Communication Factors in the Follow-up of Abnormal Mammograms

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OBJECTIVE: To identify the communication factors that are significantly associated with appropriate short-term follow-up of abnormal mammograms.

DESIGN: Prospective longitudinal study involving medical record review and patient survey.

SETTING: Ten academically affiliated ambulatory medical practices in the Boston metropolitan area.

PARTICIPANTS: One hundred twenty-six women with abnormal mammograms requiring short-term (6 months) follow-up imaging.

MEASUREMENTS: Proportion of women in the study who received appropriate follow-up care.

RESULTS: Eighty-one (64%) of the women with abnormal mammograms requiring short-term follow-up imaging received the appropriate follow-up care. After adjusting for patients' age and insurance status, 2 communication factors were found to be independently associated with the delivery of appropriate follow-up care: 1) physicians' documentation of a follow-up plan in the medical record (adjusted odds ratio, 2.79; 95% confidence interval, 1.11 to 6.98; $P = .029$); and 2) patients' understanding of the need for follow-up (adjusted odds ratio, 3.86; 95% confidence interval, 1.50 to 9.96; $P = .006$). None of the patients' clinical or psychological characteristics were associated with the delivery of appropriate follow-up care.

CONCLUSIONS: Follow-up care for women with abnormal mammograms requiring short-term follow-up imaging is suboptimal. Documentation of the follow-up plan by the physician and understanding of the follow-up plan by the patient are important factors that are correlated with the receipt of appropriate follow-up care for these women. Interventions designed to improve the quality of result follow-up in the outpatient setting should address these issues in patient-doctor communication.

KEY WORDS: test result follow-up; abnormal mammogram; patient-doctor communication; patient safety; quality improvement.

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The Institute of Medicine report, "To Err Is Human," documented the significant risks posed by unsafe health care.¹ Although most of the knowledge regarding patient safety was derived from inpatient data, there is a growing literature suggesting that medical errors are at least an equally significant problem in the outpatient setting.^{2,3} Failure to perform appropriate follow-up of abnormal test results represents one example of this important problem.

The evidence that follow-up of test results is not always done in a comprehensive and timely manner comes mainly from the field of malpractice litigation. In the last few years, failure to diagnose or delay in diagnosis has become the fastest growing area of malpractice litigation, and in some clinical areas, the highest prevalence malpractice claim.⁴ Furthermore, analysis of malpractice cases shows that about one-quarter of diagnosis-related malpractice cases can be attributed to failures in the follow-up system.⁵ These omissions are by definition avoidable and may represent the type of error that could be reduced by high-performance follow-up systems.⁶

Appropriate follow-up of abnormal test results requires multiple steps, as the physician needs to review the results, transmit them to the patient, discuss the appropriate plan with the patient, and help the patient to execute the follow-up plan. Integral to all these steps is a clear line of communication between the physician and patient. While good patient-doctor communication has long been recognized as a cornerstone for good-quality medical care,⁷ it is not clear which aspects of communication are most important to ensure that patients with abnormal test results receive the appropriate follow-up. Identification of the communication factors most closely associated with the delivery of appropriate follow-up care can suggest ways to design systems to ensure the delivery of this care.

In order to understand the communication factors involved in the delivery of appropriate follow-up care for abnormal test results, we examined a particular type of abnormal test result for which follow-up care can be particularly challenging to deliver. According to the American College of Radiology, 3% of mammograms performed in the United States are read as "marginally abnormal" for which short-term follow-up imaging in 3 to 6 months is required.⁸ While most of the women with this type of mammography results are not eventually diagnosed with breast cancer, 0.5% to 3% unfortunately are.^{9–11} The delivery of appropriate follow-up care for these women is not straightforward, as the physician must explain to them the implications of the result and the rationale for short-term repeat imaging. Furthermore, because follow-up care for these types of

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mammograms typically occurs in the future, when neither the patient nor the doctor may be focused on the problem, proper communication at the time of results review is critical.

We therefore postulate that the quality of the communication likely influences the quality of follow-up care for abnormal mammograms requiring short-term follow-up. Using a cohort of women with abnormal mammograms that require short-term follow-up imaging, this paper will document the quality of the follow-up and then examine the communication factors that are associated with the delivery of appropriate follow-up care.

