Annals of Gastroenterology (2026) **39,** 1-14

A guide to healthcare maintenance for the patient with inflammatory bowel disease

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Abstract

Healthcare maintenance plays a vital role in the long-term management of patients with inflammatory bowel disease (IBD), particularly those receiving immunosuppressive therapies. This review emphasizes the importance of maintaining up-to-date vaccinations, regular bone and mental health assessments, and appropriate cancer screening in this population. It also highlights the added complexity of preventive care in immunosuppressed patients, outlining specific modifications to vaccination and screening strategies required to ensure safe and effective disease management. Gastroenterologists and other clinicians involved in IBD care should remain familiar with current guidelines and consistently integrate preventive health measures into routine clinical practice.

Keywords Healthcare maintenance, inflammatory bowel disease, preventive care, screening, vaccinations

Ann Gastroenterol 2026; 39 (XX): 1-14

Introduction

Inflammatory bowel disease (IBD) is a chronic inflammatory disorder of the gastrointestinal tract that is characterized by a relapsing–remitting course [1]. IBD is broadly classified into 2 main subtypes, ulcerative colitis (UC) and Crohn's disease (CD), which differ in their clinical presentation, anatomical distribution and histopathological features [2-4]. IBD can affect people at any age, but is most frequently diagnosed in young adults aged between 20 and 40 years [5-7]. The global burden of IBD is increasing [8].

The exact etiology of IBD remains unclear, though genetic, environmental and microbial factors have all been implicated [5,9]. Current treatment strategies rely on corticosteroids, immunomodulators, biologic agents and small molecules, with surgical intervention reserved for refractory or complicated cases. However, immunosuppressive therapies increase susceptibility to infections, complicating disease management [10,11]. This highlights the importance of preventive care in patients with IBD [6], particularly with regard to adherence to recommended immunizations.

In addition to the risk of infection, patients with IBD face a higher likelihood of developing certain malignancies, most notably colorectal cancer (CRC) [12], warranting both age-appropriate and disease-specific surveillance [13]. Assessment of nutritional status is also essential, since malnutrition and micronutrient deficiencies are common in IBD, underscoring the need for routine screening and dietary interventions [14]. Similarly, osteopenia and osteoporosis are also prevalent, prompting recommendations for bone density screening [15]. Furthermore, the chronic and debilitating nature of IBD significantly impacts quality of life, making regular screening for depression and anxiety an integral component of comprehensive care. Lifestyle factors, such as tobacco use,

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Conflict of Interest: Dr. Farraye has served as a Consultant for Astellas, Avalo Therapeutics, Bausch, BMS, Braintree Labs, Fresenius Kabi, GI Reviewers, IBD Educational Group, Iterative Health, Janssen, Pharmacosmos, Pfizer, Sandoz Immunology, Viatris. He sits on a DSMB for Eli Lilly and Moon Lake

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Received 8 January 2026; accepted 23 May 2026; published online 9 July 2026

DOI: https://doi.org/10.20524/aog.2026.1091

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also require close monitoring, as smoking has particularly detrimental effects in CD [16].

Despite these well recognized risks, studies consistently show that preventive care measures are underutilized in the IBD population [2]. Barriers include limited awareness, reluctance to manage immunizations in immunosuppressed patients, and poor communication between providers [6]. Additional challenges, such as time constraints, competing clinical priorities and financial costs, further contribute to these gaps. As a result, many patients fail to receive optimal vaccination, dietary counselling, cancer surveillance, bone health monitoring and mental health care [6,17].

To overcome these deficiencies, closer collaboration between primary care physicians, gastroenterologists and other specialists is needed to deliver comprehensive, multidisciplinary care. Strengthening preventive care strategies is crucial, not only because of the disease's chronic and complex nature but also considering its rising global prevalence.

This manuscript reviews preventive care guidelines and clinical recommendations for patients with IBD, with a focus on nutrition, mental health, smoking cessation, bone health, vaccinations and cancer screening.

Nutrition

Diet plays an important role in the general health of patients with IBD, directly influencing gut microbiota [18]. Nutritional management in patients with IBD should focus on promoting a sustainable diet and supporting overall health. Current evidence shows that a balanced Mediterranean diet is advised for all patients with IBD unless they have a contraindication, such as a stricture [19]. This diet, rich in fruits, vegetables, whole grains, lean proteins and unsaturated fats, and low in added sugar, salt, red meats and ultra-processed foods, is considered beneficial and safe [19]. Chicco *et al* reported that adherence to this diet over a 6-month period was associated with decreased disease activity, reduced inflammatory biomarkers, and an improved quality of life in patients with UC and CD [18]. The specific carbohydrate diet, a grain-free and low-sugar regimen that restricts complex carbohydrates, has shown efficacy comparable to the Mediterranean diet in patients with IBD [20]. It is important to recognize that overly restrictive dietary practices, often adopted by patients who have concerns about food-triggered disease flares, may be more harmful than beneficial, and should be discouraged [21,22]. Legumes, fruits and vegetables are frequently avoided out of fear of symptom exacerbation; however, this practice is not supported by current evidence. On the contrary, some studies suggest that higher legume consumption is associated with a significantly lower risk of relapse [21]. Therefore, except in patients with symptomatic bowel strictures, where a low-residue diet may be temporarily indicated to reduce the risk of obstruction, individuals with IBD should be encouraged to maintain a balanced and varied diet [19].

