

Recall rate by type of radiologic finding in Quebec breast cancer screening program

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Background

- To optimize the balance of benefits and harms of breast cancer screening, recall rate need to be kept at the lowest possible without prejudice to cancer detection rate (1).
- In Quebec Breast Cancer Screening Program for around 350 000 mammograms performed yearly, between 2007 and 2017 :
 -   Good news   208 more cancers detected ;
 -   Bad news   6600 more women being recalled.
- Four types of radiologic findings lead to recall for further assessment: mass, distortion, asymmetry or calcifications (2).
- Some studies suggest uncertainty is greater for an asymmetry finding than for another type of radiologic finding (3-5).
- Yet, they are still few studies on recall rate according to the type of radiologic finding in breast cancer screening programs, in the era of digital mammography.

OUR GOALS

- Describe recall rate secular trends by radiologic findings;
- Measure association between recall rate and mammogram's characteristics, by radiologic finding;
- Assess whether some mammograms' characteristics affect differently asymmetric density recalls, compared with recalls prompted by other findings (mass, distortion, calcifications).

Methods

Setting

- The Quebec breast cancer screening program which actively invites women aged 50 to 69 years for biennial screening mammography in accredited facilities.

Ascertainment of recalls

- Mammograms with a reference for further assessment were classified as positive (abnormal) ; otherwise, as negative (normal).
- Recall rate is the number of positive mammograms over the total number of screening mammograms.
- Recall rate was computed separately for asymmetric density findings (ADF recalls) and other types of finding (OTF recalls).

Data sources

- Quebec Breast Cancer Screening program information system for the characteristics of women, radiologist, facility and exam;
- Qc College of Physicians for some radiologists' characteristics.

Statistic analysis

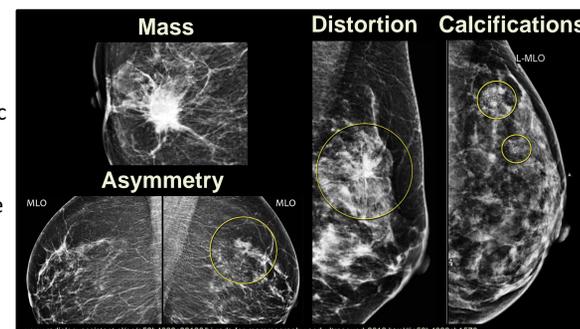
- Odds ratios and risk ratios were obtained respectively by logistic and log-binomial regression.
- GEE method was used to account for correlation between mammograms read by the same radiologist or performed in the same facility (6).
- Results in the table are adjusted for confounding.
- SAS  9.4 was used.

Mammograms included

Program's mammograms (2007 - 2017): 3 357 663

Exclusions	Percentage
Analog technology	25.1%
Special clinical context	4.6%
Missing information	0.2%
Multiple radiologic findings	0.9%

Mammograms (digital) included: 2 473 618
(482 763 women, 417 radiologists, 102 facilities)



Results

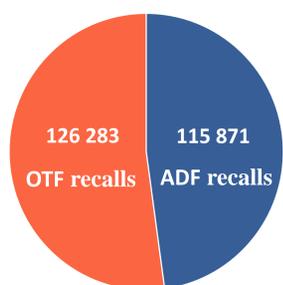
Legend

- ADF : Asymmetric density findings
- OTF : Others types of finding (mass, distortion or calcifications)

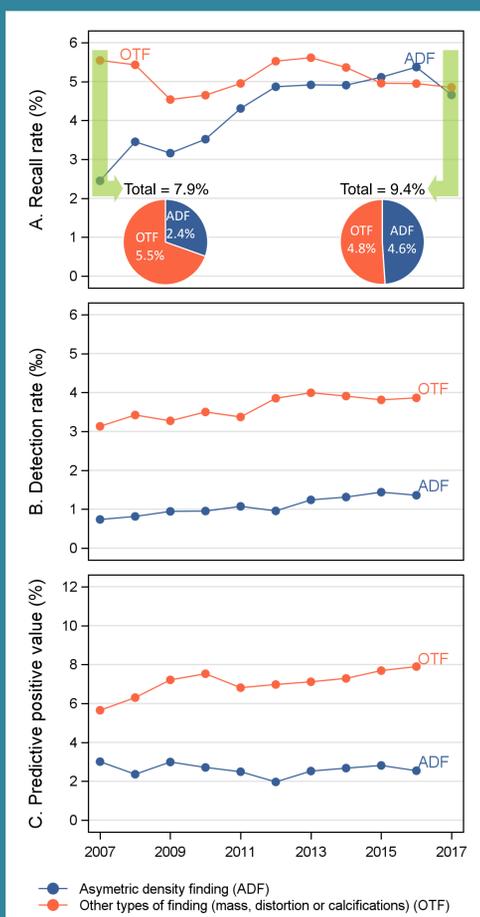
2 473 618 mammograms



242 154 recalls



The recent rise in crude recall rate in Quebec breast cancer screening program is entirely attributable to asymmetric density findings