METHODS

Setting

This study was part of a larger study to examine the quality of follow-up care women received at primary care clinics for common breast problems. Women were recruited from 1 of 10 participating general internal medicine practices in the greater Boston area. They were diverse in location, structure, and the degree of academic affiliation, and include 5 hospital-based practices, 1 university health service, 1 large group-model HMO, 2 neighborhood health centers in disadvantaged communities, and 1 suburban group practice. The study was approved by the institutional review board at each institution.

Patients

To identify women whose mammograms were interpreted as needing follow-up imaging within 6 months, we screened all mammogram reports received by the 10 participating clinics between June 1996 and June 1997. To reduce the variability introduced by nonattending-level physicians, we excluded patients whose primary care physician was a house staff member or a nurse-practitioner in the year prior to the study period. We also excluded patients who had previously been diagnosed with breast cancer prior to the study period. Because our focus was on women with a new abnormality on their mammogram, we excluded patients who had had abnormal mammogram findings during the year immediately preceding the study period (i.e., June 1995 to May 1996). Women who had undergone work-ups for a breast complaint between June 1994 and May 1995 were also excluded to minimize the influence of a recent work-up on clinical and patient behavior. We excluded patients whose primary language was listed as neither English nor Spanish, because our staff who administered the telephone surveys spoke only these 2 languages.

We initially screened 8,892 mammogram reports at the 10 sites. One hundred eighty-one women had the index abnormality for this study without meeting any of the exclusion criteria. One hundred fifty-nine (88%) of these abnormalities were detected on screening mammograms, whereas 22 (12%) were detected on mammograms done as

part of a work-up for a breast complaint. Of these 181 women, 126 (70%) participated in the baseline telephone survey. Our analysis is based on this cohort of 126 women.

Data Collection

Women eligible for the study were sent an informational letter about the study and asked to return an "opt-out" postcard if they did not want to participate. Women who did not return the "opt-out" postcard were contacted by telephone for a "baseline" survey within 6 to 8 weeks of their index abnormal mammogram. All of the baseline surveys were conducted between June 1996 and June 1997. The baseline telephone survey included questions about sociodemographic characteristics such as race, psychological factors such as discomfort during mammography, and process-of-care factors such as how the mammogram result was communicated to the patient. Women who agreed to participate in the baseline survey were also contacted for a follow-up telephone survey 7 to 8 months after their index abnormal mammogram. Trained nurse reviewers abstracted medical records for information about the clinical details and type of evaluation women received around the time of the index mammogram and for the 7 months thereafter.

Outcome Measure

The purpose of our study was to examine how patient-physician communication factors influenced the appropriateness of follow-up care for women with abnormal mammograms that require short-term follow-up. In order to determine the appropriateness of care for this population, we used the practice guideline for the management of common breast problems published in 1995 by the Harvard Risk Management Foundation in its quarterly newsletter.¹² This newsletter was circulated prior to the beginning of the study to all physicians practicing in the 10 study clinic sites. This guideline is similar to the guidelines published by the American College of Obstetrics and Gynecology.¹³ According to these guidelines, women with these abnormalities should either receive a repeat mammogram within 6 months, or be referred for a surgical evaluation. This particular guideline is largely based on a follow-up study performed by Sickles,^{11,14} who followed 7,484 women with this abnormality using follow-up mammograms at 6 months, 1 years, 2 years, and 3 years. In that study, 17% ($n = 6$) of breast cancers ($n = 36$, 0.5% of cohort) diagnosed in patients with this abnormality were identified at the 6-month follow-up mammogram.

