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Assessment of Characteristics of Capacity Among Breast Cancer Screening Facilities

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Abstract

Use of mammograms to detect presence of breast cancer is influenced by many factors, including ability to access mammography services. Access to services is often affected by the capacity of mammography facilities to serve women. We sought to describe the capacity of mammography facilities to conduct mammograms in a largely urban area of Texas. We used a 24-item survey to all mammography facilities in Texas Public Health Region 6/5 South. The survey contained questions across six domains: facility type, scheduling, staffing, mechanical capacity, cost/ payment methods, and patient reminders. We received or completed 60 surveys (43%). Most of the facilities were open only Monday through Friday (61.7%) and were open only during typical business hours (51.7%). About 83% of the facilities had one or two machines. Most facilities had only one or two staff to conduct mammograms. The results of this survey indicate that the capacity of mammography facilities vary dramatically across many characteristics of capacity. As these indicators are tied to the ability of women to access necessary preventive services, it is important to determine how these characteristics are associated with mammography utilization.

Keywords

Mammography; Breast cancer detection and prevention; Capacity; Facilities

Conflict of Interest Vicki L. Collie-Akers, Cynthia Warrick, Li Zhu, Misha Granado, Kymeira Ingram have no financial disclosures.

Background

Despite recommendations from the United States Preventive Services Task Force [1] that women over 50 receive mammograms every one to 2 years, over a quarter of women over 50 report not having a mammogram within the past 2 years [2]. Several factors have been associated with an increased likelihood of adherence to this recommendation: receiving a recommendation from a primary care physician, family history with breast cancer, socioeconomic group, and cancer knowledge [3–6]. Pain, embarrassment, anxiety, cost, and previous experience with health care have been identified as barriers to obtaining mammograms [7, 8]. Access to mammography services is also an important variable affecting whether women obtain mammograms [9]. Phillips et al. [10] reported that women were more likely to adhere to mammography screening guidelines if they lived in areas with higher percentages of facilities that provided reminders, without health professional shortages, and higher costs of screening. According to the Institute of Medicine [11] considering access to care is an imperative and “because access to care is so uneven, it is important to consider not only the internal organization of a screening service, but also how well it accommodates the financial, cultural, and educational situations of those it needs to serve” (p. 3–14).

The capacity of facilities to provide mammograms influences the extent to which such facilities are accessible. Accessibility has been measured in two different ways: proximity to mammography providers and characteristics of capacity. Marchick and Henson [12] found a significant association between the number of facilities and population density. The authors further found a correlation between the number of facilities and the percent of in situ breast cancers among both African American and white women. Zenk et al. [13] also examined proximity to facilities that provided low or free mammographies. They determined that although distance and travel time decreased as the poverty level of a particular neighborhood increased, this association was not as strong in the highest poverty, primarily African American neighborhoods. Several studies have measured characteristics of capacity, including: type of setting; staffing, waiting times, reminder systems, and extended hours [14–17]. Of the studies that measured characteristics of capacity, most assessed only a limited number of characteristics. We were not able to identify any published studies that comprehensively assessed characteristics of capacity that could influence the accessibility of mammograms.

The purpose of this study is to characterize the mammography capacity of mammography facilities in a largely urban region in Texas.

Methods

Identification and Selection of Mammography Facilities

The mammography facilities included in this study were located in Texas Public Health Region 6/5 South. This region includes 25% of Texas’ total population (5.2 million people) and is the most ethnically diverse. The region includes 16 counties: Austin, Colorado, Wharton, Matagorda, Waller, Fort Bend, Brazoria, Walker, Montgomery, Harris, Galveston, Liberty, Chambers, Hardin, Jefferson, and Orange. The included counties range in

population density from urban to rural. Included in this region are the cities of Houston, Beaumont, and Galveston. Mammography facilities located in Texas Public Health Regional 6/5 South were identified using a list of certified providers from the Food and Drug Administration. Queries of the Food and Drug Administration (FDA) database of certified mammography facilities resulted in a list of 138 providers. All of the facilities were contacted by telephone to verify the mailing address and to identify a specific contact person to mail the survey. Many of the facilities are located in hospitals and we wanted to confirm the survey would reach the correct department.

