Educational Interventions to Improve Screening

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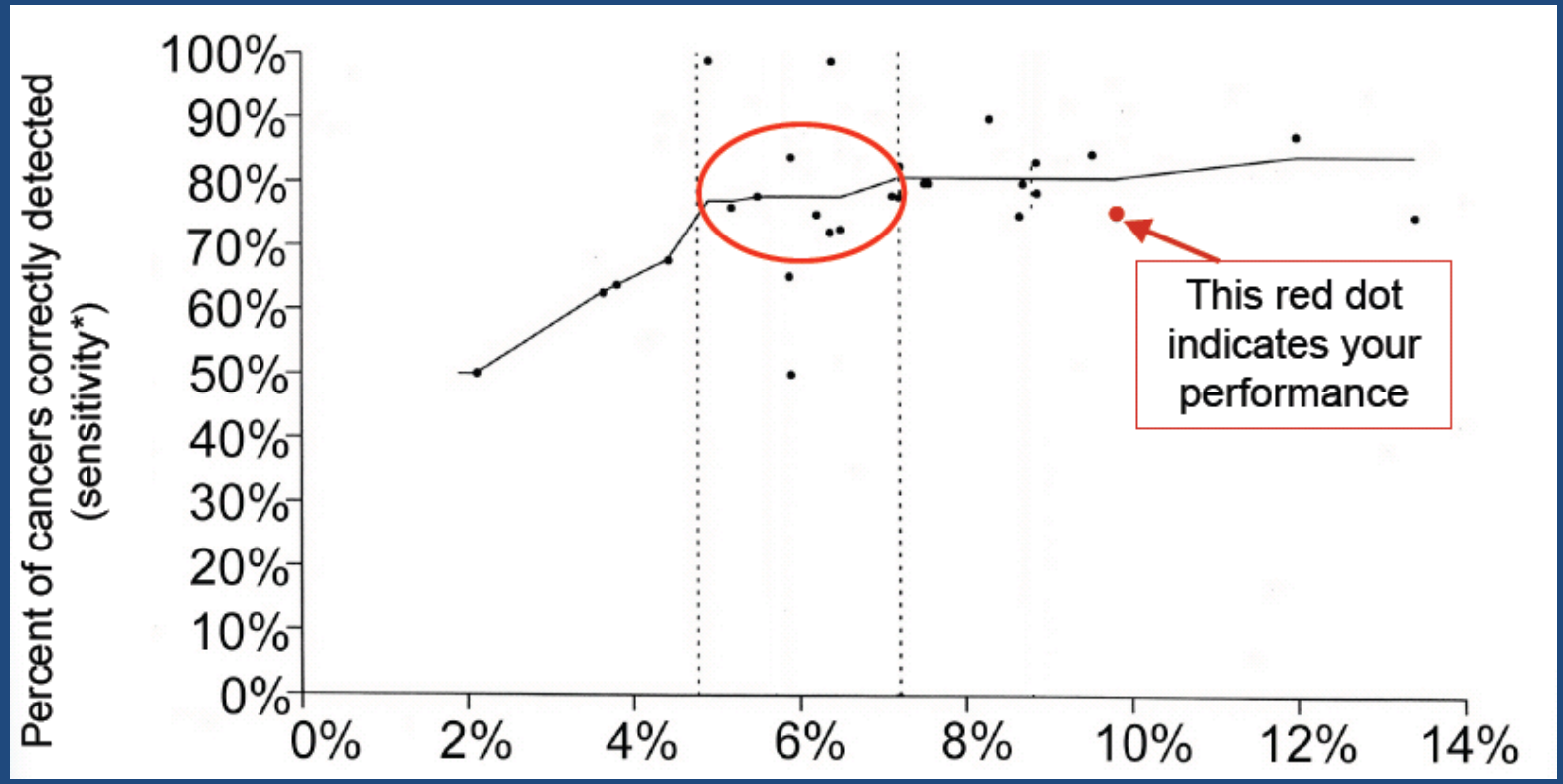
Our goal with interventions is to improve mammography interpretation

- Decrease False Positive (increasing specificity)
- While increasing or holding steady True Positives (sensitivity)

