

Nurses' knowledge of breast screening and the implications for advising women with dense breast tissue: a literature review

Abstract

Breast cancer is the second highest cause of female death in the UK. Early detection has been advanced through mammography screening programmes. This is not always effective for women with dense breast tissue. Little has been written about alternative screening approaches for these women. This article reports findings of a literature review which appraises the evidence on nurses' knowledge of breast cancer screening and the implications of this when advising women with dense breast tissue. Nurses' knowledge of breast cancer, risk factors, correct or alternative screening methods and treatment can influence women's breast cancer awareness, uptake of screening and ultimately morbidity and mortality.

Keywords: Breast screening; breast cancer detection; breast density; narrative review

Introduction

Breast cancer is the most common cancer diagnosed among women in the UK and is the second highest cause of female cancer-related deaths (Massat et al 2016). It is estimated that one in eight women will be diagnosed with breast cancer during their lifetime with incidence increasing with age (Cruwys and Pushkin 2017, Cancer Research UK 2019). Since the late 20th century the incidence has continued to increase worldwide (World Health Organization 2018) making breast cancer a significant international health and economic problem (Yusuf et al 2013, Zainal et al 2013).

Mammography screening programmes have led to early detection of breast cancer and are associated with increased breast cancer survival (Coleman 2017, Autier and Boniol 2018) and breast screening programmes are major public health strategies in all four UK nations (National Institute for Health and Care Excellence (NICE) 2013, Public Health Agency 2020, Public Health Scotland 2020, Public Health Wales 2020). The UK data suggest that between 70% and 75% of eligible women access breast screening (NICE 2017, Public Health Agency 2020, Public Health Scotland 2020, Public Health Wales 2020), whilst this is comparable to the USA and better than in many European countries it is less than in Scandinavia and the Netherlands (Eurostat, 2020) suggesting there is room for improvement. A meta-synthesis of 21 studies (which included a total of 1084 women from across the globe including one UK study) explored barriers to accessing screening from women's perspectives (Azami-Aghdash et al 2015). They found that some women are reluctant to access screening due to fear of possible results, cultural factors affecting access to screening (also reported by (Kolahdooz et al 2014)), and reported bad experiences from friends or family members diagnosed with breast cancer. Other studies similarly note reasons for women not accessing screening as a lack of understanding of what breast cancer is, the modifiable and non-modifiable risk factors and the importance of early detection (Al-Naggar and Bobryshev 2012, Guvenc et al 2012).

One risk factor in breast cancer detection is breast density (Box 1) as dense breast tissue decreases the sensitivity of mammography and can have a masking effect on underlying cancer (Freer 2015). Between 40% and 50% of women have dense breasts and 10% are classified as having extremely dense breast tissue (Cruwys 2020, Mayo Clinic 2020).

Alternative screening techniques include ultrasound or magnetic resonance imaging (MRI) are discussed later in the article.

Box 1. Dense breast tissue

The density of a woman's breast can be detected on a mammogram. Breast tissue is composed of milk glands, milk ducts, supportive breast tissue and fatty tissue. Supportive tissue appears dense or white on a mammogram while fatty tissue is non-dense and appears dark.

There are four levels of density that are commonly referred to:

- A. Almost entirely fatty which is seen in approximately 1 in 10 women
- B. Some scattered areas of density but with the majority of breast tissue being fatty. This is seen in about 4 out of 10 women.
- C. Heterogeneously dense breasts are also seen in around 4 out of 10 women where the majority but not all the tissue is dense
- D. Extremely dense which indicates that nearly all the breast is dense tissue. This is seen in about 1 in 10 women.

Younger women, those with lower body mass index and those taking hormone replacement therapy are more likely to have dense breasts. There appears to be no racial differences in breast density when age and body mass index are controlled in analyses (del Carmen *et al* 2007).

General practice nurses (GPNs) are an integral part of general practice teams and there are clear policy directions for their increased role in primary care across the UK (NHS England 2016, Scottish Government 2018). For example, they play an important role in breast cancer screening (Chiarelli *et al* 2010, Oluwatosin 2012) through educating and encouraging women to become familiar with their breasts, managing breast problems and promoting and informing women about appropriate screening programmes (Ceber *et al* 2010, Korber *et al* 2011). The Queen's Nursing Institute (2015) identifies health promotion as a central task of general practice nurses.

