Supplementation of a home-based exercise programme with a class-based programme for people with osteoarthritis of the knees: a randomised controlled trial and health economic analysis

CJ McCarthy,* PM Mills, R Pullen, G Richardson, N Hawkins, CR Roberts, AJ Silman and JA Oldham

Centre for Rehabilitation Science, University of Manchester, Manchester Royal Infirmary, UK

* Corresponding author

Executive summary

Health Technology Assessment 2004; Vol. 8: No. 46
Exercises that strengthen the lower limb musculature have been shown to produce improvements in pain and locomotor function in patients with knee osteoarthritis. Physiotherapists often provide home- and class-based exercise programmes for patients with knee osteoarthritis; however, the effect of supplementing home-based exercise with class-based exercise has not been established.

Objectives
The study aimed to establish the relative effectiveness and cost of providing a home-based exercise programme versus home-based exercise supplemented with an 8-week class-based exercise programme.

Methods
Design
The trial was a pragmatic, single-blind randomised clinical trial accompanied by a full economic evaluation.

Subjects and setting
The subjects were 214 patients, meeting the American College of Rheumatology’s classification of knee osteoarthritis, selected from referrals from the primary and secondary care settings. Patients were randomly allocated to either home-based exercise or home exercise supplemented with class exercise programmes.

Interventions
Both groups were given a home exercise programme aimed at increasing lower limb strength, and endurance, and improving balance. The supplemented group also attended 8 weeks of twice-weekly knee classes run by a physiotherapist. Classes represented typical knee class provision in the UK.

Main outcome measures
Assessments of locomotor function, using a timed score of three locomotor activities (walking, transferring and stair time), walking pain and self-reported disability with the Western Ontario and McMaster’s Universities osteoarthritis index (WOMAC) were made. General health, lower limb strength, range of movement and compliance with exercise were also measured. Patients were assessed before and after treatment, and also at 6- and 12-month follow-ups. The economic evaluation looked at health service resource use and assessed cost-effectiveness by relating differential costs to differences in quality-adjusted life-years (QALYs) based on patients’ responses to the EuroQol-5 Dimensions. Data were obtained at baseline, 1 month, 6 months and 12 months through face-to-face interviews and, where appropriate, examination of hospital medical records.

Results
Analysis involved the use of a longitudinal linear model analysis of covariance. Patients from the supplemented group demonstrated significantly greater improvement in locomotor function and decrease in pain while walking at all follow-ups. Pooled estimates of effect were –2.9 seconds [95% confidence interval (CI) –1.8 to –4.0] for locomotor function and 14.9 mm (95% CI –11.7 to –18.1) for walking pain, representing between-group differences of 12% and 27%, respectively. The supplemented group also demonstrated smaller but significant improvements in balance, strength, WOMAC score, and the physical function and pain dimensions of the Short Form-36 (p < 0.05). However, not all of these improvements were maintained over the 12-month follow-up period. There was no evidence that compliance with the home exercise programme was different or that total costs or mean QALY gains were significantly different between the groups. However, costs were slightly lower and QALY gains slightly higher in the group with the supplementary class-based programme. Thus, for most reasonable values of a decision-maker’s willingness to pay for an additional QALY, the addition of the class-based programme is likely to be cost-effective. There is considerable uncertainty around this estimate and a probability of approximately 30–35% that the intervention is not cost-effective.
Conclusions

The supplementation of a home-based exercise programme with a class-based exercise programme led to superior improvement in the supplemented group. These differential improvements were still evident at review 12 months after treatment had ceased. The additional cost of the supplemented group was offset by reductions in resource use elsewhere in the system. Compliance with the home exercise programme did not differ between the groups.

Implications for the health service

Based on this evidence, the supplementation of a home-based exercise programme with an 8-week class-based exercise programme can be confidently expected to produce small improvements in locomotor function and clinically important reductions in pain. Cost-effectiveness is somewhat less certain, although at levels of willingness to pay for an additional QALY of greater than £10,000, the probability that supplemented programmes would be cost-effective is around 70%.

