

**ACCEPTABILITY TO WOMEN OF FULL FIELD
DIRECT DIGITAL MAMMOGRAPHY**

**NHSBSP Equipment Report 0603
May 2006**

Enquiries

Enquiries about this report should be addressed to:

Patsy Whelehan
Head of Training and Technical Development
King's National Breast Screening Training Centre
King's College Hospital
Denmark Hill
London
SE5 9RB

Tel: 020 7346 3384

Email: patsy.whelehan@kingsch.nhs.uk

Published by

NHS Cancer Screening Programmes
Fulwood House
Old Fulwood Road
Sheffield
S10 3TH

Tel: 0114 271 1060

Fax: 0114 271 1089

Email: nhs.screening@cancerscreening.nhs.uk

Website: www.cancerscreening.nhs.uk

© NHS Cancer Screening Programmes 2006

The contents of this document may be copied for use by staff working in the public sector but may not be copied for any other purpose without prior permission from the NHS Cancer Screening Programmes.

The report is available in PDF format on the NHS Cancer Screening Programmes' website

Further copies

Requests for further copies should be made to the Department of Health Publications Orderline, quoting NHSBSP Equipment Report 0603

Tel: 08701 555 455

Fax: 01623 724 524

Email: doh@prolog.uk.com

CONTENTS

	Page No
PREFACE	iv
1. INTRODUCTION	1
2. METHODOLOGICAL DIFFICULTIES IN ASSESSING PAIN IN MAMMOGRAPHY	2
3. MAIN FACTORS ASSOCIATED WITH PAIN IN MAMMOGRAPHY	3
4. PAIN IN FFDDM	3
4.1 Published literature	3
4.2 Results of an unpublished study by Milner S and Perry N	4
5. SUMMARY/CONCLUSIONS	5
6. RECOMMENDATIONS	5
REFERENCES	6

PREFACE

The NHS Breast Screening Programme (NHSBSP) has set up a Digital Imaging Technologies Steering Group, reporting to the Advisory Committee on Breast Cancer Screening, to devise a structured approach to the evaluation of digital technologies for use in the programme. Among the terms of reference of the steering group is a remit to devise methodologies for assessing the acceptability to women of digital screening.

This report reviews the methodological difficulties in studying perceived pain and discomfort in mammography, and the factors affecting women's perceptions. Available evidence on the impact of changing to digital mammography is also presented. Thus, the report not only investigates methodologies for assessing acceptability, but also presents information on the likelihood that changing to digital screening would have an effect on acceptability.

This report has been prepared on behalf of the Digital Imaging Technologies Steering Group by Patsy Whelehan, Sue Milner and Dr Nick Perry. Statistical advice was provided by Dr Nora Donaldson.

1. INTRODUCTION

Many publications have described the prevalence of various levels of pain and discomfort associated with mammography, and attempted to identify factors that affect variations. Reported prevalence of pain or discomfort ranges from 1.3% to 92.3%, which reflects the methodological diversity of the publications on this subject.^{1,2} A diverse array of potentially associated factors, from age^{3,4} and breast density⁵ to temperature of the film holder⁶ has been investigated.

The importance of these questions stems largely from the potential for pain and discomfort to reduce client satisfaction levels^{6,7} and deter women from attending regularly for screening mammography.⁸⁻¹³

There are several reasons why the advent of full field direct digital mammography (FFDDM) may be expected to affect levels of perceived pain or discomfort from mammography, and levels of satisfaction with the experience of a screening mammography appointment.

The main ways in which the process of carrying out a direct digital mammogram differs from film-screen mammography, and indeed from computed mammography, concern the absence of cassette handling activities by the radiographer, and the ability to check image quality without leaving the room. In addition, the woman may be able to see the images of her breasts at the workstation, whereas it is not usual in screening mammography to show processed films to the client at the time of the examination.

