NHS

CLINICAL PRIORITIES ADVISORY GROUP
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Agenda Item No	2.1
National Programme	Trauma
Clinical Reference Group	Disability and rehabilitation
URN	2009

Title
Multi-grip Hands for Upper Limb Amputations or Congenital Limb Loss (all ages)

Actions Requested	1. Support the adoption of the policy proposition
	2. Recommend its approval as an IYSD

Proposition
Multi-grip prosthetic hands are available for routine commissioning in accordance to the criteria outlined within the policy. A prosthesis is a device that reproduces the function of the missing body part and it facilitates enablement to improve an individual's function and independence. As a multi-grip prosthetic has more than one grip pattern, it can facilitate a greater range of movements making completing tasks easier for the user. The aim of a multi-grip prosthetic is to promote a greater sense of independence and functioning for those with limb absence. The policy replaces the July 2015 'not routinely commission' clinical commissioning policy for Multi-grip Upper Limb Prosthesis for forearm loss.

Clinical Panel recommendation
The Clinical Panel recommended that the policy progress as a routine commissioning policy.

The committee is asked to receive the following assurance:	
1.	The Head of Clinical Effectiveness confirms the policy has completed the appropriate sequence of governance steps and includes an: Evidence Review; Clinical Panel Report.
2.	The Head of Acute Programmes confirms the policy is supported by an: Impact Assessment; Engagement Report; Equality and Health Inequalities Impact Assessment; Clinical Policy. The relevant National Programme of Care has approved these reports.
3.	The Director of Finance (Specialised Commissioning) confirms that the impact assessment has reasonably estimated a) the incremental cost and b) the budget impact of the policy.
4.	The Clinical Programmes Director (Specialised Commissioning) confirms that the service and operational impacts have been completed.

The following documents are included (others available on request):	
1.	Clinical Policy
2.	Engagement Report
3.	Evidence Summary
4.	Clinical Panel Report
5.	Equality and Health Inequalities Impact Assessment

In the Population what is the clinical effectiveness and safety of the Intervention compared with Comparator?

Outcome	Evidence statement
Clinical effectiveness	
Critical outcomes	
Functional outcome measures **Certainty of evidence:** Not applicable	**Myoelectric control multi-grip upper limb prosthetic compared with standard[1] upper limb prosthetics or no prosthetic use** Functional outcome measures reported in the included papers were the Box and Block Test (BBT), the Minnesota Manual Dexterity Test (MMDT), the Clothespin-relocation test (CPRT), the Nine Hole Peg Test, the Southampton Hand Assessment Procedure (SHAP), the Action Research Arm Test (ARAT), Disabilities of the Arm, Shoulder and Hand (DASH), QuickDASH and Orthotics and Prosthetics User Survey-Upper Extremity Functional Status (OPUS-UEFS)[a].

[1] For the comparison with myoelectric control multi-grip upper limb prosthetics, the term 'standard' includes passive functional prosthetics, body powered single grip devices, terminal devices, myoelectric single grip devices and non-myoelectric control multi-grip devices. Hand, partial hand or digit prosthetics are included

Certainty of evidence: Very low	In total 4 papers provided evidence relating to functional outcome measures, including 4 different comparisons: • One longitudinal crossover study compared outcomes for 6 unilateral transradial amputees using a myoelectric multi-grip prosthetic after 3 months utilisation with outcomes using their existing myoelectric single grip prosthetic at baseline (Luchetti et al 2015). • One cross-sectional study compared outcomes for unilateral below elbow amputees using a myoelectric multi-grip (n=5) or a myoelectric single grip (n=8) prosthetic (Salminger et al 2019). • One cross-sectional study compared outcomes for users of myoelectric multi-grip prosthetics (n=25), myoelectric single grip prosthetics (n=27) or body powered single grip prosthetics (n=75). This study included unilateral (n=112) and bilateral amputees (n=15) and outcomes were reported separately for transradial (n=87) and transhumeral amputees (n=35) [2] (Resnik et al 2020b). • One cross-sectional survey compared outcomes for unilateral upper limb amputees using a myoelectric multi-grip prosthetic (n=40) or a body powered single grip prosthetic (n=325) (Resnik et al 2020c). • One cross-sectional survey compared outcomes for unilateral upper limb amputees either using their myoelectric multi-grip prosthetic or no prosthetic (n=40) (Resnik et al 2020c). Myoelectric multi-grip vs myoelectric single grip: • 1 longitudinal crossover study (Luchetti et al 2015, n=6) reported a *statistically significant benefit* for 3 functional outcome measures for a myoelectric multi-grip prosthetic at 3 months vs their baseline myoelectric single grip prosthetic: BBT (median 29.0 (range 26 to 33) vs 24.0 (19 to 30), p <0.05); MMDT (138.5 (120 to 165) vs 162.5 (130 to 297), p<0.05); SHAP index of functionality (83.0 (76 to 88) vs 74.5 (43 to 84), p<0.05). Another scale, the OPUS-UEFS, was reported to show "an easier execution of activities of daily living" at 3 months by 5 of the 6 participants (from -0.48 to -8.86 points). Participants were reported to show "low DASH scores in all assessments, with values always lower than 26 points", indicating high functionality. Differences between assessments were reported to be "smaller than the minimum detectable change (10.7 points)". The study authors did not provide any further details relating to this result. **(VERY LOW)** • One cross-sectional study (Salminger et al 2019) reported *no statistically significant difference* between users of a myoelectric multi-grip prosthetic (n=5) or a myoelectric single grip prosthetic (n=8) for 4 functional outcome measures: BBT (p=0.486); CPRT

