

News Release

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3D Systems' Medical Workflow Enables OpHeart's Mission with 3D Printed Anatomical Models for Pediatric Heart Surgeries

- 3D Systems' end-to-end workflow encompassing expert biomedical engineers, state-of-the-art software, ColorJet printing technologies and materials produces accurate, detailed models to facilitate improved patient outcomes.

ROCK HILL, South Carolina, November 20, 2018 – [3D Systems](#) (NYSE: DDD), the originator of 3D printing, revealed today that it has partnered with OpHeart, a nonprofit organization whose mission is to ensure that children born with life-threatening heart defects receive the best medical treatment possible, by providing pediatric heart surgeons with the 3D-printed tools they need to better prepare and rehearse complex surgeries. According to the American Academy of Pediatrics, one percent of all children are born with Congenital Heart Defects (CHDs), making it the most common birth defect. Tens of thousands require surgery each year in the U.S. in order to survive. 3D Systems has leveraged its 20 years of anatomical modeling expertise and end-to-end medical workflow to support OpHeart's mission over the past four years by providing accurate, detailed anatomical models of patients with Congenital Heart Disease to surgeons. These models have facilitated a significant breakthrough in CHD surgery, providing vital aid to surgeons in their preparations for this complex, delicate surgical procedure.

In addition, the models are used by medical teams to explain the surgery to patients' families in an effort to keep them fully informed of the upcoming procedure and what to expect.

“Feedback from the surgeons we’ve worked with through OpHeart is that our anatomical models are tremendously helpful to them in delivering successful patient outcomes,” said Katie Weimer, vice president, medical devices, 3D Systems. “We are proud to help OpHeart deliver on its mission. We are also grateful for the opportunity to communicate the benefit of 3D printed surgical models. The models we create for OpHeart clearly demonstrate the power of 3D printing.”

3D Systems works directly with Anne Garcia, who founded OpHeart in 2015, six months after her own daughter, Ariana, was born with a life-threatening heart defect. “We fiercely believe that the ability to 3D print a replica of a CHD patient’s heart is an invaluable tool that can, to put it bluntly, save lives,” said Garcia. “By giving surgeons the ability to practice and plan for complex surgeries that involve reconnecting vessels as thin as human hairs in hearts no larger than a strawberry, it only stands to reason that the quality of surgery improves. We want every child with a life-threatening heart defect to benefit from this technology.”

In order to realize that goal 3D Systems is proud to participate in OpHeart’s “Heart-in-Hand Pledge”, whereby any requesting doctor or parent will receive a 3D printed model of their CHD patient’s heart in anticipation of surgery or catheterization, regardless of the family’s or hospital’s ability to pay.

To deliver on the Heart-In-Hand Pledge, 3D Systems segments 2D imaging data to create a 3D digital model, which is then 3D printed and shipped world-wide. 3D Systems creates the 3D printed models through a combination of its [D2P™](#) software as well as [ProJet® CJP 660Pro](#) 3D ColorJet printer and [VisiJet®](#) materials. The company’s team of expert biomedical engineers convert the 2D MRI or CT scan data of the heart into a 3D model using the D2P stand-alone modular software package, which is designed to address and consolidate all 3D model preparation steps. It relies on automatic segmentation tools that minimize the effort and time associated with the creation of a digital patient-specific model.

Once created, the digital model can be exported to the 3D Systems ProJet CJP 660Pro to create a full color model of the heart. Full color models allow the anatomy to be selectively colored which enables surgeons to easily identify and focus on specific portions of the model during consultations with other surgeons and also better communicate the surgical plan with patients’ families.

"From a surgeon's perspective, the incorporation of 3D printing into our craft is enabling tremendous breakthroughs," said Dr. Jorge Salazar, chief of pediatric and congenital heart surgery at Children's Memorial Hermann Hospital (Houston, Texas), and a member of the OpHeart Board of Directors. "The full color 3D printed models provided by 3D Systems have enabled us to achieve outcomes previously considered unobtainable. Their expertise and technology are helping us advance treatment and improve patient outcomes."

Dr. Salazar is renowned for redefining success for CHD cases and patients previously deemed inoperable. For example, Dr. Salazar has developed the Texas One-Step, performing complex repairs in one surgery instead of the conventional protocol of multiple surgeries, resulting in improved patient care and less hardship for families.

The Heart-in-Hand initiative is of utmost importance in saving children's lives, as there is no insurance reimbursement for these tools. "It is our hope that as more surgical teams work with OpHeart to employ 3D Systems' anatomical models in their CHD surgeries, we will be able to definitively demonstrate what is common sense- providing doctors the ability to better prepare for complex surgeries makes a meaningful, measurable difference in the lives of these children," added Garcia. "Hopefully, they will become the standard of care, as insurance companies recognize their value and reimburse for their use."

For more information on 3D Systems' anatomical modeling service, please visit [the company's website](#).

Forward-Looking Statements

Certain statements made in this release that are not statements of historical or current facts are forward-looking statements within the meaning of the Private Securities Litigation Reform Act of 1995. Forward-looking statements involve known and unknown risks, uncertainties and other factors that may cause the actual results, performance or achievements of the company to be materially different from historical results or from any future results or projections expressed or implied by such forward-looking statements. In many cases, forward looking statements can be identified by terms such as "believes," "belief," "expects," "may," "will," "estimates," "intends," "anticipates" or "plans" or the negative of these terms or other comparable terminology. Forward-looking statements are based upon management's beliefs, assumptions and current expectations and may include comments as to the company's beliefs and expectations as to future events and trends affecting its business and are necessarily subject to uncertainties, many

of which are outside the control of the company. The factors described under the headings "Forward-Looking Statements" and "Risk Factors" in the company's periodic filings with the Securities and Exchange Commission, as well as other factors, could cause actual results to differ materially from those reflected or predicted in forward-looking statements. Although management believes that the expectations reflected in the forward-looking statements are reasonable, forward-looking statements are not, and should not be relied upon as a guarantee of future performance or results, nor will they necessarily prove to be accurate indications of the times at which such performance or results will be achieved. The forward-looking statements included are made only as the date of the statement. 3D Systems undertakes no obligation to update or review any forward-looking statements made by management or on its behalf, whether as a result of future developments, subsequent events or circumstances or otherwise.

About 3D Systems

3D Systems is the originator of 3D printing and an innovator of future 3D solutions. It has spent its 30-year history enabling professionals and companies to optimize their designs, transform their workflows, bring groundbreaking products to market and drive new business models. This is achieved with the Company's best of breed digital manufacturing ecosystem. It's comprised of plastic and metal 3D printers, print materials, on demand manufacturing services and end-to-end manufacturing software solutions. Combinations of these products and services address a variety of advanced applications- ranging from Aerospace, Automotive, and Consumer Goods to Medical, Dental, and Jewelry. For example, 3D Systems' precision healthcare capabilities include simulation, Virtual Surgical Planning, and printing of medical and dental devices as well as patient-specific surgical instruments. More information on the company is available at www.3dsystems.com.

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