Assessment of Mammography Capacity

A 24-item questionnaire was developed to assess the mammography capacity. The questionnaire included questions in six domains that may serve to indicate the capacity of each facility to provide mammograms, including: type of facility, scheduling capacity, staff capacity, mechanical capacity, cost and payment methods, and provision of patient reminders. Type of facility was measured through one question in which respondents were asked to select the type of facility from a list or write-in a response if none of the listed items were appropriate. Scheduling capacity was measured by six questions that asked about day of the week in which mammograms were provided, facility opening and closing times, the number of mammograms conducted daily, length of time per mammogram, and average waiting times for routine or diagnostic mammograms. Questions regarding the numbers of radiology technologists, certified mammography technologists, interpreting physicians or surgeons, and radiologists were asked to gauge staff capacity. Mechanical capacity was assessed using four questions regarding the number of mammography machines, type of mammography machine, availability of ultrasound and availability of biopsies. Questions about the cost of routine and diagnostic mammograms without insurance and payment methods were used to assess cost and payment methods. Finally, one question was asked to ascertain information about patient reminders.

The questionnaire was initially mailed to all 138 facilities along with a \$15.00 U.S. Postal Service money order to provide an incentive for completion of the survey. The U.S. Postal Service provided us with a print out of the money orders that had been cashed. The number of the money order was listed in a database with the mammography facility where it was mailed. After an initially low response rate, questionnaires were administered over the telephone. Research assistants called all of the facilities for which there was no identifiable survey returned.

Data Analysis

Survey results were recorded in an SPSS database. Descriptive statistics were calculated to characterize the capacity of mammography facilities.

Results

Response Rate and Modes

A total of 88 questionnaires (63.8% of the 138 facilities initially identified) were completed via mail, fax, or telephone. Of these, 47 (53.4%) were completed by the respondent and

returned via mail or fax, and 41 (46.6%) were completed over the telephone. Of the 88, 19 were returned without identifying information. For the purposes of this study, the surveys for which it was not possible to identify the facility being described were excluded. These were excluded to avoid duplicate responses, as several respondents who completed the questionnaire over the phone indicated they had completed and returned the questionnaire via mail. For nine of the identifiable facilities, two questionnaires were completed. Additionally, for each pair of duplicate completed questionnaires, the more complete questionnaire was included, and the other was not. A total of 60 surveys (43.4% of the 138 facilities initially identified) were included in the results of this study. Of these, 20 (33.3%) were returned via mail or fax and 40 (67.7%) were completed over the telephone.

Types of Facilities

Respondents were asked to characterize the type of facility they represented, by selecting from a list of possible types. Possible responses included: breast center, outpatient imaging center, outpatient health clinic, diagnostic clinic, hospital imaging center, mobile unit, and private provider. Most of the facilities were either hospital imaging centers (43.3%) or outpatient imaging centers (30%). About 8.3% of the respondents indicated their facility was a diagnostic clinic and 6.7% indicated their facility was an outpatient health clinic. Approximately 8.3% of the survey respondents did not indicate the type of their facility.

Scheduling Capacity

Several questions were asked to describe the scheduling capacity of each facility. Table 1 responses below indicate the scheduling capacity of those facilities that participated in the survey.

Most of the facilities were open Monday through Friday (61.7%). Several facilities were open Monday through Saturday (30.0%). Two facilities were only open on Saturdays (3.3%). Many facilities opened before 8:00 am (38.3%), and 36.7% open between 8:00 and 9:00. Most facilities closed after 4:00 and before 6:00. Slightly over half of the facilities reported having hours between typical business hours between 8:00 am and 5:00 pm). Only nine facilities were open both before and after typical business hours. The number of mammograms provided daily varied widely from less than ten (16.7%) to greater than 50 (11.7%). An overwhelming majority of respondents indicated that the typical length of a routine mammogram they provided lasted between 15 and 20 min. Of the 60 facilities surveyed, only 15 provided diagnostic mammograms. The typical length of a diagnostic mammogram of those surveyed was between 30 and 39 min. The typical wait for diagnostic mammogram appointment was 1 week. Although the range of wait time for a routine mammogram appointment ranged from the same day to 3 months, about 65% of the facilities indicated the typical wait was 1 week or less.

Staff Capacity

Respondents were also asked to characterize the staff capacity of their facility. The frequencies of responses to these questions are available in the table below (Table 2).

The number of radiology technologists at the facilities surveyed varied widely from one or two (26.7%) to greater than 20 (10%). The range of number of mammography technologists was narrower from one to fifteen, with the majority of facilities employing one or two (55%). Over a quarter of the respondents indicated that their facility did not use any interpreting physicians or surgeons. Almost 22% indicated they used one to two interpreting physicians or surgeons. About 30% of the respondents did not answer this question. Most of the respondents reported that their facility used one or two radiologists (48.3%), however the range of number of radiologists used was between one and thirteen.