[2] 5 participants with amputation at the shoulder level were included in the study population figures but not in the outcomes by prosthetic type reported by the study authors

	(p=0.758); SHAP (p=0.142); ARAT (p=0.243). No further details reported. **(VERY LOW)** Myoelectric multi-grip vs myoelectric single grip vs body powered single grip: • One cross-sectional study (Resnik et al 2020b) reported comparisons across 3 prosthetic types (myoelectric multi-grip (n=25), myoelectric single grip (n=27), body powered single grip (n=75)). For 3 measures, results were reported for all transradial (TR) amputees (unilateral and bilateral) and all transhumeral (TH) amputees[3]. For one measure (QuickDASH) results were only reported for unilateral TR and TH amputees. **(VERY LOW)**: • A *statistically significant difference* across the 3 prosthetic types was reported for TR and TH amputees for one functional outcome measure: the Nine Hole Peg Test (mean items per second (standard deviation (SD)) TR: myoelectric multi-grip (n=19) 0.01 (0.01), myoelectric single grip (n=15) 0.06 (0.06), body powered single grip (n=53) 0.07 (0.06), p=0.0001; TH: myoelectric multi-grip (n=5) 0.00 (0.00), myoelectric single grip (n=10) 0.01 (0.03), body powered single grip (n=20) 0.05 (0.06), p=0.031[4]). • On another measure (BBT) there was a *statistically significant difference* across the 3 prosthetic types for TR amputees (mean (SD) myoelectric multi-grip (n=19) 15.4 (6.0), myoelectric single grip (n=15) 15.1 (9.1), body powered single grip (n=53) 20.6 (9.2), p=0.02), but *no statistically significant difference* for TH amputees (mean (SD) myoelectric multi-grip (n=5) 7.6 (6.5), myoelectric single grip (n=10) 5.2 (5.7), body powered single grip (n=20) 11.8 (9.8), p=0.21). • There was *no statistically significant difference* across the 3 prosthetic types for TR or TH amputees for the SHAP index of functionality (mean (SD) TR: myoelectric multi-grip (n=19) 39.6 (14.8), myoelectric single grip (n=15) 41.0 (21.1), body powered single grip (n=53) 44.0 (19.6), p=0.57; TH: myoelectric multi-grip (n=5) 12.8 (12.7), myoelectric single grip (n=10) 10.8 (16.6), body powered single grip (n=20) 14.4 (15.3), p=0.67). • There was *no statistically significant difference* across the 3 prosthetic types for unilateral TR or TH amputees for QuickDASH (mean (SD) TR: myoelectric multi-grip (n=18) 26.3 (18.1), myoelectric single grip (n=12) 30.9 (15.8), body powered single grip (n=45) 29.2 (19.4), p=0.72); TH: myoelectric multi-grip (n=5) 30.5 (13.3), myoelectric single grip (n=9) 28.2 (13.8), body powered single grip (n=18) 34.0 (20.7), p=0.85). Myoelectric multi-grip vs body powered single grip

[3] Results were also reported for unilateral amputees only. These are discussed under the subgroup question
[4] This result was statistically significant at a p<0.05, but no longer significant after controlling for multiple comparisons

