The present and future of gastroenterology and hepatology: an international SWOT analysis (the GASTROSWOT project)

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GASTROSWOT is a strategic analysis of the current and projected states of the different subspecialties in gastroenterology that aims to provide guidance for research, clinical, and financial planning in gastroenterology. We executed a consensus-based international strengths, weaknesses, opportunities, and threats (SWOT) analysis. Four general coordinators, six field coordinators, and 12 experts participated in the study. SWOTs were provided for the following fields: neurogastroenterology, functional gastrointestinal disorders, and upper gastrointestinal diseases; inflammatory bowel disease; pancreatology and biliary diseases; endoscopy; gastrointestinal oncology; and hepatology. The GASTROSWOT analysis highlights the following in the current state of the field of gastroenterology: the incidence and complexity of several gastrointestinal diseases, including malignancies, are increasing; the COVID-19 pandemic has affected patient care on several levels; and with the advent of technical innovations in gastroenterology, a well trained workforce and strategic planning are required to optimise health-care utilisation. The analysis calls attention to the following in the future of gastroenterology: artificial intelligence and the use of big data will speed up discovery and smarter health-care provision in the field; the growth and diversification of gastroenterological specialties will improve specialised care for patients, but could promote fragmentation of care and health system inefficiencies; and furthermore, thoughtful planning is needed to reach an effective balance between the need for subspecialists and the value of general gastroenterology services.

Lancet Gastroenterol Hepatol 2022; 7: 485–94

Published Online March 2, 2022 https://doi.org/10.1016/S2468-1253(21)00442-8

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Introduction

Gastroenterological and liver diseases are prevalent in the general population and associated with considerable morbidity, mortality, and health-care costs.[1] For example, irritable bowel syndrome (IBS) is one of the most prevalent conditions in gastroenterology, and direct and indirect costs related to IBS range from €6 billion to €8 billion per year in Europe.[2] Gastroenterology as a specialty faces social, scientific, and technological challenges that need to be addressed in the upcoming years, through thoughtful planning and judicious analysis of the current and projected state of the field. The strengths, weaknesses, opportunities, and threats (SWOT) analysis grid is a widely used strategic planning technique that divides information into favourable and unfavourable, and internal and external, determinants of care.[3] A SWOT analysis helps identify current strengths, opportunities for growth, weaknesses to address, and potential threats that are being faced in the field. As such, this framework is a simple yet powerful tool to generate meaningful information and build strategic recommendations.

Our aim was to use the SWOT framework to characterise the current and projected states of the different subspecialties in gastroenterology to provide guidance for future planning of clinical services and research. To this end we designed an international project, which we refer to as GASTROSWOT (panel).

Methods

Initial design and expert selection

Four general coordinators designed and led the study, two gastroenterologists (JPHD and EdM) and two psychologists specialised in quality of health-care research (JJM and IC). The two gastroenterologists also identified the different fields of gastroenterology to be analysed and identified gastroenterologists to participate as field coordinators (one per field). Field coordinators had to be proactive, widely-recognised experts in education or clinical research, or both, within their subspecialty. Field coordinators were asked to identify and invite two expert gastroenterologists as collaborators within each subspecialty. To curtail potential age, gender, or geographical biases, both junior and senior experts (appendix p 1) were chosen for each subspecialty, and balanced regional and gender criteria were preassigned for each field. In addition to the SWOT analysis for each subspecialty, we also assessed the effect of the COVID-19 pandemic on the field of gastroenterology.[4]

SWOT analysis

The field coordinator and the two experts each shared their views on the strengths, weaknesses, opportunities, and threats of their respective fields through an online tool designed by Calitè Research Team (Miguel Hernández University, Elche, Spain). Based on the three individual reports, each field coordinator wrote a first draft of the SWOT report that was again shared with the two field experts to reach an intra-field consensus. The general coordinators shared each intra-field consensus-based SWOT report with all the field coordinators. A consensus-based inter-field report was produced by considering the input and comments of all members (ie, general coordinators, field coordinators, invited experts) and was shared again with the whole team for a final consensus.