Mechanical Capacity

To assess the mechanical capacity, participants were asked to report the number and type of mammogram machines and whether the facility can perform ultrasounds and biopsies. The range of mammogram machines at the facilities surveyed was from one (n = 34) to 11 (n = 1). Over half had one machine (56.7%), and 26.7% had two machines. Only 15% indicated they had three or more machines. An overwhelming majority used film mammography machines (91.7%), although several indicated they used multiple types of machines. Most respondents reported their facility had the capacity to perform ultrasounds (86.7%), while half indicated that biopsies were performed at their facility.

Cost and Payment Methods

Table 3 displays the responses of participants when asked about the cost of mammograms and payment methods accepted at their facility.

The cost of routine mammograms among responding facilities ranged from \$55 to \$272, with most of the mammograms costing less than \$150 (86.7%). Diagnostic mammograms ranged from less than \$100 to greater than \$300. Half of the facilities indicated that diagnostic mammograms cost between \$100 and \$200. All of the respondents indicated that multiple payment methods were accepted at their facility, the most prevalent being cash or check (88.3%), Medicare (85.0%), Medicaid (78.3%), private (76.7%), and HMO (76.7%). Approximately 23% accepted all of the payment methods listed.

Patient Reminders

Three-quarters (n = 45) of the survey respondents reported their facility used mailings or telephone calls to remind patients of their mammogram appointments.

Discussion

The findings of this study reveal substantial variability in the capacity of facilities to serve women seeking mammograms. Information about the scheduling capacity of the facilities indicates that most are not operating outside weekdays and typical business hours. Only four facilities (6.7%) have extended hours and days of operation. Although we chose to look at extended hours as occurring both before and after typical business hours, it is notable that several facilities reported opening before 8:00, but far fewer reported closing later than five. About 43.3% of facilities had a waiting time for routine mammograms of less than a week, which is slightly better than a national survey of facilities [16]. Conversely, the percentage of

facilities that provided diagnostic mammograms with a wait time less than 1 week was 56.7% among surveyed facilities compared to 84.8% reported elsewhere [16].

The information provided by respondents also indicates that many of the facilities have varied levels of staffing. Over one quarter of the respondents did not have any interpreting physicians or surgeons. Notably 30% of respondents did not respond to this question. As the question was structured as having three responses (one-two, three-four, and five-six) to check or an option for selecting “other” with a write-in, it could be that even more facilities do not have interpreting physicians or surgeons.

Most of the respondents indicated that there were one or two mammography machines at their facility (83%). Using the FDA-approved mammography facility listing, we compared the number of machines reported by the respondents to the number provided by the FDA. The numbers matched in 75.5% of the cases. In instances where there was disagreement, in over half (61.5%) the number available from the FDA was greater than that reported by survey respondents. It is unclear why these numbers do not match in slightly less than a quarter of the cases. It is possible that the number changed between when the FDA approved the facility and this survey. Also, it is possible that the respondent’s recall might be off; however, most of the discrepancies were different by two or more. Only four of the 13 discrepancies were different by one, suggesting that the substantial rate of disagreement is more than simply being an issue of recall.

The findings of this survey indicate that most facilities accepted many different payment methods. Further, we found that a majority of facilities accept Medicaid or Medicare, however women who are participating in county or state programs that reimburse costs of mammogram may encounter much more difficulty finding a facility.

This study has a number of strengths. First, most studies assessing the capacity of mammography facilities measured fewer characteristics of capacity. This study explored six domains reflecting capacity among mammography facilities, resulting in a rich set of data that will be further explored for associations with mammography usage and differences in cancer staging at the time of detection. Second, all FDA-approved mammography facilities in the study area were included in the sample. Other studies apply inclusion and exclusion criteria, such as volume of patients, volume of patients who are Medicare/Medicaid patients, and participation in specific registries that limit the findings to similar facilities. Although limited by a lower response rate than other studies, the application of few inclusion or exclusion criteria is advantageous as it yields data about a more comprehensive sample of facilities.

