VALUE IN HEALTH 17 (2014) 655–659

Available online at www.sciencedirect.com

ScienceDirect

journal homepage: www.elsevier.com/locate/jval

BRIEF REPORT

Cognitive Overload? An Exploration of the Potential Impact of Cognitive Functioning in Discrete Choice Experiments with Older People in Health Care

Rachel Milte, BSc (Hons)[1], *Julie Ratcliffe, PhD*[2,*], *Gang Chen, PhD*[2], *Emily Lancsar, PhD*[3], *Michelle Miller, PhD*[1], *Maria Crotty, PhD*[4]

[1]*Department of Nutrition and Dietetics, Flinders University, Adelaide, Australia;* [2]*Flinders Health Economics Group, Flinders University, Adelaide, Australia;* [3]*Centre for Health Economics, Monash University, Melbourne, Australia;* [4]*Department of Rehabilitation and Aged Care, Flinders University, Adelaide, Australia*

ABSTRACT

Objectives: This exploratory study sought to investigate the effect of cognitive functioning on the consistency of individual responses to a discrete choice experiment (DCE) study conducted exclusively with older people. **Methods:** A DCE to investigate preferences for multidisciplinary rehabilitation was administered to a consenting sample of older patients (aged 65 years and older) after surgery to repair a fractured hip (N = 84). Conditional logit, mixed logit, heteroscedastic conditional logit, and generalized multinomial logit regression models were used to analyze the DCE data and to explore the relationship between the level of cognitive functioning (specifically the absence or presence of mild cognitive impairment as assessed by the Mini-Mental State Examination) and preference and scale heterogeneity. **Results:** Both the heteroscedastic conditional logit and generalized multinomial logit models indicated that the presence of mild cognitive impairment did not have a significant effect on the consistency of responses to the DCE. **Conclusions:** This study provides important preliminary evidence relating to the effect of mild cognitive impairment on DCE responses for older people. It is important that further research be conducted in larger samples and more diverse populations to further substantiate the findings from this exploratory study and to assess the practicality and validity of the DCE approach with populations of older people.

Keywords: cognition, discrete choice experiments, older people.

Introduction

There has been an exponential increase in the number of discrete choice experiment (DCE) studies undertaken within health care during the last two decades since the first seminal article by Propper [1] to assess the disutility of time spent on National Health Service waiting lists. Despite the increase in their proliferation, however, DCE studies specifically designed for and conducted with older people remain relatively rare in comparison with those conducted and reported on with general adult samples. Given future patterns of sociodemographic change and the aging of the population, it is reasonable to expect that the development of DCE studies designed specifically for application with older people is likely to increase markedly during the coming decades. The reliability of DCE responses from older people with varying levels of cognition and the threshold level of cognitive ability required for an older person to reliably complete a DCE are therefore highly important but currently under-researched areas of investigation. This exploratory study sought to investigate this issue empirically by assessing the potential effect of cognitive functioning on DCE-generated responses from a sample of older people recovering from hip fracture. Specifically, we used mixed logit, heteroskedastic conditional logit, and generalized multinomial logit regression models to more formally investigate the potential for preference and scale heterogeneity in responses for the total sample and by subgroups classified according to the absence or existence of mild cognitive impairment.

Methods

Questionnaire Design and Administration

A DCE questionnaire was developed for administration with a population of older people recovering from surgery to repair a fractured hip. The design and administration of the DCE questionnaire are discussed in detail in a separate article [2]. The DCE comprised four salient attributes relating to rehabilitation

* *Address correspondence to:* Julie Ratcliffe, Flinders Health Economics Group, Flinders Clinical Effectiveness, Flinders University, GPO Box 2100, Adelaide, SA 5001, Australia.

E-mail: julie.ratcliffe@flinders.edu.au.

1098-3015$36.00 – see front matter

http://dx.doi.org/10.1016/j.jval.2014.05.005

therapy after hip fracture including levels of pain and effort endured, the risk of further falls and injury from participating in rehabilitation therapy, and the level of mobility achieved. Following approval by the relevant research ethics committee, participants for the DCE were recruited from two hospitals in Adelaide, South Australia, sequentially over an 18-month period between May 2009 and November 2010. Patients were approached for participation if they had been admitted to a hospital with a falls-related proximal femur fracture, were 60 years or older, and were not currently receiving palliative care.

Cognitive functioning was assessed by using the Mini-Mental State Examination (MMSE), a routinely administered brief instrument for the measurement of global cognitive function [3]. The MMSE was developed in 1975 and has since proven to be valid and reliable across various clinical, epidemiological, and community survey studies [4]. MMSE scores were categorized according to the three group categorization criteria adopted by Tombaugh and McIntyre's [4] seminal review, whereby a score of 17 or below indicates severe cognitive impairment, a score of 18 to 23 indicates mild cognitive impairment, and a score of 24 or above indicates no cognitive impairment. For patients classified with severe cognitive impairment, informed consent was sought from a proxy family member who was also asked to complete the DCE questionnaire on behalf of the patient and from the patient's perspective.