The aim of this review, , was to appraise the evidence about general practice nurses' knowledge of breast cancer screening, particularly in relation to women with dense breast tissue, and to consider the implications of their level of knowledge for their role, the advice they give and for training or practice development.

Literature search strategy

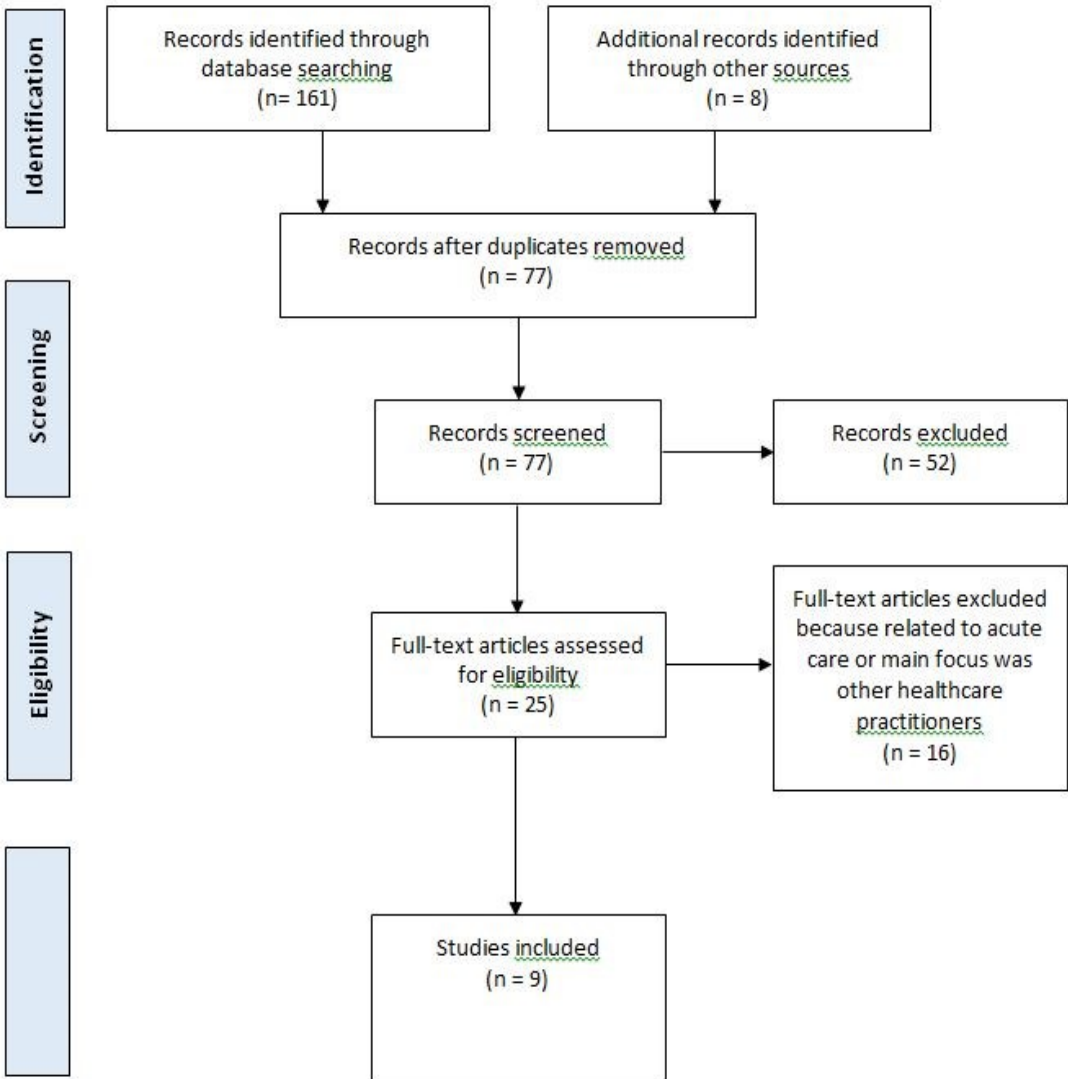
A comprehensive search of the literature was undertaken and is shown in Table 1 and Figure 1. The review revealed a lack of literature related to nurses' roles in breast screening, in particular breast density, in UK publications, but the global nature of the disease and the international advances in diagnostics and treatment suggests the international literature is relevant. Nine articles were considered relevant and included in the review.