Women in our study were considered to have received appropriate care if they received a follow-up mammogram, a surgical consult, or a breast biopsy within 7 months of the index abnormal mammogram. We chose a cut-off of 7 months because a 1-month leeway is reasonable for patients who require follow-up imaging 6 months after the index mammogram, and 7 months was the follow-up period common to all subjects in our study. Because we did not

Table 1. Characteristics of the Study Population

Characteristics	Study Population, % (n)			P Value (χ^2)
	Study Cohort (N = 126)	Adequate Follow-up (N = 81)	Inadequate Follow-up (N = 45)	
Socioeconomic factors, %				
Race (white vs others)	63.5 (80)	65.4 (53)	60.0 (27)	.544
Age (<50 yrs vs 50+ yrs) [†]	52.8 (66)	50.6 (41)	56.8 (25)	.507
Insurance status (managed care vs nonmanaged care) [‡]	84.8 (100)	89.5 (68)	76.2 (32)	.055
Education, %				.193*
<High school graduate	8.1 (10)	6.3 (5)	11.6 (5)	
High school	25.2 (31)	22.5 (18)	30.2 (13)	
Some college	21.1 (26)	26.3 (21)	11.6 (5)	
College+	45.5 (56)	45.0 (36)	46.5 (20)	
Clinical/psychological factors, %				
Family history of breast cancer	11.9 (15)	13.6 (11)	8.9 (4)	.571*
History of abnormal mammogram requiring follow-up	10.3 (13)	9.9 (8)	11.1 (5)	1.000*
Reason for mammogram, %				.220*
Screening	89.7 (113)	92.6 (75)	84.4 (38)	
Breast lump, pain, or discharge	10.3 (13)	7.4 (6)	15.6 (7)	
Degree of worry about breast cancer prior to mammogram, %				.729*
Not at all worried	70.6 (89)	67.9 (55)	75.6 (34)	
A little worried	19.1 (24)	21.0 (17)	15.6 (7)	
Somewhat/very worried	10.3 (13)	11.1 (9)	8.9 (4)	
General perception of health, %				.435*
Fair/poor	15.2 (19)	13.8 (11)	17.8 (8)	
Good	36.0 (45)	40.0 (32)	28.9 (13)	
Very good/excellent	48.8 (61)	46.2 (37)	53.3 (24)	
Pt-Dr communication factors, %				
Pt new to MD (1 year or less)	16.7 (21)	19.8 (16)	11.1 (5)	.318*
Pt given results to take home	32.5 (38)	34.2 (25)	29.6 (13)	.599
Pt received results within 1 week of mammogram	73.1 (87)	75.0 (57)	69.7 (30)	.536
PCP contacted by phone by radiologist	8.7 (11)	8.6 (7)	8.95 (4)	1.000*
Pt saw PCP after mammogram	7.9 (10)	9.9 (8)	4.4 (2)	.493*
MD documented discussion about results with patient	71.2 (89)	76.3 (61)	62.2 (28)	.096
MD explained further tests in way patient understood	39.7 (50)	45.7 (37)	28.9 (13)	.065
MD documented follow-up plan in record	73.0 (92)	79.1 (64)	62.2 (28)	.042
Pt reported being told she needed follow-up	71.4 (90)	80.2 (65)	55.6 (25)	.003

* Fisher's Exact Test.

[†] One patient had missing date of birth.[‡] Eight patients had missing insurance status.

Pt, patient; Dr, doctor.

have access to patient information beyond the initial 7 to 8 months of follow-up and several years had elapsed between data collection and data analysis, we did not contact patients or their physicians if patients did not receive adequate follow-up care.

Patient-doctor Communication Factors

Variables related to patient-doctor communication that could affect the quality of follow-up care were selected prior to statistical analysis. To select these variables, we outlined the sequence of communication events that should normally take place in order for a patient to receive the appropriate follow-up care for an abnormal mammogram result: once the mammogram has been completed, the result needs to be transmitted to the doctor and the patient.

The physician should then have the opportunity to explain the implications of the results to the patient and discuss the follow-up plan with the patient. Patient-doctor communication variables that we selected to reflect this chain of events are listed in Table 1. They include 1) whether the patient was new to their provider, 2) whether the patient was given the results to take home with her, 3) whether the patient received the results within 1 week of the index mammogram, 4) whether the primary care provider was contacted by the radiologist, 5) whether the patient saw the primary care physician following the index abnormal mammogram, 6) whether the physician documented a discussion about the results with the patient, 7) whether the patient reported that her physician explained the need for further tests in a way she would understand, 8) whether the physician documented the follow-up plan in the

medical record, and 9) whether the patient reported being told that she needed follow-up. Variables that relied on patient recall for ascertainment were assessed during the baseline survey, before subjects had had the opportunity to comply with the follow-up plan. Therefore, recall bias should have been minimized.