	• 1 cross-sectional survey (Resnik et al 2020c) reported *no statistically significant difference* for QuickDASH between myoelectric multi-grip prosthetic users (n=40) and body powered single grip prosthetic users (n=325) in multi-variate linear regression modelling (β 1.24 (95%CI -5.88 to 8.36) (p=0.7326). **(VERY LOW)** Myoelectric multi-grip vs no prosthetic use • 1 cross-sectional survey (Resnik et al 2020c) reported QuickDASH mean (±SD) for 40 participants **(VERY LOW)**: • *No statistically significant difference* for the self-reported performance of two-handed tasks using a myoelectric multi-grip prosthetic vs no prosthetic use (lift and carry bulky objects: 2.8±1.3 vs 2.7±1.1, p=0.67; spread peanut butter: 3.1±1.4 vs 3.3±1.3, p=0.60; do housework: 2.5±1.1 vs 2.8±1.2, p=0.12). • *Statistically significantly better* self-reported performance of one-handed tasks using a myoelectric multi-grip prosthetic vs no prosthetic use (i.e. using the remaining residual limb) (pick up small objects: 3.5±1.1 vs 4.5±1.1, p=0.0008; grasp rounded objects (2.6±1.2 vs 4.1±1.2, p<0.0001). **There was very low certainty evidence of better functional outcomes using a myoelectric multi-grip prosthetic from one longitudinal crossover study in which participants were tested using a multi-grip and single grip prosthetic. However, the cross-sectional studies and survey generally reported no statistically significant differences in functional outcome measures between upper limb amputees who use a multi-grip or single grip prosthetic. For the 1 cross-sectional study showing a statistically significant difference for 2 measures, the better mean scores were for users of the single grip prosthetics.** **There was very low certainty evidence of better functional outcomes for one-handed tasks using a myoelectric multi-grip prosthetic compared to no prosthetic use (i.e. using the remaining residual limb). There was no statistically significant difference in the performance of two-handed tasks with or without a myoelectric multi-grip prosthetic.**
Activities of daily living **Certainty of evidence:** Not applicable	Activities of daily living (ADLs) are critical outcomes to patients as they facilitate enablement and independence, allowing individuals to function in education, work, home and recreational settings. They encompass patients' individual rehabilitation goals and facilitate inclusion and participation. **Non-myoelectric control multi-grip upper limb prosthetics compared with standard upper limb prosthetics or no prosthetic use** No evidence was identified for this outcome. **Myoelectric control multi-grip upper limb prosthetic compared with standard upper limb prosthetics or no prosthetic use**

Certainty of evidence: Very low	ADL measures reported in the included papers were the Activities Measure for Upper Limb Amputation (AM-ULA), the Brief AM-ULA (BAM-ULA) and the Timed Measure of Activity Performance (T-MAP)[b]. Papers also reported whether patients required help with daily activities. In total 2 papers provided evidence relating to ADL, including 2 different comparisons: • One cross-sectional study compared outcomes for users of myoelectric multi-grip prosthetics (n=25), myoelectric single grip prosthetics (n=27) or body powered single grip prosthetics (n=75). Outcomes were reported separately for unilateral TR and TH amputees (Resnik et al 2020b). • One cross-sectional survey compared outcomes for unilateral upper limb amputees using a myoelectric multi-grip prosthetic (n=40) or a body powered single grip prosthetic (n=325) (Resnik et al 2020c). Myoelectric multi-grip vs myoelectric single grip vs body powered single grip: • One cross-sectional study (Resnik et al 2020b) reported comparisons across 3 prosthetic types (myoelectric multi-grip (n=25), myoelectric single grip (n=27), body powered single grip (n=75)). **(VERY LOW)** • There was *no statistically significant difference* across the 3 prosthetic types for unilateral TR or TH amputees for AM-ULA (mean (SD) TR: myoelectric multi-grip (n=18) 16.4 (6.5), myoelectric single grip (n=12) 14.9 (7.7), body powered single grip (n=45) 14.9 (5.3), p=0.68); TH myoelectric multi-grip (n=5) 11.9 (1.8), myoelectric single grip (n=9) 9.4 (4.2), body powered single grip (n=18) 12.3 (6.2), p=0.23). • On the BAM-ULA there was a *statistically significant difference* across the 3 prosthetic types for unilateral TR amputees (mean (SD) myoelectric multi-grip (n=18) 8.0 (1.6), myoelectric single grip (n=12) 9.2 (1.0), body powered single grip (n=45) 6.6 (2.1), p=0.002), but *no statistically significant difference* for TH amputees (mean (SD) myoelectric multi-grip (n=5) 3.5 (0.7), myoelectric single grip (n=9) 4.0 (not stated), body powered single grip (n=18) 4.5 (3.4), p=0.83). • There was *no statistically significant difference* across the 3 prosthetic types for unilateral TR or TH amputees for T-MAP (mean (SD) TR: myoelectric multi-grip (n=18) 3.9 (0.9), myoelectric single grip (n=12) 3.9 (0.6), body powered single grip (n=45) 5.0 (1.8), p=0.081); TH: myoelectric multi-grip (n=5) 7.4 (3.0), myoelectric single grip (n=9) 4.9 (1.2), body powered single grip (n=18) 4.6 (1.7), p=0.18). • There was *no statistically significant difference* in the percentage of participants needing help with daily activities across the 3

