Washington State Health Care Authority

Agency Medical Director Comments

Appropriate Imaging for Breast Cancer Screening in Special Populations

Dan Lessler, MD
Chief Medical Officer, Washington Health Care Authority

January 16, 2014

1

Background

- Breast cancer is the most common form of cancer in women
- Mammography remains the mainstay of screening for breast cancer
- Breast CA mortality has declined overall by 28% since 1990; it is estimated that a little less than half this decline is due to early diagnosis with screening mammography
- Recommended age and frequency of screening mammography is variable across organizations

2

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Background

- Increased breast density both increases the risk of breast cancer and decreases the sensitivity of mammography to detect small lesions
- Approximately 50% of women have "dense breasts" (BI-RADS density "c" or "d")
- Digital mammography has become the standard across the U.S., and is more sensitive than film for dense breasts
- The most important harms of mammography screening are false-positive results and over-diagnosis (detection of disease that would not have caused morbidity or mortality if not found)

Desirable Attributes of New Approaches to Screening Mammography*

- Decrease false positives
- Increase cancer detection
  - However, currently not possible to know whether any particular patient whose cancer is detected by mammography is or is not at risk of the cancer being "over-diagnosed."
- Reasonable cost effectiveness

*More definitive studies of new approaches to mammography screening that evaluate mortality are unlikely to be undertaken

Newer Approaches to Breast Cancer Screening

Digital Breast Tomosynthesis (DBT)

- Provides 3-D images and is a modification of digital mammography using a moving x-ray source and digital detector
- Approved in U.S. for breast CA screening when used in combination with mammography
- Newer tomosynthesis techniques do not significantly increase radiation exposure

Supplemental Modalities in Women with Dense Breast Tissue

- Magnetic resonance imaging (MRI)
- Hand-held ultrasound (HHUS)
- Automated whole breast ultrasound (ABUS)

Appropriate Imaging for Breast Cancer

Agency Medical Directors' Concerns

- **Safety = Low**
- **Efficacy = High**
- **Cost = High**

7

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Appropriate Imaging for Breast Cancer

Key Questions 1- 3

1) What is the effectiveness of screening with digital breast tomosynthesis (DBT) vs. digital mammography among women aged 40-74 who are candidates for screening mammography?
2) What is the comparative effectiveness of handheld ultrasonography, automated ultrasonography, and magnetic resonance imaging when used as supplemental screening modalities in women with dense breast tissue and a negative mammogram or negative DBT result?
3) What are the documented and potential harms associated with these imaging tests, including overdiagnosis and overtreatment, unnecessary biopsy as a result of false-positive imaging, patient anxiety, and radiation exposure?

8

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Appropriate Imaging for Breast Cancer

Key Questions 4 - 5

4) What is the differential effectiveness and safety of the tests of interest according to such factors as age, race or ethnicity, comorbidities, BMI, method of breast density classification, overall breast cancer risk, scan vendor, and imaging protocol (e.g., whether ultrasound is performed by a radiologist, technologist, or some combination of the two)?
5) What are the costs and cost-effectiveness (e.g., cost per cancer detected) of the imaging modalities of interest?

9

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Appropriate Imaging for Breast Cancer: State Agency Utilization

Current State Agency Policy

Cancer Screening Using:	Medicaid	UMP	DOC	LNI
Mammography	C	C	C	PA
Breast Tomography	PA*	PA	PA	PA
Breast MRI	C	PA	PA	C
Breast Ultrasound	C	PA	PA	C

* Under unlisted (unspecified) procedure code.

C: Covered
NC: Not covered
PA: Prior authorization required

10

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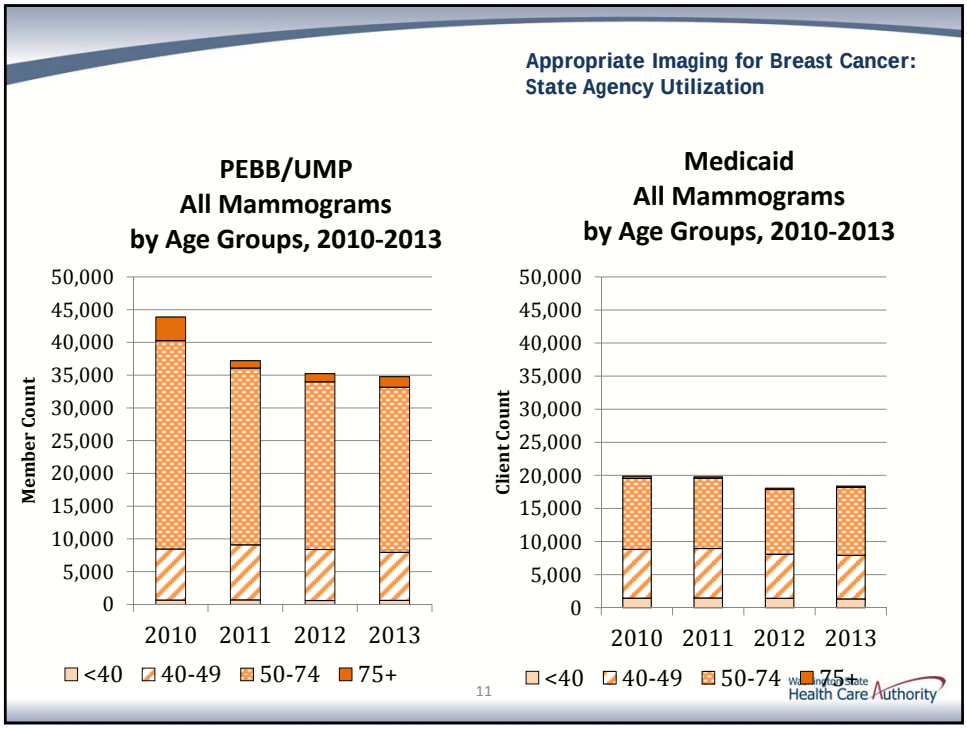
Appropriate Imaging for Breast Cancer:
State Agency Utilization
PEBB/UMP
All Mammograms
by Age Groups, 2010-2013
Member Count
50,000
45,000
40,000
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
2010 2011 2012 2013
<40 40-49 50-74 75+
Medicaid
All Mammograms
by Age Groups, 2010-2013
Client Count
50,000
45,000
40,000
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
2010 2011 2012 2013
<40 40-49 50-74 75+
11
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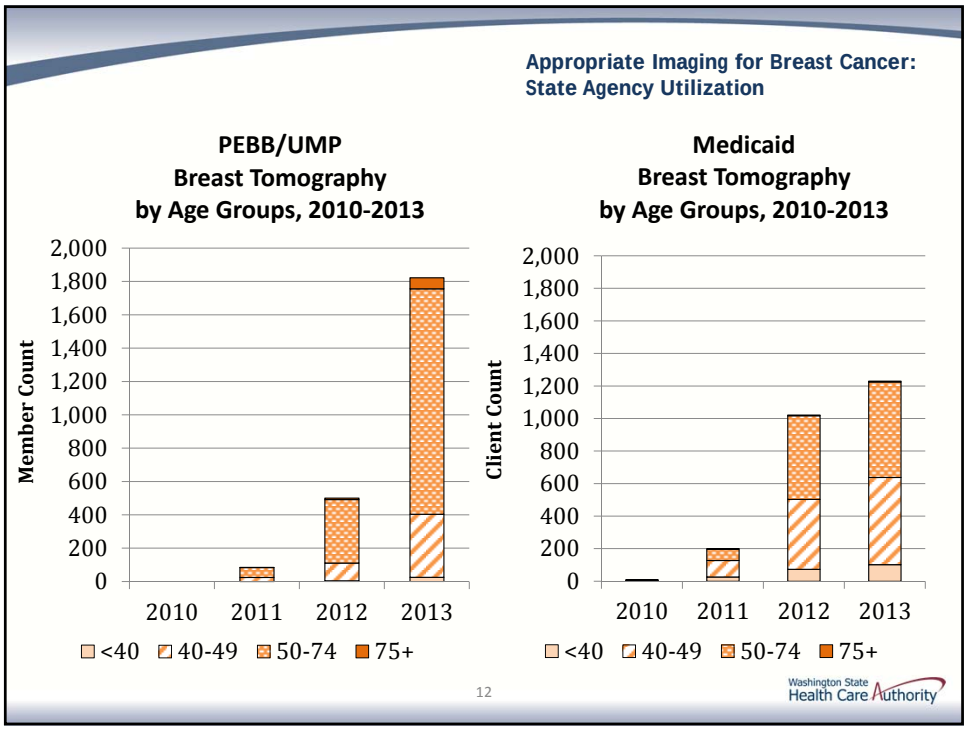
Health Care Authority


Appropriate Imaging for Breast Cancer:
State Agency Utilization
PEBB/UMP
Breast Tomography
by Age Groups, 2010-2013
Member Count
2,000
1,800
1,600
1,400
1,200
1,000
800
600
400
200
0
2010 2011 2012 2013
<40 40-49 50-74 75+
Medicaid
Breast Tomography
by Age Groups, 2010-2013
Client Count
2,000
1,800
1,600
1,400
1,200
1,000
800
600
400
200
0
2010 2011 2012 2013
<40 40-49 50-74 75+
12
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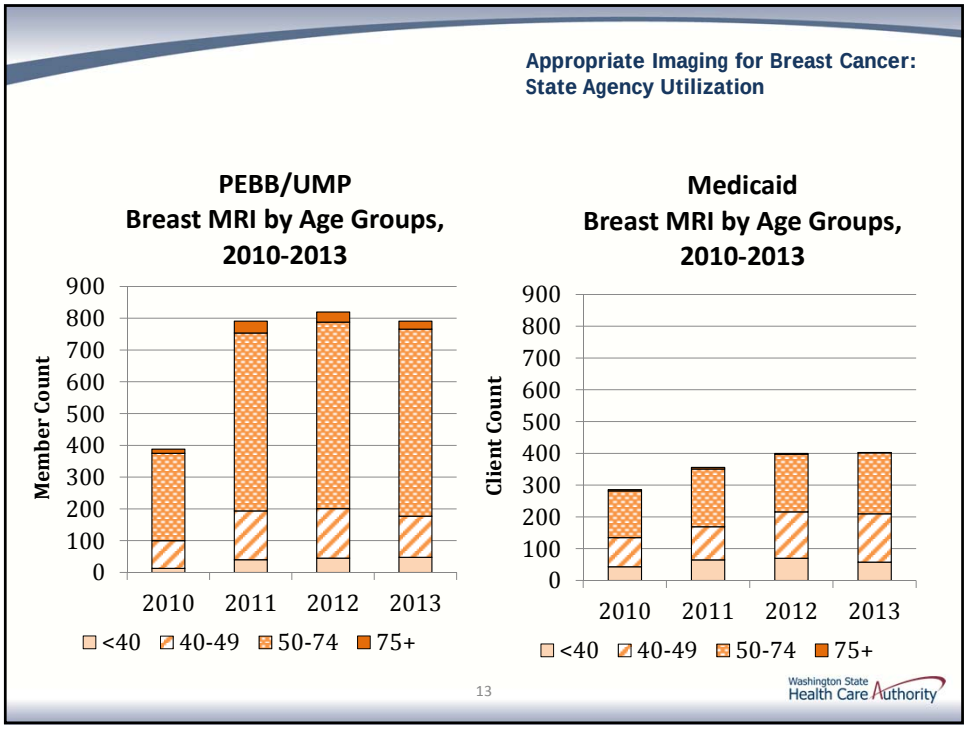
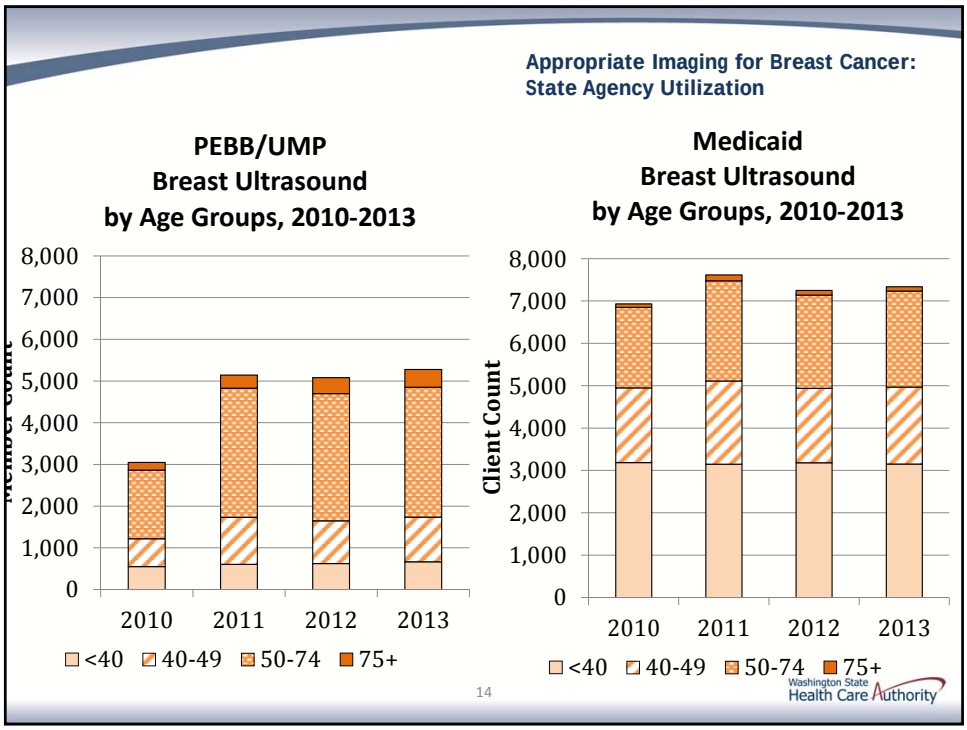
Health Care Authority


