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Education

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Abstract

Background Physical fitness is impaired after stroke, yet fitness training after stroke reduces disability. Several international guidelines recommend that fitness training be incorporated as part of stroke rehabilitation. However, information about cost-effectiveness is limited.

Methods A decision tree model was used to estimate the cost-effectiveness of a fitness programme for stroke survivors vs. relaxation (control group). This was based on a published randomised controlled trial, from which evidence about quality of life was used to estimate Quality Adjusted Life Years. Costs were based on the cost of the provision of group fitness classes within local community centres and a cost per Quality Adjusted Life Year was calculated.

Results The results of the base case analysis found an incremental cost per Quality Adjusted Life Year of £2,343.

Conclusions Physical fitness sessions after stroke are a cost-effective intervention for stroke survivors. This information will help make the case for the development of new services.

Keywords: economic evaluation, exercise, fitness, rehabilitation, stroke

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Background

Physical fitness is described as ‘a set of attributes relating to the ability to perform physical activity that are either health- or skill-related’.[1] The term ‘physical fitness training’ is often used interchangeably with ‘exercise’, even though the latter is defined as ‘a subset of physical activity that is planned, structured, and repetitive and has as a final or an intermediate objective the improvement or maintenance of physical fitness’.[1] Thus, ‘physical fitness training’ can be seen as a subset of ‘exercise’, which may also include, for example, functional task practice, as part of rehabilitation. Physical fitness is reduced after stroke, and physical fitness training can improve a range of important patient outcomes including disability.[2] Risk modelling studies suggest that physical fitness training after stroke should reduce the risk of a recurrent vascular event by about a fifth.[3] Several clinical guidelines[4,5] recommend that physical fitness training should be incorporated into stroke rehabilitation and continue to be provided following discharge to the community. The aim of this continued provision is to facilitate long-term participation in physical fitness training (and exercise more generally), as the effects often dissipate when training programmes cease.[2]

To improve longer term exercise participation after stroke, individualised, tailored counselling has been found to be a key factor,[6] and this is embedded within the training programme for professionals delivering community-based exercise and fitness after stroke classes.[7] However, despite the evidence about the benefits of community-based physical fitness training, it is not yet widely available for stroke survivors.[8,9] One possible barrier to its widespread implementation is lack of data about its cost-effectiveness. There is evidence to show the cost-effectiveness of generic exercise programmes[10,11] but not for community-based physical fitness programmes specifically for stroke survivors. Some studies have used quality of life measures to look at the benefits from exercise after stroke with mixed results.[12–16] These small studies predominantly show that there is an improvement in quality of life for those in an exercise group compared to control, but once training is stopped, these benefits may not be maintained. The quality of life data, however, have not previously been used to estimate the cost-effectiveness of the intervention.

In the UK, group physical fitness training programmes for stroke survivors are being developed in community settings

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and delivered by exercise professionals.[8] To help inform the widespread development of such services, there is a need to show the costs and benefits of health interventions for funders; therefore, cost-effectiveness measures are becoming increasingly important.

The main aim of this current analysis is to estimate the cost-effectiveness of a physical fitness programme for stroke survivors delivered in a community leisure centre setting. The physical fitness programme selected was that used by Mead et al.[16] This programme forms the foundation for the only validated Exercise and Fitness Training after Stroke course in the UK for exercise professionals who have delivered community-based Exercise after Stroke programmes across the UK since 2008.

Methods

Mead et al.[16] evaluated a mixed physical fitness training intervention (endurance and resistance training) delivered by an exercise professional to groups of up to 7 stroke survivors, after they had completed usual rehabilitation and had been discharged from hospital. Inclusion and exclusion criteria and other methodological details of this randomised controlled trial (RCT) can be found in the previous publication.[16] The classes were held three times a week for 12 weeks. Each class lasted for approximately 1 hour and 15 minutes, which included some discussion before and after the fitness class. The classes were adapted to stroke patients and tailored to the needs of individuals, with the intensity of the classes increasing over the 12 weeks. The classes were for stroke survivors who were able to walk independently with or without aids and had the capacity to consent to taking part in the classes. Carers were not involved in the intervention.

The programme for the Control group was delivered by the same exercise professional as the Fitness group, in the same location, for the same programme duration, session duration and frequency. This 'attention control' relaxation intervention, undertaken in a seated position, included deep breathing and progressive muscular relaxation (but no muscular contraction). This was selected to control for the effect of social interaction in the physical fitness group.

