Economic Evaluation of Multidisciplinary Rehabilitation Following Hip Fracture

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Bachelor of Science (Honours)

A thesis submitted in fulfilment of the requirements for the Degree of Doctor of Philosophy

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Flinders University

March 2014
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SUMMARY

Hip fracture is a major contributor to morbidity and mortality in Australia and worldwide. In addition, healthcare spending for individuals spikes following a hip fracture due to increased needs for medical and supportive care. Many patients with hip fractures are malnourished upon admission to hospital, which impacts upon the recovery and rehabilitation potential of patients, and is also a significant independent predictor of increases in healthcare costs. There is increasing scrutiny on healthcare spending and a need for approaches which demonstrate a return on investment. Therefore, finding effective strategies to improve recovery following a hip fracture is important. However rehabilitation following hip fracture is an expensive complex intervention involving multiple components (e.g. medical, nursing, and allied health interventions). Health economics has received increasing focus over the past decades as a way of evaluating not only the benefits from healthcare interventions but also their ‘value for money’. The focus of this thesis was to apply a range of methods of economic evaluation to rehabilitation following hip fracture, especially focusing on nutrition and exercise therapy. The intent was to demonstrate the strengths and potential weaknesses of various approaches.

Initially, a systematic review of the literature for economic evaluations of nutrition interventions for treatment or prevention of malnutrition was conducted (Chapter 2). Malnutrition is known to be common among patients with hip fractures, and therefore effective treatment strategies are useful in multidisciplinary rehabilitation
strategies. Only 20 articles meeting the selection criteria were identified (with an intervention increasing protein and energy intake via the oral route). Studied interventions included the provision of fortified diets but most used commercial Oral Nutritional Supplements (ONS). Seven studies included a multidisciplinary intervention with malnutrition screening and assessment, physical activity interventions, or consultations from other health professionals. The systematic review identified that there were only few high quality cost-utility studies (the preferred method of economic evaluation for regulatory bodies in Australia and around the world), but three indicated likely cost-effectiveness of their interventions in populations of hospitalised and community dwelling adults. While there is promising initial evidence for the cost-effectiveness of nutritional strategies in treating and preventing malnutrition, further studies utilizing preferred methods of economic evaluation are needed to provide more rigorous evidence to inform decision makers, especially in populations of frail older adults.

To add to the evidence for providing nutrition therapy in frail, older adults at risk of malnutrition, an economic evaluation was undertaken of a multidisciplinary rehabilitation strategy including an individualised program of nutrition and exercise therapy provided for six months following a hip fracture (Chapter 3). The study followed a cost-utility methodology, and therefore quality adjusted life years (QALY) were used to assess the benefits of the intervention. The incremental cost effectiveness ratio (ICER) calculated was $AUD28,350 which although large was below the implied cost effectiveness ratio of $50,000 for Australia. Therefore, it is
likely that this intervention of multidisciplinary rehabilitation would be considered cost-effective in Australia.

In addition to applying economic evaluation methods to healthcare interventions, this thesis also looked further into methodological issues surrounding cost-utility studies as they are applied to multidisciplinary rehabilitation strategies in frail older adults, namely the measurement of quality of life for calculation of QALY gain. A subsequent study applied two different instruments for measuring quality of life and QALY to a population of older adults following hip fracture to compare their performance (Chapter 4). It was found that the ICECAP-O, a relatively new instrument designed specifically for use in older adults, was highly correlated ($r=0.529, \ p=0.000$) with the EQ-5D-3L, a traditional instrument used worldwide for the measurement of quality of life. However, there were some systematic differences between the two instruments with the mean utility score generated from the ICECAP-O almost 0.01 higher than the score generated from the EQ-5D-3L, and this reached statistical significance ($z=-3.613 \ p=0.000$). Further work is needed to compare the performance of the new ICECAP-O instrument against more traditional instruments, especially overtime and in the generation of benefits for use in cost-utility studies.

In a final study (Chapter 5), patients’ preferences for different configurations of rehabilitation programs were elicited utilising an economic technique known as a discrete choice experiment (DCE). In this study, patients were averse to rehabilitation programs involving very high levels of therapy and severe levels of pain, but not to lower levels of therapy and moderate levels of pain. The mobility
outcome achieved from rehabilitation therapy following a hip fracture was found to be the most important determinant of rehabilitation program preference, in our sample of frail older adults. Importantly included in this study were two groups usually excluded from studies of this nature, those with cognitive impairment and from a nursing home. The study also highlighted the ability of discrete choice experiment techniques to be used to elicit preferences of frail older adults for multidisciplinary rehabilitation interventions.