Appropriate Imaging for Breast Cancer:
State Agency Utilization
PEBB/UMP
Breast MRI by Age Groups,
2010-2013
Member Count
900
800
700
600
500
400
300
200
100
0
2010
2011
2012
2013
<40
40-49
50-74
75+
Medicaid
Breast MRI by Age Groups,
2010-2013
Client Count
900
800
700
600
500
400
300
200
100
0
2010
2011
2012
2013
<40
40-49
50-74
75+
13
Washington State
Health Care Authority


Appropriate Imaging for Breast Cancer:
State Agency Utilization
PEBB/UMP
Breast Ultrasound
by Age Groups, 2010-2013
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
2010
2011
2012
2013
<40
40-49
50-74
75+
Medicaid
Breast Ultrasound
by Age Groups, 2010-2013
Client Count
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
2010
2011
2012
2013
<40
40-49
50-74
75+
14
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Uncertainties

- For all technologies under consideration, sufficient follow-up data is lacking to estimate sensitivity and specificity
- No data on more definitive outcomes of morbidity and mortality
- MRI and HHUS studies have been done in high risk populations that happen to include women with dense breast tissue, and so results are not specific to women with dense breast tissue only
- Very limited data available on ABUS
- Study populations are heterogeneous and hence meta-analysis is not possible

Summary of Harms

- False positive test result
  - May impact psychological well being
  - Some patients will go on to unnecessary biopsy with attendant risk of complications (e.g. infection; bleeding)
- Radiation exposure from DBT now comparable to that of digital mammography along

Summary: DBT

Statistic	Digital Mammography (Estimated yield)	DBT + DM (Estimated yield)	Uncertainty*
Recall rate per 1,000	100-160	80-140	Moderate-High
Biopsy rate per 1,000	14-22	12-27	Moderate
Cancer detection rate per 1,000	3-5	4-6	Moderate-High
Positive biopsy among total biopsied (PPV3)	20-25%	25-30%	Low-Moderate

* Issues of study heterogeneity and comparability of populations result in higher uncertainty. Degree of uncertainty of recall rates is because two prospective studies are from outside of U.S. There are no prospective large studies with patient outcomes.

Summary: DBT

- DBT is a promising but as yet unproven approach to screening mammography. Available studies are of poor quality, and questions remain regarding rates of recall, biopsy and cancer detection, as well as test sensitivity and specificity
- Available Economic modeling is limited
  - Available models suggest possible small benefit with likely substantial additional cost

DBT: Private Payer Examples

- National private payers
  - DBT is considered experimental, investigational or unproven for any purpose by Aetna, CIGNA, Humana, UniCare, United Healthcare and Wellpoint/Anthem
- Regional payers
  - Premera and Health Net consider DBT investigational and do not cover it
  - Regence considers DBT to be incident to either screening or diagnostic mammogram and does not cover it

Centers for Medicare & Medicaid Services

- There are no published national or local coverage determinations for DBT

Appropriate Imaging for Breast Cancer

Supplemental Screening with MRI

Statistic	Digital Mammography	Incremental Yield with MRI	Uncertainty*
Recall rate per 1,000	100-120	100-120	High
Biopsy rate per 1,000	14-22	20-40	High
Cancer detection rate per 1,000	3-5	3-11	High
Positive biopsy among total biopsied (PPV3)	20-25%	22-48%	High

* There is a high level of uncertainty around these values b/c of the lack of direct evidence from studies of MRI in women with dense breast tissue and b/c of heterogeneity of findings in studies of high risk women.

21

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Appropriate Imaging for Breast Cancer

Supplemental Screening with Hand-Held Ultrasound (HHUS)

Statistic	Digital Mammography	Incremental Yield with HHUS	Uncertainty*
Recall rate per 1,000	100-120	30-100	High
Biopsy rate per 1,000	14-22	30-60	Low-Moderate
Cancer detection rate per 1,000	3-5	2-4	Low
Positive biopsy among total biopsied (PPV3)	20-25%	5-7%	Low

* High level of uncertainty about recall rate b/c lack of direct evidence from studies of women with dense breasts and b/c heterogeneity of findings. Cancer detection rate based on three Connecticut studies.

22

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Appropriate Imaging for Breast Cancer

Supplemental Screening with Automated Whole Breast Ultrasound (ABUS)

Statistic	Digital Mammography	Incremental Yield with HHUS	Uncertainty
Recall rate per 1,000	100-120	30-100	High
Biopsy rate per 1,000	14-22	30-60	High
Cancer detection rate per 1,000	3-5	2-4	High
Positive biopsy among the total # biopsied (PPV3)	20-25%	5-7%	High

23

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Appropriate Imaging for Breast Cancer

Summary: Supplemental Screening

- MRI
  - Very limited evidence in women with dense breast tissue but otherwise low risk
  - High relative cost
- HHUS
  - Inconclusive evidence across multiple studies esp. with respect to recall rates and cancer detection rates
  - HHUS as an adjunct to screening mammography in women with dense breasts may modestly increase cancer detection, but it increases the risk of false-positive findings leading to breast biopsies.
- ABUS
  - Inadequate evidence to comment

24
24

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Economic Analysis

- Available Economic modeling is limited
- For MRI and HHUS:
  - Available models suggest possible small benefit with substantial additional cost
  - Benefit would likely be greatest in women with dense breast tissue who have additional risk factors as well

Third-Party Coverage for Supplemental Studies

Breast Ultrasound

- No information available from Health Net, Premera Blue Cross or Regence
- Cigna, Humana and United Healthcare consider breast ultrasound experimental for any type of screening

Breast MRI

- Humana and United Healthcare cover breast MRI as an adjunct to mammography when heterogeneous or extremely dense breast tissue is identified
- Aetna, UniCare, and WellPoint/Anthem cover MRI as an adjunct in women with dense breasts AND a personal history of breast cancer

Centers for Medicare and Medicaid

- No national or local coverage determination on use of breast ultrasound to supplement *screening* mammography
- No national or local coverage determination for breast MRI to supplement *screening* mammography

State Agency Recommendation

- **Digital Breast Tomography**
  - Non-coverage
- **MRI** supplementary to screening mammography in women with dense breasts
  - Non-coverage
- **Hand Held Ultrasound** supplementary to screening mammography in women with dense breasts
  - Non-coverage
- **Automated Breast Ultrasound** supplementary to screening mammography in women with dense breasts
  - Non-coverage

Questions?

More Information:

http://www.hca.wa.gov/hta/Documents/breast_imaging_draft_report_102114.pdf

Dan Lessler, MD
Daniel.Lessler@hca.wa.gov

29

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Health Technology Assessment

Order of Scheduled Presentations:

Appropriate Imaging for Breast Cancer Screening in Special Populations

	Name
1	
2	
3	
4	
5	
6	

No requests to provide public comment on the technology review were received.

Washington State Health Care Authority
Health Technology Assessment

Appropriate Imaging for Breast Cancer Screening in Special Populations

Clinical Expert

Christoph I. Lee, MD, MSHS

Director, Breast Imaging Fellowship
Department of Radiology, Section of Breast Imaging
University of Washington School of Medicine

Disclosure

Any unmarked topic will be considered a "Yes"

	Potential Conflict Type	Yes	No
1.	Salary or payments such as consulting fees or honoraria in excess of $10,000.		✓
2.	Equity interests such as stocks, stock options or other ownership interests.		✓
3.	Status or position as an officer, board member, trustee, owner.		✓
4.	Loan or intellectual property rights.		✓
5.	Research funding.	✓	
6.	Any other relationship, including travel arrangements.	✓	

If yes, list name of organizations that relationship(s) are with and for #6, describe other relationship:

I have received both grant funding and consulting fees from GE Healthcare related to digital mammography, ultrasound, and digital breast tomosynthesis.

	Potential Conflict Type	Yes	No
7.	Representation: if representing a person or organization, include the name and funding sources (e.g. member dues, governmental/taxes, commercial products or services, grants from industry or government).		✓

If yes to #7, provide name and funding Sources: _____

*If you believe that you do not have a conflict, but are concerned that it may appear that you do, you may **attach additional sheets** explaining why you believe that you should not be excluded.*

I certify that I have read and understand this Conflict of Interest form and that the information I have provided is true, complete, and correct as of this date.

X _____ 12/19/14 Christoph Lee

Signature *Date* *Print Name*

So we may contact you regarding your presentation, please provide the following:

Mail Address: 825 Eastlake Avenue East, G3-200, Seattle WA 98109-1023

Phone Number: (206) 288-6783 office, (650) 796-5098 mobile

University of Washington
School of Medicine Curriculum Vitae

Last Updated: December 16, 2014

1. PERSONAL DATA

Name	Christoph I. Lee, M.D., M.S.H.S.
Home Address	2250 70th Avenue SE Mercer Island, WA 98040 (650) 796-5098
Work Address	Seattle Cancer Care Alliance 825 Eastlake Avenue East, G3-200 Seattle, WA 98109 (206) 288-6783
Date of Birth	December 19, 1976
Birthplace	Mississauga, Ontario, Canada
Citizenship	USA
Marital Status	Married

2. EDUCATION

1994-1998	A.B. *cum laude* Princeton University, Princeton, NJ
2001-2005	M.D. *cum laude* Yale University, New Haven, CT
2010-2011	M.S.H.S., Health Services Research and Policy University of California, Los Angeles, CA

3. POSTGRADUATE TRAINING

2005-2006	Internship Transitional Year University of Hawaii, Honolulu, HI
2006-2010	Residency Diagnostic Radiology Stanford University, Palo Alto, CA

2010-2011 Fellowship
Breast Imaging
University of California, Los Angeles, CA

2010-2012 Fellowship
Health Services Research and Policy
Robert Wood Johnson Clinical Scholars Program, Los Angeles, CA

4. FACULTY POSITIONS HELD

2010-2012 Clinical Instructor
Department of Radiology, Section of Breast Imaging
UCLA David Geffen School of Medicine, Los Angeles, CA

2010-2012 Clinical Scholar
Department of Medicine, Division of General Internal Medicine
UCLA David Geffen School of Medicine, Los Angeles, CA

2011-2012 Attending Physician
Department of Radiology, Section of Acute Care Imaging
UCLA David Geffen School of Medicine, Los Angeles, CA