In total, 66 stroke survivors were recruited and randomly allocated between a Fitness (n = 32) and Relaxation group (n = 34). In the Fitness group, average age was 72 (± 10.4) and median days between stroke and start of the physical fitness training (baseline) was 178 (range 86–307). In the Relaxation group, average age was 71.7 (± 9.6) and median days between stroke and the start of the fitness training (baseline) was 161.5 (range 91.8–242.8).

Stroke survivors were assessed at baseline, 3 months and 7 months (4 months after completion of the interventions). A range of outcomes was measured, which have been previously reported.[16] This paper will focus on the quality of life data collected during the trial.

A cost-effectiveness analysis was conducted as it compared alternative courses of action in terms of costs and consequences;[17] in this case, comparing the relaxation group (control) with the fitness group (intervention). This involved calculating the costs for both groups and looking at the additional or incremental cost of the intervention compared to the control. The consequences from both groups can then be estimated from changes in quality of life in each group. Again, the additional or incremental quality of life from the intervention compared to the control is calculated and both the costs and consequences can be combined.

Quality of life

Evidence on quality of life was obtained from the previous study,[16] where quality of life, using the Short Form-36 (SF-36) health survey, was one of the outcomes. Individual scores were obtained from this RCT. Although other studies have measured quality of life for stroke survivors using the SF-36,[12] EQ-5D[13,14] and SF-12,[15] the SF36 has not been used specifically for a group-based community fitness programme for stroke survivors. Furthermore, the raw scores for each of these quality of life measures from these trials could not be obtained.

The SF-36 has become the most widely used measure of general health in clinical studies.[18] It is a questionnaire used to assess an individual's health across eight dimensions. While such scores provide a means for detecting health changes in populations after receiving an intervention, they have only a limited application in economic evaluation as they produce a profile of scores across different domains and not a single quality of life score that can be used in an economic evaluation. In addition, the SF-36 is not based on people's preferences for the outcomes; we do not know whether a higher score on the scale is associated with outcomes that are more preferred. Without a single score for quality of life, we cannot calculate Quality Adjusted Life Years (QALYs), which combine the length of time in a health state with the quality of that life.[17,18] To overcome these issues and to achieve a single quality of life score for calculating QALYs, the SF-36 scores are used to calculate a single index measure for health called the SF-6D. The health states defined by the SF-6D were valued by a representative sample of the general UK population. This sample provided utility values for the health states on a scale from 0 to 1, where 0 is dead and full health is 1.[17]

In this study, we use the SF-36 data collected in Mead et al.[16] and converted it to SF-6D, using an algorithm obtained from the University of Sheffield (http://www.sheffield.ac.uk/scharr/sections/heds/mvh/noncommercial) to calculate a cost per QALY for a fitness programme for stroke survivors lasting up to 3 months.

The overall aim of using the SF-6D values was to look for a change in quality of life over time; therefore, participants who had not completed the SF-36 questionnaire at each time point and had missing values were excluded from the

Table 1 Mean SF-6D scores for baseline, 3 months and 7 months

Group	Baseline mean SF-6D score	3 month mean SF-6D score	7 month mean SF-6D score
Fitness	0.69 (SD = 0.12) n = 28	0.73 (SD = 0.12) n = 28	0.73 (SD = 0.13) n = 28
Relaxation	0.71 (SD = 0.13) n= 27	0.72 (SD = 0.14) n = 27	0.71 (SD = 0.12) n = 27

SD, standard deviation, n, number of responses

analysis. For the Fitness and Relaxation groups, four and seven participants were excluded, respectively.

Costs

Intervention costs

The structure and set up of the Fitness group in Mead et al.[16] was used to estimate the costs for the physical fitness intervention. The costs were estimated for the first 3 months of the intervention where classes were held three times per week. We obtained detailed information on the costs of running community physical fitness classes from Edinburgh Leisure, a not-for-profit leisure provider in Edinburgh. It runs an Exercise After Stroke class and provided costs for the staff involved in delivering the classes (personal communication, Edinburgh Leisure, 2014). Using recent existing costs is standard practice for economic evaluation.[19] It was also assumed that the classes are run regardless of the number; therefore, we have assumed 7 attending each class, i.e. they are at maximum capacity and that there is no charge to the participant for the classes in the intervention period. This is in line with guidelines for community-based exercise after stroke.[8] The participants in the study were transported to each class so we have used a cost for transport by ambulance[20] and assumed one return trip per class.

