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Polygenic Risk Scores in Predicting Stroke Susceptibility: Challenges and Opportunities

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Introduction

Stroke remains a leading cause of death and disability worldwide, with its burden projected to rise due to aging populations and increasing prevalence of risk factors such as hypertension and diabetes. While traditional risk factors are well-recognized, genetic predisposition also plays a significant role in stroke susceptibility. Advances in genomic medicine have introduced polygenic risk scores as a tool to estimate an individual's genetic predisposition to complex diseases, including stroke. This article explores the potential of PRS in predicting stroke risk, the challenges in their application and the opportunities they present for personalized medicine [1]. Polygenic risk scores are derived from the cumulative effect of multiple genetic variants, each contributing a small amount to disease risk. In stroke, these scores are typically calculated using genome-wide association studies that identify common variants associated with stroke subtypes, such as ischemic and hemorrhagic strokes. By aggregating the risk conferred by these variants, PRS can stratify individuals into different risk categories, offering a new dimension to risk assessment beyond traditional clinical factors [2].

Description

PRS can complement traditional risk factors by identifying individuals at higher genetic risk who may not exhibit conventional risk markers. This early identification can guide targeted interventions and preventive measures. Incorporating PRS into clinical practice has the potential to advance personalized medicine. Tailored lifestyle and pharmacological interventions based on an individual's genetic risk could improve outcomes and reduce stroke incidence. PRS can shed light on the genetic architecture of different stroke subtypes, enhancing our understanding of their distinct pathophysiological mechanisms. This could inform subtype-specific prevention and treatment strategies. Most GWAS and PRS studies have been conducted in populations of European ancestry, limiting the generalizability of findings to other populations. Developing PRS that are robust across diverse ancestries is critical to avoid exacerbating health disparities. The use of PRS raises ethical questions, including privacy of genetic information and potential misuse in insurance or employment contexts. Additionally, communicating genetic risk to patients requires careful consideration to avoid undue anxiety or fatalism. Despite their promise, PRS currently explain only a fraction of the heritability of stroke. Their predictive accuracy must improve to make them a reliable tool in clinical settings [3].

Advances in genomic medicine have introduced Polygenic Risk Scores (PRS) as a tool to estimate an individual's genetic predisposition to complex diseases, including stroke. The development of PRS is rooted in the rapid progress of genome-wide association studies which have identified numerous genetic loci linked to stroke and its subtypes. By aggregating the contributions of these genetic variants, PRS offers a quantitative measure of inherited risk, bridging the gap between genetic research and clinical practice. Despite their nascent stage, PRS have demonstrated potential in enhancing our understanding of the genetic underpinnings of stroke and refining risk prediction models. Moreover, the integration of PRS with traditional risk assessment tools could revolutionize preventive strategies. By identifying high-risk individuals earlier, PRS enables timely interventions that might delay or prevent the onset of stroke. However, the journey from discovery to practical application is fraught with challenges, including issues of equity, data interpretation and clinical utility [4,5].

Conclusion

Polygenic risk scores offer a promising avenue for enhancing stroke risk prediction and enabling personalized prevention strategies. However, significant challenges remain in ensuring their accuracy, applicability and ethical use. Addressing these hurdles through continued research, technological innovation and policy development will be key to unlocking the full potential of PRS in reducing the global burden of stroke. The future of telemedicine in cerebrovascular disease management looks promising, with ongoing advancements in technology and increased integration into standard care practices. Continued research is needed to evaluate the long-term effectiveness of telemedicine interventions and to address any existing barriers. As technology evolves and becomes more accessible, telemedicine has the potential to play an even more significant role in enhancing the management of cerebrovascular diseases, ultimately leading to better patient outcomes and more efficient healthcare delivery.

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Conflict of Interest

None.

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