

Differences in function and safety between Medicare Functional Classification Level-2 and -3 transfemoral amputees and influence of prosthetic knee joint control

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Abstract—The functional differences between persons with amputation who are classified as Medicare Functional Classification Level (MFCL)-2 and -3 include the abilities to walk at various cadences and to negotiate environmental barriers outside the home. This study compared the effect of active microprocessor control and passive mechanical control of the prosthetic knee on function and safety in 17 subjects with transfemoral amputation (8 MFCL-2 and 9 MFCL-3). Assessed functional tasks included hill and stair descent, an attentional demand task, and an obstacle course. Self-reported measures included concentration, multitasking ability, and numbers of stumbles and falls. Active knee control was associated with significant improvements ($p < 0.05$) in hill and stair gait, speed (hills, obstacle course, and attentional demand task), and ability to multitask while walking for both cohorts. MFCL-2 subjects also reported a significant reduction ($p < 0.01$) in uncontrolled falls. Over the study, 50% of MFCL-2 subjects and 33% of MFCL-3 subjects transitioned to a higher MFCL. Results suggest that active knee control improves function and reduces the frequency of adverse events in a population that is at risk for falls. Use of active knee control may allow persons with amputation to expand their functional domain, transition to a higher MFCL, and access additional prosthetic options.

Conclusions

This study examined the influence of active and passive knee control on the function and safety of persons with transfemoral amputation who were classified as MFCL-2 and MFCL-3. Both the MFCL-2 and MFCL-3 cohorts showed significant improvements in negotiating environmental obstacles (i.e., walking down inclines, walking downstairs, and walking over uneven terrain) while using the active-control knee as compared with the passive-control knee. Active control of the prosthetic knee also resulted in significantly fewer UC falls (MFCL-2 cohort). These benefits provided by active control of the knee allowed 50 percent of MFCL-2 subjects and 33 percent of MFCL-3 subjects to transition to a higher activity level by the end of the study. Such a transition indicates that advanced technology, typically reserved for the most active subjects, equally benefits less active subjects and may address the functional limitations that prevent them from reaching higher levels of activity. Furthermore, the reduction in adverse events obtained with active knee control may lead to fewer injuries and lowered long-term medical costs in a population that is at-risk for falls and injury.

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