It can be hypothesised that these differences may affect the interaction between the client and the radiographer. A qualitative study has found that some women highlight the importance of the radiographer listening to them during the procedure.¹⁴ It is possible that if the radiographer does not have to turn away to change cassettes or place them in a film unloader that more eye contact, for example, may ensue and the women may feel that they receive more attention. There is a reported association between women's perceptions of care by radiographers and their experiences of discomfort and levels of satisfaction in mammography.^{8,9,11,12,15-17} Therefore, there is merit in investigating whether perceptions of care are affected by use of FFDDM.

One could also speculate that differences in the temperature of the room and/or the imaging platform may be important. Digital detectors are notoriously intolerant of wide fluctuations in temperature, and x-ray rooms with digital equipment may need to be kept colder than would normally be desired for mammography rooms. Doyle and Stanton⁶ have described an association between women finding the cassette holder cold and their experiences of discomfort during mammography. Despite possibly reduced room temperatures, the imaging platform of a FFDDM system may be warmer than the surface of a table for film-screen mammography because of the system's provision to maintain a stable temperature for the detector, so there are potentially two converse factors to consider.

In some cases, the design of FFDDM machines differs considerably from 'conventional' equipment. For example, in the Fischer SenoScan (Fischer Imaging Corp., Denver, Colorado, USA) and the Sectra Microdose Mammography (Sectra, Linköping, Sweden) systems, the imaging platforms and the compression paddles have a curved shape because of the slot scanning technology employed in the design. In addition, the platform is thicker than in film-screen systems. It is possible that these differences may affect the physical comfort of women being positioned for mammography.

Although there is a considerable body of literature on pain in mammography in general, there is a lack of published information on effects of different equipment, including digital equipment.

2. METHODOLOGICAL DIFFICULTIES IN ASSESSING PAIN IN MAMMOGRAPHY

Because of the wide range of different self-reported measures of pain employed across studies of pain in mammography, it is difficult to analyse the combined published evidence.

Four, five and six point verbal (or written) rating scales (VRS) are commonly used,^{1,12,15,16,18-24} but the descriptors vary. Sometimes there is a mixture of terms, eg pain and discomfort, within the same scale.^{2,11,25,26} In such cases, the inference is that different intensities of sensation are represented by the different terms: discomfort is less severe than pain.²⁷ Fallowfield²⁸ offered separate three point scales for both discomfort and pain and Rutter²⁹ gave yes/no results for discomfort and pain. Both of these studies found lower prevalence of pain than discomfort, supporting the idea that discomfort is considered less severe than pain. However, Aro¹⁵ found that similar levels of prevalence were obtained using two separate four point scales – not at all; slightly; moderately; severely – one using the word painful, and one using the word uncomfortable. This may indicate that the intervals on a scale are more influential in how people respond than the words used. It has been argued, however, that ‘discomfort’ encompasses an evaluative as well as a sensory dimension,² which could indicate that it is best not to mix the terms pain and discomfort within a single VRS.

Other scales include visual analogue scales (VAS),²⁷ where the participants place a mark at any chosen point on, most commonly, a 10 cm line. These have the advantage that they are less dependent on vocabulary but they can be difficult for participants to understand and use. Error can be introduced when the investigators translate the position of the mark into a score or rank of some kind.³⁰

Where either a VRS or VAS is used, the investigators usually decide a point on the scale to dichotomise the results into painful or not painful.^{15,24,25} The decision on where to dichotomise can appear to be arbitrary and will clearly affect the apparent percentage prevalence of pain. This may be another reason for the wide reported range.

Likert scales – level of agreement with a statement – are also used.^{6,9,31-34} Results in terms of prevalence levels are likely to be governed to some extent by the statement offered.

One study uses the Norwegian version of the McGill Pain Questionnaire (MPQ).³⁵ This is a sophisticated method for assessing pain, which provides rank values based on participants choices from a large range of sensory, affective and evaluative descriptors.³⁶ One potential problem with the use of the MPQ in assessing pain from mammography is that some of the descriptors used for scoring the sensory pain level could be used to describe the action of the compression, eg ‘pinching’, ‘pressing’, ‘pulling’. Thus the action of the equipment and the sensations in the breasts, which are separate though related, could become confused.

