in 2017 [37]. Within a year from acute admission, colectomy rates also decreased from 6% in 2007 to 4.6% in 2017 [37]. Emergency colectomy rates during admission were lower than those reported in previous prospective cohorts, 29% between 1992-1993 and 15% between 2015-2019 [38,39].

Similarly, in the United States the emergency colectomy rate decreased from 21% in 2006 to 8% in 2018 [40], whereas in Japan the prevalence of emergency colectomy remained unchanged between 2007 and 2017 [41].

As already mentioned, the indication for surgery may influence the interpretation of surgical trends. Data from Japan showed a decrease in the prevalence of elective colectomy between 2007 and 2017, associated with a change in the surgical indication towards cancer or dysplasia, which increased from 20.2% of total cases in 2007 to 34.8% in 2017 [41]. This suggests less surgery for medical-refractory disease, possibly because of the efficacy of novel treatment in inducing long-term remission, yet such a beneficial decline is counterbalanced by surgery directed at an increased prevalence of dysplasia or cancer. Similarly, 6094 UC patients were studied in the Netherlands between 1991 and 2020, with outcomes divided into 3 time periods: 1991-2000, 2001-2010 and 2011-2020. The proportion of patients undergoing surgery for colorectal cancer increased significantly from 11.3% to 16.1% and 22.8%, respectively ($P<0.001$) [42].

Both studies suggest that surgery is no longer being undertaken for medically refractory disease, but rather for long-standing complications of UC, as a result of more effective therapies. To achieve an overall surgical reduction, a deeper understanding of what drives dysplasia is needed to mitigate this outcome through further research.

Impact of advanced medical therapies on surgical rates

The shift in treatment targets, from clinical response to clinical remission, endoscopic healing, histological remission and disease clearance, represents the impact of aspirational goals to prevent progressive disease and alter the disease trajectory, measured as a reduction in surgery—which is still applied in 10-20% of UC patients [1,7]. However, the evidence for the benefits of advances in medical therapies related to these aspirations remains conflicting, and sometimes below expectations, given that many therapies are now embedded in treatment pathways through several comprehensive guidelines [5,32]. This is an important consideration, because novel treatments incur substantial expenditure for healthcare systems across Europe. Healthcare costs are shifting from hospitalization and surgery to drug

expenditure and work productivity losses [43]. A multicenter European study calculated that biologics contributed to 48% of all costs attributed to UC [44]. Considering these observations, it becomes critical to determine whether these drugs have a tangible impact on UC outcomes to justify the expenditure [45].

In most studies reporting colectomy rates before and after biologics, the decline in colectomy was linked to an increase in their use. In a recent meta-analysis, where 31 studies yielded data on colectomy rates in 294,354 adult patients with UC before (pre-2004) and after (post-2004) the introduction of biologics, the relative risk for colectomy in the post-2004 studies was 0.71 (95% confidence interval [CI] 0.56-0.9, $P < 0.01$) at 5 years post-diagnosis, suggesting a significant risk reduction in the post-biologic era [11].

In Scotland, colectomy rates decreased from 1.47 colectomies per 100 patients in 2005 to 0.44 in 2018, as biologic initiation rate increased from 0.05 to 1.26 per 100 patients with UC ($P < 0.001$) [15]. Similarly, in Denmark, a decline in the 5-year probability of colectomy was observed, from 11.7% (1979-1986) to 7.5% (2003-2011), with a parallel significant increase in the use of anti-TNF agents and immunomodulators [21]. Likewise, a study from North America reported a parallel reduction in colectomy rates from 7.8 to 4.2 per 1000 person-years between 2007 and 2016, with an increase in biologic use from 131 to 589 per 1000 patient-years during the same period [46]. In another large-scale cohort study from the United States between 2015-2020, involving 115,260 UC patients, the prevalence of colectomy in those who received biologics was significantly lower (7.3%) compared with those who did not (11%; $P < 0.001$) [47].

However, several other studies failed to show such associations. In a recent meta-analysis, it was suggested that early biologic therapy led to higher odds of colectomy (odds ratio [OR] 2.86, 95%CI 1.30-6.30), perhaps because of significant disease severity (ASUC patients) [48]. In Hungary, the colectomy rates in a 40-year population-based study did not correlate with the increased cumulative probability of biologic therapy initiation [49]. Hawthorn also reported a significant rise in the number of UC patients treated with anti-TNF agents in Cardiff, Wales, from 7.8% in 2005-2008 to 27% between 2013-2016 ($P < 0.001$), with early sustained use increasing from 0.53% to 11.5%. Despite this, the likelihood of colectomy was paradoxically greater in anti-TNF treated patients, possibly because of propensity match failure between groups [50]. A Danish register-based study identified 2128 UC patients between 2003 and 2015 and studied the yearly biologic use and surgery rates. Despite a continued steady increase in the yearly percentage of biologic users from 0% to 5% in 2015, the yearly surgical rates declined initially from 3% in 2003 to 1% in 2010 and plateaued thereafter, suggesting that biologics may have delayed but not eliminated the need for surgery [51]. In the Netherlands, early (<6 months) colectomy rates declined from 1.5% in 1991-1997 to 0.5% in 1998-2005 but then remained static at 0.3% between 2006-2010, despite the introduction of biologics, while late (>6 months) colectomy rates showed no meaningful change, which is consistent

with outcomes typically seen in patients with more severe or refractory disease [52].

