Continuous venovenous hemofiltration with or without predilution regional citrate anticoagulation: a prospective study


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 compared the costs and effects of continuous venovenous haemofiltration (CVVH) alone with CVVH plus predilution regional citrate anticoagulation (RCA) for critically-ill patients. The authors concluded that both treatments had similar costs, but the additional use of RCA produced better clinical outcomes. The costing methods used in the study were not reported in detail, and all outcomes were based on a small observational study in a single setting. Therefore, the authors’ conclusions should be interpreted with caution.

Type of economic evaluation
Cost-effectiveness analysis

Study objective
The purpose was to compare the clinical effectiveness and costs of continuous venovenous haemofiltration (CVVH) plus predilution regional citrate anticoagulation (RCA) with CVVH alone in critically ill patients with a high bleeding risk. The definition of a high bleeding risk was reported.

Interventions
Patients in the CVVH alone group were administered standard anticoagulant solutions, while patients in the RCA group received the standard CVVH and an intravenous calcium drip containing calcium 0.225mmol/ml.

Location/setting
Netherlands/secondary care.

Methods
Analytical approach:
The effectiveness data were derived from a single prospective observational cohort study. The authors did not specifically state the follow-up period or the study perspective.

Effectiveness data:
The primary outcomes were haemofilter life and azotemic control, the latter was defined as the decrease in serum levels of creatinine and blood urea nitrogen concentration in the first 72 hours of CVVH. Bleeding complications, discharge, and hospital mortality were also reported. The prospective observational sequential cohort study comprised 31 consecutive patients without RCA, and subsequently 20 patients with RCA. There were no exclusions and the two patient groups had similar demographic and biochemistry parameters at baseline. An intention-to-treat analysis was performed.

Monetary benefit and utility valuations:
None.

Measure of benefit:
The main clinical outcomes were haemofilter life and azotemic control, while secondary outcomes were patient bleeding complications, hospital mortality, and discharge. No synthesis with costs was undertaken.

Cost data:
The types of resources included standard replacement solutions, filters used, staffing, and calcium glubionate solution. The sources of resource quantities and values were not stated. The costs per hour were presented and a formula was provided. All prices were in US dollars ($), but neither the price year nor any adjustments were reported.

**Analysis of uncertainty:**
No sensitivity analyses were reported.

**Results**
The mean hourly cost for the CVVH alone group was $12.85 (interquartile range, IQR: $9.72, $18.09) compared with $14.33 (IQR: $12.83, $16.05) for the RCA group. The difference was not statistically significant.

For RCA, the mean filter life was 41 hours (IQR: 20, 62) and, for CVVH alone, it was 12 hours (IQR: 8, 28). Azotemic control favoured RCA with a decrease in creatinine level of 127 (IQR: 54, 153) compared with 41 (IQR: 20, 146) for CVVH alone and a decrease in blood urea nitrogen level of 9.1 (IQR: 3.5, 13.4) for RCA compared with 3.5 (IQR: 0, 9.3) for CVVH alone. The authors stated that hospital mortality was 61% for CVVH alone compared with 40% for RCA. All these differences were not statistically significant.

The cost and effectiveness results were not combined to produce cost-effectiveness ratios.

**Authors' conclusions**
The authors concluded that CVVH plus RCA using a citrate-based replacement solution is superior to CVVH alone with respect to filter life and azotemic control, at a comparable cost per hour, in patients at high risk of bleeding.

**CRD commentary**
Interventions:
The interventions were clearly reported including dosage and detailed clinical techniques. The authors justified their use of the CVVH plus RCA treatment.

Effectiveness/benefits:
The effectiveness data were derived from a small sequential cohort study carried out in a single setting. The details of the study methods were transparently reported and they appear to be internally valid. Although the study was not a randomised controlled trial, and so could be prone to bias or confounding, the participant demographic and biochemical profiles were shown to be similar at baseline. The results were presented separately for each effectiveness outcome and comparisons with similar studies were discussed.

Costs:
The costs appear to reflect those of the hospital perspective although this was not explicitly stated. The cost methods were not reported transparently. This is likely to be due to the cost component being a small and secondary focus of the overall study. However, it does not allow the reader to fully ascertain the methods used for determining resource quantities and valuations and why, for example, the investigators chose their cost formula or why an hourly measure was used. In addition, the price year and currency exchange rates were not stated making any reflation exercise difficult.

Analysis and results:
The health outcomes and net costs were not synthesised into cost-effectiveness ratios and, in effect, a cost-consequences analysis was performed. The authors discussed their findings generally in relation to other techniques, and specifically in comparison with other studies reporting similar results, using the same technique. The authors acknowledged several limitations of their study, but did not suggest that further research within a randomised trial design was needed to support their claims. The limited cost detail highlights the fact that the main focus of this analysis was on clinical outcomes.

Concluding remarks:
The reporting and methods used for the effectiveness outcomes were appropriate and clear, whereas there was a lack of comprehensive information on the cost analysis. Given that the study involved a small observational sample from a
single centre, the cost results should be viewed with caution.

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