# Utilizing Digital Technology to Develop a Workflow for Creating Personalized and Accessible **Prosthetic Covers**

Sivakumar, K.<sup>1,2</sup>, Sivasambu H.<sup>1</sup>, Hussaini, A.<sup>1</sup>, Andrysek J.<sup>1,3</sup>

- 1. Bloorview Research Institute, Holland Bloorview Kids Rehabilitation Hospital
- 2. Mechanical Engineering, McMaster University
- 3. Institute of Biomedical Engineering, University of Toronto

#### BACKGROUND



#### **CHALLENGES FACED BY CLIENTS:**

- High costs
- Chipping/Cracking
- Slow design process from external manufacturers

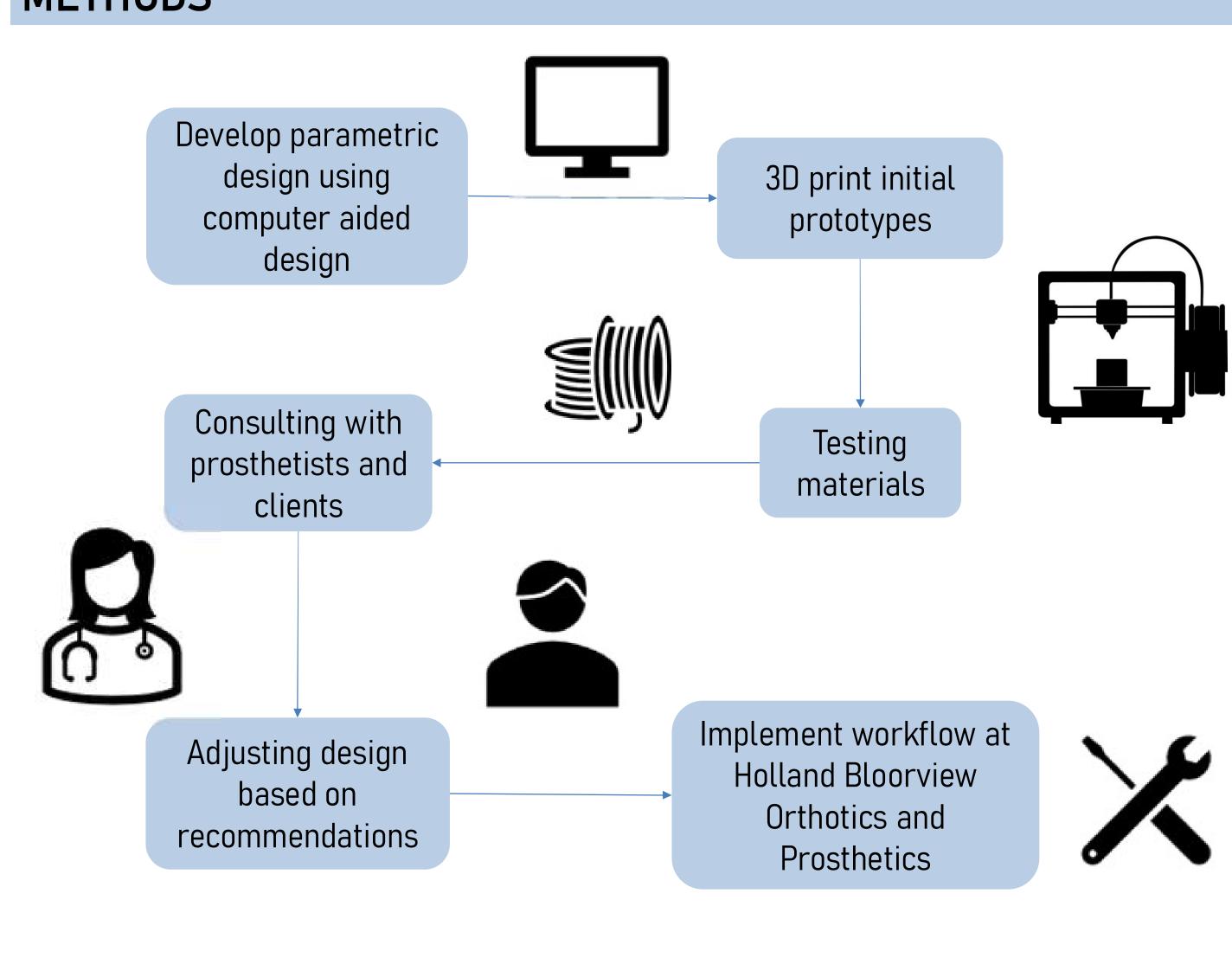
#### **OBJECTIVE**

#### **CREATE A WORKFLOW THAT:**

- Allows for design and shape personalization
- Enables prosthetists to create designs quickly
- Is cost effective in comparison to external manufacturers



## **METHODS**



# Developing Personalized and Accessible Prosthetic Covers with Digital Technology





**Blcorview** RESEARCH INSTITUTE

#### DESIGN CONSIDERATIONS

#### LEG SHAPE



Ankle shape, muscle shape and leg height must be similar

FIT

Prosthetic must fit within cover

#### **CONNECTION METHOD**



Connection must be secure to prevent separation

#### RESULTS AND DISCUSSION

#### FINAL WORKFLOW:

Workflow was tested with 1 lower limb prosthetic user Scan patient's non-Adjust CAD model to prosthetic side and match patient scan device side Determine template Print cover using that matches patient printer located at prosthetic type Holland Bloorview

#### **TESTING AND FEEDBACK:**

# Material Testing



Tested PLA, PETG, ABS and TPU, selected TPU for flexibility and durability

# Clinician Feedback



Approved overall design and connection method

#### **Client Feedback**



Recommended additional features and aesthetic changes

#### **NEXT STEPS:**

Assess workflow compatibility with other prosthetic device types

#### **IMPACT**

By bringing this process in-house, the Holland Bloorview O+P department can:

- Provide clients with enhanced customization and personalization for their prosthetic cover
- Provide clients with an affordable alternative to external manufacturers

### ACKNOWLEDGEMENTS

I would like to thank the PROPEL Lab and the Holland Bloorview Orthotics and Prosthetics Department for their support and guidance in this project.