	prosthetic types for unilateral TR or TH amputees (TR: myoelectric multi-grip (n=18) 16.7%, myoelectric single grip (n=12) 37.5%, body powered single grip (n=45) 21.2%, p=0.57); TH: myoelectric multi-grip (n=5) 20%, myoelectric single grip (n=9) 28.6%, body powered single grip (n=18) 25%, p=1.0). Myoelectric multi-grip vs body powered single grip • 1 cross-sectional survey (Resnik et al 2020c) reported *no statistically significant difference* in help needed with daily activities between myoelectric multi-grip prosthetic users (n=40) and body powered single grip prosthetic users (n=325) in multi-variate logistic modelling (OR 1.75 (95%CI 0.81 to 3.79) (p=0.1557). **(VERY LOW)** **This study and survey generally reported very low certainty evidence of no statistically significant differences in ADL for upper limb amputees. One study compared outcomes for unilateral upper limb amputees across three prosthetic types: myoelectric multi-grip, myoelectric single grip and body powered single grip prosthetics but did not report pairwise comparisons. For the one measure that showed a statistically significant difference, the best mean score was for the myoelectric single grip prosthetic. A direct (pairwise) comparison was only reported for one outcome in one survey and did not report any evidence of benefit of the myoelectric multi-grip prosthetic compared to a body powered single grip prosthetic in terms of help needed with daily activities**.
Quality of life **Certainty of evidence:** Not applicable **Certainty of evidence:** Very low	Quality of life is a critical outcome to patients as it provides an indication of an individual's general health and self-perceived well-being and their ability to participate in activities of daily living. A prosthetic aims to promote independence and enablement in daily life. **Non-myoelectric control multi-grip upper limb prosthetics compared with standard upper limb prosthetics or no prosthetic use** No evidence was identified for this outcome. **Myoelectric control multi-grip upper limb prosthetic compared with standard upper limb prosthetics or no prosthetic use** Quality of life measures reported in the included papers were the EURO Quality of Life Questionnaire 5 Dimensions (EURO-QoL EQ-5D), the Hospital Anxiety and Depression Scale (HADS) and the Veterans 12-item Health Survey (VR-12)[c]. In total 3 papers provided evidence relating to quality of life, including 3 comparisons: • One longitudinal crossover study compared outcomes for 6 unilateral transradial amputees using a myoelectric multi-grip prosthetic after 6 months utilisation with outcomes using their

	existing myoelectric single grip prosthetic at baseline (Luchetti et al 2015). • One cross-sectional study compared outcomes for users of myoelectric multi-grip prosthetics (n=25), myoelectric single grip prosthetics (n=27) or body powered single grip prosthetics (n=75). Outcomes were reported separately for TR and TH amputees (Resnik et al 2020b). • One cross-sectional survey compared outcomes for unilateral upper limb amputees using a myoelectric multi-grip prosthetic (n=40) or a body powered single grip prosthetic (n=325) (Resnik et al 2020c). Myoelectric multi-grip vs myoelectric single grip: • 1 longitudinal crossover study (Luchetti et al 2015, n=6) reported *no statistically significant difference* between a myoelectric multi-grip prosthetic at 6 months vs a myoelectric single grip prosthetic at baseline for 2 quality of life measures: EUROQoL EQ-5D summary index (median (range) 0.858 (0.539 to 0.919) vs 0.901 (0.796 to 0.919), p >0.05); EUROQoL EQ-5D visual analogue scale (90.0 (70 to 100) vs 87.5 (70 to 100), p>0.05; HADS anxiety (2.0 (0 to 9) vs 2.0 (0 to 7), p>0.05); HADS depression (3.5 (0 to 6) vs 2.5 (1 to 5), p>0.05). **(VERY LOW)** Myoelectric multi-grip vs myoelectric single grip vs body powered single grip: • One cross-sectional study (Resnik et al 2020b) reported comparisons across 3 prosthetic types (myoelectric multi-grip (n=25), myoelectric single grip (n=27), body powered single grip (n=75)). Results were reported separately for unilateral TR and TH amputees. **(VERY LOW)**: • There was *no statistically significant difference* across the 3 prosthetic types in the VR-12 mental component summary (mean (SD) TR: myoelectric multi-grip (n=18) 52.4 (11.5), myoelectric single grip (n=12) 46.3 (12.8), body powered single grip (n=45) 53.5 (10.1), p=0.085); TH: myoelectric multi-grip (n=5) 52.9 (9.4), myoelectric single grip (n=9) 50.6 (14.6), body powered single grip (n=18) 50.4 (13.1), p=0.98). • There was *no statistically significant difference* across the 3 prosthetic types in the VR-12 physical component summary (mean (SD) TR: myoelectric multi-grip (n=18) 41.1 (8.2), myoelectric single grip (n=12) 43.2 (6.9), body powered single grip (n=45) 37.5 (8.9), p=0.085); TH: myoelectric multi-grip (n=5) 44.0 (8.1), myoelectric single grip (n=9) 41.9 (5.6), body powered single grip (n=18) 34.7 (13.2), p=0.17). Myoelectric multi-grip vs body powered single grip • 1 cross-sectional survey (Resnik et al 2020c) reported *no statistically significant difference* in VR-12 mental or physical component summary between myoelectric multi-grip prosthetic

