

Educational Interventions to Improve Screening

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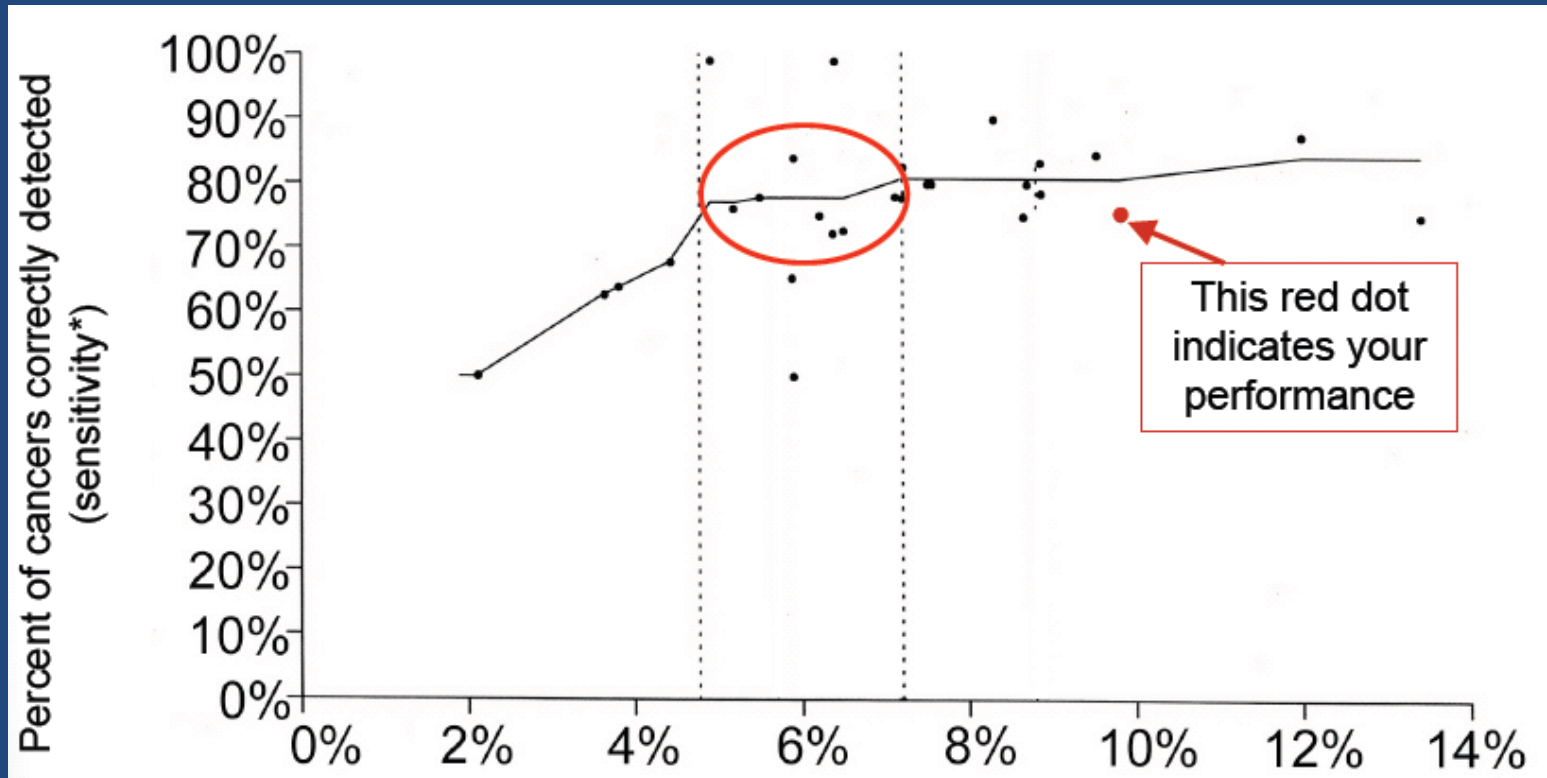
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Our goal with interventions is to improve mammography interpretation

