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Impact of insurance coverage and socioeconomic factors on screening mammography patients' selection of digital breast tomosynthesis versus full field digital mammography

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Digital breast tomosynthesis (DBT) is a recent technological advancement in mammography and is performed by obtaining tomographic images of the breast, which are acquired by low-dose exposures along an arc and are reconstructed into a series of thin images that can be viewed consecutively¹. Several studies have shown that DBT increases the cancer detection rate and reduces the recall rate associated with screening mammography, compared to full field digital mammography (FFDM), improving both sensitivity and specificity^{1–2}.

DBT has two main potential disadvantages, one of which is increased radiation. Since DBT is traditionally performed as a combined exam with FFDM, there is an increased radiation dose compared to FFDM alone. To reduce radiation dose, many institutions (including ours) perform DBT with a synthetic 2D mammogram (instead of FFDM), obtained via an algorithm that reconstructs the DBT images. The advantage of performing DBT with a synthetic 2D mammogram is that the radiation dose is similar to that of FFDM alone. The second potential disadvantage of DBT is the cost to patients. Although Medicare and Medicaid cover DBT, it is not universally covered by private insurance; therefore some women may have to pay for it out-of-pocket.

At many institutions (including ours), patients who present for screening mammography are given the choice of DBT or FFDM. The purpose of our study was to evaluate the impact of insurance coverage and other socioeconomic factors on patients' choice of screening mammography type. We also assessed patients' main reasons for selecting DBT versus FFDM.

This study was approved by the Institutional Review Board and was performed over a 6-month period (July 11th, 2016 to January 13th, 2017) at the four outpatient clinics at our academic medical institution that offered both DBT and FFDM. All women who presented

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Susan Harvey, MD, reports working as a consultant for Hologic and IBM Watson Medical

for screening mammography were given an anonymous paper survey (Figure 1) upon arrival to voluntarily complete during the visit.

Patients were informed that they would receive a bill (typically \$57), if their insurance company denied payment for DBT. A list of the insurance companies covering DBT was available at each site.

Patients choosing DBT were compared to those choosing FFDM using Fisher's exact test (insurance coverage) and Cochran-Armitage test for trend (ordinal measures of income and education). Analysis was performed using SAS version 9.3 (SAS Institute, Inc., Cary, North Carolina). All reported p-values are two-sided, and statistical significance was defined as a p-value of less than 0.05.

A total of 1,741 patients completed the survey (15% of all screening mammogram patients during the study period). Among the surveys completed, 32 (1.8%) were unusable because the type of screening mammogram selected was not reported. The remaining 1,709 completed surveys were used for data analysis. DBT was chosen by 1,301 of the patients (76.1%), while the remaining 408 patients (23.9%) chose FFDM (similar to the percentages of the overall screening population at our institution).

Most of the patients who chose DBT (n=694; 60.8%) reported doing so because of fear of missed cancer, while most of the patients who chose FFDM (n=242; 68.6%) reported cost as the reason (Figure 2).

Patients who chose DBT were significantly more likely to have insurance coverage than those who chose FFDM (Table 1). Additionally, most (89%) of the patients who selected FFDM and did not have insurance coverage for DBT reported that they would choose DBT if their insurance company begins to cover it. Patients who chose DBT had significantly higher income and higher education levels than those who chose FFDM (Table 1).

Our results show that patients who reported having insurance coverage for DBT were significantly more likely to choose DBT. Patients with higher annual household income and those who are more educated were also significantly more likely to choose DBT, possibly because they could more easily afford the potential out-of-pocket costs and understand the benefits of DBT. In the current climate of healthcare policy uncertainty, it is imperative to understand the effect that policy can have on patients' healthcare decisions. Universal insurance coverage for DBT would improve access for patients.

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Survey for women undergoing screening mammography

Please note that your completion of this confidential survey will serve as your consent to be in this research study

- 1) What type of screening mammography exam will you be having today?
 - ☐ 2D mammogram
 - ☐ 3D Tomosynthesis (a.k.a. 3D mammogram)
- 2) Does your insurance company cover 3D tomosynthesis?
 - ☐ YES
 - ☐ NO
 - ☐ Do not know/Not sure
- 3a) If you are having a 2D mammogram, which one factor most influenced your decision to not have 3D tomosynthesis?
 - ☐ Cost
 - ☐ Fear of radiation
 - ☐ Fear of having a cancer missed
 - ☐ Fear of being recalled from screening
 - ☐ Need additional information about 3D tomosynthesis
 - ☐ Other: _____
- 3b) If you are having 3D tomosynthesis, which one factor most influenced your decision to choose to have a 3D tomosynthesis?
 - ☐ Cost
 - ☐ Fear of radiation
 - ☐ Fear of having a cancer missed
 - ☐ Fear of being recalled from screening
 - ☐ Need additional information about 3D tomosynthesis
 - ☐ Other: _____
- 4) **If you did not choose 3D tomosynthesis AND your insurance company is not covering 3D tomosynthesis, please answer the following question:**

If your insurance company begins to cover 3D tomosynthesis, would you choose to have a 3D mammogram?

 - ☐ YES
 - ☐ NO
- 5) What is your annual family income?
 - ☐ Less than \$40,000
 - ☐ \$40,000 to 80,000
 - ☐ \$80,000 to 120,000
 - ☐ Greater than \$120,000
- 6) What is your highest education level completed?
 - ☐ Some high school years
 - ☐ High school graduate
 - ☐ College graduate
 - ☐ Masters degree graduate
 - ☐ Doctorate degree graduate

Figure 1.
Survey

Figure 2.
Patient-reported reasons for choosing Full Field Digital Mammography (FFDM) versus Digital Breast Tomosynthesis (DBT)

Table 1.

Impact of socioeconomic factors on choice of screening mammography type

Characteristic	DBT N (%)	FFDM N (%)	P value *
Insurance coverage for DBT:	n=1289	n=402	<0.001
Yes	783 (60.7)	35 (8.7)	
No	96 (7.4)	170 (42.3)	
Unsure	410 (31.8)	197 (49.0)	
Household income:	n=791	n=293	<0.001
< \$40,000	117 (14.8)	62 (21.2)	
\$40–80,000	227 (28.7)	101 (34.5)	
\$80–120,000	198 (25.0)	78 (26.6)	
>\$120,000	249 (31.5)	52 (17.8)	
Education:	n=858	n=315	0.001
Some high school	20 (2.3)	14 (4.4)	
High school graduate	229 (26.7)	99 (31.4)	
College degree	324 (37.8)	123 (39.0)	
Masters degree	211 (24.6)	63 (20.0)	
Doctoral degree	74 (8.6)	16 (5.1)	

* P value from Fisher's exact test for insurance and Cochran-Armitage test for trend for income and education