

Leading Barcelona Children's Hospital Embraces 3D Printing to Tackle Pediatric Disease and Drive Scientific Research

Standing at the forefront of cancer research in pediatrics in Europe, Sant Joan De Déu Barcelona Children's Hospital leverages cutting-edge 3D printing technology to advance scientific research and treatments for pediatric diseases. Using The Stratasys J5 MediJet 3D Printer to produce realistic anatomical models for pre-surgery planning, the hospital has streamlined its internal processes, reduced the risks of complex surgeries, and enhanced its overall performance.



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Arnau Valls

**R&D Engineer and
Technical Manager at
3DForHealth, SJD
Barcelona Children's
Hospital's 3D printing unit**



Cancer is a leading cause of death for children and adolescents worldwide, with the World Health Organization (WHO) estimating that 400,000 aged from 0-19 develop the disease each year. Of the various childhood cancer types, brain cancers and solid tumors are among the most widespread.

A highly specialized center for the treatment of children, private, non-profit [Sant Joan de Déu Barcelona Children's Hospital](#) (SJD Barcelona Children's Hospital) stands at the forefront of pediatric cancer research. This, together with a strong focus on the integration of advanced technologies within healthcare, has prompted the hospital to embrace 3D printing and pioneer the deployment of the technology within the sector.

Realistic Models for Improved Patient Outcomes

The use of 3D printing has enabled SJD Barcelona Children's Hospital to address complicated cases ever since its integration. In 2013, the hospital was facing an increasing number of complex, risky surgeries almost daily. With the medical team under pressure, they turned to 3D printing to produce detailed, accurate anatomical models that would assist in surgical planning – and found that it significantly improved the operating process.

“The results were extremely promising and we found that not only could 3D printing reduce surgery time by up to 40%, it could also lead to overall cost reduction,” explains Arnau Valls, R&D Engineer and Technical Manager at 3DForHealth, SJD Barcelona Children's Hospital's 3D printing unit.

After early experience of these benefits, the hospital began looking at the greater opportunities that could be realized by deploying the technology more widely across the hospital's medical and surgical processes, and the most appropriate areas in which it could be integrated. As a result, they established the 3DForHealth laboratory in 2016.

Since creating the lab, SJD Barcelona Children's Hospital has improved overall pediatric performance thanks to a significant reduction in surgical-related risks through improved safety.



The Stratasys J5 MediJet 3D printer is enabling SJD Barcelona Children's Hospital to advance research and treatments for pediatric diseases.

The lab currently supports more than 200 surgical procedures each year with anatomic models and tools such as cutting and positioning guides.

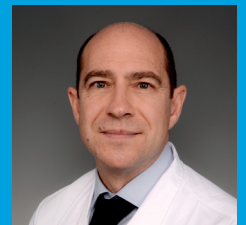
In fact, the sharp increase in the volume of pediatric cases and demand for 3D printing



The use of 3D printing in healthcare has represented a fundamental milestone compared to the use of 2D images, and now Stratasys' 3D printing technology is taking a further step forward.

Dr. José Hinojosa Mena-Bernal

**Head of the Neurosurgery
Department of SJD
Barcelona Children's
Hospital**





Faced with a complicated case of a pediatric tumor, the medical team at the hospital used the J5 MediJet to produce a personalized anatomical model and explore a way to best approach the surgery.

during pre-surgery planning has led the lab to expand its 3D printing production capacity and the sophistication of the models it can produce. Towards the end of 2021, the lab added a new [Stratasys' J5 MediJet™ 3D printer](#) through Stratasys' partner reseller [Excelencia Tech](#).

According to Valls, the realism of the multicolor, multi-material models enabled by the J5 MediJet over their previous single-material, single-color models has made a big difference, as has the speed of the Stratasys' printer. "Because we can create models and objects in one print pass, we have significantly reduced costs while increasing productivity," he explains.

Answering the call in a rare pediatric cancer case

Earlier this year, the hospital was presented with an extremely complicated case. A nine-year-old boy suffering from clivus chordoma, a rare and aggressive malignant tumor that required surgical removal. The tumor's location between the base of the skull and the first cervical vertebrae made the case even more complex because it was so close to vital cranial nerves and vessels, vascular and digestive structures, and respiratory airways.

Through a collective multi-departmental collaboration, including otorhinolaryngology and neural teams, the hospital began with the use of imaging techniques by radiologists to determine how to manage and remove the tumor.

"Through magnetic resonance imaging (MRI) we realized that to reach and remove the tumor via

a traditional approach, we would need to resect the odontoid apophysis. However, this risked disarticulating the spine of the skull and would have involved a second surgery to fix the cranial base," explains Dr. Cristóbal Langdon Montero, Specialist in Rhinology and Skull Base Surgery at SJD Barcelona Children's Hospital.

