Technoleg Iechyd Cymru
Health Technology Wales

Topic Exploration Report

Topic explorations are designed to provide a high-level briefing on new topics submitted for consideration by Health Technology Wales. The main objectives of this report are to:

1. Determine the quantity and quality of evidence available for a technology of interest.
2. Identify any gaps in the evidence/ongoing evidence collection.
3. Inform decisions on topics that warrant fuller assessment by Health Technology Wales.

Topic:	Multi-grip myoelectric upper-limb prosthetics
Topic exploration report number:	TER108

Introduction and aims

Myoelectric prosthetics use sensors applied to the skin which recognise and amplify muscle movement to activate motors which open the hand in either one grip or multiple grip patterns. Amputee patients could use myoelectric prosthetics as an alternative to body powered prosthetics or the two might be used in combination with each one being used for different tasks or activities.

Multi-grip myoelectric upper-limb prosthetics are not routinely available in NHS Wales. Patients are only able to access them if an Individual Patient Funding Request (IPFR) is granted.

Health Technology Wales researchers searched for evidence on the use of multi-grip myoelectric prosthetics in people with upper limb amputation.

Summary of findings

One systematic review was identified which compared body-powered and myoelectric prostheses. Body powered prostheses were reported to offer benefits in durability, training time, adjustment frequency, maintenance and feedback. Myoelectric prostheses were reported to improve cosmesis and phantom limb pain. Overall, it was concluded that the evidence base was insufficient to determine whether one system is better than the other and therefore selection should be based on individual needs and preferences.

Another systematic review was identified which focused on upper limb prosthesis acceptance and abandonment. Rejection rates of 38%, 45% and 32% were reported in paediatric patients for passive, body-powered and myoelectric prostheses respectively. For adults, rejection rates of 39%, 26% and 23% were reported in for passive, body-powered and myoelectric prostheses respectively

The applicability of the studies included in both systematic reviews is somewhat limited as most were published before multi-functional myoelectric prosthetics were available. Therefore they

reflect less advanced, conventional myoelectric prosthetics and as such the full benefits of multi-grip myoelectric prosthetics may not be captured.

NHS England published their Clinical Commissioning Policy (CCP) 'Multi-grip upper limb prosthesis for forearm loss' (D01/P/c) in 2015. The report states that NHS England does not routinely commission multi-grip upper limb prosthetics. Rationale states that there was not sufficient evidence to support routine commissioning.

Numerous primary studies were identified but were of limited applicability. Most studies were non-comparative and included very few patients and did not include key outcomes of interest. Most notably, there is limited evidence on quality of life differences between prosthetic approaches.

No relevant economic evidence was identified.

Areas of uncertainty

Systematic reviews of evidence on the use of multi-grip myoelectric prosthetics were identified but they conclude that the evidence base is insufficient to determine whether multi-grip myoelectric prosthetics are better than body-powered prosthetics. It is possible that the addition of evidence which has been published subsequently may allow stronger conclusions to be drawn but this will not be known until a full review and appraisal is carried out.

No relevant economic evidence was identified and as such there is uncertainty around the cost-effectiveness of multi-grip myoelectric prosthetics.

Conclusions

Some evidence was identified which considered the use of multi-grip myoelectric upper-limb prosthetics. The evidence outlines the potential benefits associated with the technology in comparison to body powered prosthetics. However, the evidence base is somewhat limited and it is unclear whether it would be sufficient to inform recommendations on the use of the technology in NHS Wales.

Brief literature search results

Resource	Results
HTA organisations	
Healthcare Improvement Scotland:	We did not identify any relevant guidance from this source
Health Technology Assessment Group	We did not identify any relevant guidance from this source
Health Information and Quality Authority	We did not identify any relevant guidance from this source
UK guidelines and guidance	
SIGN	We did not identify any relevant guidance from this source
NICE	D01/P/c Multi-grip upper limb prosthesis for forearm loss. Specialised Commissioning Team, NHS England 2015
Secondary literature and economic evaluations	
ECRI	No relevant evidence reports or special HTA reports. One potentially relevant technology forecast report: ECRI Institute. Enhanced-dexterity Prosthetic Arm (LUKE Arm) to Restore Natural Arm Functions after Amputation. Plymouth Meeting (PA): ECRI Institute; 2017 Sep 15. (Technology Forecast).
Cochrane library	We did not identify any relevant evidence from this source
Medline	Carey SL, Lura DJ, Highsmith MJ. Differences in myoelectric and body-powered upper-limb prostheses: Systematic literature review. J Rehabil Res Dev. 52(3):247-62 (2015). Biddiss EA, Chau TT. Upper limb prosthesis use and abandonment: a survey of the last 25 years.
Primary studies	
Medline	Numerous studies but most are single arm with very low patient numbers: Cowley J, Resnik L, Wilken J, Smurr Walters L, Gates D. Movement quality of conventional prostheses and the DEKA Arm during everyday tasks. Prosthet Orthot Int. 2017;41(1):33-40 Loiret I, Sanamane V, Touillet A, Martinet N, Paysant J, Fournier-Farley C, François AG. Assessment of multigrip prosthetic hand by a crossover longitudinal study. Annals of Physical and Rehabilitation Medicine 60 e34 2017 Luchetti M, Cutti AG, Verni G, Sacchetti R, Rossi N. Impact of Michelangelo prosthetic hand: Findings from a crossover longitudinal study. J Rehabil Res Dev. 52(5):605-18 2015 Lee KH, Bin H, Kim KB, Ahn SY, Kim BO, Bok SK. Hand Functions of Myoelectric and 3D-Printed Pressure-Sensored Prosthetics: A Comparative Study. Ann Rehabil Med. 41(5): 875-880 2017 Resnik L, Acluche F, Borgia M. User experience of controlling the DEKA Arm with EMG pattern recognition. PLoS One. 2018 Sep 21;13(9) 2018

	Resnik L, Acluche F, Borgia M. The DEKA hand: A multifunction prosthetic terminal device-patterns of grip usage at home. Prosthet Orthot Int ;42(4):446-454. 2017 Resnik LJ, Borgia ML, Acluche F. Perceptions of satisfaction, usability and desirability of the DEKA Arm before and after a trial of home use. PLoS One. 2;12(6) 2017
Cochrane library	Three single-arm, non-randomised studies were identified: Akihiro T. Development of myoelectric prosthetic hand fitting system. Kawasaki H. Research and development of a myoelectric prosthetic hand for below-elbow amputation Recruitment status: recruiting. Takagi T. Myoelectric/Functional hand for traumatic amputees. Recruitment status: recruiting.

Date of search:	*June 2019*
Concepts used:	Multi-grip, multi-functional, multi functional, myoelectric, upper-limb, prosthetics, prosthesis