

The Dynamics of Prosthetics Care Continuum for Persons with Amputation

Jefferson K. Rajah^{a*}, Christopher Hutchison^b, William Chernicoff^c and Paulo Gonçalves^d

^a*System Dynamics Group, Department of Geography, University of Bergen, Norway*

^b*ProsFit Technologies JSC, Sofia, Bulgaria*

^c*Toyota Mobility Foundation, United States*

^d*Institute of Management and Organisation, University of Lugano, Switzerland*

*Correspondence: jefferson.rajah@student.uib.no

As a result of steady population growth, aging population, and significantly increasing rates of diabetes and musculoskeletal conditions, the World Health Organization expects the global persons with amputation (PwA) population to double by 2050. Without proper and timely prosthetic interventions for those having gone through major lower-limb amputations, such PwA experience a significant loss in mobility, quality of life, and life expectancy. However, barriers such as financial burden associated with treatment, healthcare coverage, service capacity constraints, lack of proximity to services, as well as insufficient continuity of care for patients continue to be obstacles. Even for those with prosthesis, about 50% abandon it due to poor outcomes, including discomfort and pain. This study broadly aims to identify high-leverage policies capable of alleviating the barriers to access and reasons for abandonment across the patient journey for PwA, as well as enhancing the health and economic outcomes of prosthetics care. It employs the system dynamics method to construct a simulation model of the prosthetics care continuum for PwA, which is used for scenario analysis and policy testing.

Extended Abstract

Problem Orientation

The World Health Organization (WHO) estimates that around 0.5% of any given population require prosthetics and orthotics services, corresponding to about 35 to 40 million people globally.¹ This is a result of amputations mainly caused by traumatic injuries and medical conditions such as diabetic foot syndrome and peripheral arterial occlusive disease.² Given the steady population growth, aging population, and significantly increasing rates of diabetes and musculoskeletal conditions, WHO anticipates the persons with amputation (PwA) population to double in size by 2050.¹

Particularly for major lower-limb amputations, without proper, easily accessible, and timely prosthetic interventions, PwA experience a loss of mobility and independence, lower quality of life, and decreased life expectancy.²⁻³ Providing efficacious prosthetics services is thus a necessary component of the patient care continuum for integrating PwA into society and ensuring their human right to health care and a dignified life (cf. Sustainable Development Goal 3, Convention for the Rights of Persons with Disabilities). Apart from individual health and psychosocial outcomes, prosthetic service provision

engenders further socio-economic benefits, including positive economic externalities for families and communities, health system services, and the workforce.¹

Yet, presently, prosthetics service provision is not accessible for a vast majority of the global PwA population. Although lacking definitive data, WHO approximates that only 5 to 15% of PwA have access to prostheses.¹ Barriers to access include the financial burden associated with treatment, healthcare coverage, service capacity constraints, lack of proximity to services, as well as insufficient continuity of care for patients.³⁻⁴ Even for those with prosthesis, about 50% abandon it due to poor outcomes, including discomfort and pain.³⁻⁵ Given such outcomes, it is all the more pertinent to investigate the underlying system of care for PwA and prosthetics service provision.

Research Objectives & Method

This study broadly aims to identify high-leverage policies capable of alleviating the barriers to access and reasons for abandonment across the patient journey for PwA, as well as enhancing the health and economic outcomes of prosthetics care. It employs the system dynamics method to construct a simulation model of the prosthetics care continuum for PwA, which is used for scenario analysis and policy testing. A simulation model not only enables the testing of policy options to this end, but also quantifies and visualises the outcomes for informed decision-making.

To achieve our research objective, we expect our system dynamics modelling effort:

- To represent the person-centred prosthetics care continuum for PwA age-cohort groups in a country-level system dynamics simulation model
- To identify leverage points in the system to maximise the direct and indirect outcomes of prosthetics provision (e.g., mobility, quality of life, economic value)
- To test the efficacy of alternative policy options for prosthetics provision: traditional plaster-casting vs. digital-based solutions (e.g., ProsFit and PandoPoint model)
- To identify model-based insights relevant to health-system policymakers for bolstering the social impact of prosthetics and patient-centred care

Status of Work

Presently, the research is in its conceptualisation and model-building phase. The model structure as well as quantification of variables is being constructed with reference to existing literature and secondary data sources for United Kingdom's National Health System as the base case. Moreover, the research is being conducted in collaboration with ProsFit Technologies and Toyota Mobility Foundation – who provide data and other relevant inputs for model conceptualisation and analysis.

References

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