

## **3D Bioprinting: An Emerging Technique for Valvular Disease**

**Grant Newton Garrison**

Department of Internal Medicine, East Tennessee State University, United States

### **Abstract:**

For severe valvular disease, replacement with mechanical and bioprosthetic valves is commonly done in practice. Nearly 100 million people worldwide are affected by valvular disease, ranging from mild to severe disease. In select cases, valvular replacement can significantly improve quality of life. Yet, the valves used for replacement face limitations requiring long-term monitoring and management. 3D bioprinting offers a patient-tailored alternative, based on donor cells from the patient. Nevertheless, with the current models, there have not been any valves that have passed in vitro regulations. This project explores emerging research to identify obstacles and guide developing researchers with potential solutions.

Through review of the most recent literature, processes in 3D bioprinting and their outcomes are systematically analyzed. The designs and materials used are examined to identify trends with the information available. There are gaps in the literature as the majority of 3D-printed valves ever produced have been in recent years. This study connects finished research with areas that have yet to be explored and deduces future directions of study accordingly.

The ultimate goal of this project is to overcome the barriers that have prevented achievement of in vivo implantation of a 3D-printed valve thus far. In theory, the technique allows patients to have fully individualized valves, leading to better outcomes. With successful implementation of these valves, the limitations of current valve repair treatments are ameliorated.

### **Keywords:**

bioprinting, cardiology, valvular disease, innovation.