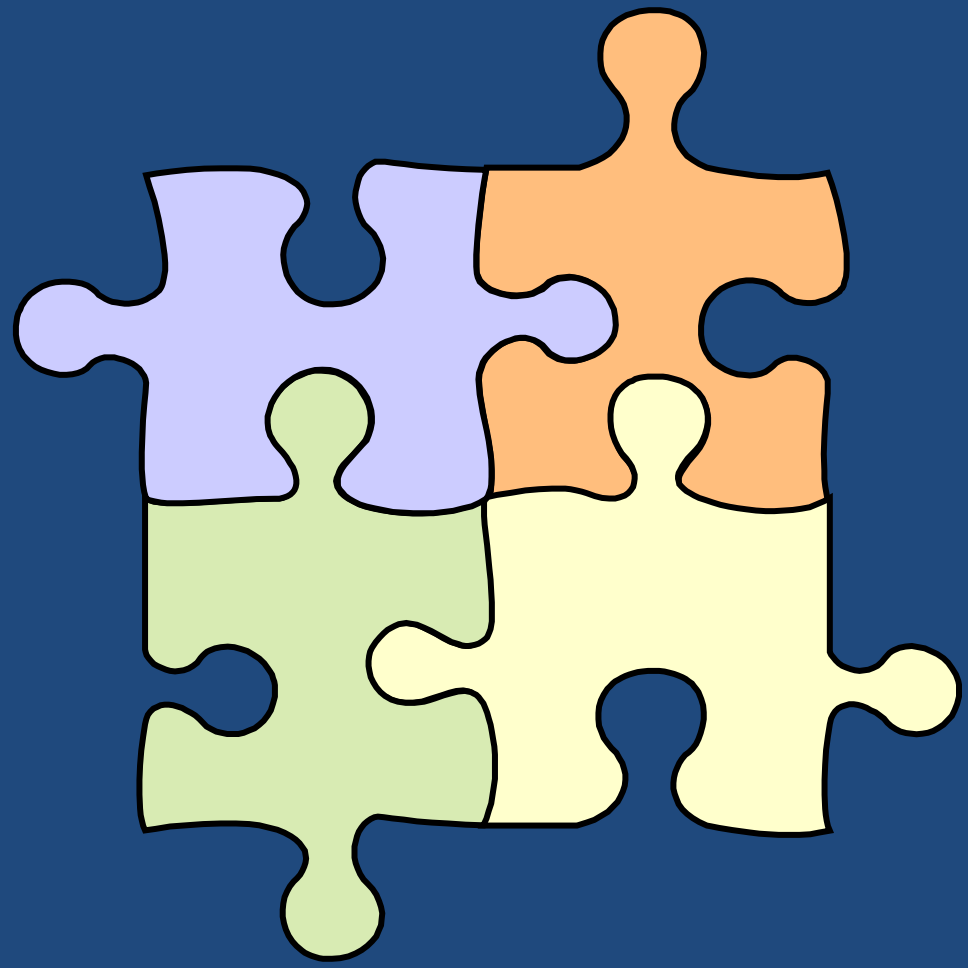


Today we will:

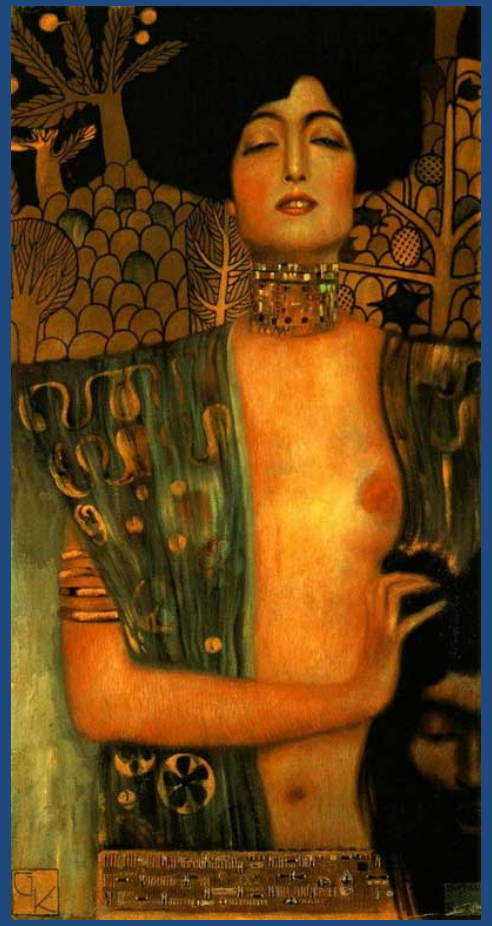
- Review educational interventions to improve mammography
- Discuss how theory is used to develop interventions
- Identify what the current gaps are

Improving Breast Imaging Quality Standards

- Suggests that residency training may be insufficient
- MQSA requires CME but how effective is it for mammography?
  - Linver M (1992)
  - Berg W (2002)
  - Adcock K (2004)
  - Scott H (2006)
  - Urban N (2007)
  - Carney P (2012)
  - Geller B (2014)



Assessing and Improving Mammography: AIM



AIM Intervention – a Collaborative Effort!

- Patty Carney
- Diana Miglioretti
- Andy Bogart
- Laura Ichikawa
- Diana Buist
- Ed Sickles
- Barbara Monsees
- Larry Bassett
- Matthew Wallis
- Karla Kerlikowske
- Bonnie Yankaskas
- Rob Rosenberg
- Bob Smith

- Project managers at the BCSC sites
- Participating radiologists

Relevant Educational Theories

- Physicians must understand that a gap exists between their actual performance and what is expected. a
- CMEs need to be ”ongoing, interactive, contextually relevant and based on needs assessment….” b
- Learners are changing and becoming much more active & self-directed learners. c

a. Davis DA, Thomson M, Oxman AD, Haynes B. Changing Physician Performance: A Systematic Review of the Effect of Continuing Medical Education Strategies. *JAMA.* 1995;274(9):700-705.
b. Robertson MK, Umble KE, Cervero RM,Impact studies in continuing education for health professions: Update. J Cont Ed in health Prof. 2003;23(3):146-56.
c. Garrison DR. Self-directed Learning: Toward a Comprehensive Model. Adult Education Quarterly, Fall 1997 vol. 48 no. 1 18-33

Theoretical Models

- Precede/Proceed Model – Educational
  - Green LW, Kreuter MW, Health Promotion Planning: An Educational and Environmental Approach. 1991, Mountain View, CA: Mayfield Publishing.

