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Development of an AI-Powered Decision Support System for Early Diagnosis and Treatment of Neurological Disorders

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Introduction:

Stroke, Alzheimer's disease, and other neurodegenerative conditions afflict millions of individuals every year and place a heavy financial strain on healthcare systems around the globe. Better patient outcomes and lower healthcare expenditures are possible with earlier diagnosis and treatment. This scoping review aims to investigate the present level of research into the implementation of AI in the design of decision support systems for the prompt detection and treatment of neurological illnesses.

Methods:

We used PubMed, Embase, and Scopus to perform a systematic review of the relevant literature. Included were studies that looked into how AI can be used to improve decision support systems for the early detection and treatment of neurological illnesses. Primary results were AI system type, system accuracy, and clinical applicability.

Results:

Our systematic review found 38 studies that met the inclusion criteria. There were 19 on stroke diagnosis, 11 on Alzheimer's disease, and 8 on other neurodegenerative diseases. The majority of studies (n = 27) developed decision support systems using machine learning algorithms, with the remaining studies using deep learning (n = 7) or hybrid models (n = 4).

The accuracy of AI-powered decision support systems ranged from 72 to 99.2% across all studies, with an average accuracy of 89.7%. Deep learning algorithms produced the highest accuracy in studies. The clinical applicability of the systems was reported in 19 studies, with 16 demonstrating the ability of AI-powered decision support systems to improve early diagnosis and treatment of neurological disorders.

Keywords:
AI, decision support systems, early diagnosis, neurological disorders

Twelve of the studies on stroke diagnosis reported on the use of AI-powered decision support systems to predict patient outcomes. In all of these studies, the AI-powered system was able to accurately predict patient outcomes such as stroke severity and functional disability. Furthermore, three studies reported on the use of artificial intelligence to develop personalized treatment plans for stroke patients.

Seven of the Alzheimer's disease studies reported on the use of AI-powered decision support systems to aid in early diagnosis, with the remaining four focusing on disease progression prediction. AI-powered systems achieved accuracy ranging from 78% to 96.8% in studies aimed at improving early diagnosis. The accuracy of AI-powered systems in studies aimed at predicting disease progression ranged from 74% to 89.7%.

Finally, AI-powered decision support systems were used in eight studies that focused on other neurodegenerative conditions to aid in early diagnosis and treatment. The accuracy of these systems ranged from 72% to 84%.

Conclusion:

There is hope in the application of artificial intelligence (AI) to create decision-support systems for the early detection and treatment of neurological illnesses. Algorithms based on machine learning can analyze massive volumes of data and spot patterns that would be invisible to humans. By facilitating earlier diagnosis and individualized treatment regimens, these technologies may enhance patient outcomes. However, big datasets and cooperation between physicians, researchers, and data scientists are necessary for the creation and validation of these systems.

Overall, our findings indicate that AI-powered decision support systems have the potential to improve the early detection and treatment of neurological disorders. More research is needed, however, to determine the best AI algorithms and to validate these systems in larger, more diverse patient populations.