Radiography 25 (2019) 170–177

Contents lists available at ScienceDirect

Radiography

journal homepage: www.elsevier.com/locate/radi

Review article

Interprofessional work in early detection of breast cancer: An integrative review

B. Strøm [a, *], J.A. Pires Jorge [b], N.R. Meystre [b], T. Kukkes [c], E. Metsälä [d], B.N. Hafslund [a]

[a] Western Norway University of Applied Sciences (HVL), Norway
[b] Haute École de Santé Vaud/University of Applied Sciences and Arts Western Switzerland (HES-SO), Switzerland
[c] Tartu Health Care Colleges (THCC), Estonia
[d] Helsinki Metropolia University of Applied Sciences (METROPOLIA), Finland

ARTICLE INFO

Article history:
Received 5 July 2018
Received in revised form
30 October 2018
Accepted 20 November 2018
Available online 13 December 2018

Keywords:
Mammography
Interprofessional work
Education

ABSTRACT

Objectives: To identify the roles of health care staff in interprofessional work related to breast cancer detection and diagnosis.
Key findings: A comprehensive search was performed using PICO to support inclusion and exclusion criteria. A shortened version of the STROBE checklist ensured evaluation of the studies. 21 included studies resulted in three main categories describing the role of health care professionals; (1) Communicating breast cancer awareness; (2) The Professional's tasks; (3) Efficacy of Interprofessional Teamwork relative to the profession and the individuals.
Conclusions: Health care professionals' roles in the breast cancer diagnostic process were described mostly from each professional's viewpoint. Support from leadership and management is needed in order to promote interprofessional work, which will benefit health care professions, professionals, and the patient.

Introduction

Cancer continues to be a global scourge and the breast cancer rate is increasing. The contribution of breast imaging to the diagnosis of breast cancer is crucial for early detection and improving the survival rate.[1] Complementary examinations are more commonly required.[2,3] The implementation of breast cancer screening programmes is not uniform across Europe, and is highly dependent on national policies, how healthcare is organised, available resources, and other factors. As a result, people with cancer face varying outcomes. This inequality must be addressed properly.[4]

In recent years, the work of health care practitioners has become increasingly collective and client/patient centred.[5] However, professionals in multidisciplinary teams are likely to use their own expertise to develop individual care goals and therefore work more like individual members of a team. Interdisciplinary teams, on the other hand, engage as a team and are able to develop a cohesive care plan, drawing on each other's expertise.[6] Each team member in an interdisciplinary team builds on each other's expertise to achieve common, shared goals. Interprofessionality crosses educational and professional boundaries where a combination of skills and knowledge lead to the achievement of the common shared goals.[7] The ability to work interprofessionally is a core competence in collaborative practice responding to the need for increased and enhanced provision of service in health care to benefit patient outcome.[8] Nevertheless, putting interprofessional collaboration into practice to improve health care is challenging.[9]

Today there is great onus on shared decision-making between the professionals and the client/patient.[10] Interprofessional collaboration takes into account the overall life situation of the client/patient, and the treatment pathway.[11] High quality care in treatment requires collaboration based on open interaction between professions, mutual trust and shared goals.[12] It is evident that interprofessional teamwork is also necessary in the chain of early detection of breast cancer.

The aim of this study was to identify how the interprofessional roles of health care staff have been described, and how each role taking part in the detection and diagnosis of breast cancer has been described.

The following research questions were set:

* Corresponding author.
E-mail address: bst@hvl.no (B. Strøm).

https://doi.org/10.1016/j.radi.2018.11.005

1. How have interprofessional roles of health care staff been described in detection and diagnosis of breast cancer?
2. How has the role of each health care professional taking part in detection and diagnosis of breast cancer been described?

Materials and methods

A comprehensive search was carried out to identify relevant studies focusing on the different types of involvement of health-care professionals in the early detection and diagnosis of breast cancer. Applying the integrative review technique enabled us to synthesize findings covering several interprofessional elements in the chain of early detection and diagnosis of breast cancer generated using different methodologies.[13] We structured the literature search and defined inclusion and exclusion criteria using the Population Intervention Context Outcome (PICO)[14] strategy (Table 1).

Inclusion criteria

The focus was the detection chain of breast cancer: from women first entering the process until the confirmation of the diagnosis by pathologists. Studies describing interprofessional or multiprofessional work by either one or several health-care professionals were included. All types of qualitative, quantitative and review studies in English were included.

Exclusion criteria

Studies about breast cancer treatment follow up, or any other care path phase after final diagnosis, were excluded. Studies that concentrated only on diagnostics, devices and pathology without an inter-professional or multi-professional viewpoint were also excluded. In addition, book chapters, journal articles and congress abstracts were excluded. Research articles published before the year 2000 were not included.

Search strategies

The first author conducted the literature search together with a health librarian. The search was carried out between the 20th and 29th of February 2016. An updated search was revised in December 2017 to ensure inclusion of the most recent research literature. A list of Medical Subject Headings (MeSH terms) was drawn up with a broad set of keywords. The following databases were searched: CINAHL, MEDLINE, Embase, Web of Science, ERIC and The Cochrane Library. The search performed in The Cochrane Library yielded no relevant results. Fig. 1 illustrates the retrieval process.

Table 1
The PICOs in search questions 1 and 2.

