

CURRENT ISSUES AND POTENTIAL ADVANCES OF 3D PRINTING IN MEDICAL FIELD

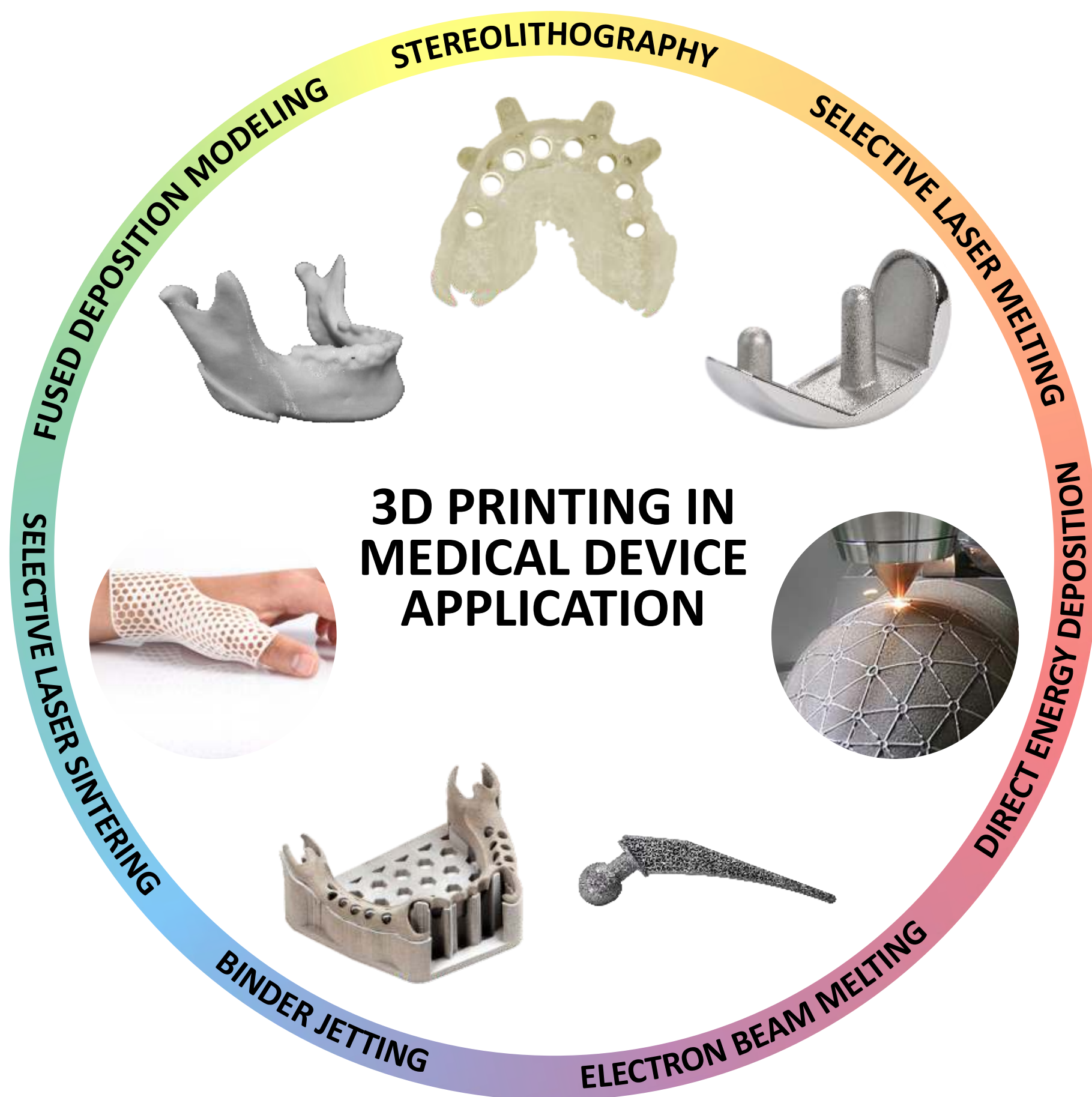
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1 Generalities

3D printing is a state-of-the-art additive manufacturing (AM) technology that builds objects layer by layer using different metallic, ceramic, or polymeric materials.

