**Adolescent IBD - recent data and practical management**

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**Abstract**

Adolescence represents a key period in the management of inflammatory bowel disease (IBD), encapsulating physical, psychological and social change. Increasing incidence of paediatric-onset IBD has led to a growing adolescent population. This review explores contemporary challenges in adolescent IBD management, including growth and development, psychosocial factors and treatment.

Growth failure, once common in paediatric-onset IBD has decreased, however sarcopenic obesity is increasingly recognised, impacting long-term outcomes. Anxiety and depression are widely prevalent, with bidirectional relationships between disease activity and mental health contributing to increased disease burden. Poor sleep quality and fatigue further affect quality of life.

The expanding therapeutic landscape offers new agents, yet licensing delays for adolescent use remain. Long-term safety concerns, including risks to fertility and cancer development, necessitate careful integration. Non-adherence is a significant barrier to effective treatment. Transitioning to adult care is a critical period requiring structured, patient-centred approaches to optimise disease control. Multidisciplinary teams caring for individuals with IBD must recognise relevant issues such as fertility and sexual health which remain unaddressed.

Surgical considerations, including "ostomy" procedures, require sensitive discussions incorporating patient autonomy and psychological support. Body image concerns contribute to anxiety and depression, underscoring the need for perioperative counselling. Social factors, including school absenteeism and employment concerns highlight the importance of holistic, flexible multidisciplinary management. Healthcare engagement on social media may aid in disseminating reliable IBD information.

This review emphasises the need for an integrated, developmentally appropriate, multidisciplinary approach to ensure optimal health and well-being in adolescents with IBD.

**Key Points**

**Growth and Puberty:** Malnutrition, inflammation, and corticosteroid exposure can lead to growth failure, pubertal delay, and sarcopenia. Sarcopenic obesity is an emerging concern, leading to poorer outcomes requiring proactive nutritional support.

**Psychosocial Impact:** Adolescents with IBD experience higher rates of anxiety, depression, and social difficulties. Bidirectional relationships between disease activity and mental health highlight the need for integrated psychological support to improve both mental health and disease outcomes.

**Treatment Adherence:** Adolescents have lower adherence to mediations, influenced by medication side effects, time pressures, and forgetfulness. Multidisciplinary team approaches, and considered transition, are critical for optimising treatment efficacy.

**Transition to Adult Care:** Structured transition incorporating shared decision-making and patient empowerment is essential to ensure continuity of care, adherence, and long-term disease control.

**Surgical and Body Image Considerations:** Stoma formation and surgical interventions are well-accepted and may establish disease improvement for many. However, significant psychological implications must be considered. Preoperative counselling, patient involvement, and peer support can help reduce body image concerns and improve post-surgical adaptation.

**Social and Educational Factors:** School absenteeism and employment concerns necessitate flexible healthcare strategies. Social media has a growing role in shaping perceptions of IBD, presenting both educational opportunities and risks, underscoring the need for healthcare provider engagement in online IBD education.

**Introduction**

Inflammatory bowel disease (IBD) is a chronic, relapsing and remitting spectrum of diseases of the gastrointestinal tract, which can be classified as ulcerative colitis (UC), Crohn’s disease (CD) and IBD-unclassified (IBDU) (1). Global incidence of IBD in younger people continues to rise, resulting in increased prevalence in adolescent populations (2,3). Adolescence is a critical period of development occurring between the onset of puberty and the establishing of social independence; encapsulated chronologically by the ages of 10 to 19 years (4). This definition is dynamic, however, as sociocultural changes, including the increased uptake of further education and deferral of marriage and procreation, increase time to social independence (5). Adolescence is a period of psychological, physical and hormonal development, particularly vulnerable to the sequelae of chronic diseases such as inflammatory bowel disease (IBD) (6).

IBD diagnosed in young people (paediatric IBD or pIBD) presents several distinct challenges (7). Malnutrition and as a result, impaired linear growth, are associated with pIBD, which in turn can lead to complications including pubertal delay, poor bone health and vitamin deficiencies (7). IBD presents psychological and social stressors, which when experienced in adolescence, can lead to significant mental health disorders and psychosocial issues (8). The combination of physical symptoms, medical appointments and treatments, as well as the resultant effects on mental health, can frequently lead to missed school days and employment absenteeism. This can promote further stress and negatively affect quality of life and development (9,10). The relationship between medical symptoms, psychological burden and social stressors is demonstrated in Figure 1.

