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MOLECULAR DIAGNOSTICS IN CLINICAL SETTINGS: CURRENT CHALLENGES AND ACHIEVEMENTS

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Advances in genomics, artificial intelligence, and high-throughput sequencing technologies are continuously expanding the role of molecular diagnostics in healthcare. Clinical next-generation sequencing (NGS), liquid biopsy, and multi-omics approaches are increasingly becoming integral components of patient management, enabling more accurate diagnosis, refined prognostic assessment, and personalized treatment selection.

The rapid evolution of genomic technologies, particularly NGS, has significantly enhanced sequencing performance while reducing both costs and turnaround times. These improvements have made clinical genomic testing more accessible and practical for routine healthcare, accelerating its integration into clinical practice and supporting the broader implementation of precision medicine.

Despite these remarkable advances and widespread adoption, several challenges continue to hinder the full clinical potential of molecular diagnostics. These include technical and analytical limitations, quality assurance and regulatory requirements, complexities in bioinformatics and data analysis, and the interpretation of clinically relevant genomic variants.

In this presentation, I will discuss the major challenges associated with implementing clinical genomics in patient care and highlight practical strategies to address these barriers. Through selected examples, I will demonstrate approaches that can enhance the clinical utility of molecular diagnostics and maximize its impact on patient outcomes.

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