2012-present Assistant Professor
Department of Radiology, Section of Breast Imaging
University of Washington School of Medicine, Seattle, WA

2012-present Assistant Professor
Department of Radiology, Section of Health Services Research
University of Washington School of Medicine, Seattle, WA

2012-present Faculty Investigator
Hutchinson Institute for Cancer Outcomes Research (HICOR)
Division of Public Health Sciences
Fred Hutchinson Cancer Research Center, Seattle, WA

2012-present Faculty Investigator
Comparative Effectiveness, Cost & Outcomes Research Center
University of Washington, Seattle, WA

2013-present Adjunct Assistant Professor
Department of Health Services
University of Washington School of Public Health, Seattle, WA

2013-present Director, Breast Imaging Fellowship
Department of Radiology, Section of Breast Imaging
University of Washington School of Medicine, Seattle, WA

5. HOSPITAL POSITIONS HELD

See Post-Graduate Training and Faculty Positions

6. HONORS

1994	Los Angeles County Medical Association Scholarship
1994-1998	Robert C. Byrd Honors Scholarship
1995	Rotary International District Grant
1996	Princeton University Summer Service Award
1997	American Heart Association Summer Research Fellowship
1998	NCAA Division I Varsity Letter (Men's Tennis)
1998	Certificate in Spanish Language & Culture, Princeton University
1998	Departmental Honors, English, Princeton University
1998	Princeton AlumniCorps Public Interest Fellowship
2002	Etta S. Chidsey Award in Cancer Research, Yale School of Medicine
2005	Farr Scholar for Excellence in Research, Yale School of Medicine
2005	Overall Honors at Graduation, Yale School of Medicine
2006	Graduation Speaker, University of Hawaii Transitional Year
2009	AMA Foundation Excellence in Leadership Award
2010	Certificate in Health Policy, Finance & Economics, Stanford GME
2010-2012	NIH/NIMHD Loan Repayment Program Award
2011	ACR E. Stephen Amis, Jr., MD, Fellowship in Quality and Safety
2011	Recognition of Exceptional Manuscript Review, *JACR*
2012-2014	GE-AUR Radiology Research Academic Fellowship (GERRAF)
2012	*JACR* Best Article of 2012, Practice Management
2012	Recognition of Exceptional Manuscript Review, *JACR*

2012	Article Selection for Best RSNA Content of 2012
2012-2014	NIH/NIMHD Loan Repayment Program Renewal Award
2013	*JACR* Best Article of 2013, Health Services Research & Policy
2013	*Radiology* Editor's Recognition Award with Special Distinction
2015-2019	American Cancer Society Mentored Research Scholar

7. BOARD CERTIFICATION

2010-present	American Board of Radiology, Board Certified Diplomate

8. CURRENT LICENSES TO PRACTICE

2005-2013	California State # A97106
2012-present	Washington State # MD60267813

9. PROFESSIONAL AND SERVICE ORGANIZATIONS

1994-1998	Princeton Community Service Committee Chairman, 1997-1998
1995-1998	Princeton University Student Health Program President, 1996-1997
1996-1998	Princeton Student Volunteer Journal (SVCommunicator) Editor-in-Chief, 1996-1998
1997-1998	Rowen Towers Afterschool Program (Trenton, NJ) President & Founder, 1997-1998
2001-2005	American Red Cross, Yale Medical Chapter President, 2001-2002
2001-2005	Yale History of Medicine Society (Nathan Smith Club) President, 2002-2003
2001-2005	Yale Migrant Health Clinic President, 2002-2003
2001-2005	Yale Radiology Interest Group President & Founder, 2001-2003

2001-present	American College of Radiology Member, ACR Radiologist Resources Committee, 2006-2010 Member, ACR Reference Committee, Breast Imaging, 2012 Member, ACR Reference Committee, Ultrasound, 2012 Member, ACR Reference Committee, Nuclear Medicine, 2012 Member, ACR Human Resources Commission, 2012-2014
2001-present	Radiological Society of North America Member, Health Services Research Committee, 2013-present
2005-present	American Medical Association Recipient, AMA Foundation Leadership Award, 2009
2006-2010	California Radiological Society Secretary, Resident & Fellow Section, 2006-2007
2006-present	American Roentgen Ray Society
2011-present	Association of University Radiologists (AUR) Faculty, Annual Meeting, 2013 and 2014 Member, Scientific Program Committee, Annual Meeting, 2014 Member, Scientific Program Committee, Annual Meeting, 2015
2011-present	Radiology Alliance for Health Services Research (RAHSR) Faculty, Annual Meeting, 2013 and 2014 Member, Scientific Program Committee, Annual Meeting, 2014
2011-present	Society of Breast Imaging

10. TEACHING RESPONSIBILITIES

A. Research Mentorship

2003-2005	Research mentee: Harry Flaster (Stanford medical student) Project: Institutional informed consent policies regarding CT scans
2008-2010	Research mentee: Emily Tsai, MD (UCLA radiology resident) Project: Incidental findings on coronary CT, economic impact
2010-2012	Research mentee: Jesse Jones, MD (UCLA radiology resident) Project: Primer on radiation dose in acute care imaging
2010-present	Research mentee: Solveig Hofvind, PhD (Norway cancer registry) Project: Mammographic performance in population-based screening
2011-2013	Research mentee: Warren Perry, MD (Yale ED resident) Project: Time-motion analysis of emergency radiologists

2012-2013	Research mentee: Luke Grauke, MD (UW breast fellow) Project: Radiologists' performance in ACR Breast MR course
2012-2013	Research mentee: Michele Rochelle, MD (UW breast fellow) Project: Variation in breast MRI BI-RADS in community settings
2012-2014	Research mentee: Aimee Lee, MD (UW radiology resident) Project: Concordance of breast MRI BI-RADS and management
2013-2014	Research mentee: Eni Obadina, MD (UW breast fellow) Project: Advanced breast imaging availability in U.S. by facility type
2013-2014	Research mentee: Diana Lam, MD (UW radiology resident) Project: Non-interpretive skills - imaging-based screening
2014-2015	Research mentee: Jessica Germino, MD (UW radiology resident) Project: Advanced breast imaging access among vulnerable women
2014-2015	Research mentee: Crystal Piper (Yale medical student) Project: 30-year trend for women authorship in academic radiology
2015-2016	Research mentee: Jessica Germino, MD (UW radiology resident) Project: Access to supplemental screening among high-risk women
2015-2016	Research mentee: Diana Lam, MD (UW breast fellow) Project: Informing decision-making for radiation-induced cancer risks
2015-2016	Research mentee: Jessica Germino, MD (UW radiology resident) Project: Current controversies in imaging-based screening

B. Course Faculty and Lectureships

2011-2012	Lecturer, Senior Resident Board Review, David Geffen School of Medicine at UCLA, Department of Radiology "Breast Imaging Oral Board Review" (2/29/2012)
2012-present	Faculty, ACR Education Center Breast MRI and Guided Biopsy Course (11/1-2/2012)
2012-present	Faculty, Medical Student Clerkship, UW School of Medicine, Department of Radiology "Breast Cancer & Screening Mammography" (8/22/12, 10/17/12, 10/16/2013) "Introduction to Diagnostic Breast Imaging" (8/22/12, 10/17/12, 10/16/2013)

2012-present Faculty, UW Resident Monthly Noon Teaching Conferences, UW School of Medicine, Department of Radiology
Breast imaging case-based conferences on quarterly basis

2012-present Faculty and Examiner, UW Resident Practical Examination, UW School of Medicine, Department of Radiology
"Breast Imaging Case Review" (10/16/2012)

2012-present Faculty, Resident Annual Lecture Series, UW School of Medicine, Department of Radiology
"Breast Cancer Screening Update" (3/14/2013)
"Digital Breast Tomosynthesis" (3/13/2014)

2012-present Faculty, Resident Journal Club, Section of Breast Imaging, UW School of Medicine, Department of Radiology
Resident journal club in breast imaging on quarterly basis

2012-2013 Lecturer, Senior Resident Board Review, UW School of Medicine, Department of Radiology
"Breast Imaging Oral Board Review" (1/25/2013)

2013-2014 Faculty and Examiner, Mock Oral Boards, UW School of Medicine, Department of Radiology
"Mock Oral Boards: Breast Imaging" (4/30/2013)

2013-present Lecturer, New ABR Core Exam Review, UW School of Medicine, Department of Radiology
"New ABR Core Exam – Breast Imaging Review" (6/11/2013)
"Breast Imaging Review for the New Boards" (2/25/2014)

C. Clinical Teaching

2010-2012 Clinical Preceptor, David Geffen School of Medicine at UCLA, Department of Radiology, Sections of Acute Care Imaging and Breast Imaging
Radiology Residents (2 per rotation, 2.5 days/week)

2012-present Clinical Preceptor, UW School of Medicine, Department of Radiology, Section of Breast Imaging
Medical Student (directed elective for Linda Chen, 10/2012)
Radiology Residents (2-3 per rotation, 2.5 days/week)
Fellows (3-4 per year, 2.5 days/week)

2013-present Director, Breast Imaging Fellowship, University of Washington School of Medicine, Section of Breast Imaging
Fellows (3 dedicated breast imaging fellows per year)

11. EDITORIAL RESPONSIBILITIES

2001-2003 Yale Journal of Health Policy, Law, & Ethics
Staff Editor, 2001-2002
Business Editor, 2002-2003
Member, Editorial Board, 2002-2003

2008-present American Journal of Roentgenology (AJR)
Reviewer, Health Policy and Practice, 2008-present
Special Consulting Editor, Best Practices, 2013-present
Member, Editorial Board, 2013-present

2009-present Journal of the American College of Radiology (JACR)
Reviewer, Health Services Research, 2009-present
Guest Editor, Special Issue on Screening, 2013
Member, Editorial Board, 2013-present

2011-present Radiology
Reviewer, Health Policy and Breast Imaging, 2011-present

2013-present Journal of the American Medical Association (JAMA)
Reviewer, Radiology and Health Policy, 2013-present

2013-present Journal of the National Cancer Institute (JNCI)
Reviewer, Radiology, 2013-present

12. SPECIAL NATIONAL RESPONSIBILITIES

1998-2001 Princeton Project 55 Tuberculosis Initiative, Washington, DC
Manager, 1998-1999
Executive Board Member, 1998-2001
- Led global TB advocacy group, founded by Ralph Nader
- Briefed U.S. Congress foreign operations subcommittee
- Co-drafted TB Control Act of 1999 (Barbara Boxer, D-CA)

1999-2001 The Lewin Group, Boston, MA
Analyst, 1999-2001
- Consultant to major biotechnology and pharmaceutical firms
- Managed large phase IV clinical effectiveness trials

2012-present RAND Corporation, Santa Monica, CA
Adjunct Scientist, RAND Health
- Evaluation of CMS Medicare Imaging Demonstration (MID)

2012-present Castlight Health, San Francisco, CA
Member, Clinical Advisory Board

• Advisor for start-up dedicated to healthcare cost transparency

2012-2014 American College of Radiology, Reston, VA
National Commission on Human Resources
Chairman, Working Group on Citizenship, 2012-2013
• Lead author of JACR manuscript on radiology citizenship

2013-2014 Centers for Medicare & Medicaid Services (CMS), Baltimore, MD
Member, Working Group, Quality Performance Measurements
• Developing performance measures for screening mammography

2014-2015 Institute for Clinical and Economic Review (ICER), Boston, MA
Scientific Consultant
• Clinical expert for review of breast imaging technologies

13. SPECIAL LOCAL RESPONSIBILITIES

2002-2004 Yale University School of Medicine, New Haven, CT
Member, New Student Orientation Committee, 2002-2003
Member, Pre-Clinical Evaluations Committee, 2002-2004

2006-2010 Stanford University School of Medicine, Palo Alto, CA
Department of Diagnostic Radiology
Member, Resident Education Committee, 2006-2007
Member, Resident Operations Committee, 2008-2009
Member, Resident Relations Committee, 2009-2010
Office of Graduate Medical Education (Stanford Hospital)
Member, Resident Leadership Certificate Committee, 2007-2008

2010-2012 David Geffen School of Medicine at UCLA, Los Angeles, CA
Robert Wood Johnson Clinical Scholars Program
Member, Fellowship Selection Committee

2012-2013 L.A. County Department of Health Services, Los Angeles, CA
Senior Advisor, Erin Saleeby, MD, Director of Women's Health

2012-present University of Washington School of Medicine, Seattle, WA
Department of Diagnostic Radiology
Member, Resident Mentorship Program, 2012-present
Member, HSR Seed Grant Selection Committee, 2012-present
Member, Fellowship Education Committee, 2013-present
Section of Breast Imaging
Member, Fellowship Selection Committee, 2012-present
Director, Breast Imaging Fellowship, 2013-present
Member, Senior Faculty Search Committee, 2014-present

2012-present Fred Hutchinson Cancer Research Center, University of Washington
Cancer Consortium Research Program, Seattle, WA
Member, Cancer Imaging Program, 2012-present
Hutchinson Institute for Cancer Outcomes Research (HICOR)
Faculty Investigator, 2013-present
Interviewer, New Faculty Selection Committee, 2013-present

14. RESEARCH FUNDING

Awarded

2010-2012
Funding Source: Robert Wood Johnson Foundation
Role: Principal Investigator
Direct Costs (Lee): $135,000
Project: Patients' willingness to donate a biospecimen for future genetic research at screening mammogram.