Overall, even with studies suggesting a reduction in surgery linked to increasing adoption of biologics, it remains important to recognize that all studies only showed indirect links or associations and not causation. There is still a paucity of data to show direct causality, which may not be possible given the follow-up periods required for medium-term outcomes.

Variability in outcomes largely reflects differences in study design, patient selection and confounding by indication. Referral-center cohorts often include patients with more aggressive or refractory disease, making biologic therapy appear neutral, or even associated with higher colectomy rates. In addition, biologics were frequently initiated in patients already at high surgical risk, particularly those with ASUC, which can create a paradoxical association between biologic use and colectomy. These factors, together with variability in treatment optimization and evolving indications for surgery, explain why some studies demonstrate a benefit while others do not.

However, evidence reporting a proportionate strength of the association with increasing use of drugs can infer causality in such settings as that of the Bradford Hill Criteria [53]. Since the introduction of advanced therapies, the treatment approach has evolved. The first shift was from episodic to maintenance therapy for the innovator biologic drug, infliximab. Following its introduction in 1999, there was a lag of about a decade for evidence about the benefits of maintenance therapy to be appreciated [54]. Thereafter, treatment approach shifted to dual therapy, followed by early therapy and treating to targets rather than symptoms [7,55]. All these confounders evolved gradually and it is difficult to measure or study their impact in the studies. Secondly, it is no longer sufficient to record drug prescribing, as we increasingly recognize therapeutic response as a factor in altering disease progression. Therapy linked to healing affects outcomes [7]. Thirdly, the response to advanced and biologic therapy relies on achieving therapeutic drug levels [56]. Drug escalation regimes to further optimize therapeutic responses are often not captured in population-based studies. Finally, disease-related factors, such as delay in diagnosis or treatment initiation, physical state and disease severity, may also influence the therapeutic response. This is particularly relevant for emergency surgery in ASUC, where age, disease duration, severity, albumin levels and C-reactive protein levels have prognostic implications and alter the pharmacokinetics of emergency infliximab therapy [57]. Given the pressures related to escalating drug costs, robust studies are warranted to examine the strength of this relationship.

Mitigating the risks of surgery in UC

Much of what we do in clinical practice is directed at improving outcomes, using evidence generated from clinical trials and observational studies to guide our therapeutic strategies. Translating knowledge from other disease states, such as Crohn's disease (CD), to UC is justifiable, given the clinical similarities between them. Several studies support

early therapy for CD to achieve lower surgery rates, even though the definitions of early therapy have evolved over the years from <2 years to <6 months. For instance, the median time of 6 weeks from diagnosis to therapy in the PROFILE study was associated with a week-48 surgery-free remission rate of 79% in the top-down group, compared with 15% for the accelerated step-up group ($P<0.001$) [58]. The SPRINT study is investigating the efficacy of top-down vs. step-up approaches in UC patients with disease duration less than 2 years, aiming to provide more robust evidence to support early therapy [59].

However, 2 studies show divergent effects of early therapy between CD and UC. A meta-analysis compiling 3 observational studies in UC showed that early biologic therapy was not associated with a lower risk of surgery, in contrast to CD (15 studies) [49]. The OR for colectomy with early biologics administered within 3 years for UC was 2.86 (95%CI 1.30-6.30), favoring delayed therapy, in contrast to CD (OR 0.63, 95%CI 0.48-0.84). The reasons remain unclear; however, it should be noted that the UC studies were all observational with 1 pediatric cohort, whereas the CD studies included 2 *post hoc* analyses of randomized controlled trials and 4 pediatric studies, and such heterogeneity may have affected the pooled data results. Definitions of early biologic therapy differed across these studies, ranging from 30 days to 3 years. Likewise, a recent study from Israel reported no significant differences in colectomy or steroid dependency rates between patients who were treated with early biologics (<3 months after diagnosis) and those treated late, after >1 year, while at the same time the probability of CD surgery 10 years post diagnosis was significantly lower for the early treated group [60]. A consensus on a consistent definition of “early” would be one step to facilitate valid comparisons of outcomes, and this definition might differ between CD (<6 months) and UC (<2 years).