Attention to micronutrients is essential, particularly iron, calcium, vitamin D, vitamin B9 and vitamin B12, as IBD can impair absorption and increase the risk of deficiencies [23]. Iron deficiency and iron deficiency anemia are common, resulting from malabsorption, poor intake and/or chronic blood loss. Symptoms include fatigue, pallor and headaches. Oral iron-rich foods are recommended (e.g., animal products, beans, lentils, peas), but in cases of malabsorption, intolerance to oral supplementation, a hemoglobin below 10 g/dL, and the need for erythropoiesis-stimulating agents, parenteral iron infusions should be recommended [24-26]. Intravenous iron dosing in IBD should be based on the hemoglobin level and the body weight, using simplified dosing tables recommended by the European consensus. These dosing schemes estimate a total iron requirement of around 1000-2000 mg, depending on the severity of the anemia and whether the patient's body weight is below or above 70 kg [26,27]. Vitamin B12 deficiency occurs in patients with ileal CD, those who have undergone an ileal resection exceeding 20 cm, or patients with UC and an ileal pouch. It manifests as megaloblastic anemia and neurological symptoms, often with elevated levels of homocysteine and methylmalonic acid [28]. Parenteral supplementation is indicated in cases of ileal disease or resection exceeding 20 cm [25]. Patients with IBD are also prone to vitamin B9 deficiency due to malabsorption, dietary avoidance of green vegetables and the use of certain drugs, such as methotrexate and sulfasalazine [29]. Given its essential role in nucleic acid and protein synthesis, folic acid supplementation is routinely recommended to prevent related complications. The appropriate dose should be individualized based on clinical context; for example, in patients receiving methotrexate, folic acid supplementation (e.g., 5 mg administered 2-3 days after methotrexate dosing) is recommended to reduce drug-related toxicity [29]. Magnesium is another key nutrient that is often low in IBD [30]. Accumulating evidence indicates that magnesium supports normal circadian rhythm and sleep regulation; accordingly, correction of magnesium deficiency may contribute to improved sleep quality and overall disease course in IBD patients [30]. Calcium and vitamin D deficiencies are common, and increase the risk of osteopenia and osteoporosis [25]. Supplementation with 1000-1500 mg/day of calcium is recommended, particularly for patients on steroids [23].

It should be noted that there are some non-evidence-based practices that should be discouraged. Some patients take high-protein powders to counteract malnutrition, but beyond meeting increased protein needs there is no proven IBD-specific benefit. In parallel, historically used markers, such as serum proteins (e.g., albumin), lack specificity for nutritional status and are highly influenced by inflammatory activity, limiting their reliability in assessing true nutritional status [19]. Likewise, off-label use of anabolic–androgenic steroids (performance-enhancing drugs) have no role in IBD management and expose patients to serious risks, such as liver injury and metabolic effects [31].

Mental health

IBD is associated with an increased risk of psychiatric comorbidities, including anxiety, depression and post-traumatic stress disorder, largely due to the chronic debilitating nature of

the disease [32]. The prevalence of these conditions ranges from 11.1-40%, depending on age, disease type and severity [33]. This contributes to fatigue, sleep disturbances and impaired quality of life, highlighting the importance of psychological care [34,35]. A study by Hill *et al* found that patients with IBD and psychiatric comorbidities incurred higher hospitalization costs and experienced longer, and more frequent hospital admissions compared to those without mental illness [36]. Depression is a major risk factor for suicidality, underscoring the importance of early recognition and intervention [37].

Despite this, up to 60% of patients with IBD are not screened for mental health conditions during routine clinical visits [33]. Healthcare providers are urged to use validated screening tools [38]. The Patient Health Questionnaire is a practical option for depression screening, with a sensitivity of 88%. It includes 9 questions, scored on a scale of 0 (no symptoms) to 3 (depressive symptoms), and assesses factors such as appetite, level of interest, and concentration. A score equal to or above 10 indicates clinical depression, and 1 item specifically assesses suicidal ideation [33,37]. Another screening tool, the Luebek interview, is a 10-min structured assessment for psychological distress [39].

These tools can help determine when referral to a mental health professional is warranted [40, 41]. Clinicians should actively identify distress symptoms and provide interventions to reduce their impact on disease outcomes [33]. Education and self-management tools can empower patients to better cope with psychological challenges, improve quality of life, and enhance disease management.

Other approaches, such as physical activity and mind–body interventions, are increasingly recognized as valuable adjuncts in the management of IBD. Regular exercise is associated with improvements in disease-related symptoms, fatigue and overall quality of life [42]. In addition, structured mind–body approaches, particularly yoga, have demonstrated beneficial effects on psychological well-being, including significant reductions in anxiety, depression and perceived stress, while also improving health-related quality of life [43]. Other complementary interventions such as acupuncture may offer benefits through modulation of inflammatory pathways and symptom improvement [44]. Data on Pilates in IBD are currently scarce; however, evidence from irritable bowel syndrome populations suggests potential benefits in reducing fatigue and improving mood, indicating a possible role in IBD that warrants further investigation [45]. Overall, individualized exercise programs and relaxation-based therapies may be recommended as supportive strategies to enhance both mental and physical health in patients with IBD, while acknowledging that evidence for certain modalities remains preliminary.

Smoking

Tobacco use increases the risk of CD, and although it appears to have a protective effect in UC [46], the overall harms outweigh any potential benefit. Smokers with IBD generally have a more severe disease course, higher rates of extraintestinal manifestations (e.g., lung cancer, skin lesions, arthritis), and a poorer response to therapy [6,47,48]. Smoking cessation is strongly recommended for all patients with IBD. Ryan *et al* demonstrated that patients who quit smoking required fewer surgical interventions than those who continued smoking [49]. Patients with IBD should also be counseled against the use of e-cigarettes and vaping, as these products should not be considered safe alternatives to conventional smoking. Although data specific to IBD are limited, current evidence does not demonstrate any benefit on disease outcomes, and some studies suggest potential adverse effects on gastrointestinal health [50]. Furthermore, given their known systemic risks, including respiratory and cardiovascular complications, clinicians should strongly recommend cessation of all nicotine-containing products, including e-cigarettes, as part of routine healthcare maintenance [50].

