
Economic evaluation of FENO measurement in diagnosis and 1-year management of asthma in Germany

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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

This study determined the cost-effectiveness of fractional exhaled nitric oxide (FENO) measurement for the diagnosis and subsequent management of mild to severe asthma. Diagnosis with FENO cost 12 Euros more per patient than the standard diagnostic methods, but it was cost-saving for patient management, compared with standard guidelines, whilst providing similar benefits. The study appears to have been based on robust methodology, although more detail on some clinical sources would have been useful. The authors' conclusions appear to be valid.

Type of economic evaluation

Cost-utility analysis

Study objective

The objective was to determine the cost-effectiveness of fractional exhaled nitric oxide (FENO) measurement for the diagnosis and subsequent management of mild to severe asthma, in comparison with the standard diagnosis and management.

Interventions

The diagnostic strategies were FENO measurement through a portable and non-invasive airway inflammation monitor (NIOX MINO) versus standard diagnostics, which were spirometry (70% of patients), reversibility testing (20% of patients), bronchial provocation (7% of patients), and sputum eosinophil count (3% of patients).

The management strategies were FENO measurement versus monitoring based on spirometry. The patients could also receive inhaled corticosteroids and long-acting beta-agonists as maintenance therapy.

Location/setting

Germany/primary and secondary care.

Methods

Analytical approach:

This economic evaluation was based on two decision tree models, which captured the clinical and economic impact of different diagnosis and management or treatment options for asthma over a one-year time horizon. The authors stated that the analysis was carried out from the perspective of the German health care payer.

Effectiveness data:

The clinical data appear to have been derived from a selection of known, relevant published studies. The data on test accuracy were obtained from a diagnostic study, while randomised controlled trials were used to assess the impact of FENO on the management of patients with asthma. The authors provided a few details on the sample sizes in these studies, but no other information was provided. The key clinical endpoint was the accuracy of the diagnostic tests.

Monetary benefit and utility valuations:

The utility estimates were derived from a study, which elicited preferences for health conditions from a sample of 228 adult asthma patients using the European Quality of life (EQ-5D) questionnaire.

Measure of benefit:

Quality-adjusted life-years (QALYs) were used as the summary benefit measure, in the asthma management model.

Cost data:

The health service costs were those of diagnostic tests, in-patient and out-patient visits to health care professionals, hospitalisations, and drug therapies. The unit costs were reported and were based on official reimbursement rates. The resource use was based on published studies and authors' assumptions. The calculation of drug costs was based on averages across recommended dosages and typical treatments. All costs were in Euros (EUR) and the price year was not explicitly reported but may have been 2006.

Analysis of uncertainty:

A series of univariate sensitivity analyses was carried out on the key model inputs to determine whether the model findings were robust. The alternative ranges of values for these were defined by the authors. A second-order sensitivity analysis was also undertaken by conducting 1,000 simulations for the relevant model inputs.

Results

In the diagnostic model, the cost per patient was EUR 38 with FENO and EUR 26 with standard diagnostics.

In the management model, the use of FENO was cost-saving compared with standard management, with reduced costs of EUR 32. FENO also produced a gain of 0.055 QALYs and was, therefore, a dominant strategy (i.e. less expensive and more effective).

The sensitivity analysis showed that the reimbursement of FENO was the most influential parameter. When FENO was added to spirometry, FENO added EUR 18 compared with spirometry alone, in the diagnostic model, but was cost-saving when compared with spirometry plus bronchoprovocation.

In general, the study findings were robust and greater cost-saving were observed in patients with severe disease. However, high uncertainty was found in the management model, with wide confidence intervals due to the similar utility values.

Authors' conclusions

The authors concluded that asthma diagnosis with FENO cost EUR 12 more per patient than standard diagnostic methods, but was cost-saving in the management of asthma patients, in comparison with standard guidelines, whilst providing similar benefits. They stated that further research should focus on the effect of FENO on patient outcomes and on the impact of correct and false diagnoses on asthma outcomes.

CRD commentary

Interventions:

The selection of the comparators was appropriate in that the new test was compared against the conventional diagnostic and treatment approaches for patients with asthma. Alternative combination strategies were also considered in the sensitivity analysis.

Effectiveness/benefits:

Little information on the approach used to identify the sources of clinical data was provided. The authors may have known the studies as no details on the methods and conduct of a literature review were given. Some data on the sample size and design of these studies were given and, in general, they appear to be appropriate. The derivation of the benefit measure was reported. The utility valuations reflected patient preferences, which were elicited using a validated instrument, although the authors noted that the EQ-5D might not have been appropriate for patients with mild asthma. QALYs are an appropriate benefit measure, which allows cross-disease comparisons.

Costs:

The categories of costs reflected the viewpoint. The authors stated that the inclusion of costs related to productivity losses would have further favoured the FENO strategy. The unit costs were provided, but the quantities of resources used and their sources were not explicitly reported. Nevertheless, the authors stated that the resources consumed in the

diagnostic and treatment model reflected the recommended patterns in the German setting.

Analysis and results:

The synthesis of the costs and benefits was based on an incremental approach, which was appropriate for the analysis and showed the dominance of FENO over usual care. The issue of uncertainty appears to have been appropriately addressed and the findings for each alternative scenario were clearly presented. An extensive description of the two decision models was provided. The authors noted some limitations of their analysis arising from the available data. For example, the published evidence was inconclusive for smokers, thus the findings may only have been relevant for non-smokers.

Concluding remarks:

The study appears to have been based on robust methodology, although more detail on some clinical sources would have been useful. The authors' conclusions appear to be valid.

Funding

Funded by a grant from Aerocrine, Solna, Sweden.

Bibliographic details

Berg J, Lindgren P. Economic evaluation of FENO measurement in diagnosis and 1-year management of asthma in Germany. *Respiratory Medicine* 2008; 102(2): 219-231

PubMedID

18029165

DOI

10.1016/j.rmed.2007.09.008

Other publications of related interest

Smith AD, Cowan JO, Filsell S, et al. Diagnosing asthma: comparisons between exhaled nitric oxide measurements and conventional tests. *Am J Respir Crit Care Med* 2004;169:473-8.

Jones SL, Kittelson J, Cowan JO, et al. The predictive value of exhaled nitric oxide measurements in assessing changes in asthma control. *Am J Respir Crit Care Med* 2001;164:738-43.

Silkoff PE, Carlson M, Bourke T, et al. The Aerocrine exhaled nitric oxide monitoring system NIOX is cleared by the US Food and Drug Administration for monitoring therapy in asthma. *J Allergy Clin Immunol* 2004;114:1241-56.

Indexing Status

Subject indexing assigned by NLM

MeSH

Adolescent; Adult; Aged; Asthma /diagnosis /economics; Biomarkers /analysis; Breath Tests /methods; Child; Cost-Benefit Analysis; Germany; Humans; Middle Aged; Models, Economic; Nitric Oxide /analysis; Practice Guidelines as Topic; Quality-Adjusted Life Years; Sensitivity and Specificity

AccessionNumber

22008102247

Date bibliographic record published

31/03/2009

Date abstract record published

24/06/2009

