Revisión sistemática y meta-análisis sobre el valor predictivo de la proteína C-reactiva en infección postoperatorias [Systematic review and meta-analysis of the predictive value of C-reactive protein in postoperative infections]
Nunes BK, Lacerda RA, Jardim JM

CRD summary
This review concluded that, along with other clinical interventions, C-reactive protein was considerably valuable in the prognosis/diagnosis of postoperative infections. This review had several limitations and it is unlikely that the summary estimates presented, or the strong conclusion, can be deemed reliable.

Authors’ objectives
To identify the diagnostic and predictive value of C-reactive protein (CRP) for the assessment of infection in surgical patients.

Searching
PubMed, EMBASE, LILACS and The Cochrane Library were searched with language restriction (not specified) for full papers published up to January 2009; search terms were reported. Bibliographies of identified studies were searched for additional studies.

Study selection
Eligible studies measured CRP preoperatively and/or postoperatively in patients undergoing surgery. The outcome of interest was postoperative infections related to CRP changes. The included studies recruited patients undergoing orthopaedic, gastrointestinal or cardiac surgery. Most of the studies conducted CRP preoperatively and postoperatively; the timing of testing post-surgery ranged from day four to day 30, where reported.

The authors did not state how many reviewers performed study selection.

Assessment of study quality
The authors assigned a level of evidence. Quality of the overall evidence base was assessed in terms of similarity of population and surgical procedure, risk factor adjustment, duration of follow-up and blinding of outcome assessors.

The authors did not state how many reviewers performed quality assessment.

Data extraction
The overall results as to whether CRP predicted infection were extracted, along with estimates of sensitivity and specificity, where reported.

The authors did not state the number of reviewers who performed the data extraction.

Methods of synthesis
Summary receiver operating characteristic (SROC) curves were produced; the model used was not reported. The area under the curve (AUC) and Q value were determined. Mean estimates of sensitivity and specificity were produced, but it was unclear whether these were simple means or derived from a meta-analytical technique. The overall diagnostic odds ratio (DOR) was also calculated.

Results of the review
Twenty studies met the inclusion criteria (5,720 patients; range 32 to 1,418). Eighteen studies were prospective cohorts, one was a case-control study and one was a retrospective/historically controlled study. Overall, the authors stated that the type of surgery and CRP analysis was homogeneous across the studies, and the use of "clean surgeries" homogenised the risk factors of surgical site infection.

All 20 studies reported that CRP was predictive of postoperative infection. Fifteen studies reported sensitivity and
specificity; sensitivity ranged from 53% (corresponding specificity 76%) to 100% (specificity 98.4%), and specificity from 65% (sensitivity 93%) to 100% (sensitivity 60%). The studies that provided these estimates had CRP measurements either preoperative, postoperative, or both (with only a single estimate of sensitivity/specificity given). Eleven studies were included in the meta-analysis; the summary estimate of sensitivity was 85% and specificity was 86%. The area under the curve was 0.9060, Q was 0.8377, and overall diagnostic odds ratio was 23.56 (95% CI 11.50 to 48.25).

Authors' conclusions
Along with other clinical interventions, C-reactive protein (CRP) was considerably valuable in the prognosis/diagnosis of postoperative infections.

CRD commentary
The authors addressed a clear research question, with broad but clear inclusion criteria. Several sources were searched; language restrictions were applied and there was no specific search for unpublished studies so bias could not be ruled out. There was no reporting on duplication in the review process, so potential for error and bias could not be assessed. It was stated that study quality was assessed, but it seemed that a level of evidence was assigned, and only an overall assessment of the evidence available given; there was no detailed assessment of individual studies.

Though the surgical techniques and consequently the risk of infection were considered homogeneous, the types of surgery spanned orthopaedic, gastrointestinal and cardiac procedure (no further detail was provided). The method for producing the summary estimates of sensitivity and specificity were not reported, and may have been simple means. The SROC model used appeared to be the Moses-Littenberg model; more robust models were available that maintained the within-study relationship between sensitivity and specificity. There was no investigation into either clinical or statistical heterogeneity across the studies. Although the authors considered this to have been "an extremely homogeneous review", there appeared to be considerable clinical heterogeneity across the studies, and the pooled results contained studies that conducted CRP test preoperatively and postoperatively. There was also a contradiction between the authors’ overall conclusion and recommendations for further research.

Overall, this review has several limitations and it is unlikely that the summary estimates, or the overly strong conclusion, can be deemed reliable.

Implications of the review for practice and research
Practice: The authors did not state any implications for practice.
Research: The authors stated that further research was needed, with homogeneous internal validity criteria, before recommending CRP as a risk marker for these infections.

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This is a critical abstract of a systematic review that meets the criteria for inclusion on DARE. Each critical abstract contains a brief summary of the review methods, results and conclusions followed by a detailed critical assessment on the reliability of the review and the conclusions drawn.