Procalcitonin testing to guide antibiotic therapy for the treatment of sepsis in intensive care settings and for suspected bacterial infection in emergency department settings: a systematic review and cost-effectiveness analysis

Marie Westwood,1* Bram Ramaekers,2 Penny Whiting,1 Florian Tomini,2 Manuela Joore,2 Nigel Armstrong,1 Steve Ryder,1 Lisa Stirk,1 Johan Severens3 and Jos Kleijnen2

1Kleijnen Systematic Reviews Ltd, York, UK
2Maastricht University Medical Centre, Maastricht, The Netherlands
3Erasmus University Rotterdam, Rotterdam, The Netherlands

*Corresponding author

Declared competing interests of authors: none

Published November 2015
DOI: 10.3310/hta19960

Plain English summary

Procalcitonin testing to guide antibiotic therapy
Health Technology Assessment 2015; Vol. 19: No. 96
DOI: 10.3310/hta19960

NIHR Journals Library www.journalslibrary.nihr.ac.uk
This report considers whether procalcitonin (PCT) testing could be used to decide whether or not to start and when to stop antibiotic treatment. PCT is produced in your body and increases when you have a bacterial infection. It can also increase when you have a viral infection, but these increases are usually smaller than for bacterial infections. We considered PCT testing in two groups of people: people with sepsis (blood poisoning) or suspected sepsis in intensive care units (ICUs) and people with possible bacterial infections in emergency departments (EDs). The evidence is current to June 2014.

We included 18 randomised controlled trials, eight in ICUs and 10 in EDs. None of the ICU studies included children, but two of the ED studies were conducted in children. All studies compared guidance on when to start or stop antibiotic therapy that included PCT testing with guidance that did not include PCT testing.

Research shows that guidance that includes PCT testing appears to reduce the amount of antibiotics used, and may reduce hospital stay. However, it is not clear that PCT testing is the main cause of these reductions, or that such reductions would follow if PCT testing was used in UK hospitals. There is no indication that PCT testing is associated with increases in adverse effects such as hospital re-admission, death, infections, need for help with breathing or other medicines. PCT testing may be cost-saving for adults with sepsis in an ICU setting and adults and children with possible bacterial infection in EDs.
Criteria for inclusion in the Health Technology Assessment journal

Reports are published in Health Technology Assessment (HTA) if (1) they have resulted from work for the HTA programme, and (2) they are of a sufficiently high scientific quality as assessed by the reviewers and editors.

Reviews in Health Technology Assessment are termed ‘systematic’ when the account of the search appraisal and synthesis methods (to minimise biases and random errors) would, in theory, permit the replication of the review by others.

HTA programme

The HTA programme, part of the National Institute for Health Research (NIHR), was set up in 1993. It produces high-quality research information on the effectiveness, costs and broader impact of health technologies for those who use, manage and provide care in the NHS. ‘Health technologies’ are broadly defined as all interventions used to promote health, prevent and treat disease, and improve rehabilitation and long-term care.

The journal is indexed in NHS Evidence via its abstracts included in MEDLINE and its Technology Assessment Reports inform National Institute for Health and Care Excellence (NICE) guidance. HTA research is also an important source of evidence for National Screening Committee (NSC) policy decisions.

For more information about the HTA programme please visit the website: http://www.nets.nihr.ac.uk/programmes/hta

This report

The research reported in this issue of the journal was commissioned and funded by the HTA programme on behalf of NICE as project number 14/18/01. The protocol was agreed in July 2014. The assessment report began editorial review in January 2015 and was accepted for publication in April 2015. The authors have been wholly responsible for all data collection, analysis and interpretation, and for writing up their work. The HTA editors and publisher have tried to ensure the accuracy of the authors’ report and would like to thank the reviewers for their constructive comments on the draft document. However, they do not accept liability for damages or losses arising from material published in this report.

This report presents independent research funded by the National Institute for Health Research (NIHR). The views and opinions expressed by authors in this publication are those of the authors and do not necessarily reflect those of the NHS, the NIHR, NETSCC, the HTA programme or the Department of Health. If there are verbatim quotations included in this publication the views and opinions expressed by the interviewees are those of the interviewees and do not necessarily reflect those of the authors, those of the NHS, the NIHR, NETSCC, the HTA programme or the Department of Health.

© Queen’s Printer and Controller of HMSO 2015. This work was produced by Westwood et al. under the terms of a commissioning contract issued by the Secretary of State for Health. This issue may be freely reproduced for the purposes of private research and study and extracts (or indeed, the full report) may be included in professional journals provided that suitable acknowledgement is made and the reproduction is not associated with any form of advertising. Applications for commercial reproduction should be addressed to: NIHR Journals Library, National Institute for Health Research, Evaluation, Trials and Studies Coordinating Centre, Alpha House, University of Southampton Science Park, Southampton SO16 7NS, UK.

Published by the NIHR Journals Library (www.journalslibrary.nihr.ac.uk), produced by Prepress Projects Ltd, Perth, Scotland (www.prepress-projects.co.uk).
Editor-in-Chief of Health Technology Assessment and NIHR Journals Library

Professor Tom Walley  Director, NIHR Evaluation, Trials and Studies and Director of the HTA Programme, UK

NIHR Journals Library Editors

Professor Ken Stein  Chair of HTA Editorial Board and Professor of Public Health, University of Exeter Medical School, UK

Professor Andree Le May  Chair of NIHR Journals Library Editorial Group (EME, HS&DR, PGfAR, PHR journals)

Dr Martin Ashton-Key  Consultant in Public Health Medicine/Consultant Advisor, NETSCC, UK

Professor Matthias Beck  Chair in Public Sector Management and Subject Leader (Management Group), Queen's University Management School, Queen's University Belfast, UK

Professor Aileen Clarke  Professor of Public Health and Health Services Research, Warwick Medical School, University of Warwick, UK

Dr Tessa Crilly  Director, Crystal Blue Consulting Ltd, UK

Dr Peter Davidson  Director of NETSCC, HTA, UK

Ms Tara Lamont  Scientific Advisor, NETSCC, UK

Professor Elaine McColl  Director, Newcastle Clinical Trials Unit, Institute of Health and Society, Newcastle University, UK

Professor William McGuire  Professor of Child Health, Hull York Medical School, University of York, UK

Professor Geoffrey Meads  Professor of Health Sciences Research, Health and Wellbeing Research and Development Group, University of Winchester, UK

Professor John Norrie  Health Services Research Unit, University of Aberdeen, UK

Professor John Powell  Consultant Clinical Adviser, National Institute for Health and Care Excellence (NICE), UK

Professor James Raftery  Professor of Health Technology Assessment, Wessex Institute, Faculty of Medicine, University of Southampton, UK

Dr Rob Riemantsa  Reviews Manager, Kleijnen Systematic Reviews Ltd, UK

Professor Helen Roberts  Professor of Child Health Research, UCL Institute of Child Health, UK

Professor Helen Snooks  Professor of Health Services Research, Institute of Life Science, College of Medicine, Swansea University, UK

Professor Jim Thornton  Professor of Obstetrics and Gynaecology, Faculty of Medicine and Health Sciences, University of Nottingham, UK

Please visit the website for a list of members of the NIHR Journals Library Board: www.journalslibrary.nihr.ac.uk/about/editors

Editorial contact: nihredit@southampton.ac.uk