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

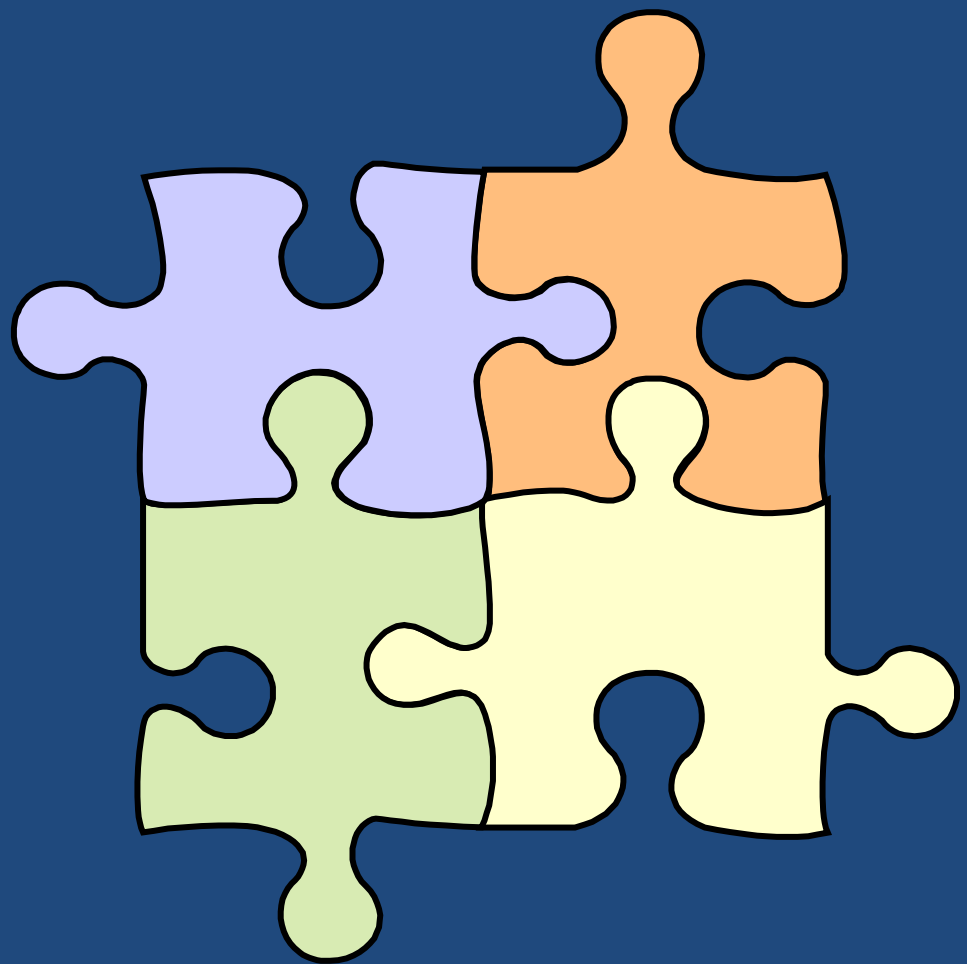


Today we will:

