

Economic Evaluation of Multidisciplinary Rehabilitation Following Hip Fracture

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TABLE OF CONTENTS

SUMMARY	6
LIST OF PUBLICATIONS AND ABSTRACTS ARISING FROM THIS THESIS	10
PUBLICATIONS	10
CONFERENCE PRESENTATIONS	10
CONFERENCE POSTERS	11
DECLARATION	13
ACKNOWLEDGEMENTS	15
LIST OF TABLES	16
LIST OF FIGURES	19
ABBREVIATIONS	21
1 INTRODUCTION AND RATIONALE FOR THESIS	24
1.1 IMPACT OF HIP FRACTURE	24
1.1.1 Incidence	24
1.1.2 Mortality	26
1.1.3 Function	27
1.1.4 Risk factors	27
1.2 IMPORTANCE OF MULTIDISCIPLINARY REHABILITATION FOLLOWING HIP FRACTURE	32
1.3 IMPORTANCE OF NUTRITION IN REHABILITATION	36
1.3.1 Impact of malnutrition	41
1.3.2 Malnutrition in hip fracture	42
1.3.3 Treatment strategies for malnutrition	48
1.4 IMPORTANCE OF EVALUATION OF HEALTHCARE INTERVENTIONS IN AN ECONOMIC FRAMEWORK	52
1.4.1 Methods of economic evaluation	52
1.4.2 Costs	56

1.5	AIMS	65
2	SYSTEMATIC REVIEW OF THE EVIDENCE FOR PROTEIN AND ENERGY SUPPLEMENTATION AS A TREATMENT STRATEGY FOR MALNUTRITION IN REHABILITATION	67
2.1	METHODS	68
2.1.1	<i>Search strategy</i>	68
2.1.2	<i>Data collection and analysis</i>	69
2.2	FINDINGS	72
2.2.1	<i>Results of the search</i>	72
2.2.2	<i>Results of studies where participants were defined as malnourished</i>	74
2.2.3	<i>Results of studies where nutritional status not specified</i>	79
2.2.4	<i>Quality assessment of published studies</i>	86
2.3	DISCUSSION	90
3	ECONOMIC EVALUATION OF A MULTIDISCIPLINARY INDIVIDUALISED NUTRITION THERAPY AND EXERCISE PROGRAM FOR HIP FRACTURE RECOVERY	96
3.1	INTRODUCTION	96
3.2	METHODS	98
3.2.1	<i>Trial participants and intervention</i>	98
3.2.2	<i>Health outcomes and resource use</i>	99
3.2.3	<i>Unit costs</i>	100
3.2.4	<i>Health related quality of life</i>	105
3.2.5	<i>Cost utility analysis</i>	105
3.3	FINDINGS	108
3.3.1	<i>Trial participants</i>	108
3.3.2	<i>Health outcomes and resource use</i>	109
3.3.3	<i>Costs</i>	111

3.3.4	<i>Health related quality of life</i>	113
3.3.5	<i>Cost utility analysis</i>	114
3.4	DISCUSSION	118
4	THE MEASUREMENT AND VALUATION OF QUALITY OF LIFE IN OLDER PEOPLE UNDERGOING REHABILITATION	128
4.1	INTRODUCTION	128
4.2	BACKGROUND	128
4.2.1	<i>Measurement of quality of life</i>	129
4.2.2	<i>Measurement of quality of life in older people</i>	133
4.2.3	<i>Use of the EQ-5D-3L in measuring quality of life</i>	134
4.2.4	<i>Use of the ICECAP-O in measuring quality of life</i>	137
4.2.5	<i>Quality of life following a hip fracture</i>	141
4.3	METHODS	144
4.3.1	<i>Study participants</i>	144
4.3.2	<i>Administration of questionnaire</i>	144
4.3.3	<i>Comparison with a general population dataset</i>	145
4.3.4	<i>Calculating utility values</i>	145
4.3.5	<i>Data analysis</i>	146
4.4	FINDINGS	147
4.4.1	<i>Study participants</i>	147
4.4.2	<i>Responses to the EQ-5D-3L and ICECAP</i>	147
4.4.3	<i>Comparison with a general population dataset</i>	163
4.5	DISCUSSION	166
5	PREFERENCES FOR REHABILITATION AFTER HIP FRACTURE	174
5.1	INTRODUCTION	174
5.2	METHODS	177
5.2.1	<i>Questionnaire design</i>	177

