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# Development of Multidisciplinary 3D Printing Service in a Hong Kong Public Hospital

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## Introduction

Medical uses for 3D printing allow clinical staff to provide precise, personalized medical care. The technology allows clinical staff to make use of patient specific models to provide (1) surgical planning and trial runs, (2) education and training, and (3) medical device prototyping. To address service needs, a 3D Model Service Development & Strategic Planning Committee (3DSSC) was established in early 2016 in Queen Elizabeth Hospital under a structured governance involving management and clinical representatives. Goals of the committee include facilitating innovations and developing skills and competency in using 3D models to enhance training/clinical practice and improve clinical outcomes.

## Objectives

(1) Apply 3D technology printing to minimize risk in conducting complex and high risk procedures
(2) Apply 3D printing technology to improve the quality of patient care

## Methodology

A 3D model service consists of 3 important phases: Preparation phase: Submission of the application to 3DSSC for screening and approval, and acquisition of patient anatomy as a de-identified DICOM file. Processing phase: Images segmented using 3D modeling software, with the final images output in Standard Tessellation Language (STL) format to enable 3D model printing. Application: User satisfaction assessment and model applied as planned

## Result

More than twenty 3D models ranging from customized complex anatomical structures to simple but ground-breaking inexpensive devices were printed achieving the objectives of pre-operative assessment and improving patient care quality. Cases included severe aortic valve stenosis, tricuspid valve regurgitation, and regurgitation of mechanical mitral valve for the Transcatheter Aortic Valve Implantation (TAVI) procedure; cases of ruptured sinus of valsalva, coarctation of aorta and complex congenital heart diseases for assessing the size of the closure device and stents. In addition, a living donor kidney and two fractured pelvic bones were made to enhance anatomical visualization. The above procedures and surgeries were undertaken uneventfully.

Models for training & education have been printed as well as for prototyping of medical devices, which include medical aids, prostheses and two urological models with tumors and a brain model.

Conclusion

The physical, spatial and tactile benefits of a realistic physical model contribute to both preparedness and confidence among clinical staff in managing complex and high risk procedures. It is anticipated that the use of 3D models will reduce risks and complications of such procedures and improve patient safety.

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