

Guidelines for the performance of fusion procedures for degenerative disease of the lumbar spine. Part 3: assessment of economic outcome

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Recommendations

Standards. There is insufficient evidence to recommend a standard for assessment of economic outcome following lumbar fusion for degenerative disease.

Guidelines. There is insufficient evidence to recommend a guideline for assessment of economic outcome following lumbar fusion for degenerative disease.

Options. It is recommended that valid and responsive economic outcome measures be included in the assessment of outcomes following lumbar fusion surgery for degenerative disease. Return-to-work rates and termination of disability compensation are two such measures. It is recommended that cost analyses related to lumbar spinal fusion include perioperative expenses as well as expenses associated with long-term care, including those incurred in both the operative and nonoperative settings.

Rationale

Lumbar fusion is commonly performed as an adjunct to the surgical treatment of patients with low-back pain due to degenerative lumbar disease. Using data from the National Hospital Discharge Survey, both Deyo, et al.,⁴ and Davis³ observed a dramatic increase in the frequency of

lumbar fusion procedures in the 1980s. Lumbar fusion has been undertaken in the setting of degenerative disc disease, spinal stenosis, spondylolisthesis, and degenerative scoliosis and is commonly supplemented with internal fixation involving a variety of devices. As the frequency and complexity of lumbar fusion surgery increases, there is a tendency for costs and complication rates to follow.⁹ In a time of contracting hospital resources, it is important to understand the economic impact of lumbar fusion. The purpose of this review is to examine the economic impact of lumbar fusion for degenerative lumbar spine disease as assessed by cost, complication rates, and rates of reoperation. These expenses of lumbar fusion must be contrasted with the return-to-work rate and the potential for improved productivity following treatment. These end points will be examined as economic outcome measures following lumbar fusion.

Search Criteria

A computerized search of the National Library of Medicine database of the literature published between 1966 and 2001 was performed. A search using the subject heading “lumbar fusion” yielded 3708 citations. The following subject headings were combined: “lumbar fusion and outcomes.” Approximately 204 citations were acquired. Only citations in English were selected. A search of this set of publications with the key words “employment status,” “mortality,” “medical care costs,” “cost containment/com-

Abbreviations used in this paper: CI = confidence interval; LOS = length of stay; QOL = quality of life; RR = relative risk.

parison,” or “cost effectiveness” resulted in 58 matches. Titles and abstracts of the articles were reviewed. Clinical series dealing with adult patients who had lumbar fusion for degenerative disease were selected. Additional references were culled from the reference lists of remaining articles.

Among the articles reviewed, 13 studies were included that dealt with lumbar fusion, complication rates, reoperation rates, and costs. Six of these articles were cohort studies that examined the economic impact of lumbar fusion compared with surgery for degenerative lumbar disease that did not involve fusion. One article was a cohort study investigating fusion with and without fixation. Two studies examined the cost benefit or cost effectiveness of lumbar fusion compared with decompression alone. The remaining study examined the responsiveness of returning to work as an economic indicator in a large series. These articles are summarized in Table 1.

Scientific Foundation

One of the more difficult results to ascertain following a medical or surgical treatment is economic outcome. Typical medical economic analyses seek to ascertain whether a given treatment-related benefit accrues in light of the expenditures required to provide that treatment. With regard to lumbar fusion procedures, benefits from treatment may include an overall improvement in low-back pain and function, an increased return-to-work rate, and/or improved patient satisfaction. The expenses of the procedures are the measured costs of the surgery, the devices implanted, and operative time. Other measurable outlays include the cost of complications and time and expenses associated with reoperation. Deyo and colleagues⁴ examined data concerning lumbar spinal disease and lumbar spinal fusion from the National Hospital Discharge Survey between 1979 and 1987. In addition to a 200% increase in spinal fusion procedures performed during this period, the authors reported significant regional variations in the performance of lumbar fusion procedures as reflected by a ninefold regional variation in frequency between the northeastern US (four/100,000) and the western US (35/100,000). Because of the increasing incidence of lumbar fusion procedures in the treatment of degenerative spine disease, it is important to examine the economic impact of lumbar fusion as a specific outcome measure.