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See Online for appendix

Panel: **Steps and methods involved in GASTROSWOT project**

Step 1: general coordinators
- Design of the study
- Identification of the gastroenterology fields
- Identification and invitation of field coordinators

Step 2: field coordinators
- Identification and invitation of two experts in their fields
- To avoid biases, overall gender, geographical, and age (junior *vs* senior expert) balance was required

Step 3: individual report and intra-field consensus-based report
- The field coordinator and two experts performed an individual report addressing the SWOTs on their field
- Using this report, the field coordinator produced an intra-field, consensus-based SWOT report draft, agreed with the two experts

Step 4: inter-field consensus-based SWOT report
- The general coordinators produced a first draft of the manuscript by joining the intra-field consensus-based SWOT reports
- This draft was discussed between general coordinators and field coordinators to form an inter-field, consensus-based SWOT report

Results

The main conclusions of GASTROSWOT for each field are summarised in the appendix (pp 2–8) and discussed in detail in this section.

Neurogastroenterology, functional gastrointestinal disorders, and upper gastrointestinal diseases

Strengths

The incidence of eosinophilic oesophagitis is on the rise,[5] which has fuelled recent clinical interest, research output, and the development of novel therapeutic options from topical steroids to biologics.[6] The prevalence of functional gastrointestinal disorders is high,[7] and the burden is costly and impactful for patients. This field has embraced interdisciplinary collaborations, such as the study of the human intestinal microbiome,[8] that have led to innovations in classification, diagnostics, and therapeutics. The development of high-resolution oesophageal manometry (Chicago classification version 4.0[9]), impedance-pH monitoring (baseline impedance and post-reflux swallow-induced peristaltic wave[10]), and high-resolution anorectal manometry (London classification[11]) have directly affected patient care. The application of novel diagnostic technologies, such as EndoFLIP[12] and mucosal impedance assessment tools,[13] improves the management of patients by identifying individuals who would benefit from novel drugs (such as relamorelin and valusetrag) and endoscopic therapies (such as gastric peroral endoscopic myotomy and pylorus dilatation). Finally, a better understanding of the role of the microbiome in the pathogenesis of functional gastrointestinal disorders[14] is transforming clinical research approaches.

Weaknesses

Gastroenterologists often underappreciate the impact functional gastrointestinal disorders have on patients, and undervalue and underutilise diagnostic testing tools for functional gastrointestinal disorders. Neurogastroenterologists often have to administer endoscopies due to workload or economic necessity, instead of developing their research and clinical interests.[15]

Opportunities

The identification of new therapeutic targets for functional gastrointestinal disorders, IBS, and functional dyspepsia has heightened the interest of pharmaceutical and device companies to fund and conduct studies in this field. The use of artificial intelligence (AI) and machine learning could promote more accurate evidence-based management of these conditions by integrating the results of motility tests, microbiota assessment, and better endoscopic evaluation.[16–20]

Threats

Despite the high prevalence and burden of functional gastrointestinal disorders, health regulatory authorities do not consider these disorders as priorities as they are not directly life threatening, leading to restrictions on reimbursement for testing and treatment in some countries, and to low research interest. The absence of age-specific, gender-specific, and manufacturer-specific normative values for motility test results hinder their general use, along with the absence of therapeutic options (particularly, prokinetics) that can be offered based on the test results. Innovations in technologies and therapies are slow to develop, in part due to suboptimal interest from industry. In addition, economic limitations reduce funding opportunities for research and implementation of new technologies in academic centres.[21] Eosinophilic gastrointestinal disorders, such as eosinophilic oesophagitis, could potentially be included in the fields of allergy or immunology, especially once effective medical therapies become available.

Inflammatory bowel disease

Strengths

The prevalence of inflammatory bowel disease (IBD) is increasing worldwide,[22] leading to a global interest in research into IBD pathogenesis and therapeutic development, and the establishment of IBD training and multidisciplinary specialty centres. New steroid-sparing targeted therapies are being developed,[23] and a shift towards head-to-head randomised controlled trials (RCTs) with different drugs are helping shape therapy positioning.[24]

Goals of care for IBD now include endoscopic healing, proactive disease monitoring, and early therapy optimisation to prevent IBD complications.[25] Several scientific steps are moving the field toward precision medicine, such as risk stratification of disease progression,[26] genetic predisposition to developing antibodies to TNF inhibitors,[27] and mRNA signatures predicting response to therapies.[28] A better understanding of the role of the microbiome and diet in the pathogenesis of IBD is prompting dedicated trials.[29] Identifying which patients can safely de-escalate therapy and who will benefit from a combination of biologics and small molecules is key to proper resource use. The implementation of electronic health tools and databases facilitates data sharing, IBD research, and patient care. Strong online IBD communities on Twitter (eg, @MondayNightIBD, @IbdClub, #fgdebate from @FrontGastro_BMJ), and international collaborations such as the International Organization for the Study of Inflammatory Bowel Disease or Surveillance Epidemiology of Coronavirus Under Research Exclusion (SECURE)-IBD allow for optimal exchange of best practices.