The PICO for question 1	The PICO for question 2
P*opulation*: health care staff	***P****opulation*: health professional
I*ntervention:* detection and diagnosis	***I****ntervention:* taking part in detection and diagnosis
C*ontext:* breast cancer diagnostic process	***C****ontext:* breast cancer
O*utcomes of Interest:* interprofessional role	***O****utcomes of Interest:* role

PICOs.
1. How have interprofessional roles (O) of health care staff (P) been described in detection and diagnosis (I) of breast cancer (C)?
2. How has the role (O) of each health care professional (P) taking part in detection and diagnosis (I) of breast cancer (C) been described?

The first author carried out the title selection. First and second authors conducted the abstract selection independently. The agreement was 73% (117/62). In order to achieve 100% consensus the definition of the beginning and end of the mammography chain in early detection and diagnosis of breast cancer had to be clarified. The first author read and appraised all 38 full-text articles. The second and third authors were allotted half of the full-text articles each, and followed the same procedure. All studies were independently appraised, and the agreement was 13/18 and 17/20, respectively. The Joanne Briggs Institution critical appraisal form was used[14] to evaluate the theoretical background and the methodological description of studies. A shortened version of the STROBE[15,16] checklist ensured evaluation of all types of studies in this integrative review, and has also been used in other published reviews.[17–19]

The search process

The search in all the databases resulted in 5079 studies, mostly irrelevant to these research questions. After the title selection, 117 abstracts were read and 79 excluded as irrelevant, 38 full-text articles were read and critically appraised. The most common reasons for exclusion were a lack of relevance, not defined as encompassing the chain of early detection of breast cancer, and a focus limited to technical devices (n = 11). The articles excluded after critical assessment were those with more than 4 assessment criteria marked as *hardly or not at all satisfied* (n = 6). The critical assessment process of the 21 included articles is presented in Table 2.

Description of the selected studies

15 articles described one profession's role in the team related to early detection of breast cancer: radiographers,[20–26] nurses,[27–30] radiologists[31–33] and midwives.[34] Six out of the 21 included studies described several professionals' roles in the team.[35–40] The following professions were mentioned: radiographers, radiologists, nurses, midwives and physicians. Most of the studies were quantitative (n = 17), the remaining ones included a literature review, one mixed-method study, a study with a qualitative design and one case study.

Data analysis

The different designs of the 21 included studies were analysed by using a suitable method that allowed for combination when extracting contents. With the two research questions and the PiCO in mind, a deductive thematic analysis was used to categorise the findings illustrated in Table 3. The data extraction stemmed from the description of the role and how each profession taking part in the chain of early detection of breast cancer was categorised and coded according to Whittemore & Knafl.[13] The characteristics of the included studies are presented in Table 4.

Results

Following the analysis of how the professions' roles and their interprofessional participation were described, three main categories of descriptions were identified: *Communication*, *Professional tasks* and *Efficacy of Professional teamwork*. For each of these main categories we identified 2-2-3 sub-categories, respectively (Table 3).