A number of studies^{7,37,38} have used a numerical rating scale (NRS) where 0 is no pain and 10 is very painful. The NRS is easy to administer and score but the scores cannot necessarily be treated as ratio data.³⁰ Again, reports which give percentage prevalence values have to be carefully scrutinised for dichotomisation of the ratings.

Some authors^{2-5,39,40} report pain levels on a number of different scales, in an attempt to make results as meaningful as possible.

A primarily qualitative approach was taken by Baskin-Smith,⁴¹ using an interview technique with open ended questions. This enabled women to use their own words to describe the experience of mammography, rather than choosing from investigator defined terms, as in the case of a VRS. This is an appealing approach, as it may take into account the different ways in which people use language, potentially enabling greater validity in a given population. It also allows a range of domains to be evaluated: sensory, affective and evaluative. Since

it is so difficult to separate these from each other effectively, there may be merit in embracing them all, as in the MPQ. Baskin-Smith and colleagues classified the responses into seven categories. Although they achieved 90% reliability of categorisation across three experienced researchers, their assignment of categories may not fully reflect the participants' perceptions of the experience. For example, the descriptions 'little strain' and 'hard pulling' were categorised as discomfort but it is not possible to know whether the women who used the terms would agree with this classification. Interestingly, 'sore' was categorised as discomfort, while 'hurt' was categorised as pain. It is not evident which category was assigned to 'she mashed me real hard'!

3. MAIN FACTORS ASSOCIATED WITH PAIN IN MAMMOGRAPHY

The literature identifies a number of factors associated with variations in perceptions of pain or discomfort. Unfortunately, for many of the factors there is little consistency across the studies. The most frequently reported associated factors include women's educational or socioeconomic status,^{4,5,12,15,16} expectation or prior experience of pain from mammography,^{3,5,7,11,12,15,17,20,26,29,42,43} and perceptions of the staff or the standard of care.^{11,12,15-17} This last category sometimes includes the woman's impression of the competence of the practitioner. Communication skills are likely to be crucial in promoting positive perceptions of staff and of the standard of care. It is also possible that excellent communication immediately prior to the procedure may reduce the expectation of pain.

The clinical/technical skills of the radiographer may be implicated in the pain experience. Eklund⁴⁴ explains how full mobilisation of the breast medially for the mediolateral oblique projection should minimise discomfort for the woman. Factors such as this have never been specifically tested, but are an example of how important the operator may be to the experience, including effects that do not result from the relationship with the client.

Factors that have less often been demonstrated to be associated with pain in mammography include lower age,³ higher breast density,⁵ presence of symptoms,⁷ fear of breast cancer,¹² nervousness prior to mammogram,⁷ less ability to use coping strategies,^{2,40} ratio of compression force to breast thickness.²⁴

The only interventions that have been shown to have an effect in reducing pain levels are patient controlled compression⁴⁵ and use of a cushioning pad.^{3,27} Both Dibble³ and Markle²⁷ attempted to identify any adverse effects on image quality from use of the cushioning pad, with the radiologists in each study giving blinded opinions on this point. The two studies conflict on whether there was any adverse effect, but in neither is the evidence strong enough to answer this question definitively.