The indications for surgery are also evolving. In the LIRIC trial, terminal ileum resection for isolated terminal ileum Crohn's disease resulted in a health-related quality of life at 1 year similar to that following infliximab therapy, thereby presenting early surgery as a viable option for surgical remission, rather than referring to it as treatment failure [61]. Whilst data to support early therapy in UC remain elusive, there is evidence for a shift in the indication for surgery moving from refractory disease and emergency surgery to elective surgery to manage disease complications [62]. Emerging evidence suggests that appendectomy may have a role in selected patients with UC, although current data remain preliminary. A large randomized controlled trial from 22 centers in Netherlands, Ireland and the UK (ACCURE trial) showed that patients undergoing appendectomy along with medical treatment had 20% less chance of relapsing within 1 year, compared with those on medical treatment only [63]. Short term results from the PASSION trial showed that 1/3 of treatment-refractory UC patients responded clinically after appendectomy, with 50% showing pathologic improvement based on the Geboes score [64]. Early results of the COSTA trial, based on a similar group, showed that refractory patients randomized to appendectomy rather than escalation to JAK

inhibitors had better chances to be in clinical remission in 12 months and avoid colectomy (33.8% vs. 12%) [65].

Minimally invasive surgical techniques, such as laparoscopic assisted colectomy and robotic assisted colectomy, can also improve surgical outcomes. Previous studies demonstrated that minimally invasive surgery offers less postoperative pain, a shorter length of stay, lower rates of incisional hernias, fewer intra-abdominal adhesions, and less chance of small bowel obstruction [66]. A recent meta-analysis of 11 non-randomized studies suggested that robotic assisted surgery had significantly fewer post procedural complications compared with a laparoscopic approach, even though the latter offered a shorter procedural time [67].

Establishing telemedicine systems to improve compliance, monitor treatment response and detect flares early may help to mitigate delays in management, hence decreasing the risk of surgery [68]. Mobile apps to document symptoms, monitored by a healthcare practitioner, can significantly assist with this goal [69]. IBD Passport can provide advice and education for travelers with inflammatory bowel disease (IBD), who often flare up during their journey, and guide them appropriately how to identify their symptoms and seek help early [70]. Home calprotectin kits (IBDoc™) can help in the adoption of a less paternalistic approach to patient monitoring, and ensure better compliance through self-monitoring and early escalation [71].

The MDT approach to decision making is also a tool that can decrease the risk of surgery, by guiding early intervention and mitigating gaps in patient care through a holistic approach. MDT working was adopted in the current guidelines and allowed earlier identification of colectomy patients, treatment optimization and planning [5]. A recent, single-center Chinese study showed that MDT discussion significantly improved preoperative diagnostic accuracy for patients with IBD who underwent surgery ($P<0.005$), decreased the frequency of elective surgery ($P<0.005$), and the rate of additional surgery or clinical recurrence [72]. Despite the strong recommendation in national guidelines, access to MDT remains uneven, with only a minority of services providing full integration in their clinical practice. As an example, a recent audit across 71 Australian hospitals showed that only 1 had a complete MDT service [73]. Widespread adoption of the MDT approach to IBD in clinical practice should be the gold standard in optimizing IBD care, improving time to treatment and diminishing delays in diagnosis [74-76].

Ultimately, a valid prediction model that identifies who is at risk of progressive disease requiring surgery for refractory, severe or complicated disease, allows us to focus therapy (top-down) or surveillance (more frequent) on each group. At the same time, the ability to predict therapeutic response through precision medicine will achieve earlier disease clearance and fulfil aspirations for modification of disease outcomes [77,78]. Prognostication with clinical factors associated with disease severity (age <40 years, male sex, extraintestinal manifestations, extensive colitis, disease extent progression, severe endoscopic activity, steroid refractoriness or dependence, disease duration >10 years, genetic screening, family history) can guide the clinician's approach [79].

Optimization of surveillance strategies, together with earlier identification and treatment of dysplasia, can support

an organ-sparing approach and reduce the future need for colectomy. Novel scoring systems are now able to dynamically predict the annual risk of colectomy [80], facilitating the development of individualized surveillance pathways. Advanced endoscopic techniques, such as endoscopic submucosal dissection, can achieve complete resection of high-risk colitis-associated neoplasia and thereby avoid the need for colectomy [81].

These interventions are presented to illustrate the breadth of evolving strategies that may influence future colectomy trends, and we acknowledge that they are supported by different levels of evidence. While improvements in medical therapy, surveillance strategies and care pathways may contribute to a reduction of colectomy rates, definitive causal relationships cannot be inferred without prospective, controlled studies designed to isolate the effect of these interventions.

