INNOVATIVE TECHNOLOGICAL ADVANCES IN LABORATORY MEDICINE

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Laboratory medicine plays an integral role in healthcare by providing healthcare professionals with objective information for disease prevention, risk assessment, diagnosis, prognosis, treatment and patient monitoring, which is safe , ensuring accurate and effective clinical decision-making. In recent years, major technological advances in laboratory medicine have significantly improved clinical laboratory diagnostics and monitoring, and improved the quality of patient care. In turn, these technological innovations have added recognized value to laboratory medicine in the health sector. Laboratory medicine is an integral part of health care , which provides medical personnel with timely objective information for the prevention, diagnosis, treatment and monitoring of diseases relies on many analytical techniques. Driven by a culture of innovation, recent technological advances have revolutionized modern laboratory medicine and added significant value and visibility to its role in healthcare and clinical decision-making. Remarkable innovations in laboratory automation, genomics, nuclear magnetic resonance spectroscopy, mass spectrometry, microfluidics, and electronic instrumentation have changed the face of research. The increasing use of these technologies, as well as their integration with microtechnology and point-of-care, has contributed to improving patient outcomes and narrowing the clinical-laboratory interface to facilitate a patient-centered approach to healthcare. Traditionally, clinical chemistry, hematology, and microbiology testing have been very demanding for laboratory personnel, who were responsible for many steps in the analytical process, from sample collection to final disposal. However, in recent decades, clinical chemistry and hematology laboratories have largely adopted automated analyzers, which significantly improve laboratory test efficiency, costs, and laboratory errors. In addition, remarkable analytical advances in genetics and genomics, nuclear magnetic resonance (NMR) spectroscopy, mass spectrometry (MS), and microfluidics have boosted laboratory automation to usher in a new era of laboratory medicine. Indeed, the development and evolution of next-generation and single-cell sequencing has revolutionized the field of genomics and transcriptomics, enabling high-throughput and low-cost sequencing of whole-genome DNA and RNA. Proteomics and metabolomics are currently defined by advances in NMR and MS technologies, expanding their applications in several clinical disciplines. Although all modern clinical chemistry and hematology analyzers are highly automated, only a few TLA systems have been developed. Cobas® (Roche Diagnostics) is an automated core laboratory instrument capable of autonomously managing sample processing, analysis and storage. When combined with one or more connectivity modules in the Trek system, this instrument can also perform sample sorting, opening, quality control, aliquoting, and in vitro resealing.

In conclusion, laboratory medicine continues to advance due to advances in innovative technologies that ultimately improve the laboratory's preventive, diagnostic, prognostic, and monitoring capabilities. Extensive progress has been made in automating key laboratory analyzers, and adequate training and education can provide several key benefits for the laboratory environment, including improved clinical workflow, reduced costs, and increased overall efficiency. confirms. New advances in analytical techniques, particularly genetic sequencing, NMR, MS, and microtechnology, also define the current era of laboratory medicine and the role of the laboratory in health care.