Table 1. Literature search criteria

Databases searched	EBSCO Academic Search Complete Cumulative Index of Nursing and Allied Health Literature (CINAHL)
Other sources	Citation search of reference lists from retrieved articles Google search for grey literature
Search terms	Breast cancer OR tumo(u)r OR neoplasm AND Screen* OR mammograph* AND

	Nurs* role OR nurs* duty OR nurs* responsibility OR nurs* intervention
Limiters	Terms found in title/abstract Publication year 2010-2020
Exclusion	Non-English language Acute hospital nursing role

Figure 2. Literature search process (PRISMA flow diagram)



Source: Moher et al (2009)

A summary of the evidence is shown in Table 2. The findings relate to general and primary care nurses' knowledge of breast cancer and the effect on screening uptake of nurses providing education to women.

Table 2. Summary of evidence

Author/country	Research methods and data collection	Sample	Main findings
Nurses' knowledge			
Prolla et al (2015) Brazil	» Descriptive cross-sectional study » Structured self-administered questionnaires and interview	135 hospital cancer nurses (response rate (RR) 88%)	» Average rate of correct answers was 65% with higher rate (>70%) for questions about screening/ diagnosis and treatment, but within these two questions very low rates (2% and 10%) related to age when mammography should be performed and time between screening » Newly qualified nurses scored higher than experienced nurses
Yousuf et al (2012) Saudi Arabia	» Cross-sectional survey » Self-administered questionnaire	210 nurses from primary healthcare centres (RR 50%)	» Nearly all participants scored >50% on general epidemiological knowledge in breast cancer questions » Two-thirds scored over 75% for cancer signs, but risk factor questions were not answered as well » Most participants (62.8%) practised self-examination but only 4% regularly every month
Ghanem et al (2011) Morocco	» Cross sectional survey » Stratified sampling » Self-administered questionnaire	92 nurses and 44 doctors	» Doctors had good knowledge of risk factors while less than half (43%) of the nurses had good knowledge » 81% of doctors compared to 22% of nurses dismissed herbal treatment as a cure for cancer » 75% of all practised self-examination (no difference between professions)
Oluwatosin (2012) Nigeria	Structured questionnaire	120 nurses (RR 66%)	» 23 understood painless lump as early sign of breast cancer compared to 47 who said pain is an early sign » 80.9% indicated breast self-examination as a method of early detection, while 40% and 30% indicated clinical and mammogram as early detection avenues
Ceber et al (2010) Turkey	Experimental post-test only, control group design	291 nurses from 48 primary health centres (RR 96%)	» Mean total knowledge of breast cancer was higher in the experimental group which had breast cancer education and also greater application to early detection practice and higher scores on a health beliefs model scale the control group which had no education

Lemlem et al (2013) Ethiopia	Cross sectional survey	270 hospital nurses randomly sampled (RR 96%)	» 156 of 270 nurses were knowledgeable about breast cancer Knowledge of breast cancer was associated significantly with regular course on nursing, respondents' family history and clinical speciality unit of work
Maimone et al (2017) US	» Multi-site emailed survey (purposive to control for confounding factors) » Aim: to gauge primary care providers' awareness of and familiarity with dense breast legislation and supplemental screening	362 responses (RR: 44%) mainly from doctors but including nurse practitioners and physician assistants (PAs) (n=51, 14%)	» Overall, 68% were aware of breast density notification laws (70% of nurses/PAs) » Implementation of supplemental imaging was variable: 26% offered supplemental exam to all women with dense breasts, 47% only to certain patients based on risk factors, 15% did not offer at all and 11% offered other another type of diagnostic test or examination » 47% felt uncomfortable discussing breast density with their patients » Only 44% stated that there had been local multidisciplinary team discussion about best or agreed patient management
Impact of nurses providing education to women			
Secginli and Nahcivan (2011) Turkey	Randomised control trial of a 2 hour nurse intervention programme which included a film, instruction in breast examination, a reminder calendar and patient leaflet	190 women who had not had clinical breast examination or mammography in the previous 12 months	» At three months the proficiency and knowledge of breast self-examination in the intervention group was 36.1% and 11.8% in control group, decreasing to 27% and 9.7% respectively at six months
Chiarelli et al (2010) Canada	Routine information collected through integrated client management system	» Breast screening uptake in 168,000 women's records analysed » 72% of centres had nurses (n=143) attached	» Significantly more women who visited breast screening centres were likely to return for follow-up and biennial screening compared to centres without nurses » Recommended that breast screening programmes should include educational activities provided by nurses to improve compliance with screening

