

The influence of walking aids on the recovery of gait function and balance following stroke

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Valorization

The long-term impact of walking aids on muscle activity, gait and balance has been sparsely investigated. This thesis used diverse study designs in different patient groups including an experimental, prospective study design in stroke patients, to generate new knowledge regarding the impact of various walking aids on muscle activity, gait and balance recovery. In addition to the clinical aspects of these investigations already discussed in earlier chapters, this valorization will consider the economic and societal relevance of the findings in this thesis as well as innovations made.

INNOVATION

Walking aids including canes and rollators are prescribed during the rehabilitation of many patient groups although clear evidence regarding the long-term impact of walking aid use is often lacking. In this thesis, cross-sectional and prospective designs were used to investigate these effects with an emphasis on post-stroke gait and balance recovery.

Epidemiological studies indicate that two thirds of people with a stroke will use a cane. [1] This intervention is supported by Clinical Practice Guidelines which recommend the use of canes following cardiovascular insult to improve balance, stability and function. [2] Despite this, physiotherapists are often reluctant to provide canes or rollators to patients, particularly during the acute and sub-acute phases, believing that usage impedes the recovery of balance and independent walking. This was evident during the recruitment phase of the Randomized Control Trial (RCT) in this thesis (see protocol Chapter 7). Many therapists advised their patients against trial participation due to the possibility of being randomized to a cane group.

These facts indicate a discrepancy between evidence based recommendations and actual clinical practice. It appears that many therapists consider current evidence to be lacking and prefer to work on the basis of clinical experience. This may reflect the fact that current research consists of cross-sectional and observational study results and lacks experimental prospective data.

Robust research results are often difficult to collect during many forms of rehabilitation including post-stroke, due to the high incidence of co-morbidities, the wide spectrum of presenting signs and symptoms and the consequent necessity of a variety of treatments and interventions. Using traditional research methods, particularly RCTs, these points lead either to high contamination and poor internal validity, or in an attempt to address these issues, to a narrow non-representative subject sample. Our replicated single case study attempted to address these challenges by incorporating several innovative steps into the conceptualization and implementation of study methods.

Firstly, hypotheses were generated based not only on clinical experience but also through the consideration of current neuroscientific knowledge. This concrete application of a “bench to bedside” approach, in which facts from academic neuroscience were

incorporated into the testing of treatments on the clinical frontline, is an aspect of research which has been identified by task-forces as desirable but is often lacking. [3] Secondly the study design - a replicated single case study - was implemented based on our reflections following recruitment difficulties during the initial RCT with acute patients (see protocol Chapter 7) and due to discussions in the literature regarding optimal designs for rehabilitation research. [4, 5]

The results of our study indicate experimentally, for the first time, that cane use following stroke does indeed impede balance and gait recovery, as suspected by many clinical therapists, and in contrast to cross-sectional design results and guideline recommendations. For the first time, to our knowledge, this thesis recommends an alternative to cane use. Although the actual product tested was “TheraTogs”, the principles developed in our work that walking aids should not require hand use, should not artificially increase the base of support and should not reduce muscle activity during walking, as canes do, could be used to develop further varieties of walking aid.

Our study also indicates that these factors are relevant not only for acute and sub-acute patients but also for chronic stroke patients. This is in contrast to studies which indicate that most functional recovery stops between 8 [6] and 20 [7] weeks post-stroke.

SOCIETAL AND ECONOMIC RELEVANCE

The need for cost effective, evidence based treatments in stroke rehabilitation is clear considering the Global Burden of Disease post stroke. A Global Burden of Stroke Study estimated that stroke survivors worldwide number 33 million. Disability Adjusted Life Years (DALYs) lost due to stroke was estimated to be 102 million in 2010, [8] and 80% of all stroke survivors live in low and middle income economies which struggle to provide rehabilitative care. [9] Economic pressures for health rationing in developed countries also means that effective, non-expensive interventions are gaining in importance.[10]

This thesis has delivered novel, clinically important evidence which may result in improved gait and balance and consequently improved functional independence. Our recommendation that walking aids should not require hand use, has the secondary effect that patients are able to implement the non-hemiplegic hand for functional tasks and not simply to hold aids. Both of these points could help to reduce the burden of health care costs for stroke survivors. The intervention itself, whilst initially requiring more capital outlay than walking aids such as canes or rollators, is cheaper than many newly developed technologies for gait rehabilitation such as robotics or virtual reality.

TARGET GROUP

The studies in this thesis indicate that an objective, evidence based prescription and use of walking aids is important in many patient groups including those undergoing accelerated rehabilitation following orthopedic rehabilitation and in stroke survivors.

As we showed that walking aid use can influence gait and balance in chronic stroke patients, it is likely that these effects are also relevant for acute and sub-acute patients. As neuroplastic and neuromuscular changes are not so clearly established in these patients, it is likely that change would be easier to generate. However, this point remains to be established in further studies. It is clear that these results are relevant for large groups of gait impaired individuals.

TRANSFER OF KNOWLEDGE

Studies have shown that many barriers exist to the implementation of new evidence into clinical practice. [11] Although attitudes to Evidence Based Practice (EBP) are generally positive, the perception exists that research can be distanced from the “real world” and is therefore often difficult to apply.[12-14] Too little time to search and appraise research findings has consistently been identified by practitioners as the main barrier to EBP. [12, 15, 16]

The difficulties of investigating clinically relevant and practically applicable interventions have been partially overcome in this thesis through the use of a real-world study design. Recruited patients were representative of chronic, cane using stroke patients and were not excluded on the basis of strict selection criteria in an attempt to maintain internal validity. It is interesting that the results appear to support the assumptions of many therapists based on clinical experience. The clinical relevance and practicability of these results may assist the willingness of clinicians to implement these new interventions.

As inadequate research and appraisal time and skills of individual studies are often cited by clinicians as a reason for not being aware of recent research, evidence appearing in guidelines or other forms of user-friendly evidence summaries is more likely to be accessed and transferred into clinical practice. It will be important to ensure that the results of our studies, and the results of other observational prospective studies indicating similar findings [17-19] are incorporated into practice guidelines. The current recommendations that cane and rollator use is primarily positive post-stroke, should be updated. Additional forms of evidence summaries, such as those produced by the Joanna Briggs Institute could also be generated to assist the transfer of these important research findings into practice. [20]

CONCLUSION

The need for cost-effective and practicable interventions to improve functional independence following stroke continues to grow as the population ages and stroke incidence increases in low and middle income countries. The results of the studies in this thesis help to provide these requirements. We have shown that an inexpensive small change to a treatment regime, which does not require large amounts of therapist input, can significantly improve aspects of gait and balance as well as freeing hands for functional tasks in large numbers of patients. This improvement may increase functional independence thus reducing care costs.

The dissemination of this knowledge through the incorporation into guidelines and evidence summaries will be an important step to facilitate knowledge transfer into clinical practice.

Further studies to identify which patient sub-groups may benefit from these interventions as well as to evaluate the influence on acute and sub-acute stroke patients are necessary.

The principles identified in this thesis for optimal walking aid support could be applied to further develop and innovate assistive walking devices.

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