Diagnostic performance of
Digital Breast Tomosynthesis (DBT) versus Digital Mammography (DM)
in a clinically referred population

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Performance of DBT vs DM

- Breast cancer screening of average-risk people*
  - Higher sensitivity, mixed findings about specificity
  - Higher diagnostic yield
  - Lower recall rate (in some but not all studies)
  - Lower indeterminate rate

- Higher-than-population-risk people (symptoms, PH, FH)**
  - Evidence is scarce**

*Systematic review by Marinovich ML et al; Expert Review of Anticancer Therapy 2018;18:785-791
**Department of Health. MSAC Application 1567, Ratified PICO Confirmation (V1.3), 2019

Aims

1. To examine diagnostic performance of DBT (vs DM), in clinically referred population including those with symptoms, PH and FH

2. To examine diagnostic performance of DBT (vs DM) in the subgroup of people with dense breasts in the above-described population

Methods – study sample

- Retrospective cohort study (collaboration with Sydney Breast Clinic)
- Routinely collected clinical data
- Patients aged $\geq$18 referred to clinic for breast imaging
    - in 2011 (DM was the primary imaging modality) and
    - In 2016 (DBT was the primary imaging modality)

Methods - outcomes

- Diagnostic accuracy (AUC-ROC, sensitivity, specificity)

- Indeterminate rate,

- Abnormal interpretation rate,

- Biopsy rate,

- Diagnostic yield (cancer detection rate)
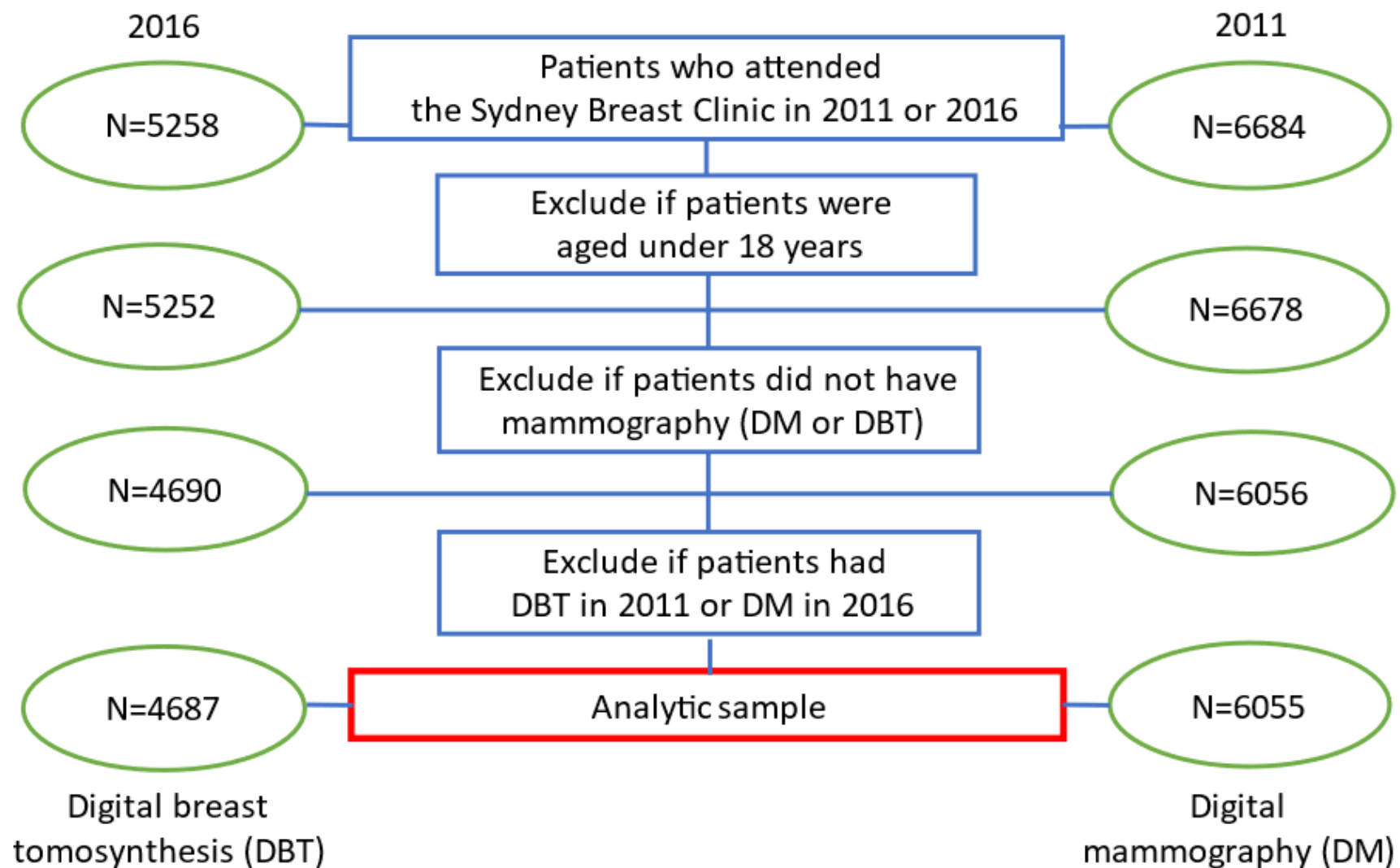
RANZCR Category