Nevertheless, many patients face challenges when attempting to quit smoking. Cessation strategies include educational programs, public health campaigns and pharmacotherapy, including anti-craving medications and nicotine replacement therapy, though the risks of these interventions, such as headaches, vomiting and withdrawal, should be considered [51,52]. Despite the importance of smoking history, studies show that 21% of patients with CD and 44% of patients with UC are never asked about smoking by their healthcare providers [53]. Routine screening for tobacco use should occur at every patient encounter.

Cardiovascular risk

Patients with IBD have an increased risk of atherosclerotic cardiovascular disease (ASCVD), specifically during periods of inflammation. A Danish Nationwide Cohort study of patients with IBD demonstrated a significantly elevated risk of myocardial infarction, stroke and cardiovascular mortality compared with matched controls. This higher risk was primarily observed during periods of active disease, including flares and disease activity [54]. Furthermore, certain anti-inflammatory therapies, such as glucocorticoids, may paradoxically increase cardiovascular risk [55]. Advanced therapies, such as Janus kinase (JAK) inhibitors, were found to carry an increased risk for major adverse cardiovascular events in the rheumatoid arthritis studies; however, real-world evidence amongst patients with IBD did not show a difference in cardiovascular event risk between JAK inhibitors and anti-tumor necrosis factor alpha (anti-TNF) agents [56, 57]. While JAK inhibitors may carry a unique cardiovascular risk, the 2025 American Gastroenterological Association (AGA) guidelines state that it would still be reasonable to use them cautiously in patients at high risk for ASCVD [58]. Close discussion between gastroenterologists and primary care physicians in patients who possess risk factors for cardiovascular disease should take place. Practical implementation should include baseline ASCVD risk stratification using standard calculators, systematic assessment and management of traditional risk factors (blood pressure, lipid profile, diabetes, smoking), parallel monitoring of inflammatory activity, structured

medication review (particularly steroid exposure), and lifestyle counseling by the treating team [59]. It is important to consider referral to a cardiologist when ASCVD is established, risk is high, or symptoms warrant specialist evaluation.

Bone health assessment

Osteoporosis is a common complication of IBD, with prevalence rates up to 42% [60]. The risk is higher in patients with CD compared to those with UC [61]. Several factors contribute to osteoporosis in IBD, including corticosteroid use, dietary restrictions, nutritional deficiencies and genetic predisposition, but malabsorption remains the most significant cause of calcium and vitamin D deficiency [62-64].

According to AGA and American College of Gastroenterology (ACG) practice updates [65], patients with IBD who have conventional risk factors should undergo bone mineral density testing with dual-energy X-ray absorptiometry of the femur or lumbar spine at diagnosis to assess bone health and fracture risk [60,66]. This recommendation applies to patients with a history of vertebral fracture, postmenopausal women, patients younger than 40 years with multiple risk factors, and individuals on chronic corticosteroid therapy [60,66]. If results are normal, screening should be repeated every 5 years, or earlier if additional risk factors are present [67]. In patients younger than 40 years, including premenopausal women and men, screening is recommended only in the presence of multiple risk factors.

Patients with or at high risk of osteoporosis should receive calcium and vitamin D supplementation [66]. The recommended intake is 1000 mg of elemental calcium daily for young men and women, and 1500 mg daily for older men and post-menopausal women. This can be obtained through diet and/or supplementation. A thorough medical history should assess malabsorption or comorbid conditions, with dose adjustment as needed [60,68].

Estrogen therapy is approved by the Food and Drug Administration (FDA) for the prevention, but not treatment, of bone fractures in postmenopausal and hypogonadal premenopausal women [66]. Risks and benefits must be carefully considered, as estrogen therapy is associated with breast cancer, deep vein thrombosis and coronary artery disease. Using the lowest effective dose for the shortest duration when indicated is recommended [62,68].

Osteopenia is also prevalent in IBD, affecting around 40% of patients [69]. Risk factors for osteopenia mirror those for osteoporosis and include chronic corticosteroid use, malnutrition and reduced mobility. Patients with osteopenia should be managed proactively with calcium, vitamin D and lifestyle measures, and may be considered for bone-protective therapy on a case-by-case basis, as in the osteoporosis guidelines [69]. The key domains of healthcare maintenance in patients with IBD, along with their associated risks and recommended management strategies, are summarized in Table 1.

