Cost-effectiveness of magnetic resonance imaging of the knee for patients presenting in primary care

DAMASK (Direct Access to Magnetic Resonance Imaging: Assessment for Suspect Knees) Trial Team

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
This study examined the cost-effectiveness of general practitioner (GP) referral to early magnetic resonance imaging (MRI) in comparison with referral to an orthopaedic specialist without prior MRI, for patients with continuing knee problems. The authors concluded that GP access to MRI was a cost-effective use of health service resources from the perspective of the UK National Health Service. The study was based on a valid and well-reported methodology. The authors’ conclusions appear to be robust.

Type of economic evaluation
Cost-utility analysis

Study objective
This study examined the cost-effectiveness of general practitioner (GP) referral to early magnetic resonance imaging (MRI) in comparison with referral to an orthopaedic specialist without prior MRI for patients with continuing knee problems.

Interventions
The two strategies examined were GP referral to early MRI and provisional orthopaedic appointment, versus referral to an orthopaedic specialist without prior MRI and with a subsequent MRI if required.

Location/setting
UK/primary care.

Methods
Analytical approach:
This economic evaluation was based on a single study with a two-year time horizon. The authors stated that the perspective was that of the National Health Service (NHS).

Effectiveness data:
The clinical evidence came from a randomised controlled trial (RCT), which was published in an accompanying paper. A sample of 553 eligible patients was enrolled from 163 general practices. The GP either referred them for MRI on the knee or to an orthopaedic specialist who could decide whether or not to undertake a MRI. Complete data were available for 386 patients. There were 206 (66% men, mean age: 40.8 years) in the early MRI group and 180 (57% men, mean age: 40.7 years) in the orthopaedic group. The length of follow-up was two years. The potential impact of baseline confounding factors was taken into account using a regression-based adjustment method. The primary clinical measure was knee functional ability, which was measured by a knee-specific instrument (KQoL-26).

Monetary benefit and utility valuations:
The utility valuations were derived from the sample of patients enrolled in the RCT, by means of the European Quality of life (EQ-5D) questionnaire administered at baseline, and at 6, 12, and 24 months later.

Measure of benefit:
Quality-adjusted life-years (QALYs) were used as the summary benefit measure. A 3.5% annual discount rate was applied to those accrued over the second year.
Cost data:
The health service costs were GP visits, nurse visits, physiotherapist, MRI examination, orthopaedic consultation, hospital admission, equipment, and medications. The costs were derived from official price lists such as NHS Reference Costs, the Personal Social Services Research Unit, and the British National Formulary. The resource use data came from the actual consumption of services by the sample of patients enrolled in the RCT. All costs were in UK pounds sterling (£) and were also presented in Euros (EUR) and US dollars ($). The price year was 2005 to 2006 and second-year costs were discounted at an annual rate of 3.5%.

Analysis of uncertainty:
A non-parametric bootstrapping approach was used to account for sampling variations. The generated mean differential cost and QALY scores were represented graphically on cost-effectiveness planes and cost-effectiveness acceptability curves were plotted for different willingness to pay thresholds. Univariate sensitivity analyses were carried out for two scenarios, which were fewer first out-patient appointments in the MRI arm and a lower unit cost for MRI.

Results
The average QALYs over two years were 1.444 (standard deviation, SD: 0.347) in the early MRI group and 1.393 (SD: 0.377) in the orthopaedic referral group. This difference (0.05 QALYs) was statistically significant.

When adjusted for baseline differences in utility, the average QALYs over two years were 1.449 in the early MRI group and 1.387 in the orthopaedic referral group, a statistically significant difference.

Total costs were £1,315.47 (SD: 1,370.51) in the early MRI group and £1,021.46 (SD: 1,178.65) in the orthopaedic referral group. This higher cost for early MRI was driven, in part, by a higher number of primary care consultations and a greater use of physiotherapy, but mostly by the greater use of MRI.

The average incremental cost per QALY gained with early MRI over orthopaedic referral was £5,840.

The uncertainty analysis showed that, using unadjusted utility data, at a threshold of £20,000 per QALY, the probability that early MRI was cost-effective was 0.81. Adjustment for baseline differences in utility values, provided more favourable results for the early MRI arm (£4,800 per QALY, 0.93 probability). The other sensitivity analyses showed that the base-case findings were robust.

Authors' conclusions
The authors concluded that GP access to MRI was a cost-effective use of health service resources from the perspective of the UK NHS.

CRD commentary
Interventions:
The selection of the comparators was appropriate, as they reflected the two possible approaches to the management of patients presenting with knee problems.

Effectiveness/benefits:
The RCT used to derive the clinical evidence was a valid source of data, given the strengths of its design. In addition, the analysis was based on the intention-to-treat principle, which further enhances the validity of the clinical endpoints. However, the study was published in a companion paper and was not extensively described in the current report. Thus, some issues of the study validity could not be evaluated. Nevertheless, the authors noted that the main strength of their study was the use of a large, multi-centre, and pragmatic trial with a rigorous design. Adjustments for baseline differences in utility scores were also conducted. The derivation of the benefit measure was appropriately described and the use of QALYs enhances the external validity of the analysis.

Costs:
The economic analysis included the cost categories relevant to the study perspective. A breakdown of cost items was provided, and resource quantities and unit costs were presented separately, which enhances the possibility of...
replicating the analysis for other settings. The sources of costs were reported for all items. Other details of the analysis were reported, such as the price year, the use of discounting, and the use of statistical analyses, making the whole economic approach transparent.

Analysis and results:
The costs and benefits were appropriately synthesised. The uncertainty was satisfactorily investigated using different approaches, which not only focused on specific data, but also considered the whole issue of uncertainty. The study findings were clearly presented. The use of non-parametric bootstrapping was appropriate and allowed account to be taken of the skewed data. The authors noted that a potential drawback of their analysis was the missing data for 30% of patients, which might have affected the reliability of the economic comparison.

Concluding remarks:
The study was based on a valid and well-reported methodology. The authors’ conclusions appear to be robust.

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