In both these interventions, blind controlled trials are clearly not possible, so there may have been a placebo effect. How the effect is achieved is perhaps unimportant, though. In the case of patient controlled compression, physical control may not be necessary, as it has also been shown that if the woman understands that she may say stop during the procedure if she feels the compression is becoming too painful, her perception of pain may be lower.¹⁷

4. PAIN IN FFDDM

4.1 Published literature

None of the reports of clinical trials of digital mammography versus film-screen mammography published to date has included any investigation of comparative acceptability to the woman of the two techniques. As some of these trials have conducted paired examinations,⁴⁶⁻⁴⁸ carried out in many cases by the same radiographer, they would have presented a good opportunity to eliminate some of the potential confounding variables

associated with woman characteristics and radiographer behaviour. However, discomfort from the second of the paired examinations would have been in danger of being overestimated as a result of four compressions having already been applied during the first examination, given that there is evidence that the number of views affects the experience of discomfort.²⁵

Only one published study, by Liang and co-workers,¹⁹ has been identified which attempts to compare women's perceptions of discomfort or acceptability between film-screen mammography and FFDDM (equipment manufacturer unknown). One of the limitations of this study is that the film-screen examinations were carried out as screening procedures, whereas the digital examinations were carried out as part of the diagnostic investigation of potential abnormalities. As there is some evidence that the reason for the examination can affect the perception of discomfort,¹⁷ this is potentially a serious limitation.

Eighty two of 106 eligible women completed a questionnaire in Liang's study.¹⁹ In addition to FFDDM, they underwent magnetic resonance imaging of the breast and sestamibi nuclear medicine scanning, as the study aimed to compare the acceptability of all three tests as potential triage methods prior to breast biopsy. No mention is made of supplementary mammographic projections, and no information is given on whether both breasts or only the side which had given rise to the recall for further investigations were imaged on digital mammography.

The women were asked to compare the level of discomfort experienced from digital mammography with that experienced at prior film-screen mammography. Fifty per cent of women reported that they found FFDDM more comfortable than a routine mammogram. Twenty per cent of the women had described routine mammography as either very or extremely uncomfortable on a five point rating scale. It is not clear what the time lapse was between the 'routine' examination and the digital mammogram. The pain questionnaire was administered on the day of the digital mammogram. As there is evidence that reported levels of discomfort or pain may be greater when there is a delay between the procedure and the data collection,^{8,11,12} this difference may have affected the findings of reduced discomfort in the recent examination compared with the earlier one.

Although data on age, race, economic status and personal or family history of breast cancer were collected in this study, these factors have not been analysed in respect of the reported comparative discomfort of digital versus film-screen mammography. In addition, perceptions of technical skills and personal manner of the operators were recorded. Although these factors are thought to affect perceptions of discomfort in mammography,^{11,12,15-17} again no subanalysis is included in the report.

4.2 Results of an unpublished study by Milner S and Perry N

Women presenting for either screening or diagnostic (proportions unknown) mammography were randomised to undergo either FFDDM on the GE Senographe 2000D (GE Healthcare, Chalfont St Giles, UK), FFDDM on the GE Senographe 2000D with enhanced explanation pointing out that the latest technology was being employed, or film-screen mammography on the Siemens Mammomat 3000 (Siemens Medical Solutions, Erlangen, Germany). There were 100 women in each of the three groups. The same radiographer carried out all examinations. No client variables were recorded. Following their examinations, all women gave responses on a four point VRS: comfortable, slightly uncomfortable, slightly painful, painful.

When the results of this study are dichotomised at the midpoint into painful or not painful, the women receiving FFDDM with enhanced explanation were least likely to report pain, followed by those receiving FFDDM without enhanced explanation. The group receiving film-screen mammography was most likely to report pain (Table 1). When the chi squared test is applied to these findings the distribution is statistically significant ($P \leq 0.025$). A pair wise comparison of all three groups with each other shows that the significant difference is between the film-screen group and the digital with enhanced explanation group ($P \leq 0.03$). A Bonferroni correction to control for type 1 error resulting from multiple comparisons was applied.

It is suggested that adding the enhanced explanation could have induced the equivalent of a placebo effect.

