Should vascular catheters be removed from all patients with candidemia: an evidence-based review

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Authors' objectives
To evaluate the effect of central venous catheter (CVC) removal on the outcome of patients with candidemia.

Searching
MEDLINE was searched from January 1966 to December 2000 without any language restrictions, using the keywords 'candidemia', 'catheter' and 'outcome'. Abstracts presented at the meetings of appropriate medical societies from 1987 to 2000 were also searched.

Study selection
Study designs of evaluations included in the review
The authors did not specify any inclusion criteria relating to the study design. Two prospective cohort studies and two retrospective studies were included in the review.

Specific interventions included in the review
Studies that evaluated catheter removal as a prognostic factor of mortality in candidemia were eligible for inclusion in the review.

Participants included in the review
Studies that examined patients with candidemia were eligible for inclusion.

The reviewed studies assessed either patients with cancer (n=619) or patients with different underlying conditions (type not specifically reported; n=245).

Outcomes assessed in the review
Studies that performed a multivariate analysis with odds ratios (ORs) and 95% confidence intervals (CIs), and included in the multivariate analysis any severity of illness score that had been validated as a predictor of death, were eligible for inclusion. The primary outcomes of interest were mortality and neutropenia, but a number of severity of illness scale scores were also used. These included the Simplified Acute Physiologic Score, the Acute Physiology and Chronic Health Evaluation (APACHE) III score, the Karnofsky performance status scale and the McCabe scale for severity of illness (see Other Publications of Related Interest nos.1-2).

How were decisions on the relevance of primary studies made?
The authors do not state how the papers were selected for the review, or how many of the reviewers performed the selection.

Assessment of study quality
The authors do not state that they assessed validity.

Data extraction
The authors do not state how the data were extracted for the review, or how many of the reviewers performed the data extraction.

The following data were extracted and presented in tabular format: study design, patient population, percentage of patients with neutropenia, assessment method for severity of illness, OR and 95% CIs, and the effect of CVC removal or retention.
Methods of synthesis
How were the studies combined?
A narrative synthesis was undertaken.

How were differences between studies investigated?
The differences in the results of the included studies were explored by examining differences in the patient populations, illness severity and inclusion criteria.

Results of the review
Four studies (n=864) were included: 2 prospective cohort (n=199) and 2 retrospective studies (n=665).

The four studies yielded conflicting results. Only one study showed a clear benefit from CVC removal in a subset of 21 neutropenic patients; another study showed no benefit, while the remaining two showed that this strategy had a marginal benefit.

In the first study, an analysis of the influence of CVC management on the prognosis was performed in 75 patients who had both a CVC in place and Karnofsky scale evaluated. The median performance status score was significantly higher in patients who had the catheter removed (40 versus 30; p=0.002), and catheter retention was the only variable associated with an increased risk of death on multivariate analysis (OR 4.22, 95% CI: 2.0, 11.6). However, in a subsequent analysis (authors’ unpublished data), it was observed that in patients who received antifungal treatment, catheter removal was only associated with a lower mortality rate in the 21 patients with neutropenia (OR 15, 95% CI: 1.16, 316.66). This variable was not significant in the 52 patients without neutropenia (OR 1.94, 95% CI: 0.53, 7.19).

In the second study, a multivariate analysis found that catheter retention was not significantly associated with death. However, severity of illness (OR 46.6, 95% CI: 6.33, 861), persistent neutropenia (OR 33.1, 95% CI: 2.2, 498) and older age (OR 1.06 for each additional year, 95% CI: 1.10, 1.11) were.

The third study was undertaken to specifically identify predictors of poor outcome. The CVC exchange was associated with a higher cure rate, and earlier exchanges had greater effects. However, the patients who retained the catheters had significantly higher APACHE III scores (p<0.001) and were more likely to have neutropenia (p<0.001). Multivariate analysis found severity of illness (OR 1.05 per additional point, 95% CI: 1.03, 1.07), visceral dissemination (OR 6.0, 95% CI: 3.3, 11), persistent neutropenia (OR 11, 95% CI: 4.6, 24), and treatment with antifungal therapy (OR 0.21, 95% CI: 0.09, 0.50) to be important predictors of death. In the subgroup of patients who had CVCs, full exchange of the catheter had a marginally beneficial effect (OR 2.0, 95% CI: 1.4, 2.9, p=0.06).

In the last study, catheter removal had a modest impact on mortality according to the multivariate analysis (OR 0.62, 95% CI: 0.38, 0.99, p=0.047) but not the univariate analysis. The other significant variables were the duration of positive blood cultures (OR 1.06, 95% CI: 1.01, 1.12), receipt of adequate antifungal treatment (OR 0.52, 95% CI: 0.32, 0.84), and hospitalisation ward (the OR for worse prognosis in intensive care units compared with surgical and medical wards was 2.06, 95% CI: 1.21, 3.51).

Authors’ conclusions
It is possible that the removal of CVCs may reduce the rate of complications due to candidemia, including death, but the findings of this literature review do not substantiate this consensus recommendation.

CRD commentary
The authors addressed a reasonably defined review question with clear inclusion criteria relating to the types of interventions and outcome measures that would be assessed. However, overly strict inclusion criteria for the outcome measures may have restricted the evidence base and limited the clinical applicability of the review. The literature search was restricted to only one database, and this means that other studies may well have been missed. The authors do not report how the studies were selected for inclusion in the review or whether any validity assessment of the studies was
undertaken. Selection bias may, therefore, have been introduced into the review process. In addition, it is difficult to assess the quality of the included studies and how this may influence the results.

The authors’ use of a narrative synthesis was appropriate, and their discussion of the results in relation to differences in study populations and the severity of underlying illness was adequate. Overall, the results of the reviewed studies appear to have been consistent with the authors’ conclusions. However, a number of biases may have been introduced into the review process, and the results should therefore be viewed with some caution.

**Implications of the review for practice and research**

Practice: The authors state that there is insufficient evidence on the benefits of the removal of CVCs in patients with candidemia, to provide practice recommendations.

Research: The authors state that the effects of CVC removal on morbidity (duration of candidemia, complications, length of hospital stay) and mortality needs to be assessed by a prospective, randomised trial that considers all known confounding variables and uses appropriate statistical analyses.

**Bibliographic details**

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**Other publications of related interest**


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the reliability of the review and the conclusions drawn.