In summary this thesis has identified that a number of economic methods can be successfully applied to the evaluation of rehabilitation approaches in older adults, and it is recommended that methods of economic analysis should be more widely applied to evaluate nutritional and rehabilitation strategies in the future to improve the evidence-base for practice in this area.
LIST OF PUBLICATIONS AND ABSTRACTS ARISING FROM THIS THESIS

Publications


Conference Presentations


Milte R, Crotty M, Miller M, Whitehead C, & Ratcliffe J 2013, ‘Quality of life in
older adults following a hip fracture: an empirical comparison of the ICECAP-O and
the EQ-5D instruments’, Top 15 Poster Oral Presentations, 2nd Fragility Fracture
Network Global Congress, 29-31 August, Berlin, Germany.

and energy supplementation: Where is the evidence?’, 16th International Congress of
Dietetics 5 - 8 September, Sydney, Australia.

interventions in older adults’, Australasian Society of Parenteral and Enteral
Nutrition 38th Annual Scientific Meeting 17-19 October, Adelaide, Australia.

overload? An exploration of the potential impact of cognitive functioning in discrete
choice experiments with older people in health care’, 34th Australian Conference of
Health Economists 27-28th September, Darwin, Australia.

**Conference Posters**

Milte R, Miller, M, Crotty, M, Cameron, I, Whitehead, C, Kurrle, S, Mackintosh, S
Thomas, S, & Ratcliffe, J 2013, ‘Economic evaluation of an individualised nutrition
and exercise program for rehabilitation following hip fracture’, 2nd Fragility Fracture
Network Global Congress, 29-31 August, Berlin, Germany.

Milte R, Crotty M, Miller M, Whitehead C, & Ratcliffe J 2013, ‘Quality of life in
older adults following a hip fracture: an empirical comparison of the ICECAP-O and
the EQ-5D instruments’, 2\textsuperscript{nd} Fragility Fracture Network Global Congress, 29-31 August, Berlin, Germany.

DECLARATION

I certify that this thesis does not incorporate without acknowledgement any material previously submitted for a degree or diploma in any university, and that to the best of my knowledge and belief it does not contain any material previously published or written by another person except where due reference is made in the text.

When I commenced my candidature, the INTERACTIVE randomised controlled trial had been designed and commenced collecting data. I was involved in the recruitment of participants, baseline assessments and administering the nutritional intervention and control visits to the participants for the remaining duration of trial in conjunction with the other staff working on the trial. Six month outcome assessments were conducted by outcome assessors to maintain their blinded nature. I conducted the analysis of the economic and quality of life data collected for the trial. I was also involved in the recruitment of participants, outcome assessments, and administration of the nutritional intervention for the ATLANTIC trial, and used quality of life data from this trial as part of the cost-utility study contained in this thesis.

For the discrete choice experiment and quality of life studies reported I conducted the recruitment of participants, and administered the questionnaires with the assistance of one other staff member. Design of the discrete choice experiment was conducted prior to my candidature commencing.
While both nutrition and exercise therapy will be considered in reference to multidisciplinary rehabilitation strategies, special focus will be given to the impact of nutrition as it is within the expertise of my discipline.

Rachel Milte

March 2014
ACKNOWLEDGEMENTS

Thank you very much to the patients and their families who participated in the studies included within this thesis. They gave up their time to participate, often in periods of ill-health for themselves or family members. They also were kind enough to allow us to not only visit them while they were in hospital, but for up to six months after they had been discharged to the community. Therefore, their ongoing participation in the projects was most appreciated.

Thank you to the staff members of the Nutrition and Dietetics and Rehabilitation, Aged, and Extended Care of Flinders University. Special thanks goes to the staff who worked on the INTERACTIVE trial who were extremely supportive and hardworking over the four years the INTERACTIVE trial was collecting data.

Thank you to my friends and family who have supported me during my candidature. Special thanks to my sister Catherine and my parents Sue and Peter who have assisted me in my candidature and assisted me with reading drafts. Thank you to my husband Damian who provided much emotional and practical support over my candidature.

