J Rehabil Med 2011; 43: 354–358

ORIGINAL REPORT

EARLY REHABILITATION MANAGEMENT AFTER STROKE: WHAT DO STROKE PATIENTS PREFER?

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Background: **Stroke rehabilitation is moving towards more intense therapy models that incorporate technologies such as robotics and computer games. It is unclear how acceptable these changes will be to stroke survivors, as little is known about which aspects of rehabilitation programmes are currently valued. Discrete choice experiments are a potential approach to assessing patient preferences, as they reveal the characteristics of programmes that are most important to consumers.**

Methods: **A discrete choice experiment was presented as a face-to-face interview to assess the priorities and preferences of stroke survivors ($n = 50$, mean age 72 years) for alternative rehabilitation service configurations. The discrete choice experiment was presented to the participants while they were on the stroke rehabilitation ward (approximately 3–4 weeks following stroke).**

Results: **Participants were highly focused on recovery and expressed strong preferences for therapy delivered one-to-one, but they did not favour very high intensity programmes (6 hours per day). While the attitudinal statements indicated high levels of agreement for programmes to incorporate the latest technology, the results from the discrete choice experiment indicated that participants were averse to computer-delivered therapy.**

Conclusion: **Whilst rehabilitation therapy is highly valued, stroke survivors exhibited stronger preferences for low-intensity programmes and rest periods. High-intensity therapy protocols or approaches dependent on new technologies will require careful introduction to achieve uptake and acceptability.**

Key words: patient preference; stroke; rehabilitation programme.

J Rehabil Med 2011; 43: 354–358

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Submitted August 29, 2010; accepted December 14, 2010

INTRODUCTION

Multidisciplinary rehabilitation improves functional outcomes and quality of life for people after stroke (1, 2); however, it is resource-intensive and thus expensive. Recent evidence suggests that increasing the intensity of therapy is associated with improved motor task performance (3) and the resource implications have led to an interest in robotics and virtual reality as a strategy for delivering augmented doses (4, 5). Most stroke survivors are elderly, and at this stage it is not clear how acceptable a shift towards a more technological approach, with increased intensity, will be to consumers. While involvement of consumers in planning and developing services is recognized as being important (6, 7), and there is evidence to suggest that effective consumer engagement results in more accessible and acceptable services, in practice the inclusion of consumer views' prior to changes in programme configurations rarely occurs (8).

Information about the attributes or characteristics of rehabilitation programmes that are valued by stroke survivors themselves is currently lacking and it is unclear what patients really want (9). While interviews and focus groups provide rich data, participants may not reveal their true feelings or may provide responses that are socially desirable (10, 11). Interviews are often conducted after the rehabilitation programme finishes and are subject to recall bias (12). Patient satisfaction surveys are commonly used (13, 14), but have been criticized for their lack of a conceptual base (15). Most importantly, although patients may report dissatisfaction with a particular service characteristic, it may not be a service characteristic that they would choose to improve if additional resources became available. Respondents in the aforementioned studies were not forced to make choices within a framework of resource constraints where their priorities could be assessed. Therefore, while patients in these studies have requested more information, more therapy and more counselling services, there is little indication as to which of these characteristics or attributes are most important to them, or the relative weight attached to each attribute, as guidance for the allocation of scarce health resources.

Discrete choice experiments (DCEs) (also referred to as conjoint analysis) are an increasingly popular tool that can be used to elicit patients' preferences for a good or service. Originating in the field of market research (16), DCEs are now increasingly being applied to help inform healthcare decision-making (17). DCEs provide information about which characteristics of services or programmes are most important to consumers, the trade-offs that consumers are prepared to make between these

characteristics, and the relative importance of these characteristics (18). DCEs are typically administered through surveys, which are made up of a series of choices of alternative service configurations based upon changing levels of the attributes presented. To our knowledge this is the first study internationally to apply DCE methodology with recent survivors of stroke.

The objective of this study was to apply DCE methods to determine stroke survivors' preferences for the delivery of alternative configurations of rehabilitation therapy services within the first few weeks of rehabilitation.

