Cost-effectiveness of a supplementary class-based exercise program in the treatment of knee osteoarthritis

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Record Status
This is a critical abstract of an economic evaluation that meets the criteria for inclusion on NHS EED. Each abstract contains a brief summary of the methods, the results and conclusions followed by a detailed critical assessment on the reliability of the study and the conclusions drawn.

Health technology
The study compared the combination of a class-based exercise programme and home-based exercise programme versus a home-based exercise programme alone for the treatment of knee osteoarthritis.

Type of intervention
Treatment.

Economic study type
Cost-effectiveness analysis.

Study population
Characteristics of the study population were not reported in this study. The reader is referred to the "parent" randomised controlled trial (RCT) (McCarthy et al. 2004, see 'Other Publications of Related Interest' below for bibliographic details).

Setting
The setting was primary care and the community. The economic analysis was carried out in the UK.

Dates to which data relate
The dates to which the effectiveness evidence referred were not reported. The cost data were derived from sources published between 2000 and 2001, and the costs were reported for the price year 1999/2000.

Source of effectiveness data
The effectiveness data were derived from a published clinical trial.

Link between effectiveness and cost data
It appears that the costing has been carried out prospectively on the same sample of patients as that used in the effectiveness study.

Study sample
The study sample comprised 214 patients, 103 in the home-based exercise alone group and 111 in the intervention group (additional class-based exercise programme with existing home-based exercise programme). Information on power calculations and the method of sample selection were not reported in this study. The authors referred instead to a separate clinical paper (McCarthy et al. 2004).
**Study design**
The analysis was based on an RCT. The authors only reported limited information for this field, referring instead to the clinical paper (McCarthy et al. 2004).

**Analysis of effectiveness**
It was not reported whether the analysis was conducted on an intention to treat basis or on treatment completers only. In addition, details on the comparability of the two patient groups were not reported in the current study. The reader is referred to the separate clinical paper for further details (McCarthy et al. 2004). The authors used the QALY as the primary outcome based on the EQ5D instrument. EQ5D measures patient Quality of Life across 5 dimensions, namely: mobility, self care, usual activities, pain/discomfort and anxiety/depression. The patients' health states were evaluated using the EuroQol 5D (EQ 5D) questionnaires through face to face interviews at baseline, and the 1, 6 and 12 month follow-up after initiation of the programmes.

**Effectiveness results**
In the home-based group, the mean EQ-5D score was 0.50 (standard error, SE=0.03) at baseline, 0.52 (SE=0.03) at 1 month, 0.54 (SE=0.03) at 6 months and 0.53 (SE=0.03) at 12 months. The mean change in EQ-5D scores over the 12-month period was 0.022 (SE=0.03).

In the class-based group, the mean EQ-5D score was 0.54 (SE=0.03) at baseline, 0.60 (SE=0.02) at 1 month, 0.58 (SE=0.02) at 6 months and 0.58 (SE=0.02) at 12 months. The mean change in EQ-5D scores over the 12-month period was 0.045 (SE=0.03)

**Clinical conclusions**
The analysis demonstrated that the combination of a supplementary class-based exercise programme with a home-based programme achieved somewhat better EQ-5D scores over the trial period in comparison with the home-based programme alone, but the difference was not statistically significant. The combined programme had a bigger impact on the patients' health states in the first month after initiation of the intervention.

**Measure of benefits used in the economic analysis**
The measure of benefits used was the quality-adjusted life-years (QALYs). EQ-5D scores were obtained through face-to-face interviews at baseline, and 1, 6 and 12 months after the initiation of treatment. Then, EQ-5D scores were converted into utility scores based on a "tariff" retrieved from interviews conducted with 3,395 citizens in the UK.

**Direct costs**
From the NHS perspective, the direct costs included in the analysis were for GP home visit, GP surgery visit, district nurse visit, practice nurse visit, day hospital attendance, day case attendance, inpatient hospitalisation, outpatient attendances, and accident and emergency attendances. Resource use was based on actual data derived from the patients' medical records and patient questionnaires conducted at baseline, and 1, 6 and 12 months after the initiation of treatment. The costs and the quantities were reported separately. Overheads, capital costs and training costs were included in the analysis, accounting for a class of average size and duration. All costs were derived from published sources and were appropriately adjusted for inflation. Discounting was not relevant as the costs were incurred within a period of 12 months. The price year was reported (1999/2000).

