The confusion assessment method for the intensive care unit (CAM-ICU) and intensive care delirium screening checklist (ICDSC) for the diagnosis of delirium: a systematic review and meta-analysis of clinical studies

Gusmao-Flores D, Figueira Salluh JI, Challhub RT, Quarantini LC

CRD summary
This review concluded that the Confusion Assessment Method for Intensive Care Unit was an excellent diagnostic tool in intensive care patients. The Intensive Care Delirium Screening Checklist had moderate sensitivity and good specificity. Inclusion was restricted to peer-reviewed studies published in English and there were limitations of the analytical methods used so the conclusions should be treated with caution.

Authors' objectives
To evaluate the current evidence on the accuracy of the Confusion Assessment Method for Intensive Care Unit (CAM-ICU) and the Intensive Care Delirium Screening Checklist (ICDSC) for diagnosis of delirium in critically ill patients.

Searching
MEDLINE, SciELO, CINAHL and EMBASE were searched for peer-reviewed papers published in English from 2001 to November 2011; search terms were reported.

Study selection
Studies that evaluated CAM-ICU and ICDSC compared to a reference standard of Diagnostic and Statistical Manual of Mental Disorders fourth edition (DSM-IV) criteria for diagnosing delirium in adult patients in an intensive care unit were eligible for inclusion. Case reports and studies that evaluated the correlation between delirium and morbidity or mortality using CAM-ICU and the ICDSC were excluded.

In included studies, most patients had been admitted to a medical intensive care unit. Prevalence of delirium ranged from 16% to 87%. Where reported, mean Acute Physiology and Chronic Health Evaluation II scores ranged from 14 to 25.5. Most studies used the Richmond Agitation Sedation Scale and excluded patients with a score less than 3.

Two reviewers independently selected studies for the review; disagreements were resolved by discussion.

Assessment of study quality
Study quality was assessed using the QUADAS tool.

The authors did not state how many reviewers assessed study quality.

Data extraction
Data were extracted by two independent reviewers to construct 2x2 tables of test performance. Sensitivity, specificity and diagnostic odds ratios (DOR) were calculated. Disagreements were resolved by discussion.

Methods of synthesis
Pooled estimates of sensitivity, specificity and diagnostic odds ratios were calculated with 95% confidence intervals. Heterogeneity was assessed using the $X^2$ and $I^2$ statistics. Summary receiver operating characteristic (SROC) curves were produced using the Moses-Littenberg model; the area under the curve (AUC) was calculated. Subgroup analyses were conducted but were not prespecified in the methods.

Results of the review
Nine studies that evaluated CAM-ICU (969 patients, range 22 to 181) and four that evaluated ICDSC (397 patients, range 59 to 126) were included in the review. All studies scored 13 or 14 (out of 14) on QUADAS; studies that scored 13 failed to report avoiding progression bias.

CAM-ICU: Pooled sensitivity was 80.0% (95% CI 77.1% to 82.6%), specificity was 95.9% (95% CI 94.8% to 96.8%)
and diagnostic odds ratio was 103.2 (95% CI 39.6 to 268.8). The area under the curve was 0.97.

**ICDSC**: Pooled sensitivity was 74% (95% CI 65.3% to 81.5%), specificity was 81.9% (95% CI 76.7% to 86.4%) and the diagnostic odds ratio was 21.5 (95% CI 8.51 to 54.4). The area under the curve was 0.89.

Results for subgroup analyses were reported. Heterogeneity was substantial across most of the analyses.

**Authors’ conclusions**
CAM-ICU was an excellent diagnostic tool in critically ill intensive care unit patients. ICDSC had moderate sensitivity and good specificity. Available data suggested that both CAM-ICU and ICDSC can be used as a screening tool for the diagnosis of delirium in critically ill patients.

**CRD commentary**
The authors addressed a clear review question supported by reproducible inclusion criteria. Relevant sources were searched. Only peer-reviewed papers were included. Studies published in languages other than English were excluded; the authors acknowledged that such studies were available. Study selection and data extraction were conducted in duplicate; it was unclear whether similar methods were used to during the quality assessment. Study quality was assessed using appropriate criteria. These results were published as a summary score and the criterion that some studies failed was indicated. The included studies seem to be good quality but progression bias may have been an issue with some studies.

Summary estimates of sensitivity and specificity were produced separately from clinically heterogeneous studies, which could overestimate accuracy. Therefore, reliability and generalisability of the pooled results were uncertain. SROC curves were produced. More robust models were available from which summary estimates of sensitivity and specificity could have been derived that maintain the relationship between these measures.

Limitations of the restricted inclusion and the analytical methods used mean that the conclusions should be treated with caution.

**Implications of the review for practice and research**
**Practice**: The authors stated that the pooled value for specificity was 96% and this suggested that when CAM-ICU was positive it was not necessary to confirm the diagnosis of delirium using DSM-IV criteria and this improved its feasibility in the intensive care unit; CAM-ICU was not only adequate for screening but also a good confirmatory diagnostic tool for delirium in critically ill patients. They also stated that the CAM-ICU seemed to be the ideal tool for the diagnosis of delirium in critically ill patients. ICDSC, by its features not dichotomous, enabled diagnosis of subsyndromal delirium, which had potential prognostic implications and could identify patients with potential therapeutic benefit.

**Research**: The authors stated that research was required to evaluate specific groups of patients.

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