Improved outcomes associated with limiting identification of Candida spp. in respiratory secretions

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
Two approaches for the diagnosis of pneumonia due to Candida spp. were examined. More specifically, full versus limited identification (ID) of rapidly growing yeasts (i.e. Candida spp.) in respiratory secretions. Full ID was defined as identifying all yeasts and fungi in respiratory secretions to the genus or species level if fungal cultures were requested. Limited ID resulted in not identifying Candida spp. in respiratory secretions, even if fungal cultures were requested.

Type of intervention
Diagnosis.

Economic study type
Cost-effectiveness analysis.

Study population
The study population comprised patients who had respiratory secretions submitted for fungal cultures.

Setting
The setting was secondary care (community teaching hospital). The economic study was carried out in the USA.

Dates to which data relate
The effectiveness and resource use data were gathered from March 2001 to March 2002. It is likely that the prices were estimated in 2000 and 2001.

Source of effectiveness data
The effectiveness evidence was derived from a single study.

Link between effectiveness and cost data
The costing was carried out retrospectively on the same sample of patients as that used in the effectiveness study.

Study sample
Power calculations to determine the sample size were not reported. There was no evidence that the initial study sample was appropriate for the clinical study question. The chart review of patients who had had respiratory secretions submitted for fungal cultures identified 313 patients in the full ID group before 5th November 2000, and 90 patients in the limited ID group after 5th November 2000. After excluding outliers (defined as patients whose length of stay was greater than two standard deviations for a given diagnosis-related group), 267 patients remained in the full ID group and 77 in the limited ID group. In the full ID group, 47.2% of the patients were female and 55.4% were older than 60 years.
The corresponding figures in the limited ID group were 53.2% (females) and 60% (older than 60 years), respectively.

**Study design**
This was a retrospective comparative study with a historical control that was carried out in a single centre, the Memorial Medical Center, a community teaching hospital for the Southern Illinois University School of Medicine (IL), USA. To ensure uniformity, a standard written protocol was used during the chart review. The length of follow-up was not reported. No patient was lost to the follow-up assessment.

**Analysis of effectiveness**
All the patients included in the study sample were considered in the analysis of effectiveness. The primary health outcomes used were:

- the percentage of patients with Candida spp. in their bloodstream,
- the interpretation of Candida spp. in respiratory secretions,
- the mortality rate,
- the length of stay, and
- the number of patients receiving antifungal therapy.

The study groups were comparable at baseline in terms of their demographics and clinical characteristics.

**Effectiveness results**
The percentage of patients with Candida spp. was 2.6% in the full ID group and 0% in the limited ID group.

In relation to the interpretation of Candida spp., the physicians thought that the presence of yeast represented colonisation of the respiratory tracts in 3% of patients in the full ID group and in 5.2% of patients in the limited ID group.

For 77.5% of full ID patients and 80.5% of limited ID patients, the physicians made no mention of Candida spp. being present in the respiratory secretions.

Antifungal therapy, for presumed pneumonia due to Candida spp., was initiated in 14.2% of full ID patients and in 7.8% of limited ID patients.

The mortality rate was 18.7% (95% confidence interval, CI: 14 - 23.4) in the full ID group and 14.3% (95% CI: 6.5 - 22.1) in the limited ID group. The difference was 4.4%, (p=0.37).

The rate of death directly related to underlying pneumonia and respiratory failure was 38.0% (19 out of 50) in the full ID group and 54.5% (6 out of 11) in the limited ID group.

The mean length of stay was 12.1 days (95% CI: 10.9 - 13.2) in the full ID group and 10.1 days (95% CI: 8.1 - 12.1) in the limited ID group. The difference was -2 days, (p=0.02).

The number of patients receiving antifungal therapy at any time during their hospitalisation was 103 (38.6%, 95% CI: 32.8 - 44.4) in the full ID group and 16 (20.8%, 95% CI: 11.7 - 29.9) in the limited ID group. The difference was -17.8%, (p=0.004).