The DCE questionnaire was administered using an interviewer mode of administration, postoperatively at approximately 1 to 2 weeks after surgery to repair the fractured hip. In advance of the main study, the DCE questionnaire was piloted with a small sample of patients (N = 10) with a range of levels of cognitive function to check respondents' understanding of the questions and to indicate that they were providing meaningful responses. The findings from the pilot study indicated that patients with mild cognitive impairment (MMSE score 19–23) were able to fully complete the questionnaire and were also able to provide meaningful responses. Minor changes to question layout and phraseology were made as a consequence of the findings of the pilot study to improve participant understanding.

Data Analysis

The data from the DCE were analyzed within the framework of random utility theory, which assumes that respondents choose the alternative that maximizes their utility. Let U_{itj} be the utility individual i derives from choosing alternative j in choice scenario t. Utility is given by

$$U_{itj} = x'_{itj}\beta_i + \varepsilon_{itj}$$

where x_{itj} is a vector of observed attributes of alternative j, β_i is a vector of individual-specific coefficients reflecting the desirability of the attributes, and ε_{itj} is a stochastic term. For a traditional linear-index model (i.e., $x'_{itj}\beta_i$), the probability of respondent i choosing alternative j in choice situation t can be specified as follows:

$$\Pr(\text{choice}_{it} = j \,|\, \beta_i) = \frac{\exp(\sigma_i x'_{itj}\beta_i)}{\sum_{k=1}^{j} \exp(\sigma_i x'_{itk}\beta_i)}$$

where σ_i is an individual-specific scale of the idiosyncratic error, which is inversely proportional to the error variance. Effects coding was used for the analysis of the DCE data. Four key econometric model specifications were applied ranging in their respective levels of model sophistication: 1) the simple conditional logit (which is unable to take account of either preference or scale heterogenity); 2) the heteroskedastic conditional logit (which can take account of scale heterogeneity); 3) the mixed logit (accounting for taste or preference heterogeneity); and 4) the advanced generalized multinomial logit (G-MNL, which takes account of both preference and scale heterogeneity simultaneously) [5–9].

Within this data set, it is reasonable to hypothesize that participants in the lower cognitive functioning subgroup may make choices that are considerably less consistent (or with a larger error variance) than those in the higher cognitive functioning subgroup. A heteroscedastic conditional logit model was used to test whether error variances differed according to lower or higher cognitive functioning [6–8]. To account for taste or preference heterogeneity, a mixed logit model was used, by specifying β_i to follow a distribution of which the mean and SD are estimated [9]. Finally, the recently operationalized G-MNL model, which can accommodate both preference and scale heterogeneity in a single model, was used [10]. Information criteria are commonly used to choose the overall fit of DCE models, with the Bayesian information criterion being increasingly used as the preferred measure [11]. All econometric analyses were conducted in Stata version 12.1 (StataCorp LP, College Station, TX), using clogit, clogithet [12], mixlogit [13], and gmnl [14] commands.

Comparisons between choice models that have been generated from two groups of respondents need to take account of differences in unobserved variability (i.e., scale) between the data sources [15]. For example, a comparison between a sample of patients with higher levels of cognitive functioning and a sample of patients with lower levels of cognitive functioning, as seen in this study, would need to take account of scale differences. The Swait and Louviere test was used to formally test for such differences across the two subsamples [16].

Results

A total of 149 patients who had recently undergone surgery to repair a hip fracture were approached, of whom 87 (58%) consented to participate in the study and 84 (56%) fully completed all the DCE questions (74 patients and 10 proxy family members). Table 1 presents a summary of characteristics of the participants. For the self-completing participants, the majority (n = 52, 70%) were women and the mean age was 80 years. While a small proportion (n = 10, 14%) were living in residential care before fracture, the vast majority were living independently in the community before admission (n = 64, 86%). The majority of self-completing participants (68%) were classified with normal cognitive function and were born in Australia (73%). In addition, the vast majority (84%) indicated that they found the DCE task either "not" or "slightly" difficult to complete and all 84 participants (100%) passed the test of internal consistency.

The results from the conditional logit regression model based on the total sample (including proxy respondents), on the self-reporting sample (excluding proxy respondents), and on self-reporting subsamples partitioned according to cognitive functioning (higher cognitive functioning and lower cognitive functioning) are presented in Table 2. Column 1, comprising the total sample, indicates that participants exhibited statistically significant positive preferences for the lowest risk of future falls (25%) and for improvements in mobility (walking with a frame with one person close-by and walking with a stick independently without help) and statistically significant negative preferences for the highest level of pain during rehabilitation (severe pain) and the longest duration of rehabilitation intervention (2 hours per day for 2 months). It can be seen from column 2 that results for the self-reporting sample (excluding proxy respondents) are very similar to results for the total sample. Columns 3 and 4 in Table 2 present results from the self-reporting subsamples partitioned according to cognitive functioning. For respondents without cognitive impairment (i.e., MMSE score $\geq$24), the conditional logit estimates