**Statistical analysis of costs**
Based on the assumption that data were missing at random, the authors imputed missing data using SOLAS software (Statistical Solutions Ltd.) using a non-parametric approach (i.e. the propensity score method). Carrying out multiple imputations, multiple data series were created, each with different imputed values for missing values. Values were assigned to each of the five dimensions of the EQ-5D and for each missing component of the resources used.
Indirect Costs
The indirect costs were not included in the analysis.

Currency
UK pounds sterling (£).

Sensitivity analysis
The authors conducted a multi-way sensitivity analysis to assess the impact of imputation of missing data on the results. A sensitivity analysis was conducted using data only from patients with complete data. Overall, data from 74 patients were used, 30 patients from the home-based group and 44 patients from the class-based group.

Estimated benefits used in the economic analysis
At the end of the 12-month period, the combined programme resulted in 0.023 mean additional QALYs (SE=0.04) compared with the home-based programme alone. The authors reported that the difference was not statistically significant.

Cost results
The total costs were reported per patient. The mean total cost over the 12-month period was 440.04 (SE=71.66) in the class-based programme and 445.52 (SE=57.43) in the home-based programme. The difference of 5.48 (SE=100.32) was not statistically significant.

Synthesis of costs and benefits
Although the authors intended to perform an incremental cost-effectiveness analysis, the class-based programme proved to be more effective in terms of the QALYs generated and less costly. It was characterised as the dominant strategy.

However, the domination of the class-based programme regarding both effectiveness and costs was not statistically significant, thereby introducing uncertainty into the results. To handle the uncertainty, the authors calculated net monetary benefits (NMBs) for each group and plotted cost-effectiveness acceptability curves. The NMBs analysis demonstrated that assuming a zero value for willingness-to-pay for an additional QALY gives a probability of 0.5 that the class-based programme is more cost-effective. If willingness-to-pay for an additional QALY increases to 30,000, the class-based programme has a probability of over 70% of being cost-effective.

The sensitivity analysis demonstrated that when using completed data there is greater probability that the class-based programme is cost-effective in comparison with the home-based programme alone. However, the reduction in costs was insignificant and the change in QALYs was 0.12 compared with the home-based group (instead of 0.023 in the missing data imputation analysis).

Authors’ conclusions
The addition of a class-based exercise programme to a home-based exercise programme is likely to be cost-effective.

CRD COMMENTARY - Selection of comparators
The selection of the comparators was explicitly justified. The home-based exercise programme alone would seem to represent the most common approach in the authors’ setting. You should decide if this represents a widely used technology in your own setting.

Validity of estimate of measure of effectiveness
The analysis was based on an RCT, which seems to have been appropriate given the study question. It was unclear
whether the study sample was representative of the study population because no details of the patients were provided. It is not possible to comment on the internal validity of the effectiveness study since the authors referred to a separate paper for details of the clinical study. In addition, no power calculations were reported. Thus, it was not possible to ascertain whether the results obtained were due to the intervention or to chance.

Validity of estimate of measure of benefit
The measure of benefits used was health utility (QALYs), measured over 12 months using the EQ-5D questionnaire.

Validity of estimate of costs
The analysis of the costs was performed from the perspective of the NHS. As such, it appears that all the relevant categories of costs have been included in the analysis. The costs and the quantities were reported separately, thus enhancing the reproducibility of the study in other settings. Appropriate statistical and sensitivity analyses were performed to assess the robustness of the results. The costs were appropriately inflated and the price year was reported, thereby enhancing any future reflation exercises. Discounting was appropriately not carried out.

Other issues
The authors compared their findings with those from other studies, attributing differences in the results to the different methodologies used for analysis. The issue of generalisability of the results to other setting was not directly addressed. The authors do not appear to have presented their results selectively. The study enrolled patients with knee osteoarthritis and this was reflected in the authors’ conclusions. The authors did not report any limitations to their study.

Implications of the study
The authors did not make explicit recommendations for future research. However, they suggested "the provision of an additional class-based exercise program to supplement a home-based exercise program should be considered for patients with osteoarthritis of the knee”.

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Other publications of related interest

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