INTRODUCTION
In order to adequately evaluate and understand advances in electric multi-articulating hand technology, evidence-based functional outcome assessments must be utilized. However, tools to measure the function of upper limb prostheses are rare (Wright 2006). Although several assessments exist for hand surgery patients, there has never been an effort to define a “tool”, or “tools”, that compare the functional outcomes of someone who has undergone a toe transfer, specialized hand surgical procedure, or hand transplantation, with an individual who has been fit with an electric multi-articulating hand, or partial hand digit prosthesis. To begin to adequately measure the outcomes of these 2 unique upper limb amputee populations, the prosthetic user of electric multi-articulating digits and the individual with a toe or hand transplant, a Functional Baseline Index Standard (FBIS) has been created that is defined by 4 validated and standardized hand dexterity tests.

METHOD
Phase 1 of this study was designed to identify an FBIS for users of electric multi-articulating hands or partial hand digits. Five categories of upper limb amputation, or congenital deficiency, were identified. These categories included: 1) amputation at the wrist disarticulation or transradial level; 2) amputation distal to the wrist with loss of all digits; 3) amputation of 4 digits with the thumb remaining; 4) amputation of the thumb with 4 digits remaining; and 5) bilateral transradial or bilateral partial hand amputation.

The FBIS for each category was defined by the results of 4 validated and standardized assessments. These tests included: 1) the Southampton Hand Assessment Procedure (SHAP), a timed test with 8 abstract objects and 14 Activities of Daily Living designed to study 6 different prehensile patterns; 2) the Box and Blocks Test (BBT) to evaluate manual dexterity; 3) the Nine Hole Peg test (NHP) to assess fine motor dexterity; and 4) the Disabilities of the Arm, Shoulder and Hand (DASH) a 30 item, self-report questionnaire designed to describe the experience of people with upper limb disorders.

An independent, experienced occupational therapist completed all assessments of the 15 individuals, 3 in each of the 5 categories, involved in the study.

RESULTS
SHAP subject scores in this study ranged from 56-86 with a transradial subject scoring a 56 and the thumb-only digit user (4 fingers intact) scoring an 86. Of the 6 grasping patterns that were tested, the highest SHAP scores were noted in the lateral grasping feature in almost every subject and level tested. The highest DASH score of the study was identified in one with bilateral upper limb amputations. Those with partial hand loss reported greater disability than those with proximal levels of limb loss. When comparing those with a transradial level of limb loss, with those with 5 digit amputations, fit with a partial hand device with electric multi-articulating digits, those with a transradial level of loss scored better in manual dexterity, however those with 5 electric multi-articulating digits, scored better in fine motor dexterity.

DISCUSSION
To date, evidence-based functional outcomes have not been measured in users of electric multi-articulating hand and digits. This preliminary research supports the benefits of the multiple prehensile grip patterns available with this type of prosthesis when compared to standard upper limb prosthetic devices. With this improved technology, it is imperative that experienced occupational therapists are actively integrated into the prosthetic fitting and training of these advanced devices. Thorough understanding of the prehensile features of these hands, and an awareness of appropriate outcomes in function with this emerging prosthetic technology, is critical for the success of a transradial or partial hand amputee.

CONCLUSION
This study sets the stage for a future “compare and contrast” research design of the FBIS of individuals fitted with electric multi-articulating hand and digits, compared to individuals with toe transfers, hand transplant or other surgical procedures. “Setting the bar” of definitive evidence, known as a FBIS, will define what should be met, or exceeded, in hand surgery and transplant patients. If this score is not met, evidence can be presented to the patient that would enable them to make an informed decision regarding amputation or prosthetic fitting with an electric multi-articulating hand or partial hand.

REFERENCES