Concluding remarks

Colectomy rates have declined in many countries over the past 2 decades, although the overall reduction has been modest outside the context of acute severe UC. Despite the widespread adoption of advanced therapies, a therapeutic ceiling appears to emerge, with limited further decreases in colectomy rates and a possible shift in surgical indications from medically refractory disease towards IBD-related dysplasia and cancer. These observations highlight the need for continued evaluation of how novel therapies influence more stringent clinical targets, such as disease clearance, as well as medium- and long-term outcomes, including cancer risk and the need for surgery. Early intervention, timely induction of remission, optimization of drug exposure, and appropriate escalation guided by clinical prognostication are all strategies that may influence long-term outcomes and warrant further study. While the need for colectomy is unlikely to be eliminated entirely, striving towards minimally invasive and safer colectomy—without compromising patient outcomes—may represent a realistic and clinically acceptable goal.

References

1. Le Berre C, Honap S, Peyrin-Biroulet L. Ulcerative colitis. *Lancet* 2023;**402**:571-584.
2. Ng SC, Shi HY, Hamidi N, et al. Worldwide incidence and prevalence of inflammatory bowel disease in the 21st century: a systematic review of population-based studies. *Lancet* 2017;**390**:2769-2778.
3. Satsangi J, Silverberg MS, Vermeire S, Colombel JF. The Montreal classification of inflammatory bowel disease: controversies, consensus, and implications. *Gut* 2006;**55**:749-753.
4. Truelove SC, Witts LJ. Cortisone in ulcerative colitis: final report on a therapeutic trial. *Br Med J* 1955;**2**:1041-1048.
5. Moran GW, Gordon M, Sinopolou V, et al; IBD guideline development group. British Society of Gastroenterology guidelines on inflammatory bowel disease in adults: 2025. *Gut* 2025;**74**:s1-s101.
6. Le Berre C, Peyrin-Biroulet L; SPIRIT-IOIBD study group. Selecting end points for disease-modification trials in inflammatory bowel disease: the SPIRIT consensus from the IOIBD. *Gastroenterology* 2021;**160**:1452-1460.
7. Turner D, Ricciuto A, Lewis A, et al; International Organization for the Study of IBD. STRIDE-II: an update on the selecting therapeutic targets in inflammatory bowel disease (STRIDE) initiative of the International Organization for the study of IBD (IOIBD): determining therapeutic goals for treat-to-target strategies in IBD. *Gastroenterology* 2021;**160**:1570-1583.
8. Leijonmarck CE, Persson PG, Hellers G. Factors affecting colectomy rate in ulcerative colitis: an epidemiologic study. *Gut* 1990;**31**:329-333.
9. Langholz E, Munkholm P, Davidsen M, Binder V. Course of ulcerative colitis: analysis of changes in disease activity over years. *Gastroenterology* 1994;**107**:3-11.
10. Wandall EP, Damkier P, Møller Pedersen F, Wilson B, Schaffalitzky de Muckadell OB. Survival and incidence of colorectal cancer in patients with ulcerative colitis in Funen county diagnosed between 1973 and 1993. *Scand J Gastroenterol* 2000;**35**:312-317.
11. Dai N, Haidar O, Askari A, Segal JP. Colectomy rates in ulcerative colitis: a systematic review and meta-analysis. *Dig Liver Dis* 2023;**55**:13-20.
12. Tsai L, Ma C, Dulai PS, et al. Contemporary risk of surgery in patients with ulcerative colitis and Crohn's disease: a meta-analysis of population-based cohorts. *Clin Gastroenterol Hepatol* 2021;**19**:2031-2045.
13. Hoie O, Wolters FL, Riis L, et al; European Collaborative Study Group of Inflammatory Bowel Disease. Low colectomy rates in ulcerative colitis in an unselected European cohort followed for 10 years. *Gastroenterology* 2007;**132**:507-515.
14. Wewer MD, Salupere R, Kievit HAL, et al; Epi-IBD group. P875 Disease course of ulcerative colitis during the first ten years following diagnosis in a prospective European population-based inception cohort—the Epi-IBD cohort. *J Crohns Colitis* 2023;**17**:i994-i995.
15. Jenkinson PW, Plevris N, Lyons M, et al. Analysis of colectomy rates for ulcerative colitis in pre- and postbiological eras in Lothian, Scotland. *Colorectal Dis* 2021;**23**:1175-1183.
16. Eriksson C, Cao Y, Rundquist S, et al. Changes in medical management and colectomy rates: a population-based cohort study on the epidemiology and natural history of ulcerative colitis in Örebro, Sweden, 1963-2010. *Aliment Pharmacol Ther* 2017;**46**:748-757.
17. Hendriksen C, Kreiner S, Binder V. Long term prognosis in ulcerative colitis—based on results from a regional patient group from the county of Copenhagen. *Gut* 1985;**26**:158-163.
18. Langholz E, Munkholm P, Davidsen M, Binder V. Course of ulcerative colitis: analysis of changes in disease activity over years. *Gastroenterology* 1994;**107**:3-11.
19. Jess T, Riis L, Vind I, et al. Changes in clinical characteristics, course, and prognosis of inflammatory bowel disease during the last 5 decades: a population-based study from Copenhagen, Denmark. *Inflamm Bowel Dis* 2007;**13**:481-489.
20. Wandall EP, Damkier P, Møller Pedersen F, Wilson B, Schaffalitzky de Muckadell OB. Survival and incidence of colorectal cancer in patients with ulcerative colitis in Funen county diagnosed between 1973 and 1993. *Scand J Gastroenterol* 2000;**35**:312-317.
21. Rungoe C, Langholz E, Andersson M, et al. Changes in medical treatment and surgery rates in inflammatory bowel disease: a nationwide cohort study 1979-2011. *Gut* 2014;**63**:1607-1616.
22. Vind I, Riis L, Jess T, et al; DCCD study group. Increasing incidences of inflammatory bowel disease and decreasing surgery rates in Copenhagen City and County, 2003-2005: a population-based study from the Danish Crohn colitis database. *Am J Gastroenterol* 2006;**101**:1274-1282.
23. Rönblom A, Holmström T, Tanghøj H, Karlsson U, Thörn M, Sjöberg D. Low colectomy rate five years after diagnosis of