Table 1 Number of women in each group who reported painful mammography

	Painful	Not painful	Total
Film-screen mammography	25	75	100
Digital mammography	21	79	100
Digital mammography with enhanced explanation	10	90	100
Total	56	244	300

5. SUMMARY/CONCLUSIONS

An overview of the literature on pain in mammography is difficult to achieve because of the heterogeneity of methods used, particularly in respect of pain scales. It is, however, clear that perceptions of pain are influenced by multiple factors, some of which are better established than others. There is enough evidence that women's experiences of pain affect both satisfaction with mammography services and intended or actual reattendance for screening⁸⁻¹³ to confirm the importance of understanding factors affecting perceptions of pain in mammography.

There has been very little investigation of the effects of equipment type on the experience of pain in mammography. The only published study which considers a possible effect of FFDDM compared with film-screen mammography has important methodological problems.¹⁹ Milner's unpublished study gives some indication that pain may be diminished in FFDDM but that women's confidence in the procedure, as affected by information communicated by the radiographer, may be more influential than the equipment itself. It remains possible that the relationship between the radiographer and the client may be affected by the difference in the procedure of FFDDM compared with film-screen, or indeed computed, mammography. Because of the influence of perceptions of care on the pain experience,^{11,12,15-17} use of FFDDM may have indirect effects on reported pain levels. Direct or indirect effects may result from factors such as temperature of the room or the imaging platform, but the importance of this type of factor is less well established in the existing literature.

6. RECOMMENDATIONS

Because of the predominant influence on pain and satisfaction in mammography of factors that are not affected by the type of equipment, and because the available evidence on pain in FFDDM does not indicate negative effects on acceptability, the steering group does not consider that this question is a matter for serious concern, or that further investigation of assessment methodologies is warranted. Therefore the recording of women's and mammographers' comments as part of the equipment evaluation process (*Guidance Notes for the Evaluation of Mammographic X-ray Equipment*, NHSBSP Publication No 51, Evaluation Form 6) is considered to remain sufficient for assessing acceptability.

Radiographic staff in the NHSBSP must recognise the influence of the way they communicate with clients on the experience of pain and the level of satisfaction with breast screening. They should understand the factors that affect pain in mammography, including those which may be different in FFDDM, and take these into account in their clinical practice.