Treatment of adolescent IBD has an array of important considerations. The armamentarium of novel therapies continues to grow, with new drugs being approved for use in adult disease. Licensing of these medications for use in children lags significantly (though some therapies have been approved for use in 16-year-olds in the UK; Table 1) (11–13). Moreover, as these medications are utilised in the teenage population, consideration must be taken over the risks of long-term exposure (i.e. on cancer risk and fertility) as well as on issues relevant to the adolescent population (such as acne and cushingoid appearances) (6,7).

Individuals with IBD will transition from paediatric to adult care during adolescence. This transition period must be approached carefully to ameliorate the risk of issues with adherence, adverse events and disease control (14,15). A well-structured transition process, incorporating integrated care networks, shared decision-making, and strategies to support patient independence, can help ensure continuity of care. Empowering adolescents through education and gradually shifting responsibility from parents to patients fosters self-management skills and long-term disease control. The transition process for young people with IBD has been well-described, and this article does not aim to re-document best practice for the clinician but to draw attention to contemporary issues affecting adolescents with IBD (16–20). This review aims to cover key issues including growth and development, psychological sequelae, social factors, the evolving treatment landscape, and the implications of surgery.

**Diagnostic Delay**

Diagnostic delay is a significant concern in adolescent IBD, particularly Crohn’s disease, which consistently shows longer delays than UC. A systematic review of 7030 paediatric cases reported pooled diagnostic delays of 5.0 months for CD versus 3.0 months for UC, similar to trends reported in adults (21). These delays are linked to higher risks of stricturing disease, fistulae, and growth impairment (22). Several factors unique to adolescents contribute to delay: young people may hesitate to disclose symptoms to parents, and qualitative research highlights feelings of being dismissed or misunderstood by healthcare providers, especially when symptoms are subtle or intermittent (23).

**Growth and Puberty**

Malabsorption, inflammation and corticosteroid use in pIBD can disrupt normal growth and pubertal development (24). Growth failure has been reported, historically, in up to 40% of patients with paediatric-onset Crohn’s disease and up to 10% of individuals with ulcerative colitis (25). Contemporary data have reported that growth failure is now less common, which may be attributed to earlier diagnosis, better care, greater nutritional support and the increased use of biologic agents (26). *Jin et al.* reported short stature in 14 (11.0%) of 127 patients diagnosed with IBD before 18 years of age, as well as 11 (10.1%) with pubertal delay (27). Some groups have noted shifts from undernutrition in adolescent IBD, with comparable rates of obesity to the general population reported (28). An example, contemporary, growth chart for an adolescent with IBD can be visualised in Figure 2. Importantly, there is increasing recognition of poor body composition, despite normal height and weight, leading to sarcopenia and sarcopenic obesity (29). In these groups, weight may remain normal or supranormal, however muscle bulk and function are decreased. Poorer pIBD outcomes have been reported in sarcopenic patients. *Atlan et al.,* utilising psoas muscle area calculated from magnetic resonance enterography (MRE), reported higher levels of sarcopenia in 101 pIBD patients compared to healthy controls. PIBD patients with a psoas mass in the lowest quartile had higher risk for biologic therapy (hazard ratio [HR] = 12.1, p = 0.046) and disease exacerbation (HR = 9, p = 0.047), compared to those in the highest quartile (30). Similarly, *Liu et al* demonstrated higher rates of surgery (p=0.022; OR =3.608) and hospitalisation (P=0.048; OR =5.500) in 65 patients with sarcopenic IBD, compared to 45 without sarcopenia. Poorer outcomes were reported in 14 individuals with sarcopenic obesity, undergoing more frequent surgery (92.86%; p<0.001; OR =69.333) (31).

**Psychosocial Factors**

* **Mental Health**

The disease course of IBD is unpredictable, intrusive and uncertain, presenting significant psychological hurdles. Treatment regimens can be challenging, and symptoms can be embarrassing and socially disruptive (32). Subsequently, individuals with IBD report psychological and social burden. *Halloran et al.* surveyed 51 young people aged 15-25 with IBD and compared the results to 210 age-matched individuals with chronic diseases. Of the IBD respondents, 41% had poor well-being and 37% were at risk of depression. When compared to the control population, the IBD group reported higher depressive symptoms (p=0.04), worse illness perception (p<0.01) and lower internal locus of control (p<0.01) (33).