- Social Cognitive Learning Theory -Psychological
  - Bandura, A, Social foundations of thought and action : a social cognitive theory. 1986, Englewood Cliffs, NJ: Prentice-Hall.

- Educational Influential Physicians –Sociological
  - Rogers, EM, Diffusion of Innovations. 1983, New York, NY: Macmillan Publishing.

Study Design

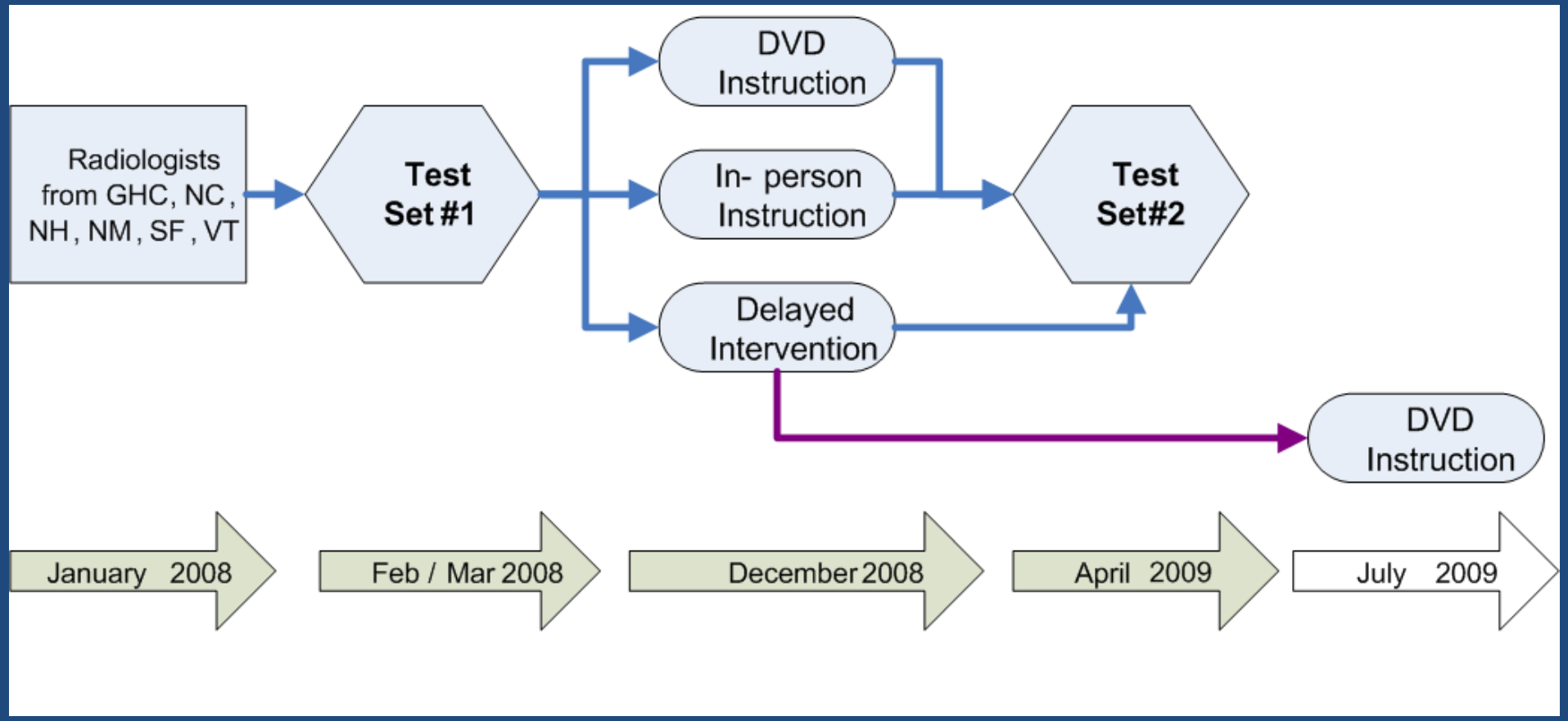
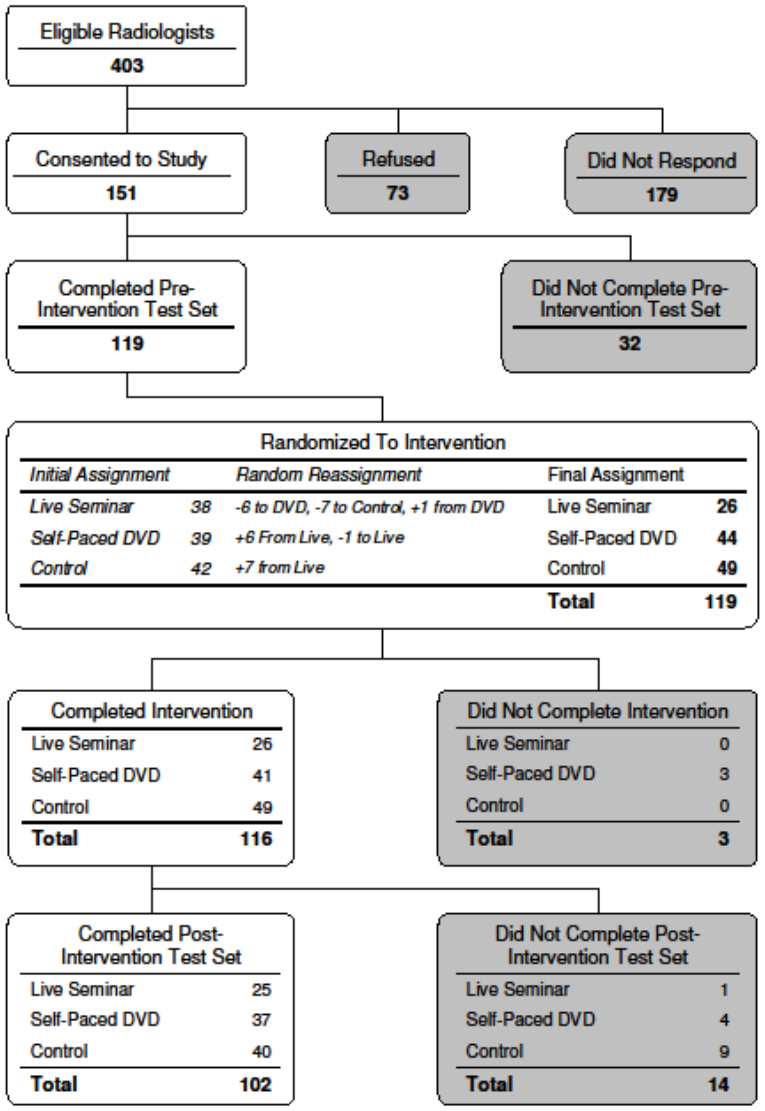
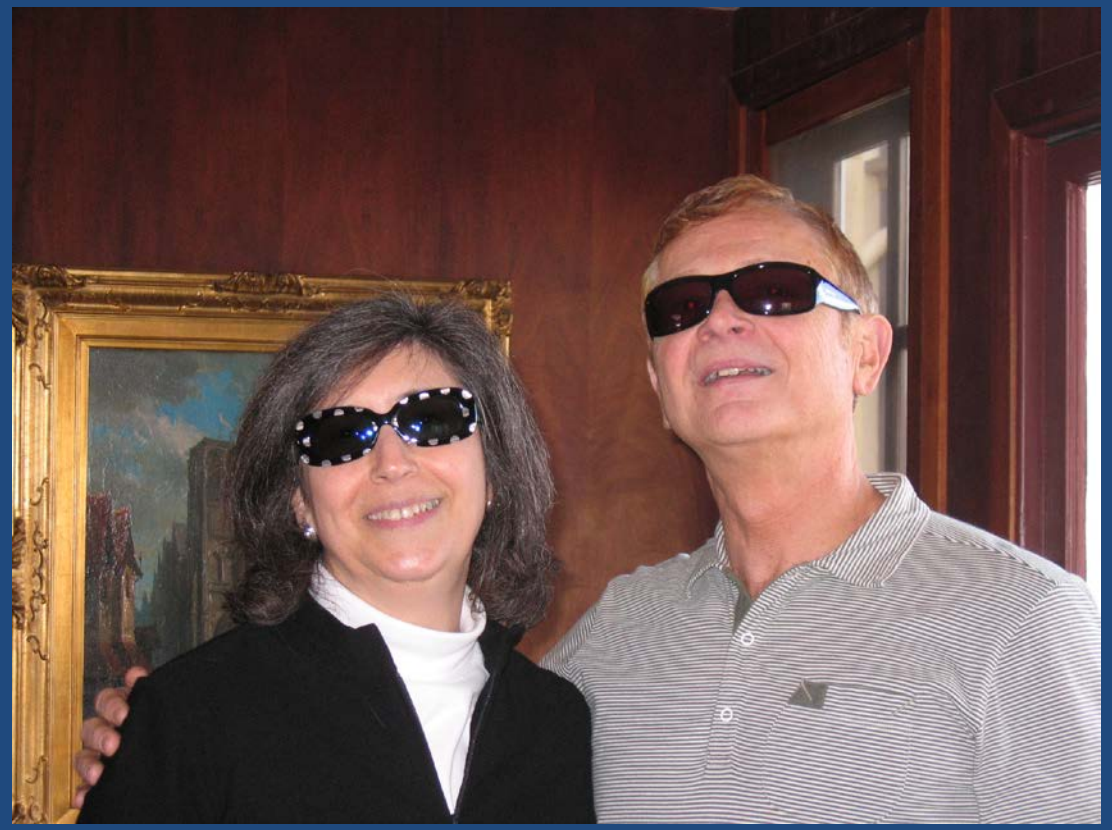


