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A New Focus in Individualised Health: From Sample-Based Statistics to N-of-1 Medicine

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Dear Editor,

Medicine is moving beyond the "average patient" to focus on the unique biology of each individual. Modern medicine has long relied on population-based statistical approaches to determine the most appropriate treatments for the "average patient." However, genetic, environmental, and lifestyle differences indicate that these averages are not always applicable at the individual level. Today, clinical practice is undergoing a profound conceptual shift-from treatment protocols derived from large-scale epidemiological data toward personalised approaches that focus on the biological and environmental uniqueness of each individual. Variations in genetic structure, environmental exposures, lifestyle, and metabolic responses among individuals render population-based generalisations insufficient for effective patient management. In this context, the "N-of-1" or single-subject trial approach has emerged as a powerful model in which an individual's own biological and contextual data serve as the primary reference point, allowing clinical decisions to be optimised on a personal level. The tangible reflections of this transformation are evident across multiple medical disciplines. In oncology, standard chemotherapy regimens are increasingly being replaced by targeted therapies tailored to the molecular profile of the tumour. For example, the use of PARP inhibitors in patients with ovarian or breast cancer carrying *BRCA1/2* mutations exemplifies how such approaches can significantly enhance therapeutic efficacy (1). In cardiology, polygenic risk scores (PRS) go beyond traditional risk factors to enable more precise risk stratification for complex conditions such as coronary artery disease. These scores provide powerful tools for the early identification of high-risk individuals and the effective implementation of preventive strategies. In diabetes management, continuous glucose monitoring (CGM) systems integrated with AI-driven algorithms enable patients to make real-time, data-informed insulin dose adjustments, reducing the risk of hypoglycaemia and improving glycaemic control (2, 3). However, the clinical integration of this data-driven personalisation process presents several challenges. Foremost among these is data security and privacy, which remain critical concerns for patients. The potential misuse of personal health information represents a significant barrier to adoption. Furthermore, the integration and standardisation of heterogeneous data from diverse sources such as electronic health records (EHRs), wearable sensors, and genomic platforms pose substantial technical challenges. In addition, AI models trained on homogeneous population data risk introducing algorithmic bias, potentially exacerbating existing health disparities (4). Finally, clinicians must acquire new analytical competencies and undergo continuous training to interpret and apply these complex, high-volume datasets. In conclusion, the transition from sample-based statistics to individual-level data analysis offers transformative opportunities for diagnostic precision, therapeutic efficacy, and preventive medicine. To successfully navigate this transformation, a multifaceted strategy is required-one that goes beyond technological investment to include the establishment of robust ethical frameworks, the development of data standards, the assurance of algorithmic fairness, and the upskilling of healthcare professionals. Addressing these challenges proactively will pave the way toward a healthcare system that is more precise, effective, and equitable.

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