Table 1 IBD health maintenance: key domains and recommendations

Domain	Key issues in IBD	Recommendations/guidelines
Bone health	Up to 42% prevalence; higher in CD than UC; risk factors include corticosteroids, malabsorption, nutritional deficiencies	- DXA scan at diagnosis for at-risk patients (disease >3 months, vertebral fracture, postmenopausal women, <40 years with risk factors, chronic steroids). - Repeat every 5 years if normal; earlier if risk factors. - Supplement calcium (1000-1500 mg/day) + vitamin D. - Estrogen therapy only for prevention; lowest dose, shortest duration
Cardiovascular risk	Increased risk of ASCVD (MI, stroke), especially during active disease; contribution of systemic inflammation and corticosteroid use	-Assess baseline ASCVD risk using standard calculators -Screen and manage traditional risk factors - Minimize corticosteroid use when possible - Monitor disease activity and aim for tight inflammatory control - Use JAK inhibitors cautiously in high ASCVD risk patients - Encourage lifestyle modification (diet, exercise, smoking cessation)
Mental health	High prevalence of anxiety, depression, PTSD (11-40%). Associated with higher costs, hospitalizations, suicidality	- Routine screening recommended (e.g., PHQ-9, Luebek interview) - Refer to mental health professionals when indicated - Address suicidality promptly - Provide education and self-management tools
Nutrition	Diet influences microbiota. Risks from ultra-processed food, high sugar/salt, animal protein. Protective role of fiber (CD only). Deficiencies in iron, calcium, vitamin D, B12 common	- Mediterranean diet recommended - Avoid ultra-processed/high sugar/salt foods - Correct deficiencies: iron (oral or IV if malabsorption or intolerance to oral supplementation), B12 (parenteral if ileal disease/resection >20 cm), calcium+vitamin D - Monitor patients with ileal CD, resections, UC pouches
Smoking	Increases risk of CD, worsens course; protective effect in UC outweighed by harm. Poorer therapy response, more EIMs	- Strongly advise smoking cessation in all IBD. - Use education, campaigns, pharmacotherapy, nicotine replacement. - Screen for tobacco use at every visit

ASCVD, atherosclerotic cardiovascular disease; CD, Crohn's disease; DXA, dual-energy X-ray absorptiometry; EIM, extraintestinal manifestations; IBD, inflammatory bowel disease; IV, intravenous; MI, myocardial infarction; PHQ-9, Patient Health Questionnaire-9; PTSD, posttraumatic stress disorder; UC, ulcerative colitis

Tuberculosis screening

According to the current guidelines, the initial evaluation of patients with IBD includes a comprehensive clinical history, vaccination status review, and screening for infections such as tuberculosis (TB), hepatitis B, hepatitis C and varicella, along with baseline laboratory assessment. Among these, screening for latent TB is particularly critical, given the significant risk of reactivation with immunosuppressive and biologic therapies [70]. TB screening should be performed prior to initiation of immunosuppressive therapies, including biologic agents and JAK inhibitors. This recommendation is supported by expert guidelines, as anti-TNF agents and other biologic therapies are associated with an increased risk of TB reactivation, and may lead to disseminated disease in patients with untreated infection [71]. Accordingly, a comprehensive evaluation should be carried out, including assessment of TB risk factors and appropriate diagnostic testing. In patients diagnosed with latent TB, treatment should be initiated before starting biologic or other immunosuppressive therapies [71]. An individualized approach for repeat testing should be considered in patients who are at risk, and those living in endemic parts of the world.

Vaccination in patients with IBD

Patients with IBD, especially those on immunosuppressive medications, are at increased risk of infection. Although many of these infections are preventable with proper immunization, vaccination rates among patients with IBD remain low. Reluctance is often attributed to fear of adverse effects, despite the lack of evidence linking vaccination to IBD flares [6,72]. In general, patients with IBD are advised to follow the standard, age-appropriate vaccination schedule—ideally before initiating immunosuppressive therapy, as these treatments might decrease the immune response [25]. According to the Centers for Disease Control and Prevention, Advisory Committee on Immunization Practices (ACIP), and Infectious Diseases Society of America, inactivated and killed vaccines are safe for all patients with IBD, regardless of their immunosuppressive therapy. Live vaccines, however, should be used with caution, as they carry a risk of reactivating infection in immunosuppressed patients [73-75].

Recommended vaccines include the inactivated influenza vaccine, pneumococcal vaccines (PCV15, PPSV23, PCV 20 and PCV 21), hepatitis A and B vaccines, tetanus–diphtheria–pertussis, human papillomavirus (HPV) vaccine, meningococcal vaccine, inactivated recombinant herpes zoster vaccine, and several COVID-19 vaccines [65]. Household contacts of patients with IBD should also remain up to date with routine vaccinations, including live vaccines such as measles, mumps and rubella (MMR) vaccine, rotavirus (for infants aged 2-7 months), and varicella. Patients should avoid handling diapers of infants vaccinated with rotavirus for 4 weeks post-vaccination [6, 65]. For travel, household contacts may receive live vaccines, such as yellow fever and oral typhoid, but oral polio vaccine should never be used [25]. A summary of recommended vaccines, indications, dosing schedules, and key precautions in patients with IBD is provided in Table 2.

