Analytical Techniques for Therapeutic Drug Monitoring and Clinical Toxicology

Abstract

Therapeutic drug monitoring (TDM) and clinical toxicology (CT) studies play significant roles in understanding and controlling the observed variabilities in therapeutic response of administered drug products, as well as proffering measures to improve the safety and efficacy of treatments that patients receive. However, the optimization of patient care through TDM continues to remain a challenge in many health jurisdictions despite the numerous advancements and progress in analytical techniques and technology. The practice of TDM and CT in the optimization of patient care is still evolving and requires a myriad of technical and material resources to achieve the needed optimal health outcomes. One of the critical elements in this endeavour is the availability of analytical techniques that are sensitive, cost effective, and high performing in terms of accuracy and precision and also possess seamless workflow. This chapter, thus, discusses the various high-throughput analytical techniques employed in TDM and CT, as well as the challenges associated with their respective applications as reported in the literature. It must be emphasized that consideration for a suitable analytical method for TDM and CT comes with careful planning and decision making. Factors to be considered include but are not limited to the availability of expertise (clinical and laboratory), equipment/instrument, the physicochemical nature of the target analyte (drug, metabolite, toxicant, or toxin), and the clinical situation presenting the need for TDM. Other important factors such as sample preparation and storage, analytical method development and validation, and interferences associated with matrix effect also require careful consideration in order to assure the reliability and quality of TDM or CT data needed for informed clinical decision.