Although there are a number of strengths, this study does have a few notable limitations. Despite efforts to increase the response rate, the response rate for this study is somewhat low (43.4%). Other studies assessing mammography facility capacity report response rates between 85 and 90% [14, 17]. The use of incentives and multiple attempts to reach respondents were intended to increase the response rate. It is not clear why this occurred. It is possible that contacts at the facility were not available or incorrectly identified, that the importance and benefits of responding were not clearly conveyed, or that a mode of

responding that would be better suited for busy health care providers was not explored. Additionally, several facilities (30 of 138, 21.7%) originally identified from the list of FDA-approved facilities were already closed by the time that the surveys were sent. Finally, it should be noted that several surveys were returned with notes from staff indicating they could not participate in research and/or accept incentives.

This number seems notably high and warrants further research to determine the cause of these closures, how typical the rate of closure is, and if the closure rate varies by type of facility.

The results of this study indicate that the capacity of mammography facilities vary dramatically across many characteristics of capacity. As these indicators are tied to the ability of women to access necessary preventive services, an important next step is to determine how these different characteristics are associated with mammography utilization and diagnosis of breast cancer.

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Table 1

Characteristics of scheduling capacity

Characteristic of scheduling capacity	% (N)
Days of the week facility open	
Open Monday–Friday	61.7 (37)
Open Monday–Saturday	30.0 (18)
Open two or fewer days of the week	5.0 (3)
Missing	3.3 (2)
Facility opening times (Monday through Friday)	
7:00–7:59 am	38.3 (23)
8:00–8:59 am	36.7 (22)
9:00 am	20.0 (12)
Facility closing times	
2:00–2:59	1.7 (1)
3:00–3:59	5.0 (3)
4:00–4:59	28.3 (17)
5:00–5:59	46.7 (28)
6:00–6:59	8.3 (5)
7:00–7:59	3.3 (2)
8:00–8:59	1.7 (1)
Open only during typical business hours	51.7 (31)
Open extended hours *	15.0 (9)
Typical number of mammograms conducted daily	
< 10/day	16.7 (10)
10–15/day	23.3 (14)
16–20/day	25.0 (15)
21–49/day	18.3 (11)
>50/day	11.7 (7)
Typical length of routine mammogram	
<15 min	5.0 (3)
15–20 min	78.3 (47)
>20 min	13.3 (8)
Typical length of diagnostic mammogram	
<20 min	1.7 (1)
20–29 min	3.3 (2)
30–39 min	10.0 (6)
40 min	11.7 (7)
Typical wait for routine mammogram	
1–2 days	35.0 (35)
<1 week	8.3 (5)
1 week	21.7 (13)
2 weeks	10.0 (6)

Characteristic of scheduling capacity	% (N)
3 weeks	3.3 (2)
1 month	6.7 (4)
2–3 months	6.7 (4)
Typical wait for diagnostic mammogram	
1–2 days	45.0 (27)
3–4 days	11.7 (7)
1 week	15.0 (9)
2 weeks	5.0 (3)
3 weeks	1.7 (1)
4–6 weeks	3.3 (2)

* Open extended hours refers to having operating hours that began before 8:00 a.m. and ended after 5:00 p.m.

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Table 2

Characteristics of staffing

Indicators of staff capacity	% (N)
Number of radiology technologists	
1–2	26.7 (16)
3–4	11.7 (7)
5–6	16.7 (10)
7–10	16.7 (10)
11–20	11.7 (7)
>20	10.0 (6)
Number of mammography technologists	
1–2	55.0 (33)
3–4	18.3 (11)
5–6	10.0 (6)
7–10	10.0 (6)
11–20	3.3 (2)
Number of interpreting physicians or surgeons	
0	26.7 (16)
1–2	21.7 (13)
3–4	10.0 (6)
5–6	0.0 (0)
7–12	6.7 (4)
No response	30.0 (18)
Number of radiologists	
1–2	58.3 (29)
3–4	16.7 (10)
5–6	11.7 (7)
7–13	16.7 (10)

Table 3

Cost and payment methods accepted

Cost and payment methods	% (N)
Cost of routine mammogram	
<\$100	47.1 (25)
\$100–149	45.0 (27)
\$150–199	6.7 (4)
\$200–249	3.3 (2)
\$250–299	3.3 (2)
Cost of diagnostic mammogram	
<\$100	33.3 (20)
\$100–149	26.7 (16)
\$150–199	23.3 (14)
\$200–249	6.7 (5)
\$250–299	1.7 (1)
\$300	6.7 (4)
Payment methods accepted	
Cash/check	88.3 (53)
Medicare	85.0 (51)
Medicaid	78.3 (47)
Non-Profit	30.0 (18)
Private	76.7 (46)
HMO	76.7 (46)
County/state	28.3 (17)
Other	13.3 (8)
All listed	23.3 (14)