REFERENCES

1. Bennett IC, Robert DA, Osborne JM, Baker CA. Discomfort during mammography: a survey of women attending a breast screening center. *Breast Disease*, 1994, 7(1): 35–41.
2. Asgahari A, Nicholas MK. Pain during mammography: the role of coping strategies. *Pain*, 2004, 108: 170–179.
3. Dibble SL, Israel J, Nussey B, Sayre JW, Brenner RJ, Sickles EA. Mammography with breast cushions. *Women's Health Issues*, 2005, 15: 55–63.
4. Gupta R, Nayak M, Khoursheed M, Roy S, Behbehari AI. Pain during mammography: impact of breast pathologies and demographic factors. *Medical Principles and Practice*, 2003, 12(3): 180–183.
5. Kornguth P, Keefe FJ, Conaway MR. Pain during mammography: characteristics and relationship to demographic and medical variables. *Pain*, 1996, 66: 187–194.
6. Doyle CA, Stanton MT. Significant factors in patient satisfaction ratings of screening mammography. *Radiography*, 2002, 8(3): 159–172.
7. Loeken K, Steine S, Laerum E. Mammography: influence of departmental practice and women's characteristics on patient satisfaction: comparison of six departments in Norway. *Quality in Health Care*, 1998, 7(3): 136–141.
8. Baines CJ, To T, Wall C. Women's attitudes to screening after participating in the National Breast Screening Study. A questionnaire survey. *Cancer*, 1990, 65: 1663–1669.
9. Carney PA, Harwood BG, Weiss JE, Eliassen MS, Goodrich ME. Factors associated with interval adherence to mammography screening in a population-based sample of New Hampshire women. *Cancer*, 2002, 95: 219–227.
10. Elwood M, McNoe B, Smith T, Bandaranayake M, Doyle TC. Once is enough – why some women do not continue to participate in a breast cancer screening programme. *The New Zealand Medical Journal*, 1998, 111(1066): 180–183.
11. Cockburn J, Cawson J, Hill D, De Luise T. An analysis of reported discomfort caused by mammographic X-ray amongst attenders at an Australian pilot breast screening program. *Australasian Radiology*, 1992, 36(2): 115–119.
12. Drossaert CHC, Boer H, Seydel ER. Monitoring women's experiences during three rounds of breast cancer screening: results from a longitudinal study. *Journal of Medical Screening*, 2002, 9(4): 168–175.
13. Barter-Godfrey S, Tacket A. *Women and Health: Views of Women aged 50–64, Living in Lambeth, Southwark and Lewisham (with a Focus on Breast Cancer Screening)*. 2005. London: London South Bank University.
14. Poulos A, Llewellyn G. Mammography discomfort: a holistic perspective derived from women's experiences. *Radiography*, 2005, 11: 17–25.
15. Aro AR, Absetz-Ylöstalo P, Eerola T, Pamilo M, Lönnqvist J. Pain and discomfort during mammography. *European Journal of Cancer*, 1996, 32(10): 1674–1679.
16. Dullum JR, Lewis FC, Mayer JA. Rates and correlates of discomfort associated with mammography. *Radiology*, 2000, 214(2): 547–552.
17. Van-Goethem M, Mortelmans D, Bruyninckx E, Verslegers I, Biltjes I, Van-Hove E et al. Influence of the radiographer on pain felt during mammography. *European Radiology*, 2003, 13(10): 2384–2389.
18. Leaney BJ, Martin M. Breast pain associated with mammography. *Australasian Radiology*, 1992, 36(2): 120–123.
19. Liang W, Laurence WF, Burnett CB, Hwang YT, Freedman M, Trock BJ et al. Acceptability of diagnostic tests for breast cancer. *Breast Cancer Research and Treatment*, 2003, 79(2): 199–206.
20. Poulos A, Rickard M. Compression in mammography and the perception of discomfort. *Australasian Radiology*, 1997, 41(3): 247–252.
21. Poulos A, McLean D, Rickard M, Heard R. Breast compression in mammography: how much is enough? *Australasian Radiology*, 2003, 47(2): 121–126.
22. Sapir S, Patlas M, Strano SD, Hadas-Halpern I, Cherny NI. Does mammography hurt? *Journal of Pain and Symptom Management*, 2003, 25(1): 53–63.
23. Shrestha S, Poulos A. The effect of verbal information on the experience of discomfort in mammography. *Radiography*, 2001, 7(4): 271–277.
24. Sullivan DC, Beam CA, Goodman SM, Watt DL. Measurement of force applied during mammography. *Radiology*, 1991, 181(2): 355–357.
25. Caseldine J, McGahan C. *Survey into Pain Experienced by Women Undergoing Single or Two-view Breast Screening Mammography*. NHS Cancer Screening Programmes, 2001 (Occasional Report 01/1). Sheffield: NHSBSP.
26. Stomper PC, Kopans DB, Sadowsky NL, Sonnenfeld MR, Swann CA, Gelman RS et al. Is mammography painful? *Archives of Internal Medicine*, 1988, 148(3): 521–524.
27. Markle L, Roux S, Sayre JW. Reduction of discomfort during mammography utilising a radiolucent cushioning pad. *The Breast Journal*, 2004, 10(4): 345–349.