- ulcerative colitis. Results from a prospective population-based cohort in Sweden (ICURE) diagnosed during 2005-2009. *Scand J Gastroenterol* 2016;**51**:1339-1344.
24. Solberg IC, Lygren I, Jahnsen J, et al; IBSEN Study Group. Clinical course during the first 10 years of ulcerative colitis: results from a population-based inception cohort (IBSEN Study). *Scand J Gastroenterol* 2009;**44**:431-440.
 25. Targownik LE, Singh H, Nugent Z, Bernstein CN. The epidemiology of colectomy in ulcerative colitis: results from a population-based cohort. *Am J Gastroenterol* 2012;**107**:1228-1235.
 26. Abou Khalil M, Boutros M, Nedjar H, et al. Incidence rates and predictors of colectomy for ulcerative colitis in the era of biologics: results from a provincial database. *J Gastrointest Surg* 2018;**22**:124-132.
 27. Kaplan GG, Seow CH, Ghosh S, et al. Decreasing colectomy rates for ulcerative colitis: a population-based time trend study. *Am J Gastroenterol* 2012;**107**:1879-1887.
 28. Kin C, Kate Bundorf M. As infliximab use for ulcerative colitis has increased, so has the rate of surgical resection. *J Gastrointest Surg* 2017;**21**:1159-1165.
 29. Song EM, Yang SK. Natural history of inflammatory bowel disease: a comparison between the East and the West. *Intest Res* 2022;**20**:418-430.
 30. Park SH, Kim YJ, Rhee KH, et al; Songpa-Kangdong Inflammatory Bowel Disease [SK-IBD] Study Group. A 30-year trend analysis in the epidemiology of inflammatory bowel disease in the Songpa-Kangdong district of Seoul, Korea in 1986-2015. *J Crohns Colitis* 2019;**13**:1410-1417.
 31. Cha JM, Park SH, Rhee KH, et al. Long-term prognosis of ulcerative colitis and its temporal changes between 1986 and 2015 in a population-based cohort in the Songpa-Kangdong district of Seoul, Korea. *Gut* 2020;**69**:1432-1440.
 32. Visser E, Luberto A, Heuthorst L, et al. The impact of advanced medical therapies on time to resection and colorectal cancer outcomes in ulcerative colitis patients undergoing colectomy. *J Crohns Colitis* 2025;**19**:jjaf015.
 33. DeLeon ME, Stocchi L. Elective and emergent surgery in the ulcerative colitis patient. *Clin Colon Rectal Surg* 2022;**35**:437-444.
 34. Kayal M, Saha A, Poojary P, et al. Emergent colectomy rates decreased while elective ileal pouch rates were stable over time: a nationwide inpatient sample study. *Int J Colorectal Dis* 2019;**34**:1771-1779.
 35. Manti M, Kamperidis N, Toskas A, Misra R, Arebi N. P0519 Upadacitinib in acute severe ulcerative colitis among previously anti-TNFα exposed patients. *J Crohns Colitis* 2025;**19**:i1065-i1066.
 36. Shaihi M, Dodd S, Kallis C, et al. Nationwide improvement in outcomes of emergency admission for ulcerative colitis in England, 2005-2013. *Aliment Pharmacol Ther* 2019;**50**:176-192.
 37. King D, Rees J, Mytton J, et al. The outcomes of emergency admissions with ulcerative colitis between 2007 and 2017 in England. *J Crohns Colitis* 2020;**14**:764-772.
 38. Travis SP, Farrant JM, Ricketts C, et al. Predicting outcome in severe ulcerative colitis. *Gut* 1996;**38**:905-910.
 39. Adams A, Gupta V, Mohsen W, et al. Early management of acute severe UC in the biologics era: development and international validation of a prognostic clinical index to predict steroid response. *Gut* 2023;**72**:433-442.
 40. Abd El Aziz MA, Larson DW, Grass F, et al. Emergent and urgent surgery for ulcerative colitis in the United States in the minimally invasive and biologic era. *Dis Colon Rectum* 2022;**65**:1025-1033.
 41. Uchino M, Ikeuchi H, Hata K, et al. Changes in the rate of and trends in colectomy for ulcerative colitis during the era of biologics and calcineurin inhibitors based on a Japanese nationwide cohort study. *Surg Today* 2019;**49**:1066-1073.
 42. Heuthorst L, Harbech H, Snijder HJ, et al. Increased proportion of colorectal cancer in patients with ulcerative colitis undergoing surgery in the Netherlands. *Am J Gastroenterol* 2023;**118**:848-854.
