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The new paradigm of precision medicine: Evidence-based clinical oncology

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Precision medicine is an emerging approach for disease treatment and prevention that takes into consideration the variations in genomic makeup, environmental exposure, and social economic status of each individual. Evidence-based oncology integrates the clinical expertise, patient values and the best available evidence, especially the cancer genomic information of a patient in clinical decision making. Next-generation sequencing (NGS) technologies have revolutionized genomic research by decreasing the cost of sequencing while increasing the throughput. Clinical application of NGS in cancer can detect clinically actionable genetic/genomic alterations that are critical for cancer care. In certain cancers, patient risk and prognosis can be predicted based on the mutation profile identified by NGS. Many targeted therapies have been developed for cancer patients who bear specific genomic alterations. However, choosing right NGS techniques for appropriate clinical applications can be challenging, especially in clinical oncology, where the material for testing is often limited and the turn-around time of testing is frequently constrained to just a few days. Currently, targeted NGS approaches have emerged as the best fit for clinical oncology. We have developed and validated multiple large NGS panels that allow the detection of single nucleotide variations (SNVs), small indels, copy number variations (CNVs), and novel fusion genes in different cancers, as well as pathogenic variants associated with cancer predispositions. These panels have been applied to thousands of clinical cases and have provided critic genomic information to aid in patient management decision making. Currently, whole exome and whole genome sequencing are mostly used in cancer research. As the cost of running NGS-based test continues to decrease and software for NGS data analysis continues to improve, clinical application of whole exome, whole genome, and whole transcriptome sequencing in precision cancer care is just a matter of time.

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