Designing, Fabricating, and Documenting a Novel Methodology for Creating Hyper realistic Part-Task Trainers for Prosthetic Clinician Training Integrating Medical Imaging and Additive Manufacturing

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The objectives of this project are to:

1) Fabricate realistic-feeling and appearing physical models of amputee residual limbs with anatomically correct skeletal structures for student palpation practice.

2) Develop a novel process for using medical imaging as a component of a turnkey system to 3D print skeletal structures with a temporary mold simultaneously.

3) Provide a set of guidelines for students and others to use when integrating multiple materials used in part task trainer fabrication to avoid material waste.

Abstract

Clinicians use physical models of portions of the human anatomy to practice clinical skills in a safe, effective and standardized manner. In prosthetic care, accurately identifying the underlying skeletal structure of a residual limb of an amputee is of particular importance as fitting a socket onto a limb effectively has been recognized as the most important factor influencing end-user satisfaction and safety. Increased access to standardized part task trainer (PTT) models has been demonstrated to improve clinician self-efficacy, psychomotor skills and scores on tests of performance of clinical interventions.

Significance

No standardized, accurate PTTs are widely available to clinicians or students for training. Creating a system that facilitates fabrication of such models based on readily available medical imaging and current additive manufacturing tools (3D printers) can provide access to a broad range of clinicians and eliminate the burden of requiring them to locate patient models for practicing various physical palpation skills. Further, including a resource to assist with optimization of use of materials can help reduce costs for production of these devices.

Contribution to literature/entrepreneurial practice

Development of a systematic approach for development and fabrication of part task trainers can encourage more educational programs to adopt the use of such training aids, thereby enhancing the quality of experiences for their students. This could also motivate an entrepreneur to consider offering services that leverage the developing technologies used in this project.

Methodology/Timeline

Dec.-Jan.: Acquire digital assets & materials for fabrication/design molds

Feb.-April: Create PTTs/feedback from clinicians; generate notes, photos & videos

May-August: Optimize documents for guidelines for fabrication, mold design and optimization of materials use.