	users (n=40) and body powered single grip prosthetic users (n=325) in multi-variate linear regression modelling (VR-12 mental β 2.59 (95%CI -2.14 to 7.32) (p=0.2825); VR-12 physical β -0.97 (95%CI -3.99 to 2.05) (p=0.5295)). **(VERY LOW)** **One study and one survey reported very low certainty evidence of no statistically significant difference in quality of life in direct (pairwise) comparisons between upper limb amputees using myoelectric multi-grip and myoelectric single grip or body powered single grip prosthetics respectively. One study compared outcomes for unilateral upper limb amputees across three prosthetic types: myoelectric multi-grip, myoelectric single grip and body powered single grip and reported no statistically significant difference between the 3 prosthetic types but did not report pairwise comparisons with myoelectric multi-grip prosthetics.**
Important outcomes	
Prosthetic abandonment **Certainty of evidence:** Not applicable **Certainty of evidence:** Very low	Prosthetic abandonment is an important outcome to patients as it may reflect issues with functional aspects of the prosthetic. Prosthetic abandonment is seen more frequently with proximal amputations. **Non-myoelectric control multi-grip upper limb prosthetics compared with standard upper limb prosthetics or no prosthetic use** No evidence was identified for this outcome. **Myoelectric control multi-grip upper limb prosthetic compared with standard upper limb prosthetics or no prosthetic use** In total, one longitudinal survey provided data relating to prosthetic abandonment in people with upper limb amputation using different prosthetics. Resnik et al 2020a stated the percentage of respondents who reported using a different prosthetic in the 12-month follow-up survey than they had been using in the baseline survey. This was reported for different baseline prosthetic devices: • Myoelectric multi-grip (n=33): 58% • Body powered single grip (n=232): 20% • Myoelectric single grip (powered hook) (n=14): 43% • Myoelectric single grip (Sensor speed) (n=10): 40% • Myoelectric single grip (Greifer) (n=6): 67% No statistical tests reported. **(VERY LOW)** **This survey provides very low certainty evidence about the percentage of prosthetic users who had changed device in a 12-month period. However, it does not provide any statistical evidence that examines prosthetic abandonment for myoelectric control multi-grip prosthetics compared to standard upper limb prosthetics.**

Patient satisfaction and prosthetic acceptability **Certainty of evidence:** Not applicable	Patient satisfaction and prosthetic acceptability are important outcomes as this promotes inclusion and can assist with the psychological adaptation to limb difference. Acceptability can promote prosthetic use. **Non-myoelectric control multi-grip upper limb prosthetics compared with standard upper limb prosthetics or no prosthetic use** No evidence was identified for this outcome.
Certainty of evidence: Very low	**Myoelectric control multi-grip upper limb prosthetic compared with standard upper limb prosthetics or no prosthetic use** Measures reported in the included papers were the Trinity Amputation and Prosthesis Experience Scales Satisfaction Scale (TAPES-SAT), the Amputee Body Image Scale (ABIS) and the Orthotics and Prosthetics User Survey Client Satisfaction with Devices Scale (OPUS-CSD)[d]. In total, 3 papers provided evidence relating to patient satisfaction and prosthetic acceptability, including 3 comparisons: • One longitudinal crossover study compared outcomes for 6 unilateral transradial amputees using a myoelectric multi-grip prosthetic after 6 months utilisation with outcomes using their existing myoelectric single grip prosthetic at baseline (Luchetti et al 2015). • One cross-sectional study compared outcomes for myoelectric multi-grip prosthetics users (n=25), myoelectric single grip prosthetics users (n=27) or body powered single grip prosthetics users (n=75). Outcomes were reported separately for unilateral TR and TH amputees (Resnik et al 2020b). • One cross-sectional survey compared outcomes for unilateral upper limb amputees using myoelectric multi-grip prosthetics (n=40) vs myoelectric single grip prosthetics (n=30). Outcomes were also compared for users of myoelectric multi-grip prosthetics and any (myoelectric or body powered) single grip prosthetic (n=364) (Resnik et al 2020d). Myoelectric multi-grip vs myoelectric single grip: • 1 longitudinal crossover study (Luchetti et al 2015, n=6) reported *no statistically significant difference* between a myoelectric multi-grip prosthetic at 6 months vs a myoelectric single grip prosthetic at baseline for 2 patient satisfaction measures: TAPES-SAT (median (range) 43 (27 to 46) vs 43 (35 to 45), p >0.05); ABIS (median (range) 36.0 (33 to 50) vs 34.0 (33 to 48), p>0.05). **(VERY LOW)**

