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Personalized Medicine Transforming Healthcare through Tailored Therapies

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Abstract

Personalized medicine, also known as precision medicine, is an emerging healthcare approach that customizes medical treatment according to an individual's genetic, environmental, and lifestyle characteristics. This mini-review highlights its principles, applications, challenges, and future potential in improving patient outcomes.

Introduction

Personalized medicine also known as precision medicine, is revolutionizing the way diseases are diagnosed, prevented and treated by tailoring healthcare interventions to an individual's genetic profile, environment, and lifestyle factors [1]. Unlike the conventional one-size-fits-all approach, personalized medicine emphasizes patient-specific strategies that optimize therapeutic outcomes and minimize adverse effects [2].

Advances in genomics proteomics metabolomics and bioinformatics have accelerated the growth of personalized medicine, enabling clinicians to predict disease susceptibility select targeted therapies, and implement preventive measures [3].

In particular, oncology and pharmacogenomics have been at the forefront of this transformation, with molecular profiling of tumors guiding the selection of drugs such as trastuzumab for HER2-positive breast cancer and gefitinib for EGFR-mutated lung cancer [4].

Beyond treatment, personalized medicine has significant implications for public health and preventive care, allowing the identification of high-risk individuals for conditions such as cardiovascular disease and diabetes before the onset of symptoms [5].

This proactive, patient-centered approach has the potential to enhance clinical outcomes, reduce healthcare costs, and improve quality of life, marking a paradigm shift in modern medicine.

Applications in Healthcare

Oncology: Cancer treatment has greatly benefited from personalized medicine. Molecular testing identifies driver

mutations, such as EGFR in lung cancer and HER2 in breast cancer, enabling targeted therapies that improve survival rates [3].

Pharmacogenomics: By analyzing genetic variations in drug-metabolizing enzymes, clinicians can predict drug responses, minimizing adverse effects and optimizing therapeutic efficacy [4].

Preventive Medicine: Personalized medicine facilitates risk prediction for chronic diseases like diabetes and cardiovascular disorders. Early identification allows lifestyle modifications and preventive interventions, reducing disease burden [2].

Challenges and Future Perspectives

Despite its potential, personalized medicine faces challenges, including high costs, limited access to genomic testing, data privacy concerns, and the need for specialized infrastructure [5].

However, with ongoing technological advancements in next-generation sequencing, artificial intelligence, and large-scale biobanking, the integration of personalized medicine into routine clinical practice is expected to become more feasible and impactful in the near future.

Conclusion

Personalized medicine is redefining healthcare by providing precise, effective, and patient-centered treatments. Although challenges remain, continued research, policy support, and technological innovation will accelerate its adoption, ultimately enhancing patient care and global health outcomes.

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