28. Fallowfield LJ, Rodway A, Baum M. What are the psychological factors influencing attendance, non-attendance and re-attendance at a breast screening centre? *Journal of the Royal Society of Medicine*, 1990, 83(9): 547–551.
29. Rutter DR, Calnan M, Vaile MSB, Field S, Wade KA. Discomfort and pain in mammography: description, prediction and prevention. *British Medical Journal*, 1992, 305(6855): 443–445.
30. Jensen M.P., Karoly P. (2001). Self-Report Scales and Procedures for Assessing Pain in Adults. In: Turk D.C., Melzack R., eds. *Handbook of Pain Assessment* (2nd edition). New York: The Guildford Press (pp 15–34).
31. Bakker CA, Lightfoot NA, Steggle S, Jackson C. The experience and satisfaction of women attending breast cancer screening. *Oncology Nursing Forum*, 1998, 25(1): 115–121.
32. Brett J, Austoker J. Development and validation of the E.B.S: a measure to assess women's experience at all stages of the breast screening process. *Journal of Public Health*, 2004, 26(1): 79–83.
33. Conlon M, Lightfoot NA, Bissett R, Steggle S, White J, Jackson C. Predictors of re-attendance at an organised breast screening centre. *Current Oncology*, 1998, 5(2): 85–90.
34. Papas MA, Klasser AC. Pain and discomfort associated with mammography among urban low-income African-American women. *Journal of Community Health*, 2005, 30(4): 253–267.
35. Hafslund B. Mammography and the experience of pain and discomfort. *Radiography*, 2000, 6: 269–272.
36. Melzack R., Katz J. (2001). The McGill Pain Questionnaire: Appraisal and Current Status. In: Turk D.C., Melzack R., eds. *Handbook of Pain Assessment* (2nd edition). New York: The Guildford Press (pp 35–52).
37. Loeken K, Steine S, Sandvik L, Laerum E, Finset A. A new measure of patient satisfaction with mammography: validation by factor analytic technique. *Family Practice*, 1996, 13(1): 67–74.
38. Sharp PC, Michielutte R, Freimanis R, Cunningham L, Spangler J, Burnett V. Reported pain following mammography. *Archives of Internal Medicine*, 2003, 163(7): 833–836.
39. Domar AD, Eyvazzadeh A, Allen S, Roman K, Wolf R, Orav J et al. Relaxation techniques for reducing pain and anxiety during screening mammography. *American Journal of Roentgenology*, 2005, 184: 445–447.
40. Kashikar-Zuck S, Keefe FJ, Kornguth P, Beaupre P, Holzberg A, Delong D. Pain coping and the pain experience during mammography: a preliminary study. *Pain*, 1997, 73(2): 165–172.
41. Baskin-Smith J, Miakowski C, Dibble SL, Weekes D, Nielsen BB. Perceptions of the mammography experience. *Cancer Nursing*, 1995, 18(1): 47–52.
42. Drossaert CHC, Boer H, Seydel ER. Does mammographic screening and a negative result affect attitudes towards future breast screening? *Journal of Medical Screening*, 2001, 8(4): 204–212.
43. Kornguth P, Keefe FJ, Wright KR, Delong D. Mammography pain in women treated conservatively for breast cancer. *Journal of Pain*, 2000, 1(4): 268–274.
44. Eklund GW. Mammography Compression: Science or Art. *Radiology*, 1991, 181: 339–341.
45. Miller D, Martin I, Herbison P. Interventions for relieving the pain and discomfort of mammography. The Cochrane Database of Systematic Reviews 2002,(3. Art.No: CD002942. DOI: 10.1002/14651858.CD002942.).
46. Lewin JM, Hendrick RE, D'Orsi CJ, Isaacs PK, Moss LJ, Karellas A, Sisney GA, Kuni CC, Cutter G.R. Comparison of full-field digital mammography with screen-film mammography for cancer detection: results of 4,945 paired examinations. *Radiology*, 2001, 218: 873–880.
47. Skaane P, Young K, Sjennald A. Population-based mammography screening: comparison of screen-film and full-field digital mammography with soft-copy reading: the Oslo I study. *Radiology*, 2003, 229: 877–884.
48. Pisano ED *et al.* for the Digital Mammographic Imaging Screening Trial (DMIST) Investigators Group. Diagnostic Performance of Digital versus Film Mammography for Breast Cancer Screening. *New England Journal of Medicine*, 2005, 353(17): 1773–1783.

