Lumbar laminectomy alone or with instrumented or noninstrumented arthrodesis in degenerative lumbar spinal stenosis: patient selection, costs, and surgical outcomes

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
Lumbar laminectomy alone or with instrumented or noninstrumented arthrodesis in degenerative lumbar spinal stenosis.

Type of intervention
Treatment.

Economic study type
Cost-effectiveness analysis.

Study population
Patients with degenerative lumbar stenosis undergoing laminectomy alone or with instrumented or noninstrumented arthrodesis.

Setting
4 hospitals (departments of orthopaedic surgery of university referral centres) situated in Boston, Massachusetts, Winston Salem, North Carolina and Hanover, New Hampshire, USA.

Dates to which data relate
Patients were entered in the study from January 1989 until June 1993. Costs were obtained from the Brigham and Women's Hospital, using the administrative computing system. Cost dates were not stated.

Source of effectiveness data
Single study.

Link between effectiveness and cost data
Costing was undertaken using the computerised cost information from one of the hospitals included in the study.

Study sample
Eight surgeons from the four centres invited 310 consecutive, eligible patients to participate in the study during the period of enrolment (January 1989 to June 1993). Entry criteria included age 50 years and over and the presence of each of the following:

(1) back, buttock, and/or lower extremity pain;

(2) radiographic evidence of compression of cauda equina or existing nerve roots by ligamentum falvum, facet joints,
osteophytes, and/or disc material; and

(3) the surgeon’s judgement that patients had clinically significant degenerative lumbar spinal stenosis.

38 patients (12% of those eligible) refused to participate, leaving 272 eligible patients who completed postoperative questionnaires. At 6 months follow-up, 2 patients had died and 34 (12.5% of participants) either refused to continue in the study or were lost to follow-up. As a consequence, 236 patients in total had complete postoperative and 6-month follow-up data. At 24 months follow-up, an additional 8 patients died and 29 refused to continue to participate, leaving 199 patients in total with complete 24-month follow-up data. Of the 272 patients in the study, 194 (71%) had laminectomy without arthrodesis, 37 (14%) had noninstrumented arthrodesis and 41 (15%) had instrumented arthrodesis.

**Study design**
This was a prospective, multicentre, non-randomised observational study.

**Analysis of effectiveness**
Analysis was based on treatment completers only. The main health outcomes used in the analysis were: health status, walking capacity, back and leg pain and satisfaction with surgery. The questionnaires used included the Sickness Impact profile, a 136-item generic health status instrument used for patients with low back pain.

**Effectiveness results**
The major predictor of the decision to perform arthrodesis was the individual surgeon, \( p = 0.0001 \). Noninstrumented arthrodesis was associated with superior relief of low back pain at 6 months \( p = 0.004 \) and 24 months \( p = 0.01 \). This difference persisted in multivariate analysis, with borderline statistical significance. There were no significant differences in the other outcomes across treatment groups.

**Clinical conclusions**
Noninstrumented arthrodesis enhances resolution of the back pain component of the syndrome of lumbar spinal stenosis.

**Modelling**
Logistic regression was used to identify factors associated with arthrodesis and linear regression models were used to adjust for confounders.

**Measure of benefits used in the economic analysis**
The main health outcomes used in the analysis were: health status, walking capacity, back and leg pain and satisfaction with surgery.

**Direct costs**
Quantities and costs were analysed separately. Only direct health service costs were considered: inpatient cost of surgery and length of stay. Costs were obtained from the Brigham and Women's Hospital, using the administrative computing system. The price dates were not stated.

**Statistical analysis of costs**
Analyses were performed with the SAS statistical package. All \( p \) values are two-tailed. A \( p \) value of less than 0.01 was considered statistically significant, with \( p \) values between 0.01 and 0.05 considered borderline significant. Demographic and clinical characteristics associated with the use of arthrodesis and instrumentation were compared with the chi-
squared and Kruskal-Wallis tests, respectively.

**Indirect Costs**
Not considered.

**Currency**
US dollars ($).

**Sensitivity analysis**
No sensitivity analysis was performed.

**Estimated benefits used in the economic analysis**
The major predictor of the decision to perform arthrodesis was the individual surgeon, \( p=0.0001 \). Noninstrumented arthrodesis was associated with superior relief of low back pain at 6 months \( p=0.004 \) and 24 months \( p=0.01 \). This difference persisted in multivariate analysis, with borderline statistical significance. There were no significant differences in the other outcomes across treatment groups.

**Cost results**
Mean hospital costs of laminectomy alone were $12,615, costs of noninstrumented arthrodesis were $18,495 and costs of instrumented arthrodesis were $25,914, \( p=0.0001 \).

**Synthesis of costs and benefits**
Costs and benefits were not combined. The use of instrumentation results in greater hospital costs, but without superior symptom relief, functional improvement or patient satisfaction.

**Authors' conclusions**
The authors concluded that:

1. the individual surgeon was a more important correlate of the decision to perform arthrodesis than clinical variables such as spondylolisthesis;

2. noninstrumented arthrodesis resulted in superior relief of back pain after 6 and 24 months; and

3. instrumented arthrodesis was the most costly option.

**CRD COMMENTARY - Selection of comparators**
The reason for the choice of the comparators is clear, as all were widely used health technologies in the authors' settings. You, as a database user, should consider whether these comparators are appropriate for your own setting.

**Validity of estimate of measure of benefit**
Data do not appear to have been used selectively to prove a particular point and the choice of health outcomes is justified. Appropriate and extensive comparisons were made with other similar studies.

**Validity of estimate of costs**
Adequate details of methods of quantity/cost estimation were given and no important cost items were omitted.

**Other issues**
The authors considered that their findings were limited by the number of participating surgeons, the modest sample size and the non-randomised design.

**Implications of the study**
A well designed randomised controlled study of lumbar arthrodesis and instrumentation, including a formal economic component is needed.

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