 43. Zhao M, Gönczi L, Lakatos PL, Burisch J. The burden of inflammatory bowel disease in Europe in 2020. *J Crohns Colitis* 2021;**15**:1573-1587.
 44. Burisch J, Vardi H, Schwartz D, et al; Epi-IBD group. Health-care costs of inflammatory bowel disease in a pan-European, community-based, inception cohort during 5 years of follow-up: a population-based study. *Lancet Gastroenterol Hepatol* 2020;**5**:454-464.
 45. Burisch J, Zhao M, Odes S, et al. The cost of inflammatory bowel disease in high-income settings: a Lancet Gastroenterology & Hepatology Commission. *Lancet Gastroenterol Hepatol* 2023;**8**:458-492.
 46. Barnes EL, Jiang Y, Kappelman MD, et al. Decreasing colectomy rate for ulcerative colitis in the United States between 2007 and 2016: a time trend analysis. *Inflamm Bowel Dis* 2020;**26**:1225-1231.
 47. Khoudari G, Mansoor E, Click B, et al. Rates of intestinal resection and colectomy in inflammatory bowel disease patients after initiation of biologics: a cohort study. *Clin Gastroenterol Hepatol* 2022;**20**:e974-e983.
 48. Law CCY, Tkachuk B, Lieto S, et al. Early biologic treatment decreases risk of surgery in Crohn's disease but not in ulcerative colitis: systematic review and meta-analysis. *Inflamm Bowel Dis* 2024;**30**:1080-1086.
 49. Wetwittayakhleng P, Gönczi L, Lakatos L, et al. Long-term colectomy rates of ulcerative colitis over 40 years of different therapeutic eras-results from a western Hungarian population-based inception cohort between 1977 and 2020. *J Crohns Colitis* 2023;**17**:712-721.
 50. Hawthorne AB, Arms-Williams B, Cannings-John R, et al. Impact of antitumour necrosis factor therapy on surgery in inflammatory bowel disease: a population-based study. *BMJ Open Gastroenterol* 2024;**11**:e001373.
 51. Qvist N, Vadstrup K, Alulis S, Borsi A, Munkholm P, Olsen J. Increased use of biologics in the era of TNF-α inhibitors did not reduce surgical rate but prolonged the time from diagnosis to first time intestinal resection among patients with Crohn's disease and ulcerative colitis - a Danish register-based study from 2003-2016. *Scand J Gastroenterol* 2021;**56**:537-544.
 52. Jeuring SF, Bours PH, Zeegers MP, et al. Disease outcome of ulcerative colitis in an era of changing treatment strategies: results from the Dutch population-based IBDL cohort. *J Crohns Colitis* 2015;**9**:837-845.
 53. Hill AB. The environment and disease: association or causation? *Proc R Soc Med* 1965;**58**:295-300.
 54. Papamichael K, Lin S, Moore M, Papaioannou G, Sattler L, Cheifetz AS. Infliximab in inflammatory bowel disease. *Ther Adv Chronic Dis* 2019;**10**:2040622319838443.
 55. Gold SL, Steinlauf AF. Efficacy and safety of dual biologic therapy in patients with inflammatory bowel disease: a review of the literature. *Gastroenterol Hepatol (N Y)* 2021;**17**:406-414.
 56. Gordon BL, Battat R. Therapeutic drug monitoring of infliximab in acute severe ulcerative colitis. *J Clin Med* 2023;**12**:3378.
 57. Toskas A, Manti M, Kamperidis N, Arebi N. Infliximab precision dosing in inflammatory bowel disease (IBD) patients: a review of current literature. *Cureus* 2024;**16**:e76424.
 58. Noor NM, Lee JC, Bond S, et al; PROFILE Study Group. A biomarker-stratified comparison of top-down versus accelerated step-up treatment strategies for patients with newly diagnosed Crohn's disease (PROFILE): a multicentre, open-label randomised controlled trial. *Lancet Gastroenterol Hepatol* 2024;**9**:415-427.
 59. The SPRINT trial. Available from: <https://www.clinicaltrialsregister.eu/ctr-search/trial/2020-003420-16/ES>
 60. Lujan R, Buchuk R, Focht G, et al. Early initiation of biologics and disease outcomes in adults and children with inflammatory bowel diseases: results from the epidemiology group of the nationwide Israeli inflammatory bowel disease research nucleus cohort.

