INTRODUCTION
Benefits of microprocessor-controlled prosthetic knees (MPK) in terms of significant reduction in stumbles and falls as well as significant improvements in function and mobility have been well established in the Medicare Functional Classification Level (MFCL) - 3 and 4 amputee populations (e.g. 1). Little is known, however, whether lower functioning transfemoral amputees might also benefit from using MPKs. This systematic review was conducted to analyze the scientific literature for proven effects of the use of MPKs in the MFCL-2 amputee population.

METHOD
The Medline and EMBASE databases as well as the online library of the Journal of Prosthetics and Orthotics were searched. Methodological quality of studies was evaluated using the criteria of a Cochrane Review by Hofstad et al. (2). Internal validity and degree of bias were assessed using the SIGN 50 assessment forms.

RESULTS
Literature search revealed five clinical trials with a total of 57 unilateral transfemoral MFCL-2 amputees. Methodological quality was rated moderate in three papers and low in two studies. Risk of bias was found to be moderate in all five studies.

Safety outcomes demonstrated a significant reduction in the number (up to 80%) and frequency of falls as well as significant improvements in parameters indicating the risk of falling, such as the Timed up and go test (TUG, 28%) and the Activities-specific balance confidence scale (ABC, 26%), when using a MPK as compared to mechanical knees.

Functional and mobility outcomes showed significant improvements in gait speed, walking on uneven terrain and obstacle course, ramp/downhill and stair mobility. About 50% of MFCL-2 subjects were able to improve overall mobility to MFCL-3. Performance times and perceived difficulty to complete different groups of activities of daily living (ADL) revealed significant improvements when using a MPK. About 90% of MFCL-2 amputees preferred a MPK over a mechanical prosthetic knee.

DISCUSSION
Falls and fear of falling are important issues related to prosthesis use that may indicate a decline in function. This review found that safety related outcomes of the use of a hydraulic MPK in the MFCL-2 population improved significantly and are comparable to those for higher functioning amputees (e.g. 1). Hydraulic MPKs may therefore be considered a relevant option to reduce falling associated with prosthesis use in MFCL-2 amputees.

By definition, MFCL-2 amputees are not believed to have the physical ability or potential to perform common outdoor activities that are typical for MFCL-3 individuals. The studies analyzed in the present systematic review have clearly demonstrated that MFCL-2 amputees may take advantage of improved function, namely in activities requiring prosthetic knee flexion during weight bearing that are actually typical for MFCL-3, by using a MPK.

CONCLUSION
Improved safety, function, and mobility eventually results in improved satisfaction of MFCL-2 amputees with high preference for a hydraulic MPK. However, these results are based on a limited number of studies and amputees. Despite the fact that further research with bigger study samples is warranted, trial fittings with hydraulic MPKs in the MFCL-2 amputee population may be considered appropriate to evaluate individual patient benefits.

CLINICAL APPLICATIONS
The results of this systematic review suggest that hydraulic MPKs may also be considered in medium to high MFCL-2 transfemoral amputees.

REFERENCES