The team used a patient-specific 3D-printed model of the pathology to explore alternative approaches, which led them to opt for an endoscopic approach, through the nostrils – to access the upper part of the tumor – and through the mouth, to remove it in its entirety. This was much less invasive and avoided contact with many vital structures and organs and resulted in a better outcome for the patient.



Using the 3D printed model produced with the J5 MediJet enabled the medical team to opt for a less aggressive approach to the surgery of the nine-year-old patient and preserve his organ and vital functions.

“The detail of the model from the J5 MediJet 3D printer was invaluable in planning this approach and instrumental to the success of the surgery. What’s more, we were able to preserve the organs and vital functions of the young patient,” Dr. Langdon Montero says.

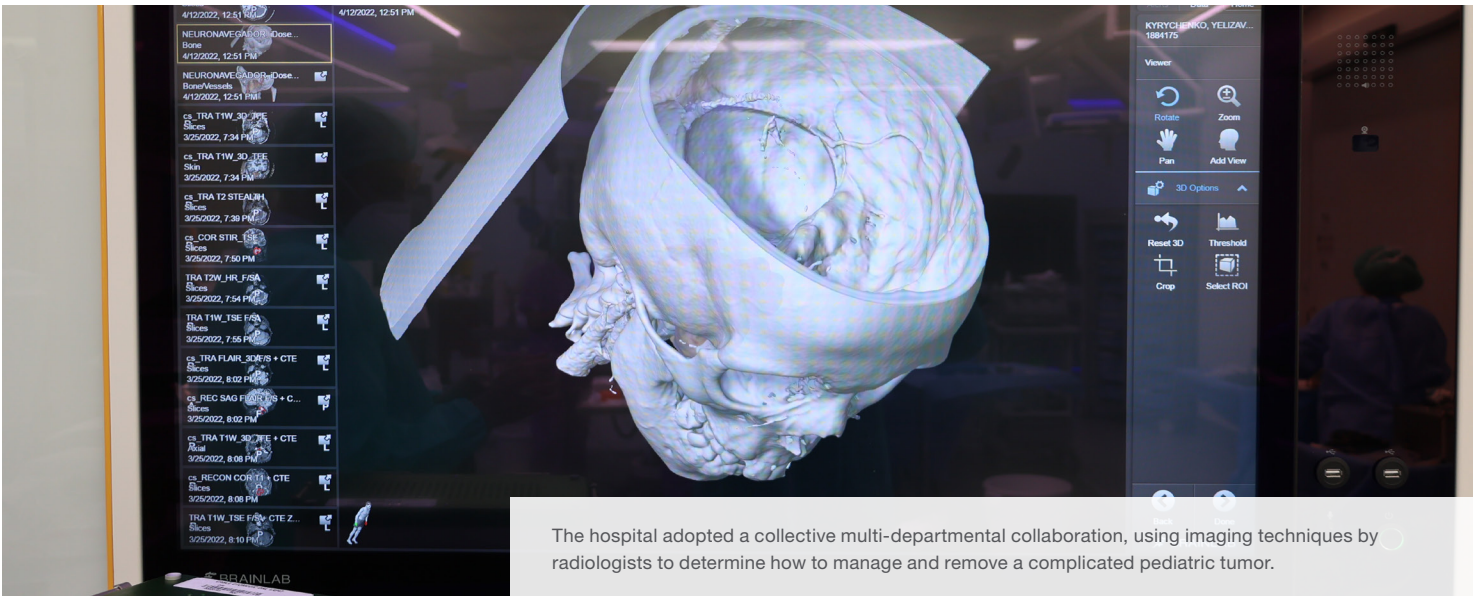
A path to continued growth for 3D printing for surgical planning

In 2021, the 3DForHealth lab at SJD Barcelona Children’s Hospital became the first in Spain to be accredited by the Generalitat de Catalunya for the quality of its customized 3D printed models. Beyond the unit’s production of biomedical models for internal use, this official recognition allows the unit to offer the service externally to other hospitals.

“The use of 3D printing in healthcare has represented a fundamental milestone compared to the use of 2D images, and now Stratasys’ 3D printing technology is taking a further step

forward,” says Dr. José Hinojosa Mena-Bernal, Head of the Neurosurgery Department of SJD Barcelona Children’s Hospital.

The next stage for the hospital is to integrate 3D printing into the planning process as a standard procedure. The hospital is inaugurating a Pediatric Cancer Center, designed to become one of the most advanced oncology centers in Europe, where 3D printing will be central to the medical processes. “The extreme realistic reproduction enabled by the Stratasys’ J5 MediJet 3D printer can really make the difference when approaching complex pathologies like pediatric cancer, and the case of this nine-year-old patient witnesses how crucial it can be in saving lives. The potential is huge, but the integration process is still at an initial stage. What I hope to see in the coming months is an even broader adoption and integration of 3D printing into hospital processes,” concludes Dr. Hinojosa Mena-Bernal.



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