

News Release

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3D Systems Healthcare Solutions Advance Treatment of National Sled Hockey Champion

- Precision healthcare and medical 3D printing solutions enable surgery to alleviate pain caused by spinal deterioration

LITTLETON, Colorado, October 11, 2016 – [3D Systems](#) (NYSE:DDD) announced today the successful spinal surgery of national sled hockey champion Mark Weimer, aided by 3D Systems' proprietary digital manufacturing workflow for healthcare. The complicated 15-hour surgery was performed by Dr. George Frey of Mighty Oak Medical in Englewood, CO, to alleviate pain caused by nerve and spinal cord compression following previous operations. 3D Systems' workflow was central to the success of the procedure, enabling the replication of complex patient anatomy for surgical planning, instrumentation and reference.



Mark Weimer became a champion sled hockey player in 2010 despite an injury that left him partially paralyzed in 1984.

3D Systems supported Dr. Frey in helping Mighty Oak Medical gain clearance and bring to market its FIREFLY[®] Technology for pedicle screw guidance. As a partner to Mighty Oak, 3D Systems has provided expert digitization and manufacturing services, and created patient-specific anatomical models to assist with planning in and help ensure precise pedicle screw placement during Weimer's surgery.



Weimer holding the 3D printed reference model of his spine produced on the 3D Systems ProX[®] 800 Stereolithography (SLA) printer.

After a fall from construction scaffolding left Mark Weimer partially paralyzed in 1984, he adapted his life's passions to coexist with his injury. Weimer joined a sled hockey team in 1996 and joined the U.S. National Team in 2000. Following consecutive championship victories in 2010 and 2011, Weimer retired after 15 years on the ice to take up coaching and share his love of the game with his grandsons.

In the midst of these active years, Weimer underwent spinal fusion surgery in 2001 to combat the loss of muscle strength he had been experiencing in his right arm. As time went by, however, this spinal fusion and Weimer's neurological condition led to the deterioration of the remaining spinal disks and vertebrae below

the fusion site, causing compression of his nerves and spinal cord. As a result, Weimer began to experience pain in his quads as well as bowel and bladder problems in 2014.

To resolve the pain and other issues stemming from Weimer's anatomical and neurological condition, 3D Systems used Weimer's CT scan data to generate a 3D model of Weimer's spine that accounted for his natural anatomy as well as the foreign structures added in previous surgeries. Using this information, Dr. Frey was able to design his approach and plan the navigation required to safely address and avoid critical regions.

Using the digital representation of Weimer's spine prepared by 3D Systems, biomedical engineers at Mighty Oak Medical determined the required trajectory of each pedicle screw and designed the associated surgical guides that would ensure accurate placement. These guides, along with a foot-long reference model of Weimer's spine,

were 3D printed by 3D Systems on a ProX® 800 Stereolithography (SLA) printer using a plastic material that can be sterilized for use in the operating room.

3D Systems announced the successful surgery on October 10 during a visit by U.S. Congressman Jared Polis. Polis toured the company's Denver Customer Innovation Center alongside Weimer, heard Weimer's rehabilitation story, and was walked through the advanced end-to-end workflow of 3D Systems' precision healthcare solutions.

"It is wonderful to have so many innovative businesses throughout my community," said Congressman Polis. "3D technology can transform lives around the world and right here in Colorado. In Congress, I'm fighting to remove roadblocks to innovation, and to that end – it's important for me to hear from companies throughout my district, such as 3D Systems."

"The toolset we have at our disposal is uniquely adaptable to some of the most structurally complex cases being tackled by modern medicine," said Kevin McAlea, Executive Vice President, General Manager, Metals & Healthcare, 3D Systems. "By enabling new visualizations and processes, we are helping transform daunting procedures into addressable, step-by-step treatment plans."

For more information on Mark Weimer's surgery, read the [full case study](#).

About 3D Systems

3D Systems provides comprehensive 3D products and services, including 3D printers, print materials, on-demand manufacturing services and digital design tools. Its ecosystem supports advanced applications from the product design shop to the factory floor to the operating room. 3D Systems' precision healthcare capabilities include simulation, Virtual Surgical Planning, and printing of medical and dental devices as well as patient-specific surgical instruments. As the originator of 3D printing and a shaper of future 3D solutions, 3D Systems has spent its 30 year history enabling professionals and companies to optimize their designs, transform

their workflows, bring innovative products to market and drive new business models.

More information on the company is available at www.3dsystems.com

FIREFLY® Technology is a registered trademark of Mighty Oak Medical.