Hepatitis B vaccine

Both acute hepatitis B (HBV) infection and the reactivation of chronic HBV can occur in patients with IBD and may lead to severe complications [76]. The ACG and the European Crohn's and Colitis Organization (ECCO) recommend screening all patients with IBD for HBV infection at diagnosis [65,77]. Vaccination is recommended for non-immune patients [78,79]. Patients with antibodies to hepatitis B surface antigen (anti-HBs) less than 10 mIU/mL should receive a single challenge dose of hepatitis B vaccine. If antibody levels remain less than 10 mIU/mL after 4-8 weeks, a new full-dose series of hepatitis B vaccination should be administered [57]. Routine periodic monitoring of anti-HBs titers is generally not required in immunocompetent individuals who achieve protective levels; however, in immunocompromised patients, including those with IBD, who are receiving immunosuppressive therapy, periodic reassessment of anti-HBs titers may be considered to ensure maintenance of protective immunity. Post-vaccination serologic testing is particularly important in patients receiving immunomodulators or biologics, and the anti-HBs titers should be measured 1-3 months after vaccination to ensure an adequate response (anti-HBs ≥10 mIU/mL) [65]. There are several available vaccines. Engerix-B is given in 3 doses at 0, 1 and 6 months [80,81]. Heplisav-B, FDA-approved in 2017, is an inactivated yeast-derived vaccine that uses a new immunostimulatory adjuvant. It requires only 2 doses over 1 month and has shown higher immunogenicity than Engerix-B [82]. The recombivax HB vaccine may also be administered in a 2-dose schedule at 0 and 4-6 months for people aged 11-15 years. PreHevbrio is a 3-dose series administered at 0, 1 and 6 months. Similarly, Twinrix (hepatitis A and B) is also administered at 0, 1 and 6 months, in people aged 18 years and older [83]. Response rates to the HBV vaccines are lower in patients with IBD compared to the general population. However, booster shots and revaccination can improve protection by up to 50% [84,85]. ACIP currently recommends 2 doses of Heplisav-B for all patients with IBD older than 18 years [82]. In patients already receiving immunomodulator or biologic therapy at the time of initial vaccination assessment, vaccination should still be administered, although response rates may be reduced. In this setting, higher-dose (e.g., double-dose regimens of 40 μg per injection) or accelerated vaccine schedules (e.g., 0, 1, 2 and 6 months) may be considered to improve immunity, with post-vaccination serologic testing recommended to confirm an adequate response [86,87].

Influenza vaccine

Patients with IBD, especially those on glucocorticoids, thiopurines, JAK inhibitors or other immunosuppressants,

Table 2 Vaccination in patients with IBD

Vaccine	Indication in IBD	Schedule/Dosing	Cautions/Notes
Hepatitis B (Engerix-B, Heplisav-B, Recombivax HB PreHevbrio, Twinrix)	All patients with IBD without seroprotection	Please see text	Check anti-HBs 1-3 months post-vaccine. If <10 mIU/mL → revaccinate.
Influenza (inactivated)	All patients with IBD plus household contacts	Annual vaccination, ideally before fall season	Use high dose/recombinant/adjuvant vaccine for ≥65 years or anti-TNF users. Live intranasal vaccine contraindicated in immunosuppressed.
Pneumococcal (PCV13, 15 PPSV23, 20 and PCV 21)	All patients with IBD ≥50 and 19-49 if immunosuppressed	- PCV-20 or PCV-21 or PCV15 followed by PPSV23 ≥8 weeks later - PPSV23 booster after 5 years and at age 65	All adults with an age or risk indication for vaccination should receive PCV21, PCV20, or PCV15; when PCV15 is administered, it is followed by PPSV23. If PPSV23 given first, wait ≥1 year before PCV20 or PCV21.
Herpes zoster (Shingrix)	Patients with IBD ≥50 years (or ≥19 years if immunosuppressed)	2 doses, 2–6 months apart	Recombinant vaccine only (Shingrix). Live vaccine (Zostavax) no longer available in the US.
HPV (Gardasil-9)	Women and men, especially those <26 years; individualized for 27–45 years	2-3 doses over 6 months, depending on age of initiation	Safe in immunosuppressed patients. Still need routine cervical screening.
COVID-19 (mRNA, adenovirus, inactivated)	All patients with IBD, especially immunosuppressed	Primary series+boosters	Safe and effective in patients with IBD.
RSV (Arexvy, Abrysvo, mRESVIA)	Adults ≥75 years, or ≥60 years with risk factors	Single dose before RSV season	All patients aged 75 years and older and patients aged 60-74 with risk factors for adverse RSV outcomes.
Other inactivated vaccines (TDaP, hepatitis A, meningococcal, etc.)	As per age and travel guidelines	Standard schedules	Safe in IBD, regardless of immunosuppression.
Live vaccines (MMR, varicella, yellow fever, oral typhoid, live influenza, cholera)	Only in non-immune patients off immunosuppressants ≥3 months and not starting therapy within 6 weeks	Standard schedules	Contraindicated during immunosuppression. Household contacts may receive them but avoid exposure to rotavirus vaccine shedding.

HBs, hepatitis B surface antibody; TNF, tumor necrosis factor; HPV, human papillomavirus; IBD, inflammatory bowel disease; MMR, measles, mumps and rubella; mRNA, messenger RNA; PCV13/15/20/21, 13/15/20/21-valent pneumococcal conjugate vaccine; PPSV23, 23-valent pneumococcal polysaccharide vaccine; RSV, respiratory syncytial virus; TDaP, tetanus, diphtheria and acellular pertussis vaccine

have a higher risk of influenza infection and associated complications [57]. Annual vaccination reduces this risk across all patient groups. The ACIP and gastroenterology practice guidelines recommend yearly influenza vaccination before the fall season for all patients with IBD and their household contacts [88,89]. Although antibody responses may be reduced in patients receiving anti-TNF therapy, infliximab or tofacitinib [88], any degree of protection is considered beneficial. High-dose, recombinant or adjuvanted influenza vaccines should be administered to patients ≥65 years, and may be advantageous for patients on anti-TNF therapy, as they induce stronger antibody responses [57,90]. The live intranasal influenza vaccine is contraindicated in patients with IBD on immunosuppressants, and its use should also be avoided in household contacts, given the theoretical risks of viral transmission [65].