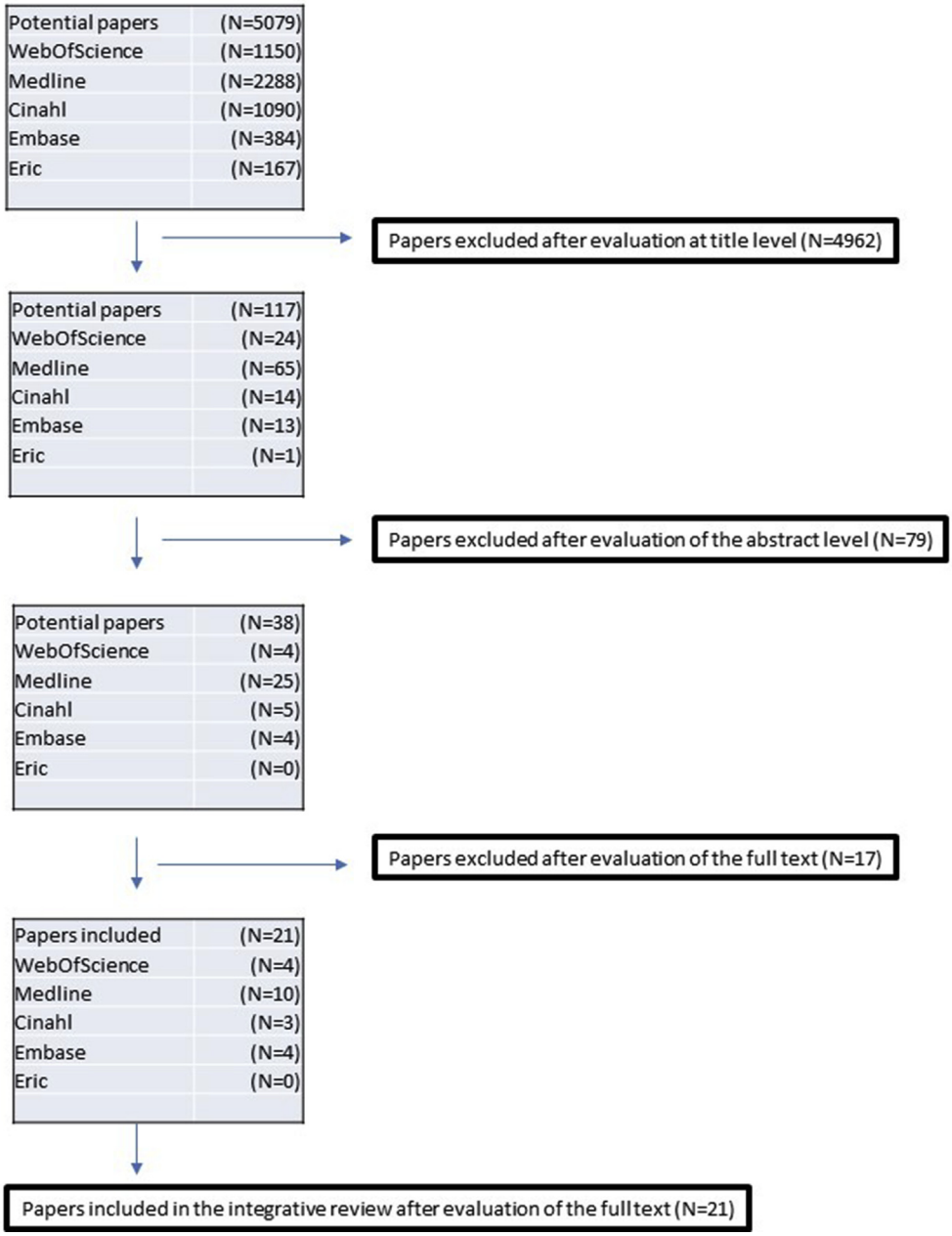

Figure 1. The selection process of the studies.

Communicating breast cancer awareness

Communicating breast cancer awareness comprised two subcategories: Health Promotion and Patient Support. In Health Promotion, the described roles provided verbal and written information, and explained the benefits of screening. To promote awareness among patients, educating and encouraging the population to participate in cancer screening was described as necessary. The purpose of providing patient support is to explain and give emotional support before, during and after the breast imaging examination. This also included the use of assessment questionnaires to identify women at high risk (Table 3 – Category 1).

Professional tasks

In professional tasks, the subcategories were Role Expansion and Qualifications. Different types of role expansion were described for all professions; they included educating the public about one's own profession, educating about the benefits of the screening programme, and patient counselling. Performing different tasks, such as needle biopsy (SNCB), clinical breast examination (CBE) and ultrasound examinations, were mentioned. Identification of suspicious findings in mammograms and reporting examination results were also described in relation to certain professions. Several professions described qualifications, such as a higher awareness of breast cancer and improved confidence when explaining the entire diagnostic process to the patient. Greater confidence enabling practitioners to voice reasoned arguments in team meetings was also mentioned. For radiographers there was specific mention of improved communication skills. Continuous training and education were mentioned as necessary to maintain the current level of competencies and standard of service, and were indicated as non-problematic (Table 3 – Category 2).

Table 2
Critical assessment criteria of the included studies.

Assessment criteria of the studies										
Ref.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
(27)	**	**	**	**	*	**	*	**	**	**
(20)	**	**	**	**	*	*	–	**	*	*
(31)	**	**	**	**	*	**	*	**	*	*
(35)	**	*	*	**	**	**	*	**	**	*
(31)	*	**	**	**	–	**	*	**	**	*
(28)	**	**	**	**	*	**	*	**	**	**
(29)	**	**	**	**	**	**	*	**	**	**
(49)	**	**	**	**	*	**	**	**	**	**
(37)	**	**	**	**	*	**	*	**	**	**
(22)	*	**	**	**	*	**	*	**	**	**
(65)	**	**	*	**	*	**	*	**	–	*
(73)	**	**	*	*	*	*	–	**	*	*
(38)	**	**	*	*	*	*	–	*	**	*
(32)	**	**	**	**	**	**	*	**	**	*
(25)	**	**	**	**	x	**	*	**	–	*
(24)	**	*	**	*	**	**	*	**	*	*
(23)	*	**	*	*	–	*	–	**	*	*
(33)	**	**	*	*	*	*	–	*	*	*
(26)	**	**	**	**	*	*	–	**	*	**
(39)	**	**	**	*	–	*	–	*	*	*
(40)	**	**	**	x	x	*	–	*	–	**

1. Study background and theoretical framework is clearly defines.
2. Purpose, aim and research question are clearly defined.
3. The design is clearly stated.
4. The setting is clearly described.
5. Independent and dependant variables, confounders are clearly described.
6. Data sources and analysis methods are clearly described.
7. Efforts to address potential sources of bias are described.
8. Research questions are answered logically.
9. Study limitations and generalisability are discussed.
10. Relevance to the topic.
**Assessment criteria are satisfied.
*Assessment criteria are partly satisfied.
- Assessment criteria are hardly or not at all satisfied.
X Assessment criteria do not apply.

Efficacy of interprofessional teamwork

Efficacy of interprofessional teamwork comprised three subcategories: The Profession and The individual, The Health Care Team, and The Patient Experience. The impacts mentioned for the professions and the individuals were higher qualifications in general, as well as greater respect, influence and responsibility leading to the growth of the specific profession for those taking part in the chain of early detection of breast cancer. Having a more advanced and expanded role increased job satisfaction and motivation. Together, all these factors were mentioned as strengthening the trust and confidence in the profession. The benefits described for the health-care team were greater flexibility, fewer misunderstandings and less work overlap. Mutual feedback possibilities improved communication for the health care team, and enabled the necessary shared decision-making in early detection in mammography. The described patient impact was less anxiety and stress, as well as lower pain score. For the patient, interprofessional teamwork influenced the recall rate and increased understanding of breast cancer. Overall, improvements in the mammography chain also benefit the patient (Table 3 – Category 3).

