

## HEMODIALYSIS MACHINE FOR DEVELOPING COUNTRIES

Hannah Yorke Gambhir<sup>1</sup>, Neeha Rahman<sup>1</sup>, Ellen van Wijngaarden<sup>1</sup>, Ria Shah<sup>1</sup>, Roshan Roy<sup>1</sup>, Melina Tahami<sup>1</sup>, Marina Freire-Gormaly<sup>1</sup>,

<sup>1</sup>Department of Mechanical Engineering, York University, Toronto, Canada  
marina.freire-gormaly@lassonde.yorku.ca

### ABSTRACT

Approximately 10% of the worldwide population of 7.8 billion people are affected by chronic kidney disease. People in developing countries are particularly impacted due to the lack of affordable dialysis machines which is the main treatment option for kidney disease. We propose a design for an adaptable, user-friendly and cost-effective hemodialysis machine for use in developing countries based on locally available resources available for sustainable design. Software tools such as Solidworks and COMSOL were used in the preliminary design phase to reduce the costs of prototyping to model the structure and simulate the flows through the device. Medical grade parts were selected to meet the standards of the Federal Food and Drug Administration and Health Canada. The design focuses on minimizing cost through reducing material and applying additive manufacturing to create a compact and portable design weighing under 20 kg. While conventional commercially available hemodialysis machines cost upwards of \$5000, the presented prototype costs under \$650 to manufacture. The design incorporates a modular set up to ensure that individual sub-components can be fixed or replaced as needed. Human centred design strategies were followed during the design process to ensure that minimal training is required to use the equipment. This study highlights the possibility of reducing the manufacturing costs of lifesaving medical devices. While this project focuses on sub-Saharan Africa, aspects of the final design could be applied to reduce health care inequalities around the world while focusing on patient safety.

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