Pneumococcal vaccines

Patients with IBD face a higher risk of pneumococcal pneumonia, the third most common vaccine-preventable infection in this group [91,92]. While immunosuppressants such as anti-TNF agents and steroids may not directly increase risk, immune dysfunction in IBD contributes to susceptibility [80]. Vaccination mitigates the risk of severe disease [93]. Therefore, patients should be vaccinated as early as possible, preferably before the initiation of immunosuppressive therapy [80]. Previously, the 2 most common vaccines were the 13-valent pneumococcal conjugate vaccine PCV-13 (Prevnar or Prevnar 13®) and the 23-valent pneumococcal polysaccharide PPSV23 vaccine (Pneumovax®23). More recently, the 20-valent (PCV 20) and the 21-valent (PCV 21) pneumococcal conjugate vaccines have become available, and have simplified the vaccination schedule against pneumococcal infection [57,65]. According to recent recommendations from the ACIP, immunosuppressed patients should receive either a single dose of PCV-20 or PCV-21, or a dose of PCV15 first, followed by PPSV23 at least 8 weeks later. If PPSV23 is given first, PCV20 or PCV21 should be administered at least 1 year later [94,95]. Immunocompetent patients should receive 1 dose of PCV-20 or PCV-21 alone, or a dose of PCV-15 followed by a dose of PPSV23 1 year later [94].

Herpes zoster vaccine

Patients with IBD, particularly those with CD, are at increased risk of herpes zoster (HZ) [96], especially when using immunosuppressants such as tofacitinib [97], upadacitinib [98], corticosteroids, thiopurines or anti-TNF agents [99]. Two vaccines are approved: recombinant zoster vaccine (Shingrix) and the live attenuated zoster vaccine (Zostavax) [6]. Zostavax is no longer available in the United States, because of its poor efficacy and adverse effects [100]. The ACG and ECCO recommend administering zoster vaccination to immunocompetent patients with IBD aged 50 years and older [65,77,99], as well as immunosuppressed patients aged 19-49 years and patients at risk of needing immunosuppressive medications. These include patients aged over 40 with a prior history of HZ, those on repeated steroids, on combination therapy and those on tofacitinib or upadacitinib, as well as patients who are of Asian ethnicity, have a history of diabetes mellitus, or showed previous failure of anti-TNF therapy. In 2021, ACIP recommended administering 2 doses of Shingrix for the prevention of HZ in adults aged 19 years or older who are, or will be immunosuppressed as a result of disease or therapy [6,67,80]. Cost-effectiveness analyses also support vaccinating patients with IBD 18 years and older [101].

Human papilloma virus

Patients with IBD are at increased risk of cervical cancer, and this risk is further heightened by smoking and the use of immunosuppressants such as thiopurines [102]. Early vaccination has demonstrated significant protective effects against cervical intraepithelial neoplasia, reducing HPV-related cancer risk by up to 90% [103]. The ACOG and the ECCO recommendations include vaccination for immunosuppressed individuals [104,105]. There are 3 types of vaccines: the bivalent Cervarix vaccine, the quadrivalent Silagard vaccine, and the 9-valent Gardasil vaccine. All 3 can be safely used in immunocompromised patients, as they use non-live agents [102]. The preferred vaccine is Gardasil-9, administered as a 2- or 3-dose series over 6 months, depending on the age that the vaccine was initiated [106]; it is approved for use in men and women aged 9-45 years. For women aged 27-45, ACIP recommends individualized decision-making, as most have prior HPV exposure [6,107]. However, even completion of vaccination does not eliminate the necessity for routine cervical cancer screening, as vaccines do not provide protection against all high-risk HPV types that are associated with cancer [102].

COVID-19 vaccine

A study conducted by Khan *et al* revealed that patients with IBD had a comparable incidence of Coronavirus disease 2019 (COVID-19) compared to the general population [108], though corticosteroid use is linked with more severe outcomes [109]. Adverse event rates after vaccination are comparable to those without IBD [110]. COVID-19 vaccines elicit a protective immune response in all individuals with IBD, including older patients and those utilizing corticosteroids, thus underscoring the effectiveness of vaccination, even among immunosuppressed individuals at an increased risk of severe COVID-19 outcomes [111]. There are 3 types of available vaccines: messenger ribonucleic acid (mRNA) (Pfizer and Moderna), adenovirus vector vaccines (AstraZeneca, Sputnik, CanSino and Janssen/Johnson), and inactivated vaccines (Sinopharm and Sinovac) [110]. All are safe and effective in patients with IBD, including those who are immunosuppressed, though TNF antagonists may accelerate antibody decay, making booster doses essential [79].

RSV vaccine

The respiratory syncytial virus (RSV) is the second most common opportunistic infection in patients with IBD, and can lead to severe respiratory complications, especially in immunosuppressed and older individuals [112-115]. A retrospective study demonstrated that patients with IBD infected with RSV had a higher risk of hospitalization compared to healthy controls with RSV. The risk is heightened by corticosteroid use [116]. Immunization can prevent RSV infection, ideally just before the RSV season. In 2023, ACIP recommended a single dose of RSV vaccination for all adults aged more than 75 years, and for those aged 60 years and older who have a heightened risk of severe infection [113]. The newest recommendations recommend consideration of vaccination for adults aged 60-74 years with risk factors for adverse events, if infected with RSV [117]. Two vaccines are approved by the FDA for this purpose, the RSVpreF (ABRYSVO) (Pfizer) and RSVPreF3 (Arexvy) (GSK). Both are recombinant protein vaccines and target the prefusion form of the RSV F protein [113,118]. A third mRNA vaccine, mRESVIA (mRNA-1345), has also shown safety and efficacy [119].

Live vaccines

As previously stated, live attenuated vaccines (e.g., MMR, varicella, live influenza, yellow fever, cholera, oral typhoid) carry a risk of disseminated infection in immunosuppressed patients. They may be considered in selected patients on low-dose immunosuppression, but decisions should be individualized, involving the gastroenterologist, infectious disease specialist and patient consent [6,65,73,120].