	• 1 cross-sectional survey (Resnik et al 2020d) reported *no statistically significant difference* between myoelectric multi-grip prosthetic users (n=40) and myoelectric single grip prosthetic users (n=30) in bi-variate linear regression modelling for 2 measures: TAPES-SAT β 0.11 (95%CI not reported) (p=0.4812); OPUS-CSD β -0.57 (95%CI not reported) (p=0.9023). **(VERY LOW)** Myoelectric multi-grip vs myoelectric single grip vs body powered single grip: • One cross-sectional study (Resnik et al 2020b) reported comparisons across 3 prosthetic types (myoelectric multi-grip (n=25), myoelectric single grip (n=27), body powered single grip (n=75)). Results were reported separately for unilateral TR and TH amputees. **(VERY LOW)**: • There was *no statistically significant difference* across the 3 prosthetic types in TAPES-SAT (mean (SD) TR: myoelectric multi-grip (n=18) 3.8 (0.7), myoelectric single grip (n=12) 3.5 (0.7), body powered single grip (n=45) 4.0 (0.7), p=0.051); TH: myoelectric multi-grip (n=5) 3.7 (0.5), myoelectric single grip (n=9) 3.5 (0.5), body powered single grip (n=18) 3.7 (0.9), p=0.64). Myoelectric multi-grip vs any single grip (myoelectric or body powered): • 1 cross-sectional survey (Resnik et al 2020d) reported *no statistically significant difference* between myoelectric multi-grip prosthetic users (n=40) and single grip prosthetic users (n=364) in bi-variate linear regression modelling for 2 measures: TAPES-SAT β -0.07 (95%CI not reported) (p=0.5286); OPUS-CSD β 1.58 (95%CI not reported) (p=0.6043). (**VERY LOW)** **One study and one survey reported very low certainty evidence of no statistically significant difference in patient satisfaction and prosthetic acceptability in direct (pairwise) comparisons between upper limb amputees using myoelectric multi-grip and myoelectric single grip or any single grip prosthetics respectively. One study compared outcomes for unilateral upper limb amputees across three prosthetic types: myoelectric multi-grip, myoelectric single grip and body powered single grip and reported no statistically significant difference between the 3 prosthetic types but did not report pairwise comparisons with myoelectric multi-grip prosthetics.**
Device durability **Certainty of evidence:** Not applicable	Device durability is an important outcome for patients as it can impact on functional use. It also reflects service delivery needs including maintenance and cost. **Non-myoelectric control multi-grip upper limb prosthetics compared with standard upper limb prosthetics or no prosthetic use**

Certainty of evidence: Very low	No evidence was identified for this outcome. **Myoelectric control multi-grip upper limb prosthetic compared with standard upper limb prosthetics or no prosthetic use** In total, one longitudinal crossover study provided non-comparative evidence relating to device durability in people with unilateral upper limb amputation using a myoelectric control multi-grip prosthetic. Luchetti et al 2015 reported that 4 of 6 participants (66.7%) experienced at least one temporary failure of the myoelectric control multi-grip prosthetic over the 6-month study period. No further details were reported. **(VERY LOW)** **There is very low certainty evidence about the proportion of patients who experienced at least one temporary device failure during one study. However, this study does not provide any evidence about the durability of myoelectric control multi-grip prosthetics compared to standard upper limb prosthetics.**
Frequency of replacement and/or re-fitting **Certainty of evidence:** Not applicable **Certainty of evidence:** Not applicable	Device durability is an important outcome for patients as it can impact on functional use. It also reflects service delivery needs including maintenance and cost. **Non-myoelectric control multi-grip upper limb prosthetics compared with standard upper limb prosthetics or no prosthetic use** No evidence was identified for this outcome. **Myoelectric control multi-grip upper limb prosthetic compared with standard upper limb prosthetics or no prosthetic use** No evidence was identified for this outcome.
Safety	
Adverse events **Certainty of evidence:** Not applicable **Certainty of evidence:** Not applicable	Safety is an important outcome to patients to ensure prosthetic devices do not cause issues in the residual limb. Users may experience over-use injuries and/or pain in remaining muscle groups to operate the device. **Non-myoelectric control multi-grip upper limb prosthetics compared with standard upper limb prosthetics or no prosthetic use** No evidence was identified for this outcome. **Myoelectric control multi-grip upper limb prosthetic compared with standard upper limb prosthetics or no prosthetic use** No evidence was identified for this outcome.
Abbreviations: ABIS: Amputee Body Image Scale, ADL: activities of daily living, AM-ULA: Activities Measure for Upper Limb Amputation, ARAT: Action Research Arm Test, BAM-ULA: Brief Activities Measure for Upper Limb Amputation, BBT: Box and Block Test, CI: confidence interval, CPRT:	

