

DEVELOPMENT AND VALIDATION OF A DECISION TOOL FOR THE SELECTION OF USED WHEELCHAIR RECOVERY OPTIONS

CLAVER DIALLO^{1,2,3}, FRANÇOIS ROUTHIER^{4,5,6}, and DAOUD AÏT-KADI^{1,2,3}

¹ Network Organization Technology Research Centre (CENTOR), Université Laval; ² Centre for Interdisciplinary Research in Rehabilitation and Social Integration (CIRRI), Université Laval and Institut de réadaptation en déficience physique de Québec (IRDQP); ³ Department of Mechanical Engineering, Université Laval; ⁴ Research Centre, Institut universitaire de gériatrie de Montréal; ⁵ Division of Physical Medicine and Rehabilitation, Department of Medicine, Dalhousie University; ⁶ Department of Assistive Devices, IRDPQ

This study presents the development and validation of a computerized decision tool, CAAMUS, designed to assist in the selection of the appropriate recovery options for used manual wheelchairs. The decision tool selects the appropriate recovery option with high consistency, less operating time, better data access and allows uniform decision-making for different users. This paper presents the selection algorithms and the reliability of the recovery options made by the decision tool in comparison with the decisions made by expert wheelchair mechanics. Results of validation-tests have shown no statistically significant difference between the two methods ($K=0.75$ and $0.025 \leq p \leq 0.920$).

Background

With healthcare costs soaring to unprecedented levels, the recovery of medical supplies has proven to provide substantial savings and higher service levels [1-3]. In the Province of Quebec (Canada), the *Régie de l'assurance-maladie du Québec* (Quebec Health Insurance Board) has reported annual savings of about 2 million CAN\$ since the launch of a mandatory end-of-life wheelchair recovery program called "Wheeled mobility assistive devices valorization", in 13 public rehabilitation centres in 2000 [2]. Valorization activities refer to repair, refurbishing, remanufacturing, cannibalizing, and recycling activities that extend wheelchairs lifecycle [1,3] and make them available to customers at affordable prices [5]. The increase in the number of wheelchairs collected or returned called for the improvement of the recovery process and the design of a decision tool to assist the mechanics of different rehabilitation centers. As recovery processes put large financial and operational costs on local and provincial budgets, recoverable product selection should be performed after careful evaluation and analysis based on adequate decision-making criteria. Furthermore, the safety and well-being of the users of the refurbished or recovered products require the evaluation and selection process to be systematic, detailed and accurate.

A research team from Université Laval and decision-makers from the Department of Assistive Devices of the *Institut de réadaptation en déficience physique de Québec* (Québec City Rehabilitation Institute [IRDQP]), with the support of the *Régie de l'assurance-maladie du Québec*, have developed a computer-based decision tool for the selection of wheelchairs recovery option. The design of this tool, named CAAMUS (*Classification Automatisée des Aides à la Mobilité USagés*), is based on the expertise of the mechanics who perform the recovery processes and on mathematical modelling to carry-out the selection task.