Figure 1: Flow Chart of Study Participants



Our Three Educationally Influential Physician Opinion Leaders



Our Intervention Development Plan

- Diagnostic research
  - Focus groups
  - Determine the types and location of findings that are challenging (test set 1)
- Develop a Live Seminar with teaching cases and expert review
- Develop DVD with same teaching cases and expert review
- Evaluate the acceptability & feasibility of both interventions
- Measure their effectiveness compared to the control group

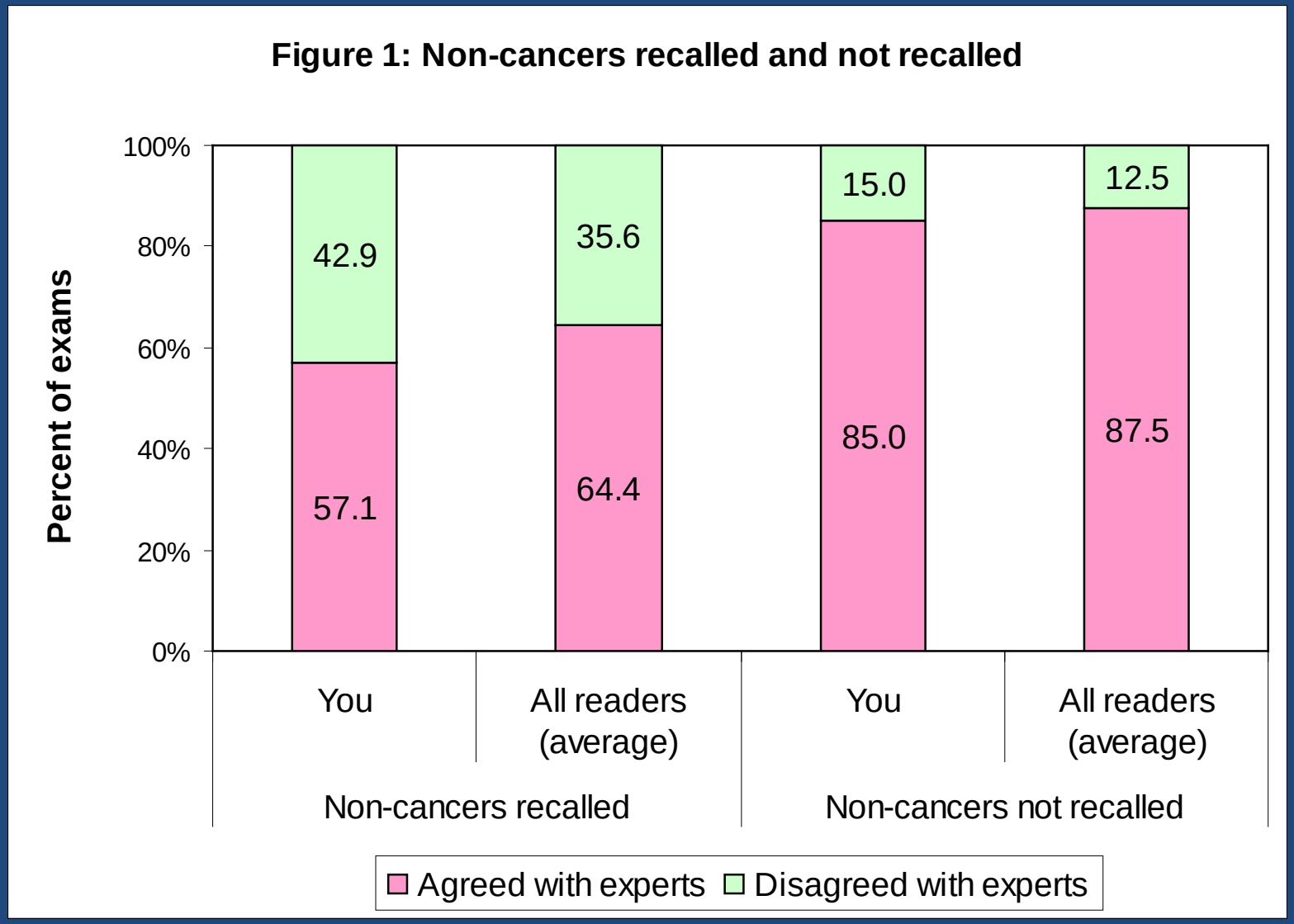
Advantages of the DVD

- Self paced
- Can be completed over several sessions
- Performed home/office (No travel required)
- Immediate feedback on whether their responses were correct
- Extra cases for additional practice

Advantages of the Live Seminar

- Immediate collation of results to let radiologists see how they compare to others in the seminar
- Experts can tailor teaching points to the specific questions of the participants
- Experts can provide immediate feedback on improvement noticed during seminar

Feedback to Radiologist (performance gap)