Control costs

The control group in Mead et al.[16] was set up as a relaxation class; this was costed using similar estimates as the intervention group and we have assumed 7 attending each class.

Model

A decision tree model was developed (TreeAge Pro 2014) as it is a simple way to outline different alternatives and is most common structure for decision models in economic evaluation.[19] A decision tree allows for each scenario to be represented by probabilities of events occurring with associated costs and outcomes (utilities) and is appropriate for modelling a short-term intervention. The costs and outcomes are summed for each pathway and weights by the pathway probabilities.[21]

Base case

The base case analysis shows the expected outcome from the most likely scenario, in this case this assumes that the 3 month intervention from the RCT is the most likely scenario

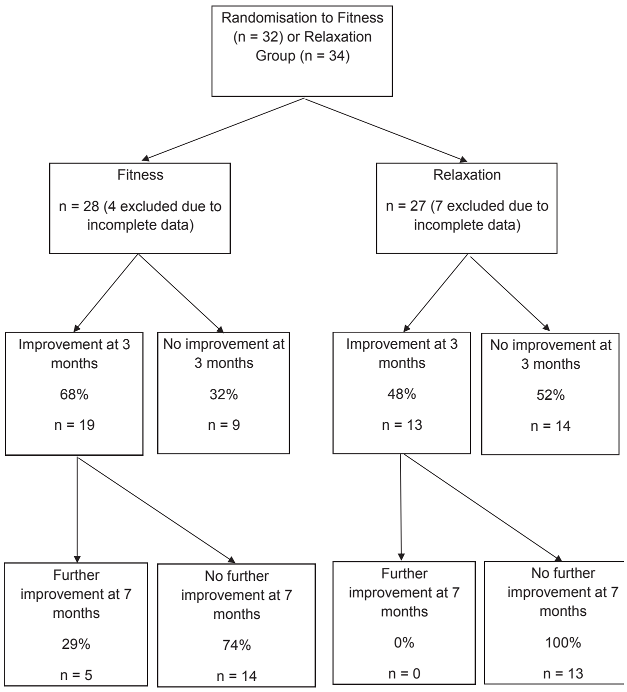

Figure 1 Base case – flow diagram of quality of life gain from baseline to seven months.

as this is where the primary data comes from. Within the base case analysis, quality of life gains were incorporated based on the 7 month follow-up data (Table 1). As the physical fitness intervention was conducted for 3 months, the costs were only assumed to apply to the 3 month duration of the intervention for the base case.

Quality of life

The decision tree model structure (Figure 1) shows the two groups – Fitness (intervention) and Relaxation (control) – and within each group stroke survivors were assumed to improve or experience no improvement (i.e. their quality of life remains the same as baseline) between baseline and 3 months, and between 3 and 7 months. Deterioration in quality of life was not considered in the model as it was assumed that if participants were deteriorating they would not continue with the intervention.

Those who did not show improvement at 3 months were assumed to remain at their baseline quality of life and not progress further; therefore, a decrease in quality of life was not considered in the model.

Table 2 Cost of 12 week physical fitness (intervention) programme

	No. of classes	No. of stroke survivors per class	Unit cost	Total cost	Cost per person	Source
Cost per hour of exercise professional	36	7	£10	£352	£50	Edinburgh Leisure, cost per hour of staff (Personal Communication)
Admin for classes	36	7	£10	£176	£25	Edinburgh Leisure (assume 30 min admin per class = 18 h for 12 weeks)
Training costs for instructors	36	7	£720	£20	£3	Later Life Training course inc. VAT[7]
Overheads	36	7	£25	£900	£129	Estimated
Transport to Classes	36	7	£48	£1,727	£247	Cost per return patient journey of ambulance service[20]
Total				£3,176	£454	

Table 3 Cost of relaxation (control) group for 12 week programme

	No. of classes	No. of stroke survivors per class	Unit cost	Total cost	Cost per person	Source
Cost per hour of exercise professional	36	7	£10	£352	£50	Edinburgh Leisure, cost per hour of staff (Personal Communication)
Admin for classes	36	7	£10	£176	£25	Edinburgh Leisure (assume 30 min admin per class = 18 h for 12 weeks)
Overheads	36	7	£10	£360	£51	Estimated
Transport to classes	36	7	£48	£1,727	£247	Cost per patient journey of ambulance service[20]
Total				£2,616	£374	

Scenarios

In order to show a range of potential scenarios for the delivery of the physical fitness training programme, different scenarios were analysed including: i) comparing the physical fitness training group to usual care, ii) physical fitness classes were assumed to continue for up to 12 months after the initial 3 month intervention, and, iii) less than 7 attendees per class where the incremental cost per QALY is above £20,000.