Discussion

Communicating breast cancer awareness

It is a well-known fact that health promotion interventions boost breast cancer awareness and screening, and it is imperative that the health-care professionals responsible for communicating breast cancer awareness are knowledgeable and skilled. Breast screening can have both positive and negative effects on individuals, and ethical and legal considerations suggest that women should be fully informed about the benefits, limitations and potential harms of a screening process and its aftermath.[41]

Health-care staff also teach women how to perform breast-self-examination (BSE). There is contradictory evidence about the usefulness of educational interventions in breast self-examination. There is inadequate evidence of the effect of BSE.[1] Nevertheless, BSE is recommended for raising awareness among women at risk rather than as a screening method.[42]

There are several tools, which enable a woman to calculate her individual risk of breast cancer. These tools are based on statistical models. For example the Gail model.[43] The Gail Model includes 7 key factors, and health-care professionals involved in the breast cancer diagnosis process are a key factor in advising women on how to estimate their breast cancer risk, and offering informed interpretations of such estimates without causing unnecessary fear or worry.

Professional tasks

As a concept, role extension implies supplementary skills and responsibilities that extend beyond the statutory responsibilities and competencies at the point of professional registration.[44] For some professionals, role extension meant performing clinical breast examinations[30,34] and informing the patient about the results.[27] Radiographers mentioned performing needle biopsies,[21,23,25] ultrasound examinations,[23,25] and reporting mammograms[24,25,38] as their role extension. None of these roles are routine procedures for radiographers, which means that they are supplementary skills or extended responsibilities.

The advanced radiography practitioner is identified as someone who has progressed professionally to a higher level than colleagues through role extension, and has the ability to direct and encourage service delivery within their specialist area.[44] Mammography is a specialist area and in several studies professional growth[21,23–26] and shared responsibility[22,37,38] were mentioned as contributing to deliver high quality service in the chain of early detection of breast cancer. The wording of these descriptions appears to indicate an advanced role for the radiographer. In many countries, role advancement has occurred in response to practical considerations, such as shortages of physicists/radiologists and cost-saving measures, coupled with radiographers' willingness to develop their own work.[45] Although the evidence surrounding advanced practice is still limited, the focus should be on providing improved and safer services to the patient/clients.[46,47]

Training is necessary to maintain the current level of competence and standard of service. A majority of radiographers indicated that they were prepared to undertake more responsibilities, provided that the necessary training was available. They did not believe that extra training and education presented a challenge for them.[20,25] Also, a shared understanding of and consensus regarding each professional group's tasks and work assignments within the interprofessional team is necessary.[7] To achieve this, access to quality education and training in the form of face-to-face as well as e-learning CPD courses for all health-care professionals involved in the breast cancer diagnostic process is important. This should be taken into account by policy-makers and stakeholders who are the ones who design breast cancer diagnostic guidelines.

Efficacy of professional teamwork

From the viewpoint of individual health-care professionals and professions, teams, and patients, the interprofessional approach

Table 3
Findings from interprofessionals health care staff roles and participation in detection and diagnosis of breast cancer.

Findings		Ref.	Profession
I.	**Communicating Breast Cancer Awareness**		
I.I	***Health Promotion***		
	Describing symptoms and benefits of early treatment	20,26,28,35	Radiographer, Nurse, Midwife
	Providing written information	27	Nurse
	Explaining awareness, risk and benefits of screening	20,26–29,35	Radiographer, Nurse, Midwife
	Explaining breast self-examination BSE	27,35	Nurse, Midwife
	Motivating and encouraging to seek doctors consultation	20,26	Radiographer
I.2	***Patient support***		
	Explaining the procedure and possible sensation of pain	28,29	Nurse
	Providing emotional support and dealing with stress	20,26–29,36	Radiographer, Nurse
	Identifying patient at risk - RAQ	27,39	Nurse, Radiographer
	Information when informed about having breast cancer	36	Nurse
	Communicating in case of abnormal screening findings	31	Radiologist
	Better when they work only at BDC	31	Radiologist
2.	**Professionalś tasks**		
2.I	***Role expansion***		
	Educating the public about the profession	33	Radiologist
	Delivering health promotion + counselling	21,23,26	Radiographer
	Lecturing to the public about mammography screening	32	Radiologist
	Perform risk analysis	26,39	Radiographer
	Monitoring the women at the examination	29	Nurse
	Preforming SNCB – needle biopsy	21,23,25	Radiographer
	Performing Clinical Breast Examination – CBE	23,30,34	Midwife, Nurse
	Performing ultrasound	23,25	Radiographer
	Identifying suspicious mammogram findings	38	Radiographer
	Reporting mammograms; alone and as second/third	23,24	Radiographer
	Informing the patient about the result	27	Nurse
	Willingness of role extension possibilities	23	Radiographer
2.2	***Qualifications***		
	Increased confidence to deliver health promoting messages	20	Radiographer
	Confidence to respond to symptoms of emotional distress	20,26,35	Radiographer, Nurse, Midwife
	Increased communication skills	36	Radiographer
	Increased capability to detect small lumps	30	Nurse
	Increased awareness of breast cancer	20,35	Radiographer, Nurse, Midwife
	Being able to deliver reasoned arguments	21	Radiographer
3.	**Efficacy of Interprofessional teamwork**		
3.I	***The profession and the individual***		
	Growth of the profession, respected, acknowledgement	21,23–26	Radiographer
	Awareness of role influences – clarifying the professional role	22,37,38	Radiologist, Radiographer, Nurse
	Increase in quality	22	Radiographer, Radiologist
	Increase in job satisfaction/motivation	23,35	Nurse, Midwife, Radiographer
	Being part of decisions making - responsibility	23,27	Nurse, Radiographer
	Perceived improvement needs	23–25,34,38	Midwife, Nurse, Radiographer
3.2	***The Health Care Team***		
	Greater flexibility and increased biopsy capacity	21	Radiographer
	Reduced waiting time for the results	25,32,40	Radiographer, Nurse, Radiologist
	Addresses the shortage of radiologists	24	Radiographer
	Reduction in the retention of experienced radiographers	24	Radiographer
	Mutual feedback possibilities	21,40	Nurse, Radiographer, Radiologist
	Decreases misunderstandings and work overlap	22,25,40	Radiographer, Nurse, Radiologist
	Improved communication and shared decision making	25,40	Radiographer, Nurse, Radiologist
	Decrease in the recall rate	37,38	Radiographer, Radiologist
3.3	***The Patient Experience***		
	Increased understanding of BC and encouraged attendance	32	Radiologist
	More time with the patient	21,26	Radiographer
	Lower state of anxiety	28,32,33	Nurse, Radiologist
	Lower pain score	29	Nurse
	Lower stress and increased patient fighting spirit	36	Nurse
	Reduced recall rate	38	Radiographer, Radiologist
	Improved mammography chain	25,32	Radiologist, Radiographer