Costs, Complications, Hospitalizations, and Reoperations

Malter and colleagues¹² performed a population-based study of patients who underwent lumbar surgery for degenerative disease in Washington state in 1988. The study was not prospective, nor was it clear that all patients were eligible for all therapies. Using diagnosis and procedure codes from the Washington State Department of Health's computerized system, the authors obtained data on 6376 patients of whom 1041 underwent lumbar fusion. Rates of reoperation, complications, and associated costs (in 1988 US dollars) were examined through the next 5 years. The complication rates associated with lumbar arthrodesis procedures were 18% compared with a 7% complication rate following lumbar surgery without arthrodesis (chi-square test, $p < 0.001$). The LOS was significantly longer for

fusion-treated patients (7 days compared with 5.1 days; $p < 0.001$). In 1988 dollars, hospital costs averaged \$7101 per patient treated with fusion and \$4161 per patient treated without fusion ($p < 0.001$). These authors examined reoperation rates to determine if fusion reduced the need for repeated lumbar surgery within 5 years. Reoperation rates were similar between those treated with fusion (RR 1.1; 95% CI 0.9–1.3) and those not. Because the indications for surgery were not examined, the only conclusions that could be drawn from this study were that lumbar fusion procedures are associated with increased costs and complications.

Using similar methods and a hospital discharge registry in Washington state, Deyo and colleagues⁵ examined 18,122 hospitalizations for lumbar surgery between 1986 and 1988. The majority (84%) of cases requiring surgery involved spinal stenosis or disc displacement. Excluded were cases involving malignant lesions, infection, or fractures. Approximately 15% of patients in this cohort underwent arthrodesis in addition to decompression. The reported mortality rate was less than 1%. The complication rate was 17.4% among patients treated with fusion compared with a 7.6% rate for those with lumbar disease treated surgically without fusion (chi square test, $p < 0.0005$). The LOS among patients who were treated with fusion was approximately 7.6 days compared with 5.4 days for those who did not undergo fusion ($p < 0.0005$). In 1986 to 1988 dollars, the cost of hospitalization was \$6491 for fusion-treated patients compared with \$3793 for patients treated surgically without fusion ($p = 0.0005$). Logistic-regression models were used to examine the risk of complications or prolonged hospitalization and indicated that the RR for a complication or prolonged hospitalization with any type of lumbar fusion procedure was 2.7 (95% CI 1.5–4.9). The lack of information regarding the indications for surgery and the clinical outcome following surgery limit the usefulness of this information.

Deyo, et al.,⁶ examined lumbar surgery data for 1985 obtained from the Health Care Financing Administration for all Medicare recipients, excluding those on Medicare for chronic renal failure or Social Security Disability. Using ICD-9-CM diagnosis and procedure codes, data were accrued on the frequency of lumbar surgery performed with or without fusion and the incidence of associated complications. The study was not undertaken prospectively nor was it certain that all patients were eligible for all therapies. Specific data were obtained for 6-week mortality rates, requirements for assisted living, and the need for blood transfusion. An economic analysis was completed for LOS and cost. These data were compared with similar data from 1 year prior to 4 years after the study date. A study population of 27,111 patients was obtained of whom 1524 (5.6%) underwent lumbar fusion. For patients treated surgically with fusion, the mean hospital costs (1985 US dollars) were \$10,091 compared with \$6754 for patients treated without fusion (chi-square test, $p < 0.0005$). A logistic regression was completed to determine RR and (95%) CIs for several variables. In the fusion group, the RR was 1.9 (95% CI 1.6–2.2) for the presence of complications, 5.8 for blood transfusion (5.2–6.6), 2.0 for 6-week mortality (1.2–3.4), and 2.2 for discharge to a nursing home (1.7–3.0). This cohort study revealed that lumbar surgery with fusion was more expensive and