These factors have been demonstrated to culminate in decreased quality of life, increased psychological distress and higher likelihood of developing depression and/ or anxiety when compared to non-IBD cohorts (34–36). Anxiety and depression in adolescent IBD have been demonstrated to affect social function. *Mackner et al.* surveyed 50 adolescents with IBD and their families, noting higher levels of anxious and depressive behaviour compared to 42 control families (p<0.05). They reported lower social competence scores when compared to healthy controls (p<0.01), with clinically significant scores present in 22% of those with IBD compared to 2% in the healthy group (p<0.01) (37).

In addition to the increased risk of developing mental health disorders in adolescent IBD, concurrent or pre-existing mental health disorders in this group can also lead to important sequelae such poorer quality of life, school attendance and higher healthcare use (38). With all-cause mental health disorder prevalence continuing to increase within the adolescent population, it is important for the teams managing this group to recognise that these conditions can co-exist with IBD (39).

Bidirectionality has been demonstrated in the relationship between gastrointestinal symptoms and mental health disturbance in individuals with IBD. *Gracie et al.* demonstrated, in 405 adults with IBD, over two-year follow-up, that individuals with greater disease activity at baseline were more likely to develop abnormal anxiety scores (hazard ratio [HR], 5.77; 95% CI, 1.89-17.7). They noted that individuals with quiescent IBD and higher anxiety scores were more likely to experience IBD flares (HR, 2.08; 95% CI, 1.31-3.30) and to escalate therapy (HR, 1.82; 95% CI, 1.19-2.80) (40).

Higher incidence of mental health conditions in IBD in younger people has been reflected in antidepressant use. In a Finnish registry study conducted by *Virta and Kolho,* antidepressant medications were issued to 8 of 248 (3.2%) adolescents with IBD when compared to 12 of 992 healthy controls (1.2%) (p=0.031) (41).

In addition to anxiety and depression, *Cooney et al.,* have reported increased risk of developing new posttraumatic stress disorder (adjusted hazard ratio [aHR], 2.47; 95% CI, 1.23-4.94), eating disorders (aHR, 1.85; 95% CI, 1.05-3.26), self-harm (aHR, 1.49; 95% CI, 1.00-2.21) and sleep disturbance (aHR, 1.40; 95% CI, 1.15-1.71) in adolescents (median age 19.0) with IBD compared to healthy controls (38).

Given the established relationship between IBD and mental health conditions, psychology support should be considered, in all cases, at all stages of diagnosis and management (33). *Berenblum Tobi et al.* highlighted, through a qualitative approach, the perspectives of adolescents with IBD and their caregivers on addressing mental health within clinical care. Thematic analysis of interviews underscored the importance of trust, direct communication, and tailored approaches to reduce stigma and support patient-centred mental health discussions (42). In a prospective service evaluation undertaken by Eccles et al., integrated psychological support improved IBD symptoms (ΔSIBD; p=0.003) and depression scores (ΔPHQ-9, p=0.006); albeit in small numbers (n=15). Metanalysis, conducted by *Tarricone et al*, of 43 primary research studies, demonstrated efficacy of antidepressants in the reduction of depression, anxiety and IBD activity as well as improving quality of life. Only five studies, however, reported on pharmacological intervention alone. Purely psychological interventions demonstrated benefits across mental health sequelae, without noting improvement in IBD activity (43). Cochrane review has reported positive effects of psychotherapy on quality of life and depression, specifically in adolescent IBD, though no effect was noted on quality of life, depression and IBD remission with educational intervention (44). Only two studies were included with specific adolescent populations, and further evidence is required in this area.

