

## **Adult Male Circumcision Device for Use in Clinical Settings**

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Sub-Saharan Africa is the region most heavily affected by HIV, accounting for 67% of HIV positive cases and 72% of AIDS deaths globally in 2007. Public health officials believe adult male circumcision can be an effective HIV prevention intervention and recommend task shifting as an approach to increase the volume of male circumcisions performed in sub-Saharan Africa. Current scale up complications in sub-Saharan Africa include high procedural cost, clinical tools complexity, trained human resources

shortages and inefficiencies in health delivery methodologies, preventing many countries from reaching their mass circumcision scale up target goals. A task shifting approach is one method that can both reduce costs and improve healthcare services by delegating critical tasks to less specialized healthcare providers. As a result, the aim of this research is to develop a functional, safe, cost effective adult male circumcision device allowing less-trained healthcare providers to perform the circumcision procedure. This paper discusses the design concept and development of an adult male circumcision device for use in a task shifting clinical setting. Preliminary engineering analyses were completed to support the prototype design, and validation tests on human cadavers and bovine adult reproductive organs were completed to prove the device operates effectively and safely.

## **Determination of Surgical Robot Tool Force Requirements Through Tissue Manipulation and Suture Force Measurement**

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Through the use of a cadaveric porcine model, forces necessary for manipulation of the abdominal organs were evaluated using an instrumented probe. Additionally, forces for tissue puncture, knot tightening, and suture breakage have been measured in order to

determine the requirements placed upon the design of novel robotic surgical tools. The break forces for a variety of suture sizes and types were evaluated including sizes 3-0 through 7-0 polypropylene, size 1 polybutestor, size 4-0 chromic gut, and size 6-0 braided polyester. Tests of the tissue puncture force and knot tightening forces were carried out using the same instrumented probe, while the suture break forces were measured using a tension testing machine. The measured forces were found to compare well against the literature and provide a good basis from which to design robotic surgical tools with the appropriate capabilities.