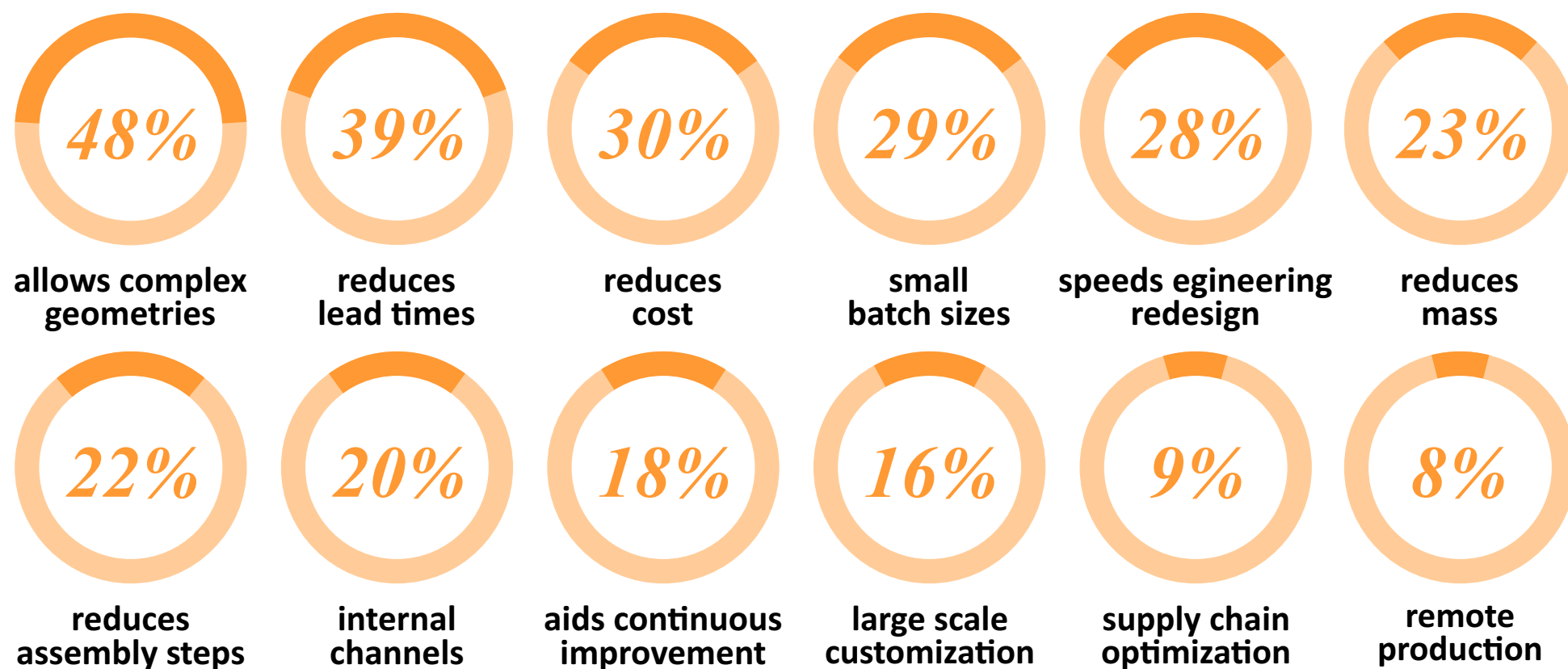
AM is gaining traction in many areas of production, especially when dealing with complex geometries that are hard to reproduce using conventional manufacturing methods, providing great advantages such as manufacturing speed, increased flexibility, high customizability, and being a cost-effective and environmentally friendly technology. As technology advances, the possibilities for AM are endless, and the medical field benefits greatly from a multitude of 3D printing techniques and materials.



