Maximizing Multi-dimensional Big Data to Explore Risk and Benefit Ratio of Immunotherapy

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Immune-checkpoint inhibitors (ICIs) have transformed patient care in oncology but are associated with a unique spectrum of organ-specific inflammatory toxicities known as immune-related adverse events (irAEs). Given the expanding use of ICIs, an increasing number of patients with cancer experience irAEs, including severe irAEs. Proper diagnosis and management of irAEs are important to optimize the quality of life and long-term outcomes of patients receiving ICIs; however, owing to the substantial heterogeneity within irAEs, and despite multicentre initiatives, performing clinical studies of these toxicities with a sufficient cohort size is challenging. Pioneering studies from the past few years have demonstrated that aggregate clinical data, real-world data (such as data on pharmacovigilance or from electronic health records) and multi-omics data are alternative tools well suited to investigating the underlying mechanisms and clinical presentations of irAEs. We have developed research strategies to utilize different sources of 'big data' for the study of irAEs. By maximizing the unique power of big data, we successfully identified biomarkers of irAE risk, characterized the effects of demographic and anthropometric factors on irAE risk and constructed landscape of toxicities of CAR-T therapy. Harnessing big data will accelerate research on irAEs and provide key insights that will improve the clinical benefits of patients receiving immunotherapies.

Keywords: immune-related adverse events; cancer immunotherapy; clinical benefits; anti-PD-1/PD-L1