

## 3D printing to improve surgical outcomes



Cardiolgist Dr Rob Cooper

Surgeons at three Liverpool hospitals are using detailed, 3D printed anatomical models created from patient scan data to improve operative results and drive hospital efficiencies.

The 3D printed models allow clinicians to better understand the nature of the patient's problems before surgery. The surgeons can perform surgical simulations on the models and test the size and placement of any medical devices that may be needed. In addition to improving outcomes the correct use of models can shorten theatre times and save costs.

The Innovation Agency has supported an SME to deliver this innovative service in one hospital and has provided £25,000 funding to support 3D printing in two further hospitals, which was match funded by those hospitals.

An outreach programme will also run 3D printing workshops at regional hospitals to encourage wider adoption.

## BENEFITS TO PATIENTS

Models of patients' organs are rendered using images from MRI and CT scans and are 3D printed in a variety of materials by 3D LifePrints, a company based in Alder Hey Children's Hospital.

3D LifePrints are able to print in a variety of materials including hard and flexible polymers, silicone, plaster and woodfill which mimic the texture and density of bone and tissue.

Surgeons have been using the 3D prints for:

- Surgical planning and reference
- Surgical simulation and teaching
- Testing and sizing of surgical devices
- Doctor to patient communication

The models help to:

- Improve surgical outcomes
- Improve surgical planning, which shortens the time a patient is anaesthetised
- Reduce the time that the surgical team is in theatre
- Reduce patients' time undergoing rehabilitation treatment
- Improve surgical skills and training

3D LifePrints has been working with Alder Hey Children's Hospital since August 2015. During 2016 it provided more than 50 models, mainly to the Cardiac, Orthopaedic and Cranio-facial departments.

One of 3D LifePrints' models was a sterilised 3D printed child's spine for use during a complex, and ultimately successful, 14 hour congenital kyphoscoliosis operation.

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## HOW WE HELPED

The Innovation Agency provided funding to Alder Hey Children's Hospital's Institute in the Park and their Innovation Hub, creating a space for innovations to be developed; 3D LifePrints was invited to be a founding member of the Innovation Hub.

A tour of the Innovation Hub by the Innovation Agency's Innovation Scouts sparked interest and led to a new contract for the company, with Liverpool Heart and Chest Hospital.

A third trust became involved thanks to a grant from the Innovation Agency which enabled a collaboration between 3D LifePrints, Liverpool Heart and Chest Hospital and the Royal Liverpool and Broadgreen Hospitals. The £25,000 match-funded award will enable the trusts to partner with 3D LifePrints to run 3D printing projects specifically for cardiac and vascular surgery.

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## WHAT THE CLINICIANS SAY

Mr Iain Hennessey, Paediatric Surgeon and Clinical Director of Innovation at Alder Hey Children's Hospital: "The potential of 3D printing to revolutionise healthcare is immense. The ability to produce what you want, when you want it will clearly be a disruptor in many sectors, but the highly variable nature of medicine really lends itself to this process.

"Having a 3D print hub embedded in our hospital has allowed us to explore where this technology can best be applied; exciting times."

Dr Robert Cooper, Cardiologist, Liverpool Heart and Chest Hospital: "For each patient with an atrial septal defect the hole is a slightly different size and requires an individual approach. Having a 3D model printed from the scan of a patient has the potential to improve patient care and reduce patient anxiety through a better understanding of their individual condition."

Dr Steve Powell, Director of Accelerator, the home for life science focused business on the Liverpool Health Campus: "We are purchasing 3D models for, among other things, the simulation of implanting stents during abdominal endovascular aneurysm repair and for better understanding of transplant surgery. Studies have shown that using 3D anatomical models can reduce surgical times by up to 22 per cent and help prevent complications."

Video link: <https://www.youtube.com/watch?v=0NMQWIVoLVw>

## WHICH NATIONAL CLINICAL OR POLICY PRIORITIES DOES THIS EXAMPLE ADDRESS?

- Care and quality
- Funding and efficiency
- Driving economic growth