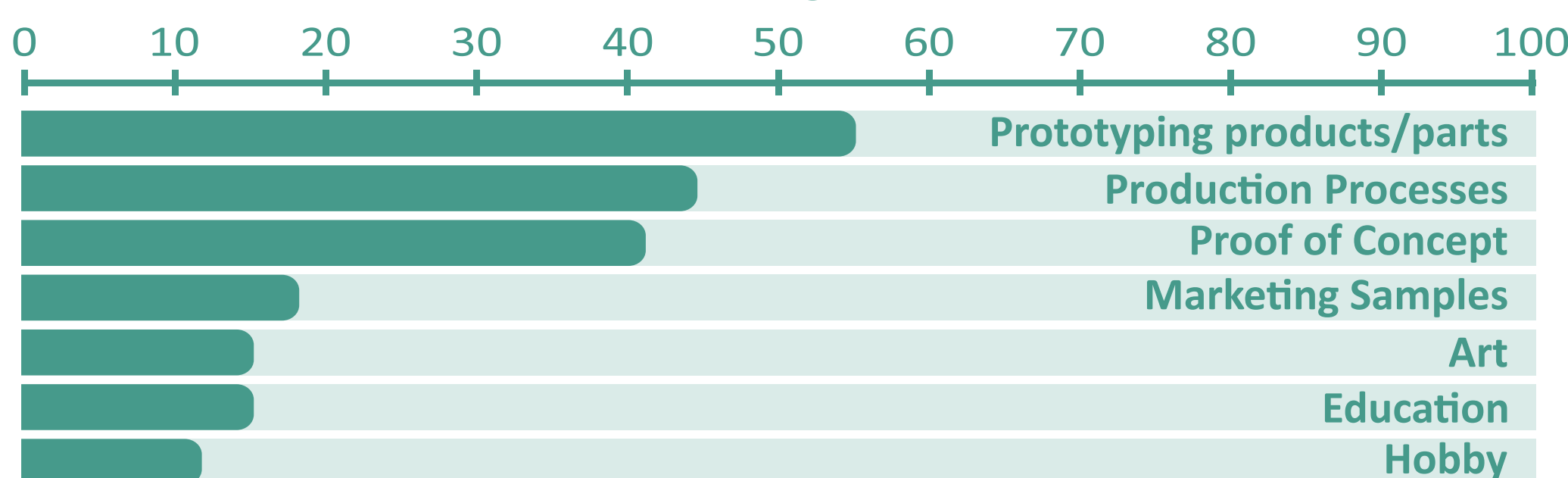
2 Benefits for professionals

3D printing has become integral for professionals seeking to innovate and achieve efficiency gains in production. A 2019 study by Sculpteo, an online 3D printing service provider, surveying 1000 specialists from various industries revealed how professionals rate the benefits of 3D printing technology.

Competitive advantages of 3D Printing



How 3D-Printing is used (%)