Socioeconomic and Clinical Covariates

Because previous studies have shown that sociodemographic factors such as race,¹⁵ and psychological factors such as discomfort during mammography¹⁶⁻¹⁸ might impact on the compliance to follow-up care, we examined these variables to look for potential confounders. Sociodemographic variables, including the patient's race, insurance status, and education level were ascertained during the baseline telephone survey. Psychological factors, including degree of worry about breast cancer prior to the index mammogram, degree of discomfort and embarrassment during mammography, and self-perception of health, were also assessed during the baseline phone interviews. Clinical variables including age, family history of breast cancer, history of abnormal mammograms, and reason for the index mammogram were ascertained during the chart review. Sociodemographic, psychological, and clinical covariates measured are listed in Table 1.

Statistical Analysis

Descriptive statistics were used to examine the sociodemographic, clinical, and psychological profile of the study population. The χ^2 test was used to examine the univariate association between each of these baseline characteristics and the outcome of interest. The Fisher's exact test was used in place of the χ^2 test when cell size for any variable was less than 10.

We then examined each covariate, including each patient-doctor communication factor, to look for significant association with our outcome of interest. In this preliminary analysis, we calculated the odds ratio (OR) for the appropriate follow-up for each covariate, after adjusting for age, race, and the number of previous mammograms. We adjusted for these 3 variables, as prior research suggested that these variables have previously been associated with the appropriate follow-up of abnormal mammogram results.^{19,20} In recognizing the contextual effect of the physician and clinic on our outcome of interest, we constructed clustered models with the physician as the primary cluster and the clinic as the secondary cluster in examining each of the covariates.

Covariates that were significantly associated with the outcome at a level of $P < .20$ in the preliminary analysis, together with the 3 control variables (age, race, and number or prior mammograms), were selected as candidate variables for the clustered multivariable analysis. Nonsignificant variables were then taken out of the multivariable model using a backward elimination method with the staying criterion of $P < .05$. Candidate variables were also checked

for confounding before they were eliminated from the model. We also considered interactions between age and variables that reflect patients' understanding of follow-up plans, because the effect of good patient-doctor communication may be different for older versus younger patients.

Univariate analyses were carried out using the SAS software package (The SAS Institute, Cary, NC). Clustered models were built using SAS-callable SUDAAN (RTI International, Research Triangle Park, NC).

RESULTS

Characteristics of the Study Subjects

Age, racial makeup, and education levels were not statistically different between the women who received appropriate follow-up care and those who did not (Table 1). There was a trend suggesting that patients who had managed care insurance were more likely to receive the appropriate follow-up ($\chi^2 = 3.69$, $P = .055$). Clinically, the 2 groups had similar family history of breast cancer and personal history of abnormal mammograms that required follow-up. The index mammograms were obtained for similar reasons in both groups. The degree of worry about breast cancer and their perception of general health did not differ.

Primary Outcome

Overall, 181 women had an abnormal mammogram requiring 6-month follow-up, and 126 (70%) completed the baseline telephone survey. Age, family history of breast cancer, and reason for mammogram were not different between the survey responders and the nonresponders (age > 50: 47% in responders vs 51% in nonresponders [$P = .65$]; positive family history of breast cancer: 12% in responders vs 13% in nonresponders [$P = .88$]; mammogram done for screening: 90% in responders vs 87% in nonresponders [$P = .63$]).

We then analyzed the data on the 126 women who responded to the baseline telephone survey. Within this group, 81 (64%) received appropriate and timely follow-up, while 45 (36%) did not. Of the 81 women who received the appropriate follow-up, 71 (88%) received a follow-up mammogram within 7 months from the date of the index mammogram, and the remaining 10 (12%) received either a breast surgical consult or breast biopsy. One patient, who received appropriate follow-up care, was diagnosed with breast cancer during the course of the study.