has several benefits. It strengthens each profession, since in the interprofessional context the uniqueness of each profession becomes more visible.[21,22,26,37,38] Also, work motivation and satisfaction increase when participating in shared decision-making, learning from other health-care professionals, sharing experience, and witnessing the improved quality of care and diagnostics.[22,27,30,34,35]

For health-care teams, the benefits of the interprofessional work model include more flexibility in performing tasks, occasional opportunities to replace other professionals for certain tasks, the possibility to give and receive timely feedback, fewer errors and misunderstandings, as well as lower patient recall rate.[21,32,37,38,40] However, in order to reach these benefits, all professionals involved must be motivated to work together, believe in the benefits of this model, receive support from the leaders, and have the necessary education and training. It is important to clarify staff members' roles, and continuously monitor that the processes lead to the goal. This also helps the patient to understand the team members' contribution in the chain.

Table 4
Characteristics of reviewed studies.

Ref.	Author/Year/ Country	Design/Method	Sample	*Descriptions of interprofessional roles of health care staff in detection and diagnosis of breast cancer*
23	Moran, S., J. K. Taylor, et al., 2013. (AU)	Questionnaires/ Thematic analysis	N = 253/ radiographers	Current workforce advantages/concerns: Important, skilled work, dedication/ Lack of recognition and limitations. Potential workforce advantages/concerns: Professional recognition, responsibility/voluntary and specialties. Patient care: Improved outcomes and reduced waiting time. Role changes in the past 5–10 years: increase in duties 29%, undertake procedures 20%, US examinations.
24	Moran, S. and H. Warren-Forward 2011. (AU)	Experiment	N = 9/ radiographers	Sensitivity: screen readers 79% and 93%, radiographers 57%–97%. Specificity: screen readers 82% and 84%, radiographers between 63 and 80%. Two radiographers attained higher sensitivity results than the current readers. Strategies needed to address shortages of radiologists and retention of experienced radiographers.
25	Moran, S. and H. Warren-Forward 2011. (AU)	Survey/ Questionnaire	Estimated N = 300 –350/ radiographers	Levels of interest: Image interpretation 73%, Training 57%, Core biopsies 50%, Health promotion 44%, Counselling 43%, Ultrasound 43%. 79% prepared to undertake more responsibilities with training. 47% involved in core biopsies and localizations, increased interest 66%, increased professional equity 47%. Positive/negative reasons for role extension: Increased job satisfaction, responsibility, professional recognition and to provide more timely service to women/Increased stress, higher recall rate, lack of acceptance and increased shortage of radiographers.
33	O'Mahony, N., E. McCarthy, et al., 2012. (IE)	Survey/ Questionnaire	N = 306/women	Radiologist qualifications/job: 76% of patients believed that radiologists held radiography degrees/take X-rays, perform scans, and report to the doctor. Lack of awareness amongst patients and in paramedical disciplines regarding roles and responsibilities of radiologist.
34	Kaviani, A., B. Delavar, et al., 2006. (IR)	Cross-sectional study	N = 4/midwives	The inter-observer agreement (kappa) for mass detection was 36%, which indicates a fair agreement. For the necessity of referring the patient to a surgeon, the kappa value was 38%, categorized as fair.
38	Leader, J. K., C. M. Hakim, et al., 2006. (US)	Experiment/ Intervention	Technologists/ radiologists	Identify suspicious screening mammography examinations. Adding images from the prior screening examination to the images from the current examination had the greatest positive effect on the radiologists' performance when interpreting. Can reduce recall rates by 50%.
39	Shah, C., S. Berry, et al., 2012. (US)	Survey/ Questionnaire	N = 5878/women	17.2% of women were found to be at high risk based on the Gail model. Identification of women at high risk for BC can be incorporated into an annual screening mammography visit using an RAQ.
40	Taplin, S. H., S. Weaver, et al., 2015. (US)	Case study	Nurses/ radiologists/ technologists	Establishing explicit goals of care. Clarifying roles in care. Involving patients as partners. Managing interdependent tasks within and across groups. Identifying implications for practice.
				Descriptions of health professional participation in detection and diagnosis of breast cancer
20	Burgess, C., E. Teasdale, et al., 2012. (UK)	Intervention/Semi-structured interviews	N = 25/ radiographers	Radiographers who completed the training increased their confidence to deliver health-promoting messages describing symptoms, explaining risk, explaining breast awareness advice, discussing benefits of early treatment, delivering intervention in a motivating style, dealing with distress. Benefits of training: increase own breast cancer awareness.
21	Dixon, A. M. and C. Dearnley 2008. (UK)	Case study/ modified 'open' style questioning/ grounded theory	N = 14/ radiographers	Role extension in SNCB leads to greater flexibility and increased biopsy capacity. More time with the patient. Give feedback and argument in multidisciplinary team. Radiographer feels respected and professional growth.
22	Henderson, L. M., M. W. Marsh, et al., 2015. (US)	Survey	N = 912/433 Mammography technologists	Nonlead technologists were more likely to have a mentor than to be a mentor and reviewed mammograms with other technologists more frequently, compared with lead technologists. Lead technologists were more likely to mark screening mammogram images prior to the radiologist's review Nonlead technologists reported a more frequent direct face-to-face interaction with radiologists compared with lead technologists, and communicated more frequently with radiologists. 50.6% of lead and 62.6% of nonlead technologists reported discussing diagnostic mammograms with radiologists.
27	Benito, L., G. Binefa, et al., 2014. (Es)	Literature review/ content analysis	22 articles/nurses	Participation in multidisciplinary team meetings and decision-making processes. Monitoring the process of providing care. Providing verbal and written information throughout the process, and explaining and expounding the benefits of screening. Encouraging the population to participate in cancer screening. Identifying the physical, social, and psychological needs of patients. Training patients on breast abnormalities.
28	Fernandez-Feito, A., A. Lana, et al., 2015. (ES)	Randomized controlled trial (RCT)	N = 436/Spanish women	Women of the experimental group had 60% less probability of having a high anxiety state. Regarding trait anxiety, no differences were observed between groups. The stratified analysis showed that this positive impact was greater in women who did not fear the screening outcome or breast cancer.
29	Fernandez-Feito, A., A. Lana, et al., 2015. (ES)	Randomized controlled trial (RCT)	N = 436/women	The entire nursing intervention had a positive effect on the pain experienced by women during the mammography, 26.3% of the women in the control group experienced pain during the test, while the incidence of pain in the experimental group was 19%. The effect of the intervention was greater in women with the highest levels of Trait anxiety or State anxiety. Compared with normal care, women who received nursing intervention had a significantly lower pain score. 93.2% of the women in the control group and 94.8% in the experimental group were completely satisfied with the care provided in the screening program.

