DEVELOPMENT OF A LIGHTWEIGHT, LOW-COST, MYOELECTRIC PROSTHESIS
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INTRODUCTION
Most existing myoelectric prostheses are designed for the 50th percentile male. That means they are too large and too heavy for 73% of people (Tilley and Dreyfuss 2001). The largest reason persons in the US reject the use of a prosthesis is the uncomfortable weight of the device (Biddiss and Chau 2007). We need small, lightweight, cosmetic devices that are inexpensive and still strong and fast enough to be comparable to existing devices.

METHOD
The Rehabilitation Institute of Chicago is advancing enabling technologies such as stronger lightweight motors (Sensinger, Clark et al. 2011) and transmissions (Sensinger and Lipsey 2012). These new technologies have allowed us to develop a modular, low-cost, powerful upper-limb prosthesis that is as small and as lightweight as a 25th percentile female arm. Such a design can be fit to 87% of adults and more than half of adolescents (Tilley and Dreyfuss 2001).

RESULTS
We have developed a modular, lightweight prosthesis that includes a 330g elbow, modular wrist flexion and wrist rotation, and a hand with powered thumb and wrap-around fingers. It uses novel lightweight, durable motors and gears to achieve a total weight acceptable for use by a 25th percentile female.

DISCUSSION
We will discuss the enabling technologies that allowed us to achieve these goals, our overall design, initial responses from prostheteists and subjects, and our future direction as we make the prosthesis even lighter and stronger before we launch a clinical trial.

CONCLUSION
We have developed a lightweight, inexpensive, myoelectric prosthesis that is small enough and affordable enough to be used by a large portion of people across the world that are currently unable to use myoelectric devices.

CLINICAL APPLICATIONS
One of the main reasons persons with an upper-limb amputation reject the use of a prosthesis is excessive weight (Biddiss and Chau 2007). The low weight and low cost of this device will make it more accessible to many of these persons.

REFERENCES