* **Fatigue and Sleep**

Systematic review by *Vijver et al.,* demonstrated significantly higher fatigue amongst adolescents with IBD compared to healthy controls (45). Micronutrient deficiencies (i.e. iron, vitamins D and B12) are established contributors to these symptoms and should be regularly monitored and supplemented as needed, following clinical guidelines (46). Poor sleep and psychosocial factors also cause fatigue. *Benhayon et al.* compared the Pittsburgh Sleep Quality index (PSQI) scores of 96 young people (aged 9-17) with depression and Crohn’s disease with 19 healthy controls. Disease activity (β=0.086, p<0.01), abdominal pain (β=0.108, p<0.01) and depression (β=0.075, p<0.01) and anxiety (β=0.071, p<0.01) scores demonstrated significant association with poorer sleep quality (47). *Szigethy et al.* implemented a behavioural intervention – consisting of 2 to 4 sessions focussing on sleep hygiene, behavioural strategies and hypnosis - in 48 participants with IBD (aged 15-30). They reported improvements in PSQI (mean change, 4.036; P < 0.001), multidimensional fatigue inventory score (mean change, 11.97; P < 0.001) as well as anxiety, depression and Crohn’s activity scores (all p<0.01) (48). A systematic review by *Emerson et al.,* included 4 randomised control trials evaluating psychological interventions, such as cognitive behavioural therapy, for management of IBD-associated fatigue. This work demonstrated efficacy however the included studies were small and underpowered (49).

* **Body Image and Surgery**

Physical changes in adolescence can lead to body image dissatisfaction. This can lead to decreased self-esteem, quality of life and increases in anxiety and depression (50). Impaired body image perception has been reported in IBD cohorts, for example by *Muller et al.,* who surveyed 347 individuals with IBD, with 66.8% reporting impaired body image; often linked to the effects of the illness and interventions (51). A Study of 330 patients with IBD by *McDermott et al.,* reported association of body dissatisfaction with clinical disease activity (p < 0.001), steroid use (p=0.03) and stoma-forming and non-stoma-forming surgeries (p=0.01)(52). A study by *Alison et al.* described the process of stoma surgery in adolescent IBD. Participants reported concern regarding the effects of surgery on physical attractiveness, fertility, pregnancy and childbirth. Participants expressed desire to be involved with the decision-making process ahead of surgery and appreciated when surgeons explained the situation and operation in an understandable manner (53).

Various recommendations exist for the management of adolescent IBD regarding stoma surgery (54). Clinical guidelines, as provided by the *Association of Stoma Nurses UK,* highlight the importance of assessment for anxiety and depression and consider referral to psychology services (55). Healthcare providers are encouraged to adopt a collaborative approach and respect the autonomy of young people in decision-making (56). Peer support in adolescents with stomas may be beneficial, as well as pre-procedure access to relevant literature or specifically designed tools (54,57).

* **Social media**

More recently, acceptance of stoma surgery appears to be higher in adolescents. One explanation for this relates to positive content shared through online platforms such as Instagram and TikTok. *Linz et al*.published an analysis of “ostomy related content” on TikTok supporting this hypothesis. They reported that 43% of content was educational and that 79% of videos generated supportive comments, with only 5.3% critical comments. However, only 3.5% of videos were shared by healthcare professionals. This is in keeping with analysis of ostomy-related content on YouTube, in which content was largely “not educationally useful” (65%) and not in keeping with recognised guidelines (58). Young people demonstrate significant engagement with platforms such as TikTok, with 75.6% of online users in the United Kingdom aged between 15 and 24 years using the app (59). The recent *James Lind Alliance Priority Setting Partnership* for digital technology for adolescents and young people with IBD, highlighted several key areas where adolescents sought digital resources to improve their IBD care, including for support and education (60). Given the wide usership of social media and documented desire for education, engagement by healthcare providers could effectively disseminate quality information (61).

* **Education and employment**

Chronic illness in adolescence can lead to decreased school and college attendance, which can, negatively affect development (62). IBD has been demonstrated to significantly impact school attendance, with clinic visits and appointments the leading cause of absenteeism (63). Healthcare providers should employ strategies to facilitate school attendance, including telephone or after-school appointments and administration of infusions in the community where possible. Having IBD may lead to anxiety around employment and published work has reported lower participation in the workforce amongst patients with IBD (64). *Netjes et al,* however, reported comparable rates of employment in 1115 individuals with IBD in the Netherlands, compared to reference groups. They also reported that individuals with IBD, in some age groups (those aged 45-54 years) were more likely to be able to remain in employment than those with other chronic conditions (65).

* **Smoking and vaping in the adolescent IBD population**

The effects of cigarette smoking in healthy individuals and on IBD behaviour are well documented (66,67). It is more relevant to adolescent health, however, to consider the effects of e-cigarette use. In the UK, since 2021 the proportion of children (aged 11-17) vaping has been greater than smoking (7.2% v 5.1%). In 2024, 18% of this demographic were found to have tried vaping and 4.2% do so regularly (68). Reports of the effects of e-cigarette use on IBD are variable, with *Sheehan et al.,* demonstrating no difference in IBD related outcomes in vapers versus IBD controls (69). Furthermore, while the effects of vaping appear to be favourable for health as an alternative to tobacco smoking, the health risks compared to having never smoked or vaped are significant (70). Health risk behaviours are likely to be more prevalent in the adolescent population and clinical teams should seek to discuss this, as well as social and lifestyle factors through accepted screening tools (71,72).

