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Applications of Artificial Intelligence-based Systems in the Management of Esophageal Varices

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ADMINISTRATIVE INFORMATION

Support - This study received no external funding.

Review Stage at time of this submission - Completed but not published.

Conflicts of interest - None declared.

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Amendments - This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 14 August 2024 and was last updated on 14 August 2024.

INTRODUCTION

Review question / Objective The aim of this systematic review is to present, in a structured and rigorous manner, the various applications of AI-based systems in the management of esophageal varices.

Condition being studied Esophageal varices are submucosal dilations in the lower esophagus, resulting from portal hypertension commonly seen in various liver and extrahepatic diseases, with liver cirrhosis being the most frequent cause. The significance of proper diagnosis and treatment lies in the substantial morbidity and mortality associated with esophageal varices, particularly variceal hemorrhage. Key components of effective management include early and accurate identification of patients at high risk for variceal hemorrhage, selecting optimal treatment for each patient, managing acute variceal hemorrhage if it occurs, and secondary prophylaxis to prevent further bleeding.

METHODS

Search strategy This systematic review was developed and written following the latest Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) protocol from 2020, adhering to criteria for identifying, selecting, analyzing the quality of studies, assessing risk of bias, and synthesizing the data coherently.
To conduct this study, articles to be included were searched using the PubMed, EMBASE, Wiley, and Cochrane Library databases from their inception up to June 2024. The search was performed using the following combinations of terms: (,,artificial intelligence" OR ,,AI" OR ,,machine learning" OR ,,deep learning" OR ,,computer-aided diagnosis" OR ,,neural networks" OR ,,artificial neural networks" OR ,,computer-aided management") AND (,,management" OR ,,diagnosis" OR ,,analysis" OR ,,evaluation" OR ,,identification") OR ,,risk assessment" AND (,,esophageal varices" OR ,,esophageal bleeding" OR ,,esophageal veins" OR ,,esophageal hemorrhage" OR ,,variceal bleeding" OR ,,variceal hemorrhage").

Participant or population Adult cirrhotic patients with esophageal varices.

Intervention Not applicable.

Comparator Not applicable.

Study designs to be included Observational studies.

Eligibility criteria This systematic review included clinical studies published in English up to June 2024 that analyzed adult cirrhotic patients with esophageal varices and assessed the effectiveness of AI systems in managing these varices.
Systematic reviews, meta-analyses, studies involving pediatric populations, preclinical studies, articles published in languages other than English, abstracts, conference reports or proceedings, case reports, editorials and letters to the editor were subsequently excluded from the study. Additionally, studies that evaluated the effectiveness of AI systems in managing both esophageal and gastric varices and reported results collectively, rather than by subgroup, were excluded. This systematic review focused specifically on esophageal varices.

Information sources To conduct this study, articles to be included were searched using the PubMed, EMBASE, Wiley, and Cochrane Library databases from their inception up to June 2024.

Main outcome(s) In most studies, AI applications were trained and subsequently tested on both internal and external databases, and their accuracy was comparable to, or in some cases even superior to, that of human experts.
Implementing AI systems in medicine has the potential to provide personalized and high-quality patient care, while also assisting clinicians by analyzing large amounts of data in a short time and integrating multiple pieces of information for more efficient, safe, and personalized diagnosis and treatment plans. This approach also reduces the risk of medical errors and the costs associated with patient care.

Quality assessment / Risk of bias analysis This systematic review was developed and written following the latest Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) protocol from 2020, adhering to criteria for identifying, selecting, analyzing the quality of studies, assessing risk of bias, and synthesizing the data coherently.

Strategy of data synthesis Due to the anticipated heterogeneity among the included studies, a meta-analysis was not deemed appropriate. Therefore, a narrative synthesis approach was used to summarize the findings, and relevant data were presented in tabular format. We conducted a qualitative synthesis of all included studies.

Subgroup analysis Subgroup analysis was conducted in accordance with the available data from the extracted data from the included studies, such as type of algorithm.

Sensitivity analysis No sensitivity analysis was conducted in our systematic review.

Country(ies) involved Romania.

Keywords Artificial intelligence; esophageal varices; variceal bleeding; endoscopy; CT scans; clinical data.

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