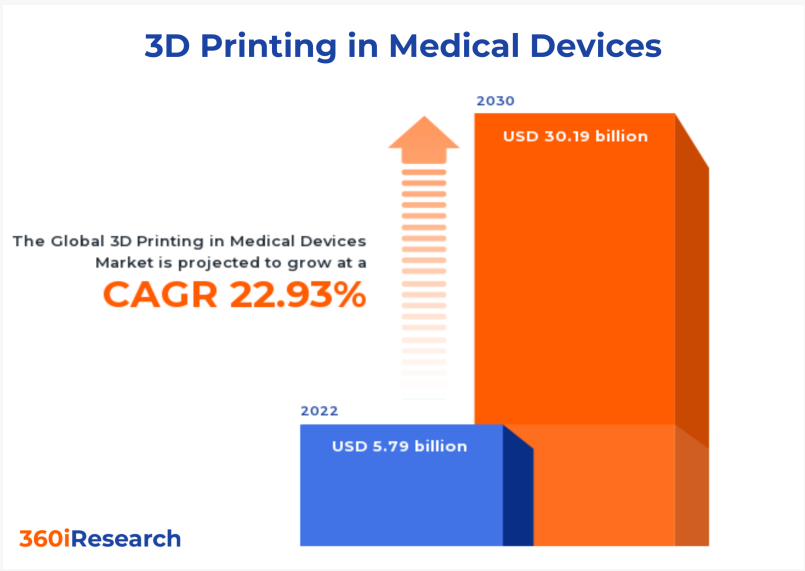
3D Printing in Medical Devices Market worth $30.19 billion by 2030 - Exclusive Report by 360iResearch

The Global 3D Printing in Medical Devices Market to grow from USD 5.79 billion in 2022 to USD 30.19 billion by 2030, at a CAGR of 22.93%.



3D Printing in Medical Devices Market - Exclusive Report by 360iResearch

PUNE, MAHARASHTRA, INDIA, November 7, 2023 /EINPresswire.com/ -- The "3D Printing in Medical Devices Market by Product Type (Bone & Cartilage Scaffolds, Ligament & Tendon Scaffolds, Prosthetics & Implants), Technology (Droplet Deposition/Extrusion-Based Technologies, Electron Beam Melting, Laser Beam Melting), Component, End User - Global Forecast 2023-2030" report has been added to 360iResearch.com's offering.

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Various 3D printing technologies have emerged in the medical device industry, offering innovative solutions for orthopedic implants, surgical instruments, and patient-specific models. The significant advantage of 3D printing is its ability to manufacture highly-customized devices tailored to individual patient's anatomy and requirements. 3D-printed cranial implants can be designed based on precise measurements from scans or MRI images, ensuring an accurate fit while minimizing complications during surgery. Patient-specific guides help surgeons accurately plan and execute complex procedures, such as joint replacement surgeries, with greater precision. In recent years, 3D printing has emerged as a driving force for innovation in medical

devices owing to its inherent benefits in customization and rapid prototyping. There is an increasing trend toward using this technology for personalized medicine and patient-specific prosthetics, orthopedic implants, dental appliances, and surgical instruments. These applications have been facilitated by advancements in biocompatible materials such as metals, polymers, ceramics, and even biological substances, such as hydrogels, for tissue engineering. Despite its numerous benefits, the widespread adoption of 3D printing in medical devices faces challenges owing to higher costs associated with the 3D printed medical devices, and a lack of expertise to operate these devices act as a restraining factor. Moreover, ongoing R&D efforts by market companies to advance 3D printing materials for medical purposes are expected to revolutionize 3D printing in the medical device industry.

Product Type: Increasing demand for prosthetics & implants for increased satisfaction with medical treatments