- 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

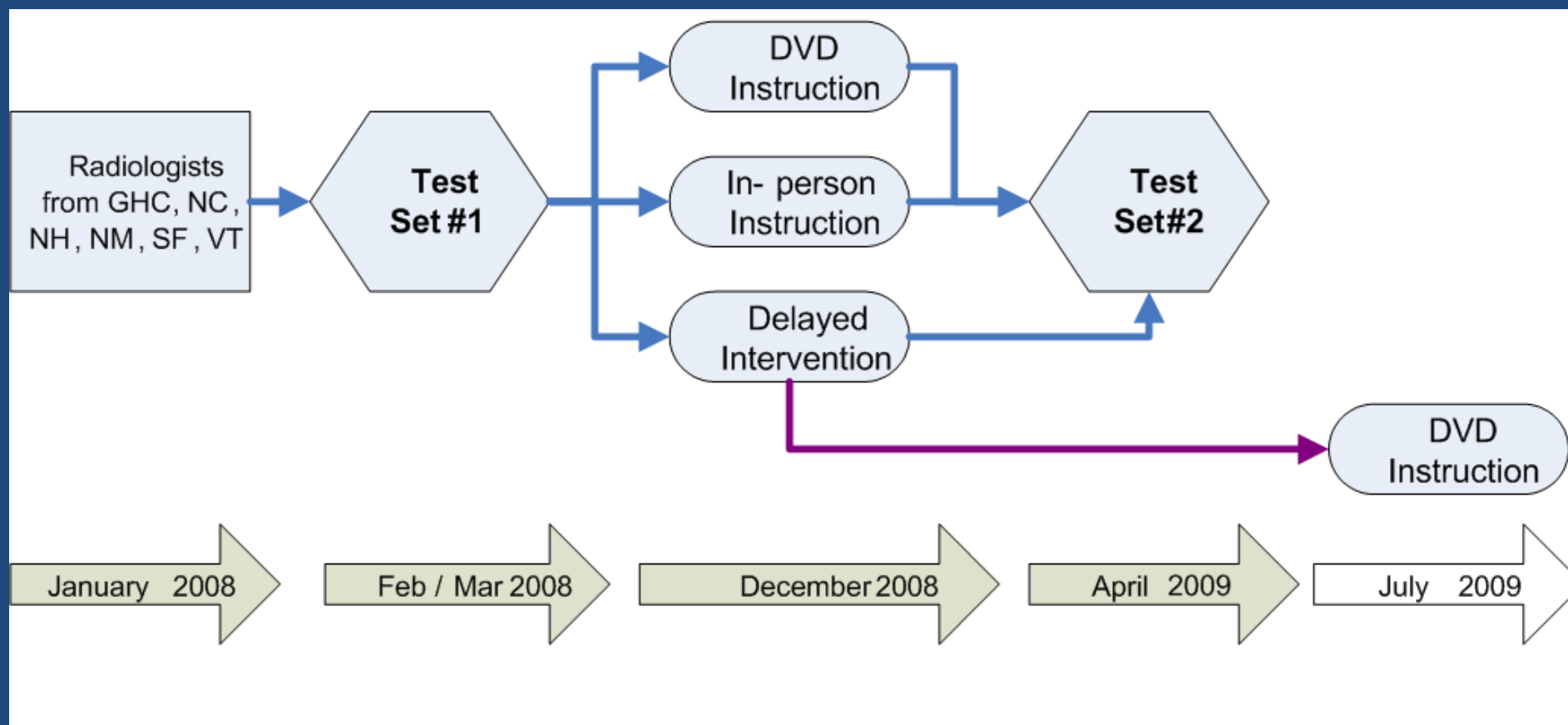
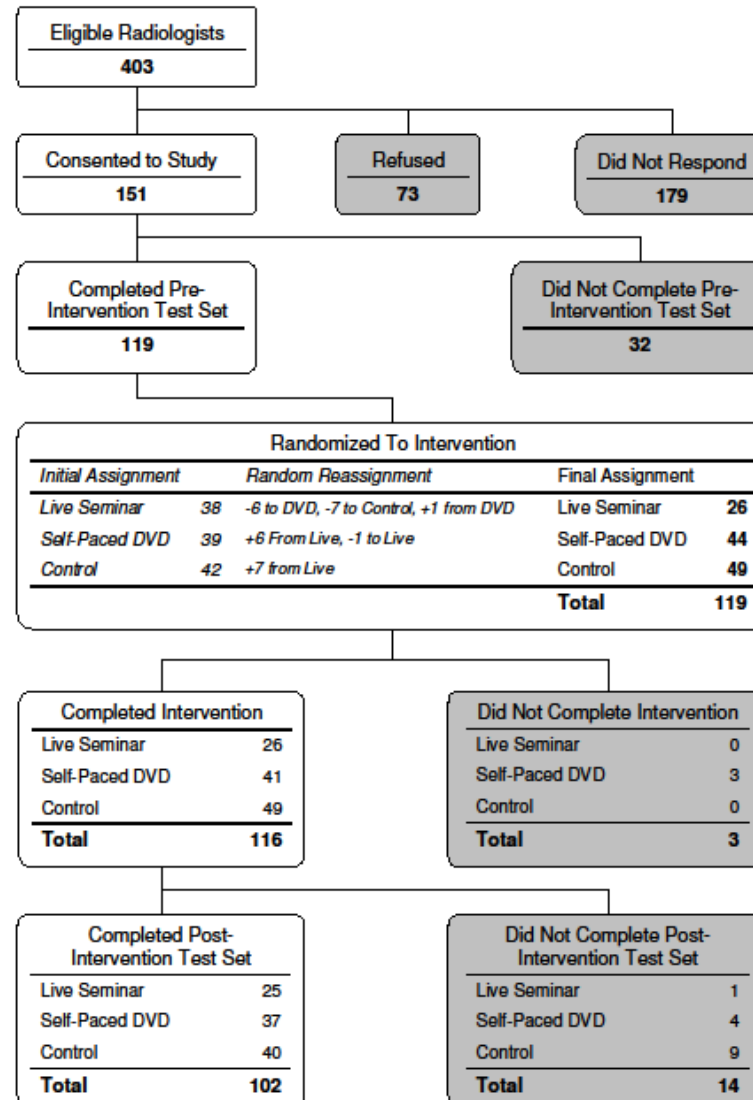