METHODS

Establishing the attributes and their levels

Characteristics of stroke rehabilitation that were likely to be important to patients, and that were capable of being directly influenced by policy makers, were identified based on a review of the literature. Firstly, international (19, 20), national (21) and South Australian (22) stroke care guidelines were reviewed to ensure that issues relevant to policy makers were considered. Secondly, a search of electronic databases using Medical Subject Headings (MeSH) including "patient preference" and "patient satisfaction" was undertaken to identify qualitative and quantitative studies that had previously explored stroke survivors' perceptions of rehabilitation programmes. Subsequently, a series of face-to-face qualitative interviews ($n = 10$) were conducted with a group of patients participating in subacute rehabilitation. Characteristics identified from the literature and confirmed by patients to be important and realistic were then developed into 4 attributes with 3 levels each. A fifth attribute, "cost", was also included to allow estimation of the monetary value or willingness to pay assigned to alternative levels of each of the characteristics presented. The design of the DCE was restricted to 5 attributes as previous evidence and our own pilot study findings confirmed that a larger attribute set would be too cognitively demanding for the majority of the participants (23). The 5 attributes and associated levels included in the DCE are presented in Table I. A small pilot study was conducted with a separate group of patients ($n = 5$) participating in rehabilitation to ensure that the questions were understandable and that levels were capable of being traded.

Producing scenarios

Three levels for each of the 5 attributes results in 243 possible scenarios ($= 3^5$). We used a fractional factorial design and the techniques described in Burgess & Street (24) to reduce this to a more practical 18 binary choice sets, which are 100% efficient for the estimation of main effects. This design was divided into 3 versions, each containing 6 of the choice sets. Therefore, 6 binary choice sets were presented and participants stated which rehabilitation programme they preferred. As patients were all receiving rehabilitation and were interviewed at rehabilitation locations, a "forced" choice experiment was appropriate. An example of a choice question is presented in Table II.

Table I. *Attributes and levels used in the discrete choice experiment (DCE)*

Attribute	Levels
Mode of therapy	Group therapy Individual therapy Computer therapy
Dose of therapy	30 min per day 3 h per day 6 h per day
Team providing therapy	Community based doctor and physiotherapist visiting Same specialist therapy team from admission to discharge Different specialist team for each phase
Amount of recovery made	70% recovery 80% recovery 90% recovery
Cost of therapy programme	No cost 50 AUD per week 100 AUD per week

Administering the questionnaire

Participants were recruited from 3 hospitals in Adelaide, South Australia: the Repatriation General Hospital, Griffiths Rehabilitation Hospital, and St Margaret's Rehabilitation Hospital. The study was approved by their associated institutional review committees. Patients were approached sequentially between October 2009 and January 2010 after referral to the research team by a key contact staff member at each hospital. Inclusion criteria were diagnosis of stroke, adequate communication to complete the questionnaire as determined in consultation with the treating team (including a speech pathologist), and absence of cognitive impairment (participants needed a Mini-Mental State Examination (MMSE) (25) score of $\geq 24/30$). All patients who gave informed consent to participate took part in a face-to-face interview with the same study researcher (KL) who administered the questionnaire in an interview-style format. The interviews were completed on the rehabilitation ward, approximately 2 weeks into the participant's rehabilitation programme. As patients in the sample were typically transferred to the rehabilitation ward approximately 1–2 weeks following a stroke, this meant that participants completed the questionnaire approximately 3–4 weeks following the stroke.