Intervention Development

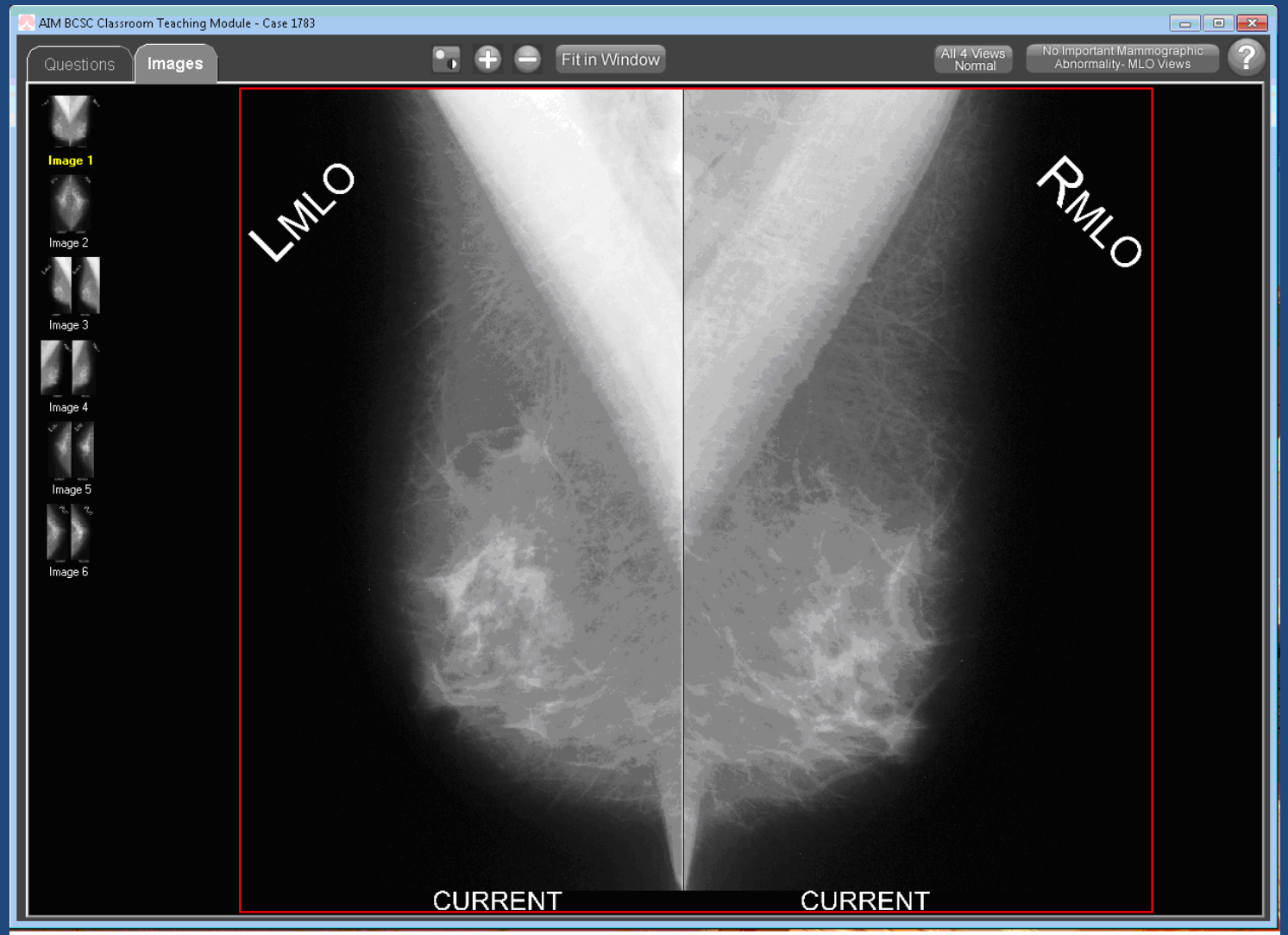
- Reviewed cases that radiologist had trouble with in test set 1
- Selected similar cases but also added in normal mammograms
  - Available additional imaging was retrieved
  - Cases were digitized

- Each of the 3 experts wrote teaching points for 1/3 of the cases
- One expert reviewed all the teaching points and edited it so that they were all similar in size, words and tone.