Bone & cartilage scaffolds are biocompatible and biodegradable structures that support the growth and regeneration of bone and cartilage tissues, which mimic the natural extracellular matrix while providing mechanical strength, thereby promoting tissue repair and regeneration. Ligament & tendon scaffolds are similar to bone scaffolds, which are designed to assist in the regeneration of ligaments and tendons by providing a temporary framework for cells to grow on. 3D printing technology can create customized implants and prosthetics specifically tailored to individual patient needs, allowing for more precise fitting, better functionality, and improved comfort compared to traditional manufacturing methods. Moreover, standard implants are mass-produced, off-the-shelf solutions for common medical conditions such as joint replacements. Surgical guides are patient-specific tools that help surgeons plan and execute complex surgical procedures accurately. Surgical guides can be precisely tailored to each individual's anatomy using 3D printing technology. Craniomaxillofacial guides assist surgeons in reconstructive surgeries of the skull and facial bones by providing accurate templates for bone cutting, positioning, and fixation. Moreover, dental guides are used in dental procedures, such as implant placement or orthodontic treatments, to ensure proper positioning and alignment of dental components. Orthopedic guides are designed to assist in the accurate alignment of orthopedic implants during joint replacement surgeries that allow for precise preparation of the bone surface, ensuring optimal contact between the implant and natural bone structure for improved stability and longevity. The surgical instruments in 3D printing technology have been used to create various surgical instruments such as retractors, scalpels, and forceps. 3D-printed retractors can be customized to suit individual patient anatomies or specific procedural requirements. The production of 3D printed scalpels allows for modifications in blade design that can enhance cutting efficiency or reduce tissue damage during surgery. Furthermore, 3D printed surgical fasteners such as clips or staples can be designed to provide optimal strength, flexibility, and biocompatibility. Additionally, combining 3D printing with tissue engineering techniques has allowed the creation of bioengineered constructs containing living cells, which hold significant potential for regenerative medicine applications, including developing functional organs or tissues for transplantation.

Component: Growing utilization of various equipments based on material compatibility, and

production speed
Innovative 3D printers have revolutionized medical device manufacturing by providing higher precision and enhanced flexibility in product design. Biocompatible materials play a crucial role in the creation of 3D-printed medical devices. Metals, such as titanium and stainless steel, provide high strength-to-weight ratios, making them ideal choices for orthopedic implants and surgical instruments. Additionally, polymers such as polyether ether ketone (PEEK) have emerged as a significant alternative owing to their lightweight nature and resistance to chemicals or wear. Continuous research is being conducted to discover newer materials with enhanced properties that could further optimize medical device manufacturing. Ceramic materials possess unique characteristics such as biocompatibility, high hardness, corrosion resistance, and low thermal conductivity, which make them suitable for several biomedical applications. Zirconia-based ceramics are widely used for dental crowns, while hydroxyapatite has proven effective as bone graft material. Moreover, ongoing research focuses on developing biodegradable ceramic scaffolds for tissue regeneration and drug delivery systems. Although not a conventional choice in medical device production, paper has emerged as a versatile material for 3D printing low-cost medical devices. Resin materials in 3D printing offer high resolution and smooth surface finish, critical for producing accurate medical models and complex implants. In addition, photopolymer resins utilized in SLA or digital light processing (DLP) techniques have enabled the creation of finely detailed anatomical structures for surgical planning and education purposes. Furthermore, biocompatible resins are gaining traction for their potential applications in temporary implants or drug delivery systems. Bespoke services and advanced software solutions have also become indispensable components of the 3D printing ecosystem within the medical field. Services, including rapid prototyping, on-demand manufacturing, and post-processing support, accelerate product development cycles while eliminating upfront investment costs. Moreover, advanced CAD/CAM software allows efficient design modification and simulation, ultimately improving patient outcomes.

End User: Wider application across the hospitals for better patient care and efficiently streamline clinical workflows
Academic institutions & research laboratories are at the forefront of advancing 3D printing technology in medical devices. These institutions actively engage in cutting-edge research, exploring novel applications and refining existing ones, collaborating with industry partners to develop prototypes and validate new device designs. Additionally, these institutions are responsible for training the next generation of professionals utilizing and advancing the field of 3D printing in medical devices. Furthermore, ambulatory surgical centers (ASCs) have embraced 3D printing technology to improve patient care by leveraging its potential to create custom-fit implants, prosthetics, and surgical instruments. ASCs need to streamline their operations as outpatient facilities for efficiency, cost-effectiveness, and better patient outcomes. Diagnostic centers primarily use 3D printing technology to create patient-specific anatomical models based on medical imaging data (such as CT or MRI). This technology has revolutionized diagnostic capabilities by producing physical representations of complex internal structures that can aid clinicians in better understanding specific conditions, planning treatment strategies, or educating patients about their health issues. Moreover, recent advancements in bioprinting have led to the

development of organ-on-a-chip platforms that can replicate human tissue responses, enabling researchers to study disease progression and test potential drug candidates more accurately. Hospitals have a pivotal role in adopting 3D printing in medical devices, utilizing this technology to offer better patient care and efficiently streamline clinical workflows. Custom 3D-printed implants and prosthetics have been widely adopted for their superior fit, resulting in better functional outcomes and reduced patient recovery times. Furthermore, 3D-printed surgical instruments and guides enable precision during surgeries, reducing complications and improving overall surgical outcomes.