Finally, a very big thank you to my three supervisors. Thank you for providing the opportunity to work on these unique and interesting projects, and for providing much guidance throughout my candidature. You have all been very generous with your time and knowledge, and I have benefited much from your experience.
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<tr>
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<th>Description</th>
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<tbody>
<tr>
<td>AQOL</td>
<td>Assessment of quality of life instrument</td>
</tr>
<tr>
<td>AUD</td>
<td>Australian dollars</td>
</tr>
<tr>
<td>BMD</td>
<td>Bone mineral density</td>
</tr>
<tr>
<td>BMI</td>
<td>Body mass index</td>
</tr>
<tr>
<td>CAD</td>
<td>Canadian dollars</td>
</tr>
<tr>
<td>CBA</td>
<td>Cost benefit analysis</td>
</tr>
<tr>
<td>CCA</td>
<td>Cost consequences analysis</td>
</tr>
<tr>
<td>CEA</td>
<td>Cost effectiveness analysis</td>
</tr>
<tr>
<td>CI</td>
<td>Confidence intervals</td>
</tr>
<tr>
<td>CMA</td>
<td>Cost minimisation analysis</td>
</tr>
<tr>
<td>COPD</td>
<td>Chronic obstructive pulmonary disease</td>
</tr>
<tr>
<td>CUA</td>
<td>Cost utility analysis</td>
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<tr>
<td>DCE</td>
<td>Discrete choice experiment</td>
</tr>
<tr>
<td>DOHA</td>
<td>Department of Health and Ageing</td>
</tr>
<tr>
<td>DRG</td>
<td>Diagnostic related group</td>
</tr>
<tr>
<td>Abbreviation</td>
<td>Description</td>
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<tr>
<td>DVA</td>
<td>Department of Veterans Affairs</td>
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<tr>
<td>GI</td>
<td>Gastrointestinal</td>
</tr>
<tr>
<td>HEHP</td>
<td>High energy high protein diet</td>
</tr>
<tr>
<td>HLC</td>
<td>High level care</td>
</tr>
<tr>
<td>HRQoL</td>
<td>Health related quality of life</td>
</tr>
<tr>
<td>HUI</td>
<td>Health utilities index</td>
</tr>
<tr>
<td>ICER</td>
<td>Incremental cost effectiveness ratio</td>
</tr>
<tr>
<td>LLC</td>
<td>Low level care</td>
</tr>
<tr>
<td>LOS</td>
<td>Length of stay</td>
</tr>
<tr>
<td>MAC</td>
<td>Mid arm circumference</td>
</tr>
<tr>
<td>MAUI</td>
<td>Multi-attribute utility instrument</td>
</tr>
<tr>
<td>MNA</td>
<td>Mini nutritional assessment</td>
</tr>
<tr>
<td>NFS</td>
<td>Not further specified</td>
</tr>
<tr>
<td>NHCDC</td>
<td>National Hospital Cost Data Collection</td>
</tr>
<tr>
<td>NSW</td>
<td>New South Wales</td>
</tr>
<tr>
<td>PA</td>
<td>Physical activity</td>
</tr>
<tr>
<td>PBAC</td>
<td>Pharmaceutical Benefits Advisory Committee</td>
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<tr>
<td>Abbreviation</td>
<td>Description</td>
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<td>--------------</td>
<td>--------------------------------------</td>
</tr>
<tr>
<td>PEG</td>
<td>Percutaneous endoscopic gastrostomy</td>
</tr>
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<td>PSA</td>
<td>Probabilistic sensitivity analysis</td>
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<tr>
<td>QALY</td>
<td>Quality adjusted life year</td>
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<td>QOL</td>
<td>Quality of life</td>
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<tr>
<td>RR</td>
<td>Risk ratio</td>
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<tr>
<td>SD</td>
<td>Standard deviation</td>
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<tr>
<td>SE</td>
<td>Standard error</td>
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<tr>
<td>SGA</td>
<td>Subjective global assessment</td>
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<tr>
<td>ONS</td>
<td>Oral nutritional supplement</td>
</tr>
<tr>
<td>OR</td>
<td>Odds ratio</td>
</tr>
<tr>
<td>TCP</td>
<td>Transitional care program</td>
</tr>
<tr>
<td>TSF</td>
<td>Triceps skin fold</td>
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