Precision Medicine in Ulcerative Colitis

Citation: EMJ Gastroenterol. 2026; https://doi.org/10.33590/emjgastroenterol/Z90MBX3Y

EMJ
European Medical Journal

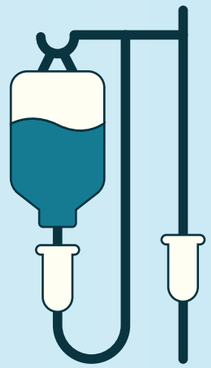
Ulcerative Colitis at a Glance

UC is characterised by inflammation and ulceration of the colonic mucosa and rectum lining.[1,2]

Global prevalence of UC is reported to range from 2.4–298.5/100,000.[3]

Unmet needs in IBD management are a result of incompletely understood pathophysiology and disease heterogeneity.[4]

Precision medicine aims to integrate differences in a person's genes, environment, and lifestyle to provide the most appropriate treatment and more effective care.[2,4]



Advanced Therapies

Advanced therapies include biologics and targeted small molecules, such as anti-TNF agents, anti-integrin antibodies, anti-IL-12/23 and IL-23 antibodies, JAK inhibitors, and S1P receptor modulators.[5]

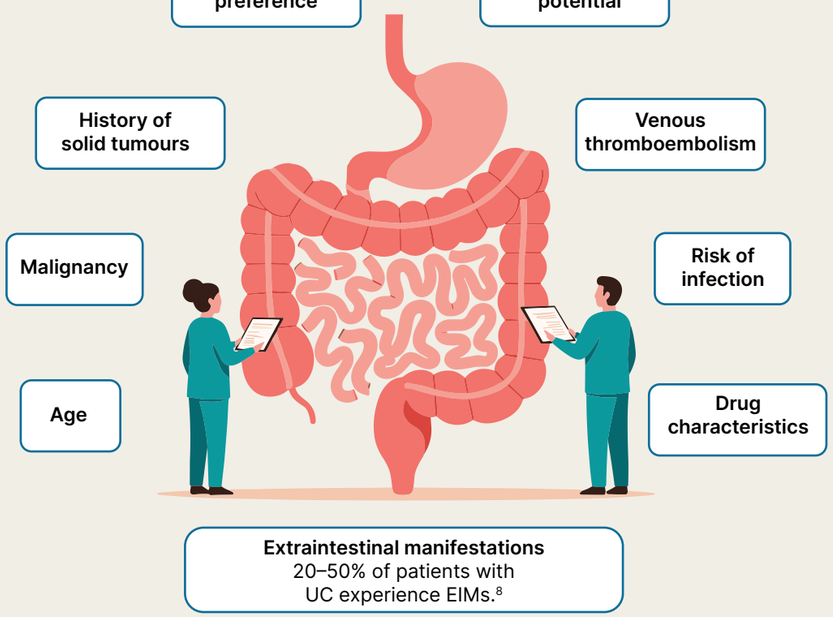
Despite advancements in IBD therapies, durable corticosteroid-free remission remains at about one-third in pivotal clinical trials.[6]

This has led to the concept of a therapeutic ceiling.[6]

This ceiling may reflect the strategy and timing of intervention,[6] highlighting the potential role of precision medicine in UC treatment.

Therapy Considerations

Treatment selection in UC requires consideration of several clinical aspects.[7]



Takeaways

Different UC phenotypes, disease heterogeneity, and a variable disease course make it difficult to personalise care.

An expanding armamentarium of advanced therapies, alongside a number of clinical considerations, makes selecting treatment options exceedingly challenging.

A range of tools may support the delivery of effective precision medicine in UC, but further research and validation are needed before their full potential can be realised in clinical practice.

Precision Medicine Toolkit



Biomarkers

Role: Help identify molecular UC subtypes, predict treatment response, and assess disease severity.[9]

Limitation: There is a lack of compelling, unequivocal, independent validation of biomarkers.[9]

Therapeutic Drug Monitoring

Role: Can optimise the use of biologics in patients with IBD through measurements of drug concentrations and anti-drug antibodies.[10] Dashboard systems can integrate patient covariates to inform personalised dosing.[11]

Limitation: Variation in methodology and recommendations across relevant guidelines can lead to inconsistencies in TDM.[10]

AI

Role: Can address complexities associated with IBD, including diagnostic challenges, risk stratification, and personalised treatment.[12]

A systematic review identified 139 studies applying AI in precision medicine. Results revealed good predictive performance across diagnosis, treatment response, and prognosis. Area under the curve values ranged from 0.85–0.90.[13]

Limitation: Validation through prospective studies and standardisation of protocols are still required before widespread clinical application.[12]

Multi-omics

Role: Improve understanding of mechanisms underlying UC to deliver more individualised care.[12]

Limitation: Heterogeneity of omics data, complexities of molecular pathways, and high volume of data pose challenges for clinical implementation.[12]

MicroRNAs

Role: Offer the potential to assist with the development of personalised therapies that minimise associated side effects.[14,15]

Limitation: Clinical translation faces challenges, including the lack of a carrier system for targeted delivery, stability, and efficient cellular uptake.[14]

Abbreviations:

EIM: extraintestinal manifestations; IBD: inflammatory bowel disease; S1P: sphingosine 1-phosphate; TDM: therapeutic drug monitoring; UC: ulcerative colitis.

References

1. Kaur A, Goggolidou P. J Inflamm (Lond). 2020;17:15.
2. Chaemsupaphan T et al. Expert Rev Gastroenterol Hepatol. 2025;19(10):1063-79.
3. D'Haens GRAM et al. Drugs R D. 2019;19:227-34.
4. Venner JM et al. Curr Treat Options Gastro. 2025;23:21.
5. Pietschner R et al. Visc Med. 2023;39(2):46-53.
6. Solitano V et al. Lancet Gastroenterol Hepatol. 2026;11(8):645.
7. Mukhtar MS, Mosli MH. Saudi J Gastroenterol. 2024;30(3):126-37.
8. Idris O et al. Pak J Med Sci. 2026;42(1):168-72.
9. Varley RB, Lee JC. Expert Rev Gastroenterol Hepatol. 2025;19(4):359-63.
10. Shi C et al. Acta Pharmaceutica Sinica B. 2026;16(1):616-41.
11. Cheah E, Huang JG. World J Gastroenterol. 2023;29(10):1539-50.
12. Iacucci M et al. Gastroenterology. 2025;169:416-31.
13. Ceccato HD et al. Am J Transl Res. 2025;17(1):28-46.
14. Sokal-Dembowska A et al. Int J Mol Sci. 2025;26(10):4750.
15. Wilk A et al. Int J Mol Sci. 2026;27(3):1534.