5.2.2	<i>Study participants</i>	178
5.2.3	<i>Administration of questionnaire</i>	179
5.2.4	<i>Data analysis</i>	179
5.3	FINDINGS	182
5.4	DISCUSSION	191
6	GENERAL DISCUSSION	196
6.1	INTRODUCTION	196
6.2	COST EFFECTIVENESS OF NUTRITION INTERVENTIONS FOR FRAIL OLDER ADULTS: ADDING TO THE EVIDENCE	196
6.3	CALCULATING UTILITIES VIA MULTI ATTRIBUTE UTILITY INSTRUMENTS: APPLYING A NEW INSTRUMENT	198
6.4	PREFERENCES FOR REHABILITATION STRATEGIES: VALUE OF OUTCOME	200
6.5	LIMITATIONS OF THE STUDY DESIGN	201
6.6	CONCLUSIONS	204
6.7	FUTURE RESEARCH DIRECTIONS	206
7	REFERENCES	209
	APPENDICIES	242
	APPENDIX 1: SEARCH STRATEGY USED FOR MEDLINE DATABASE	242
	APPENDIX 2: PATIENT INFORMATION SHEET AND CONSENT FORM FOR INTERACTIVE TRIAL	245
	APPENDIX 3: DATA COLLECTION FORMS FOR INTERACTIVE TRIAL	251
	APPENDIX 4 MINI-MENTAL EXAMINATION FORM	256
	APPENDIX 5: EXAMPLE OF DISCRETE CHOICE EXPERIMENT AND ICECAP-O AND EQ-5D DATA COLLECTION FORM	258
	APPENDIX 6: PATIENT INFORMATION SHEET AND CONSENT FORM FOR DISCRETE CHOICE EXPERIMENT AND ICECAP-O AND EQ-5D PROJECT	268
	APPENDIX 7: PERMISSIONS FOR INCLUSION OF MATERIAL FROM PUBLISHED PAPERS IN THESIS	273
	APPENDIX 8: PUBLICATIONS ARISING FROM THIS THESIS	279

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

Milte R, Ratcliffe J, Miller M, Whitehead C, Cameron ID & Crotty M 2013, 'What are frail older people prepared to endure to achieve improved mobility following hip fracture? A discrete choice experiment', *Journal of Rehabilitation Medicine*, vol. 45, no. 1, pp. 81-6.

Milte R, Ratcliffe J, Miller M, & Crotty M 2013, 'Economic evaluation for protein and energy supplementation in adults: opportunities to strengthen the evidence', *European Journal of Clinical Nutrition*, vol. 67, pp. 1243-1250.

Milte R, Ratcliffe J, Chen G, Lancsar E, Miller M, & Crotty M 2014, 'Cognitive overload? An exploration of the potential impact of cognitive functioning in discrete choice experiments with older people in health care', *Value in Health*, vol. 17, no. 5, pp.655-9.

Conference Presentations

Milte R, Crotty M, Miller M, Flynn T, Norman R, & Ratcliffe J 2014, 'Quality of life of frail older people following hip fracture. An empirical comparison of the ICECAP-O and EQ-5D 3L', 3rd ICECAP users' workshop 27th February, Birmingham, UK.

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.

Milte R, Ratcliffe J, Miller M, & Crotty M 2012, 'Economic evaluations for protein and energy supplementation: Where is the evidence?', 16th International Congress of Dietetics 5 - 8 September, Sydney, Australia.

Milte R, Ratcliffe J, Miller M, & Crotty M 2012, 'Cost effectiveness for nutritional interventions in older adults', Australasian Society of Parenteral and Enteral Nutrition 38th Annual Scientific Meeting 17-19 October, Adelaide, Australia

Milte R, Chen G, Lancsar E, Miller M, Crotty M, & Ratcliffe J 2012, 'Cognitive 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', 2nd Fragility Fracture Network Global Congress, 29-31 August, Berlin, Germany.

Ratcliffe J, Milte R, Crotty M, Cameron I, Miller M & Whitehead C 2010, 'What are frail older people prepared to endure to achieve improved mobility following a hip fracture? A discrete choice experiment'. Australian & New Zealand Society for Geriatric Medicine Annual Scientific Meeting. 5-7 May, Coolumb, Australia.

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

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LIST OF TABLES

Table 1.1 Factors influencing hip fracture risk (Adapted from Marks 2010)	28
Table 1.2 Factors associated with risk of malnutrition in older adults.....	39
Table 1.3 Prevalence of malnutrition in patients with hip fractures	45
Table 1.4 Accepted forms of economic evaluation.....	55
Table 1.5 Studies estimating the medical costs associated with hip fracture.....	61
Table 1.6 Studies estimating the cost of hip fracture including rehabilitation.....	63
Table 1.7 Studies estimating the cost of hip fracture including social and community care costs	64
Table 2.1 Drummond criteria for assessing quality of economic literature	71
Table 2.2 Design and cost outcomes of included studies when participants defined as malnourished	77
Table 2.3 Design and cost outcomes of included studies where nutritional status not specified.....	82
Table 3.1 Unit costs for healthcare resources utilized.....	104
Table 3.2 Characteristics of participants included in INTERACTIVE.....	108
Table 3.3 Mean utilizations of healthcare resources for the intervention and control groups over six months.....	110
Table 3.4 Number of participants in the intervention and the control groups who used healthcare services during the six months	111
Table 3.5 Overview of the mean costs for control and intervention group over six months (\$AUD).....	112