- Gastroenterology* 2024;**166**:815-825.
61. Ponsioen CY, de Groof EJ, Eshuis EJ, et al; LIR!C study group. Laparoscopic ileocaecal resection versus infliximab for terminal ileitis in Crohn's disease: a randomised controlled, open-label, multicentre trial. *Lancet Gastroenterol Hepatol* 2017;**2**:785-792.
 62. Baek SJ, Lee KY, Song KH, Yu CS. Current status and trends in inflammatory bowel disease surgery in Korea: analysis of data in a nationwide registry. *Ann Coloproctol* 2018;**34**:299-305.
 63. ACCURE Study Group. Appendectomy plus standard medical therapy versus standard medical therapy alone for maintenance of remission in ulcerative colitis (ACCURE): a pragmatic, open-label, international, randomised trial. *Lancet Gastroenterol Hepatol* 2025;**10**:550-561.
 64. Sahami S, Wildenberg ME, Koens L, et al. Appendectomy for therapy-refractory ulcerative colitis results in pathological improvement of colonic inflammation: short-term results of the PASSION study. *J Crohns Colitis* 2019;**13**:165-171.
 65. Visser E; COSTA study group. DOP053 Efficacy of appendectomy in inducing remission in moderate-to-severe ulcerative colitis: preliminary one year results of a multicentre prospective cohort study (COSTA). *J Crohns Colitis* 2025;**19**:i187-i189.
 66. Lee GC, Bhamra AR. Minimally invasive and robotic surgery for ulcerative colitis. *Clin Colon Rectal Surg* 2022;**35**:463-468.
 67. Zaman S, Mohamedahmed AYY, Abdelrahman W, et al. Minimally invasive surgery for inflammatory bowel disease: a systematic review and meta-analysis of robotic versus laparoscopic surgical techniques. *J Crohns Colitis* 2024;**18**:1342-1355.
 68. George LA, Cross RK. Remote monitoring and telemedicine in IBD: are we there yet? *Curr Gastroenterol Rep* 2020;**22**:12.
 69. Park M, Lee J, Cheon JH, Yoon N, Yu J, Nam H. User-needs based app for patients with inflammatory bowel disease: development and usability study. *BMC Health Serv Res* 2025;**25**:1285.
 70. Philip V, Soubieries A, Poullis A. Health concerns associated with travelling with inflammatory bowel disease (IBD): a questionnaire survey. *Clin Med (Lond)* 2018;**18**:288-292.
 71. Hejl J, Theede K, Møllgren B, et al. Point of care testing of fecal calprotectin as a substitute for routine laboratory analysis. *Pract Lab Med* 2018;**10**:10-14.
 72. Wu Q, Wang X, Wu F, et al. Role of a multidisciplinary team (MDT) in the diagnosis, treatment, and outcomes of inflammatory bowel disease: a single Chinese center's experience. *Biosci Trends* 2021;**15**:171-179.
 73. Godfrey D, Koczanowski S, Selvarajah J, Gao W, Segal J, Pellino G. Exploring the evidence that supports the benefits of the multidisciplinary team in inflammatory bowel disease. *Am J Med* 2025;**138**:1724-1733.
 74. IBD UK. IBD Standards: core statements. London: IBD UK; 2019. Available from: <https://ibduk.org/ibd-standards> [Accessed 22 September 2026].
 75. Kim SH, Buhle A, Roberts A, et al. Multidisciplinary inflammatory bowel disease conference: the impact of the expert pathologist on patient care. *Inflamm Bowel Dis* 2024;**30**:1482-1491.
 76. Kuriakose Kuzhiyanjal AJ, Limdi JK. Management of acute severe ulcerative colitis-an update for generalist and specialist clinicians. *Br Med Bull* 2024;**151**:3-15.
 77. Lamb CA, Saifuddin A, Powell N, Rieder F. The future of precision medicine to predict outcomes and control tissue remodeling in inflammatory bowel disease. *Gastroenterology* 2022;**162**:1525-1542.
 78. Vieujean S, Louis E. Precision medicine and drug optimization in adult inflammatory bowel disease patients. *Ther Adv Gastroenterol* 2023;**16**:17562848231173331.
 79. Torres J, Caprioli F, Katsanos KH, et al. Predicting outcomes to optimize disease management in inflammatory bowel diseases. *J Crohns Colitis* 2016;**10**:1385-1394.
 80. Wijnands AM, Penning de Vries BBL, Lutgens MWMD, et al; Dutch Initiative on Crohn and Colitis (ICC). Dynamic prediction of advanced colorectal neoplasia in inflammatory bowel disease. *Clin Gastroenterol Hepatol* 2024;**22**:1697-1708.
 81. East JE, Gordon M, Nigam GB, et al. British Society of Gastroenterology guidelines on colorectal surveillance in inflammatory bowel disease. *Gut* 2025;**75**:e335023.