**Clinical management of IBD in Adolescence**

* **Drug Approval**

The therapeutic landscape in inflammatory bowel disease has undergone significant development over the last 20 years, however delay exists between the licencing of medications in adults and children (11). Infliximab and Adalimumab are biologic drugs targeting anti-TNF and are approved by the Food and Drug Administration (FDA; USA), European Medicines Agency (EMA; European Union) and Medicines and Healthcare products Regulatory Agency (MHRA; UK) for use in IBD patients over six years of age (73–76). Anti-TNF medicines are mostly employed first line where biologic therapy is required. Ustekinumab (an anti-IL-12/IL-23 agent) and vedolizumab (anti a4b7 integrin) are approved by the FDA, EMA and MHRA for use in adults (>18 years of age) and are employed in the UK at the point of treatment failure of anti-TNF therapy (77–80). Medications inhibiting Janus Kinase (JAKi), i.e upadacitinib, filgotinib and tofacitinib, are approved for use in adults (>18) for use in treatment-refractory IBD, as well as being approved for use in dermatological conditions in those twelve years and older (81–83). Ongoing clinical trials are currently exploring the use of these medicines in this group (84). Variability in the age of cohorts included in pre-licensing trials has culminated in heterogeneity in the age at which some drugs are recommended by NICE (National Institute for Health and Care Excellence; UK). Etrasimod, a sphingosine 1-phosphate (S1P) receptor modulator, is hence recommended by NICE for the treatment of moderate to severely active ulcerative colitis in individuals aged sixteen and over (12,85). Similarly, inclusion of patients aged 16 and over in clinical trials has led to NICE recommendation of risankizumab for use in moderately active colitis and Crohn’s disease in this group (13,86–88). Details of approval of medications relevant to adolescent IBD populations are presented in Table 1. As outlined by *Croft et al.,* the IBD community can improve the licensing of drugs for adolescents by promoting earlier inclusion of paediatric populations in clinical trials, aligning trial designs with adult studies to support extrapolation, and ensuring patient-centred approaches that address the unique needs and burdens faced by young people with IBD (11).

* **Adherence**

Nonadherence is a key barrier to effective treatment, particularly in the adolescent population, with several studies reporting the lowest levels of adherence in this group (89,90). Many barriers leading to nonadherence have been reported including lack of time, medication side effects, feeling well and the perception that a medication is not effective (91). Unwanted physical side effects are particularly pertinent to the adolescent, peri-pubertal population where body image is a stressor (52). Hypertrichosis and weight gain, with cushingoid distribution, are well documented with frequent steroid use (6). Dermatological side effects, such as paradoxical psoriasis and eczema, are established in biologic agents use such as infliximab (92). Acne with upadacitinib may lead to discontinuation of therapy (93).

* **Surgery**

Surgery has an important role in the management of IBD in select groups at all ages, particularly in treatment-refractory colitis and acute severe colitis. Likelihood of stoma formation or “ostomy” surgery is highest during the first ten years of diagnosis, and as IBD is increasingly diagnosed in childhood, many younger people are living with stomas. While for many, stoma surgery may bring about active improvement in clinical symptoms and allow for improvement in quality of life, for some it can lead to body image concerns, reduced social activity, low self-esteem, which in turn lead to depression and anxiety (94,95).

**Sexuality, Contraception, fertility and counselling in IBD**

Addressing sexuality, fertility, and reproductive health is important in providing a holistic approach to adolescent IBD care. These topics are often not well addressed in paediatric settings (96).

IBD is associated with sexual dysfunction, with reports of up to 60% of individuals being affected. Meta-analysis, conducted by *Zhao et al.* has demonstrated these findings in males and females. Moreover, this metanalysis noted that younger (<50 years) male (5 studies, RR = 1.29, 95% CI: 1.03–1.62, p= 0.019) and female patients (3 studies, RR = 1.85, 95% CI, 1.42–2.41, p< 0.001) with IBD had significantly increased odds of sexual dysfunction compared to healthy controls (97). The cause of impaired sexual function is multimodal, incorporating physical symptoms (active disease, perianal disease, malnutrition and resultant hypogonadism) as well as the consequences of surgery; altered body image; and psychological disorders (anxiety and depression) (98).

