

## CAT 4. Among people with Parkinson's, what is the cost-effectiveness of fall prevention?

Appraised by Kevin Galbraith, January 2017

**Update due 2019**

### Clinical question

Among people with Parkinson's, what is the cost-effectiveness of fall prevention from the perspective of the health service?

### Background

Among people with Parkinson's, falls are both frequent and recurrent, with 45–68% falling annually, and two-thirds of these falling recurrently.<sup>1</sup> The cost to the health service resulting from falls is considerable – it is more than tripled when a person with Parkinson's sustains a broken hip.<sup>2</sup> This CAT sought to determine the cost-effectiveness of preventing falls among people with Parkinson's, from the perspective of the health service.

### Clinical bottom line

- There is moderate strength evidence from a single economic analysis, that Tai Chi is a cost-effective intervention for preventing falls among people with Parkinson's of mild-to-moderate severity.<sup>3</sup>
- Two economic analyses evaluating exercise interventions were inconclusive.<sup>4,5</sup>
- Further economic analyses are needed, to ascertain the cost-effectiveness of interventions at different stages of Parkinson's. In view of the influence in the UK of the NICE cost-effectiveness threshold on policy decisions,<sup>6</sup> further local studies are needed.

- Current NICE guideline recommendations do not include Tai Chi. This CAT suggests it could be considered in patients with Parkinson's of mild or moderate severity who are at risk of falling.

### Search terms

(Parkinson Disease/ OR Parkinson\$) AND (Accidental falls/ OR fall\$) AND prevention AND cost-effective\$.

### Search strategy

Ovid Medline, and adapted for Embase, Cochrane Library, and CINAHL. All searches up to October 2017.

### Evidence

30 hits, among which there were three economic analyses of interventions to prevent falls in people with Parkinson's.<sup>3-5</sup>

Farag I, Sherrington C, Hayes A, et al. Economic evaluation of a falls prevention exercise program among people With Parkinson's disease. *Movement Disorders* 2016;31(1):53-61.

## Summary

An economic analysis from the health care system perspective, based on an assessor-blinded randomised controlled trial, in which 231 people aged 40 years and over with Parkinson's were randomised to 6 months of a minimally supervised exercise programme, or usual care. Cost-effectiveness was estimated using incremental cost per fall prevented (documented using falls calendars) as the primary analysis and cost per extra person avoiding mobility deterioration (improvement or no change in the 12-point Short Physical Performance Battery Score between baseline and 6 months). A cost-utility analysis using the Short Form-6D was also performed. Planned subgroup analyses for the low-disease-severity group were undertaken. There was no significant difference between groups in terms of the rate of falls (primary outcome), though there were fewer falls in the intervention group, with an average falls per person of 4.08 (standard deviation [SD] 7.93) compared to 7.05 (SD 20.62) among controls. The impact of the intervention on those with milder disease (UPDRS < 26) was significantly greater ( $p$  for interaction term < 0.001). The average cost of the intervention was \$A1010 (£6083<sup>8</sup>) per participant. Incremental cost-effectiveness of the program relative to usual care was \$A574 (£3453<sup>8</sup>) per fall prevented, \$A9,570 (£5,759<sup>8</sup>) per extra person avoiding mobility deterioration, and \$A338,800 (£203,820<sup>8</sup>) per quality-adjusted life year gained. The intervention had an 80% probability of being cost-effective, relative to the control, at a willingness-to-pay threshold of \$A2,000 (£1,204<sup>8</sup>) per fall prevented. In the low-disease-severity group, the program was cost-saving when compared to usual care, for all health outcomes.

The following should be noted:

- This minimally supervised exercise program was cost-saving compared to usual care among those with low disease severity. This conclusion should be treated with caution however, as it is derived from a subgroup analysis. Though planned a priori, it was not supported by the overall analysis, which failed to show a reduction in falls as a result of the intervention.
- If the intervention is more cost-effective among those with milder Parkinson's, a differential effect across levels of disease severity could explain the low cost-effectiveness in the overall analysis.