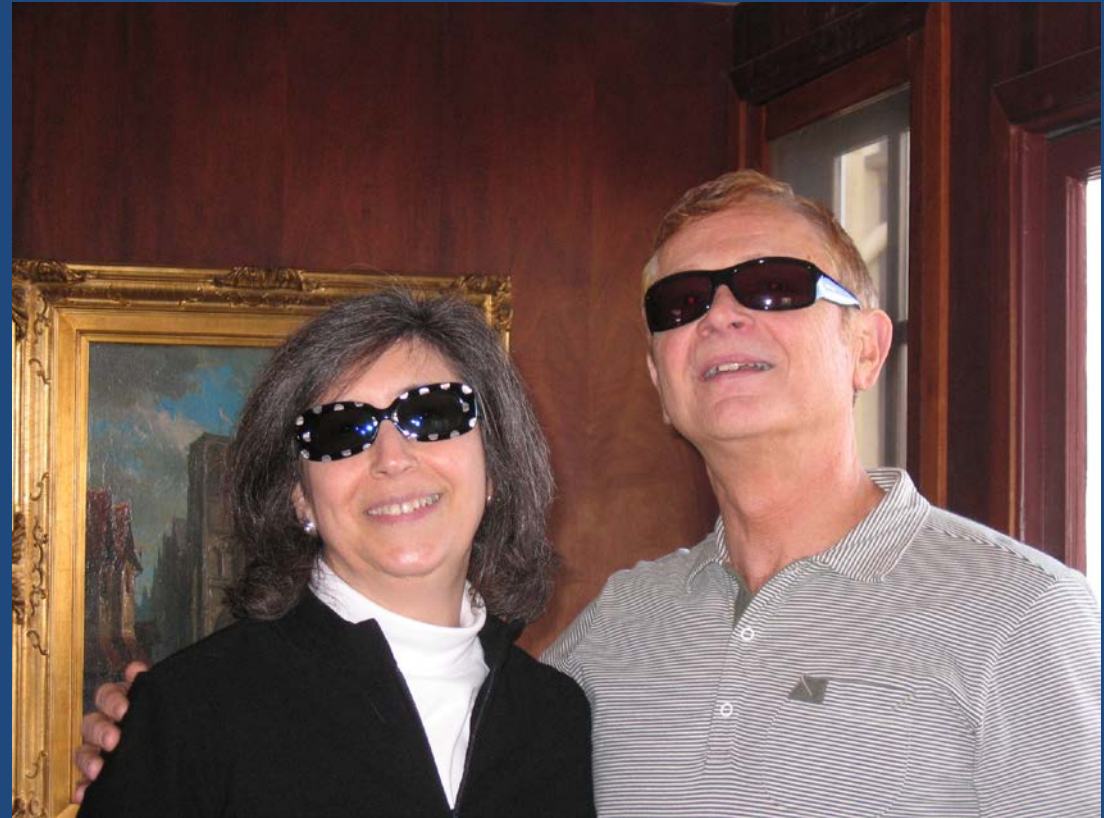


