Cost comparison between the atraumatic and cutting lumbar puncture needles

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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.

CRD summary
The study aimed to determine which type of spinal needle (atraumatic versus cutting needle) was preferred for performing a diagnostic lumbar puncture from a cost perspective. The authors concluded that the use of atraumatic needles for diagnostic lumbar puncture was cost-saving when compared with standard cutting needles. The focus of the model was cost outcomes, so the derivation of the clinical estimates driving the difference in costs was not well reported, which makes the results presented uncertain.

Type of economic evaluation
Cost-effectiveness analysis

Study objective
The study aimed to determine which type of spinal needle was preferred for performing a diagnostic lumbar puncture from a cost perspective.

Interventions
The two interventions compared were the atraumatic spinal needle (22-gauge Sprotte) and a cutting spinal needle (22-gauge Quincke).

Location/setting
USA/secondary care.

Methods
Analytical approach:
A decision-tree mapping clinical pathways was used to synthesise data from a range of sources in the published literature. The time horizon of the analysis was from time of the lumbar puncture to the resolution of the post-lumbar puncture headache (if applicable). The base-case model was based on a 40-year old patient with a neurological indication for a diagnostic lumbar puncture. The authors stated the study perspective was that of the health care system.

Effectiveness data:
The evidence came from a selection of known, recent studies selected from the published literature. The probability of post-lumbar puncture headaches was based on randomised controlled trial data for the cutting needle and a meta-analysis of RCTs for the atraumatic needle. Probabilities associated with recovery from post-lumbar headache after conservative management, aggressive medical management, conventional invasive treatment and aggressive invasive treatment came from other published literature. The main clinical estimates were the probability of successful insertion, post-lumbar puncture headache, and time for recovery from post-lumbar puncture headache.

Monetary benefit and utility valuations:
Not relevant.

Measure of benefit:
No summary measure of benefit was derived.

Cost data:
The costs included diagnostic lumbar puncture (labour and equipment), management of post-lumbar puncture headaches, and surgery. The sources of resource use and prices were the US estimates of Medicare costs, Medicare
reimbursement rates, and the published literature. The price year was 2011. Costs were given in US $ and were inflated to 2011 levels using the medical care component of the Consumer Price Index.

Analysis of uncertainty:
One-way and probabilistic sensitivity analyses (1,000 simulation runs) were conducted to assess uncertainty. The results of the one-way sensitivity analysis were presented as a graph; the probabilistic sensitivity analysis results were given in the text.

Results
Lumbar puncture performed using a standard cutting needle was estimated to cost US $192.15 per procedure on average. In comparison, lumbar puncture with an atraumatic needle was estimated to cost US $166.08, a cost-saving of US $26.07.

The cost saving per procedure was estimated to translate into an annual cost saving of $10.4 million per year, based on an estimated 400,000 procedures performed each year.

Sensitivity analyses showed that costs were most sensitive to the effectiveness of epidural blood patch (an aggressive invasive treatment) for post-lumbar puncture headache.

Authors' conclusions
The authors concluded that the use of atraumatic needles for diagnostic lumbar puncture was cost-saving when compared with the use of standard cutting needles.

CRD commentary
Interventions:
The interventions compared were reasonably simple and were adequately described, although it was unclear whether there any comparators had been omitted or whether there was only one available type of each needle.

Effectiveness/benefits:
The methods used to identify and select the data were not reported, which meant it was not possible to make any assessment on validity or whether the best available data were used. The selection of data values was not discussed; for example, it was not clear why the probability of post-lumbar puncture headache was taken from two different sources when the two interventions were compared in the single study which was used for cutting needle probabilities alone. The focus of the analyses presented was costs, even though the cost differences were driven by clinical effectiveness differences. A more comprehensive discussion surrounding the validity of these estimates would have reduced the high levels of uncertainty.

Costs:
The costs included in the analysis were relevant to the stated study perspective and were well reported. The sources of resource use data were provided and appeared relevant to the study setting. As with the effectiveness estimates, it was not always clear why certain data had been selected; there appeared to be a mixture of Medicare costs and Medicare reimbursement rate. Whether these were actual differences or just terminology, and whether this would have had an impact on the conclusions reached was not clear. The method of inflation was appropriate and reported. Discounting was not appropriate, so not performed. Overall, the level of reporting surrounding the costs was adequate.

Analysis and results:
The analysis was undertaken using a decision model, which was adequately reported. The focus was clearly on cost outcomes, so it was unclear whether patient preference or differential impact on health-related quality of life during the procedure existed, which could be incorporated into the model. However, with no clinical utility of the tests evaluated, the results could only be seen as partial. The selection of model inputs appeared ad-hoc, so the level of uncertainty may be high. Uncertainty analysis was addressed using appropriate methods. The base-case results and results of sensitivity analysis were adequately reported. However, given the lack of reporting surrounding the derivation of clinical data, the results were uncertain.

Concluding remarks:
The focus of the model was cost outcomes and, as a consequence, the derivation of the clinical estimates driving the difference in costs was not well reported, which makes the results presented uncertain.

**Funding**
The study was supported by the National Institutes of Health (NIH), USA.

**Bibliographic details**
Tung CE, So YT, Lansberg MG. Cost comparison between the atraumatic and cutting lumbar puncture needles. Neurology 2012; 78(2): 109-113

**PubMedID**
22205758

**DOI**
10.1212/WNL.0b013e31823efca9

**Original Paper URL**
http://www.neurology.org/content/78/2/109.abstract

**Indexing Status**
Subject indexing assigned by NLM

**MeSH**
Adult; Costs and Cost Analysis; Decision Making; Female; Humans; Male; Monte Carlo Method; Needles /classification /economics; Post-Dural Puncture Headache /economics /etiology; Sensitivity and Specificity; Spinal Puncture /adverse effects /economics

**AccessionNumber**
22012009263

**Date bibliographic record published**
08/06/2012

**Date abstract record published**
12/03/2013