Project Title

Advancing Adoption of 3D Printing for Clinical Use in TTSH

Project Lead and Members

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- Ms Cindy Lim

Organisation(s) Involved

Tan Tock Seng Hospital

Healthcare Family Group(s) Involved in this Project

Medical, Nursing, Healthcare Administration

Applicable Specialty or Discipline

Orthopaedic, Radiology, Surgery

Aim(s)

To produce customised 3D prints at scale quickly and cheaply, as well as enable rapid prototyping of 3D printed medical devices.

Background

See poster appended/ below

Methods

See poster appended/ below

Results

See poster appended/ below

Conclusion

See poster appended/ below

Project Category

Care & Process Redesign

Build Environment, Facilities Engineering

Technology

Medtech, 3D Printing, Product Development, Prototyping Resources

Keywords

3D Printing Centre, Customized 3D Prints, Protype 3D Medical Devices

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Advancing Adoption of 3D Printing for Clinical Use in TTSH

Automation, IT, Robotics

Tan Tock Seng HOSPITAL
National Healthcare Group

Project Summary

3D printing enables clinicians to effectively deliver personalised care but use of this technology in TTSH was nominal. Whatever need for 3D printing was satisfied either by outsourcing or through attempts at collaboration with industry partners. The former was costly and inefficient, while the latter was oftentimes ineffective due to the lack of expertise in medical product design. To advance adoption of clinical 3D printing, we decided to create an in-house, point-of-care ecosystem that is adequately resourced and has the necessary governance systems established. With the formation of a Medical 3D Printing Centre, TTSH now has the capacity to produce customised 3D prints at scale quickly and cheaply, as well as enable rapid prototyping of 3D printed medical devices. Since then, 3D prints have been integrated as new standards for certain types of care, new service streams created using proprietary/highly personalised prints, and medical pedagogical methods enhanced with customised trainers.

Background Need:

With its scope for customisation and ability to shorten the manufacturing process, 3D printing enables clinicians to effectively deliver personalised care. The use of 3D printing in TTSH for clinical care, however, had been sporadic and limited in scope.

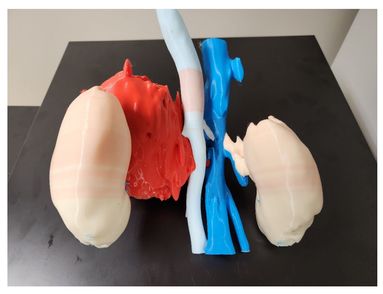
Whenever 3D printing was required, they were outsourced to external vendors. This was costly, required long turnaround time, and was potentially risky given the need to load patient information to vendors' systems.

Individual clinicians and departments have separately attempted to develop 3D-printed (3DP) devices for clinical use in collaboration with industry partners. But oftentimes, they struggle to translate a clinical concept into a final product as neither party has expertise in medical product design. Long-term collaboration to enable industry partners to build this expertise is impracticable given the ad-hoc nature and narrow scope of these projects.

Given the high barriers to adopting 3D printing for clinical care, use cases for this technology remained limited in TTSH despite its rapid advancement in healthcare globally.

Innovation:

- In-house facility improves access and removes barriers for clinicians
- Consolidates efforts and optimises resources
- Point-of-care ecosystem
- Secure PDPA
- Shortens turnaround time
- Scalable governance systems



Results:

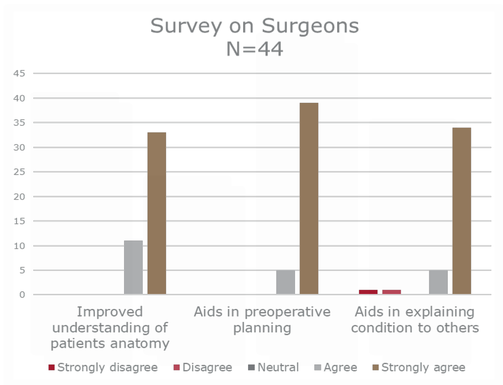
Outcomes	Before	After
Efficiency: Turnaround time	1-2 Weeks	Shortest 1-2 days
Workload	<5 a year	262 (CY2022)
Reach	95% Ortho, 5% other depts	24% Other depts
New service types	Anatomical models – Educational and preop planning Surgical jigs Cranial cap prosthesis Finger prosthesis Nose prosthesis Educational trainers	

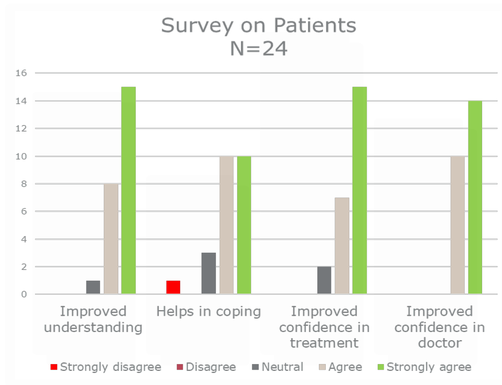
Solution:

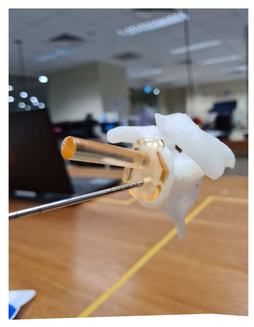
Our solution was to create an in-house, point-of-care ecosystem in the form of a TTSH Medical 3D Printing Centre. The Centre would centralise 3D printing efforts and resources across the hospital into a single facility to avoid duplication and optimise resource use.

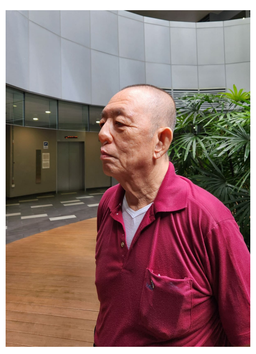
To facilitate 3DP uptake and rapid prototyping, the Centre strived to achieve the following:

Point-of-Care 3DP Centre		
Infrastructure: Physical space Hardware	**Regulation:** Quality management systems Risk management frameworks Standard operating protocols Institutional governance	**Technical Expertise:** 3D printing: industry collab Multidisciplinary clinical teams









Conclusion

Enabling effective access and improving efficiency, the innovation of an in-house, point-of-care 3D printing centre in TTSH has advanced the reach of 3D printing in the medical sphere. This has resulted in the creation of multiple care streams with positive patient and surgeon outcomes to ultimately improve patient care.