Results

Base case

The average SF-6D scores are shown in Table 1 for baseline, 3 months and 7 month follow up for each group.

The costs for the physical fitness group were estimated to be £454 per person for 3 month physical fitness sessions based on 7 people attending each class (Table 2). The costs for the control group were estimated to be £374 based on 7 people attending each class (Table 3).

Physical fitness (intervention) arm

Once those who had not completed the SF-36 fully were removed, 28 were left in the Fitness group. Of these, 19 (68%) had an improvement in their quality of life score at 3 months with an average improvement of 0.1. Of the group that had shown improvement at 3 months, 5 (26%) showed a further improvement at 7 months with an average improvement of 0.08.

Relaxation (control) arm

Once those who had not completed the SF-36 were removed, 27 were left in the Relaxation group. Of these, 13 (48%) had an improvement in their quality of life score at 3 months with an average improvement of 0.1. Of the group that had shown

Table 4 Cost for physical fitness intervention – 3 months to 12 months

	No. of classes	No. of stroke survivors per class; 1 session per week	Unit cost	Total cost	Cost per person	Source
Class cost to individual	36	7	£3	£756	£108	Estimated from leisure class costs
Exercise professional	36	7	£10	£352	£50	Edinburgh Leisure (Personal Communication)
Admin for classes	36	7	£10	£176	£25	Edinburgh Leisure (assume 30 min per class = 18 h)
Overheads	36	7	£25	£900	£129	Estimated
Training costs for instructors	36	7	£720	£20	£3	Later Life Training course inc. VAT[7]
Total				£2,205	£315	

improvement at 3 months, there was no further improvement in this group at 7 months.

Combining the cost and quality of life data, the incremental costs and effectiveness from the Fitness group compared to the Relaxation group were calculated. The incremental cost of the fitness programme based on a 3 month programme was £80 (Table 2). At the end of the follow up period (7 months), the incremental effectiveness was 0.03. Therefore, the incremental cost per QALY was calculated as £2,343.

Scenario 1: Comparing the fitness training group to usual care

The base case included the conservative assumption that the control group was associated with the cost of relaxation therapy (Table 3). However, this may not reflect the most appropriate comparator, as the relaxation classes were part of the RCT, but in practice many stroke survivors are likely to receive no intervention. To illustrate the effect this may have on the cost-effectiveness results, here we have kept the Fitness group the same but have assumed a zero cost for the control arm, and assumed an improvement of 0.01 (Table 1) in quality of life, using the same proportions for those in the Relaxation group, to account for some natural recovery for survivors of stroke.

The incremental effectiveness of the intervention arm compared to the control arm was 0.08 and was associated with an incremental cost of £454. The incremental cost per QALY thus increased to £5,869.

Scenario 2: Physical fitness classes to continue for up to 12 months

As the literature states that the benefits from short term exercise programmes do not appear to be maintained over the long term once exercise has stopped,[12–16] we have estimated the cost per QALY of a hypothetical physical fitness programme that runs beyond the 3 months and up to 12 months, with the class delivered once a week in the period after the initial 3 month intervention. The costs are shown in Table 4 and are similar to that of the 12 week programme with 7 stroke survivors attending each class who pay a small fee to attend and make their own way to the classes. This is more in line with the classes offered by Edinburgh Leisure.

The costs of the weekly physical fitness programme were estimated to be £315 from 3 months to 12 months. Adding this cost to the initial intensive intervention (£454) resulted in an annual intervention cost of £769 per person.

In order to estimate the QALY gain associated with the 12 month physical fitness programme, an assumption was made that individuals who had maintained their quality of life improvement up to 7 months, would go on to experience some residual improvement up until 12 months. As such, the assumption was made that for those that had experienced quality of life gain up until 7 months; their quality of life remained 0.05 greater than baseline (i.e. half their initial improvement of 0.1).