The questionnaire was presented in 3 sections; the first section consisted of a series of attitudinal statements, which were related to the attributes of the DCE. The statements were followed by a 6-point Likert scale with response options ranging from strongly agree to strongly disagree. The second section consisted of the DCE. The interviewer introduced this section by explaining to the patient the concept of the DCE (that is, that it involves making hypothetical choices between two different programmes, and that it reveals the sorts of rehabilitation programmes that are most preferred by patients). A warm-up task was completed initially to familiarize the participant with DCE questions. This involved an everyday-choice scenario in which the participant was asked to choose between two restaurants for dinner (in which the restaurants varied in proximity, cost, portion sizes and variety on the menu). Following the warm-up task, the attributes and levels relating to the choice of rehabilitation programme were described to each participant. The 6 choice sets comparing hypothetical rehabilitation programmes (1 and 2) were then presented sequentially, and each participant indicated which rehabilitation programme they preferred for each choice (an example of one of the choice sets included in the DCE is provided in Table II).

The third section consisted of socio-demographic information, including age, gender, living situation, country of birth, level of educational attainment and income, and questions relating to quality of life as measured by the EuroQol Group (EQ-5D™) (26) and Investigating Choice Experiments for the Preferences of Older People – Capability (ICECAP) (27) instruments.

Table II. *Example of discrete choice question included in the questionnaire*

Programme 1	Programme 2
Individual therapy	Group therapy
30 min per day	6 h per day
100 AUD per week	No cost
Same specialist team from admission to discharge	Community-based physiotherapist and doctor visiting
80% recovery	90% recovery

Data analysis

Data were analysed using conditional (fixed-effects) logistic regression to account for repeated observations from each person (in STATA). The dependent variable was binary (0,1) reflecting whether the participant chose rehabilitation programme 1 or 2 from each choice set. Explanatory variables were the differences between the levels of each rehabilitation programme attribute for programme 1 vs programme 2.

The attribute levels were effects coded for analysis (18). The base cases, excluded from the regression model, are therapy in small groups, minimum therapy provided, therapy provided by a community team, lowest percentage of recovery (70%) and zero cost. Statistically significant coefficients indicate the importance of that attribute in influencing preferences and determining overall utility. Coefficients with positive signs indicate that as the level of the attribute increases so does the utility derived.

Previous studies undertaken in the healthcare sector have found that when completing DCEs, some respondents exhibit dominant preferences (18). Respondents with dominant preferences consistently choose the scenario with the better level of a particular attribute and do not "trade-off" between this attribute and others (18) (for example, respondents may always choose the programme that results in the most recovery). Lanscar & Louviere (28) argues that dominant preferences are valid responses and omitting them from analysis may result in bias and reduced statistical efficiency. In this study, respondents with dominant preferences were identified but not excluded from analysis.

Table III. *Characteristics of respondents*

	n (%)
Gender	
Male	24 (48)
Female	26 (52)
Age, years, mean	72.4
20–50	2 (4)
51–70	15 (30)
71+	32 (64)
Did not disclose	1 (2)
Living situation	
Alone	24 (48)
With others	26 (52)
Household income, AUD	
0–20,000	24 (48)
20,000–40,000	15 (30)
40,000+	10 (20)
Did not disclose	1 (2)
Modified Rankin Scale	
2 (slight disability)	7 (14)
3 (moderate disability)	32 (64)
4 (moderately severe disability)	11 (22)

RESULTS

Characteristics of respondents

Within the study period, 63 people with stroke were referred to the researchers. Thirteen of the 63 were excluded due to dysphasia ($n=8$), did not meet MMSE cut-off score ($n=2$), were not able to speak English fluently ($n=2$), and one person did not consent. Fifty remaining participants results in an estimation sample of 600. The characteristics of the study participants are presented in Table III. The mean age of stroke survivors was 72.4 (range 27–92), 48% were males and most (64%) had moderate disability (a Modified Rankin Score of 3).

Responses to the attitudinal statements are presented in Table IV. The majority of respondents (80%) felt that participating in rehabilitation always results in recovery. Respondents also felt that rest was an important part of rehabilitation (94%) and that facilities should use the latest technologies (98%).