2010-2014
Funding Source: NIH (NIMHD) L60 MD005349
Role: Principal Investigator
Direct Costs (Lee): $117,639
Project: Community level access and utilization of breast imaging technologies.

2012-2014
Funding Source: GE-AUR Radiology Research Academic Fellowship
Role: Principal Investigator
Direct Costs (Lee): $140,000
Project: Cost-effectiveness analysis of adjunct screening breast tomosynthesis for women with dense breasts.

2013-2014
Funding Source: AHRQ K72PCO3 25505
Role: Co-Investigator (PI: Sullivan)
Direct Costs (Lee): $26,925
Project: Imaging techniques for metastatic breast cancer

2012-2016
Funding Source: NIH (NCI) P01 CA154292
Role: Co-Investigator (PI: Miglioretti/Kerlikowske)
Direct Costs (Lee): $153,098 (estimated for 10% FTE)
Project: Risk-based breast cancer screening in community settings.

2014-2016
Funding Source: GE Healthcare 124.03-2013-GES-0003
Role: Co-Investigator (PI: Lehman)
Direct Costs (Lee): $34,031 (estimated for 5% FTE)
Project: Automated breast ultrasound and tomosynthesis screening in women with dense breasts.

2015-2019
Funding Source: American Cancer Society MRSG-14-160-01-CPHPS
Role: Principal Investigator

Direct Costs (Lee): $675,000
Project: Adoption of advanced breast imaging and access to screening mammography among vulnerable women

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8. **Lee CI**, Basu PA. Radiologist's guide to health services and policy research training. AJR Am J Roentgenol 2011; 197(6):W978-979.

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10. Hofvind S, **Lee CI**, Elmore JG. Stage-specific breast cancer incidence rates among participants and nonparticipants of a population-based mammographic screening program. Breast Cancer Res Treat 2012; 135(1):291-9.

11. **Lee CI**, Bassett LW, Lehman CD. Breast density legislation and opportunities for patient-centered outcomes research. Radiology 2012; 264(3):632-636.

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29. **Lee CI**, Ichikawa L, Rochelle MC[#], Kerlikowske K, Miglioretti DL, Joe BN, Sprague BL, Wernli KJ, DeMartini WB, Lehman CD. Breast MRI BI-RADS assessments and abnormal interpretation rates by clinical indication in U.S. community practices. Acad Radiol 2014; 21(11):1370-6. doi: 10.1016/j.acra.2014.06.003.

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[#]trainee mentee

B. Medical Books

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10. Perry WM, **Lee CI**, Steers WN, Post L, Forman HP. Time-motion analysis of emergency department physicians and emergency radiologists at a level 1 trauma facility. Radiological Society of North America Annual Meeting. Chicago, IL. November, 2012.

11. Grauke LJ, **Lee CI**, DeMartini WB, Newstead GM, Sandhir V, Lehman CD. Radiologists' performance in the ACR breast MR with guided biopsy course. Association of University Radiologists Annual Meeting. Los Angeles, CA. April, 2013.

12. Rochelle MC, **Lee CI**, Ichikawa L, Kerlikowske K, Joe BN, Sprague BL, Wernli KJ, DeMartini WB, Lehman CD. Variation in breast MRI BI-RADS assessment by clinical indication in U.S. community settings. Association of University Radiologists Annual Meeting. Los Angeles, CA. April, 2013.

13. Obadina ET, Bogart A, **Lee CI**, Hubbard RA, Hill DA, Sprague BL, Haas JS, Tosteson AN, DeMartini WB, Lehman CD, Onega T. Variations in the availability of advanced breast imaging based on radiology facility characteristics. Association of University Radiologists Annual Meeting. Baltimore, MD. April, 2014.

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2. **Lee CI**. The U.S. response to the global multi-drug resistant tuberculosis epidemic. Rotary International Meeting. Washington, D.C., March 9, 1999.

3. **Lee CI**. Emergency physician informed consent practices and awareness of radiation dose associated with diagnostic CT scans. Connecticut College of Emergency Physicians Annual Meeting. Hartford, CT, November 15, 2002.

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5. **Lee CI**. Institutional informed consent policies regarding diagnostic CT scans at major academic medical centers. Association of University Radiologists Annual Meeting. Montreal, Quebec, May 4, 2005.

6. **Lee CI**. Radiology group practice models. California Radiological Society Annual Meeting. Newport Beach, CA, October 20, 2007.

7. **Lee CI**. Extracardiac incidental findings on screening coronary CT: clinical and economic impact. Radiological Society of North America Annual Meeting. Chicago, IL, December 1, 2009.

8. **Lee CI**. Patients' concerns and attitudes in regards to providing a biospecimen at screening mammogram for research purposes. Radiological Society of North America Annual Meeting. Chicago, IL, December 1, 2011.

9. **Lee CI**. An introduction to the cost-effectiveness analysis of adjunct screening breast tomosynthesis for women with dense breasts. Association of University Radiologists Annual Meeting. San Antonio, TX, March 21, 2012.

10. **Lee CI**. Citizenship in radiology: introduction to a concept and its measure. ACR Human Resources Commission. Radiological Society of North America Annual Meeting. Chicago, IL, November 26, 2012.

11. **Lee CI**. Cost-effectiveness analysis of adjunct tomosynthesis for screening women with dense breasts. GE AUR Radiology Research Academic Fellowship Annual Winter Meeting. San Diego, CA, February 14, 2013.

12. **Lee CI**. Comparative effectiveness and patient-centered outcomes research. Association of University Radiologists Annual Meeting. Los Angeles, CA, April 10, 2013.

13. **Lee CI**. Fostering research in the new radiology curriculum. Association of University Radiologists Annual Meeting. Los Angeles, CA, April 12, 2013.

14. **Lee CI**. Current evidence for adjunct screening with digital breast tomosynthesis. Washington State Radiological Society Annual Meeting. Seattle, WA, June 1, 2013.

15. **Lee CI**. Variation in availability of advanced breast imaging based on facility characteristics. Breast Cancer Surveillance Consortium P01 Annual Meeting. Sausalito, CA, June 4, 2013.

16. **Lee CI**. Variation in breast MRI BI-RADS assessments and recall rates by clinical indication in U.S. community settings. Breast Cancer Surveillance Consortium P01 Annual Meeting. Sausalito, CA, June 5, 2013.

17. **Lee CI**. Cost-effectiveness analysis of adjunct breast tomosynthesis for screening women with dense breasts. Breast Cancer Surveillance Consortium P01 Annual Meeting. Sausalito, CA, June 5, 2013.

18. **Lee CI**. Current controversies and challenges: evidence for adjunct digital breast tomosynthesis for screening. University of Washington CME Course: Current Concepts and Challenges in Breast Cancer. Seattle, WA, October 24, 2013.

19. **Lee CI**. Introduction to academic radiology: opportunities for radiology health services research. Radiological Society of North America Annual Meeting. Chicago, IL, December 2, 2013.

20. **Lee CI**. Update: cost-effectiveness of adjunct tomosynthesis for screening women with dense breasts. GE AUR Radiology Research Academic Fellowship Annual Winter Meeting. San Diego, CA, February 6, 2014.

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Appropriate Imaging for Breast Cancer Screening in Special Populations

An Assessment of
Comparative Clinical Effectiveness
& Comparative Value

Presented to the Washington State Health Care Authority by
Daniel A. Ollendorf, PhD
January 16, 2015

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Overview

- Project Scope, Comparators, Outcomes of Interest
- Breast Density Legislation
- Systematic Review of Published Evidence
- Comparative Value
- Evidence Ratings
- Clinical Guidelines
- Payer Coverage Policies
- Summary

2

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Background

- Breast cancer: most common form of cancer in women
  - ~240,000 new cases annually in U.S.
  - ~40,000 deaths
- Breast cancer mortality in decline for past 25 years
  - Most models suggest that about half of decline due to early detection from mammography, about half from improvements in therapy
  - Some controversy around these estimates, however

3

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Background

- Screening mammography
  - Benefits of screening established in 9 RCTs of >600,000 women followed for 10-20 years
    - 20-25% reductions in mortality after 15 years of follow-up in women age 50-69
- Film mammography replaced by digital technology in mid-2000s:
  - Better image precision, including better contrast resolution in women with dense breast tissue

4

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Digital Breast Tomosynthesis (DBT)

- An extension of digital mammography
- Acquires multiple images in an arc around the breast
  - Software reconstructs individual "slices" (tomograms) in addition to standard 2D mammogram
- Virtual 2D image can be created so that DBT radiation exposure ≈ digital mammography
- Rapid adoption of technology:
  - Likely to be accelerated by new CPT code (effective 1/1/15)

5

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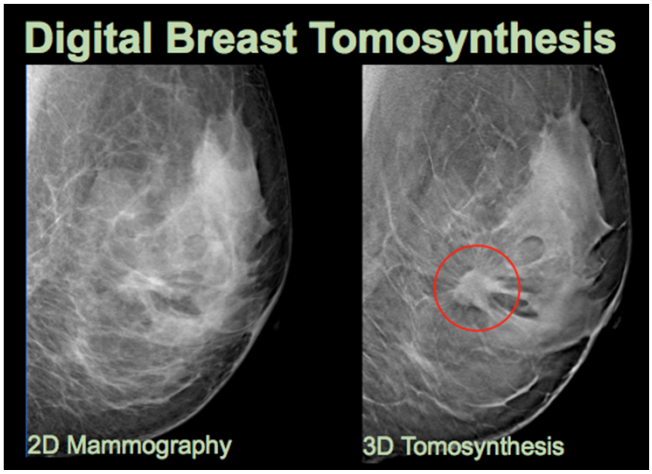
DBT vs. DM Image



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Source: http://ww1.prweb.com/prfiles/2010/11/27/4280464/Screenshot20101127at5.03.34PM.png

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Breast Density

- Areas that absorb more x-ray energy and appear more "white" on mammography
- 4-category qualitative rating scale
  - heterogeneously dense: may obscure small masses
  - extremely dense: may lower sensitivity of mammography
- Density-related decrease in sensitivity of film mammography mitigated somewhat by digital mammography
- Density also an independent risk factor for breast cancer

7

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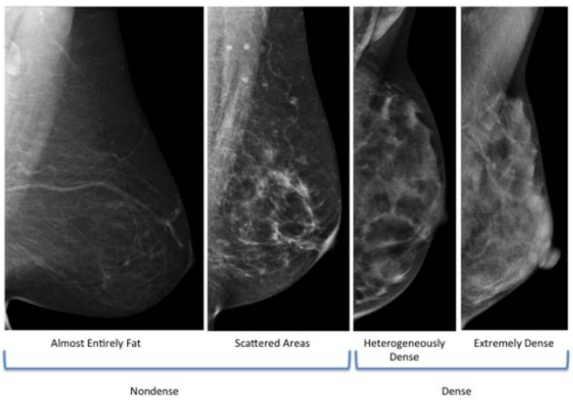
Breast Density on Mammography