Weaknesses

Individuals from minority ethnic and racial background, within the countries where trials are conducted (eg, African American and Hispanic individuals in the USA), with IBD, and people aged over 60 years with IBD,[22] are under-represented in epidemiological studies and RCTs, which curtails our knowledge on specific disease risk factors, natural history, and response to therapies.[30]

We need to expand knowledge on the safety and efficacy of available IBD drugs. For example, remission rates induced by drugs have plateaued to suboptimal levels irrespective of the drugs' mechanism of action. There is a scarcity of standardised treatment positioning and algorithms for different disease phenotypes. Lastly, ineffective therapies are still overused for moderate to severe IBD (eg, mesalamine and chronic corticosteroids).

The identification of hundreds of genes associated with IBD,[31] and the complexity of gut microbiome dysbiosis, challenge us to identify the right therapeutic targets for IBD.

Opportunities

The emergence of IBD in new geographical areas is an opportunity to better define microbiota and environmental risk factors. Big data and AI can help assess patient disease characteristics and personalise disease management, by taking genetic and microbiota signatures and patient characteristics into account. Incorporating patient-reported outcomes into treatment algorithms should result in a more holistic approach to IBD care.[25] Furthermore, the advent of biosimilars should lower the total cost burden of IBD care.[32]

Threats

The rapid rise of IBD in industrialised and low-income countries might overwhelm health-care systems with limited resources. The high cost associated with the increased complexity of IBD management using advanced therapies might limit patient access to quality care. The increased use of biosimilars to mitigate costs has limited the use of newer biologics with improved safety profiles. RCTs designed to examine the efficacy of new drugs as first-line therapy are facing challenges to recruit patients who are biologic-naive. Furthermore, the multitude of innate and environmental factors that interact to alter unique individual disease and optimal personal management approaches adds substantially to the complexity of IBD.

Pancreatology and biliary diseases

Strengths

There is a growing interest among gastroenterologists in pancreatology and biliary diseases, in part due to the high prevalence and burden of these disorders (eg, gallstone disease, acute pancreatitis, pancreatic cysts[1]). The development of magnetic resonance cholangiopancreatography, endoscopic ultrasonography, and endoscopic retrograde cholangiopancreatography (ERCP) have contributed to the growth of this field, by improving diagnosis of pancreatobiliary disorders and expanding therapeutic modalities.[33] Since ERCP is an invasive and potentially risky test, selecting which patients should undergo an ERCP is important to avoid secondary effects on patients that do not need the test. Over the past few years, MRI and endoscopic ultrasound have helped to distinguish which patients should receive an ERCP. Furthermore, the safety and efficacy of ERCP has improved, in part because of studies that assessed the rates of procedural complications, and risk factors and guidelines that outlined ERCP performance measures.[34–37] Diagnostic and therapeutic interventions, such as endoscopic ultrasonography-guided gallbladder drainage,[38] and endoscopic management of pancreatic collections, such as cholangioscopy and pancreatoscopy,[39] are improving, being used more frequently, and are getting more refined. For some pathologies, such as infected pancreatic necrosis, endoscopic management is replacing more invasive surgical options.[40] The progress in the field has spurred the development of national and international guidelines for the management of pancreatobiliary disorders,[41–45] and a training curricula for ERCP, endoscopic ultrasonography, and other advanced procedures.[46–49] Validated training assessment tools for ERCP and endoscopic ultrasonography allow a universal assessment portfolio,[50–52] which can be used in train the trainer programmes. There is increasing research in the field of molecular diagnostics for pancreatobiliary diseases such as pancreatic cancer (addressed in the oncology section) and pancreatic cysts. National and international multicentre trials are being developed for

the treatment of acute and chronic pancreatitis,[53,54] following a successful model of collaborative research designed by the Dutch Pancreatitis Study Group.[55]

Weaknesses

There is an absence of highly reliable and accurate diagnostic criteria for early chronic pancreatitis[56] and indeterminate biliary strictures. Current recommendations for the management of early phase acute pancreatitis are based on low quality evidence,[57] and endoscopic therapeutic options for the management of chronic pancreatitis are scarce and show poor results.[58,59] Diagnosis and risk stratification of pancreatic cystic lesions is still a work in progress, despite there being many (but often not aligned and not followed) published guidelines.[42,60,61] The small pool of ERCP indications reduces the case load for adequate training and maintenance of competences. The scarcity of standardisation of ERCP practice across institutions leads to less adherence to published performance measures and results in higher rates of adverse events in low volume centres.

