The cost effectiveness of B-type natriuretic peptide measurement in the primary care setting: a UK perspective

Collinson PO

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.

Health technology
The study examined the use of B-type natriuretic peptide (BNP) and N-terminal prohormone of BNP (NTproBNP) measurement to determine whether patients presenting in primary care with suspected cardiac failure should be subjected to echocardiography.

Type of intervention
Screening.

Economic study type
Cost-effectiveness analysis.

Study population
The study population comprised patients presenting to primary care with symptoms that suggested cardiac failure and who required additional diagnostic tests.

Setting
The setting was primary care. The economic study was carried out in the UK.

Dates to which data relate
The dates to which the effectiveness data referred were unclear. The price year was not reported.

Source of effectiveness data
The estimates of effectiveness appear to have been based largely on author opinion.

Modelling
A decision tree was used to show the decision steps used in current practice and to compare them with the effect of interposing a preliminary screening test. The model was used to identify the level of screening test specificity that would result in cost neutrality between the two strategies, and to calculate the cost-savings associated with one strategy compared with another.

Methods used to derive estimates of effectiveness
The author’s assumptions appear to have been informed by published and unpublished data sources.

Estimates of effectiveness and key assumptions
The author assumed a disease prevalence of 20% amongst the patients tested. A dataset was simulated in which the sensitivity and specificity of a test based on BNP measurement were 90% and 80%, respectively. A second analysis was based on a hospital dataset that had shown that greater than 99% sensitivity could be achieved by setting the decision threshold at 169 pg/mL for NTproBNP, giving a corresponding specificity of 56%. Echocardiography was assumed to be the "gold" standard.

**Measure of benefits used in the economic analysis**

The author assumed equal effectiveness of both diagnostic pathways. This assumption is only valid when the sensitivity of a test based on BNP measurement is 100%. The author acknowledged that, with less than 100% sensitivity, the screening test would result in false negatives and missed diagnoses in comparison with the strategy of giving all patients echocardiography.

**Direct costs**

Discounting was not relevant as the author included only the costs of the diagnostic tests. The screening test for BNP was assumed to cost $20. An echocardiography was assumed to cost $200. The source of the unit costs and the dates to which the data referred were not reported.

**Statistical analysis of costs**

A deterministic analysis of the costs was performed.

**Indirect Costs**

The indirect costs were not included in the analysis.

**Currency**

The currency was not reported.

**Sensitivity analysis**

The author conducted a one-way sensitivity analysis around the assumed disease prevalence. A one-way threshold analysis was used to determine the specificity of the initial screening test at which cost neutrality was attained (i.e. the costs of each diagnostic pathway were equal).

**Estimated benefits used in the economic analysis**

The author stated that a cost-minimisation analysis was performed on the assumption that the effectiveness of the two diagnostic pathways was the same. However, the author reported that, when the sensitivity and specificity of the initial screening test were set at 90% and 80% respectively, the use of an initial screening test based on BNP measurement before echocardiography resulted in two missed diagnoses for 100 patients tested when compared with a strategy of providing all patients with echocardiography. When the sensitivity of the initial screening test was set to 100%, the number of diagnoses was equal between the two treatment strategies.

**Cost results**

The net, cost-saving of interposing an initial screening test before echocardiography was $11,800 when the sensitivity of the test was set at 90% and the specificity at 80%.

When the sensitivity was set at 100% and the specificity at 58%, the cost-saving was $10,860.

**Synthesis of costs and benefits**
Authors' conclusions
The use of a pre-screening test based on natriuretic peptides before referral for echocardiography was cost-effective.

CRD COMMENTARY - Selection of comparators
The comparator was selected to represent current recommended practice in the study setting. However, the author acknowledged that, in a UK setting, the target of referring all patients for echocardiography was not achievable. You must decide whether the comparators are relevant in your own setting.

Validity of estimate of measure of effectiveness
The author justified some of his assumptions by quoting previously reported results without providing references, and by referring to an unpublished dataset. Other assumptions were left unjustified. Some estimates, such as disease prevalence, were subjected to a one-way sensitivity analysis. However, for the most part, the assumptions were not subject to scrutiny and their validity would appear questionable. Note: subsequent to this abstract being published, the author has informed us that the data used in the final modelling analysis has been published in a separate paper in the International Journal of Cardiology (Lim et al 2007, see 'Other Publications of Related Interest' below for bibliographic details).

Validity of estimate of measure of benefit
The analysis was based on the therapeutic equivalence of the two diagnostic pathways compared. This is only valid when the sensitivity of the pre-screening test is set at 100%. In an analysis where the sensitivity was set at 90%, the result was two missed diagnoses of cardiac failure out of 100 patients tested. The author did not comment on the potential health implications of these missed diagnoses. The economic analysis included only costs.

Validity of estimate of costs
The author did not specify a perspective for the analysis. The economic analysis was based solely on the cost of testing for BNP measurements and the cost of echocardiography. The omission of staff costs and the costs of general practitioner visits may favour the two-test strategy. The costs and the quantities were reported separately. The number of tests used was derived from a decision tree model that incorporated the sensitivity and specificity of the initial pre-screening test and the disease prevalence. The unit costs appear to have been based on author's assumptions. The author referred to the fact that a pre-screening test based on BNP measurement was cost-effective provided that the ratio of the cost of echocardiography to pre-screening was at least two, but no sensitivity analysis was specified or reported on this basis. The price year and currency were not specified, which hinders the interpretation of the study results.

Other issues
No comparison was made with the findings from other studies. The issue of generalisability to other settings was not addressed, nor was it precisely clear what the study setting was intended to be. The author does not appear to have fully reported the sources of quoted results or the range of sensitivity analyses performed. The author's strong conclusion that BNP measurement is the test of choice for initial testing in the primary care setting does not appear to be justified on the basis of this simple and relatively unclear analysis. The author acknowledged that some referrals for echocardiography might have been for reasons additional to the diagnosis of cardiac failure.

Implications of the study
The author made no recommendations for further research.

Source of funding
None stated.

**Bibliographic details**
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**Other publications of related interest**
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**Indexing Status**
Subject indexing assigned by NLM

**MeSH**
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