1 (Normal)

2 (Benign) — Negative for cancer

3 (Indeterminate)

4 (Suspicious) — Positive/abnormal test

5 (Highly suspicious)

Patient inclusion/exclusion

Study population characteristics

		DBT in 2016 (N=4687)	DM in 2011 (N=6055)
Age	Mean (SD)	55.2 (11.3) years	53.6 (10.9) years
Breast symptoms	Yes	1029 (22%)	1922 (25%)
Personal history of BC	Yes	362 (8%)	471 (8%)
Family history of BC	Yes	2650 (57%)	3167 (52%)
Breast density	Not dense	1722 (37%)	2198 (36%)
	Dense	2940 (63%)	3311 (55%)
	Unknown density	25 (0.5%)	546 (9%)
Breast cancer	Yes (total)	82 (1.8%)	105 (1.7%)
	DCIS	11 (0.2%)	16 (0.3%)
	Invasive cancer	69 (1.5%)	87 (1.4%)
	Unknown	2 (0.04%)	2 (0.03%)
	No	4563 (97%)	5927 (98%)
	Unknown outcome	13 (0.3%)	10 (0.2%)

DBT vs DM in clinically referred population (1)

	DBT				DM			
	Overall			Dense breasts only		Overall			Dense breasts only
Number of patients	4658			2920		6042			3072
Number of cancers	82			55		105			54
		95% CI			95% CI		95% CI			95% CI
Cancer rate, %	1.72	1.38 - 2.15		1.89	1.44 - 2.47	1.71	1.40 - 2.08	1.76	1.34 - 2.31
invasive cancer rate, %	1.48	1.16 - 1.88		1.64	1.23 - 2.19	1.44	1.16 - 1.78	1.60	1.19 - 2.12
DCIS rate, %	0.24	0.12 - 0.44		0.24	0.11 - 0.52	0.26	0.16 - 0.44	0.16	0.06 - 0.40
diagnostic yield, %	1.42	1.11 2.00		1.51	1.10 - 2.04	1.41	1.13 - 1.75	1.16	0.82 - 1.62
Indeterminate rate, %	1.59	1.26 - 2.00		1.71	1.29 - 2.27	1.09	0.85 - 1.39	0.91	0.62 - 1.33
Abnormal interpretation rate, %	2.83	2.38 - 3.36		3.01	2.44 - 3.72	2.17	1.82 - 2.58	1.99	1.53 - 2.56
Biopsy rate, %	8.2	7.4 - 9.0		10.4	9.3 - 11.6	9.9	9.1 - 10.6	14.6	13.3 - 15.9

