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Australia develops digital tool to give surgeons a pre-theatre rehearsal

14 June 2022 | News

Surgical planning tool designed by Engineering PhD student advances the efficacy of next generation 3D-printed bone implants

Researchers at Australia-based University of Sydney's School of Aerospace, Mechanical and Mechatronic Engineering are developing a surgical planning tool to assist surgeons in planning complex jawbone reconstruction procedures using new generation devices.

Using advanced computational technology and decision-making algorithms, the tool works by generating a 'digital twin' of the patient using CT scan data. It then rapidly simulates different designs of the implant before 3-D printing the final, optimal design, allowing surgeons to perform a digital 'rehearsal' prior to theatre.

Jawbone reconstruction – or orthognathic surgery – is a complicated medical procedure whereby a person's jaw is treated for significant trauma, such as from a car crash or gunshot wound, or diseases like oral cancer.

The surgical planning tool combines computer-aided design (CAD) tools with high-fidelity computer-aided engineering models and optimisation algorithms that can accurately simulate the medical device while under physiological load.

The researchers have recently partnered with Professor Jonathan Clark AM, Chair of Head and Neck Cancer Reconstructive Surgery at Chris O'Brien Lifehouse to help translate the new technology into a clinical reality.