Background: Mammography screening for asymptomatic older women has been shown to be effective in reducing breast cancer mortality. Physicians and patients report pain as a major barrier for many women in the screening process; however, few studies report both the degree and type of pain women experience during the screening.

Methods: Two hundred women 40 years and older were interviewed immediately following screening mammography. They were questioned about the pain they experienced, the difference between their experience and their expectations, and the most stressful part of the entire procedure.

Results: Seventy-two percent of the women reported the pain to rank 4 or less on a scale of 0 to 10 (mean ± SD score, 2.95 ± 2.09). The highest level of pain reported resulted from the compression of the breasts (3.25 ± 2.43). Ninety-six percent reported that the pain was “less than” or “about as expected.” Most (94%) said they were “very likely or somewhat likely to get a mammogram next year.” The most stressful part of the procedure was waiting for the results, according to 39% of the women.

Conclusions: The relatively low level of pain reported is useful information for both patients and practitioners. Adherence to screening recommendations is more likely to occur when both parties are able to anticipate the most painful and stressful elements of mammography.

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Most studies report that women who are 60 years and older are less likely than younger women to have ever had screening mammography or to have been recently screened.\(^{12,14-10}\) despite the fact that both the sensitivity and positive predictive value of mammography is greater for older women.\(^{20}\)

Explanations for why older women are less likely to be screened are complex; however, lack of physician recommendation appears to be particularly important.\(^{21-23}\) Barriers consistently reported in surveys of physicians include cost of mammography, reliability of readings, patient discomfort, patient refusal, low yield, physician forgetfulness, and confusion over guidelines.\(^{24}\)

Based on the need to increase breast cancer screening among older women, a community education program was funded by the National Cancer Institute in 1999. The Program to Increase Screening Mammography (PRISM), a 3-year project, was designed to recruit women 65 years and older who receive care in private primary care practices. The 43 participating practices were randomized to receive either the educational program on breast cancer screening or a control program on skin cancer education.

Before initiation of the program, focus groups of women aged 65 to 80 years were asked to determine their perceptions of barriers to mammography screening. In addition, a needs assessment of the physicians enrolled in the project was conducted. Both women and physicians listed “pain during mammography” as a barrier to screening for many women. In addition, older women were more likely than younger women to mention pain as a barrier. Because both physicians and patients regard pain as one of the most important barriers, and one that needs to be addressed in any educational program, we decided to conduct a study to obtain detailed information on pain experienced during the mammography procedure, and to determine if pain is related to age.

Several studies have examined pain associated with mammography in different settings and at various times following mammography examinations. Dullum et al\(^{25}\) interviewed 1800 women 3 to 145 days (mean, 21 days) following a screening mammography. Fifty-two percent of their sample reported experiencing moderate to extreme discomfort during the procedure (on a scale where 0 indicates no pain and 4 extreme pain). In another study conducted by Keemers-Gels et al,\(^{20,954}\) women were asked to complete questionnaires immediately following mammography screening, again using a 4-item pain scale. While only 9.3% reported severe pain, 21.6% reported moderate pain.

Bruyninckx et al\(^{27}\) asked women to complete 3 questionnaires in their study, one immediately before, the second immediately after, and the third several weeks after the procedure. The pain scale used was a 10-point scale with 0 indicating “no pain at all” and 10 indicating “very severe pain.” Seventy-five percent of the women reported pain during the procedure. Despite the use of the pain scale, the reported results focused on the occurrence rather than the intensity of pain; therefore, there was no indication of the degree of pain that women experienced.

While all of the reviewed studies certainly add to the knowledge about pain associated with mammography, more information is needed concerning the degree of pain women anticipate compared with the actual pain they feel. In addition, it would be helpful to understand the pain experienced during the different stages of the procedure, and the relative importance of pain as part of the overall process of mammography screening.\(^{28}\)

This study was designed to (1) address the issues surrounding the degree of pain that women reported immediately following the procedure; (2) determine whether pain was the most stressful part of the process of obtaining a mammogram; and (3) examine the association of medical and physical factors with pain during the mammography procedure.

METHODS

Following the approval of the protocol by the institutional review board, 200 women were recruited from the Breast Screening Center at the Wake Forest University Baptist Medical Center from August to November 2001. All mammography examinations were performed on a Lorad MIV mammographic unit (Lorad Corp, Danbury, Conn) by experienced mammography technologists using standard procedures. Representative days of clinic operation were selected and adhered to during the 6-month period. All women 40 years and older who had a screening mammography performed were approached immediately after the procedure by a trained female research assistant and asked to participate in the study. Of the 223 eligible women, 200 (89.7%) completed the interview.

During the 13 interview sessions, 368 women participated in mammography screening at the facility. Among them, 23 who were approached by the research assistant were younger than 40 years, and 122 were never approached owing to scheduling conflicts (ie, while the research assistant was interviewing one woman, another completed her screening procedure and left). A small proportion of the 122 women were probably younger than 40 years and would not have been eligible if approached; however, we did not collect information on the women who did not give consent for the study.

After obtaining verbal informed consent as approved by the institutional review board, the staff member asked the women about the amount of pain they experienced during the procedure on a 0-to-10 numeric analog scale (“This shows a scale representing pain, where 0 is no pain at all; 10 is the worst pain you have ever felt; and 5 is about average: for example, a mild headache or shoes that are a little too tight”). To determine the primary sources of pain, women were asked about pain when raising their arm; pain when the skin was pulled during placement of the breast on the plate and during compression; pain in the breast during compression; and pain in the ribs or breast bone from pressing against the plate.

