Evidence-based medicine is affordable: the cost-effectiveness of current compared with optimal treatment in rheumatoid and osteoarthritis

Andrews G, Simonella L, Lapsley H, Sanderson K, March L

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 examined current treatment and optimal treatments for patients with either rheumatoid arthritis (RA) or osteoarthritis (OA). Current treatment was defined as services used and interventions prescribed in Australia in 2000/01. Services included general practitioner (GPs) and specialist contacts, imaging, pathology and hospital care. Interventions included pharmaceuticals, surgery and exercise. Optimal treatment referred to interventions and services used in accordance with evidence-based practice guidelines.

Type of intervention
Treatment.

Economic study type
Cost-utility analysis.

Study population
The study population comprised two hypothetical cohorts of patients with RA and OA.

Setting
The setting was primary and secondary care. The economic study was carried out in Australia.

Dates to which data relate
The effectiveness and resource use data were derived from studies published between 1986 and 2004. The costs were expressed using 2000/01 prices.

Source of effectiveness data
The effectiveness evidence was derived from a synthesis of published studies.

Outcomes assessed in the review
The outcomes estimated from the literature were disease prevalence, disability weights associated with specific conditions, disease severity distribution, and treatment effect.

Study designs and other criteria for inclusion in the review
The authors carried out several reviews of the literature to identify relevant primary studies. However, details of these reviews were not reported. Disability weights were obtained from the Australian Burden of Disease and Injury study. Data on specific services and treatments received were derived from hospital surveys, surveys of GP consultations, and the Australian Institute of Health and Welfare (AIHW) National Hospital Morbidity database. Treatment effects were...
estimated from meta-analyses and randomised clinical trials. The method used to calculate treatment effect was described.

**Sources searched to identify primary studies**
Not reported.

**Criteria used to ensure the validity of primary studies**
The use of clinical trials and meta-analyses enhances the internal validity of the primary estimates.

**Methods used to judge relevance and validity, and for extracting data**
Not reported.

**Number of primary studies included**
Twenty-five primary studies provided the clinical data.

**Methods of combining primary studies**
Weighted averages were often calculated to combine estimates derived from the primary studies. The effect size was adjusted by a conversion factor in order to obtain changes in disability weights. Also, the effect size obtained from the literature was downgraded to take account of poor adherence in routine practice.

**Investigation of differences between primary studies**
Not reported.

**Results of the review**
The prevalence of RA was 0.3% (or 57,762 adults in Australia in 2000/01). The disability weight for RA was 0.23. Specifically, the disability weight was 0 for no disability, 0.21 for mild disease, 0.37 for moderate disease, and 0.94 for severe disease.

The prevalence of OA was 3.6% (or 677,842 adults in Australia in 2000/01). The disability weight for OA was 0.12. Specifically, the disability weight was 0.01 for mild disease, 0.14 for moderate disease, and 0.42 for severe disease.

The severity distribution for RA was 38% for no disability, 35% for mild disease, 17% for moderate disease, and 10% for severe disease.

The severity distribution for OA was 46% for mild disease, 41% for moderate disease, and 13% for severe disease.

The effect size (variance in parentheses) of treatment for RA was 0.78 (0.06) for disease-modifying antirheumatic drugs (DMARDs), 0.36 (0.06) for non-steroidal anti-inflammatory drugs (NSAIDs), 0.45 (0.02) for systemic corticosteroids, and 1.51 (0.08) for combined methotrexate and leflunomide.

The effect size of treatment for OA was 0.49 (0.04) for NSAIDs, 0.11 (0.04) for systemic corticosteroids, 0.11 (0.04) for analgesics, 0.35 (0.02) for exercise, 0.78 (0.02) for exercise and medication, 1.07 (0.01) for joint replacement, and 0.09 (0.02) for arthroscopy.

**Measure of benefits used in the economic analysis**
The summary benefit measure was the expected number of years lived with disability (YLD). These were estimated using a mathematical approach that was described extensively in the study. The disability weights were obtained by
multiplying the treatment effect size by a conversion factor that was taken from the literature. The instrument used to obtain the disability weights was a modification of the EuroQol 5D. The YLD was calculated as the product of prevalence of OA or RA and the associated disability weight. Discounting was not necessary given the short time horizon of the analysis.

**Direct costs**
The analysis of the costs was carried out from the perspective of the government or the health service. It included the costs of medications (DMARDs, NSAIDs, corticosteroids, analgesics and opioids), GP and specialist visits, hospital stay, imaging, pathology, surgery and exercise. Potential toxicity associated with the drugs was taken into consideration. The unit costs were presented separately from the quantities of resources used for most items. Resource consumption was based on data derived from published sources such as primary studies and government databases. For example, it was estimated that 70% of patients suffering from RA received DMARDs and 30% received NSAIDs with the current treatment. The resource use data for the optimal treatment were based on international clinical guidelines. The costs were obtained from multiple Australian sources, including the Australian Medical Benefit Schedule of prices, the National Hospital Cost Data Reference Manual, and the Pharmaceutical Benefit Schedule. Discounting was not relevant as 1-year costs were assessed. The costs were adjusted to 2000/01 values using the relevant inflator/deflator health consumer price index.

**Statistic analysis of costs**
The costs were treated deterministically in the base-case.

**Indirect Costs**
The indirect costs were not included in the economic evaluation.

**Currency**
Australian dollars (AUD).

**Sensitivity analysis**
A sensitivity analysis, based on Monte Carlo simulation, was carried out to provide confidence intervals (CIs) around some key parameters. A multivariate stepwise linear regression was carried out to determine the strongest predictors in variance around the cost-effectiveness estimates. Univariate sensitivity analyses were performed on some variables.