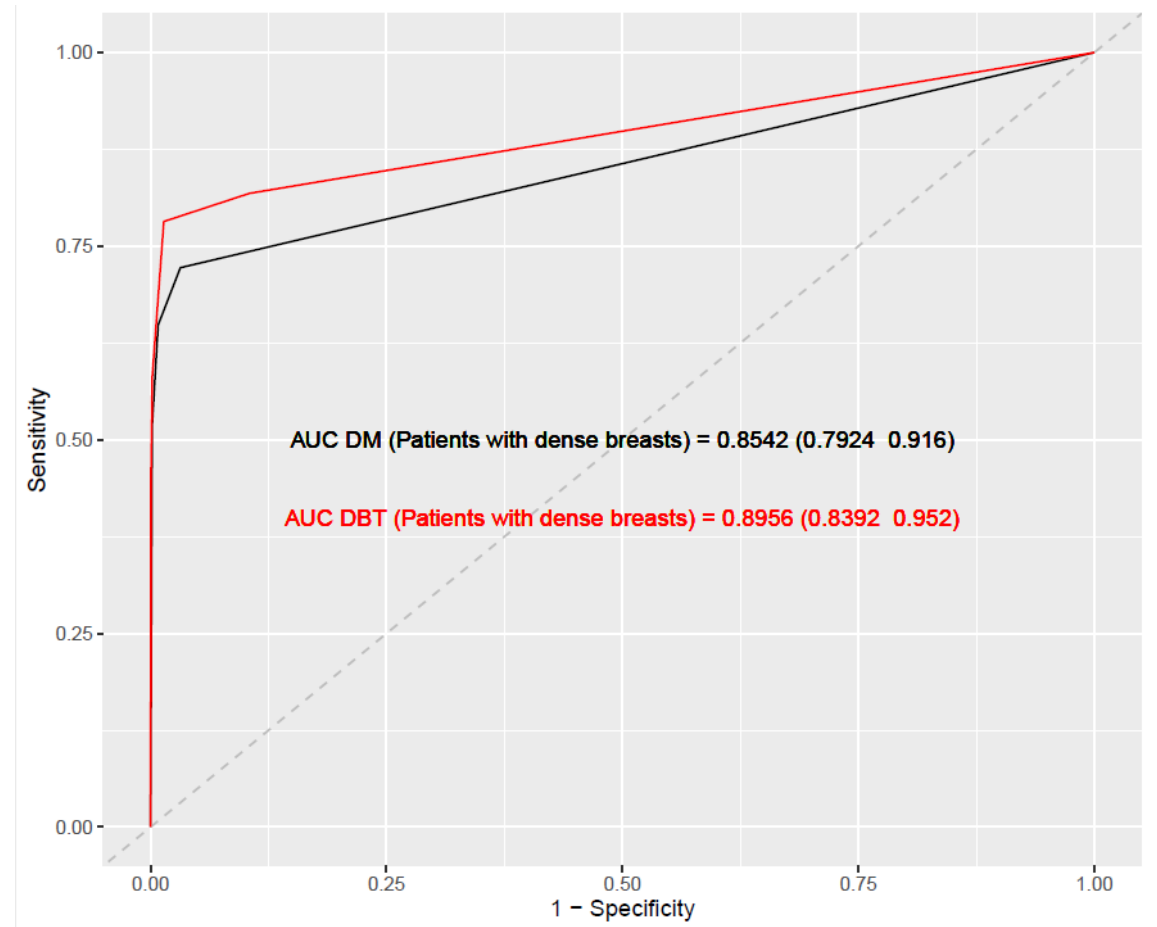# DBT vs DM in clinically referred population (2)

	DBT				DM			
	Overall		Dense breasts only		Overall		Dense breasts only	
Number of patients	4658		2920		6042		3072	
Number of cancers	82		55		105		54	
		95% CI		95% CI		95% CI		95% CI
Sensitivity, %	79.3	68.9 - 87.4	78.2	65.0 - 88.2	80.0	71.1 - 87.2	64.8	50.6 - 77.3
Specificity, %	98.6	98.3 - 100.0	98.6	98.1 - 99.0	99.3	99.0 - 99.5	99.2	98.8 - 99.5
PPV, %	51.2	42.2 - 60.2	51.8	40.6 - 62.9	65.6	56.7 - 73.8	59.3	45.8 - 71.9
NPV, %	99.6	99.4 - 99.8	99.6	99.3 - 99.8	99.6	99.5 - 99.8	99.4	99.0 - 99.6
False positive abnormal interpretation rate, %	48.8	39.9 - 57.8	48.2	37.2 - 59.4	34.4	26.4 - 43.4	40.7	28.3 - 54.2
AUC-ROC for mammogram	**0.91**	**0.87 - 0.95**	**0.90**	**0.84 - 0.95**	**0.91**	**0.88 - 0.95**	**0.85**	**0.79 - 0.92**
AUC-ROC for US when used with DM/DBT			0.95	0.91 - 0.99			0.95	0.90 - 0.99

DBT vs DM in clinically referred population (3)

