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Terpenoids in Plant Resistance: Unraveling Biosynthetic Pathways and Ecological Functions

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Introduction

Brain tumours present a significant health challenge, requiring accurate and timely diagnosis for effective treatment planning and prognostication. Clinical Decision Support Systems (CDSS) have emerged as invaluable tools, integrating clinical data, imaging and machine learning algorithms to aid healthcare professionals in making evidence-based decisions. This systematic review evaluates the current state of CDSS for brain tumour diagnosis and prognosis, highlighting their performance, limitations and potential for improving patient outcomes. Brain tumours are a diverse group of neoplasms that can have varying clinical presentations and outcomes. Early and accurate diagnosis, as well as accurate prognostic evaluation, are critical for devising optimal treatment plans and improving patient survival rates. Clinical Decision Support Systems (CDSS) offer a promising solution to enhance the precision and efficiency of brain tumour management. This review aims to provide an overview of the existing CDSS, their methodologies and their impact on brain tumour diagnosis and prognosis. A systematic search of electronic databases was conducted to identify relevant studies on CDSS for brain tumour diagnosis and prognosis. Selection criteria included articles published from 2010 to 2021, written in English and focusing on CDSS for primary brain tumours. Studies were assessed based on their methodology, data sources, performance metrics and limitations. Various studies have explored the use of image-based CDSS, leveraging machine learning algorithms to analyze brain imaging data such as MRI and CT scans. These systems have shown promising results in identifying tumour characteristics, distinguishing between benign and malignant tumours and aiding in the differentiation of tumour subtypes [1].

Description

While the sensitivity and specificity of image-based CDSS have improved over time, challenges remain, including limited sample sizes, imbalanced datasets and variability in image acquisition protocols. Biomarker-based CDSS utilize molecular and genetic data to assist in brain tumour diagnosis. These systems have shown potential in accurately classifying tumours based on genetic alterations, expression profiles and epigenetic changes. However, the integration of genomic data into clinical practice remains complex, with issues of data standardization, cost and ethical concerns. CDSS designed for prognostication have been developed to predict patient survival outcomes based on clinical, imaging and genomic data. These systems consider various prognostic factors, such as age, tumour size, histology and genetic mutations. They can provide valuable insights into treatment planning and facilitate personalized care. However, the heterogeneity of brain tumours and the dynamic nature of their progression pose challenges for accurate long-term prognostic predictions [2].

CDSS can aid in predicting treatment responses to specific therapies, guiding clinicians in selecting the most effective treatment options for individual patients. These systems integrate patient data with treatment history and outcomes, allowing for personalized treatment plans. However, treatment response prediction remains an evolving field and further research is required to enhance its accuracy and applicability. Clinical Decision Support Systems for brain tumour diagnosis and prognosis have shown great promise in improving patient care and outcomes. Image-based and biomarker-based CDSS offer valuable insights into brain tumour characteristics, while survival prediction and treatment response prediction systems facilitate personalized treatment strategies. However, addressing the challenges of data availability, ethical considerations and algorithm transparency is crucial for the successful integration of CDSS into routine clinical practice. Continued research and collaboration between healthcare providers, researchers and data scientists are essential to advance the field and realize the full potential of CDSS in brain tumour management [3].

Brain tumours present a complex challenge in the field of healthcare, requiring accurate and timely diagnosis for effective treatment and improved patient outcomes. In recent years, Clinical Decision Support Systems (CDSS) have emerged as valuable tools in assisting clinicians with brain tumour diagnosis and prognosis [4]. CDSS leverage advanced technologies, such as artificial intelligence and machine learning, to analyze medical data and provide evidence-based recommendations. This systematic review aims to explore the current state of CDSS in brain tumour diagnosis and prognosis, evaluating their performance, limitations and potential impact on clinical practice. A comprehensive search of electronic databases, including Indexed at, Scopus and Embase, was conducted to identify relevant studies published between 2010 and 2023. The search strategy incorporated a combination of keywords related to brain tumours, clinical decision support systems, diagnosis and prognosis. The inclusion criteria comprised studies focusing on CDSS for brain tumour diagnosis or prognosis, written in English and involving human subjects. Two independent reviewers screened the titles, abstracts and full texts of the retrieved articles to select studies meeting the inclusion criteria. Data extraction included study characteristics, CDSS features, performance metrics and clinical outcomes [5].

Conclusion

Clinical decision support systems have the potential to revolutionize brain tumour diagnosis and prognosis by providing accurate and personalized recommendations. The reviewed studies demonstrate the effectiveness of CDSS in accurately classifying brain tumours and predicting patient survival rates. However, challenges such as data heterogeneity, limited sample sizes, lack of external validation and interpretability issues must be addressed for successful implementation of CDSS in routine clinical practice. Future research should focus on large-scale, prospective studies to further validate and refine CDSS algorithms. Collaboration among researchers, clinicians and policymakers is crucial to overcome these challenges and harness the full potential of CDSS in improving brain tumour patient outcomes. Integration of CDSS into existing electronic health record systems is critical for seamless implementation in clinical workflows. Standardized protocols for data exchange

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and interoperability should be developed to ensure effective integration of CDSS into routine practice. User-friendly interfaces and decision support tools that align with the existing clinical workflow are necessary to ensure practicality and ease of use for clinicians.

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Conflict of Interest

None.

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