Discrete choice experiments model estimation

The results of the conditional logit model for the total sample are presented in Table V. Attributes indicated as statistically significant are identified as important in determining preferences. Several coefficients had a negative sign, indicating that participants were averse to these attribute levels. The relative size of the coefficients attached to each attribute indicates that computer-based therapy was the most undesirable characteristic, followed by a cost of 100 AUD per week and 6 hours of therapy per day. In comparison, making a recovery of 90% was most highly desired by participants, followed by individual therapy. Subgroup analysis was undertaken to determine whether aversion to computer-based therapy was associated with age. Whilst patients younger than 70 years ($n=18$) were found to be averse to computer-based therapy (coefficient –0.5503; $p=0.012$), the strength of this aversion was not as strong as patients older than 70 years ($n=32$) (coefficient –0.7857; $p=0.000$).

Sixteen respondents (32%) exhibited dominant preferences throughout the choice set presented: 8 (16%) always chose the programme with most recovery, 3 (6%) always chose the most inexpensive programme, and 2 (4%) always chose the programme with the least time spent in therapy.

Table VI summarizes the estimated willingness to pay (WTP) values for attribute levels. The WTP values reflect the strength of importance of the attribute levels presented by the coefficients

Table IV. *Responses to attitudinal statements* – n *(%)*

	Strongly agree *n* (%)	Agree *n* (%)	Somewhat agree *n* (%)	Somewhat disagree *n* (%)	Disagree *n* (%)	Strongly disagree *n* (%)	Total *n* (%)
Participating in rehabilitation always results in recovery	12 (24)	17 (34)	11 (22)	3 (6)	5 (10)	1 (2)	49 (98)
Rest is an important part of a rehabilitation programme	14 (28)	30 (60)	3 (6)	1 (2)	1 (2)	0	49 (98)
Rehabilitation services should be provided regardless of the costs to the health services	17 (34)	30 (60)	2 (4)	0	1 (2)	0	50 (100)
Rehabilitation services should use the latest technologies	17 (34)	27 (54)	5 (10)	0	1 (2)	0	50 (100)
It doesn't matter whether you have the same therapy team from admission to discharge	5 (10)	20 (40)	7 (14)	6 (12)	12 (24)	0	50 (100)

Table V. *Model results for all respondents (*n = *50)*

Characteristic	Coefficient	*p*	95% CI
Individual therapy*	0.3071	0.016	0.0583 to 0.5558
Computer therapy*	–0.7067	0.000	–0.9555 to –0.4578
H per day (3)	0.1728	0.163	–0.0698 to 0.4153
H per day (6)*	–0.3572	0.005	–0.6048 to –0.1096
Same therapy team	0.0978	0.428	–0.1438 to 0.3394
Different team	0.0571	0.649	–0.1885 to 0.3027
Recovery 80%	–0.1353	0.275	–0.3783 to 0.1077
Recovery 90%*	0.7946	0.000	0.5379 to 1.0512
Cost 50 AUD per week	–0.0428	0.730	–0.2859 to 0.2003
Cost 100 AUD per week*	–0.6381	0.000	–0.8849 to –0.3914

No. of observations = 600.
No. of respondents = 50.
$\chi^2 = 122.25$ ($p < 0.000$).
*Significant at 5% or better level.

in Table V in monetary terms. Thus, the preferences of participants were strongest for the health outcome attribute, "amount of recovery", with participants being willing to pay 60 AUD on average for a 90% recovery. Participants also exhibited positive WTP values for individual therapy (23 AUD) and lower intensity therapy programmes (13 AUD–14 AUD). Participants' strong aversions to computer therapy and high-intensity programmes were reflected in their relatively high negative WTP.