Findings

The literature suggests that nurses' knowledge of cancer signs and symptoms and the importance of breast self-examination is generally good, but that their knowledge of risk factors and epidemiology is lacking (Ghanem et al 2011, Yousuf et al 2012, Lemlem et al 2013). There also appears to be no correlation between knowledge of breast cancer and factors such as nurses' age, professional qualification or years since qualification (Oluwatosin 2012), although a family history of breast cancer influenced participants' knowledge in Lemlem et al's (2013) survey.

The international literature suggests nurses' knowledge about breast cancer can affect the quality or effectiveness of care provided to women. For example, Ceber et al (2010) found a greater uptake of screening by women who were cared for by nurses who had attended a breast cancer training programme. Similarly, Oluwatosin (2012) showed that nurses with the correct knowledge about signs and symptoms such as painless breast lumps was associated with reports of more appropriate care, for example clinical examination and mammogram as early detection measures. Nurses' influence on cancer screening uptake was shown by Chiarelli et al (2010) in a large regional population analysis of routinely collected breast screening data. The researchers found that significantly more women (86% compared to 77%) returned for screening updates in centres nurses compared to centres without nurses. Similarly, Secginli and Nahcivan (2011) found that three times as many women (36% compared to 12%) who attended a nurse-led education programme practised self-examination three months later compared to those who did not receive the intervention. The difference continued at six months with 27% compared to 10% still practising self-examination.

Only one US study (Maimone et al 2017) addressed nurses' knowledge of breast density specifically and found that 68% of the 362 primary care doctors, nurses or physicians' assistants who responded to the multi-site survey were aware of new breast density notification laws, which require some US states to inform women following mammography of their breast density. However, the survey also reported that respondents lacked familiarity with managing women with dense breast tissue and that there was considerable variation in practice. Nearly half (47%) of respondents felt 'uncomfortable' or only 'slightly comfortable' discussing breast density with their patients and only 44% said there had been local discussion about management strategies. Reasons why practitioners might have felt uncomfortable discussing breast density may reflect the multifaceted nature of advice for women because of the subjectivity of breast density assessment and overall breast cancer risk, combined with variable availability of and access to alternative approaches to screening. To combat this Maimone et al (2017) recommended improved education for practitioners, literature synopses, interdisciplinary discussions, information pamphlets for patients and bolstering of online resources (Maimone et al 2017). These findings are useful for GPNs in the UK as the respondents included nurses working in primary care settings not just cancer or breast screening centres.

Six different measurement indicators with sub variables were used in the studies making comparisons or generalisations difficult. Many of the indicators do not have specificity for knowledge measurement, but can be used as complimentary or proxy measures about relative knowledge (Chiarelli et al 2010, Secginli and Nahcivan 2011).

Many of the studies assessed nurses knowledge of breast cancer and breast cancer screening and drew inferences from this that better patient outcomes were more likely if nurses had good knowledge; whilst the link between a knowledgeable professional and practice is reasonable only Ceber *et al* (2010) explicitly showed this link. This is common with other

research where the impact of education is only measured at the health professional level rather than the subsequent impact on the patient or organisation (Reeves *et al* 2016).

An important feature of four of the studies was the use of a randomisation (Secginli and Nachcivan, 2011; Lemlem et al, 2013) and controlled experimental design (Ceber et al 2010; Maimone et al, 2017) to determine the level and effect of nurses' knowledge in supporting and encouraging women to comply with breast screening. This provides higher order evidence (Ingham-Broomfield, 2016) which appears objective and reliable using methods where potential biases are considered or controlled for.

