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Economic evaluation of MR cholangiopancreatography compared to diagnostic ERCP for the investigation of biliary tree obstruction

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KEYWORDS
Magnetic resonance cholangio-pancreatography;
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Abstract *Background:* Use of magnetic resonance cholangiopancreatography (MRCP) for confirmation of presence of biliary obstruction is virtually risk-free. However, unlike diagnostic endoscopic retrograde cholangiopancreatography (ERCP), no therapeutic option can be offered simultaneously with MRCP. The aim of the study is to assess the cost-effectiveness of MRCP when compared with the conventional practice of diagnostic ERCP for the investigation of biliary obstruction in adults.
Methods: Cost-effectiveness analysis from the perspective of the health care provider. Sensitivity analysis includes presentation of a family of cost effectiveness acceptability curves and the impact of different risks of common bile duct stones associated with ultrasound and liver function test results. The main outcome measure is cost per quality adjusted life year (QALY).
Results: Baseline results, at 37% probability of common bile duct stones, show that MRCP is the dominant strategy, with expected savings of £149 (£325 to −£15) and expected QALY gain of 0.011 (0–0.030) per case. The probability of avoiding unnecessary therapeutic ERCP is 30%. For patients at high risk of common bile duct stones (probability >60%) ERCP is the preferable strategy.

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Conclusions: The baseline estimate is that MRCP would be both cost saving and would result in improved quality of life outcomes compared to diagnostic ERCP, but its potential sources of economic benefit are highly dependent on access to, and waiting lists for adequate MRI technology at hospital level.

Introduction

Use of magnetic resonance cholangiopancreatography (MRCP) for confirmation of presence of biliary obstruction is virtually risk-free and its fixed cost is only about half that of diagnostic endoscopic retrograde cholangiopancreatography (ERCP). However, no therapeutic option can be offered simultaneously with MRCP, unlike ERCP; there is thus a trade off between increased diagnostic costs in patients who ultimately require invasive treatment and cost and health benefits for patients who can avoid an unnecessary invasive diagnostic procedure. In the absence of direct economic evidence on this trade off a model based assessment is required. Our model incorporates the most frequent conditions affecting the biliary tree, such as common bile duct stones (CBDS), benign biliary strictures and peripancreatic cancer.[1] The UK NHS R&D Programme commissioned this assessment of the clinical and cost effectiveness of MRCP compared to the conventional practice of diagnostic ERCP for an adult UK population. A monograph in the Health Technology Assessment series gives further details of methods.[2]

Almost all patients with symptoms suspected to be of biliary origin in the UK will be referred for ultrasound (US) either by the general practitioner or specialist.[3] Patients for whom MRCP is contraindicated (i.e. exclusions for MRI, such as claustrophobia and cardiac pacemakers) or ERCP (i.e. previous gastric surgery) are excluded from the scope of the model. Cholangiocarcinoma in the intrahepatic bile duct and primary sclerosing cholangitis (PSC) were both excluded because they are uncommon conditions normally associated with liver treatment.

The economic and clinical impact of MRCP or ERCP is highly dependent on the incidence of CBDS in the patient groups being considered. Previous research has estimated the incidence of CBDS within populations demonstrating different US and liver function test (LFT) results.[4] The economic impact of MRCP compared to ERCP within these patient groups together with higher risk groups is explored.

Methods

A probabilistic economic model was constructed in order to evaluate the relative cost-effectiveness of adopting MRCP scanning compared to diagnostic ERCP for the investigation of biliary obstruction in adults. The primary outcome measure for the economic evaluation was cost per quality adjusted life year (QALY). The decision problem is illustrated in the structure of the decision tree presented in Fig. 1. The structure of this decision analytic model includes the most frequent conditions affecting the biliary tree where MRCP can provide diagnostic information comparable to ERCP.[5–8] The decision tree structure and its underlying assumptions were developed in discussion with a consultant gastroenterologist, two consultant radiologists and a consultant biliary pancreatic surgeon.

The model considers the costs from the perspective of the health care provider as it is the most relevant to the decision maker within the context of reorganising NHS resources. The time horizon for the analysis was 12 months, the main reason being that the relief of pain is experienced in the short term after the removal of the stone and that more than three-quarters of patients suffering from pancreatic head lesions die within a year of diagnosis.[9]

In order to facilitate the modelling, the following main assumptions have been introduced. For MRCP all patients incur the cost of the MRCP test. Patients with a negative test result incur no additional cost and achieve no gain in utility, with false negative patients maintaining a utility associated with an untreated condition, for example CBDS. All patients with a positive MRCP incur the additional cost and utility decrement of a therapeutic ERCP, with endoscopic stent for malignant strictures and surgery for benign strictures. True positives achieve a gain in utility from appropriate treatment and false positives achieve no utility gain. For diagnostic ERCP the tree follows a similar structure with the associated additional utility decrements and mortality risks. See also Table 1 and the HTA monograph[2] for more details of the assumptions within the model.