Figure 1: Flow Chart of Study Participants



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

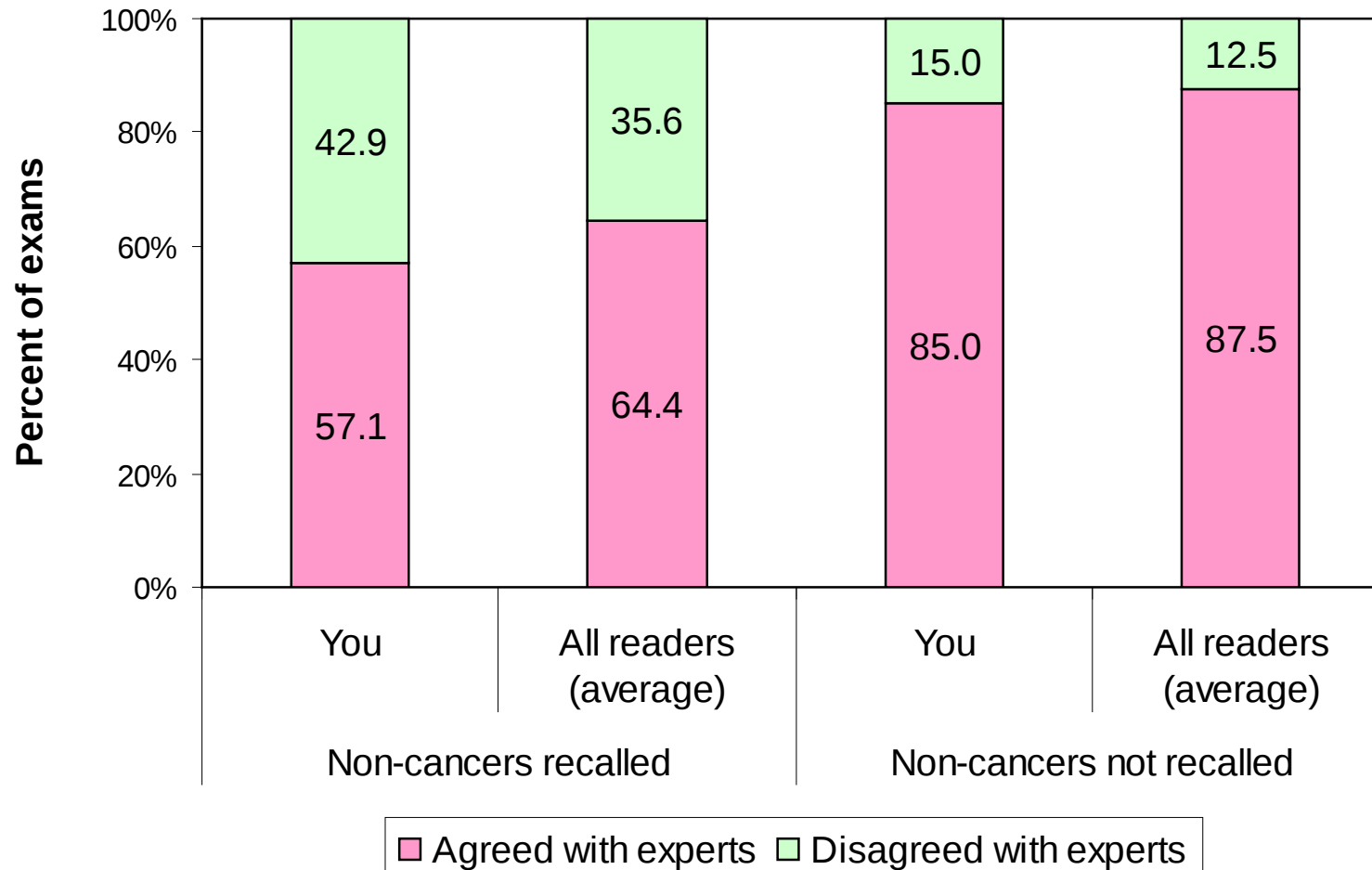
- Self paced
- Can be completed over several sessions
- Performed home/office (No travel required)
- Immediate feedback on whether their responses were correct
- Extra cases for additional practice