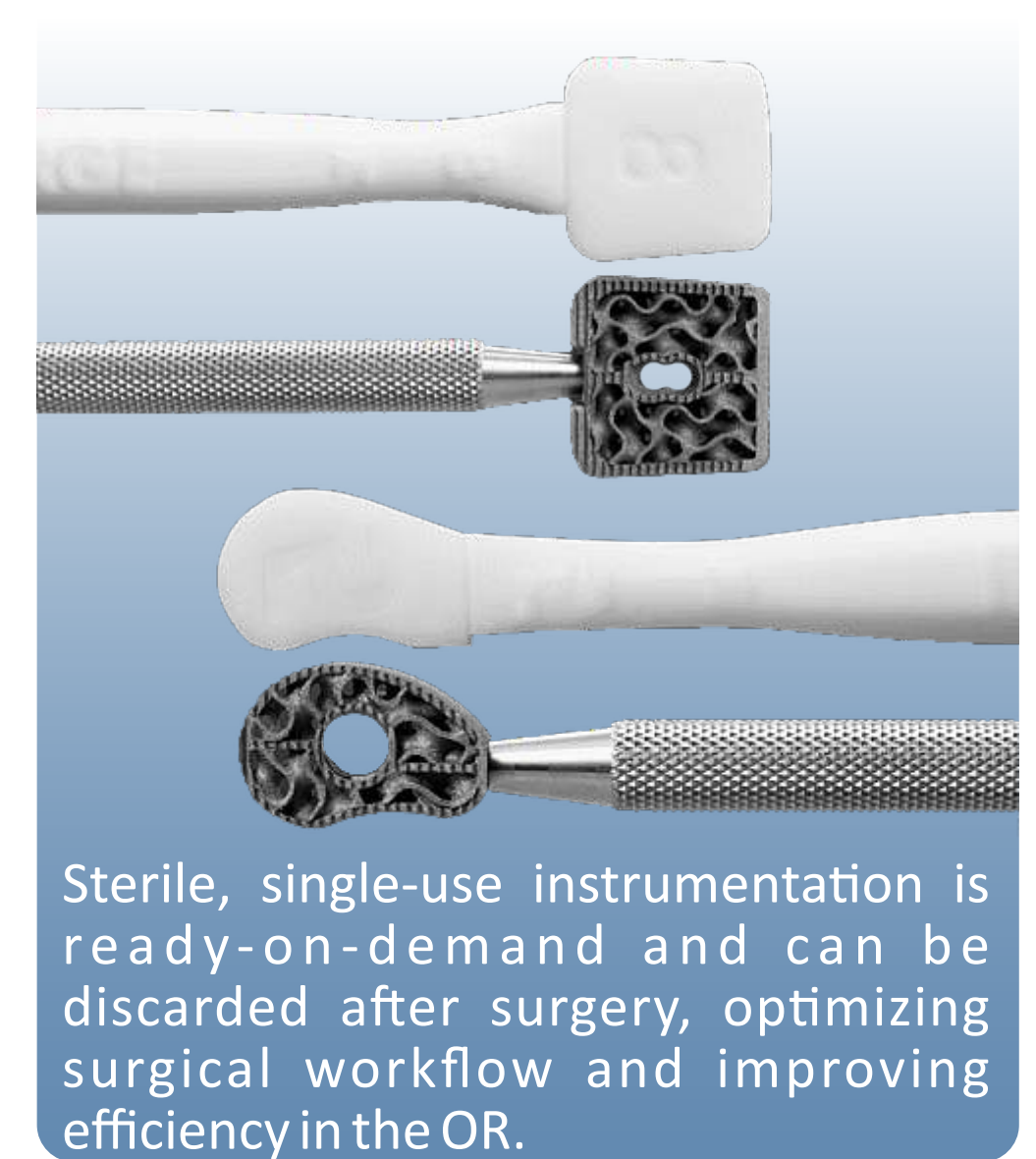