Sexual dysfunction is rarely discussed in IBD clinic, with a disparity in expectation between the healthcare provider and patient. *Rivière et al.* surveyed 358 patients with IBD, noting that greater than 80% of gastroenterologists would not raise the topic, for concern around the lack of management options available should issues arise, whereas more than 50% of patients were expecting to discuss sexual dysfunction with their clinician (99). Greater awareness of sexual issues among individuals with IBD is required to work towards improvements in services to address this.

Contraception counselling and utilisation should be effective and embedded within the management of adolescents with IBD (100). The risk and benefit of oral contraceptives containing oestrogen must be carefully weighed against risk of venous thromboembolism, which is increased in active IBD (101). The *Faculty of Sexual and Reproductive Healthcare* do not advise any restriction in long-acting reversible contraceptive (LARCs) use, though it is advised that depot medroxyprogesterone acetate is generally only used after other methods have been exhausted due to risk of osteoporosis (102).

IBD does not inherently reduce fertility, but disease sequelae such as psychosocial issues and abdominal and pelvic surgery, as well as voluntary childlessness, have been demonstrated to contribute to lower birth rates amongst women with IBD (103).

Pre-conception, healthcare professionals involved in the management of patients with IBD should provide information based on guidance provided by ECCO (European Crohn’s and Colitis Organisation) (100). Treatments that are teratogenic or impair fertility should be reviewed – a full list of these medications is available from ECCO. Most treatments are considered low risk during pregnancy, apart from methotrexate and JAK inhibitors which have demonstrated teratogenicity (104,105). Drugs used in disease flare are relatively safe in pregnancy and use must be considered against the risk of active disease on pregnancy outcomes (106).

**Conclusion**

Adolescents with IBD encounter distinct challenges that require tailored management. The interplay between physical development, psychological growth, and the social pressure of adolescence amplifies the impact of living with a chronic condition during this critical time. Key issues, such as growth and nutrition, mental health, treatment adherence and reproductive health, underline the importance of a comprehensive, multidisciplinary approach to care.

A focus on open communication is essential, particularly around topics such as body image, sexuality, and fertility, which are often underexplored in clinical settings. Efforts to address stigma and misinformation, including through the responsible use of social media, can foster greater understanding and support for young people with IBD. Equally, improving access to psychological support, nutritional counselling, and clear, age-appropriate educational resources is crucial to optimising both health outcomes and quality of life.

By recognising and addressing these unique needs, healthcare teams can ensure that adolescents with IBD receive the support required to navigate this challenging period. A proactive and collaborative approach can empower young people with IBD to achieve improved disease management, personal development, and overall well-being as they transition into adulthood.

**Contributions:**

Zachary Green (ZG): conceptualization, writing – original draft. James J. Ashton (JJA): conceptualization, writing – review and editing, supervision. R Mark Beattie (RMB): conceptualization, writing – review and editing, supervision.

**Funding:**

ZG is funded by Crohn's in Childhood Research Association (CICRA). JJA is funded by an NIHR advanced training fellowship (NIHR302478).

**Conflicts of Interest**

JJA is a SAB member for Orchard Therapeutics. JJA is an Associate Editor of Frontline Gastroenterology. RMB was Editor in Chief of Frontline Gastroenterology 2018-2024. The rest of the authors have no competing interest.

**Ethical Statement:**

The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. No ethics approval.

**Figure 1:** A diagram demonstrating the biopsychosocial factors involved in the care of adolescents with IBD and the consequences of difficulties in these areas. Figure created using BioRender (BioRender.com, 2024) (107).

**Figure 2:** An example weight-for-age growth chart for a hypothetical patient with adolescent IBD. Weight is initially static and then decreasing until IBD diagnosis at around 13.5 years of age. Treatment and nutritional supplementation allow for catch-up growth to the 50th centile. Overnutrition and lifestyle factors lead to weight reaching the 75th centile, which eventually decreases to the 50th centile with dietetic and multidisciplinary team recognition and intervention. Figure generated using ggplot2 in R Studio (R version 4.4.0 (24/04/2024)(108,109). Centile lines generated using UK-WHO growth charts (110–112).