Opportunities

The use of AI in pancreatobiliary pathologies such as strictures and cysts has not yet been explored.[62] The development of disposable endoscope platforms and disposable components offer the opportunity to optimise the safety of ERCP.[63,64]

Threats

In 2021, pancreatic and biliary disorders were the second and third most common hospital gastrointestinal diagnoses in the USA.[1] However, there is a scarcity of public and policy awareness of the burden and cost of these disorders. This gap results in low funding, and low industry and research interest in pancreatobiliary diseases. The declining reimbursement and increasing costs of advanced diagnostic and therapeutic procedures (with a clear annual increase in endoscopic ultrasound procedures[1]) dampens the development of, and enthusiasm for, innovative techniques. The increased availability of interventional radiology procedures will mean that some gastrointestinal procedures that were only performed by endoscopists are now also performed by radiologists, so a proportion of patients are managed by radiologists.

Endoscopy

Strengths

Endoscopic screening and surveillance have improved survival for several gastrointestinal malignancies.[65] The ability to record and share high quality procedural images and videos has revolutionised endoscopy training and knowledge dissemination. Advances in the field of endoscopy have shifted the treatment of many conditions from surgery to minimally invasive endoscopy techniques, including endoscopic management of obesity,[66,67] peroral endoscopic myotomy, and endoscopic pyloromyotomy.

Weaknesses

Rapid incorporation of new technologies and a scarcity of comparative effectiveness trials have resulted in the adoption of some procedures without clear evidence of clinical benefit. There is too much reliance on the opinion of endoscopy experts—who could have conflicts of interest with device manufacturers or more advanced training than average endoscopists—to guide endoscopic practice. Many endoscopic procedures are done for indications with low probability of diagnostic findings (eg, chronic abdominal pain), resulting in increased health-care costs but no improvement in clinical outcomes.[68,69] Addressing the overuse and underuse of endoscopy should be done by defining better which patients should undergo an endoscopy and outlining quality measures.[70] The development of non-invasive, or less invasive, diagnostic tests or interventions can limit the unnecessary use of endoscopy, such as using stool-based tests for colon cancer screening[71] and using swallowable sponge cell sampling for Barrett's oesophagus and dysplasia screening.[72]

Opportunities

The development of new endoscopic accessories and techniques can replace the need for surgery in some gastrointestinal pathologies. The incorporation of AI in endoscopy will improve polyp detection and the diagnostic accuracy of dysplasia, enhance standardisation in diagnosis and management, and reduce overall health-care costs.[19] Furthermore, simplifying the regulatory burdens for devices and accessories with proven cost-effectiveness should stimulate healthy competition and reduce costs.

Threats

The adoption of costly devices and accessories in endoscopy should be done only after their effect on improving patient safety or outcome has been objectively measured (eg, only use disposable duodenoscopes once data on infection transmission rates is available[63]). Other specialists such as colorectal or thoracic surgeons are increasingly performing endoscopic procedures without meeting the more stringent gastrointestinal competency requirements.

Gastrointestinal oncology

Strengths

Gastrointestinal cancers are a major health problem receiving increasing awareness.[73] Liver cancer is the sixth most commonly diagnosed cancer and the fourth leading cause of cancer death worldwide.[74]

In the past few decades, gastrointestinal oncology has achieved substantial organisational and scientific advances.[74] Many international organisations have nurtured a strong network of experts, prompting a real revolution in this subspecialty.[75] Adoption of colorectal cancer screening programmes, and early detection and

therapy of dysplastic lesions (eg, Barrett oesophagus dysplasia) and gastrointestinal cancers have improved patients' prognosis and quality of life. Gastroenterologists also play a central role in cancer therapy, by performing organ-preserving tumour resections (in rectal and oesophageal cancer) and in palliative therapy (with luminal stents, feeding tubes, and nerve block).[76] The introduction of specific surveillance programmes for high-risk individuals (eg, individuals with hereditary cancer syndromes, intestinal metaplasia, Barrett's oesophagus, or IBD), and advances in genetics screening and genome-wide analysis of patients at high risk of disease are making personalised therapies and improved prognosis possible.[77]