Technology: Rising adoption of photopolymerization technology for manufacturing microscale devices

Droplet deposition/extrusion-based technologies involve depositing small droplets or continuous filaments of material to create 3D structures. Extrusion-based methods are ideal for bioprinting and fabricating complex medical devices owing to their versatility in handling various materials, such as hydrogels, polymers, and composites. Fused deposition modeling (FDM) is an extrusion-based process that utilizes thermoplastic materials to build objects layer by layer. It has gained popularity in the medical field for creating low-cost anatomical models used in surgical planning, patient education, and prosthetics manufacturing. Low-temperature deposition manufacturing (LDM) uses a low-temperature extrusion process to deposit layers of material, significantly reducing thermal stress on sensitive biomaterials and making it suitable for tissue engineering and drug delivery systems. Multiphase jet solidification (MJS) is an inkjet-like technology that solidifies liquid droplets upon contact with a cooling substrate, which enables the creation of highly complex structures with intricate features ideal for implantable devices and microfluidic components. Electron beam melting (EBM) is a powder bed fusion technique that uses a high-energy electron beam to selectively fuse metal particles layer by layer. EBM has been employed for producing customized implants made from metals, such as titanium, offering superior mechanical properties and biocompatibility. Laser beam melting (LBM) is another powder bed fusion method wherein a focused laser beam selectively melts powder particles. LBM excels at producing high-quality metal parts, such as dental prosthetics and orthopedic implants, with complex geometries and excellent mechanical properties. Direct metal laser sintering (DMLS) is a laser-based powder bed fusion technology that combines metal particles to create functional components. DMLS offers rapid production and customization as it is known for its ability to fabricate intricate medical devices, such as hearing aids and dental restorations. Selective laser melting (SLM) uses a high-power laser to fully melt metal powders into solid 3D structures. This technology has demonstrated great potential in producing complex implants with tailored mechanical properties and porous structures that promote tissue integration. Selective laser sintering (SLS) is a powder bed fusion process that employs a laser to sinter powdered materials without fully melting them. Widely used for creating plastic medical models, SLS can also produce biocompatible ceramic components for bone replacements or coatings on metallic implants. The photopolymerization technique involves hardening liquid photopolymer resins using ultraviolet light or other radiation sources. These offer high-resolution printing capabilities required for manufacturing microscale devices, such as microneedles for drug delivery systems. Digital light processing (DLP) is a vat polymerization

method in which a digital projector selectively exposes photosensitive resin layers to ultraviolet light. DLP's speed and accuracy make it an attractive option for producing dental restorations, surgical guides, and hearing aids. PolyJet 3D printing technology is a jetting-based process that deposits precise droplets of photopolymers onto the build platform and cures them with ultraviolet light. This technology enables the simultaneous printing of multiple materials and colors, allowing for versatile medical devices, such as patient-specific anatomical models or multi-material implants. Stereolithography (SLA) is a vat polymerization method that uses ultraviolet lasers to trace patterns on the surface of a liquid photopolymer resin. SLA has been widely adopted in medical applications, such as dental models, surgical planning tools, and custom prosthetics, as one of the earliest 3D printing techniques. Two-photon polymerization (2PP) is an ultra-high-resolution technology based on multiphoton absorption processes that allow for fabricating intricate 3D microstructures in photosensitive.

Regional Insights:
The Americas represents a highly developing landscape for 3D printing in the medical devices market due to the presence of strong healthcare infrastructure, rising R&D investments, and strict FDA regulations that encourage innovation in 3D printing. The favorable government initiatives and investments for introducing 3D printing in medical devices across Australia, India, and South Korea is benefiting the market growth in the Asia-Pacific. The massive presence of advanced technologies that assist in 3D printing with ongoing research and development (R&D) activities encourages the availability of novel 3D printing medical devices in the EMEA region. In Europe, EU countries have unified their regulations under the Medical Device Regulation (MDR), which mandates strict control over 3D-printed medical device manufacturing.