(*continued on next page*)

Table 4 (*continued*)

Ref.	Author/Year/ Country	Design/Method	Sample	*Descriptions of interprofessional roles of health care staff in detection and diagnosis of breast cancer*
30	Iannotti, R. J., L. J. Finney, et al., 2002. (US)	Intervention/pre and post-test	N = 38/female nurse practitioners	Estimated size of detectable lesion was unrelated to timing of training and training in nursing school, estimated size of detectable lesion was marginally related to prior training with a breast model. Following training, trainees were successful at detecting most of the 18 lumps in the test models. Trainees reported a significant decrease in the size of breast lesions they could detect after training. The training had a significant effect on trainees' estimates of their detection abilities.
31	Carney, P. A., M. Kettler, et al., 2009. (US)	Surveys/	N = 257/ radiologists	Very few (<6%) reported routinely communicating with women when screening mammograms were either normal or abnormal. 47% routinely communicated with women when their diagnostic mammograms were normal, while 77% often or always communicated with women when their diagnostic exams were abnormal. Those who spent 40–79% of their time in breast imaging (94.6%) were more likely to be frequent communicators compared to those who spent less time.
35	Ceber, E., M. Turk, et al., 2010. (TR)	Experimental post-test	N = EG 157 and CG 134/nurses and midwives	The mean knowledge score on epidemiology, symptoms, early detection, risk factors of breast cancer, knowledge of BSE for the experimental group were 28:18 and the control group 21:02 There were no significant differences in perceived susceptibility, seriousness of breast cancer, benefits of BSE and barriers to BSE. No significant association was found between health beliefs, BSE, and mammography in the experimental group or in the control group. Those working in primary health care settings are ideal providers of education about breast cancer and early detection practices.
36	Fukui, S., K. Ogawa, et al., 2008. (JP)	Randomized design (RTC)	N = 84 in EG and N = 9 in CG/women	Support from CST trained nurse has reduced psychological distress and improved coping among patients informed of their cancer diagnosis.
37	Henderson, L. M., T. Benefield, et al., 2015. (US)	Retrospective cohort study	N = 372/ radiologists, N = 356/ technologists	The results of the likelihood ratio tests indicate that the technologists had a statistically significant effect on the radiologists' recall rate, sensitivity, specificity, and CDR for both SFM and FFDM.

From the patient's viewpoint, it is beneficial to be supported by a team sharing the same values, as opposed to situations where patients encounter different professionals performing solely their own professional tasks. The practice of interprofessional teamwork in breast cancer diagnostics produces more patient-centred, coordinated and seamless services. These in turn reduce unnecessary patient anxiety and worry.[28,29,32,33] The time saved thanks to a reduced occurrence of mistakes and delays can be utilised to address the individual needs of patients.[22,40] This improves the mammography experience, which, according to studies, has a great impact on mammography attendance rates.[21,26]

Limitations

This review was blinded and framed by a pre-stated search strategy in order to control and avoid potential biases in this literature review. Nevertheless, this study has some limitations. This study found no role description for some health care professions involved in the breast cancer detection and diagnosis pathway such as pathologists and biomedical laboratory scientists. Moreover, an extension of the keywords linked to the aim of the study could have been considered, for example *staff development* and *work environment* would have been pertinent to produce valid results about interprofessional collaboration of health care professions.