Overall population
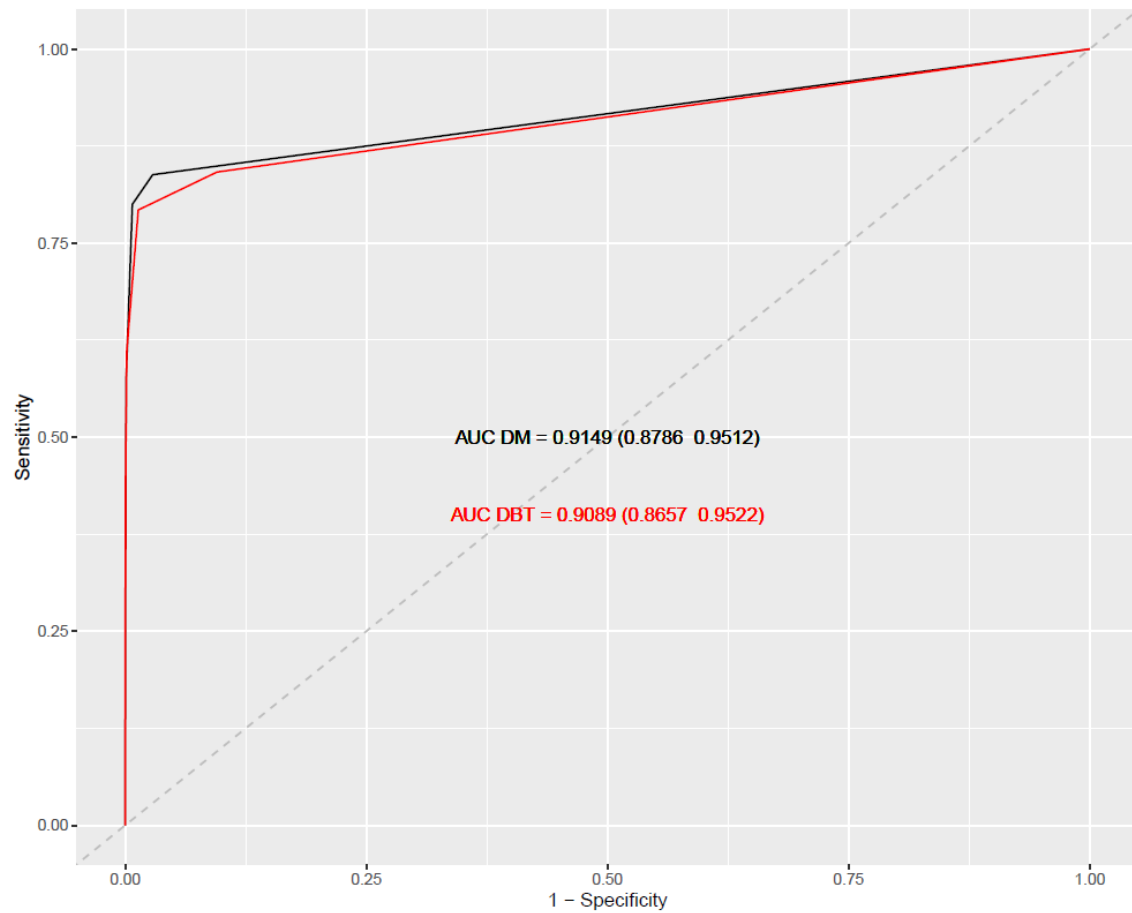
Restricted to dense breasts

AUC DM = 0.9149 (0.8786 0.9512)

AUC DBT = 0.9089 (0.8657 0.9522)

AUC DM (Patients with dense breasts) = 0.8542 (0.7924 0.916)

AUC DBT (Patients with dense breasts) = 0.8956 (0.8392 0.952)

Conclusions

- In the clinically-referred population,
  - DBT had similar AUC-ROC to DM.
  - DBT had similar diagnostic yield to DM.
  - DBT had lower biopsy rate than DM.
  - DBT appears to have higher abnormal interpretation rate and indeterminate rate than DM (not stat sig).
- When limited to patients with dense breasts, DBT may have higher AUC-ROC due to higher sensitivity (not stat sig).

Acknowledgement

Questions?

Please feel free to contact me on naomi.noguchi@sydney.edu.au

*These data are not for citing because they are under review by the Department of Health (MSAC) and a journal.