**Clinical conclusions**
The effectiveness study showed that the use of the limited ID protocol represented a safe alternative to full ID.
addition, it led to fewer antifungal therapies being administered and to shorter hospital stay.

Measure of benefits used in the economic analysis
The health outcomes were left disaggregated and no summary benefit measure was used in the economic analysis. In effect, a cost-consequences analysis was performed.

Direct costs
Discounting was not relevant since the costs were incurred during a short time period. The unit costs and the quantities of resources used were not presented separately. The categories of costs included in the economic evaluation and the cost/resource boundary of the study were not reported. It is likely that the unit costs and resource data were estimated from the hospital database. A price year was not reported, but the costs were likely to have been estimated in 2000 and 2001.

Statistical analysis of costs
The costs were presented as mean values with 95% CIs. The Wilcoxon ranked sum test was used to test the statistical significance of differences in the estimated costs.

Indirect Costs
The indirect costs were not considered in the economic evaluation.

Currency
US dollars ($).

Sensitivity analysis
Sensitivity analyses were not conducted.

Estimated benefits used in the economic analysis
See the 'Effectiveness Results' section.

Cost results
The mean actual variable cost was $9,407 (95% CI: 7,870 - 10,945) in the full ID group and $6,973 (95% CI: 5,042 - 8,905) in the limited ID group. The difference was -$2,434, (p=0.03).

Synthesis of costs and benefits
Not relevant since a cost-consequences analysis was carried out.

Authors' conclusions
The full identification (ID) of rapidly growing yeasts in respiratory secretions, for the diagnosis of pneumonia due to infection with Candida spp., was of little diagnostic relevance. It also led to unnecessary antifungal treatments, higher hospital costs and longer inpatient stay in comparison with limited ID. On the other hand, limited ID was a safe and effective approach.

CRD COMMENTARY - Selection of comparators
The rationale for the choice of the comparator was clear. Full ID represented the standard approach at the authors'
institution, while limited ID was a new diagnostic procedure that was introduced to replace full ID. You should decide whether they are valid comparators in your own setting.

**Validity of estimate of measure of effectiveness**
The effectiveness evidence was derived from a retrospective comparative study with a historical control. Both groups were evaluated retrospectively and in different timeframes. Such a design represents a weak source of evidence and may have led to bias and confounding factors. Factors other than the study intervention could have had an impact on the results. However, the study groups were quite comparable at baseline. A further limitation to the internal validity of the study was the fact that the data were derived from a single institution and could not reflect diagnostic patterns in other centres. Finally, the method of sample selection was not clearly reported, as the authors did not state whether some patients were excluded from the initial study sample (with the exception of outliers). If all relevant patients were identified from the chart review, then the study sample is likely to have been representative of the study population. The performance of the limited ID strategy in the diagnosis of pneumonia was not addressed. In addition, it was unclear whether limited ID did or did not impair the diagnosis of pneumonia. The link between the diagnostic practice and the mortality rate was unclear. These facts may limit the relevance of the effectiveness analysis.

**Validity of estimate of measure of benefit**
No summary benefit measure was used in the analysis because a cost-consequences analysis was conducted.

**Validity of estimate of costs**
No details on the economic analysis were provided. The perspective adopted in the study and the cost items included in the economic evaluation were not reported. The source of the economic data was unclear. The cost estimates were likely to have been specific to the study institution and sensitivity analyses were not conducted. However, the costs were treated stochastically and CIs were presented. A single price year was not explicitly reported, but the cost estimates were likely to have been gathered in 2000 and 2001.

**Other issues**
The authors compared some of their results with those from other studies, but did not address the issue of the generalisability of the study results to other settings. The authors did not report any further limitations of their study. Sensitivity analyses were not carried out, which further limits the external validity of the analysis. The study referred to patients whose respiratory secretions were submitted for fungal cultures and this was reflected in the authors’ conclusions. The lack of validity of the economic analysis and the weaknesses of the effectiveness analysis raise uncertainties about the relevance of the findings.

**Implications of the study**
The conclusion of the study should be viewed in the light of the limitations of the present analysis.

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