Weaknesses

Gastrointestinal oncology is not recognised as a subspecialty in most countries, which often compromises integrated gastrointestinal cancer management because no single physician is responsible for the entire patient treatment plan. Despite decades of research, some gastrointestinal cancers, such as oesophageal or pancreatic cancer, still have a very poor prognosis.[74] The multidisciplinary nature of the field can decrease cohesion among different health-care professionals, sometimes competing for the same gastrointestinal interventions (eg, percutaneous transhepatic cholangiography *vs* ERCP or transanal minimally invasive surgery *vs* endoscopic submucosal dissection). Furthermore, the lack of a united voice among the different specialties involved in cancer management limits having an effective influence on policy makers and research organisations.

Opportunities

Introduction of big data analysis and AI can contribute to better identification of individuals with (new) high-cancer-risk profiles who would benefit from screening or early intervention, and could lead to better endoscopic detection techniques. Similarly, scientific progress can fuel interdisciplinary collaboration with the development of new professional specialties and better clinical and research collaboration.

Threats

There is still an important disparity between countries regarding access to screening or therapies.[78] Regulatory issues might challenge the eventual approval of an interdisciplinary subspecialty in gastrointestinal oncology. Meanwhile, competition between different specialists for particular treatment modalities challenges medical progress and delays the effect of these treatments on patients' prognosis and quality of life. From a public health perspective, risk factors for gastrointestinal cancers (eg, nutrition, lifestyle, and obesity) are on the rise, which will probably be followed by an increased incidence of these cancers.

Hepatology

Strengths

The burden of liver disease is substantial and growing, leading to high morbidity, mortality, and economic cost.[1] Viral hepatitis, alcohol consumption, and obesity are the most important determinants of liver disease.[79] Scientific progress in hepatology has been effective in slowing or halting the progression of several liver diseases. For example, novel treatments have helped efforts to eliminate hepatitis C.

Weaknesses

Liver diseases lack specific symptoms and are often diagnosed at a late stage resulting in a poor prognosis. Hepatology is often positioned as part of gastroenterology but the link to luminal gastroenterology is weak. The cognitive nature of dealing with patients with very complex conditions is challenging (ie, hepatology is considered an intellectually challenging subspecialty). The reliance on a procedure-based payment structure is a threat to a speciality with scarce specific procedures such as hepatology, and lower revenues in hepatology might drive trainees away. The magnitude of the expected increase in the burden of liver disease is far greater than can be managed by the current cadre of hepatologists.

Opportunities

Disease-specific interventions for alcohol-related liver disease, metabolic-associated liver disease, and autoimmune liver diseases are scarce. Metabolic dysfunction-associated fatty liver disease[80] (non-alcoholic fatty liver disease) is one of the biggest challenges in the field because of the absence of targeted treatments. Anti-fibrotic therapies are only just starting to be developed. Hepatocellular carcinoma management needs further refining with regards to surveillance, therapeutic options, and care pathways. There is increasing basic and translational research in the field and many pharmaceutical companies have entered the field to explore therapeutic options. Furthermore, hepatology should seize the opportunity to coordinate with other specialists (eg, interventional radiologists, pathologists, intensive care physicians) to deliver a multidisciplinary approach to liver care.

Threats

Patients with liver disease live with stigma because of the societal link with alcohol misuse and other lifestyle practices associated with liver disease. Patients tend to come from populations with poor access to care. Management of patients with liver disease requires access to complex technologies that are absent in health-care environments with poor access to resources. Although there are drugs in development for metabolic-associated fatty liver disease, many have not shown promising results in RCTs,[81] and the absence of a development breakthrough

might discourage pharmaceutical companies from further investments in the field. The field is increasingly depending on interventional radiologists for invasive procedures such as liver biopsies and paracentesis. Hepatology needs to develop close relationship with several specialties (eg, radiology, pathology, nephrology, cardiology, surgery) and the absence of these collaborations in a health system compromises care.