- Appropriate outcome measures were applied, and were measured and valued appropriately.
- Future costs and outcomes were not discounted. It may be argued, however, that prevention of falls, improved mobility and quality of life are experienced immediately, obviating the requirement for discounting.
- Assumptions were explained, and sensitivity analyses conducted. Incremental cost-effectiveness ratios (ICER) were lower under the assumption that all participants were involved in a group-based programme, with a programme cost of \$A653 per participant, resulting in a cost per QALY gained of \$A267,600 (£161,576<sup>8</sup>). Removal of hospital admission outliers from the cost data also resulted in lower cost-effectiveness ratios with the ICER of \$A220,800 (£133,326<sup>8</sup>) per QALY gained. It should be noted that the National Institute for Health and Care Excellence in the UK operates a 'threshold' above which treatments are less likely to be recommended for use in the National Health Service. This threshold is currently £20,000 to £30,000 per QALY gained.<sup>6</sup>
- Service-use data were self-reported, but hospital discharge summaries were obtained (where possible) to confirm the length of stay and reason for admission.
- All outcomes were ascertained blind to the group allocation.
- Overall, the methodology of this economic analysis appears robust, but no firm conclusions can be drawn.

Fletcher E, Goodwin VA, Richards SH, Campbell JL, Taylor RS. An exercise intervention to prevent falls in Parkinson's: an economic evaluation. *BMC health services research*. 2012;12:426.

## Summary

A cost-utility analysis from the perspective of the health-care system, based on a randomised controlled trial (RCT) of a ten week group exercise intervention aiming to reduce falls among people with Parkinson's. The RCT found no significant difference in the rate of falls between the intervention group (n=64) and usual care controls (n=66). The mean cost of the intervention was £76 per participant. There was no statistically significant difference between groups in total healthcare (-£128, 95% CI: -734 to 478), combined health and social care costs (£-35, 95% CI: -817 to 746) or QALYs (0.03, 95% CI: -0.02 to 0.03) at 20 weeks. Cost-effectiveness acceptability curves indicated more than 80% probability that the intervention is a cost-effective strategy relative to usual care. The following should be noted:

- It was unclear why a cost-utility analysis was conducted, based on a trial with null findings that may have been underpowered to detect real differences between groups. The economic analysis was similarly underpowered, with wide confidence intervals around effect sizes. This may explain the null findings (Type II error).
- 37 participants were excluded from the economic analysis due to missing data, and differed from those included, in that they were more predominantly male, and had higher health care costs. Although there was no difference in missing data between groups, the whole sample may have had milder disease on average, compared to the background population. This could reduce external validity.
- The intervention was not described in detail. It is therefore difficult to judge whether a different intensity or duration might have resulted in different effect sizes.
- Sensitivity analyses only explored the effect of missing data, and not the effect of different costs or benefit data.
- Overall, there are significant methodological limitations to this economic analysis, and no conclusions can be drawn from it.

Li F, Harmer P. Economic Evaluation of a Tai Chi Intervention to Reduce Falls in People With Parkinson Disease, Oregon, 2008-2011. *Preventing chronic disease*. 2015;12:E120.

## Summary

A cost-effectiveness analysis from the perspective of the health care system, based on a RCT of a 6-month Tai Chi program compared with two other interventions: (1) resistance training and (2) stretching. The Tai Chi intervention comprised twice-weekly group classes lasting 60 minutes. Tai Chi, with an adherence rate of 77%, had the lowest average number of falls ( $P = 0.01$ ) and incidence rate ( $P = 0.005$ ) compared with either stretching or resistance training. Compared with stretching, the Tai Chi program cost less, and was more effective (180 falls prevented and 0.13 QALY gained). Compared with the Tai Chi, resistance training program cost more and was less effective (85 more falls and a decreased QALY of -0.11). In terms of incremental cost effectiveness, Tai Chi showed an average reduction of Can\$175 per additional fall prevented and Can\$3,394 per participant per additional QALY gained compared with stretching. Incremental cost-effectiveness was quantified for resistance training, but the data have been omitted from this summary as the comparison group was unclear. The following should be noted:

- In the incremental cost-effectiveness analyses, the comparison group for resistance training was unclear. However, this does not alter the conclusion that Tai Chi was the most cost-effective of the three interventions.
- Outcome data were self-reported, and therefore prone to recall error and recall bias. However, some attempt was made to mitigate this by monthly telephone contact to verify fall frequency.
- Participants were recruited from a suitably wide array of sources, but the inclusion of only mild and moderate cases restricted the external validity of the study. It is unknown whether the intervention would yield similar cost-effectiveness ratios in more severe disease.
- The intervention was clearly described, and all relevant costs were included and appropriately discounted. Outcomes were clinically relevant, and appropriate sensitivity analyses were conducted. Overall, the study was of moderately good quality.