Combining the 12 month cost and QALY data, the incremental cost per QALY was calculated at £3,244 based on incremental effectiveness of 0.04 and an incremental cost of £136 (assuming there is a cost for the control group over the first 3 months, Table 3 and those who do not improve after the 3 month intervention do not continue). We then assumed that the costs for the control group were 0 with an assumed improvement for the control group of 0.01 to account for some natural recovery; there was an incremental effectiveness of 0.09 and the incremental cost per QALY increased to £5,860.

Scenario 3: Less than 7 attendees per class

We have assumed that the classes are run with 7 people attending each class, but it is likely these numbers will vary

Table 5 Summary of results by scenario

Scenario	Incremental cost	Incremental QALY	Cost per QALY
Baseline – 3 month intervention	£80	0.03	£2,343
Scenario 3: 3 people attend each class	£1,059	0.03	£20,062
Scenario 1: Comparing the fitness training group to usual care	£454	0.08	£5,869
Scenario 3: 3 people/2 people	£1,059/£1,588	0.08	£13,692/£20,530
Scenario 2: Physical fitness classes to continue for up to 12 months	£136	0.04	£3,244
Scenario 3: 3 attend for 3 months, 2 for up to 12 months	£832	0.04	£19,891

throughout the course. For this scenario, we have changed the numbers attending each class in the base case and scenarios 1 and 2 to look at where the incremental cost per QALY falls close to or above £20,000. The cost in the control group remains the same in the base case and scenario 2.

In the base case, if 3 people attend each class the cost increases to £1,059 per person and the incremental cost per QALY to £20,062.

Table 5 shows a summary of each scenario and the results.

Discussion

To our knowledge, this is the first study to explore the cost-effectiveness of a physical fitness after stroke programme. We have demonstrated that, depending on the scenario, the cost per incremental QALY ranges from approximately £2,400 to £5,870 (Table 5), and are, therefore, below the £20,000 threshold that is generally regarded as acceptable by the National Institute for Health and Care Excellence.[22] The original RCT[16] demonstrated significant clinical benefits from the physical fitness training intervention; here we demonstrate cost-effectiveness.

Two studies were found for exercise programmes for various different patient groups looking at preventing the development of stroke through facilitating physical activity.[10,11,14] However, the studies by Anokye et al.[10] and Roux et al.[11] did not report stroke-specific data, while the study by Cooke et al.[14] was not a group-based physical fitness training programme and so cannot be used as comparisons.

The group format for exercising is less expensive than a one-on-one programme and may be more feasible to roll out and capture a wider group of stroke survivors. This may be important in more rural areas where physical fitness classes for those with different health conditions could be combined to increase numbers attending and the cost-effectiveness of these classes. In addition, stroke survivors have reported specific psychosocial benefits from exercising in group format.[23,24]

Study limitations

The data used in the analysis were taken from a study published in 2007 and the numbers included in the study were small. However, given the lack of cost-effectiveness evidence available for this type of programme, it is important to look at data that are available to expand the evidence base. In addition, there is no reason to think that the quality of life data would have changed substantially in that time period.

The model only includes the cohort of stroke survivors from the Mead study.[16] Therefore, the cost per QALY is based on a small number of survivors; however, no other quality of life data were available and the cost data used were from 2014 which is standard practice in economic evaluation.[19]

As with all modelling studies, certain assumptions were made. Making these assumptions allows for the estimation of the expected costs and benefits from the intervention based on the current data available.[19] This allowed us to present what may happen if resources are made available for this intervention.

Although incorporated into the SF-36 values, we did not explicitly include other potential benefits in the model such as a change in walking speed and a change in walking distance. These are also important outcomes after a stroke for survivors to perform everyday tasks, and need to be explored further.

Given the benefits from exercise and fitness training for stroke survivors, there is a potential for a reduction in the use of other health services including GP appointments, outpatient appointments and reduction in medication use. These costs have not been included in the model as information is not available. However, the savings could offset the cost of the programme and reduce the incremental cost per QALY.

Costs for the fitness programme were estimated using information from a regional class which is already running. These costs may be an under- or over-estimate and costs may vary depending on the region where they place.

In summary, using the data available, group-based physical fitness after stroke services, delivered by qualified exercise professionals, were found to be cost-effective, with the incremental cost per QALY below that required by NICE for implementation.

