

Title	Comparative Value of Erythrocyte Sedimentation Rate (ESR) and C-Reactive Protein (CRP) Testing in Combination Versus Individually for the Diagnosis of Undifferentiated Patients With Suspected Inflammatory Disease or Serious Infection: A Systematic Review and Economic Analysis
Agency	CADTH 865 Carling Ave., Suite 600 Ottawa ON K1S 5S8 Tel: 613 226 2553, Fax: 613 226 5392; www.cadth.ca
Reference	https://www.cadth.ca/sites/default/files/pdf/HT0006-OP0516_ESRandCRP_e.pdf

Aim

The aim of this report was to address the issue of when, if ever, it is appropriate to concurrently test ESR and CRP versus ESR or CRP alone to help diagnose inflammatory disease or serious infection.

Conclusions and results

The results indicated that ESR/CRP tests had consistently higher sensitivity values and lower specificity values relative to ESR and CRP tests alone. In contrast, sensitivity values of ESR + CRP tests were consistently lower and their specificity values were consistently higher than those of individual ESR and CRP tests. Combined tests were defined as ESR+ CRP (positive findings for both ESR and CRP), and ESR/CRP (positive findings for either ESR or CRP).

ESR + CRP was statistically more specific than both ESR and CRP in diagnosis of periprosthetic infections and giant cell arteritis, and more specific than ESR in the diagnosis of orthopedic infections in children. In terms of relative sensitivity, the ESR/CRP combination was shown to be statistically superior to ESR, and comparable, if not superior, to CRP in diagnosis of periprosthetic infections in adults and orthopedic infections in children. The systematic review revealed no statistical differences in diagnostic performance measures between ESR + CRP versus ESR and CRP alone in detecting inflammatory bowel diseases, and differentiating viral from bacterial bronchiolitis in children.

In the economic analysis, the basecase incremental cost per false negative avoided for ESR/CRP compared to ESR alone was \$611 in periprosthetic patients and \$3,929 for pediatric orthopedic infections. The incremental cost per false negative avoided for ESR/CRP compared to CRP alone was estimated to be \$839 in periprosthetic patients and \$5,391 for pediatric orthopedic infections. The basecase incremental cost per false-positive avoided for ESR+ CRP compared with ESR alone ranged from CAD\$46 for pediatric infections to CAD\$123 for the detection of giant cell arteritis. The incremental cost per false-positive avoided for ESR + CRP versus CRP alone ranged from CAD\$99 for inflammatory bowel disease to CAD\$378 for pediatric orthopedic infections.

Recommendations

Not applicable.

Methods

In the systematic review, each of the diagnostic performance measures was estimated for the comparison between ESR, CRP and a combination of these two tests. To estimate pooled diagnostic performance measures, direct comparisons were made between each of the four comparators (i.e., ESR + CRP, ESR/CRP, ESR alone, and CRP alone) versus reference standard. To determine the relative performance of combined ESR and CRP testing versus individual ESR or CRP testing, indirect comparisons were conducted to provide a comparative estimate between the two tests using the Bucher method.

A cost-effectiveness analysis was conducted to compare combined ESR and CRP testing with either ESR or CRP alone. The cost-effectiveness outcome evaluated depended on whether a positive combined test was based on both ESR and CRP being positive (ESR + CRP) or either ESR or CRP being positive (ESR/CRP). The analysis was conducted from a third-party payer perspective. The four target populations of the analyses were patients suspected of periprosthetic infections, children suspected of having orthopedic infections, patients suspected of having inflammatory bowel diseases, and patients suspected of having giant cell arteritis. The comparators in the evaluation were combined ESR and CRP testing; ESR testing alone; and CRP testing alone. In this analysis, pairwise comparisons of ESR + CRP versus ESR alone and ESR + CRP versus CRP alone were conducted. Data inputs were obtained from the meta-analyses, CADTH survey results on resource use and costs and provincial benefit schedules. Sensitivity analyses were conducted on all variables that affected the model.

Further research/reviews required

Directions for future research can incorporate large studies to assess the performance of ESR and CRP testing in combination versus individually for the diagnosis for diagnosing inflammatory and infectious disorders.

Written by

Nazila Assasi and Gord Blackhouse, PATH, McMaster University, Canada.