Table 3.6 Utility of the intervention and control groups using AQL over six months	114
Table 3.7 Cost effectiveness of intervention group over the control group for rehabilitation following hip fracture over six months	114
Table 4.1 Population norms for EQ-5D-3L utility values.....	135
Table 4.2 EQ-5D-3L utility values in studies targeting older people and nursing home residents.....	137
Table 4.3 Population norm values for the ICECAP-O.....	140
Table 4.4 Studies measuring quality of life in patients after surgery for hip fracture	142
Table 4.5 Demographic characteristics of the sample (n=87).....	147
Table 4.6 Distribution of responses to EQ-5D-3L items by all participants (n=87) and selected subgroups.....	148
Table 4.7 Distribution of responses to ICECAP-O items by all participants and selected subgroups.....	152
Table 4.8 Utility values calculated from EQ-5D-3L and ICECAP for all patients with hip fractures, and selected subgroups.....	158
Table 4.9 Correlations between participant characteristics and ICECAP and EQ-5D- 3L score measured by Pearson correlation or Spearman Rho.....	160
Table 4.10 Paired comparison of the ICECAP-O and EQ-5D-3L utilities	160
Table 4.11 Association between ICECAP-O score and sample characteristics as measured by Kruskal Wallis or Mann-Whitney U Test.....	161
Table 5.1 Responses to attitudinal questions for total sample and by subgroup: living in residential care vs the community prior to fracture.....	184

Table 5.2 Conditional logit model results (total sample). Data shown as Coefficients with 95% confidence intervals	185
Table 5.3 Results of conditional logit model for subgroups based on living in the community or in residential care	189
Table 5.4 Marginal rates of substitution using risk of falls and duration of effort as value attributes	190

LIST OF FIGURES

Figure 2.1 Flow diagram showing study selection process.....	73
Figure 2.2 Number of studies meeting the Drummond criteria for the design of the studies	86
Figure 2.3 Number of studies meeting the Drummond criteria for data collection ...	87
Figure 2.4 Number of studies meeting the Drummond criteria for analysis and interpretation of data	88
Figure 2.5 Comparison of the number of Drummond criteria met and year of study publication	89
Figure 3.1 Levels of precision in hospital costing.....	100
Figure 3.2 Cost effectiveness plane for the difference in quality adjusted life years	115
Figure 3.3 Cost effectiveness acceptability curve for difference in quality adjusted life years	117
Figure 4.1 The EuroQol descriptive dimensions.....	130
Figure 4.2 The ICECAP-O attributes	139
Figure 4.3 Scatter plot comparison of the ICECAP-O and EQ-5D-3L utilities.....	159
Figure 4.4 Bland-Altman plot of differences in ICECAP-O and EQ-5D-3L utilities.	162
Figure 4.5 Comparison of the utility values for the ICECAP-O for the general population (n=1052) and hip fracture (n=82) samples	163
Figure 4.6 Comparison of the utility values for the EQ-5D-3L for the general	

population (n=632) and hip fracture (n=82) samples	164
Figure 5.1 Number of dominant responses for each attribute	183
Figure 5.2 Proportion of dominant responses in participants from residential care.	183

ABBREVIATIONS

AQOL	Assessment of quality of life instrument
AUD	Australian dollars
BMD	Bone mineral density
BMI	Body mass index
CAD	Canadian dollars
CBA	Cost benefit analysis
CCA	Cost consequences analysis
CEA	Cost effectiveness analysis
CI	Confidence intervals
CMA	Cost minimisation analysis
COPD	Chronic obstructive pulmonary disease
CUA	Cost utility analysis
DCE	Discrete choice experiment
DOHA	Department of Health and Ageing
DRG	Diagnostic related group

DVA	Department of Veterans Affairs
GI	Gastrointestinal
HEHP	High energy high protein diet
HLC	High level care
HRQoL	Health related quality of life
HUI	Health utilities index
ICER	Incremental cost effectiveness ratio
LLC	Low level care
LOS	Length of stay
MAC	Mid arm circumference
MAUI	Multi-attribute utility instrument
MNA	Mini nutritional assessment
NFS	Not further specified
NHCDC	National Hospital Cost Data Collection
NSW	New South Wales
PA	Physical activity
PBAC	Pharmaceutical Benefits Advisory Committee

PEG	Percutaneous endoscopic gastrostomy
PSA	Probabilistic sensitivity analysis
QALY	Quality adjusted life year
QOL	Quality of life
RR	Risk ratio
SD	Standard deviation
SE	Standard error
SGA	Subjective global assessment
ONS	Oral nutritional supplement
OR	Odds ratio
TCP	Transitional care program
TSF	Triceps skin fold