MMR and varicella zoster vaccines are recommended for non-immune patients with IBD who have been off immunosuppression therapy for 3 months and are not expected to start therapy within 6 weeks [120]. Recommendations on the use of live vaccines, according to the level of immunosuppression, are outlined in Table 3.

Table 3 Guidelines for live vaccine use according to immunosuppression status [25,123]

Level of immunosuppression	Medications/doses	Guidelines for administration
High-level immunosuppression	- Patients on glucocorticoids (prednisone >20 mg/day for >2 weeks or within 3 months of stopping) - Patients on biologics (adalimumab, infliximab, vedolizumab, or ustekinumab) or discontinuation within 3 months - Patients on effective doses of methotrexate, 6-mercaptopurine, azathioprine or discontinuation within 3 months	- Live vaccines should not be administered to patients on high level immunosuppression - Vedolizumab users can receive live vaccines only if the benefits outweigh the risks, which should be assessed by the clinician
Low-level immunosuppression	-Patients on glucocorticoids (prednisone <20 mg/day for <2 weeks) - Patients on low dose methotrexate (<0.4 mg//kg/week), low dose azathioprine (<3.0 mg/kg/day), and 6-mercaptopurine (<1.5 mg/kg/day)	- Live vaccines can be safely administered ≥4 weeks after immunosuppression - Live vaccines should be avoided within 2 weeks of initiation of immunosuppression
No immunosuppression	- Patients who have discontinued immunosuppressive therapy for ≥3 months or those who are not on any immunosuppressive medications	- Live vaccines can be safely administered in this population

Cancer screening

Patients with IBD, particularly those receiving immunosuppressive therapies, face an increased risk of developing several malignancies [121]. This risk is attributed both to long-standing intestinal inflammation, and to impaired immune surveillance caused by immunosuppressive medications [122]. Recognizing this vulnerability is essential, as it allows clinicians to select appropriate cancer screening modalities with the goal of reducing morbidity and mortality. The relative cancer risks, contributing factors and screening recommendations for patients with IBD are summarized in Table 4.

Colorectal cancer (CRC)

The risk of CRC in patients with IBD is approximately 2-fold higher than in the general population, primarily because of chronic colonic inflammation and immune dysregulation [123-125]. While average-risk individuals undergo colonoscopy every 10 years starting at the age of 45 [126], the AGA recommends that patients with IBD begin screening colonoscopy no later than 8 years after diagnosis, regardless of disease phenotype [127,128]. Subsequent surveillance intervals are risk-stratified:

- Low risk: patients in remission with mucosal healing and at least 2 negative surveillance exams may extend intervals to 5 years [25].
- Intermediate risk: patients with mild mucosal inflammation, a family history of CRC (no first-degree relative under 50 years), or moderate polyposis may undergo colonoscopy every 2-3 years [25,127].
- High risk: patients with severe histological inflammation, extensive pseudopolyposis or concomitant primary sclerosing cholangitis (PSC) require annual colonoscopy with staging biopsies or chromoendoscopy [25].

The role of random biopsies in surveillance continues to be debated. While their diagnostic yield is limited, and procedure times prolonged, they may be beneficial in very high-risk settings such as PSC, prior history of dysplasia or foreshortened colon [129,130]. Increasingly, dye-based chromoendoscopy or narrow-band imaging with targeted biopsies is favored over random sampling alone, for better detection in high-risk patients.

Breast cancer

The link between IBD and breast cancer remains controversial. While a meta-analysis by Gong *et al* showed no significant association between breast cancer and IBD [131], a genome-wide association study meta-analysis by Gao *et al* suggested a causal relationship [132]. Proposed mechanisms include genetic susceptibility and G-protein-coupled estrogen receptor upregulation on breast cells. Some evidence suggests that CD, but not UC, may increase the risk [12]. In the absence of IBD-specific guidelines, women with IBD should follow standard screening recommendations [12]. According to the US Preventative Services Task Force, biennial mammography is advised for women aged 40-74 years [133].

Cervical cancer

Whether IBD increases the risk of cervical cancer is also controversial. Previously, data showed that the use of immunosuppressive medications is associated with a higher risk of developing cervical cancer [65]. A nationwide Danish cohort study reported higher risk among women with CD [134]. In a recent meta-analysis, there was no statistically significant higher risk for cervical cancer in patients with IBD compared with the general population, regardless of disease subtype or medication use (anti-TNF or thiopurine) [135]. Since HPV is the most common cause of cervical cancer [136], the ACIP recommends that patients with IBD on immunosuppressive drugs receive 3-dose HPV vaccination up to the age of 26 [137]. Recent guidelines recommend that women with IBD undergo age-appropriate cervical cancer screening similar to the general

Table 4 Summary of cancer risk and screening recommendations in patients with IBD

Cancer type	Relative risk in IBD	Main risk factors	Screening recommendations
Colorectal cancer (CRC)	~2-fold higher vs. general population	Chronic colonic inflammation, PSC, pseudopolyps, family history	Start colonoscopy ≤8 years after diagnosis; interval depends on risk: 5 years (low risk), 2-3 years (intermediate risk), annually (high risk, PSC, dysplasia, severe inflammation)
Breast cancer	Conflicting evidence: no clear risk vs. causal GWAS link; higher risk with CD	Genetic factors, altered estrogen receptor signaling	Follow standard population guidelines: biennial mammography age 40-75 (EUSOBI)
Cervical cancer	Controversial; some data suggest increased risk with CD and immunosuppressants, others show no difference	HPV infection, immunosuppressive therapy	HPV vaccination (3-dose, ≤26 years, on immunosuppression); age-appropriate Pap screening as per general population
Prostate cancer	Increased, especially in UC	Chronic rectal/ prostate inflammation, immunosuppressive therapy	Begin PSA at age 40; repeat every 1-2 years until age 70
Skin cancer (melanoma, NMSC)	↑37% melanoma risk; thiopurines ↑ NMSC risk; anti-TNFs ↑ melanoma risk	Immunosuppressive therapy, sun exposure	No universal schedule; dermatology referral, ongoing surveillance, sun

