Study of the cost-effectiveness of three staining methods for identification of Pneumocystis carinii in bronchoalveolar lavage fluid

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
Three alternative staining methods for the identification of Pneumocystis carinii (P. carinii) in bronchoalveolar lavage fluid were studied. The methods used Giemsa, toluidine blue O and methenamine silver stains.

Type of intervention
Diagnosis.

Economic study type
Cost-effectiveness analysis.

Study population
The study population comprised patients infected with the human immunodeficiency virus (HIV).

Setting
The setting was tertiary care. The economic study was carried out in Bangkok, Thailand.

Dates to which data relate
The effectiveness and resource use data were taken from a paper published in 2002. The price year was not reported.

Source of effectiveness data
According to the author, the effectiveness data were derived from a review of studies.

Modelling
A decision tree analysis was used to estimate the cost-effectiveness of the three staining methods.

Outcomes assessed in the review
The detection rates for each of the three staining methods were taken from an earlier paper.

Study designs and other criteria for inclusion in the review
Not reported.

Sources searched to identify primary studies
Not reported.
Criteria used to ensure the validity of primary studies
Not reported.

Methods used to judge relevance and validity, and for extracting data
Not reported.

Number of primary studies included
One study was used to identify the model parameters (Saksirisampant et al. 2002, see ‘Other Publications of Related Interest’ below for bibliographic details).

Methods of combining primary studies
Not reported.

Investigation of differences between primary studies
Not reported.

Results of the review
The detection rate was 0.52 with Giemsa stain, 0.60 with toluidine blue stain and 0.60 with methenamine silver stain.

Measure of benefits used in the economic analysis
The paper used “expected utility” as the summary measure of health benefit. The author stated that this measure was derived from the prevalence of P. carinii in the Thai adult HIV-infected population, although the methods used to obtain it were not reported.

Direct costs
The study considered the costs of the hospital laboratory, but only the costs of the tests appear to have included. The source of the costs seems to have been the parasitology laboratory of the hospital at which the study providing the effectiveness data was undertaken. No further details of the methods used for costing were included in the present paper. No price year was reported, and no breakdown of resource use or individual unit costs was given.

Statistical analysis of costs
The cost data were treated deterministically.

Indirect Costs
No indirect costs were included in this study.

Currency
Thai baht (US dollar 1 = baht 42).

Sensitivity analysis
A one-way sensitivity analysis was undertaken. This varied the prevalence of P. carinii to assess the generalisability of the study findings.
Estimated benefits used in the economic analysis
The “expected utility” was 0.50 for the Giemsa stain, 0.51 for the toluidine blue O stain, and 0.51 for the methenamine silver stain.

Cost results
The cost per test was baht 5.00 with the Giemsa stain, baht 7.00 with the toluidine blue O stain, and baht 27.00 with the methenamine silver stain.

Synthesis of costs and benefits
Cost-effectiveness ratios were estimated as the cost per unit of utility obtained. The results were:

- baht 10.00 per unit of "expected utility" with the Giemsa stain;
- baht 13.73 per unit of "expected utility” with the toluidine blue O stain; and
- baht 52.94 per unit of "expected utility” with the methenamine silver stain.

The sensitivity analysis confirmed that the Giemsa stain was the most cost-effective of the three techniques at all prevalences from 10 to 100%.

Authors’ conclusions
The Giemsa stain was the most cost-effective of the three techniques for identifying Pneumocystis carinii (P. carinii).

CRD COMMENTARY - Selection of comparators
This study compared the identification of P. carinii using Giemsa, toluidine blue O and methenamine silver stains. The author reported that these staining methods are more practical than other available diagnostic methods, such as polymerase chain reaction or an immunofluorescence study of bronchoalveolar lavage, since staining methods are less expensive. You should consider how this relates to your setting in terms of current practice. A limited sensitivity analysis of the study results was carried out across a range of prevalences.

Validity of estimate of measure of effectiveness
The measure of effectiveness used in the study was obtained from another paper. No information was provided on how this paper was identified, the study design, or how the data were extracted. This means that it is not possible to comment on the extent of bias in the methods. The paper reported the proportion of samples tested that were identified as positive, rather than the sensitivity and specificity of the test which are commonly used in diagnostic studies.

Validity of estimate of measure of benefit
The paper identified “expected utility” as the measure of health benefit. The author reported that this measure had been derived from another paper, although it was unclear how the utilities had been calculated or what they represented. This severely limits the interpretation and applicability of the study results.

Validity of estimate of costs
This study identified the costs to the hospital laboratory. The cost of performing each test was taken from another paper, but no details of how the costs were obtained were reported in the present paper. No breakdown of resource use or individual unit costs was reported. These factors limit the scope to generalise the results to other settings. The price year was not reported, which will prevent any future reflation exercises. The extent of uncertainty around the unit costs and resources used was not assessed.
Other issues
Overall, this paper lacked detail. In particular, information on the methods used to collect the effectiveness parameters and the cost data was absent. The use of the proportion of samples that tested positive as the measure of effectiveness, rather than the sensitivity and specificity of the tests, was a serious flaw in the study methodology and makes interpretation of the results difficult. The author reported that the sensitivity analysis across a range of prevalences added to the generalisability of their study findings. However, there was no comment on how the findings might actually be applied to other settings. The author's conclusions reflected the data presented in the paper.

Implications of the study
The author did not make any direct recommendations for changes in practice or further research. However, the concerns over the study methods and the calculation and interpretation of the "expected utility" made it difficult to assess whether the study conclusions are valid.

Source of funding
None stated.

Bibliographic details

PubMedID
15712538

Other publications of related interest


Indexing Status
Subject indexing assigned by NLM

MeSH
Azure Stains; Bronchoalveolar Lavage Fluid /microbiology; Coloring Agents; Cost-Benefit Analysis; Humans; Methenamine; Pneumocystis carinii /isolation & purification; Pneumonia, Pneumocystis /diagnosis; Staining and Labeling /economics /methods; Tolonium Chloride

AccessionNumber
22005000255

Date bibliographic record published
31/03/2006

Date abstract record published
31/03/2006