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Radiographer involvement in mammography image interpretation: A survey of United Kingdom practice

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ABSTRACT

Breast cancer is most often diagnosed using x-ray mammography. Traditionally mammography images have been interpreted and reported by medically qualified practitioners – radiologists. Due to radiologist workforce shortages in recent years some non-medical practitioners, radiographers, now interpret and report mammography images. The aims of this survey were to describe the characteristics and practices of radiographers who interpret and report mammography images in NHS hospitals in the UK, and in particular to establish the extent of their practice beyond low-risk asymptomatic screening cases.

This service evaluation demonstrated that UK radiographers are interpreting and reporting images across the full spectrum of clinical indications for mammography including: low-risk population screening, symptomatic, annual surveillance, family history and biopsy/surgical cases. The survey revealed that radiographers are involved in a diverse range of single and double reading practices where responsibility for diagnostic decision making is shared or transferred between radiologists and/or other radiographers. Comparative analysis of sub-group data suggested that there might be differences in the characteristics and practices of radiographers who interpret only low-risk screening mammograms and those who interpret and report a wider range of cases.

The findings of this survey provide a platform for further research to investigate how and why the roles and responsibilities of radiographers who interpret and report mammograms vary between organisations, between practitioners and across different examinations. Further research is also needed to explore the implications of variation in practice for patients, practitioners and service providers.

Introduction

The inability of the medical (radiology) profession to keep pace with increasing demand for mammography image interpretation and reporting (MIIR) was recognised over 45 years ago.[1] Hillman et al.[2] in the USA were the first to suggest using non-medical personnel to supplement the mammography image interpretation (MII) workforce and in the UK pilot schemes to train radiographers to interpret and report screening mammograms were first initiated in the 1990s.[3–6]

Radiographers in the UK have now been involved in MII for over 20 years. In 1995 they had a formal MII role in 6% (6/103) National Health Service Breast Screening Programme (NHSBSP) units[7] and by 2008, 205 (69.7%) of the 10 consultant and 284 (260 qualified and 24 trainee) advanced practitioner radiographers working in the NHSBSP interpreted mammography images.[8] Price and Le Masurier's[9] most recent NHS survey of longitudinal change in NHS radiographer roles revealed that radiographers were interpreting mammograms in 22% (38/177) responding Trusts.

The client population in breast screening programmes is 'low risk' and 'asymptomatic', including women without physical signs or symptoms of breast cancer and those in an age-defined group considered most likely to benefit from early detection of preclinical disease. Mammography is also performed in 'high risk' asymptomatic populations, to detect recurrence in people previously diagnosed and treated for breast cancer (annual surveillance mammography) and in people with a familial or genetic predisposition to breast cancer (family history screening), for example. Mammograms are also obtained from women outside screening programmes, and from men, who go to their doctor with symptoms that might indicate underlying breast disease (symptomatic cases).

Whilst radiographer involvement in NHSBSP MII is well-established, is monitored nationally and has an underpinning

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evidence base, little is known about the extent to which current UK radiographer involvement in MIIR goes beyond low-risk population screening cases. A postal survey of UK consultant breast radiographers published in 2014[10] demonstrated that all 22 respondents (response rate 22/24; 91%) worked in symptomatic services but offered no further information about their MIIR practices. Kelly et al.'s[11] case study publication explained how appointing a consultant breast radiographer increased service capacity and reduced waiting lists because they delivered additional 'fast track' symptomatic clinics and were fully accountable for MIIR independent of radiologists.

The survey reported here was performed to elicit more information about the characteristics, roles, responsibilities and opinions of radiographers involved in MIIR in the UK. The aims of the survey were to:

- describe the demographic and professional characteristics of UK radiographers who interpret and report mammograms;
- determine how MIIR services are delivered and how diagnostic decision making responsibility is distributed between radiographers and radiologists;
- identify drivers for, and barriers to, radiographer involvement in MIIR;
- identify a population of radiographers who might participate in further research about radiographer performed MIIR.