FPNV Positioning Matrix:

The FPNV Positioning Matrix is essential for assessing the 3D Printing in Medical Devices Market. It provides a comprehensive evaluation of vendors by examining key metrics within Business Strategy and Product Satisfaction, allowing users to make informed decisions based on their specific needs. This advanced analysis then organizes these vendors into four distinct quadrants, which represent varying levels of success: Forefront (F), Pathfinder (P), Niche (N), or Vital(V).

Market Share Analysis:

The Market Share Analysis offers an insightful look at the current state of vendors in the 3D Printing in Medical Devices Market. By comparing vendor contributions to overall revenue, customer base, and other key metrics, we can give companies a greater understanding of their performance and what they are up against when competing for market share. The analysis also sheds light on just how competitive any given sector is about accumulation, fragmentation dominance, and amalgamation traits over the base year period studied.

Key Company Profiles:

The report delves into recent significant developments in the 3D Printing in Medical Devices Market, highlighting leading vendors and their innovative profiles. These include 3D Systems Corporation, Abbott Laboratories, Anatomics Pty Ltd., Anisoprint SARL, Ansys, Inc., Apium Additive Technologies GmbH, Arkema SA, BICO Group, Biomedical Modeling Inc., Carbon, Inc., EOS GmbH, Evonik Industries AG, Formlabs Inc., GE HealthCare Technologies Inc., Henkel AG & Co. KGaA, Johnson & Johnson Services, Inc., Materialise NV, Organovo Holdings Inc., Prodways Group, Proto Labs, Inc., RapidMade Inc., Renishaw PLC, Restor3d, Inc., Siemens AG, SLM Solutions Group AG, Smith & Nephew PLC, Solvay S.A., Stratasys Ltd., Stryker Corporation, Thermo Fisher Scientific Inc., Zimmer Biomet Holdings, Inc., and Zortrax S.A..

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Market Segmentation & Coverage:

This research report categorizes the 3D Printing in Medical Devices Market in order to forecast the revenues and analyze trends in each of following sub-markets:

Based on Product Type, market is studied across Bone & Cartilage Scaffolds, Ligament & Tendon Scaffolds, Prosthetics & Implants, Surgical Guides, Surgical Instruments, and Tissue Engineering Products. The Prosthetics & Implants is further studied across Custom Implants and Standard Implants. The Surgical Guides is further studied across Craniomaxillofacial Guides, Dental Guides, and Orthopedic Guides. The Surgical Instruments is further studied across Retractors, Scalpels, and Surgical Fasteners. The Prosthetics & Implants commanded largest market share of 28.12% in 2022, followed by Surgical Guides.

Based on Technology, market is studied across Droplet Deposition/Extrusion-Based Technologies, Electron Beam Melting, Laser Beam Melting, and Photopolymerization. The Droplet Deposition/Extrusion-Based Technologies is further studied across Fused Deposition Modeling, Low-Temperature Deposition Manufacturing, and Multiphase Jet Solidification. The Laser Beam Melting is further studied across Direct Metal Laser Sintering, Selective Laser Melting, and Selective Laser Sintering. The Photopolymerization is further studied across Digital Light Processing, Polyjet 3D Printing Technology, Stereolithography, and Two-Photon Polymerization. The Photopolymerization commanded largest market share of 34.23% in 2022, followed by Droplet Deposition/Extrusion-Based Technologies.

Based on Component, market is studied across Equipment, Materials, and Services & Software. The Materials is further studied across Ceramics, Paper, and Resin. The Equipment commanded largest market share of 43.45% in 2022, followed by Materials.

Based on End User, market is studied across Academic Institutions & Research Laboratories, Ambulatory Surgical Centers, Diagnostic Centers, and Hospitals. The Hospitals commanded largest market share of 56.12% in 2022, followed by Diagnostic Centers.

Based on Region, market is studied across Americas, Asia-Pacific, and Europe, Middle East & Africa. The Americas is further studied across Argentina, Brazil, Canada, Mexico, and United States. The United States is further studied across California, Florida, Illinois,

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