Factors Associated with Appropriate Follow-up

Table 2 illustrates how sociodemographic, clinical, psychological, and communication factors are associated with the appropriate follow-up of abnormal mammograms requiring short-term follow-up. In the partially adjusted analyses, after adjusting for race, age, number of previous mammograms, and clustering by clinic site and physician, only the patient's insurance status was found to be

Table 2. Predictors for Adequate Follow-up of Mammograms Requiring Short-term Repeat Imaging (N = 126)

Predictors for Adequate Follow-up	n	Partially Adjusted Model*		Final Multivariable Model†	
		OR	P Value	OR (95% CI)	P Value
Socio-demographic factors					
Race (white vs others)	80	1.20	.67	—	—
Age (50+ yrs vs <50 yrs)	59	1.34	.49	2.86 (1.06 to 7.69)	.038
Managed care	100	3.14	.04	3.54 (1.17 to 10.66)	.026
Education (<college vs college+)	67	1.11	.81	—	—
Clinical/psychological factors					
Family history of breast cancer	15	1.58	.49	—	—
No history of abn mammogram requiring follow-up	113	1.19	.79	—	—
More than 1 prior mammogram	71	1.05	.91	—	—
Reason for mammogram (Screening vs diagnostic)	113	2.26	.18	—	—
Worried about breast cancer prior to mammogram	37	1.56	.34	—	—
No embarrassment during mammogram	102	1.25	.62	—	—
Discomfort during mammogram	54	1.26	.51	—	—
Worse preception of health (Good/fair/poor vs excellent/very good)	64	1.50	.24	—	—
Pt-Dr communication factors					
Pt new to MD (1 year or less)	21	2.03	.20	—	—
Pt given results to take home	38	1.30	.57	—	—
Pt received results within 1 week of mammogram	87	1.18	.73	—	—
PCP contacted by phone by radiologist	11	1.03	.96	—	—
Pt saw PCP after mammogram	10	2.63	.23	—	—
MD documented discussion about results with patient	89	1.94	.10	—	—
MD explained further tests in way patient understood	50	2.13	.08	—	—
MD documented follow-up plan in record	92	2.37	.05	2.79 (1.11 to 6.98)	.029
Pt reported being told she needed follow-up	90	4.32	.004	3.86 (1.50 to 9.96)	.006

* Univariate association adjusted for race, age, number of previous mammograms, and clustering by site and physician.

† Adjusted for variables in the final multivariable model, and clustering by site and physician.

OR, odds ratio; CI, confidence interval.

associated with the primary outcome, with patients in managed care plans more likely to receive the appropriate follow-up (OR = 3.14; $P = .04$). None of the clinical and psychological factors was significantly associated with appropriate follow-up.

In contrast, several patient-doctor communication factors were found to be associated with appropriate follow-up in the partially adjusted analyses ($P < .1$). Women who reported being told that follow-up was needed were significantly more likely to receive the appropriate follow-up care (OR = 4.32; $P = .004$). In addition, there was a trend indicating that the following groups had increased likelihood of receiving the appropriate follow-up: 1) women whose physician documented a discussion of the mammogram results with their patients (OR = 1.94; $P = .10$), 2) women who reported that their physician explained further tests in a way that they understood (OR = 2.13; $P = .08$), and 3) women whose physicians documented the follow-up plan in the medical record (OR = 2.37; $P = .054$).

In the clustered multivariable analysis, women whose physicians documented the follow-up plan in the medical record (OR = 2.79; 95% confidence interval [CI], 1.11 to 6.98; $P = .029$) and women who reported being told that follow-up was needed (OR = 3.86; 95% CI, 1.50 to 9.96;

$P = .006$) were independently more likely to receive the appropriate follow-up. Older women and women with managed care plans were also more likely to receive the appropriate follow-up (age > 50: OR = 2.86; 95% CI, 1.06 to 7.69; $P = .038$; managed care plan: OR = 3.53; 95% CI, 1.17 to 10.66; $P = .026$). Interaction terms between age and patients' understanding of follow-up plans did not reach statistical significance (age by "patient stated MD explained need for further tests in way she understood": OR = 1.6; $P = .51$; age by "patient stated that she needed follow-up": OR = 0.21; $P = .21$). Comparison of follow-up rates for the 2 significant communication variables appears in Table 3.