Methods

This research used a quantitative cross-sectional 'survey' design to collect data on a series of variables at a single point in time.[12] The survey was designed to capture maximum variation across individual radiographers and workplace sites and to identify patterns of association.[12] The data collection instrument was a project-specific self-completion questionnaire intended to generate data from a large number of people, in standardised format, at relatively low cost and in a short period of time.[13]

The questionnaire was administered online using commercially available software (SurveyMonkey®). The web based nature of the survey facilitated completion at a time and place convenient to respondents and allowed for ready download of responses to an electronic database (Microsoft Excel®).

Ethical considerations

This survey met the Health Research Authority definition of 'service evaluation' as it sought to define current care and standards across multiple services, did not involve a patient care intervention and collected existing data.[14] Participants were not required to divulge personal identifiable information and responses were anonymised using random identification numbers allocated by the SurveyMonkey® software. A favourable ethical opinion was obtained from the university research ethics committee (SHREC/RP 238).

Questionnaire development & piloting

The highly structured survey comprised closed and forced response questions to collect factual data. Limited character 'free-text response' boxes allowed participants to add further information when selecting 'other, please specify' options. Early questions asked about demographic and professional characteristics and MIIR practices. Later sections sought participant opinion about variations in practice that had been observed anecdotally by the researcher and issues that had been raised in the existing peer reviewed literature about radiographer performed MIIR. At the end of the questionnaire, respondents interested in participating in further research were invited to contact the researcher by email, outside the survey to preserve the anonymity of their responses.

An initial paper draft of the questionnaire was piloted for face and content validity.[12] Four members of university faculty not involved directly in the project but with experience of designing questionnaires for student research were asked to work through the questionnaire. Following discussion, where they felt the presentation, instructions and questions were not simple, clear, comprehensible and unambiguous, revisions were made. A second pilot of the revised wording and layout was undertaken using the SurveyMonkey® software with six breast imaging postgraduate students familiar with the response data required. Any potential target participants, for example students who were involved in MIIR, were excluded from the online pilot. Again, following discussion minor modifications were made to ensure that the survey operated as intended, generated the required data and effectively guided participants through the filter and 'skip' questions.

Questionnaire administration and participant recruitment

The study had no sampling frame because there is no register of radiographers involved in MIIR in the UK – it is not known how many radiographers are qualified and/or practising MIIR in NHS screening or symptomatic breast services. To reach the largest number of potential participants a hardcopy mailshot was posted to all (n = 103) NHSBSP units, all (n = 206) NHS Trusts offering symptomatic breast imaging services listed on 'NHS Choices' (www.nhs.uk) and to all (n = 45) ex-students of the researcher's host university MIIR modules.

The recruitment mailshot contained a covering letter, participant information sheet (PIS) and A4 poster, all containing the online survey web address. The covering letter invited departmental managers to circulate the PIS to relevant members of staff and display the poster on staff noticeboards. Ex-students were sent an individual covering letter and PIS. A notice advertising the survey was published in the Society of Radiographers' professional magazine 'Imaging and Therapy Practice'. The survey was open for three months during April to June 2012.

Following distribution of posters and PIS, participants had 3 months to make an informed choice to participate in the study. Participants had to tick a box confirming that they had read and understood the PIS and consented to take part, on the preliminary page of the survey.

Data analysis

The survey results were predominantly quantitative nominal and interval data and were coded and analysed using SurveyMonkey® and Microsoft Excel® software. Data were collated using simple and derived mathematical measures (frequency, percentage) and summary descriptive statistics (mean, mode and range). These data described the personal and professional characteristics of the respondents and the nature of their MIIR practices (workload, case mix and diagnostic decision making responsibility). Inferential statistics (t tests) were used to compare sub-group data.

Study limitations

The following limitations are acknowledged in the study. A recognised risk of questionnaires which are administered remotely, asynchronously and by self-completion is missing data.[12] The questionnaire used in this study was piloted to try to reduce the risk of participants not understanding or misunderstanding the

questions, not knowing which questions to answer or not knowing what information was being sought. Open questions were avoided, filtering was kept to a minimum and structured drop-down response menus were provided to reduce the risk of question skipping. Participants were advised of the estimated completion time in the PIS to reduce the risk of missing responses due to respondent fatigue.