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)

Figure 1: Non-cancers recalled and not recalled



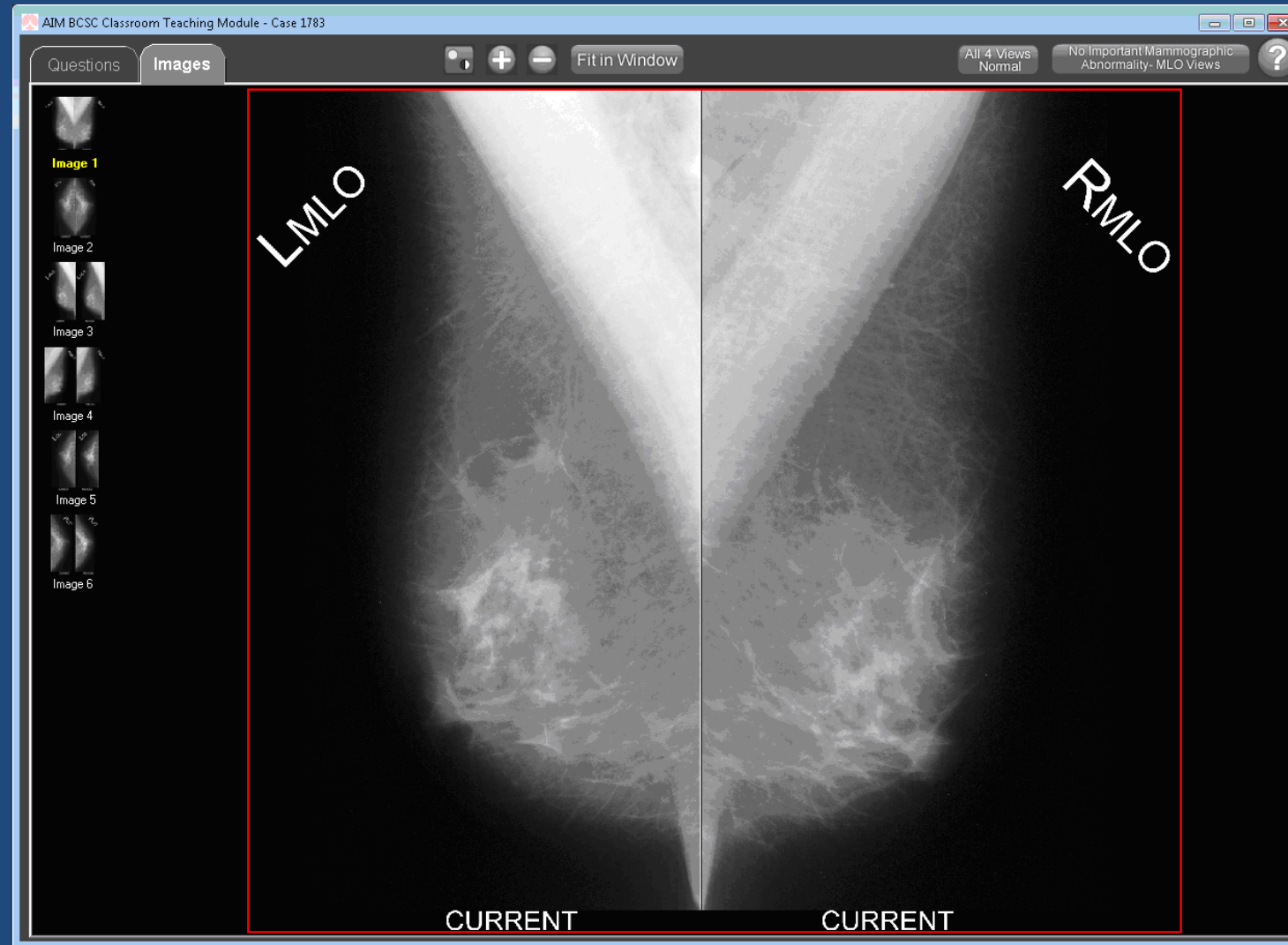
Intervention Development

- 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		Total
	Intermediate	Subtle	
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

AIM BCSC Classroom Teaching Module - Case 1783

Questions Images Fit in Window ?

15%

Image 1

Image 2

Image 3

Image 4

Image 5

Image 6

BI-RADS breast density

(A) Almost entirely fat, < 25%

(B) Scattered fibroglandular densities, 25 - 50%

(C) Heterogeneously dense, 51 - 75%

(D) Extremely dense, > 75%

(B) - Your answer has been submitted

Scattered fibroglandular densities, 20 - 50%

Click "OK" to continue

OK

Immediate Feedback on Responses

AIM BCSC Classroom Teaching Module - Case 1783

Questions Images

Image 1
Image 2
Image 3
Image 4
Image 5
Image 6

Case Scoring - Case 1783

✓ MLO Views Viewing images will annotate the abnormality (yellow) and your click (red). No Yellow Annotation = No abnormality on image

✗ CC Views No Red Annotation = You selected no abnormality

✓ BI-RADS assessment
Your Answer
BI-RADS 0, 4 or 5 Needs additional imaging evaluation, Suspicious or highly suggestive of malignancy
Correct Answer
BI-RADS 0, 4 or 5 Needs additional imaging evaluation, Suspicious or highly suggestive of malignancy

✓ BI-RADS breast density
Your Answer
Scattered fibroglandular densities, 25 - 50%
Correct Answer
Scattered fibroglandular densities, 25 - 50%