**Estimated benefits used in the economic analysis**
For patients with RA, the YLD averted in a cohort of 53,545 patients were 4,448 (95% CI: 2,380 to 12,629) with current treatment and 7,758 (95% CI: 3,561 to 19,680) with optimal treatment. The burden of disease averted was 26% with current treatment and 48% with optimal treatment (compared with no treatment).

For patients with OA, the YLD averted in a cohort of 597,957 patients were 31,180 (95% CI: 14,724 to 48,257) with current treatment and 43,690 (95% CI: 18,648 to 63,341) with optimal treatment. The burden of disease averted was 27% with current treatment and 39% with optimal treatment (compared with no treatment).

**Cost results**
For patients with RA (n=53,545), the total costs of treatment (in millions) were AUD 85.5 (95% CI: 77.1 to 190.5) with current treatment and AUD 92.1 (95% CI: 62.5 to 248.9) with optimal treatment.

For patients with OA (n=597,957), the total costs of treatment (in millions) were AUD 787.7 (95% CI: 479.7 to 1,667.6) with current treatment and AUD 1,110.3 (95% CI: 545.2 to 2,449.2) with optimal treatment.
Synthesis of costs and benefits

Incremental cost-utility ratios (i.e., incremental cost per YLD averted) were calculated to combine the costs and benefits of the alternative treatment strategies.

For patients with RA, the incremental cost per YLD averted (compared with no treatment) was AUD 19,227 (95% CI: 11,251 to 44,116) with current treatment and AUD 11,890 (95% CI: 9,082 to 25,930) with optimal treatment.

For patients with OA, the incremental cost per YLD averted (compared with no treatment) was AUD 25,226 (95% CI: 14,450 to 67,151) with current treatment and AUD 25,414 (95% CI: 19,650 to 51,338) with optimal treatment.

Overall, for RA patients, optimal treatment would require 7% more funds but would result in an 85% increase in health gains at AUD 2,000 per YLD averted. This appears to be an attractive figure from the perspective of the health service. In OA, optimal treatment would require a 40% increase in funds for a 40% increase in health gain. Therefore, the decision on whether to move from current to optimal treatment was less clear.

The sensitivity analysis showed that most of the variables for both arthritic disorders had substantial uncertainty, as the wide CIs showed.

The regression analysis showed that the variance of the cost-utility ratio was predicted by hospital costs, prevalence estimates and treatment effect. For optimal treatment, significant predictors were the treatment effect, hospital costs, prevalence and severity levels.

The univariate sensitivity analysis suggested that variations in uncertain parameters did not alter the conclusions of the base-case analysis.

Authors’ conclusions

Optimal treatment for patients with rheumatoid arthritis (RA) would be efficient from the perspective of the health service payer in Australia. Less attractive conclusions were obtained for patients with osteoarthritis (OA), but the cost-effectiveness ratio amounted to AUD 25,000 per year lived with disability (YLD) averted.

CRD COMMENTARY - Selection of comparators

The rationale for the choice of the comparators was clear since current treatment in Australia in 2000/01 was compared with optimal treatment as defined in international guidelines. Both strategies were compared with no treatment. You should decide whether they are valid comparators in your own setting.

Validity of estimate of measure of effectiveness

The effectiveness data were estimated from published studies. The studies were identified from a review of the literature, although details of the methods and conduct of the review were not reported. Some information on the designs of the primary studies was provided. Data on treatment efficacy came from a synthesis of published meta-analyses or clinical trials, thus ensuring the validity of these estimates. The approach used to extract and then combine the primary estimates was reported, but the authors did not explicitly address the issue of homogeneity amongst the primary studies. Sensitivity analyses were appropriately performed to investigate the impact of changes in some clinical data.

Validity of estimate of measure of benefit

The summary benefit measure was appropriate for assessing the burden of disease. The YLD represents a component of disability-adjusted life-years (DALYs), which are widely used to synthesise burden of disease and survival in a single index. DALYs are generally comparable with the benefits of other health care interventions.

Validity of estimate of costs
The analysis of the costs was consistent with the perspectives adopted in the study. The economic data were derived from published sources but limited information on such studies was provided. Much of the data on resource consumption reflected conventional treatment patterns. The unit costs were presented separately from the quantities of resources used, which enforces the possibility of replicating the analysis in other settings. The issue of variability in the economic data was addressed in the Monte Carlo analysis. The authors reported the price year, which will facilitate reflation exercises in other time periods.

Other issues
The authors reported the results from other studies but did not make explicit comparisons with their own findings. The issue of the generalisability of the study results to other settings was not explicitly addressed although sensitivity analyses were performed, which enhance the external validity of the analysis. The authors stated that the main limitation of the analysis was the lack of primary data on prevalence and resource usage. It was also pointed out that the assumption that efficacy can be used as a proxy for effectiveness could have led to an overestimation of the benefits of treatment. Further, all patients were presumed to be eligible for treatment.

Implications of the study
The study results support the implementation of optimal treatments for patients with RA.

Source of funding
Supported by the National Health and Medical Research Council of Australia.

Bibliographic details

PubMedID
16541479

Other publications of related interest


Indexing Status
Subject indexing assigned by NLM

MeSH
Antirheumatic Agents /economics /therapeutic use; Arthritis, Rheumatoid /economics /therapy; Australia; Cost-Benefit Analysis; Evidence-Based Medicine /economics; Health Care Costs; Humans; Models, Econometric; Osteoarthritis /economics /therapy

AccessionNumber
22006000783
Date bibliographic record published
31/10/2006

Date abstract record published
31/10/2006