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Source: Scheel JR et al. Am J Obstet Gynecol. 2014 Jun 21. pii: S0002-9378(14)00628-0. doi: 10.1016/j.ajog.2014.06.048 (Epub ahead of print)

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Breast Density Legislation

- National advocacy sparked by efforts of breast cancer survivor with missed cancer on mammography
- 19 states have passed legislation requiring notification of dense breast tissue with mammography
  - 2 of these require insurance coverage for supplemental screening
- State of Washington: bill introduced in January 2014, but never debated on House or Senate floors
- Major concern: legislative mandate that outpaces accumulation of scientific evidence

9

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Supplemental Modalities in Women with Dense Breast Tissue

- Magnetic resonance imaging (MRI)
  - Similar process to DBT (reconstruction of detailed cross-sectional views) but using strong magnetic fields instead of x-ray energy
- Handheld ultrasound (HHUS)
  - Used for screening and also to visualize cyst aspiration and breast biopsy
- Automated whole breast ultrasound (ABUS)
  - Newest technology, uses an automated transducer rather than handheld probe for image acquisition

10

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Key Questions

1. What is the effectiveness of screening with digital breast tomosynthesis (DBT) vs. digital mammography among women aged 40-74 who are candidates for screening mammography?
2. What is the comparative effectiveness of handheld ultrasonography, automated ultrasonography, and magnetic resonance imaging when used as supplemental screening modalities in women with dense breast tissue and a negative mammogram or negative DBT result?
3. What are the documented and potential harms associated with these imaging tests, including overdiagnosis and overtreatment, unnecessary biopsy as a result of false-positive imaging, patient anxiety, and radiation exposure?

11

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Key Questions

4. What is the differential effectiveness and safety of the tests of interest according to such factors as age, race or ethnicity, comorbidities, BMI, method of breast density classification, overall breast cancer risk, scan vendor, and imaging protocol (e.g., whether ultrasound is performed by a radiologist, technologist, or some combination of the two)?
5. What are the costs and cost-effectiveness (e.g., cost per cancer detected) of the imaging modalities of interest?

12

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Project Scope

Population:

- DBT: All asymptomatic women age 40-74 who are candidates for screening mammography every 1-2 years
- Supplemental screening: All asymptomatic women age 40-74 with heterogeneously or extremely dense breast tissue and normal mammography or DBT result

Supplemental Screening Tests:

- MRI
- HHUS
- ABUS

13

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Project Scope

Comparators

- DBT: Digital mammography was primary comparator (film mammography studies were allowed)
- Supplemental screening: head-to-head, vs. no supplemental screening
- Also allowed comparisons to clinical/self exams or other forms of additional follow-up

14

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Project Scope

Outcomes:

- Breast cancer mortality
- Health-related quality of life
- Cancers detected/missed
- Rates of recall and biopsy
- Other test characteristics (e.g., sensitivity and specificity, PPV)
- Harms (radiation, "overdiagnosis", unnecessary workup)

15

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Literature Search

- Published studies Jan 1990 – Nov 2014
- All study designs included, regardless of comparator(s) or duration of follow-up
- Excluded studies that focused only on technical performance (e.g., image precision)

16

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Study Quality Ratings

- RCTs/Cohorts: USPSTF Criteria
- Diagnostic Accuracy Studies: QUADAS-2 with certain modifications
  - Use of digital vs. film mammography as reference standard
  - Method for classification of breast density
  - "Good": consecutive sample, low withdrawal rate, sufficient follow-up
  - "Fair": allowance for small differences between groups or loss to follow-up
  - "Poor": insufficient follow-up, selection bias, substantial and/or differential loss to follow-up, inappropriate interval between test and reference standard

17

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Overall Strength of Evidence

- Risk of bias: study design and quality
- Consistency: direction and magnitude of findings
- Directness: direct comparison of major interventions and/or direct measurement of key outcomes
- Precision: confidence interval around estimates of intervention effect

18

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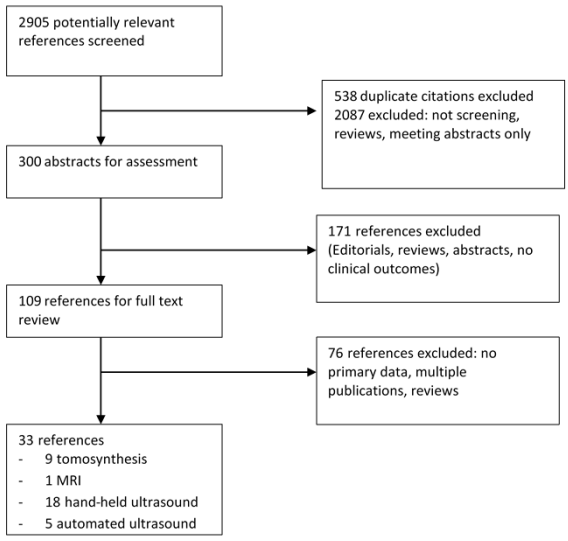
PRISMA flowchart showing results of literature search



19

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Findings

20

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Quality & Type of Evidence

- *No* studies directly measuring impact of testing on breast cancer morbidity and/or mortality
- *No* RCTs
- DBT: All studies rated poor
  - Insufficient follow-up for interval cancers and/or
  - Imbalanced patient groups and/or
  - Selection bias
- Few good-quality studies of supplemental tests
  - One RCT of MRI, but not in target population

21

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KQ1: Effectiveness of DBT

22

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0 RCTs, 9 Cohort Studies, Total N=313,298

TEST	COMPARATOR	STRENGTH OF EVIDENCE	DIRECTION OF EFFECT
Effectiveness of Screening			
DBT	Digital mammography; film mammography	Low	Incremental test performance vs. DM; improved cancer detection Incomplete follow-up precludes definitive conclusions

23

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DBT Studies

- Earliest large studies came from Europe (Ciatto, 2013; Skaane, 2013)
  - 10-15% reductions in recall
  - 30-50% increase in cancer detection rate (~1-2 add'l cancers per 1,000)
- Largest US multicenter study was recently published (Friedewald, 2014) (N=~174,000 receiving DBT)
  - 17% reduction in recall *but* 7% increase in biopsy
  - 29% increase in cancer detection
- Only US study with complete follow-up had imbalanced groups and 20% loss to follow-up (Destounis, 2014)

24

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Estimated Yield: DBT vs. DM

Statistic	Digital mammography	DBT+Digital mammography	SOE
Recall rate per 1,000	100-160	80-140	Moderate
Biopsy rate per 1,000	14-22	12-27	Low-moderate
CDR per 1,000	3-5	4-6	Low
PPV3	20-25%	25-30%	Low-moderate

CDR: cancer detection rate; PPV3: positive predictive value of biopsies actually performed

25

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KQ2: Effectiveness of Supplemental Screening

26

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0 RCTs, 24 Cohort Studies (18 HHUS, 5 ABUS, 1 MRI)

TEST	COMPARATOR	STRENGTH OF EVIDENCE	DIRECTION OF EFFECT
Effectiveness of Supplemental Screening			
HHUS N=96,002	Digital or film mammography alone	Low-moderate	Comparable: small increase in cancer detection vs. very high false-positive rate; substantial study heterogeneity
ABUS N=28,093	Digital mammography alone	Insufficient	Substantial study heterogeneity; wide variation in study findings
MRI N=427*, 5,652	Digital or film mammography alone	Low	Likely incremental to mammography but limited evidence in target population

*Single study in women with dense breast tissue and negative mammogram; others in women at very high breast cancer risk

27

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HHUS Studies

- 18 studies conducted worldwide in ~100,000 women with dense breast tissue and negative mammogram
  - Only 4 with digital mammography
- High degree of between-study heterogeneity, results ranged *widely*
  - Recall 21-186 per 1,000: all prospective studies had recall rates >100 per 1,000
  - Cancer detection rate: 0.4-14 per 1,000 (median 3.2)
  - Biopsy rate: 12-114 per 1,000 (median 46); PPV3 on biopsy very low (range 3-18%)

28

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ACRIN 6666 Trial

- Only prospective US-based trial of HHUS with multiple screening rounds (N=2,809)
  - But in *high-risk population only*
  - Women randomized to receive mammography alone or mammography+ultrasound in alternate order
  - Depending on screening round, HHUS arm saw increase in cancer detection of 4-6 per 1,000
  - However, in first screening round:
    - More than twofold increase in recall (266 vs. 115 per 1,000)
    - More than fourfold increase in biopsy (102 vs. 24 per 1,000) and PPV3 of only 6.8%
  - Similar patterns in subsequent screening rounds

29

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Estimated Yield: HHUS+DM vs. DM

Statistic	Digital Mammography	Incremental Yield With HHUS	SOE
Recall rate per 1,000	100-120	30-100	Low
Biopsy rate per 1,000	14-22	30-60	Low-moderate
CDR per 1,000	3-5	2-4	Moderate-high
PPV3	20-25%	5-7%	High

CDR: cancer detection rate; PPV3: positive predictive value of biopsies actually performed

30

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ABUS Studies

- 5 studies of 28,000 women; no RCTs
- Even more heterogeneity than seen with HHUS:
  - Recall 23-207 per 1,000
  - Cancer detection rate: 0-12 per 1,000
  - Biopsy rate: 12-36 per 1,000 (but not reported in 2 of the 5 studies)
  - PPV3: 0% and 9.8% in the 2 studies reporting these data

31

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Brem, 2014

- Large, prospective, multinational study (N=~15,000) of fair quality
- 35% increase in cancer detection (7.3 vs. 5.4 per 1,000)
- Nearly twofold increase in recall (285 vs. 150 per 1,000)
- Biopsy rate of 36 per 1,000, PPV3 = 9.8%
- PPV1 (% of abnormal screening results resulting in cancer diagnosis) lower for ABUS+DM vs. DM alone (2.6% vs. 3.6% respectively)

32

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Estimated Yield: ABUS+DM vs. DM

Statistic	Digital Mammography	Incremental Yield With ABUS	SOE
Recall rate per 1,000	100-120	30-100	Insufficient
Biopsy rate per 1,000	14-22	30-60	Insufficient
CDR per 1,000	3-5	2-4	Insufficient
PPV3	20-25%	5-7%	Insufficient

CDR: cancer detection rate; PPV3: positive predictive value of biopsies actually performed

Due to high uncertainty, yield estimates same as for HHUS

33

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MRI Studies

- Only 1 study in target population (women with dense breasts and normal mammogram):
  - High sensitivity, specificity and PPV, but…
  - MRI used as third-line screen after normal DM *and* ultrasound; and
  - Population was very high risk (nearly half of women had personal history of breast cancer)
- Studies in other high risk populations added for context:
  - Sensitivity: 71-100%; Specificity: 76-98%
  - Cancer detection rate: 8-67 per 1,000
  - Biopsy rate: 29-157 per 1,000
    - PPV3: 17-89% (median 48%)

34

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Estimated Yield: MRI+DM vs. DM

Statistic	Digital Mammography	Incremental Yield With MRI	SOE
Recall rate per 1,000	100-120	100-120	Low
Biopsy rate per 1,000	14-22	20-40	Low
CDR per 1,000	3-5	3-11	Low
PPV3	20-25%	22%-48%	Low

CDR: cancer detection rate; PPV3: positive predictive value of biopsies actually performed

35

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KQ3: Harms of General Population or Supplemental Screening

36

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TEST	COMPARATOR	STRENGTH OF EVIDENCE	DIRECTION OF EFFECT
Potential Harms of Screening			
All	Digital or film mammography alone	Insufficient	General underreporting of harms (1) Magnitude of overdiagnosis unclear and controversial (2) Unnecessary biopsy—reported complications <1%, but patient anxiety also of concern (3) Only DBT involves radiation exposure, approximately equal to mammography*

*Best estimates from modeling studies suggest <1 add'l cancer per 1,000 screened after 20 screening rounds with mammography or DBT