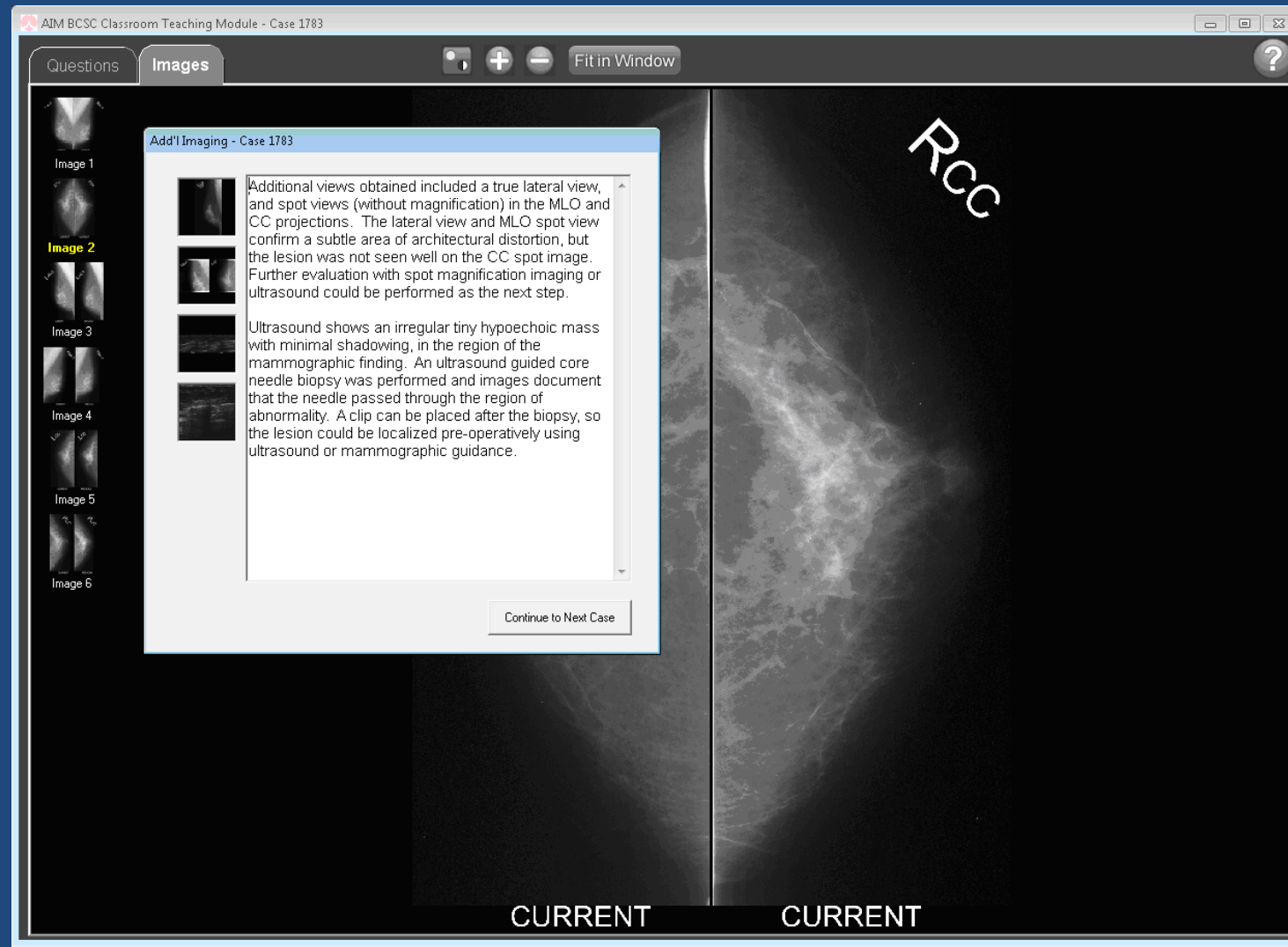
✗ Most important abnormal breast finding that requires recall
Your Answer
Mass
Correct Answer
Asymmetry

Imaging Findings
In the upper right breast, there is a focal asymmetry with a question of architectural distortion. The finding was present on the prior mammogram but is more conspicuous on the current examination. It is seen well only on the MLO view and is likely obscured by dense fibroglandular tissue on the CC view. This finding is sufficiently abnormal to prompt an incomplete assessment, with the recommendation to recall the patient for additional imaging. Because it is uncertain if the finding represents focal glandular tissue or a breast mass obscured by superimposed breast tissue, additional mammographic views with or without magnification are warranted. Although the finding could be seen in retrospect, the lack of interval change should not justify evaluation of a suspicious lesion.

Continue

CURRENT CURRENT

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				
<i>Lesion Level</i>				
	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 n=25	Self-Paced DVD Intervention n=37	Control n=40
Re-calibrated PPV*			
<i>Lesion Level</i>			
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	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)

		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