The likelihood of obtaining a mammogram within the next year and the source of the greatest stress surrounding mammography also were queried. Basic demographic information was collected, along with physical characteristics such as height, weight, and bra size. Women also were questioned regarding the amount of caffeine consumed in the past 3 days and how this differed from the amount they normally consume.

Data were analyzed using means±SDs for metric variables, frequencies for nominal variables, and percentages for ordinal variables. Ordinary least squares multiple regression analysis was used to identify the most important predictors of pain. All analyses were conducted using the SPSS PC Statistical Package for Windows, version 10.07 (SPSS Inc, Chicago, Ill).
RESULTS

Demographics of the sample of women participating in mammography screening are presented in Table 1. Briefly, the women ranged in age from 40 to 98 years (59.2±12.8 years), 82% were white, and 84% had a high school education or more.

Seventy-two percent of the women whose answers are summarized in the following tabulation reported overall pain associated with the mammogram as a score of less than or equal to 4 on a 10-point scale:

<table>
<thead>
<tr>
<th>Nature of Pain</th>
<th>Mean±SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall pain</td>
<td>2.95±2.09</td>
</tr>
<tr>
<td>Pain when rising arm</td>
<td>0.58±1.56</td>
</tr>
<tr>
<td>Pain when skin is pulled</td>
<td>1.52±1.89</td>
</tr>
<tr>
<td>Pain when breast is compressed</td>
<td>3.25±2.43</td>
</tr>
<tr>
<td>Pain in rib/breast bone</td>
<td>0.74±1.72</td>
</tr>
</tbody>
</table>

When asked to describe the pain during each part of the procedure, they rated the average pain from raising their arm to get into position for the procedure; from their skin being stretched; from the plate pressing against the ribs or sternum; and from compression of the breast. The major source of pain was from the actual compression of the breast during the procedure (mean±SD, 3.25±2.43). The percentages of women who rated overall pain or pain related to a specific aspect of the procedure at a score of 5 or greater are presented in the Figure.

Pain was not related to age or ethnicity. Premenopausal women (n=47) experienced a significant increase in pain that was related to the proximity of their last menstrual period; those whose last period occurred within 8 to 14 days reported more pain (P=.02).

When asked how likely it was that they would get a mammogram next year, 94% reported that they were either “very likely” or “somewhat likely” to do so. Only 2% of them reported that they were unlikely to have another mammography examination in a year, and they were primarily younger women.

Women were asked what bothered them the most about the entire process of obtaining a mammogram. The most stressful part of the process was “waiting for the results,” followed by “actually having the mammography done.” The responses are shown in Table 2.

A common recommendation for women concerned about pain during mammography is to decrease the amount of caffeine consumed for several days before the procedure. Women were asked the number of caffeine-containing drinks they had in the past 3 days and if it was more, less, or the same as they normally drink. However, there was no correlation between amount of caffeine consumed and reported pain.

Multivariate analysis of the demographic, physical, medical, and behavioral characteristics indicated that, except for proximity to menstruation in premenopausal women, pain was not associated with any of the characteristics considered. Age, race, education, breast size, body mass index, caffeine intake, presence of other medical problems, self rating of health status, or self-reported sensitiv-
Mammography is an important tool for breast cancer screening; therefore, removing any barriers that may impede the process is important. Pain is a common barrier listed by both physicians and patients but the extent of the actual pain experienced by women has been difficult to determine. This study questioned women immediately following screening mammography to determine the amount of pain they experienced. The results suggest that the actual pain experienced and reported immediately following mammography is relatively low (an average score of 3 on a 0-10 scale) and most women reported that the pain was “less than” or “about as expected.” In addition, the amount of pain experienced would not deter 94% of the women from returning for mammography screening the next year.

In this study, only 7 women cut back on their caffeine consumption in preparation for the procedure. It appears that women ignore the often-given advice; however, there was no correlation between the amount of caffeine consumed and the degree of pain reported. Given that many women appear to enjoy their caffeine and that the level of pain reported was low, this may not be an important issue in patient education.

Although women often express beliefs relating pain to breast size during mammography, we found no correlation between size of breast (bra size or cup size) and reported pain. It may be reassuring, especially to women who are concerned about breast size and pain, that in this study breast size was not related to the level of reported pain.

This study found that waiting for the results of a mammography was the most stressful part of the process. This finding emphasizes the need for additional education on how long it will probably take before the results are available. Any measures that can be instituted to minimize the waiting period would be helpful in lessening this source of stress. It would also be helpful to point out to women that 5% to 10% of those who are screened are recalled for further testing; that about 15% of those recalled will have a biopsy performed; and that approximately one third of biopsy results reveal cancer. This gives a cancer rate of 5/1000 among women screened.

Women expressing particular concerns about potential pain may benefit from additional counseling citing the results of this study. It is possible to give them more specific information on the degree of pain they might expect because of the analogy we provide while rating the pain on the 0 to 10 scale (“5 is about average: for example, a mild headache or shoes that are a little too tight”). Almost three fourths of the women described the pain as less than this average referent.

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Corresponding author and reprints: Penny C. Sharp, EdD, Department of Family and Community Medicine, Wake Forest University School of Medicine, Medical Center Boulevard, Winston-Salem, NC 27157-1084 (e-mail: psharp@wfubmc.edu).

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