37

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KQ4: Differential Effects of Screening in Key Subgroups

38

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TEST	COMPARATOR	STRENGTH OF EVIDENCE	DIRECTION OF EFFECT
Potential Harms of Screening			
All	Digital or film mammography alone	Insufficient	Subgroup data extremely limited (1) Improvements in test performance appear to be mostly independent of age (2) Technologist/radiologist experience also not a significant predictor (3) Some early data suggest a "learning curve" with use of ABUS*

*Arleo 2013: Recall rate dropped from 247 per 1,000 to 126 per 1,000 between first and third calendar quarters after implementation

39

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KQ5: Costs and Cost-Effectiveness of Screening Tests of Interest

40

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5 Studies

TEST	COMPARATOR	STRENGTH OF EVIDENCE	DIRECTION OF EFFECT
Costs and Cost-effectiveness of Screening			
DBT	DM	Insufficient	$50,000-$100,000 per QALY gained in single model-based study (biennial screening, dense breasts only)
HHUS	Digital or film mammography alone	Low	4 studies: $325,000 per QALY gained, $60,000-$200,000 per add'l cancer detected
ABUS	Digital mammography alone	Insufficient	No studies in target population
MRI	Digital or film mammography alone	Insufficient	No studies in target population

41

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Economic Impact of Frontline and Supplemental Screening: Published Evidence

- DBT+DM vs. DM:
  - Single decision analysis of *biennial screening in women with dense breasts* (DBT premium: $50)
  - DBT: 0.5 fewer deaths and 405 fewer false positives per 1,000 after 12 screening rounds
  - Cost-effectiveness: $54,000 per QALY gained
- Supplemental screening (HHUS+DM vs. DM alone):
  - Four studies (one model, three single-center evaluations)
  - Modeled cost-effectiveness: $325,000 per QALY gained
  - Single-center studies: $60,000-$200,000 per additional cancer detected

42

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Economic Impact of Frontline and Supplemental Screening: ICER Cohort Model

- Target Populations:
  - Asymptomatic Washington women age 40-74 eligible for general screening
  - As above but with dense breast tissue and negative mammogram or DBT
- Strategies:
  - DBT/DM vs. DM (frontline)
  - DM+HHUS, ABUS, or MRI vs. DM or DBT alone (supplemental)
- Costs
  - Medicare fee schedule

43

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Economic Impact of Frontline and Supplemental Screening: ICER Cohort Model

- Outcomes and costs (per 1,000 tested) over 1 year:
  - Recalls, biopsies, false positives (with and without biopsy), cancers detected, cancers missed (interval cancers)
  - Costs of screening, recall, biopsy, and detection of interval cancers
  - Supplemental screening results stratified by overall breast cancer risk
- Key assumptions:
  - Perfect compliance with frontline and supplemental screening
  - Supplemental screening would occur immediately following negative DM or DBT result
  - All abnormal supplemental tests would result in biopsy
  - Assumed performance of certain tests in an average-risk population (e.g., MRI)

44

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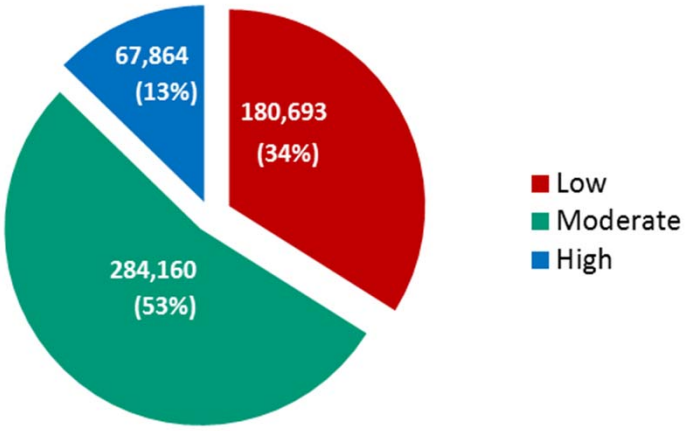
Screening-Eligible Washington Women, by Level of Breast Cancer Risk*



*Low, moderate, and high risk corresponds to 5-year risks of <1.7%, 1.7-3.0%, and >3.0% respectively

45

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Comparison of DBT to Digital Mammography, per 1,000 Women Screened

Outcome (per 1,000 screened)	Digital Mammography	DBT
Overall Population		
Recalls	107.0	91.0
Biopsies Performed	18.1	19.3
Cancers Detected (True Positives)	3.6	3.7
False Positive (with Biopsy)	14.5	15.6
False Positive (without Biopsy)	83.3	67.2
Cancers Missed (Interval Cancers)	0.7	0.6
Cost (per Woman Screened, $)	189	245
Women w/Dense Breast Tissue		
Recalls	130.6	114.6
Biopsies Performed	22.1	24.3
Cancers Detected (True Positives)	4.2	4.3
False Positive (with Biopsy)	17.9	20.0
False Positive (without Biopsy)	105.7	89.6
Cancers Missed (Interval Cancers)	0.9	0.8
Cost (per Woman Screened, $)	194	249

46

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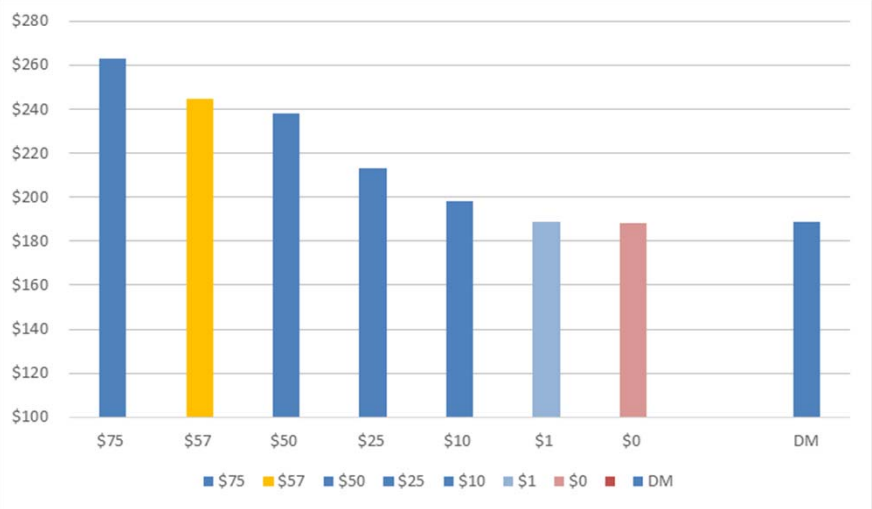
Total Cost per Woman Screened, at Different Payment Premiums for DBT



47

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Sensitivity Analyses on Test Performance

Outcome (per 1,000 screened)	DM Basecase Sn: 84.0 Sp: 90.0	DBT Basecase Sn: 85.5 Sp: 91.5	(A) Sn: 84.0 Sp: 91.5	(B) Sn: 87.0 Sp: 93.0	(C) Sn: 89.0 Sp: 95.0	(D) 1 add'l cancer detected
Overall Population						
Recalls	107.0	91.0	91.0	71.6	51.7	91.0
Biopsies Performed	18.1	19.3	19.3	15.2	11.0	19.3
Cancers Detected	3.6	3.7	3.6	3.8	3.9	4.7
False + (with Biopsy)	14.5	15.6	15.6	11.4	7.1	14.6
False + (w/o Biopsy)	83.3	67.2	67.2	52.3	32.4	67.2
Interval Cancers	0.7	0.6	0.7	0.6	0.5	0.6
Cost (per Woman Screened)	$189	$245	$245	$242	$238	$244

Sn: Sensitivity; Sp: Specificity; DM: Digital mammography; DBT: Digital breast tomosynthesis

NOTES: Recalls refer to positive mammograms or DBTs recalled for additional imaging and/or biopsy; findings may not sum perfectly due to rounding

48

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Supplemental Screening with HHUS, ABUS, or MRI: Results

- Rate of biopsy 3-4 times that of digital mammography alone
- 4-6 additional cancers detected over DM (but 1-2 of these have the potential to be overdiagnosed)
- All tests would identify nearly all of the cancers missed by mammography
- Incremental costs driven by cost of screening test: MRI ($602), ABUS ($243), HHUS ($159)
- Cancer yield greatest in higher-risk women

49

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Supplemental Screening with HHUS, ABUS, or MRI: Results

- When DBT was considered the frontline test, total strategy costs were similar:
  - Fewer women recalled for additional imaging, but…
  - More women sent to supplemental screening as a result of initial negative test
- When DBT assumed to detect 1 add'l cancer per 1,000, biopsy rate declined
  - Incremental costs of supplemental screening reduced by 2-11%, depending on type of test

50

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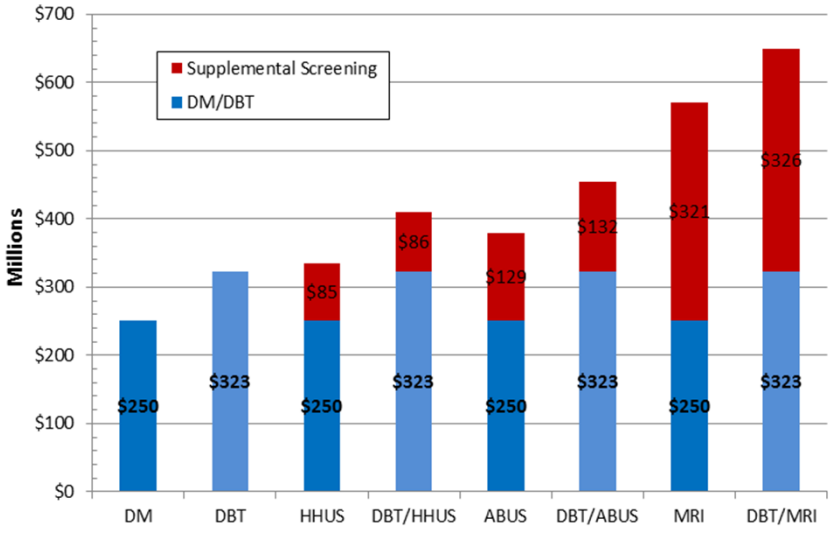
Costs of DBT or DM and Supplemental Screening Among Washington Women with Dense Breasts



51

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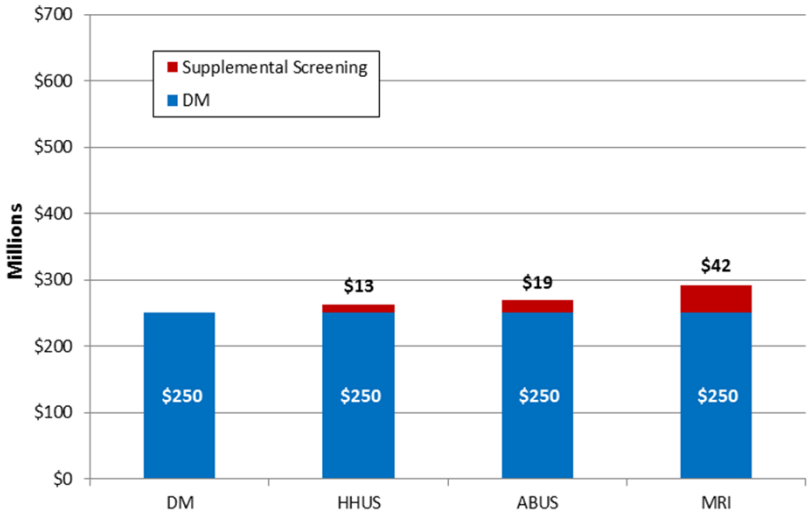
Costs of DM and Supplemental Screening Among Higher-Risk Women Only



52

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Economic Impact of Frontline and Supplemental Screening in Washington: Summary

- Comparison of DBT vs. digital mammography in all screening-eligible women suggests reductions in recall only offset a small % of additional screening costs:
  - Cost neutrality only approached with very small premium
  - Greater cost offsets seen with more optimistic scenarios for improved test performance
  - Reductions in recall would accumulate over longer time horizon
- Supplemental screening with any technology would substantially increase screening costs if performed in all women with dense breast tissue
  - Risk-based targeting results in much smaller increase