Recommendations for future research

It is recommended that future research investigates methods of increasing compliance with home exercise programmes and evaluates the impact of these interventions in the primary care setting, where most patients with knee osteoarthritis are managed.

Publication

NHS R&D HTA Programme

The research findings from the NHS R&D Health Technology Assessment (HTA) Programme directly influence key decision-making bodies such as the National Institute for Clinical Excellence (NICE) and the National Screening Committee (NSC) who rely on HTA outputs to help raise standards of care. HTA findings also help to improve the quality of the service in the NHS indirectly in that they form a key component of the ‘National Knowledge Service’ that is being developed to improve the evidence of clinical practice throughout the NHS.

The HTA Programme was set up in 1993. Its role is to ensure that high-quality research information on the costs, effectiveness and broader impact of health technologies is produced in the most efficient way for those who use, manage and provide care in the NHS. ‘Health technologies’ are broadly defined to include all interventions used to promote health, prevent and treat disease, and improve rehabilitation and long-term care, rather than settings of care.

The HTA programme commissions research only on topics where it has identified key gaps in the evidence needed by the NHS. Suggestions for topics are actively sought from people working in the NHS, the public, consumer groups and professional bodies such as Royal Colleges and NHS Trusts. Research suggestions are carefully considered by panels of independent experts (including consumers) whose advice results in a ranked list of recommended research priorities. The HTA Programme then commissions the research team best suited to undertake the work, in the manner most appropriate to find the relevant answers. Some projects may take only months, others need several years to answer the research questions adequately. They may involve synthesising existing evidence or designing a trial to produce new evidence where none currently exists.

Additionally, through its Technology Assessment Report (TAR) call-off contract, the HTA Programme is able to commission bespoke reports, principally for NICE, but also for other policy customers, such as a National Clinical Director. TARs bring together evidence on key aspects of the use of specific technologies and usually have to be completed within a limited time period.

Criteria for inclusion in the HTA monograph series

Reports are published in the HTA monograph series if (1) they have resulted from work commissioned for the HTA Programme, and (2) they are of a sufficiently high scientific quality as assessed by the referees and editors.

Reviews in Health Technology Assessment are termed ‘systematic’ when the account of the search, appraisal and synthesis methods (to minimise biases and random errors) would, in theory, permit the replication of the review by others.

The research reported in this monograph was commissioned by the HTA Programme as project number 94/39/14. As funder, by devising a commissioning brief, the HTA Programme specified the research question and study design. The authors have been wholly responsible for all data collection, analysis and interpretation and for writing up their work. The HTA editors and publisher have tried to ensure the accuracy of the authors’ report and would like to thank the referees for their constructive comments on the draft document. However, they do not accept liability for damages or losses arising from material published in this report.

The views expressed in this publication are those of the authors and not necessarily those of the HTA Programme or the Department of Health.

Editor-in-Chief: Professor Tom Walley
Series Editors: Dr Peter Davidson, Professor John Gabbay, Dr Chris Hyde,
Dr Ruairidh Milne, Dr Rob Riemsma and Dr Ken Stein
Managing Editors: Sally Bailey and Caroline Ciupek

ISSN 1366-5278
© Queen’s Printer and Controller of HMSO 2004

This monograph may be freely reproduced for the purposes of private research and study and may be included in professional journals provided that suitable acknowledgement is made and the reproduction is not associated with any form of advertising.

Applications for commercial reproduction should be addressed to NCCHTA, Mailpoint 728, Boldrewood, University of Southampton, Southampton, SO16 7PX, UK.

Published by Gray Publishing, Tunbridge Wells, Kent, on behalf of NCCHTA.
Printed on acid-free paper in the UK by St Edmundsbury Press Ltd, Bury St Edmunds, Suffolk.