Effect of COVID-19

Strengths

International collaborations, through prospective cohort studies and registries such as TIVURON, REKIN, the SECURE-IBD database, the COVID-Hep registry, and SECURE-Liver registry, have helped guide health-care professionals in their practice.[82]

Weaknesses

The COVID-19 pandemic has led to a substantial drop in, or complete suspension of, outpatient visits, endoscopy, and other clinical services. This drop in clinical services has led to growing waiting lists for surgery to treat benign and malignant gastrointestinal disorders.[83] Halting screening and surveillance programmes has led to a substantial reduction in cancer detection.[84] COVID-19 has further delayed procedures that are deemed not urgent, such as oesophageal manometry, breath tests, and acid reflux monitoring. After the first COVID-19 wave there was an extraordinary effort to continue preventive and therapeutic care for gastrointestinal disorders. However, because of a limited capacity for endoscopy, prioritisation of indications was required. The use of predictive scores and alternate screening strategies such as faecal immunochemical tests or faecal calprotectin played an important role.[85]

Despite initial concerns, patients with liver diseases and IBD are not over-represented in COVID-19 cohorts, but the current pandemic has affected their care. Screening programmes for hepatocellular carcinoma have been postponed,[86] and hepatitis C virus micro-elimination efforts have been halted. Concerns of potential exposure to SARS-CoV-2 stopped organ donation efforts and organ transplantation in most regions. Severe COVID-19 is associated with abnormalities in liver biochemistry that require careful assessment.[87] IL-6 antagonists and corticosteroids used against severe COVID-19 come with a risk of hepatitis B virus infection reactivation, warranting astute screening.[88] Because of initial concerns that immuno-suppressive drugs could put patients at risk of severe COVID-19, many patients with IBD interrupted their maintenance therapies and many delayed evaluation of symptoms out of fear of exposure in hospitals or clinics, and fear of delayed initiation or adjustment of treatment.[89] Furthermore, it is also important to recognise the negative effect of the pandemic on the emotional health of these patients.[90,91]

Trainees saw declines in endoscopy and patient care volume, raising concerns about their competency to independently perform procedures and care for patients with complex presentations after graduation.[92] Endoscopists expressed concerns with aerosol-generating procedures, access to personal protective equipment, and reduction of endoscopy volumes and reimbursement.[93,94]

Opportunities

COVID-19 accelerated the use of telehealth, which was embraced by both patients and clinicians, and is likely to continue after COVID-19. Telehealth opens opportunities to improve patient care and monitoring, while minimising the burden of logistics, cost, and time away from work or family. Routine follow-up can be done virtually along with remote monitoring via e-health applications and point-of-care testing. The pandemic has spurred the use of virtual medical conferences and social media educational platforms, which have the advantages of increased inclusivity and accessibility and a reduced carbon footprint.[95,96]

Threats

The COVID-19 pandemic has diverted funds away from gastroenterology. It is unclear whether a quick reversal will occur soon. The worldwide economic and social crises ensuing after the pandemic might slow that process. The economic downturn has already affected the developmental pipelines of many endoscope and accessory manufacturers and has slowed down innovation through clinical trials. The consequences of an increased gap between different socioeconomic levels regarding health care must be addressed.[97] The consequences of the pandemic on metabolic conditions and alcohol and tobacco consumption are unknown and should be investigated.[98]

Conclusion

This Viewpoint maps the present and future of gastroenterology as a discipline and highlights the challenges and opportunities from six fields within the specialty. We established a GASTROSWOT panel composed of experts with a wide range of expertise.

We identified pivotal themes in gastroenterology (figure). First, the incidence of many diseases affecting the gastrointestinal system is increasing. The epidemic of lifestyle-associated disorders such as metabolic syndrome has fuelled the rising incidence of metabolic dysfunction-associated fatty liver disease, and environmental changes are likely to drive the rise of immune disorders such as IBD, eosinophilic oesophagitis, primary biliary cholangitis, primary sclerosing cholangitis, and autoimmune hepatitis. Increasing prevalence of obesity will affect benign and malignant gastrointestinal diseases.[99] Gastrointestinal cancers are among the leading cause of death, and the incidence of oesophageal and pancreatic cancers is rising. These epidemiological developments

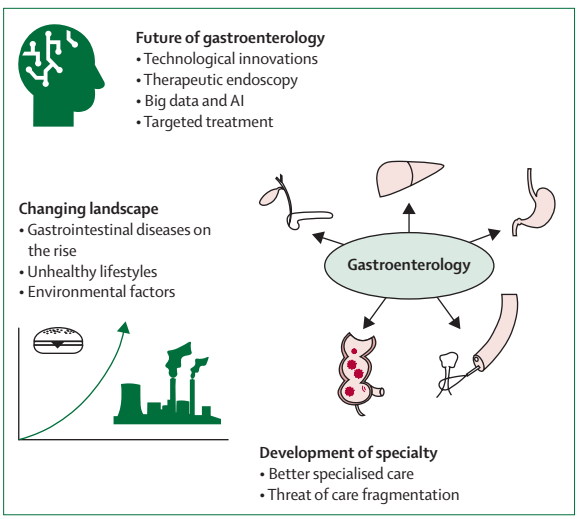

Figure: **Identification of pivotal themes in gastroenterology**
SWOTs=strengths, weaknesses, opportunities and threats.

require a well trained workforce able to cope with the challenges ahead, and high-level strategic planning in health-care use.