TNF, tumor necrosis factor; CD, Crohn's disease; CRC, colorectal cancer; EUSOBI, European Society of Breast Imaging; GWAS, genome-wide association study; HPV, human papillomavirus; IBD, inflammatory bowel disease; NMSC, non-melanoma skin cancer; PSC, primary sclerosing cholangitis; PSA, prostate-specific antigen; UC, ulcerative colitis

population, with strong emphasis on coordination between gastroenterologists, primary care and gynecologists [138].

Prostate cancer

Several factors, such as the patient's age and overall health status, are taken into consideration before recommending prostate cancer screening [139]. Similar to the general population, patients with IBD are advised to start screening for prostate cancer at 40 years or 45 years, depending on other risk factors. Suspicious findings on digital rectal examination or prostate specific antigen >4 ng/mL warrant a prostate biopsy [140].

Skin cancer

Skin cancer is one of the most prevalent cancers in immunosuppressed patients [141]. A meta-analysis by Singh *et al* showed that IBD was associated with a 37% increased risk of melanoma, further amplified by biologic therapy (notably anti-TNF agents), while thiopurine use is linked to non-melanoma skin cancers (NMSC) [142,143]. The CESAME study demonstrated a persistent NMSC risk even after thiopurine discontinuation, underscoring the need for lifelong surveillance [144]. Thus, healthcare providers need to monitor patients with IBD for skin cancer. Primary preventative measures are encouraged in patients with IBD, and include limiting direct sun exposure, and the use of sunscreen that is protective against both UVA and UVB. Other measures include educating patients on the importance of regular skin examinations for early detection of precancerous and cancerous lesions [143]. While there is no specific screening schedule for skin cancer in patients with IBD, a dermatological referral is warranted to determine the frequency of skin examination in each patient, based on their unique risk profile. Clinicians should also inquire about symptoms of skin and soft tissue inflammation, such as erythema nodosum, pyoderma gangrenosum, fissures, skin tags and lesions in the perianal areas and genital areas, as patients may be reluctant to report these findings, and conditions such as hidradenitis suppurativa may be misinterpreted as minor skin infections [145]. Some studies emphasize the need to actively assess for skin lesions suggestive of hidradenitis suppurativa in patients with IBD [146].

Lymphoma

The higher risk of lymphoma observed in the IBD population is largely linked to immunomodulator use, particularly thiopurines, whereas evidence for an association with anti-TNF therapy remains inconclusive [147]. Evidence suggests that thiopurine therapy in patients with IBD is associated with a 6-fold increased risk of lymphoma relative to the general population [148]. However, Muller *et al*, in a retrospective multicenter study, showed that lymphomas occurring in patients with IBD do not seem to have a worse outcome than those in patients without IBD [148]. No dedicated lymphoma screening test is recommended; instead, providers should maintain clinical vigilance (e.g., evaluating new lymphadenopathy or systemic symptoms) and include the risk in shared decision-making.

A practical overview of healthcare maintenance interventions according to visit timing is summarized in Table 5.

Table 5 Healthcare maintenance in IBD according to visit timing

Domain	Initial visit	Every visit	Annually	Recommendations
Smoking	Assess status	Reassess & counsel cessation	Reassess & counsel cessation	Avoid smoking, vaping
Mental health	Screen	Assess symptoms; re-screen if at risk	Assess symptoms; re-screen	Refer if positive
Nutrition	Assess diet & deficiencies	Monitor intake; check micronutrients	Monitor intake; check micronutrients	Mediterranean diet preferred
Bone health	DXA if risk factors	-	-	Repeat according to guidelines
Vaccination	Review status	Update as needed	Influenza vaccine	Prefer before immunosuppression
Hepatitis B	Screen and vaccinate if needed	-	-	If anti-HBs <10 → booster/revaccinate; check titers post-vaccine
Other vaccines	Administer as indicated	-	Boosters as needed	Pneumococcal, HPV, zoster, COVID-19, RSV
Tuberculosis	Screen before biologics	-	Repeat yearly if at risk	Required before immunosuppression
Cancer screening	Screen	-	Per guidelines	Colorectal cancer (IBD-specific), cervical, skin
Cardiovascular	Baseline risk	Monitor blood pressure/lifestyle	Reassess risk	Higher risk with active disease
Medications	Review therapy	Monitor steroids/ immunosuppression	Monitor steroids/ immunosuppression	Affects infection risk

HBs, hepatitis B surface antibody; DXA, dual-energy X-ray absorptiometry; HPV, human papillomavirus; IBD, inflammatory bowel disease; RSV, respiratory syncytial virus

Concluding remarks

Healthcare maintenance is a cornerstone of high quality IBD management. However, because of limited knowledge, clinic time constraints, or the perception that preventive care falls outside their specialty, gastroenterologists may not consistently address these issues. It is essential for providers to be familiar with current healthcare maintenance guidelines, including vaccinations, cancer screening and general well-being measures, and to ensure that all patients with IBD adhere to them.

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