DISCUSSION

To our knowledge this is the first study to apply DCE methods to examine stroke survivors' preferences for rehabilitation programmes. Participants admitted to stroke rehabilitation wards demonstrated strong preferences for individual therapy, did not yet feel ready for new technologies, such as virtual reality, and demonstrated an aversion to very high doses of therapy programmes. Furthermore, their preferences suggested that, whilst recovery is important, it was not the only factor that they consider when choosing a rehabilitation programme. DCE studies in other healthcare fields have reported similar findings, indicating that process attributes are highly valued by patients in addition to health outcomes (18). In general participants' preferences indicated that they would not be "willing to do anything" to achieve greater recovery. These findings have implications for recent therapy approaches, such as virtual reality and high-intensity rehabilitation programmes

Table VI. *Willingness to pay/marginal rates of substitution*

	Willingness to pay (AUD)	Lower limit[a]	Upper limit[a]
Individual therapy	23.105	3.257	45.571
Computer therapy	–53.392	–84.415	–33.712
H per day (3)	13.019	–4.930	34.575
H per day (6)	–27.163	–50.004	–9.712
Same therapy team	7.366	–11.707	27.912
Different team	4.282	–15.764	26.857
Recovery 80%	–10.260	–30.580	9.447
Recovery 90%	60.245	37.801	96.175

[a]Confidence intervals estimated using the bootstrap method.

such as constraint-induced movement therapy, suggesting they may have limited initial acceptability. While previous studies (10, 29) have found that patients reported that the expertise of the staff was important, the DCE participants did not exhibit strong preferences for the alternative rehabilitation therapy teams presented.

Some inconsistencies between responses to the attitudinal statements and the DCE were apparent. Whilst the majority of participants in the attitudinal statements agreed that rehabilitation services should use the latest technologies, in practice respondents were averse to computer-based therapy within the DCE. This apparent discrepancy may reflect differences in interpretation, given the more general phraseology of "latest technologies" vs more specific "computer-based therapy" label presented within the DCE. The findings from this study suggest that patients' attitudes and their real-world choices may differ, and highlights the benefits of applying the DCE methodology in determining consumer preferences in a realistic and specifically described context.

This study demonstrates the feasibility of the application of the DCE approach with recent stroke survivors. However, the results should be interpreted with some caution, since it was undertaken on a relatively small sample of Australian stroke survivors at a particular time-point in their recovery. Further research is required to verify the findings of this study in larger samples of stroke survivors and at different time-points following stroke.

Moreover, the DCE was designed and applied to post-stroke rehabilitation within the Australian healthcare system. It is possible that the attributes and levels included in this DCE may need to be adjusted to be appropriate for application in other countries where patient preferences may differ.

In addition, it is likely that patients with different rehabilitation needs will have different preferences. While this study involved a relatively homogenous group in terms of patient characteristics (for example, approximately two-thirds were classified as having a "moderate disability" by the Modified Rankin Scale), further research is required to determine the preferences of subgroups of participants in larger and more heterogeneous samples. This would provide further insights into the relationship between preferences and possible differences in rehabilitation needs.

Patient preferences are also likely to be influenced by age. As expected, younger participants in this study were less averse to computer-based therapy than older participants. This finding is likely to reflect a lack of familiarity with computers and technology in older people, but this may change over time as future generations become increasingly familiar with technology.

The inclusion of the cost attribute enabled estimation of WTP values for the other attribute levels. However, as there is currently no direct cost incurred by the consumer for receiving rehabilitation services within Australia's healthcare system, it is possible that this attribute may have lacked credibility with some participants.

Finally, further research is required to establish the reliability and validity of DCEs with older people (30). Older people may

have difficulty with the complexity of DCEs. The DCE in this study was administered in an interview format that may have assisted participants to understand the task. However, further research is required to determine appropriate modes of delivery and DCE study design for older people with differing clinical and socio-demographic characteristics.

In conclusion, DCEs offer a promising way forward for engaging consumers about their preferences for alternative rehabilitation programme configurations. This study showed that the characteristics of programmes are important to stroke survivors in addition to the amount of recovery made. In general, stroke survivors exhibited stronger preferences for low-intensity programmes and rest periods. High-intensity therapy protocols or approaches dependent on new technologies will require careful introduction to ensure a good level of take up rates and acceptability to consumers.

ACKNOWLEDGEMENT

Kate Laver is supported by an Australian Postgraduate Award Scholarship. Julie Ratcliffe is funded by an NHMRC Health Services Program Grant (402791).

Conflict of interest: The authors declare no conflicts of interest.

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