

CADTH Reference List

Microprocessor- Controlled Knee Prosthetics for Individuals With Transfemoral Amputation

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Key Messages

- One health technology assessment, 2 systematic reviews, 3 randomized controlled trials, and 9 non-randomized studies were identified regarding the clinical effectiveness of microprocessor-controlled knee prosthetics for individuals with transfemoral amputation.
- Four economic evaluations were identified regarding the cost-effectiveness of microprocessor-controlled knee prosthetics for individuals with transfemoral amputation.

Research Questions

1. What is the clinical effectiveness of microprocessor-controlled knee prosthetics for individuals with transfemoral amputation?
2. What is the cost-effectiveness of microprocessor-controlled knee prosthetics for individuals with transfemoral amputation?

Methods

Literature Search Methods

A limited literature search was conducted by an information specialist on key resources including MEDLINE, the Cochrane Database of Systematic Reviews, the international HTA database, the websites of Canadian and major international health technology agencies, as well as a focused internet search. The search strategy comprised both controlled vocabulary, such as the National Library of Medicine's MeSH (Medical Subject Headings), and keywords. The main search concepts were microprocessor and knee or transfemoral prosthetics. No filters were applied to limit the retrieval by study type. Where possible, retrieval was limited to the human population. The search was also limited to English-language documents published between January 1, 2011 and January 27, 2021. Internet links were provided, where available.

Selection Criteria

One reviewer screened literature search results (titles and abstracts) and selected publications according to the inclusion criteria presented in Table 1. Full texts of study publications were not reviewed.

Results

One health technology assessment,¹ 2 systematic reviews,^{2,3} 3 randomized controlled trials,⁴⁻⁶ and 9 non-randomized studies⁷⁻¹⁵ were identified regarding the clinical effectiveness of microprocessor-controlled knee prosthetics for individuals with transfemoral amputation. Four economic evaluations¹⁶⁻¹⁹ were identified regarding the cost-effectiveness of microprocessor-controlled knee prosthetics for individuals with transfemoral amputation.

Table 1: Selection Criteria

Criteria	Description
Population	Individuals (of all ages) with transfemoral amputation
Intervention	Microprocessor-controlled knee prosthetics
Comparator	Mechanically controlled (i.e., non-microprocessor-controlled) knee prosthetics
Outcomes	Q1: Clinical effectiveness (e.g., quality of life, functionality [e.g., activities of daily living, Medicare Functional Classification Level], energy efficiency, productivity, ambulation, comfort, safety [e.g., adverse events]) Q2: Cost-effectiveness (e.g., cost per quality-adjusted life-year gained)
Study Designs	Health technology assessments, systematic reviews, randomized controlled trials, non-randomized studies, economic evaluations

Additional references of potential interest that did not meet the inclusion criteria are provided in Appendix 1.

References

Health Technology Assessments

- Henrikson NB, Hafner BJ, Dettori JR, et al. Microprocessor-controlled lower limb prostheses: health technology assessment. Tacoma (WA): Washington State Health Care Authority; 2011: https://www.hca.wa.gov/assets/program/mc_lower_prosthetic_final_report%5B1%5D.pdf Accessed 2021 Feb 1.
See: Summary of evidence – Microprocessor-controlled prosthetic KNEES (p.9-11)

Systematic Reviews and Meta-analyses

- Kannenberg A, Zacharias B, Probsting E. Benefits of microprocessor-controlled prosthetic knees to limited community ambulators: systematic review. *J Rehabil Res Dev.* 2014;51(10):1469-1496. [Medline](#)
- Sawers AB, Hafner BJ. Outcomes associated with the use of microprocessor-controlled prosthetic knees among individuals with unilateral transfemoral limb loss: a systematic review. *J Rehabil Res Dev.* 2013;50(3):273-314. [Medline](#)

Randomized Controlled Trials

- Cao W, Yu H, Zhao W, Meng Q, Chen W. The comparison of transfemoral amputees using mechanical and microprocessor-controlled prosthetic knee under different walking speeds: a randomized cross-over trial. *Technol Health Care.* 2018;26(4):581-592. [Medline](#)
- Hafner BJ, Askew RL. Physical performance and self-report outcomes associated with use of passive, adaptive, and active prosthetic knees in persons with unilateral, transfemoral amputation: randomized crossover trial. *J Rehabil Res Dev.* 2015;52(6):677-700. [Medline](#)
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Non-Randomized Studies

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Economic Evaluations

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See: Summary (p.vii)

Appendix 1: References of Potential Interest

Previous CADTH Reports

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Systematic Reviews and Meta-analyses

Unclear Population – Transfemoral Amputation Not Specified

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Alternative Intervention – Not Specific to Microprocessor-Powered Knee Prosthetics

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See: Microprocessor Knees (p.153-154)

Alternative Control – Comparison Between Different Microprocessor-Powered Knee Prosthetics

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Randomized Controlled Trials

Unclear Population – Transfemoral Amputation Not Specified or Not Restricted to Transfemoral Amputees

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Non-Randomized Studies

Unclear Population – Transfemoral Amputation Not Specified or Not Restricted to Transfemoral Amputees

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Mixed Intervention – Not Restricted to Microprocessor-Controlled Knees

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Mixed Control – Not Restricted to Mechanical Prosthetic Knees

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Alternative Control – Comparison Between Different Microprocessor-Powered Knee Prosthetics

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Alternative Control – Non-Amputee

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Economic Evaluations

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Alternative Outcome – Direct Medical Costs

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See: Position Statement