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References

1 Caspersen CJ, Powell KE, Christenson GM. Physical activity, exercise, and physical fitness: definitions and distinctions for health-related research. *Public Health Rep* 1985; 100: 126–31.
2 Saunders DH, Sanderson M, Hayes S et al. Physical fitness training for stroke patients. *Cochrane Database Syst Rev* 2016; 3: CD003316.
3 Hackam DG, Spence JD. Combining multiple approaches for the secondary prevention of vascular events after stroke: a quantitative modeling study. *Stroke* 2007; 38: 1881–5.
4 Winstein CJ, Stein J, Arena R et al. Guidelines for adult stroke rehabilitation and recovery: a guideline for healthcare professionals from the American Heart Association/American Stroke Association. *Stroke* 2016; 47: e98–e169.
5 NICE. *Stroke Rehabilitation*. CG162. 2013.
6 Morris J H, MacGillivray S, Mcfarlane S. Interventions to Promote Long-Term Participation in Physical Activity After Stroke: A Systematic Review of the Literature. *Arch Phys Med Rehabil* 2014; 95: 956–67.
7 Laterlife Training. http://www.laterlifetraining.co.uk/courses/exercise-for-stroke-instructor (accessed 19/5/15).
8 Best C, van Wijck F, Dennis J et al. A survey of community exercise programmes for stroke survivors in Scotland. *Health Soc Care Community* 2012; 20: 400–11.
9 The PARCS project. *Person-centred Activities for people with Respiratory, Cardiac and Stroke conditions*. Chest Heart and Stroke Scotland 2014.
10 Anokye NK, Trueman P, Green C et al. The cost-effectiveness of exercise referral schemes. *BMC Public Health* 2011; 11: 954.
11 Roux L, Pratt M, Tengs TO et al. Cost effectiveness of community-based physical activity interventions. *Am J Prev Med* 2008; 35: 578–88.
12 Aidar FJ, Silva AJ, Reis VM et al. [A study on the quality of life in ischaemic vascular accidents and its relation to physical activity]. *Revista de Neurología* 2007; 45: 518–22.
13 Ada L, Dean CM, Lindley R. Randomized trial of treadmill training to improve walking in community-dwelling people after stroke: the AMBULATE trial. *Int J Stroke* 2013; 8: 436–44.
14 Cooke EV, Tallis RC, Clark A et al. Efficacy of functional strength training on restoration of lowerlimb motor function early after stroke: phase I randomized controlled trial. *Neurorehabil Neural Repair* 2010; 24: 88–96.
15 Globas C, Becker C, Cerny J et al. Chronic Stroke Survivors Benefit From High-Intensity Aerobic Treadmill Exercise: A Randomized Control Trial. *Neurorehabil Neural Repair* 2012; 26: 85–95.
16 Mead GE, Greig CA, Cunningham I et al. STroke: A Randomized Trial of Exercise or Relaxation (STARTER). *J Am Geriatr Soc* 2007; 55: 892–9.
17 Drummond MF, Sculpher MJ, Torrance GW et al. *Methods for the Economic Evaluation of Health Care Programmes*. 3rd ed. New York: Oxford University Press; 2005.
18 Brazier J, Roberts J, Deverill M. The estimation of a preference-based measure of health from the SF-36. *J Health Econ* 2002; 21: 272–92.
19 Drummond MF, O'Brien B, Stoddart GL et al. Economic evaluation using decision analytic modelling. In: *Methods for the Economic Evaluation of Health Care Programmes*. 2nd ed. Oxford: Oxford University Press; 2005. p. 277.
20 ISD Scotland. *Scottish Ambulance Service, expenditure and statistics, by region, April 2013–March 2014*. 2014.
21 Briggs A, Claxton K, Sculpher M. *Decision Modelling for Health Economic Evaluation*. New York: Oxford University Press; 2006.
22 Dillon A. *Carrying NICE over the threshold*. 2015. https://www.nice.org.uk/news/blog/carrying-nice-over-the-threshold (accessed 30/6/15).
23 Cairn-Levy G, Kendall M, Young A et al. They psychosocial effects of exercise and relaxation classes for persons surviving a stroke. *Can J Occup Ther* 2009; 76: 73–80.
24 Sharma H, Bulley C, van Wijck F. Experiences of an exercise referral scheme from the perspective of people with chronic stroke: a qualitative study. *Physiotherapy* 2012; 98: 341–8.