Conclusions

In the studies reviewed, health care professionals' roles in the breast cancer diagnostic process were mostly described from each professional's viewpoint. In other words, professional roles are described from a multidisciplinary team perspective. Few studies were found in which the professional was described as a member of an interprofessional team, though the benefits of the interprofessional method were widely recognised. As interdisciplinary teamwork requires not only working in a group as an individual (multidisciplinary perspective), but also collaborative engagement in all aspect of the teamwork (interdisciplinary perspective), support from leadership and management is needed in order to foster interprofessional work, which benefits health-care professions, professionals, and patients. In addition, the education, training and professional development of health practitioners must integrate the interdisciplinary perspective from the outset by fostering acquisition of teamwork skills and competencies to promote effective interprofessional collaboration during clinical work placements.

Conflict of interest

None noted conflict of interest.

Acknowledgements

The European Commission's support for the production of this publication does not constitute an endorsement of the contents, which reflects the views only of the authors, and the Commission cannot be held responsible for any use, which may be made of the information contained therein.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.radi.2018.11.005.

References

1. *Strategies IWGotEoC-P, Organization WH. Breast cancer screening: IARC.* International Agency for Research on Cancer; 2016.
2. Tagliafico AS, Bignotti B, Rossi F, Signori A, Sormani MP, Valdora F, et al. Diagnostic performance of contrast-enhanced spectral mammography: systematic review and meta-analysis. *Breast* 2016;**28**:13–9.
3. Vedantham S, Karellas A, Vijayaraghavan GR, Kopans DB. Digital breast tomosynthesis: state of the art. *Radiology* 2015;**277**(3):663–84.