Second, gastroenterology as a discipline has greatly benefitted from technical innovations that have led to a better diagnostic armamentarium (eg, endoscopy, manometry). The ability to record and disseminate high-quality procedural images has improved education and powered the development of endoscopy. The advance of AI using deep learning methods is an important innovation in medical imaging analysis. AI will increase diagnostic accuracy in endoscopic diagnosis, and improve the reliability of endoscopic reporting. Endoscopy as a field faces an enormous challenge as it is used increasingly for interventional therapy that often approaches surgery. Advances in our understanding of disease pathogenesis and the development of targeted medical therapies, such as those seen in IBD, have revolutionised patient care, but also lead to increased health-care costs and challenges in managing scarce resources.

Finally, growth and diversification of a medical specialty can both optimise the care of patients with complex diseases and lead to the fragmentation of care. The rapid expansion of medical knowledge and technology, and the increased complexity in managing gastrointestinal disorders, has led to the need for subspecialisation within the field of gastroenterology and hepatology. We need to be mindful that a very specialised and focused view of patients can be detrimental to their care, and as specialists, we must keep a holistic, comprehensive, and multidisciplinary approach to patient care. One of the greatest challenges of gastroenterology is to devise a strategy to deal with opposing needs: providing specialised and in-depth care of gastrointestinal disorders while keeping the patient at the centre of what we do.

An important strength of this SWOT analysis is that its contributors represent different regions, genders, and expertise levels (early career and senior). However, it is not an exhaustive analysis addressing every possible strength, weakness, opportunity, and threat. Instead, it addresses the most relevant topics and issues. Despite our efforts to recruit a diverse group of contributors with balanced perspectives, our analysis is based on the views of a small number of people, and the conclusions might be biased towards wealthier health-care systems.

Contributors

EdM developed the concept. JPHD and EdM are gastroenterologists and were general coordinators during the project. IC and JJM are psychologists and were general coordinators during the project. EVS and DA contributed to the section on neurogastroenterology, functional gastrointestinal disorders, and upper gastrointestinal disorders, and HH was field coordinator for this field during the project. WA and SHP contributed to the section on inflammatory bowel disease, and AC was field coordinator for this field during the project. JV and RP contributed to the section on pancreatology and biliary diseases, and PC was field coordinator for this field during the project. SB and JL contributed to the section on endoscopy, and VKS was field coordinator for this field in the project. MEvL and MA contributed to the section on gastrointestinal oncology, and AC was field coordinator for this field during the project. SL and AR contributed to the section on hepatology, and JPHD was field coordinator for this field during the project. JJM and IC independently verified the development of the manuscript. JJM, IC, JPHD and EdM contributed to the design of the manuscript. AC performed final style review. All authors reviewed and approved the final manuscript.

Declaration of interests

EdM is a consultant for Takeda Pharmaceutical Company, Abbott, and Mylan. WA received consultancy fees from AbbVie, Amgen, Arena Pharmaceuticals, Dynacare, Janssen, Merck, Novartis, Pfizer, Sandoz, and Takeda. SL received speaker and advisor fees from Gilead and AbbVie, and grants from Gilead. RP is a consultant to HCL Technologies, and on the scientific advisory board at Nestlé. VKS is consultant to AbbVie and Nestlé Health Science and has received grant funding from Orgenesis and Theraly. JV is a consultant to Olympus America, and on the scientific advisory board at Aspero Medical. AC consults for, is on the advisory board of, and has received education grants from from AbbVie, Takeda, Janssen, and Pfizer. The Radboud University Medical Center, on behalf of JPHD, received honoraria or research grants from Gilead and AbbVie. All other authors declare no competing interests.

Acknowledgments

The GASTROSWOT team thanks the Spanish Association of Gastroenterology for endorsing the project.

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