A web-based survey was chosen to avoid the cost of printing and posting questionnaires but this also increased the risk of low response.[12] To participate in the survey radiographers had to access the internet. Recruitment relied on departmental managers displaying survey posters in places where radiographers involved in MIIR could see them. Managers were asked to display the poster on staff noticeboards but more suitable locations might have been walls or worktops adjacent to computer workstations.

Questionnaire respondents are not always a representative sample of the wider population of interest.[13] The data generated in this survey was not intended to characterise the whole population of radiographers involved in MIIR across the UK, but rather generate an illustrative picture of the range and diversity of the characteristics and practices of such radiographers and provide a foundation for further research.

Results

Sixty-six radiographers participated in the survey. No formal 'response rate' calculation was possible as the total number of radiographers involved in MIIR in the UK is not known. As expected there were several 'missing' data and as such all percentages quoted are based on the number of participants providing a response to each question.

Half the respondents worked in either a dedicated screening (NHSBSP, n = 17, 26%; private, n = 1, 1%) or symptomatic (n = 15, 23%) unit; the remainder (n = 33, 50%) worked in combined NHS breast services. The mammography cases interpreted and reported by the respondents encompassed the full spectrum of clinical applications: low-risk population screening, symptomatic referrals, annual surveillance (AS) and family history (FH) cases; one respondent interpreted and reported biopsy and surgical specimen mammography. Table 1 shows the breast imaging unit type and types of mammograms interpreted and reported by participants.

Demographic and professional characteristics

The geographic distribution of respondents is illustrated in Fig. 1. This figure also illustrates how many respondents in each region interpreted only low-risk population screening cases and how many interpreted and reported a wider mix of mammography cases. No respondents worked in Wales; no respondents that worked in Scotland (n = 2) or Northern Ireland (n = 1) interpreted mammograms other than low-risk screening cases.

The average (mode) age category of respondents was 46–50 years (n = 18; 31%) with 11 (19%) respondents aged 45 years or less and 29 (50%) respondents aged 51 years or over; 8 respondents did not disclose this information. The respondents

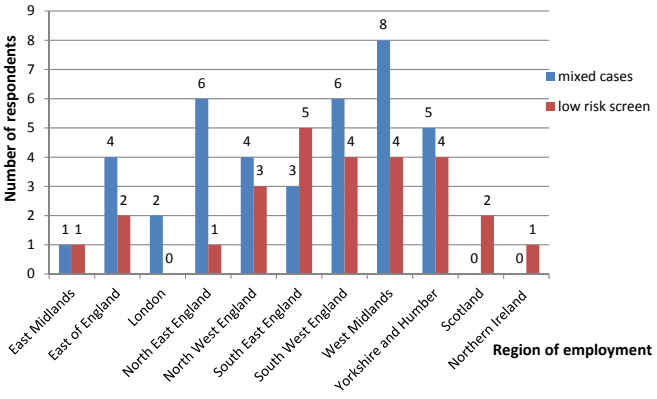

Figure 1. Geographic distribution and MIIR case mix of survey respondents.

involved in interpreting and reporting a wide range of mammography cases (n = 39) tended to be younger than those participants involved only in low-risk population screen reading (n = 12) although the difference was not statistically significant (p = 0.11, t-test).

Sixty (91%) of the 66 survey participants disclosed their banding and grading. The majority (39/60, 65%) were Band 7 advanced practitioners. Sixteen (27%) of the 60 respondents were Band 8; all who were Band 8b (n = 4) and Band 8c (n = 5) were Consultant radiographers; the 7 Band 8a respondents had a variety of job titles including consultant, superintendent or principal radiographer, advanced practitioner and radiographer. Five (8%) of the 60 respondents were Band 6 'radiographers' – free-text comments from two who undertook MIIR indicated they were in the process of being re-graded.

MIIR workload

The participants usually had specifically allocated sessions to undertake MIIR although 13 (28%) integrated it into their normal mammography (image acquisition) duties. Thirty-five participants (73% of 48 responses) had their own regular MIIR sessions and did additional sessions to cover radiologist absence. Fourteen participants (32% of 44 responses) did additional MIIR sessions to cover radiologist vacancies. Two participants (5% of 44 responses) not normally undertaking MIIR did sessions to cover for radiologist absence.