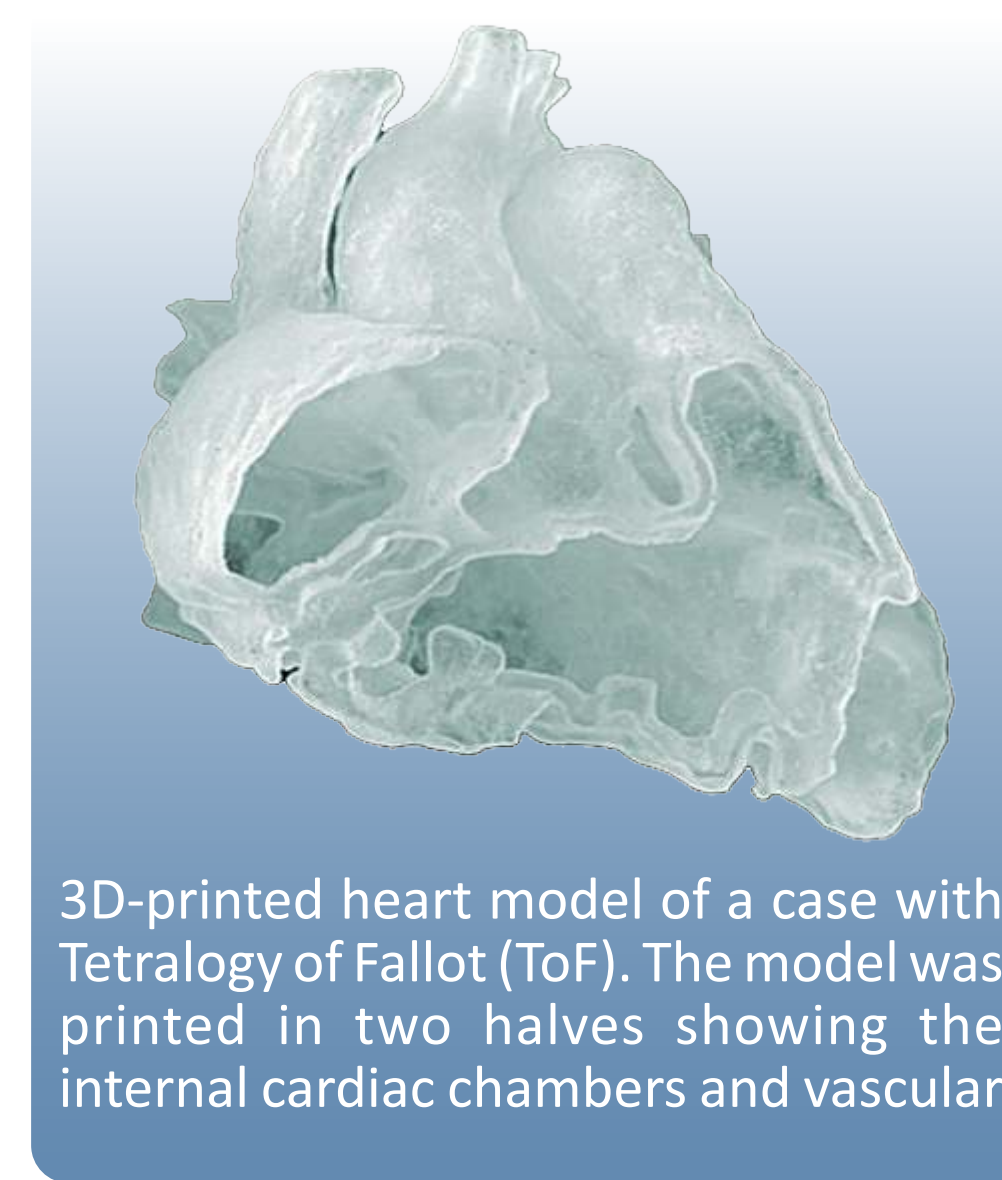