Discussion

Mammography is the standard screening test for breast cancer and is offered to all women aged between 50 and 70 years in the UK and has been shown to reduce deaths due to breast cancer (NICE 2013, Public Health Agency 2020, Public Health Scotland 2020, Public Health Wales 2020). However, mammography is not reliable for early detection in women with dense breasts as tumours can be missed as they are not visible. For example, evidence suggests that in the UK mammography can miss around 3,500 breast cancers each year (Lee et al 2010, Cruwys and Pushkin 2017). As 40% to 50% of women are considered to have dense breast tissue it is important that nurses such as GPNs who are approached by patients for advice about breast screening know about effective screening procedures for both women with and without dense breasts to advise them appropriately. Maimone et al (2017) showed that primary care practitioners including nurses in the US lacked this knowledge which contributed to their discomfort when talking to women about breast density.

Other screening tests such as ultrasound or MRI in conjunction with mammography can increase substantially the detection of early stage breast cancer in women with dense breasts (Vourtsis and Berg 2019). These screening tests are available routinely in countries such as

the US and France, but are not generally offered to women in the UK (Cruwys 2020) . This is an emerging area of study (Checka et al 2012, Brem et al 2015, Freer 2015) and whilst MRI and ultra-sound are suggested to supplement mammography, Vourtsis and Berg (2019) have noted that the availability of ultrasound is limited due to a shortage of trained operators across Europe and that automated breast sonography may be an option in the future, but at present has too many false positives to be implemented widely.

As MRI is expensive, Vourtsis and Berg 2019 recommend it as a screening method for high risk patients as it appears to reduce the number of women who present at or progress to late stage disease (Vourtsis and Berg 2019). Conversely, DeSantis et al (2015) do not support these alternative screening methods and suggested that mammogram and self-examination can be as effective and should not be overlooked when advising women.

There is growing public awareness of the fact that increased breast density is a risk factor for cancer and an aspect of missed diagnoses. In the US, for example, patient advocacy groups have successfully lobbied for legislation in over 25 states to mandate that women are informed about the density of their breasts following each mammogram (Rhodes et al 2015, Maimone et al 2017). Patient advocacy groups have also been created in the UK and Ireland and information originating from the US has been adapted for Europe (Table 3). A template letter (<http://bit.ly/2UC08tq>) for women to use to request information about breast density has been produced as greater awareness and knowledge can support informed decisions and improve women's confidence in their own breast health surveillance.

Table 3. Patient advocacy groups and links to information

Group	Purpose	Interest or social media link
Dense Breast-info	Website originally set up in the US has a European sister site to provide information to healthcare professionals and patients	https://eu.densebreast-info.org/
Breast Density Matters UK	Facebook page on which to share information about breast density and increase UK patient and healthcare practitioner education	@breastdensitymattersuk
Being Dense	Set up with aim to inform Irish women in particular about the breast cancer risks associated with dense breasts	http://www.beingdense.com twitter: @breastdense

Conclusion

The literature shows that where nurses are knowledgeable about breast cancer, risk factors, screening methods and treatments they can effectively influence women's uptake of breast screening which in turn has a positive effect on earlier detection, treatment and outcomes. Mammography alone may not be appropriate for all women therefore there is a need to ensure that nurses know about and can refer women for other screening methods and support self-examination techniques for women with dense breast tissue. This will help to address concerns about or lack of confidence in the ability of mammography to detect cancer, which may deter some women from accessing breast screening programmes (Azami-Aghdash et al 2015).

The findings imply there is a need for continuing nurse education programmes to enhance their knowledge and practice. GPNs play an important role in promoting breast cancer awareness and uptake of breast screening as they often have more contact than other health professionals with healthy women (Queen's Nursing Institute, 2015) before and after screening takes place. Nurses who are asked for advice about breast screening must have up-to-date knowledge, including about breast density, as different approaches internationally means that internet-based health advice can be confusing, which could affect uptake of screening. Maimone et al (2017) suggested that primary care practitioners can help to address this by holding interdisciplinary discussions so that all team members are aware of clinical management strategies and options and that they should develop information pamphlets available for patients.

Despite undertaking a comprehensive search there was little relevant literature on nurses' roles in breast screening and in particular breast density in UK publications. There is a need for UK-based research that replicates studies undertaken in the US (Maimone et al 2017) to determine GPNs awareness of the factors associated with cancer screening in women with dense breast tissue.

Clearer guidelines on the merits and availability of different screening techniques are also needed to increase uptake and decrease the number of missed cancer cases. Finally, online resources need to be improve, for example greater information on recognised NHS sites, to help people navigate the information and to promote greater awareness and knowledge to enable women to make more informed decisions and improve their confidence in their own breast health surveillance.

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