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| --- | --- | --- | --- | --- | --- |
| **Drug Name** | **Mechanism of Action** | **FDA Approval Age** | **EMA Approval Age** | **NICE recommendation** | **Additional Use** |
| Infliximab(73,74,113,114) | Anti-TNFα monoclonal antibody | Adults (≥18)Paediatric Crohn's (≥6)Paediatric UC (≥6) | Adults (≥18) paediatric Crohn's (≥6)paediatric UC (≥6) | **Adults (≥18)****paediatric Crohn's (6-17)****paediatric UC (6-17)** | Behçet's disease, VEO-IBD |
| Adalimumab(73–76) | Anti-TNFα monoclonal antibody | Adults (≥18)Juvenile Idiopathic Arthritis (≥2)paediatric Crohn's (≥6) paediatric UC (≥5) | Adults (≥18)Juvenile Idiopathic Arthritis (≥2)paediatric Crohn's (≥6)paediatric UC (≥5) | **Adults (≥18)****paediatric Crohn's (6-17)****paediatric UC (6-17)** | Uveitis; VEO-IBD |
| Golimumab(73,115,116) | Anti-TNFα monoclonal antibody | Adults (≥18) | Adults (≥18) | Adults (≥18) |   |
| Vedolizumab(77,78,117,118) | Anti-α4β7 integrin monoclonal antibody | Adults (≥18) | Adults (≥18) | Adults (≥18) | Refractory IBD in adolescents |
| Ustekinumab(79,80,119,120) | Anti-IL-12/23 monoclonal antibody | Adults (≥18), Adolescents with Plaque Psoriasis (≥12) | Adults (≥18), Adolescents with Plaque Psoriasis (≥12) | Adults (≥18)paediatric severe psoriasis (6-17)paediatric Crohn’s (6-17) |
| Tofacitinib(81,121,122) | Janus kinase (JAK) inhibitor | Adults (≥18), Polyarticular Course Juvenile Idiopathic Arthritis (≥2) | Adults (≥18) | Adults (≥18)active polyarticular juvenile idiopathic arthritisjuvenile psoriatic arthritis (2-17) | Adolescent acute severe colitis, refractory colitis |
| Mirikizumab(123–125) | Anti-IL-23 monoclonal antibody | Adults (≥18) moderate to severe colitis | Adults (≥18), moderate to severe colitis | Adults (≥18), moderate to severe colitis |
| Etrolizumab(126) | Anti-β7 integrin monoclonal antibody | Not yet approved | Not yet approved | Not yet approved | Not applicable |
| Etrasimod(12,127,128) | S1P receptor modulator | Adults (≥18) | **Adults (>16), moderate to severe colitis** | **Adults (>16), moderate to severe colitis** | Not applicable |
| Filgotinib(129,130) | JAK1 inhibitor | Not approved for RA due to safety | Adults (≥18), moderate to severe colitis | Adults (≥18), moderate to severe colitis | Not applicable |
| Guselkumab(131–133) | Anti-IL-23 monoclonal antibody | Adults (≥18) | Adults (≥18) | Adults (≥18), moderate to severe plaque psoarisis | Limited dermatological conditions |
| Ozanimod(134–136) | S1P receptor modulator | Adults (≥18) | Adults (≥18) | Adults (≥18), moderate to severe colitis | Not applicable |
| Risankizumab(13,88,137,138) | Anti-IL-23 monoclonal antibody | Adults (≥18) | Adults (≥18) | **Adults (>16), moderate to severe colitis, moderately to severely active Crohn's disease** | Not applicable |
| Upadacitinib(82,83,139,140) | JAK1 inhibitor | Adults (≥18), Adolescents with Atopic Dermatitis (≥12) | Adults (≥18), Adolescents with Atopic Dermatitis (≥12) | Adults (≥18), moderate to severe colitis, moderately to severely active Crohn's disease; paediatric atopic eczema (12-17) | Adolescent acute severe colitis, refractory colitis |
| Table 1: Important biologic drugs, with EMA paediatric investigation plans and current approval or recommendation status according to FDA, EMA and NICE (*EMA, European Medicines Agency; FDA, Food and Drug Administration and NICE, National Institute for Health and Care Excellence). NICE included rather than MHRA (Medicines and Healthcare products Regulatory Authority) to reflect “off-licence” recommendations.*  |

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