The use of ketorolac in lumbar spine surgery: a cost-benefit analysis


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 use of traditional narcotic analgesic drugs (morphine or meperidine) or ketorolac with narcotic analgesic drugs for post-operative intramuscular pain treatment for patients undergoing either simple lumbar laminectomy with discectomy (LL) or those undergoing lumbar fusion with or without instrumentation (LF).

Type of intervention
Treatment.

Economic study type
Cost-effectiveness analysis.

Study population
Within the LL group, 12 out of 35 patients were female in the narcotic group and 6 out of 31 patients were female in the ketorolac group, and the mean age for these two groups was 39.5 years and 38.6 years respectively. For the LF group, 7 out of 16 patients were female in the narcotic group and 12 out of 22 patients were female in the ketorolac group, the mean age of these two groups being 43.5 years and 46.7 years respectively.

Setting
The setting was the secondary care sector and the economic study was conducted in Colorado, USA.

Dates to which data relate
Effectiveness data were collected between March 1991 and April 1992, with an interruption from May 1991 through December 1991 due to the inability of the manufacturer to provide ketorolac. Price dates were not stated.

Source of effectiveness data
Evidence for final outcomes was based on a single study.

Link between effectiveness and cost data
Costing was undertaken prospectively on the same patient sample as that used in the effectiveness study.

Study sample
200 consecutive patients admitted for elective lumbar disc surgery were randomised to receive postoperative intramuscular treatment as required with either traditional narcotic analgesic drugs (morphine or meperidine) or ketorolac with narcotic analgesic drugs. Two surgical categories were assessed: LL and LF with or without instrumentation (LF). No power calculations to determine the sample size were reported. In total, within the LL group there were 35 patients in the narcotic group and 31 in the ketorolac group. For those undergoing LF, there were 16 in
the narcotic group and 22 in the ketorolac group. Patients were screened for chronic lung disease, arthritis, or any other disease process that might impair postoperative respiratory function or physical activity. Other exclusion criteria included documented allergy to aspirin or other NSAIDs, morphine or meperidine, age greater than 65 years, body weight less than 50kg, serum creatinine greater than 1.5 mg/dl, concurrent medication (e.g. warfarin, lithium and methotrexate), and a history of liver disease, CHF, peptic ulcer disease or a bleeding disorder. Once the exclusion criteria were applied, 104 patients were left in the study.

**Study design**
The study was single-centred, randomised and unblinded.

**Analysis of effectiveness**
It was not stated whether this study was based on intention to treat but this seems likely. The primary health outcomes considered were pain and sedation scores, and morbidity due to opiate drugs (respiratory depression, urinary retention, nausea and vomiting). There were no statistically significant differences between study groups in terms of age, sex, weight, use of pre-operative assistive devices or prior lumbar surgery. Length of stay and use of post-anaesthesia care unit (PACU) antiemetic or narcotic analgesic drugs did not differ between LL and LF groups.

**Effectiveness results**
26 out of 31 patients in the LL ketorolac group required postoperative injectable narcotic drugs and this was significantly less than for the narcotic group in which all 35 patients needed this (p<0.05). On the other hand, no significant difference in this respect was noted when comparing the LF group. More patients in the LL and the LF ketorolac group received naproxen than did LL/LF narcotic patients and this difference was statistically significant. Ketorolac patients in both surgical categories experienced better pain control than narcotic group patients. LL ketorolac patients experienced slightly less sedation than those in the narcotic group, and a similar trend was noted for fusion patients (these differences were not statistically significant). A significant improvement in postoperative ambulation was demonstrated in the fusion ketorolac group.

**Clinical conclusions**
For both surgical categories ketorolac patients experienced better pain control than the narcotic patients. LL ketorolac patients experienced less sedation than those in the narcotic group, and a similar trend was noted for fusion patients. A significant improvement in postoperative ambulation was demonstrated in the LF ketorolac group.

**Modelling**
Not undertaken.

**Measure of benefits used in the economic analysis**
This study was a cost-minimisation analysis. Whilst the consequences were reported separately from costs, the economic analysis explored cost comparisons (of which cost savings were one element).

**Direct costs**
Costs were not discounted and this was appropriate given the timescale. Costs, but not quantities, were reported. The costs calculated included the costs of the drugs and the cost of hospital stay and both these costs were based on actual data. No price date was provided.

**Statistical analysis of costs**
Between treatment comparisons of total analgesic and drug costs were made with two independent sample t tests.
Indirect Costs
Not undertaken.

Currency
US dollars ($).

Sensitivity analysis
No sensitivity analysis was undertaken.

Estimated benefits used in the economic analysis
Ketorolac patients in both surgical categories experienced better pain control than narcotic group patients. LL ketorolac patients experienced less sedation than those in the narcotic group, and a similar trend was noted for LF patients. A significant improvement in postoperative ambulation was demonstrated in the fusion ketorolac group.

Cost results
The overall annual financial impact of the use of ketorolac in lumbar spine patients would provide net savings of approximately $211,095. The net effect of the use of ketorolac therapy amounted to reduced stay as against increased medication cost and was calculated as a cost saving of $352 for LL patients. For the LF group, length of stay did not differ significantly between groups. Total yearly savings were estimated to be $238,295.

Synthesis of costs and benefits
Costs and consequences were reported separately and the economic analysis was, in essence, a cost-minimisation study.

Authors’ conclusions
In terms of effects (consequences), LL patients in the ketorolac treatment group used much less narcotic analgesic than those in the narcotic group. Less sedation and better post-operative ambulation was experienced in the LL ketorolac group. The increase in drug cost of the ketorolac group was more than offset by a half day reduction in hospitalisation for the LL ketorolac patients so that overall, over a year, the impact of the use of ketorolac in lumbar spine patients was estimated to result in net savings of $211,095.

CRD COMMENTARY - Selection of comparators
The appropriate comparator was used within this study.

Validity of estimate of measure of benefit
On the benefit side, the results are likely to be internally valid.

Validity of estimate of costs
Resource quantities were not reported and only general cost data were provided, limiting the transparency of the study findings. The main conclusion was that the use of ketorolac is cost-effective due to reduced costs as a result of decreased length of hospital stay. This assumes that cost savings can be realised when this may not in fact be the case.

Other issues
It would be useful for the study follow-up period to be extended beyond the length of hospital stay.
Source of funding
None stated.

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