Clothespin-relocation test, DASH: Disabilities of the Arm, Shoulder and Hand, EURO-QoL EQ-5D: EURO Quality of Life Questionnaire 5 Dimensions, HADS: Hospital Anxiety and Depression Scale, MMDT: Minnesota Manual Dexterity Test, OPUS-CSD: Orthotics and Prosthetics User Survey Client Satisfaction with Devices Scale; OPUS-UEFS: Orthotics and Prosthetics User Survey-Upper Extremity Functional Status, QuickDASH: Quick Disabilities of the Arm, Shoulder and Hand, SD: standard deviation, SHAP: Southampton Hand Assessment Procedure, TAPES-SAT: Trinity Amputation and Prosthesis Experience Scales Satisfaction Scale, TH: transhumeral, T-MAP: Timed Measure of Activity Performance, TR: transradial, VR-12: Veterans 12-item Health Survey

a Functional outcome measures:

- BBT assesses arm/hand dexterity through the number of wooden blocks moved from one area to another in 1 minute with higher scores indicating higher functionality
- MMDT assesses arm/hand dexterity through the time taken (in seconds) to place 60 round pegs into holes with lower scores indicating higher functionality
- CPRT assess functionality through the time taken to transfer 4 clothespins of various strengths from a horizontal bar to a vertical one. Lower scores indicate higher functionality
- The Nine Hole Peg Test assesses arm/hand dexterity through the time taken to accurately place and remove 9 pegs into and from a pegboard. Mean score calculated as items per second. Higher scores indicate higher functionality
- SHAP assesses hand dexterity in 12 abstract object tasks and 14 activities of daily living. Time in seconds to complete each task is inputted into a scoring chart that calculates an overall index of functionality with higher scores indicating higher functionality
- ARAT assesses upper limb motor function through 4 sections with different tasks with a maximum score of 57 points. Higher scores indicate higher functionality
- DASH assesses upper limb physical function in activities of daily living using a 30-item self-report questionnaire (DASH is listed as a functional outcome measure in the PICO). Scores range from 0 (no disability) to 100 (most severe disability) with lower scores indicating higher functionality. The PICO states that the minimally clinical important difference is an improvement in DASH score of >14
- QuickDASH is a self-report questionnaire assessing difficulty performing activities, amount of limitation, extent of interference with activities and extent of arm, shoulder and hand pain and tingling. Scores range from 1 (very easy) to 5 (cannot do at all) with lower scores indicating higher functionality
- OPUS-UEFS assesses upper limb physical function in activities of daily living using a 23-item self-report questionnaire. Scores range from 0 to 100 with lower scores indicating higher functionality

b ADL measures:

- AM-ULA is an assessment of activity performance for 18 everyday tasks. Each task is rated on task completion, speed, movement, quality, skilfulness of prosthetic use and independence. Total score is the average score x 10 with higher scores indicating better performance
- BAM-ULA is an assessment of ability to complete 10 everyday tasks. Total score is the number of completed activities with higher scores indicating better performance
- T-map is an assessment of time taken to complete 5 everyday activities. Lower scores indicate better performance

c Quality of life measures:

- EuroQoL EQ-5D assesses self-reported health-related quality of life for 5 items (mobility, self-care, usual activities, pain and discomfort, and anxiety and depression). A summary index scored from 0 to 1 and a visual analogue scale from 0 to 100 were used to rate perceived health status. Higher scores indicate higher quality of life
- HADS assesses anxiety and depression using a 14-item self-report questionnaire. Scores range from 0 to 21 with lower scores indicating less anxiety or depression. The authors gave a cut-off of ≥ 8 for considering participants to be anxious or depressed
- The VR-12 is a 12-item self-report questionnaire assessing health-related quality of life with a mental and physical component summary. Scores range from 1 to 100 with higher scores indicating higher quality of life

d Patient satisfaction measures:

- TAPES-SAT is a 10-item self-report questionnaire assessing prosthetic satisfaction through colour, shape, noise, appearance, weight, usefulness, reliability, fit, comfort and overall

satisfaction. Items are rated on a 5-point scale from 1 (very dissatisfied) to 5 (very satisfied) with higher scores indicating higher satisfaction • ABIS assesses body image concerns using a 20-item self-report questionnaire. Scores range f rom 20 to 100 with lower scores indicating fewer concerns A modified version of the OPUS-CSD self-report questionnaire was used with 8-items assessing prosthetic satisfaction through fit, weight, comfort, donning ease, appearance, durability, skin irritation and pain. Items are rated on a 4-point scale from 1 (strongly agree) to 4 (strongly disagree) with lower scores indicating higher satisfaction.

