

# The cost-effectiveness of magnetic resonance imaging for investigation of the knee joint

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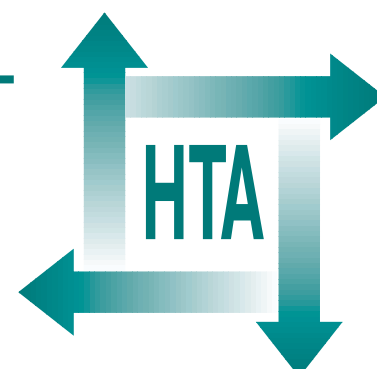
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## *Executive summary*

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## Executive summary

### Objectives

This study considered the role of magnetic resonance imaging (MRI) in the diagnosis of knee injuries in a district general hospital (DGH) setting. The principal objective was to identify whether the use of MRI had a major impact on the clinical management of patients presenting with chronic knee problems, in whom surgery was being considered, whether it reduced overall costs and whether it improved patient outcome.

In addition, the research:

1. explored the 'diagnostic accuracy' of initial clinical investigation of the knee by an orthopaedic trainee, consultant knee specialist and consultant radiologist
2. considered the variability and diagnostic accuracy of interpretations of knee MRI investigations between radiologists
3. measured the strength of preference for the potential diagnostic/therapeutic impact of knee MRI (i.e. the avoidance of surgery).

### Methods

#### Randomised controlled trial

The research was based on a single-centre randomised controlled trial conducted at Kent and Canterbury Hospital. Patients attending with knee problems in whom surgery was being considered were recruited from routine orthopaedic clinics. Most patients had been referred by their general practitioner. Patients were randomised to either investigation using an MRI scan (MRI trial arm) or investigation using arthroscopy (no-MRI trial arm).

The study investigated the benefits of knee MRI at two levels: diagnostic/therapeutic impact (i.e. avoidance of surgery) and patient outcome (using the Short Form with 36 items and EQ-5D quality-of-life measurement instruments). Quality of life was assessed at baseline and at 6 and 12 months. Costs were assessed from the perspectives of the NHS and patients. All analyses were by intention to treat.

### Substudies

#### *Investigation of diagnostic accuracy*

For the investigation of diagnostic accuracy of initial clinical investigation, the sample comprised 114 patients recruited in a separate study conducted at St Thomas' Hospital. The sample was drawn from patients presenting at the Accident and Emergency Department with an acute knee injury. All study patients received an MRI scan, but initial diagnosis was made without access to the scan or the radiologist's report. After 12 months, all clinical notes and MRI scans of study patients were reviewed and a final 'reference standard' diagnosis for each patient was reached. Comparison was made between the diagnosis recorded by each clinician (i.e. orthopaedic trainee, knee specialist and consultant radiologist) and the reference diagnosis.

#### *Investigation of the generalisability of results*

For this substudy, the MRI images from 80 patients (recruited at St Thomas' Hospital) were interpreted independently by seven consultant radiologists at DGHs and the St Thomas' Hospital MRI radiologist. For each area of the knee, the level of agreement (measured using weighted kappa) between the responses of the eight radiologists and the reference standard diagnosis was assessed.

#### *Investigation of preferences*

The investigation of potential patient preferences for the diagnostic/therapeutic impact of MRI was explored using a discrete choice conjoint measurement research design. Choices involved selecting between two alternative scenarios described using four attributes, and data were collected from 585 undergraduate sports science students and analysed using a random-effects probit model.

### Results

#### Randomised controlled trial

The trial recruited 118 patients (59 randomly allocated to each arm). The two groups were similar in important respects at baseline.

The central finding was of no statistically significant differences between groups in all measures of

health outcome, although a trend in favour of the no-MRI group was observed. However, the use of MRI was found to be associated with a positive diagnostic/therapeutic impact: a significantly smaller proportion of patients in the MRI group underwent surgery (MRI = 0.41, no-MRI = 0.71;  $p = 0.001$ ). There was a similar mean overall NHS cost for both groups.

## Substudies

### **Investigation of diagnostic accuracy**

The exploration of diagnostic accuracy found that, when compared to orthopaedic trainees (44% correct diagnoses) or to radiologists reporting an MRI scan (68% correct diagnoses), the accuracy rate was higher for knee specialists (72% correct diagnoses).

### **Investigation of the generalisability of results**

This generalisability study indicated that, in general terms, radiologists in DGHs provide accurate interpretations of knee MRI images that are similar to a radiologist at a specialist centre. The one area of the knee for which this did not hold was the lateral collateral ligament.

### **Investigation of preferences**

The central finding for this substudy was that, on average and within the range specified, choices in this group of potential patients were not significantly influenced by variation in the chance of avoiding surgery.

## Conclusions

### **Implications for healthcare**

The evidence presented in this report supports the conclusions that the use of MRI in patients presenting at DGHs with chronic knee problems in whom arthroscopy was being considered did not increase NHS costs overall, was not associated with significantly worse outcomes and avoided surgery in a significant proportion of patients.

## Recommendations for further research (in priority order)

1. The trial data demonstrated that the use of MRI in patients with chronic knee problems reduced the need for surgery. However, the link between diagnostic processes and changes in health outcome is indirect and the finding of no-MRI-related effect on health outcome may, therefore, be a consequence of the limited power of the trial. Further research to confirm (or contradict) these findings would be valuable.
2. The investigation of diagnostic accuracy involved comparison with a reference diagnosis established by a panel of two clinical members of the research team. It would be interesting to explore the extent to which the results would differ using an external panel.
3. The result from the preference study, indicating that the potential diagnostic/therapeutic impact of knee MRI was not highly valued, is a surprising finding that would be important to explore in general public or patient populations.
4. The focus for the trial-based aspects of this research was the DGH and patients presenting with chronic knee problems who were being considered for surgery. Care should be taken in generalising from these results to other patient groups (e.g. acute knee injuries) or to other settings (e.g. specialist centres). Further clinical trials would be required in order to answer such questions.

## Publication

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# NHS R&D HTA Programme

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Initially, six HTA panels (pharmaceuticals, acute sector, primary and community care, diagnostics and imaging, population screening, methodology) helped to set the research priorities for the HTA Programme. However, during the past few years there have been a number of changes in and around NHS R&D, such as the establishment of the National Institute for Clinical Excellence (NICE) and the creation of three new research programmes: Service Delivery and Organisation (SDO); New and Emerging Applications of Technology (NEAT); and the Methodology Programme.

This has meant that the HTA panels can now focus more explicitly on health technologies ('health technologies' are broadly defined to include all interventions used to promote health, prevent and treat disease, and improve rehabilitation and long-term care) rather than settings of care. Therefore the panel structure has been redefined and replaced by three new panels: Pharmaceuticals; Therapeutic Procedures (including devices and operations); and Diagnostic Technologies and Screening.

The HTA Programme will continue to commission both primary and secondary research. The HTA Commissioning Board, supported by the National Coordinating Centre for Health Technology Assessment (NCCHTA), will consider and advise the Programme Director on the best research projects to pursue in order to address the research priorities identified by the three HTA panels.

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