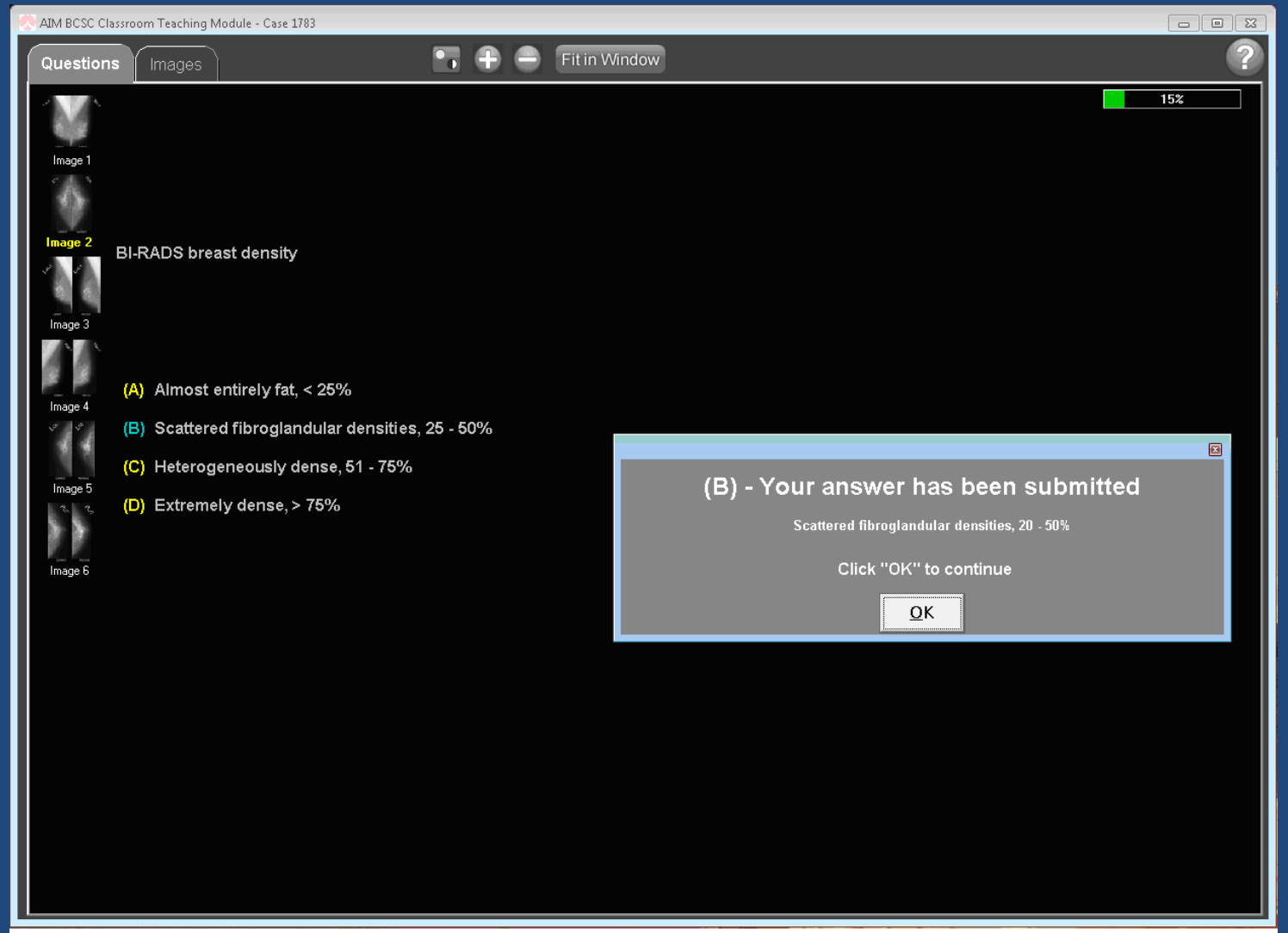
Intervention Case Composition

	Expert-rated difficulty		
	Intermediate	Subtle	Total
Cancers			
AIM films	6	8	14
COMISA add-ins	(not rated)	(not rated)	4
Non-Cancers			
expert recalls	2	4	6
expert non-recalls	(not applicable)	(not applicable)	16
Total			40

Current Views

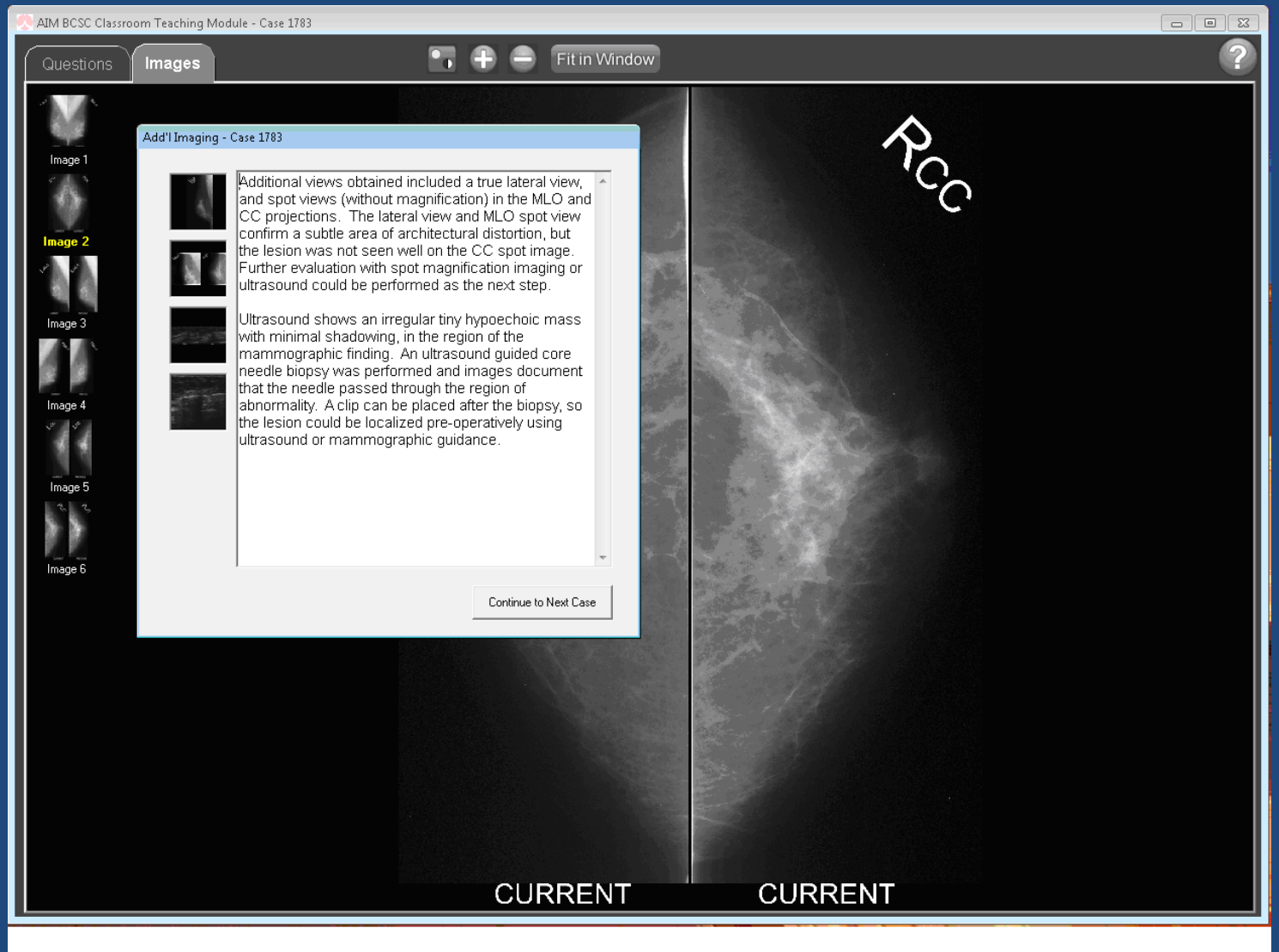


Breast Density



Immediate Feedback on Responses

Additional Views with Teaching Point



Special considerations for analyses

Expert Recall

- Cases included:
  - Cancers
  - Cases that the experts felt needed to have additional imaging to determine whether there was a high chance of cancer

Recalibrated PPV/NPV

- PPV and NPV could not be compared directly across test sets because the prevalence of cancer (and expert recall) differed!