## Commentary

Three economic analyses were found – two evaluating exercise interventions, and the other a course of Tai Chi.<sup>3-5</sup> Only the Tai Chi intervention significantly reduced the fall rate, and it did so at lower cost than the control intervention.<sup>3</sup> One of the exercise intervention studies appeared to be underpowered to detect a real effect.<sup>5</sup> The other was cost-saving in a subgroup analysis of those with milder disease.<sup>4</sup> As a subgroup analysis, this should be treated with caution. The National Institute for Health and Care Excellence (NICE) in the UK operates a ‘threshold’ above which treatments are less likely to be recommended for use in the National Health Service. This threshold is currently £20,000 to £30,000 per QALY gained.<sup>6</sup> It is difficult to judge the outcomes of overseas studies by this metric however, because of fluctuating exchange rates and different arrangements (and therefore costs) for service provision. Further local economic analyses are needed, from the perspective of the National Health Service. The current NICE guideline recommends the following:<sup>7</sup>

- Consider referring people who are in the early stages of Parkinson’s disease to a physiotherapist with experience of Parkinson’s disease for assessment, education and advice, including information about physical activity.
- Offer Parkinson’s disease-specific physiotherapy for people who are experiencing balance or motor function problems.
- Consider the Alexander Technique for people with Parkinson’s disease who are experiencing balance or motor function problems.

This CAT did not find economic analyses pertaining to the Alexander Technique. The NICE recommendation was made on the basis of a single randomised controlled trial.<sup>8</sup> This CAT suggests Tai Chi could also be considered in patients with Parkinson’s of mild or moderate severity who are at risk of falling.

## References

1. Canning CG, Paul SS, Nieuwboer A. Prevention of falls in Parkinson’s disease: A review of fall risk factors and the role of physical interventions. *Neurodegenerative Disease Management*. 2014;4(3):203–221.
2. Pressley J, Louis E, Tang M-X, et al. The impact of comorbid disease and injuries on resource use and expenditures in parkinsonism. *Neurology*. 2003;60(1):87–93.
3. Li F, Harmer P. Economic Evaluation of a Tai Ji Quan Intervention to Reduce Falls in People With Parkinson Disease, Oregon, 2008–2011. *Preventing chronic disease*. 2015;12:E120.
4. Farag I, Sherrington C, Hayes A, et al. Economic evaluation of a falls prevention exercise program among people With Parkinson’s disease. *Movement Disorders*. 2016;31(1):53–61.
5. Fletcher E, Goodwin VA, Richards SH, Campbell JL, Taylor RS. An exercise intervention to prevent falls in Parkinson’s: an economic evaluation. *BMC health services research*. 2012;12:426.
6. National Institute of Health and Care Excellence: Guide to the methods of technology appraisal 2013 [www.nice.org.uk/process/pmg9/resources/guide-to-the-methods-of-technology-appraisal-2013-pdf-2007975843781](http://www.nice.org.uk/process/pmg9/resources/guide-to-the-methods-of-technology-appraisal-2013-pdf-2007975843781). Accessed 11.04.2017.
7. National Collaborating Centre for Chronic Conditions. Parkinson’s disease: national clinical guideline for diagnosis and management in primary and secondary care. London: Royal College of Physicians;2006. 1860162835.
8. XE currency converter. [www.xe.com/currencyconverter/](http://www.xe.com/currencyconverter/). Accessed 11.04.2017.
9. Stallibrass C, Sissons P, Chalmers C. Randomized controlled trial of the Alexander technique for idiopathic Parkinson’s disease. *Clinical rehabilitation*. 2002;16(7):695–708.

This Critically-Appraised Topic, the others in the series, and the related clinical summary, are the work of the Evidence-Based Practice Themed Working Group:

- Lynn Rochester (Chair)
- Kevin Galbraith
- Donald Grosset
- Mike Samuel
- Katherine Deane
- Debbie Davies
- Julia Johnson
- Carl Clarke
- Janine Barnes
- Alison Yarnall

---

**The UK Parkinson's Excellence Network is the driving force for improving Parkinson's care, connecting and equipping professionals to provide the services people affected by the condition want to see.**

The tools, education and data it provides are crucial for better services and professional development.

The network links key professionals and people affected by Parkinson's, bringing new opportunities to learn from each other and work together for change.

Visit [parkinsons.org.uk/excellencenetwork](https://parkinsons.org.uk/excellencenetwork)