Selective references:

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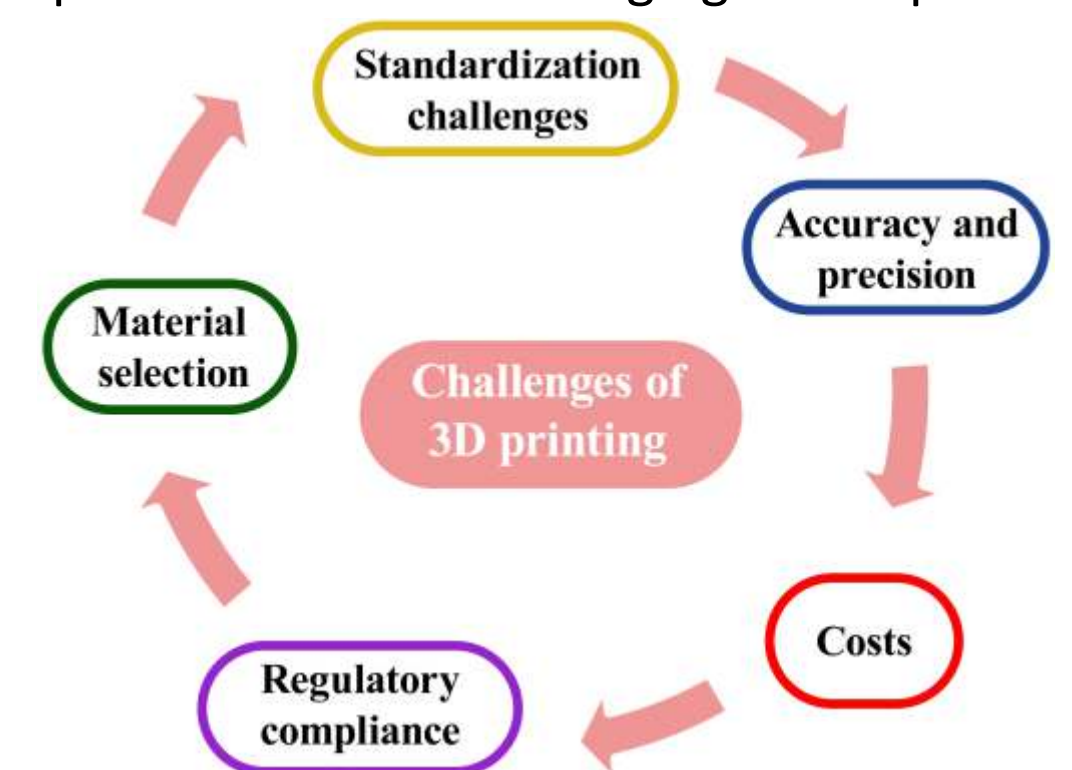
3 3D Printing trends in the biomedical sector

From patient-specific implants and surgical guides to bioprinting and pharmaceutical manufacturing, 3D printing is a rapidly growing technology that is transforming the medical industry and revolutionize how medical devices and components are designed and manufactured. This technology has been widely used in the medical industry for various applications, including printing prosthetic limbs, surgical guides, customized implants, rapid prototyping medical devices and components, and food manufacturing. Researchers are exploring using 3D printing for various medical applications, including producing tailored drug delivery devices, fabricating tissues and organs for regenerative medicine, manufacturing surgical guides and implants, and developing models for surgical planning and training.



4 3D-printing challenges in medical field

One of the critical challenges of AM technology in the medical sector is material selection. It is essential to identify and develop new biocompatible, sterilizable materials that can withstand the harsh environment of the human body while being safe for human use. In addition, the material's properties must match the intended application, such as strength, flexibility, and wear resistance. During 3D printing for medical applications, high accuracy and precision are key ingredients for quality parts. The technology has progressed significantly in meeting these requirements; however, achieving the required level of accuracy and precision can be challenging and requires careful consideration of the printing process, materials, design, and adherence to strict quality control standards. Regulatory compliance is another significant challenge that must be addressed in 3D printing for medical applications. Medical devices produced using 3D printing must meet strict regulatory standards to ensure their safety and effectiveness. Deviation from the desired specifications and imposed regulations can result in significant consequences for the patient.



5 What's next

3D printing technology has emerged as a powerful tool in the medical industry, enabling the production of complex medical devices and implants customized to meet individual patient's specific needs while being cost-effective. Future research in 3D printing for the medical sector will trend on creating new materials and methods, enhancing the quality and security of printed items. Thus will make it possible to create medical equipment and implants that are more individually tailored and efficient, enhance the results of surgical procedures, and lower healthcare expenses for patients and healthcare providers. The technology offers several advantages, such as reduced lead times, improved patient outcomes, and cost savings. AM in the medical industry is widespread, with applications ranging from dental implants and orthopedic devices to prosthetics and hearing aids. AI algorithms can be used to analyze medical data and identify patterns that can aid in diagnosing and treating diseases. Integrating AI with additive manufacturing technology is expected to play a vital role in the future of medical manufacturing, leading to further advancements and improvements in patient care. Continued research and development will be necessary to ensure these

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