- We “recalibrated” PPV and NPV to make the comparisons sensible.

Change in Sensitivity & Specificity Before and After Intervention

	Relative to Expert Recall		
	Live Intervention	Self-Paced DVD Intervention	Control
	n=25	n=37	n=40
Sensitivity			
Lesion Level			
pre-intervention	51.3 (11.2)	52.5 (10.9)	54.4 (11.0)
post-intervention	61.2 (9.9)	63.5 (9.8)	61.4 (11.2)
change	10.0 (12.8)	10.9 (10.7)	7.0 (13.5)
Specificity			
pre-intervention	77.9 (12.1)	74.8 (13.9)	73.1 (11.0)
post-intervention	76.8 (9.5)	75.0 (14.8)	74.9 (12.6)
change	-1.2 (12.3)	0.2 (15.5)	1.8 (10.3)

Change in PPV and NPV

	Relative to Expert Recall		
	Live Intervention	Self-Paced DVD Intervention	Control
	n=25	n=37	n=40
Re-calibrated PPV*			
Lesion Level			
pre-intervention	48.5 (11.2)	46.3 (12.1)	44.4 (12.5)
post-intervention	50.7 (11.2)	51.7 (13.3)	49.4 (10.7)
change	2.2 (12.8)	5.4 (14.3)	5.0 (9.2)
Re-calibrated NPV*			
pre-intervention	88.3 (4.9)	90.1 (4.3)	89.0 (5.1)
post-intervention	89.5 (6.0)	90.0 (5.0)	89.7 (5.4)
change	1.2 (5.6)	-0.1 (5.1)	0.7 (6.0)

	Relative to Cancer		
	Live Intervention n=25	Self-Paced DVD Intervention n=37	Control n=40
Sensitivity			
pre-intervention	62.0 (15.0)	66.4 (13.2)	65.5 (13.9)
post-intervention	66.1 (14.6)	70.3 (14.9)	65.8 (15.9)
change	4.1 (15.5)	3.9 (16.7)	0.3 (19.2
Specificity			
pre-intervention	69.3 (12.0)	65.8 (13.8)	64.1 (10.2)
post-intervention	69.2 (9.0)	67.8 (14.0)	67.5 (12.1)
change	-0.1 (12.5)	1.9 (14.8)	3.4 (10.0)

	Relative to Cancer		
	Live Intervention	Self-Paced DVD Intervention	Control
	n=25	n=37	n=40
Sensitivity			
pre-intervention	62.0 (15.0)	66.4 (13.2)	65.5 (13.9)
post-intervention	66.1 (14.6)	70.3 (14.9)	65.8 (15.9)
change	4.1 (15.5)	3.9 (16.7)	0.3 (19.2
Specificity			
pre-intervention	69.3 (12.0)	65.8 (13.8)	64.1 (10.2)
post-intervention	69.2 (9.0)	67.8 (14.0)	67.5 (12.1)
change	-0.1 (12.5)	1.9 (14.8)	3.4 (10.0)

Comparison of the effects of intervention on four performance measures relative to two reference outcomes

	Relative to Expert Recall			Relative to Cancer	
	Adjusted OR[a]	p		Adjusted OR[a]	p
Sensitivity					
Live vs. Control	1.24 (0.90, 1.72)	0.190		1.22 (0.78, 1.90)	0.384
DVD vs. Control	**1.34 (1.00, 1.81)**	**0.050**		1.28 (0.85, 1.92)	0.237
Specificity					
Live vs. Control	**0.80 (0.64, 1.00)**	**0.048**		**0.79 (0.65, 0.95)**	**0.015**
DVD vs. Control	0.90 (0.74, 1.10)	0.299		0.92 (0.77, 1.09)	0.343
PPV					
Live vs. Control	1.13 (0.69, 1.86)	0.631		1.11 (0.59, 2.09)	0.743
DVD vs. Control	**1.94 (1.24, 3.05)**	**0.004**		**1.81 (1.01, 3.23)**	**0.045**
NPV					
Live vs. Control	1.08 (0.84, 1.39)	0.547		1.06 (0.74, 1.51)	0.752
DVD vs. Control	0.96 (0.77, 1.21)	0.760		0.94 (0.67, 1.30)	0.694

More results

- More participants showed improvement from the Live Intervention.
- The actual magnitude of improvement was greater for the DVD.
- The live intervention group more frequently reported intention to change their clinical practice as a result of the intervention compared to the DVD group (50% versus 17.6%, P = .02).
- The majority of participants in both interventions groups felt the interventions were a useful way to receive CME mammography credits. (Carney P, 2013)

Limitations

- We used digitized films instead of digital.
- It was difficult to recruit and retain participants leading to lower power than planned.
- Improvement was seen in the control group.

In the future interventions need to:

- Be offered to low performers
- Show clinical improvement
- Be short in duration
- Individualized to the needs of the learners
- Provide data for both Graduate and Continuing Medical Education

More research is needed to determine intervention effectiveness