Supplementary material

Supplementary Table 1 Ulcerative colitis (UC) colectomy rates by country

Country	Author [ref.]	Study type	Publication date	Total sample size (UC cohort)	Study period	1-year%	2-year%	3-year%	5-year%	10-year%	20-year%	30-year%
Denmark	Jess [19]	Population-based	2007	1575	1962-1987	9	—	—	—	24	—	—
Denmark	Jess [19]	Population-based	2007	1575	1991-1993	11	—	—	—	24	—	—
Denmark	Jess [19]	Population-based	2007	1575	2003-2004	6	—	—	—	24	—	—
Denmark	Rungoe [21]	Nationwide cohort	2014	35,782	1979-1986	11.7	—	—	—	—	—	—
Denmark	Rungoe [21]	Nationwide cohort	2014	35,782	2003-2011	7.5	—	—	—	—	—	—
Denmark	Vind [22]	Population-based	2006	562	2003-2005	6	—	—	—	—	—	—
Hungary	Wetttayakhlang [50]	Population-based	2023	1370	1977-1995	—	—	—	1.7	3.5	—	—
Hungary	Wetttayakhlang [50]	Population-based	2023	1370	1996-2008	—	—	—	2.5	4.2	—	—
Hungary	Wetttayakhlang [50]	Population-based	2023	1370	2009-2018	—	—	—	3.7	4.5	—	—
Sweden	Leijonmark [8]	Population-based	1990	1586	1960-1990	—	—	—	20	28	45	—
Sweden	Eriksson [16]	Population-based	2017	1428	1963-1975	—	—	—	—	20.9	—	—
Sweden	Eriksson [16]	Population-based	2017	1428	1976-1990	—	—	—	—	12.9	—	—
Sweden	Eriksson [16]	Population-based	2017	1392	1991-2005	—	—	—	—	12.3	—	—
Norway	Solberg [24]	IBSEN cohort	2009	519	1994-2004	3.5	—	—	7.6	9.8	—	—
Norway	Ronnblo [23]	Population-based	2016	524	2009-2014	—	—	—	5.3	—	—	—
Scotland	Jenkinson [15]	Registry	2020	2720	2005-2009	3.5	—	8.8	12.3	—	—	—
Scotland	Jenkinson [15]	Registry	2020	2720	2010-2014	3.9	—	7.3	9.2	—	—	—
Scotland	Jenkinson [15]	Registry	2020	2720	2015-2018	4.6	—	5.4	—	—	—	—
Wales	Hawthorne [51]	Population-based	2024	1250	2005-2016	—	—	—	6.6	—	—	—
European	Hoie [13]	Multinational cohort	2007	781	1993-2003	—	—	—	—	8.7	—	—
European	Wewer [14]	Multinational cohort	2019	816	2010-2020	—	—	—	—	6	—	—
USA	Kin [28]	Nationwide cohort	2017	58,681	2003-2004	—	1.6	—	—	—	—	—
USA	Kin [28]	Nationwide cohort	2017	58,681	2007-2011	—	2.5	—	—	—	—	—
USA	Barnes [47]	Nationwide cohort	2020	93,930	2007-2016	—	—	—	—	2.4	—	—
Canada	Targownik [25]	Population-based	2012	3752	1984-2008	—	—	—	7.5	10.4	14.8	—
Korea	Cha [31]	Population-based	2019	1013	Cumulative	1	—	—	1.9	2.2	5.1	6.4
Korea	Cha [31]	Population-based	2019	1013	1986-1999	4.6	—	—	4.6	5.3	8.5	9.8
Korea	Cha [31]	Population-based	2019	1013	2000-2009	0.7	—	—	1.9	2.2	—	—
Korea	Cha [31]	Population-based	2019	1013	2010-2015	0	—	—	0.8	—	—	—