53

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Integrated Evidence Ratings

54

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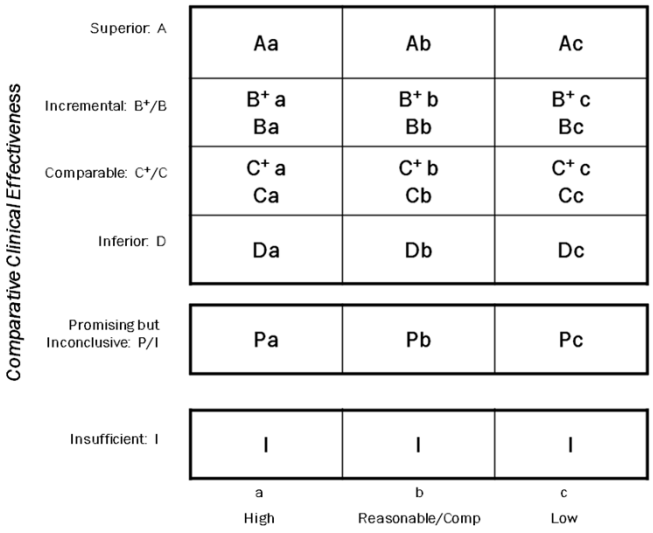
ICER Rating Matrix



55

Evidence Ratings: DBT vs. DM

- Comparative Clinical Effectiveness: C+
- Comparative Value:
  - a (if premium <$30)
  - b (if premium $30-$60)
  - c (if premium >$60)

56

Evidence Ratings: Supplemental Screening

- Comparative Clinical Effectiveness:
  - MRI+DM vs. DM: B+ (A)*
  - HHUS+DM vs. DM: P (C+)*
  - ABUS+DM vs. DM: I
- Comparative Value:
  - MRI+DM vs. DM: c (b)*
  - HHUS+DM vs. DM: c (b)*
  - ABUS+DM vs. DM: N/A

*Rating in brackets reflects use in risk-targeted subgroup

57

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Clinical Practice Guidelines

58

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Practice Guidelines

- DBT:
  - ACS and NCCN note promise of DBT but do not recommend it as of yet
  - ACR and Wash. State Radiological Society (WSRS) describe benefits of DBT and encourage reimbursement of test to enable collection of long-term data
  - American Society of Breast Disease (ASBD) notes limitations that still remain with digital mammography and consider DBT a major advancement

59

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Practice Guidelines

- MRI (ACS, NCCN, ACR/SBI):
  - Recommended as adjunct to mammography in high-risk women (e.g., lifetime risk >20%, genetic mutations, history of chest radiation)
- HHUS:
  - ACS has no current recommendation for or against HHUS
  - NCCN does not recommend routine supplemental screening in women with dense breast tissue and no other risk factors
  - ACR/SBI recommends HHUS as an adjunct in MRI-eligible women who cannot have an MRI for any reason, and suggest consideration of HHUS in women with dense breast tissue
- ABUS:
  - No guidelines identified

60

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Payer Coverage Policies

61

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CMS

- HHUS/ABUS
  - Available NCD relates only to use for diagnosis
- MRI
  - Available NCD/LCDs relate only to use for diagnosis
- DBT
  - Final rule for 2015 relates only to separate payment for DBT, not to considerations of coverage

62

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Private Payers

- HHUS/ABUS:
  - Considered investigational as a screening tool by Humana, United, and CIGNA
  - No available policies from other national or regional payers
- MRI:
  - Generally covered only for women considered at high risk for breast cancer
  - Humana and United consider dense breast tissue an indication for adjunct MRI screening, regardless of other risk factors
- DBT:
  - Covered by Regence, but at no additional payment currently
  - Considered investigational by other regional/national payers

63

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Appendix: Quality Criteria

64

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Quality Ratings: USPSTF criteria and QUADAS-2

Outcome Studies:

- **"Good":**
  - Comparable groups with no or low attrition; intent-to-treat analysis used in RCTs
  - Reliable and valid measurement instruments used
  - Clear description of intervention and comparator(s)
  - All important outcomes considered
  - Attention to confounders in design and analysis
- **"Fair":**
  - Generally comparable groups, some differential follow-up may occur; intent-to-treat analysis used in RCTs
  - Acceptable measurement instruments used
  - Some but not all important outcomes considered
  - Some but not all potential confounders are accounted for
- **"Poor":**
  - Noncomparable groups and/or differential follow-up; lack of intent-to-treat analysis for RCTs
  - Unreliable or invalid measurement instruments used (including not masking outcome assessment)
  - Key confounders given little or no attention

65

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Quality Ratings: USPSTF criteria and QUADAS-2

QUADAS-2 (Diagnostic Accuracy Studies):

- Designed to rate risk of bias and applicability in 4 key domains:
  - Patient selection
  - Index test
  - Reference standard
  - Flow and timing
- Rated in terms of % of studies with levels of bias risk or applicability concerns that are:
  - Low risk/concern
  - High risk/concern
  - Unclear

66

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HTCC Coverage and Reimbursement Determination Analytic Tool

HTA's goal is to achieve *better health care outcomes* for enrollees and beneficiaries of state programs by paying for proven health *technologies that work*.

To find best outcomes and value for the state and the patient, the HTA program focuses on three questions:

1. Is it safe?
2. Is it effective?
3. Does it provide value (improve health outcome)?

The principles HTCC uses to review evidence and make determinations are:

Principle One: Determinations are evidence-based

HTCC requires scientific evidence that a health technology is safe, effective and cost-effective[1] as expressed by the following standards[2]:

- Persons will experience better health outcomes than if the health technology was not covered and that the benefits outweigh the harms.
- The HTCC emphasizes evidence that directly links the technology with health outcomes. Indirect evidence may be sufficient if it supports the principal links in the analytic framework.
- Although the HTCC acknowledges that subjective judgments do enter into the evaluation of evidence and the weighing of benefits and harms, its recommendations are not based largely on opinion.
- The HTCC is explicit about the scientific evidence relied upon for its determinations.

Principle Two: Determinations result in health benefit

The outcomes critical to HTCC in making coverage and reimbursement determinations are health benefits and harms[3]:

- In considering potential benefits, the HTCC focuses on absolute reductions in the risk of outcomes that people can feel or care about.
- In considering potential harms, the HTCC examines harms of all types, including physical, psychological, and non-medical harms that may occur sooner or later as a result of the use of the technology.
- Where possible, the HTCC considers the feasibility of future widespread implementation of the technology in making recommendations.
- The HTCC generally takes a population perspective in weighing the magnitude of benefits against the magnitude of harms. In some situations, it may make a determination for a technology with a large potential benefit for a small proportion of the population.
- In assessing net benefits, the HTCC subjectively estimates the indicated population's value for each benefit and harm. When the HTCC judges that the balance of benefits and harms is likely to vary substantially within the population, coverage or reimbursement determinations may be more selective based on the variation.
- The HTCC considers the economic costs of the health technology in making determinations, but costs are the lowest priority.

[1] Based on Legislative mandate: See RCW 70.14.100(2).

[2] The principles and standards are based on USPSTF Principles at: http://www.ahrq.gov/clinic/ajpmsuppl/harris3.htm

[3] The principles and standards are based on USPSTF Principles at: http://www.ahrq.gov/clinic/ajpmsuppl/harris3.htm

Using evidence as the basis for a coverage decision

Arrive at the coverage decision by identifying for Safety, Effectiveness, and Cost whether (1) evidence is available, (2) the confidence in the evidence, and (3) applicability to decision.

1. Availability of Evidence:

Committee members identify the factors, often referred to as outcomes of interest, that are at issue around safety, effectiveness, and cost. Those deemed key factors are ones that impact the question of whether the particular technology improves health outcomes. Committee members then identify whether and what evidence is available related to each of the key factors.

2. Sufficiency of the Evidence:

Committee members discuss and assess the evidence available and its relevance to the key factors by discussion of the type, quality, and relevance of the evidence[4] using characteristics such as:

- Type of evidence as reported in the technology assessment or other evidence presented to committee (randomized trials, observational studies, case series, expert opinion);
- The amount of evidence (sparse to many number of evidence or events or individuals studied);
- Consistency of evidence (results vary or largely similar);
- Recency (timeliness of information);
- Directness of evidence (link between technology and outcome);
- Relevance of evidence (applicability to agency program and clients);
- Bias (likelihood of conflict of interest or lack of safeguards).

Sufficiency or insufficiency of the evidence is a judgment of each clinical committee member and correlates closely to the GRADE confidence decision.

Not Confident	Confident
Appreciable uncertainty exists. Further information is needed or further information is likely to change confidence.	Very certain of evidentiary support. Further information is unlikely to change confidence

3. Factors for Consideration - Importance

At the end of discussion a vote is taken on whether sufficient evidence exists regarding the technology's safety, effectiveness, and cost. The committee must weigh the degree of importance that each particular key factor and the evidence that supports it has to the policy and coverage decision. Valuing the level of importance is factor or outcome specific but most often include, for areas of safety, effectiveness, and cost:

- Risk of event occurring;
- The degree of harm associated with risk;
- The number of risks; the burden of the condition;
- Burden untreated or treated with alternatives;

[4] Based on GRADE recommendation: http://www.gradeworkinggroup.org/FAQ/index.htm

- The importance of the outcome (e.g. treatment prevents death vs. relief of symptom);
- The degree of effect (e.g. relief of all, none, or some symptom, duration, etc.);
- Value variation based on patient preference.

HEALTH TECHNOLOGY EVIDENCE IDENTIFICATION

Discussion Document:

What are the key factors and health outcomes and what evidence is there?

Safety Outcomes	Safety Evidence
Radiation	
Over-diagnosis	
Unnecessary work up	
Efficacy – Effectiveness Outcomes	**Efficacy / Effectiveness Evidence**
Mortality	
Health related quality of life	
Cancers detected/missed	
Rates of recall and biopsy	
Sensitivity	
Specificity	
PPV	
Special Population / Considerations Outcomes	**Special Populations/ Considerations Evidence**
Cost	**Cost Evidence**
Cost	
Cost-effectiveness	
Cost-utility	

Medicare Coverage and Guidelines

[From Page 35 of evidence report]

3. Medicare …

3.1 Breast Ultrasound

Centers for Medicare and Medicaid Services (CMS)

The national coverage determination (NCD) for breast ultrasound relates only to its use for diagnosis rather than screening. There is also no current local coverage determination (LCD) for screening that covers the state of Washington. LCDs for Illinois (L26890) and Kentucky (L31856) on breast imaging relate only to breast ultrasound's diagnostic use.

3.2 Breast MRI

Centers for Medicare and Medicaid Services (CMS)

The national coverage determination (NCD) for MRI relates only to its general diagnostic use rather than as a breast cancer screening method. There is no local coverage determination (LCD) for breast MRI screening that covers the state of Washington. LCDs for Illinois (L26890) and Kentucky (L31856) cover the use of breast MRI, but, as with ultrasound, indications are limited to diagnostic purposes only.

3.3 Digital Breast Tomosynthesis

Medicare

There are no published national or local coverage determinations for DBT.

[From Page 30 of evidence report]

2. Clinical Guidelines and Training Standards

2.1 Magnetic Resonance Imaging (MRI) of the Breast

The American Cancer Society (ACS) (2014)

http://www.cancer.org/cancer/breastcancer/moreinformation/breastcancerearlydetection/breast-cancer-early-detection-acs-recs

The ACS recommends annual adjunctive MRI for women at high risk for breast cancer. This includes women whose lifetime risk of breast cancer is 20% to 25% or greater; women who have a known *BRCA1* or *BRCA2* gene mutation, or who have a first-degree relative with these genetic mutations if they have not been tested themselves; women who had radiation therapy to the chest between ages 10 and 30; and women who have Li-Fraumeni syndrome, Cowden syndrome, or Bannayan-Rilyey-Ruvalcaba syndrome. The ACS recommends against MRI screening for women with a low lifetime risk of breast cancer, defined as less than 15%. The society suggests that there is not enough evidence to form MRI recommendations for women with moderate risk of developing breast cancer, or who may be at increased risk for breast cancer due to factors such as having extremely or heterogeneously dense breast tissue on mammogram, a personal history of breast cancer, ductal carcinoma in situ, lobular carcinoma in situ, atypical ductal hyperplasia, or atypical lobular hyperplasia.