We also examined the concordance between patients reporting good physician explanations and physicians documenting such discussion. We noted that among the 89 women whose physician documented a discussion about results with the patient, 23 (26%) denied during the baseline interview that she was told about the need for follow-up care. Seven of these 23 women (30.4%) did not receive appropriate follow-up care. Of these 23 women, 43% had attended at least some college, and 39% were above the age of 50. These 23 women did not differ significantly in terms of education or age from the other women in the cohort (education: $P = .99$; age: $P = .41$).

Table 3. Comparison of Appropriate Follow-up Rate for Statistically Significant Communication Variables

	Appropriate Follow-up	No Appropriate Follow-up	Total (N = 126)	
Women whose physician documented follow-up plan in record, n (%)	64 (70)	28 (30)	92 (73)	
Women whose physician did not documented follow-up plan in record, n (%)	17 (50)	17 (50)	34 (27)	Unadjusted OR = 2.29, $\chi^2 = 4.1$, $P = .04$
Women who reported being told she needed follow-up care, n (%)	65 (72)	25 (28)	90 (71)	
Women who reported not being told she needed follow-up care, n (%)	16 (44)	20 (56)	36 (29)	Unadjusted OR = 3.25, $\chi^2 = 8.6$, $P = .003$

DISCUSSION

In this study, we found that about one-third of women did not receive adequate follow-up care for marginally abnormal mammograms. Documentation of the follow-up plan by the physician and understanding of the follow-up plan by the patient were associated with higher rates of adequate follow-up. These findings highlight one of the most important quality issues related to the clinical encounter,²¹ as patient safety and satisfaction are jeopardized when the patient-physician communication regarding the follow-up of abnormal test results break down. Given the circulation of a newsletter to clinicians and the administration of a mammography-related baseline survey in this study, the follow-up rates in the typical clinical setting are likely even lower. These results, in conjunction with those from other studies,²²⁻²⁵ highlight the ongoing need to address this gap in quality. Fortunately, this issue is beginning to receive national attention. Studies have shown that both patients²⁶ and physicians²⁷ are concerned about this issue. The Agency for HealthCare Research and Quality (AHRQ),²⁸ in a recent set of recommendations issued to patients on how to prevent medical errors, recommends to patients that "no news (on test results) is not good news," suggesting that the results follow-up systems currently employed by our health care system are insufficient to protect patients' safety.

Previous studies have identified that race, insurance status, socioeconomic factors, and other clinical variables may predict whether a patient receives the appropriate follow-up of abnormal test results. While these findings potentially enable us to target high-risk groups for intervention, these factors are not readily modifiable and intervention strategies born out of these findings are difficult to implement on a large scale. For example, providing monetary incentives to patients with abnormal Pap smears can indeed increase the adherence rate to the follow-up plan in economically poor populations,²⁵ but these interventions are difficult to sustain long term. Also implicit in these interventions is the presumption that patient nonadherence is largely responsible for this gap in quality. Our results,

we believe, offer a different perspective on the problem: patient factors alone do not account for the quality gap, and patient-doctor communication is a potential target for intervention.

We found that 2 apparently simple steps in the chain of patient-doctor communication events are independently predictive of the favorable outcome. First, we found that patients who reported being told that they needed follow-up for their abnormal mammogram result were more likely to receive it. This may suggest that patients who have a better understanding of their care plans receive better quality care. Unfortunately, current practice environments may not allow physicians sufficient time to spend on patient education,²⁹ and not surprisingly, a gap often exists between what patients actually understand and what health care professionals expect them to. This is further highlighted by the significant proportion of women (23 out of 89) whose physician documented a discussion about the abnormal test result that did not recall this discussion. If we make the reasonable assumption that a discussion did indeed occur for these women, our findings suggest that not all patients can recall the contents of a discussion with a physician. Strategies advocated by health literacy experts,³⁰⁻³² which include asking patients to describe their understanding after information is delivered to them, may be helpful. Providing some memory aid, such as written instructions may also prove useful. Other strategies may include the deployment of advanced patient-doctor communication systems that allow physicians and patients to discuss with each other test results and follow-up plans via secured e-mail and to set electronic reminders to ensure the follow-up plan is carried out.

