ARTHETA-0: An Innovative, Affordable Approach to the Onsite, Rapid 3D Printing of Artery Stents, Parameterized to Fit Individual Patients' Needs

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The ARTHETA-0 is a 3D printer with a novel motion system that specializes in printing vascular-stents. The stent manufacturing industry, as it stands, uses extremely inefficient and unaffordable methods, such as laser-cutting, to fabricate stents. These methods require extensive infrastructure and must therefore be completed at an external location. Additionally, these methods follow a one-size fits all approach when manufacturing stents. The ARTHETA-0 addresses all of the shortcomings of the stent manufacturing industry. It uses a novel, simplistic motion system that utilizes polar coordinates and a horizontally-static print bed to print stents made of Thermoplastic Polyurethane (TPU). This allows it to be incredibly affordable at under $500 (versus industry standards which exceed $100,000), while printing stents with incredible accuracy and precision (due to its innovative motion system that can print cylindrical structures with almost no ovality). The simplistic fused deposition modeling (FDM) system makes the ARTHETA-0 extremely accessible. It can be implemented on-site, in hospitals and can print stents that are customized to patient-specific dimensions, unlike anything seen before. Stents can be printed within two hours of parameter input, eliminating all shipping time. Additionally, the actual stents are of extremely high quality and can comprise of complex designs due to the dual extrusion system in the ARTHETA-0 which uses Polyvinyl Alcohol (PVA) as a support material to print the stent with TPU. Once placed in water, only the PVA dissolves. The stents are also biodegradable due to the usage of TPU, reducing the risk of post-stenting complications such as restenosis.

Awards Won:
Second Award of $2,000
Sigma Xi, The Scientific Research Honor Society: Second Physical Science Award of $1,000