## **3D Printing in Medicine: Building the Future of** Healthcare

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## Abstract

Precision medicine-which emphasizes customized medicines for specific patients—was developed as a result of data analytics, genetics, and imaging, which defined the unique characteristics of every individual and critiqued generic treatments. Technological advances in medical 3D printing have been predicted to revolutionize the health care industry by facilitating the quick manufacturing of customized medications and treatments. Notwithstanding its limitations, this technology redefines surgical planning and promises significant opportunities in the pharmaceutical and healthcare sectors. The adoption of several 3D printing technologies in the pharmaceutical industry is examined in this article. These technologies include stereo-lithography, pressure-assisted micro-syringe, fused filament fabrication, binder jetting, inkjet printing, and selective laser sintering. Their possible applications in healthcare environments for customized medication are presented. In addition to summarizing upcoming advancements for integration in pharmacies and hospitals, this paper analyzes the current status of fused deposition modeling (FDM) technology in pharmaceutical and medical research, its applications in customized therapies, and its limitations.

Keywords: 3D Printing, Additive Manufacturing (AM), Bio-Printing, Powder Bed Fusion (PBF), Healthcare Artificial Intelligence (HAI), Medical Imaging

## I. Introduction

The adoption of 3D printing technology has transformed the fabrication of pharmaceutical products through facilitating personalized prescription regimens and drug delivery, promoting therapeutic efficacy, and redefining the healthcare industry by offering patients superior therapeutic results<sup>[1].</sup> Considering a patient's specific physiology, pharmacological reactions, and genetic profile in consciousness, personalized medicine is a contemporary method of therapies. In order to fabricate different dosage forms that have distinct geometries, release profiles, and

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