Second, we found that documentation of the follow-up plan by the treating physician was associated with the appropriate follow-up of test results. While documentation may simply be a marker for the occurrence of a discussion between the patient and doctor regarding the abnormal mammogram result, there is evidence to suggest that documentation itself is an important element of quality care. This insight is reinforced by the literature on error prevention.³³ Documentation can be understood as a systemic

approach to overcome the momentary oversights that can lead to significant poor outcomes in complex organizations.³⁴ It is interesting to note that documentation was predictive of the favorable outcome after controlling for whether the patient reports being told about the follow-up plan. This suggests that documentation might serve as a "back-up" reminder for the physician to ensure the appropriate execution of the follow-up plan, as well as a way for members of the care team to communicate with each other. Strategies to improve documentation of the follow-up plan should focus on making documentation as easy as possible for the physician, and may include the use of standardized templates within the electronic medical record.

Our results also offer insight on other strategies to address the quality problem in result follow-up. For example, new legislation now mandates that all Medicaid patients who undergo a mammogram receive their results in writing. A recent study performed by Priyanath, however, suggests that this strategy may be inadequate.³⁵ While Priyanath showed that the new legislation increased patients' satisfaction regarding the speed of mammography result reporting, patients were still no more likely to remember the appropriate follow-up plan. This is consistent with our results, which suggest that the provision of the mammogram results to the patient may not, by itself, be sufficient to ensure the execution of the appropriate follow-up plan; women in our study who were given the mammography results to take home with them and those who received the results within 1 week were not more likely to receive the appropriate follow-up care (result to take home: OR = 1.30, $P = .57$; result within 1 week, OR = 1.18, $P = .73$). Taken together, these 2 studies potentially underline the role clinicians play in helping patients interpret abnormal test results and creating follow-up plans that are readily understood by patients. While the negative findings from our study should be interpreted in light of its relatively small sample size, they lend further strength to Priyanath's results.

This study has several limitations. This is an observational study whose results could have been affected by volunteer bias. The number of subjects included in this study is relatively small, and therefore the study might have been underpowered to detect other factors predictive of good follow-up care. Specifically, our power to statistically identify (at $P < .05$) a risk factor for receiving adequate follow-up at an odds ratio of 2.25 is only 57%.^a This may explain why some of the factors previously cited as predictors of follow-up, such as race and number of prior mammograms, were not found to be significant predictors in this study. Other potentially important physician factors, such as the amount of time physicians spent on educating patients, were not measured in this study and would merit investigation in future studies. The length of follow-up period common to all women was only 7 months, and it is unclear whether more women would have been classified as having received the appropriate care if we had observed them for longer periods. However, other studies have reported

similar rates of appropriate follow-up care.^{20,22} This study only focused on the follow-up of abnormal mammograms requiring further short-term follow-up, and its findings may not be generalizable to other types of follow-up in health care. These findings might not readily translate to the follow-up of patients with symptoms, or in patients seen in nongeneral medicine clinics.

In summary, follow-up of abnormal results represents a challenge in the outpatient setting, where follow-up actions often have to be performed in the future. We found that up to one-third of women with abnormal mammograms requiring short-term follow-up do not receive the appropriate follow-up care. We also found that documentation of the follow-up plan by the physician and the awareness of the follow-up plan by the patient are independently associated with the delivery of appropriate follow-up care. Our health care system needs to adopt better strategies to ensure that appropriate follow-up of abnormal tests occurs. We believe that these strategies need to address how patients and physicians communicate with each other about abnormal test results. Further research is needed to determine whether better result management systems can reduce the present quality gap.

^aThis power calculation assumes 1) a 34 to 66 distribution in the risk factor of interest, and 2) the group without the risk factor had a 0.4 probability for receiving adequate follow-up and the group with the risk factor had a 0.6 probability of receiving adequate follow-up.

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