Perspective
Volume 6:6, 2022

Journal of Hepatology and Pancreatic Science

ISSN: 2573-4563 Open Access

Computerized Reasoning and the Fate of Gastroenterology and Hepatology

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Introduction

In the upcoming decade, the practice of gastroenterology and hepatology (GI) will undoubtedly be altered by the incorporation of artificial intelligence (AI). Although the use of artificial intelligence (AI) in health care is not new, there have been rapid advances, and the AI landscape of the future is beginning to emerge. AI promises to improve and speed up clinical and procedural gastrointestinal (GI) practice and research in a variety of ways, including endoscopic assistance through computer vision technology and the predictive capabilities of the vast amounts of data in electronic health records. At first glance, the extensive body of research on AI applications in gastroenterology may seem overwhelming. However, the purpose of this review is to provide a breakdown of the most important studies that have been conducted up to this point and to demonstrate the numerous potential ways this technology may affect the field. This review will also take a look into the future and imagine how the gastrointestinal system (GI) can change over the next few years, as well as any potential obstacles that need to be overcome before this future can be realized. In the 1950s, the term "artificial intelligence" (AI) was first used to describe the use of computers to carry out traditionally human-like tasks like problem-solving and nuanced decision-making. In recent decades, there has been a flurry of interest in AI-driven health care and medicine, in large part due to the plethora of data that has become accessible since the EHR was created. By making use of the enormous amounts of data that are currently stored in the electronic health record (EHR), it is hoped that AI-driven health care will one day be able to lead to improvements in all aspects of patient care [1].

Modeling

Algorithms ranging from "supervised" to "unsupervised" learning are included in machine learning (ML), which is at the heart of the most cutting-edge AI. These frameworks, as Rattan et al. described in the previous issue, allow researchers to complete tasks with speed, precision, and accuracy that were previously impossible. ML is particularly effective because it can organize and analyse a large amount of clinical data, such as imaging, laboratory, and documentation data. Since the majority of the data in the EHR is stored as unstructured data, research could only previously access it through laborious chart review.ML algorithms can perform a wide range of tasks, including disease identification and outcome prediction, with an accuracy that is superior to that of traditional statistical methods by gaining access to these data. The substantial body of ML research on image recognition is primarily to blame for the significant promise of AI applications in gastroenterology. Improved disease detection and classification with greater accuracy than even the most experienced endoscopists have been achieved through the use of these algorithms, which have already been applied to endoscopy with encouraging results. However, many obstacles remain, including the identification of algorithmic biases, expanding generalizability, and increasing interpretability. Additionally, widespread adoption is required for these new developments to truly transform health care. The medical community has a lot of skepticism about how AI can be used in clinical practice, which needs to be addressed in the coming years [2].

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Received: 01 November, 2022, Manuscript No. hps-22-83421; **Editor assigned:** 02 November, 2022, PreQC No. P-83421; **Reviewed:** 15 November, 2022, QC No. Q-83421; **Revised:** 19 November, 2022, Manuscript No. R-83421; **Published:** 25 November, 2022, DOI: 10.37421/2573-4563.2022.6.206

Discussion

To demonstrate the potential for AI to transform clinical practice, we highlight significant AI-based studies in gastroenterology and hepatology in this article. We look at how artificial intelligence (AI) has been used in various fields of gastroenterology and hepatology (GI), such as upper endoscopy, colonoscopy, capsule endoscopy, pathology, radiology, and electronic health record (EHR) data, as well as potential future developments that promise to significantly improve patient care while reducing the administrative burden on healthcare providers. Research into the potential uses of novel ML algorithms in upper endoscopy, colonoscopy, and wireless capsule endoscopy (WCE) has grown at an exponential rate over the past ten years. Major advances have already been made in reducing the overall burden placed on endoscopists, determining potential treatment options, and identifying diseases in their early stages. A number of high-quality reviews that concentrate on specific endoscopic modalities outline the extensive research that has been done to comprehend the ways in which ML can transform endoscopic practice. We will talk about important studies on ML-driven endoscopy and how this technology could change how doctors work in the future. Most of the ML research done so far in upper endoscopy has focused on Barrett's esophagus (BE), esophageal squamous cell cancer (SCC), the infection caused by Helicobacter pylori (H. pylori), and gastric cancer [3].

BE is the primary risk factor for esophageal adenocarcinoma development and is particularly linked to poor survival. Because only one in ten cases of esophageal adenocarcinoma is diagnosed during a screening program, it is difficult to screen for BE and early esophageal adenocarcinoma. As a result, AI research has focused on developing a tool that can detect neoplastic changes in BE and has the potential to improve clinical outcomes. Based on endoscopy images, a Support Vector Machine (SVM) model was developed in 2016 to identify early neoplastic changes in BE patients with sensitivity and specificity of 0.86 and 0.87, respectively. Neoplasia was also detected from volumetric laser endomicroscopy images using an algorithm that combined multiple ML models and had a sensitivity and specificity of 90% and 93%, respectively. Additionally, the system identified dysplasia more accurately than general endoscopists, 88% versus 73%.In over 92% of cases, this model also helped determine the best place for a biopsy. A convolutional neural network (CNN) trained on 919 nondysplastic BE control images and 916 endoscopic images of patients with histology-proven neoplastic BE was used to create another model. Early neoplasia could be detected using this model with a sensitivity of 96.4 percent and a specificity of 94.2 percent, respectively [4].

Another disease in gastroenterology in which the possibility of ML is being considered is esophageal SCC. In 2019, 2428 endoscopy images were used to train a deep neural network (DNN), which was able to identify esophageal SCC with a sensitivity of 97.8% and a specificity of 85.4%, respectively. A group of senior endoscopists had an identification accuracy of 88.8%, while junior endoscopists had an identification accuracy of 77.2%. However, when the endoscopists were given access to the DNN tool to help with decision-making, all of the endoscopists' diagnostic abilities significantly improved. A model was likewise made to explicitly distinguish dysplasia and early esophageal SCC. Based on 6473 narrow-band images, this CNN-driven model detected dysplasia and early esophageal SCC with 98% and 95% accuracy, respectively. Using a ML-driven model during live endoscopy to aid in the diagnosis of esophageal SCC was demonstrated to be feasible in these studies [5].

Conclusion

Although numerous efforts have been made to incorporate AI into healthcare, all originate from wealthy nations. Since all AI/ML-based software is data-driven, low- and middle-income countries with healthcare systems that do not generate a lot of electronic, standardized data have very few opportunities to participate in the AI ecosystem. If you weren't a part of the creation of these models, there would be a significant spectrum bias, which could make it harder to use them in low- and middle-income countries. As a result, despite being touted as the key to healthcare equity, AI risks becoming yet another barrier to equality. Incorporating low- and middle-income nations into AI model development projects will be a challenge in the future.

Acknowledgement

None.

Conflict of Interest

None.

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How to cite this article: Gao, Shengtao. “Computerized Reasoning and the Fate of Gastroenterology and Hepatology.” Hepatol Pancreat Sci 6 (2022): 206.