ADF versus OTF recalls -- screening year, radiologist experience and a few women's characteristics affect them differently, after adjusting for confounders

	ADF recalls		OTF recalls		ADF vs OTF		ADF vs OTF	
	Rate (%)	OR (99% CI)	Rate (%)	OR (99% CI)	RR (99% CI)	RR (99% CI)	RR (99% CI)	RR (99% CI)
Women age at screening								
50-54	4.72	1.00 Ref	4.89	1.00 Ref	1.00	Ref		
55-59	4.71	1.00 (0.96-1.04)	5.17	1.06 (1.03-1.09)	0.97	(0.95-1.00)		
60-64	4.65	0.98 (0.94-1.03)	5.24	1.08 (1.04-1.11)	0.96	(0.94-0.99)		
65-69	4.61	0.98 (0.92-1.03)	5.31	1.09 (1.05-1.13)	0.95	(0.93-0.98)		
P value		0.51		<.01		<.01		
Women history of breast aspiration-biopsy								
No	4.73	1.00 Ref	4.92	1.00 Ref	1.00	Ref		
Yes	4.35	0.92 (0.84-1.00)	6.60	1.37 (1.32-1.43)	0.82	(0.77-0.87)		
P value		<.01		<.01		<.01		
Women breast density								
< 25%	3.14	1.00 Ref	3.38	1.00 Ref	1.00	Ref		
25-49%	4.89	1.60 (1.40-1.82)	5.10	1.54 (1.43-1.66)	1.02	(0.95-1.10)		
50-75%	5.59	1.84 (1.57-2.15)	6.12	1.88 (1.70-2.07)	0.99	(0.91-1.08)		
> 75%	4.42	1.43 (1.21-1.70)	6.26	1.92 (1.67-2.21)	0.87	(0.79-0.95)		
P value		<.01		<.01		<.01		
Women body mass index								
< 20	4.84	1.00 Ref	4.78	1.00 Ref	1.00	Ref		
20.0-24.9	4.85	1.00 (0.95-1.05)	4.79	1.00 (0.95-1.06)	1.00	(0.97-1.03)		
25.0-29.9	4.68	0.96 (0.90-1.03)	5.12	1.08 (1.01-1.15)	0.95	(0.92-0.99)		
30.0-34.9	4.50	0.92 (0.85-1.00)	5.58	1.18 (1.10-1.27)	0.89	(0.85-0.94)		
� 35.0	4.13	0.84 (0.77-0.92)	6.04	1.28 (1.18-1.40)	0.81	(0.77-0.86)		
P value		<.01		<.01		<.01		
Year screening exam occurred								
2007-2009	3.26	1.00 Ref	5.18	1.00 Ref	1.00	Ref		
2010-2013	4.64	1.45 (1.09-1.92)	5.34	1.03 (0.87-1.22)	1.21	(0.99-1.48)		
2014-2017	4.89	1.53 (1.05-2.22)	4.92	0.95 (0.76-1.18)	1.29	(1.01-1.64)		
P value		<.01		0.01		0.03		
Radiologist number of years with the program								
0-2	6.18	1.00 Ref	5.44	1.00 Ref	1.00	Ref		
3-5	5.54	0.89 (0.75-1.06)	4.73	0.86 (0.74-0.99)	1.01	(0.92-1.11)		
6-9	5.32	0.85 (0.69-1.06)	4.62	0.84 (0.70-1.00)	1.02	(0.91-1.14)		
�10	4.24	0.67 (0.53-0.84)	5.20	0.95 (0.81-1.11)	0.85	(0.74-0.97)		
P value		<.01		0.03		<.01		

Findings

- ADF recalls entirely explain the Quebec 2007-2017 crude digital recall rate rise (from 7.9% to 9.4%).
- In 2007, ADF accounted for ~   of crude call rate; In 2017, it accounted for ~  .
- Controlling for confounders, positive mammograms:
 - done in 2014-2017 were 29% more likely to be ADF recalls than in 2007-09;
 - read by   10 y experience radiologists were 15% less likely to be ADF recalls than those read by 0-2 y experience radiologists.
- OTF recalls are higher in women of older age, with positive history of breast aspiration-biopsy, with very dense breasts and with a higher body mass index; This is not true for ADF recalls.

Generated hypothesis

- The rise in ADF recall since 2007 could be mostly explain by one projection only findings.

Next step

- One projection versus two projections ADF-same story ?

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