There is a great need for the development of biomimetic human tissue models that allow elucidation of the pathophysiological conditions involved in disease initiation and progression. Conventional two-dimensional (2D) in vitro assays and animal models have been unable to fully recapitulate the critical characteristics of human physiology. Alternatively, three-dimensional (3D) tissue models are often developed in a low-throughput manner and lack crucial native-like architecture. The recent emergence of bioprinting technologies has enabled creating 3D tissue models that address the critical challenges of conventional in vitro assays through the development of custom bioinks and patient derived cells coupled with well-defined arrangements of biomaterials. Here, we provide an overview on the technological aspects of 3D bioprinting technique and discuss how the development of bioprinted tissue models have propelled our understanding of diseases’ characteristics (i.e. initiation and progression). The future perspectives on the use of bioprinted 3D tissue models for drug discovery application are also highlighted.