National Comprehensive Cancer Network (NCCN) (2014)

http://www.nccn.org/professionals/physician_gls/pdf/breast.pdf

The NCCN recommends MRI as an adjunct to mammography starting at age 30 for women with a lifetime risk of breast cancer greater than 20% (using Claus, BRCAPRO, BOADICEA, or Tyrer-Cuzick models), as well for women with mutations in BRCA1, BRCA2, TP53, or PTEN and their untested first-degree relatives. In addition,

they recommend annual screening MRI for those receiving radiation therapy to their chest between the ages of 10 to 30 years starting 8 to 10 years following the radiation therapy or at age 40, whichever comes first.

The NCCN guidelines also state that there is insufficient evidence to recommend for or against annual MRI screening for the following women: those with a 15% to 20% lifetime risk for breast cancer; those with a personal history of breast cancer, ductal carcinoma in situ, lobular carcinoma in situ, atypical ductal hyperplasia, atypical lobular hyperplasia; or those with heterogeneously dense or extremely dense tissue on mammography. NCCN recommends against MRI for women with a lifetime risk of less than 15%.

American College of Radiology / Society of Breast Imaging (2010)

http://www.jacr.org/article/S1546-1440(09)00480-3/fulltext

Joint guidelines from the American College of Radiology and the Society of Breast imaging recommend annual screening MRI examinations starting at age 30 for BRCA mutation carriers and their untested first degree relatives, for women with greater than a 20% lifetime risk for breast cancer on the basis of family history, women with a history of chest irradiation (usually for Hodgkin's disease), and a single screen of the contralateral breast for women with newly diagnosed breast cancer (Lee et al., 2010). They recommend considering screening MRI for women with a lifetime risk between 15% and 20% on the basis of a personal history of breast or ovarian cancer or biopsy proven lobular neoplasia or atypical ductal hyperplasia.

The European Society of Breast Imaging (2007)

http://www.eusobi.org/html/img/pool/330_2008_863_OnlinePDF.PDF

The European Society of Breast Imaging recommends annual MRI screening examinations for women with a BRCA mutation, first degree relatives of BRCA carriers, women with radiation to their chest wall between the ages of 10 and 30 years, women with Li-Fraumeni syndrome (TP53 mutation carriers) and their untested first degree relatives, and women with Cowden syndrome (PTEN mutation carriers) and their first degree relatives) (Mann et al., 2007).

2.2 Hand-held Ultrasonography (HHUS) of the Breast

The American Cancer Society (ACS) (2014)

http://www.cancer.org/cancer/breastcancer/moreinformation/breastcancerearlydetection/breast-cancer-early-detection-acs-recs

The ACS has no recommendation on HHUS for breast cancer screening.

National Comprehensive Cancer Network (NCCN) (2014)

http://www.nccn.org/professionals/physician_gls/pdf/breast.pdf

Under breast screening considerations, the NCCN guidelines state "Dense breasts limit the sensitivity of mammography. Dense breasts are associated with an increased risk for breast cancer, but there is insufficient evidence to support routine supplemental screening in women with dense breasts and no other risk factors" (NCCN, 2013). Under the same section they also note, "There are several studies supporting the use of ultrasound for breast cancer screening as an adjunct to mammography for high risk women with dense breast tissue."

American College of Radiology / Society of Breast Imaging (2010)

http://www.jacr.org/article/S1546-1440(09)00480-3/fulltext

Joint guidelines from the American College of Radiology and the Society of Breast imaging recommend considering annual screening ultrasound examinations in addition to mammography for women eligible for

MRI screening who cannot have MRI for any reason (Lee et al., 2010). They recommend considering ultrasound in women with dense breast tissue as an adjunct to mammography.

2.3 Automated Whole Breast Ultrasonography (ABUS)

There are no guidelines currently recommending ABUS to screen for breast cancer from any major clinical society, including the American Cancer Society, the National Comprehensive Cancer Network, the American College of Radiology, and the Society of Breast Imaging.

2.4 Digital Breast Tomosynthesis (DBT)

American Cancer Society (ACS) (2014)
http://www.cancer.org/healthy/findcancerearly/examandtestdescriptions/mammogramsandotherbreastimagingprocedures/mammograms-and-other-breast-imaging-procedures-improving-mammo

The ACS suggests that DBT **"**uses more radiation than most standard 2-view mammograms, but it may allow doctors to see [dense areas] more clearly. Some studies have suggested it might lower the chance that the patient will be called back for unnecessary tests. It may also be able to find more cancers." ACS does not provide a recommendation for or against use of DBT.

American College of Radiology (ACR) (2014)
http://www.acr.org/About-Us/Media-Center/Position-Statements/Position-Statements-Folder/20141124-ACR-Statement-on-Breast-Tomosynthesis

While digital mammography is the only breast cancer screening procedure that has been proven to reduce mortality, tomosynthesis is a very promising technology that has been shown to reduce recall rates and increase cancer detection, thus having a positive impact on patient care. The ACR acknowledges the lack of studies demonstrating long-term benefits, and encourages payers to reimburse for tomosynthesis so that additional large-scale studies can be conducted.

American Society of Breast Disease (ASBD) (2013)
https://www.asbd.org/news/ASBD_statement_on_Tomosynthesis12-16-13.pdf

Despite the growing use of full-field digital mammography over film, screening mammography is still limited by overlapping breast tissue. The use of DBT has the potential to overcome these limitations and improve diagnostic accuracy of breast cancer. DBT has the potential to improve patient outcomes, particularly with regards to diagnostic work-up following screening. By increasing cancer detection and reducing recalls, DBT has utility as both a diagnostic and screening tool and may have the greatest impact on women with dense breast tissue.

National Comprehensive Cancer Network (NCCN) (2014)
http://www.nccn.org/professionals/physician_gls/pdf/breast.pdf

Under breast screening considerations, the NCCN guidelines state that "Early studies show promise for DBT mammography. Two large trials showing a combined use of digital mammography and tomosynthesis resulted in improved cancer detection and decreased call back rates; of note, this is double the dose of radiation and is a factor in recommending this modality. Definitive studies are still pending" (NCCN, 2013).

Washington State Radiological Society (WSRS) (2014)
http://www.wsrs.org/position_statements.html

Adding DBT to standard mammography screening programs would help overcome many of the current limitations of digital mammography, such as its inability to distinguish overlapping breast tissue. As evidenced by recent studies, the addition of DBT will likely result in the additional detection of one cancer for every

1,000 women screened. Moreover, it will reduce the number of unnecessary call-backs as well as decrease patient anxiety and lost productivity as a result of false-positive findings. DBT has the potential to both improve patient outcomes and decrease healthcare costs by identifying more early-stage cancers and expediting diagnostic workup. WSRS urges payers to reimburse for DBT so this advancement in breast cancer screening can be more widely utilized.

Clinical Committee Findings and Decisions

Efficacy Considerations

- What is the evidence that use of the technology results in more beneficial, important health outcomes? Consider:
  - Direct outcome or surrogate measure
  - Short term or long term effect
  - Magnitude of effect
  - Impact on pain, functional restoration, quality of life
  - Disease management
- What is the evidence confirming that use of the technology results in a more beneficial outcome, compared to no treatment or placebo treatment?
- What is the evidence confirming that use of the technology results in a more beneficial outcome, compared to alternative treatment?
- What is the evidence of the magnitude of the benefit or the incremental value?
- Does the scientific evidence confirm that use of the technology can effectively replace other technologies or is this additive?
- For diagnostic tests, what is the evidence of a diagnostic tests' accuracy?
  - Does the use of the technology more accurately identify both those with the condition being evaluated and those without the condition being evaluated?
- Does the use of the technology result in better sensitivity and better specificity?
- Is there a tradeoff in sensitivity and specificity that on balance the diagnostic technology is thought to be more accurate than current diagnostic testing?
- Does use of the test change treatment choices?

Safety

- What is the evidence of the effect of using the technology on significant morbidity?
  - Frequent adverse effect on health, but unlikely to result in lasting harm or be life-threatening, or;
  - Adverse effect on health that can result in lasting harm or can be life-threatening?
- Other morbidity concerns?
- Short term or direct complication versus long term complications?
- What is the evidence of using the technology on mortality – does it result in fewer adverse non-fatal outcomes?

Cost Impact

- Do the cost analyses show that use of the new technology will result in costs that are greater, equivalent or lower than management without use of the technology?

Overall

- What is the evidence about alternatives and comparisons to the alternatives?
- Does scientific evidence confirm that use of the technology results in better health outcomes than management without use of the technology?

Next Step: Cover or No Cover

If not covered, or covered unconditionally, the Chair will instruct staff to write a proposed findings and decision document for review and final adoption at the following meeting.

Next Step: Cover with Conditions

If covered with conditions, the Committee will continue discussion.

1) Does the committee have enough information to identify conditions or criteria?
    - Refer to evidence identification document and discussion.
    - Chair will facilitate discussion, and if enough members agree, conditions and/or criteria will be identified and listed.
    - Chair will instruct staff to write a proposed findings and decision document for review and final adoption at next meeting.

2) If not enough or appropriate information, then Chair will facilitate a discussion on the following:
    - What are the known conditions/criteria and evidence state
    - What issues need to be addressed and evidence state

The chair will delegate investigation and return to group based on information and issues identified. Information known but not available or assembled can be gathered by staff ; additional clinical questions may need further research by evidence center or may need ad hoc advisory group; information on agency utilization, similar coverage decisions may need agency or other health plan input; information on current practice in community or beneficiary preference may need further public input. Delegation should include specific instructions on the task, assignment or issue; include a time frame; provide direction on membership or input if a group is to be convened.

Clinical Committee Evidence Votes

First Voting Question

The HTCC has reviewed and considered the technology assessment and information provided by the administrator, reports and/or testimony from an advisory group, and submissions or comments from the public. The committee has given greatest weight to the evidence it determined, based on objective factors, to be the most valid and reliable.

Is there sufficient evidence under some or all situations that the technology is:

	Unproven (no)	Equivalent (yes)	Less (yes)	More (yes)
Effective				
Safe				
Cost-effective				

Discussion

Based on the evidence vote, the committee may be ready to take a vote on coverage or further discussion may be warranted to understand the differences of opinions or to discuss the implications of the vote on a final coverage decision.

- Evidence is insufficient to make a conclusion about whether the health technology is safe, efficacious, and cost-effective;
- Evidence is sufficient to conclude that the health technology is unsafe, ineffectual, or not cost-effective
- Evidence is sufficient to conclude that the health technology is safe, efficacious, and cost-effective for all indicated conditions;
- Evidence is sufficient to conclude that the health technology is safe, efficacious, and cost-effective for some conditions or in some situations

A straw vote may be taken to determine whether, and in what area, further discussion is necessary.

Second Vote

Based on the evidence about the technologies' safety, efficacy, and cost-effectiveness, it is

_____Not Covered _____ Covered Unconditionally _____ Covered Under Certain Conditions

Discussion Item

Is the determination consistent with identified Medicare decisions and expert guidelines, and if not, what evidence is relied upon.

Next Step: Proposed Findings and Decision and Public Comment

At the next public meeting the committee will review the proposed findings and decision and consider any public comments as appropriate prior to a vote for final adoption of the determination.

1) Based on public comment was evidence overlooked in the process that should be considered?

2) Does the proposed findings and decision document clearly convey the intended coverage determination based on review and consideration of the evidence?

Next Step: Final Determination

Following review of the proposed findings and decision document and public comments:

Final Vote

Does the committee approve the Findings and Decisions document with any changes noted in discussion?

If yes, the process is concluded.

If no, or an unclear (i.e., tie) outcome Chair will lead discussion to determine next steps.