In the Population what is the cost effectiveness of the Intervention compared with Comparator?

Outcome	Evidence statement
Cost effectiveness	**Non-myoelectric control multi-grip upper limb prosthetics compared with standard upper limb prosthetics or no prosthetic use** No evidence was identified for cost effectiveness **Myoelectric control multi-grip upper limb prosthetic compared with standard upper limb prosthetics or no prosthetic use** No evidence was identified for cost effectiveness

From the evidence selected, are there any subgroups of patients that may benefit from the intervention more than the wider population of interest?

Outcome	Evidence statement
	Non-myoelectric control multi-grip upper limb prosthetics compared with standard upper limb prosthetics or no prosthetic use No evidence was identified regarding any subgroups of patients that would benefit more from a non-myoelectric control multi-grip upper limb prosthetic. **Myoelectric control multi-grip upper limb prosthetic compared with standard upper limb prosthetics or no prosthetic use** No evidence was identified regarding any subgroups of patients that would benefit more from a myoelectric multi-grip prosthetic. Four of the six included papers only included participants with unilateral amputation (Luchetti et al 2015, Resnik et al 2020c, Resnik et al 2020d, Salminger et al 2019). The remaining two papers included both unilateral and bilateral amputees (Resnik et al 2020a, Resnik et al 2020b). Resnik et al 2020a pooled the results of unilateral and bilateral amputees for the only outcome that they reported by type of prosthetic. Resnik et al 2020b reported three functional outcome measures separately for all participants (both unilateral and bilateral

	amputees) and for unilateral amputees only. Four papers included participants with different levels of amputation (Resnik et al 2020a, Resnik et al 2020b, Resnik et al 2020c, Resnik et al 2020d), but only one paper (Resnik et al 2020b) reported outcomes separately for transradial and transhumeral amputees. However, although some outcomes were reported separately in some studies, the pattern of results appeared similar for the different populations. No statistical tests of difference in effect between unilateral and bilateral amputees or between transradial or transhumeral amputees were reported.

The condition has the following impacts on the patient's everyday life:

- **Patients have no problems in walking about**
- **Patients have moderate to severe problems in washing or dressing or are unable to wash or dress**
- **Patients have moderate to severe problems in doing their usual activities or are unable to do their daily activities**
- **Patients have no to slight pain or discomfort**
- **Patients are slight to moderately anxious or depressed**

Further details of impact upon patients:

Patients with upper limb (arm, hand or finger(s)) loss, either as a result of amputation (loss which could be the result of surgery or trauma) or congenital (birth) deficiency are routinely offered rehabilitation (support and training to adapt to a missing body part). A prosthetic is a device that reproduces the function of the missing body part and it facilitates enablement (ways to promote doing activities) to improve an individual's function and independence. Each patient has their own experience of living with limb loss and has unique goals and requirements from a prosthetic, which is why it is hard to determine a general impact the condition has on a patient's everyday life.

Prosthetic users may experience pain and discomfort from the socket site and/or over-use in other muscles (upper limb imbalance) as they adapt to control and utilise the prosthetic. Challenges in the use and function of the prosthetic can lead to abandonment of the device.

A multi-grip prosthetic has more than one grip pattern, facilitating more natural movements. The myoelectric controlled device means it is powered by an external battery source and controlled by co-ordinated muscle movements in the remaining limb, which promotes hand independence in completing tasks. The aim of providing a myoelectric control multi-grip prosthetic is to promote a greater sense of independence and functioning for those with limb loss, allowing them to participate in activities of daily living like dressing, washing or eating and completing work and family roles.

Patients may feel frustrated or experience the psychological consequences (including psychological distress) of limb loss, as no prosthetic can replace the complex function of the hand and the hand has more than just a functional role, as it is used in social and communicative functioning. An appropriate prosthetic can help with patient and societal acceptance of limb loss.

Further details of impact upon carers:
Carers may have been supporting patients with limb loss, to assist with physical tasks as well as supporting the individual in the emotional consequences of living with an upper limb amputation or congenital upper limb deficiency.

This can place a significant emotional and psychological burden on patients, carers and their wider families as they may require more assistance, have greater care needs and require help to complete household activities or work and family roles. This can place additional pressure on carers and wider families emotionally, physically and also financially. The appropriate prosthetic can facilitate inclusion, independence and active participation, reducing the demands placed on carers and their wider families.

Considerations from review by Rare Disease Advisory Group
Not applicable.

Pharmaceutical considerations
Not applicable.

Considerations from review by National Programme of Care
The policy received the full support of the Trauma PoC on the 13th July 2022.