

The TOMMY trial: a comparison of TOMosynthesis with digital MammographY in the UK NHS Breast Screening Programme – a multicentre retrospective reading study comparing the diagnostic performance of digital breast tomosynthesis and digital mammography with digital mammography alone

Fiona J Gilbert,^{1*} Lorraine Tucker,¹ Maureen GC Gillan,² Paula Willsher,¹ Julie Cooke,³ Karen A Duncan,⁴ Michael J Michell,⁵ Hilary M Dobson,⁶ Yit Yoong Lim,⁷ Hema Purushothaman,⁸ Celia Strudley,⁹ Susan M Astley,¹⁰ Oliver Morrish,¹¹ Kenneth C Young⁹ and Stephen W Duffy¹²

¹Department of Radiology, University of Cambridge, Cambridge, UK

²Aberdeen Biomedical Imaging Centre, University of Aberdeen, Aberdeen, UK

³Jarvis Breast Centre, Guildford, UK

⁴North East Scotland Breast Screening Centre, Aberdeen, UK

⁵Breast Radiology, King's College Hospital, London, UK

⁶West of Scotland Breast Screening Service, Glasgow, UK

⁷The Nightingale Centre, University Hospital South Manchester, Manchester, UK

⁸Department of Radiology, St Bartholomew's Hospital, London, UK

⁹National Co-ordinating Centre for Physics of Mammography, Royal Surrey County Hospital, Guildford, UK

¹⁰Department of Imaging Science and Biomedical Engineering, University of Manchester, Manchester, UK

¹¹East Anglian Regional Radiation Protection Service, Cambridge University Hospitals, Cambridge, UK

¹²Wolfson Institute of Preventive Medicine, Queen Mary University of London, London, UK

*Corresponding author

Declared competing interests of authors: Dr Michell reports personal fees, non-financial support and grants from Hologic, the supplier of the mammographic and tomographic equipment, outside the submitted work. Dr Astley reports grants from NIHR during the conduct of the study; non-financial support from Matakina; and workshop training sessions and non-financial support from Hologic outside the submitted work. No others declared.

Published January 2015

DOI: 10.3310/hta19040

Plain English summary

A comparison of TOMosynthesis with digital MammographY

Health Technology Assessment 2015; Vol. 19: No. 4

DOI: 10.3310/hta19040

NIHR Journals Library www.journalslibrary.nihr.ac.uk

Plain English summary

Breast screening is recognised as the best way to detect early-stage breast cancer and reduce the number of deaths from this disease. In a standard breast screening radiograph (mammogram), overlapping breast tissue may hide some cancers or make normal tissue appear abnormal.

Digital breast tomosynthesis (DBT) takes multiple low-dose radiographs of the breast that are processed by a computer to reconstruct a DBT image. This allows abnormalities in the breast be seen more clearly and could make it easier to see small cancers and decrease the number of 'false alarms'. DBT images are usually read with a standard two-dimensional (2D) mammogram. This double radiation exposure could be avoided if a 2D mammogram could be created from DBT images.

The study compared the accuracy of reading (1) a 2D mammogram with (2) 2D mammogram with a DBT or (3) synthetic 2D mammogram with a DBT to identify breast cancer. Data from 7061 cases were analysed: 6021 cases from women (47–73 years) recalled after routine screening for further tests and 1040 cases from women (40–49 years) with a family history of breast cancer attending annual breast screening.

The results of the study indicated that the use of a combination of 2D + DBT or synthetic 2D + DBT produces a small increase in the number of cancer cases detected and could help reduce the number of women who are recalled for unnecessary tests, that is false alarms, which could reduce health-care costs and patient anxiety.

ISSN 1366-5278 (Print)

ISSN 2046-4924 (Online)

Impact factor: 5.116

Health Technology Assessment is indexed in MEDLINE, CINAHL, EMBASE, The Cochrane Library and the ISI Science Citation Index and is assessed for inclusion in the Database of Abstracts of Reviews of Effects.

This journal is a member of and subscribes to the principles of the Committee on Publication Ethics (COPE) (www.publicationethics.org/).

Editorial contact: nihredit@southampton.ac.uk

The full HTA archive is freely available to view online at www.journalslibrary.nihr.ac.uk/hta. Print-on-demand copies can be purchased from the report pages of the NIHR Journals Library website: www.journalslibrary.nihr.ac.uk

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 funded by the HTA programme as project number 09/22/182. The contractual start date was in December 2010. The draft report began editorial review in February 2014 and was accepted for publication in August 2014. 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.

© Queen's Printer and Controller of HMSO 2015. This work was produced by Gilbert *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, Faculty of Education, University of Winchester, 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 Riemsma 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

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