4. Perry N, Puthaar E. *European guidelines for quality assurance in breast cancer screening and diagnosis*. European Communities; 2006.
5. Reeves S, Fletcher S, Barr H, Birch I, Boet S, Davies N, et al. A BEME systematic review of the effects of interprofessional education: BEME Guide No. 39. *Med Teach* 2016;**38**(7):656–68.
6. Ferguson M. *Multidisciplinary vs. Interdisciplinary teamwork: becoming a more effective practitioner: swhelper*. 2014. updated 2014/01/14. Available from: https://www.socialworkhelper.com/2014/01/14/multidisciplinary-vs-interdisciplinary-teamwork-becoming-effective-practitioner/.
7. Sheehan D, Robertson L, Ormond T. Comparison of language used and patterns of communication in interprofessional and multidisciplinary teams. *J Interprof Care* 2007;**21**(1):17–30.
8. Suter E, Arndt J, Arthur N, Parboosingh J, Taylor E, Deutschlander S. Role understanding and effective communication as core competencies for collaborative practice. *J Interprof Care* 2009;**23**(1):41–51.
9. Nancarrow SA, Booth A, Ariss S, Smith T, Enderby P, Roots A. Ten principles of good interdisciplinary team work. *Hum Resour Health* 2013;**11**(1):19.
10. Shay LA, Lafata JE. Where is the evidence? A systematic review of shared decision making and patient outcomes. *Med Decis Making* 2015;**35**(1):114–31.
11. Elwyn G, Frosch D, Thomson R, Joseph-Williams N, Lloyd A, Kinnersley P, et al. Shared decision making: a model for clinical practice. *J Gen Intern Med* 2012;**27**(10):1361–7.
12. D'amour D, Oandasan I. Interprofessionality as the field of interprofessional practice and interprofessional education: an emerging concept. *J Interprof Care* 2005;**19**(sup1):8–20.
13. Whittemore R, Knafl K. The integrative review: updated methodology. *J Adv Nurs* 2005;**52**(5):546–53.
14. Institute JB. *Joanna Briggs institute reviewers' manual*. 2011 edition. Joanna Briggs Institute; 2011.
15. da Costa BR, Cevallos M, Altman DG, Rutjes AW, Egger M. Uses and misuses of the STROBE statement: bibliographic study. *BMJ Open* 2011;**1**(1):e000048.
16. Vandenbroucke JP, Von Elm E, Altman DG, Gøtzsche PC, Mulrow CD, Pocock SJ, et al. Strengthening the reporting of observational studies in epidemiology (STROBE): explanation and elaboration. *PLoS Med* 2007;**4**(10):e297.
17. Hafslund B, Nortvedt MW. Mammography screening from the perspective of quality of life: a review of the literature. *Scand J Caring Sci* 2009;**23**(3):539–48.
18. Metsälä E, Henner A, Ekholm M. Quality assurance in digital dental imaging: a systematic review. *Acta Odontol Scand* 2014;**72**(5):362–71.
19. Metsälä E, Meystre NR, Jorge JP, Henner A, Kukkes T, dos Reis CS. European radiographers' challenges from mammography education and clinical practice—an integrative review. *Insights Imaging* 2017:1–15.
20. Burgess C, Teasdale E, Omar L, Tucker L, Ramirez AJ. Training radiographers to deliver an intervention to promote early presentation of breast cancer. *Radiography* 2012;**18**(4):232–7.
21. Dixon AM, Dearnley C. Radiographer-performed stereotactic needle core biopsy: making a difference. *Radiography* 2008;**14**(Suppl. 1):e85–90.
22. Henderson LM, Marsh MW, Benefield T, Pearsall E, Durham D, Schroeder BF, et al. Characterizing the mammography technologist workforce in North Carolina. *J Am Coll Radiol* 2015;**12**(12 Pt B):1419–26.
23. Moran S, Taylor JK, Warren-Forward H. Assessment of the willingness of Australian radiographers in mammography to accept new responsibilities in role extension: Part two – qualitative analysis. *Radiography* 2013;**19**(2):130–136 7p.
24. Moran S, Warren-Forward H. A retrospective study of the performance of radiographers in interpreting screening mammograms. *Radiography* 2011;**17**(2):126–31.
25. Moran S, Warren-Forward H. Assessment of the willingness of radiographers in mammography to accept new responsibilities in role extension: Part one – quantitative analysis. *Radiography* 2011;**17**(4):270–274 5p.
26. Omar L, Burgess CC, Tucker LD, Whelehan P, Ramirez AJ. Can radiographers be trained to deliver an intervention to raise breast cancer awareness, and thereby promote early presentation of breast cancer, in older women? *Radiography* 2010;**16**(2):101–7.
27. Benito L, Binefa G, Lluch T, Vidal C, Milà N, Puig M, et al. Defining the role of the nurse in population-based cancer screening programs: a literature review. *Clin J Oncol Nurs* 2014;**18**:E77–83 1p.
28. Fernandez-Feito A, Lana A, Baldonedo-Cernuda R, Pilar Mosteiro-Diaz M. A brief nursing intervention reduces anxiety before breast cancer screening mammography. *Psicothema* 2015;**27**(2):128–33.
29. Fernandez-Feito A, Lana A, Cabello-Gutierrez L, Franco-Correia S, Baldonedo-Cernuda R, Mosteiro-Diaz P. Face-to-face information and emotional support from trained nurses reduce pain during screening mammography: results from a randomized controlled trial. *Pain Manag Nurs* 2015;**16**(6):862–70.
30. Lannotti RJ, Finney LJ, Sander AA, De Leon JM. Effect of clinical breast examination training on practitioner's perceived competence. *Cancer Detect Prev* 2002;**26**(2):146–8.
31. Carney PA, Kettler M, Cook AJ, Geller BM, Karliner L, Miglioretti DL, et al. An Assessment of the likelihood, frequency, and content of verbal communication between radiologists and women receiving screening and diagnostic mammography. *Acad Radiol* 2009;**16**(9):1056–63.
32. Lee J, Hardesty LA, Kunzler NM, Rosenkrantz AB. Direct interactive public education by breast radiologists about screening mammography: impact on anxiety and empowerment. *J Am Coll Radiol* 2016;**13**(1):12–20.
33. O'Mahony N, McCarthy E, McDermott R, O'Keeffe S. Who's the doctor? Patients' perceptions of the role of the breast radiologist: a lesson for all radiologists. *Br J Radiol* 2012;**85**(1020):e1184–9.
34. Kaviani A, Delavar B, Noparast M, Hatmi Z, Najafi M, Haghighat S, et al. The accuracy of midwives' clinical breast examination in detection of breast lumps. *Asian Pac J Cancer Prev* 2006;**7**(2):279–82.
35. Ceber E, Turk M, Ciceklioglu M. The effects of an educational program on knowledge of breast cancer, early detection practices and health beliefs of nurses and midwives. *J Clin Nurs* 2010;**19**(15–16):2363–71.
36. Fukui S, Ogawa K, Ohtsuka M, Fukui N. A randomized study assessing the efficacy of communication skill training on patients' psychologic distress and coping. *Cancer* 2008;**113**(6):1462–70.
37. Henderson LM, Benefield T, Marsh MW, Schroeder BF, Durham DD, Yankaskas BC, et al. The influence of mammographic technologists on radiologists' ability to interpret screening mammograms in community practice. *Acad Radiol* 2015;**22**(3):278–89.
38. Leader JK, Hakim CM, Ganott MA, Chough DM, Wallace LP, Clearfield RJ, et al. A multisite telemammography system for remote management of screening mammography: an assessment of technical, operational, and clinical issues. *J Digit Imag* 2006;**19**(3):216–25.
39. Shah C, Berry S, Dekhne N, Lanni T, Lowry H, Vicini F. Implementation and outcomes of a multidisciplinary high-risk breast cancer program: the William Beaumont Hospital experience. *Clin Breast Cancer* 2012;**12**(3):215–8.
40. Taplin SH, Weaver S, Chollette V, Marks LB, Jacobs A, Schiff G, et al. Teams and teamwork during a cancer diagnosis: interdependency within and between teams. *J Oncol Pract* 2015;**11**(3):231–8.
41. Agide FD, Sadeghi R, Garmaroudi G, Tigabu BM. A systematic review of health promotion interventions to increase breast cancer screening uptake: from the last 12 years. *Eur J Publ Health* 2018 Dec 1;**28**(6):1149–55.
42. WHO. Breast cancer: prevention and control 2017 [Available from: http://www.who.int/cancer/detection/breastcancer/en/index3.html.
43. Gail MH, Brinton LA, Byar DP, Corle DK, Green SB, Schairer C, et al. Projecting individualized probabilities of developing breast cancer for white females who are being examined annually. *JNCI: J Natl Cancer Inst* 1989;**81**(24):1879–86.
44. Hardy M, Snaith B. Role extension and role advancement—is there a difference? A discussion paper. *Radiography* 2006;**12**(4):327–31.
45. Grehan J, Butler M-L, Last J, Rainford L. *The introduction of mandatory CPD for newly state registered diagnostic radiographers: an Irish perspective*. Radiography; 2017.
46. Hardy M, Johnson L, Sharples R, Boynes S, Irving D. Does radiography advanced practice improve patient outcomes and health service quality? A systematic review. *Br J Radiol* 2016;**89**(1062):20151066.
47. Thom S. Does advanced practice in radiography benefit the healthcare system? A literature review. *Radiography* 2017;(24):1–24.