The average (mean) monthly MIIR workload of the participants was: 9 (3.5 h) half day sessions for screen reading (range 2–48 sessions), 4.3 sessions (range 1–12 sessions) for arbitration or consensus cases, 4.4 sessions (range 2–10 sessions) for assessment extra views, 2.1 sessions (range 1–8 sessions) of FH cases, 3 sessions (range 1–8 sessions) of AS cases and 9.5 sessions (range 2–32 sessions) for symptomatic cases. Within the sample, four 'outlier' participants undertook more than 20 sessions per month of either screen reading (n = 1; 48 sessions; ID 2026) or symptomatic cases (n = 3; 30, 32, 32 sessions; IDs 4090, 6251, 2797).

Table 1
Work locations of respondents and type of MIIR cases.

MIIR practice (number and percentage of respondents) Type of unit	Low risk screening – including assessment (n = 44; 67%)	Family history (n = 34; 51%)	Annual surveillance (n = 30; 45%)	Symptomatic (n = 27; 41%)
Screening unit (NHS n = 17; private n = 1)	14 (78%)	9 (50%)	5 (3%)	2 (1%)
Combined unit (n = 33)	27 (82%)	16 (47%)	15 (45%)	15 (45%)
Symptomatic unit (n = 15)	3 (20%)	9 (60%)	10 (67%)	10 (67%)

The average (mean) monthly MIIR caseload of the participants was: 604 (range 200–1600) screen reading cases, 53 (range 10–160) arbitration or consensus cases, 33 (range 2–50) assessment extra views, 31 (range 5–100) FH cases, 65 (range 10–200) AS cases and 116 (range 10–400 sessions) symptomatic cases. Within the sample three 'outlier' participants interpreted more than 1000 screen reading cases per month (1200 cases, ID 2458; 1250 cases, ID 2575; 1600 cases, ID 9988), one outlier interpreted more than 100 arbitration/consensus cases per month (ID 6985), two outliers interpreted more than 50 FH cases per month (100 cases, IDs 8024, 2744); two outliers interpreted more than 100 AS cases per month (150 cases, ID 3627; 200 cases, ID 9622) and two outliers interpreted and reported more than 200 symptomatic cases per month (340 cases, ID 3627; 400 cases, ID 2797).

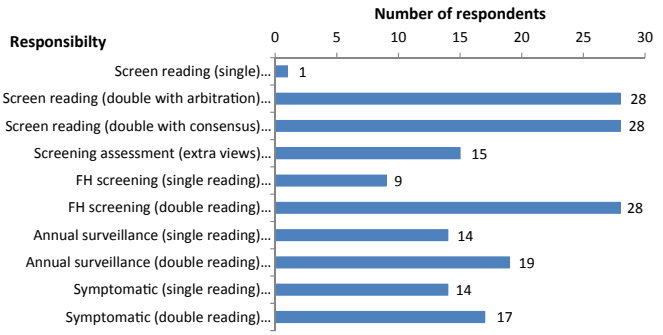

Figure 2. Mammography image interpretation responsibility.

MIIR roles and responsibilities

Participants were involved in a wide variety of operational working practices. Although 15 (23%) respondents did not answer this question, 94% (48/51) of those who did said their MII opinion was recorded and retained as part of the official patient record. Three respondents stated their opinion was not recorded; one (ID 2744) gave no further explanation but the other two explained that it was a temporary situation until local protocols were developed:

> "*Awaiting protocols and agreement from Senior Managers – currently undertake reporting for own benefit to maintain competency whilst waiting for official agreement*" *(ID 9576)*;
>
> "*Protocol for radiographer reporting is still in progress*" *(ID 5351)*.

Survey participants had a range of MIIR roles and responsibilities and were involved in a variety of practices for recording and communicating diagnostic decisions about mammography appearances to other members of the healthcare team – Table 2 illustrates the diversity. These data highlighted that a higher percentage of respondents participating in MIIR beyond low-risk screening cases ('mixed cases' sub-group) produced free-text reports to describe their findings compared to the overall participant group (62%, 52% respectively).

Thirty (45%) of the 66 participants contributed to consensus decision making (discussion to reach agreement) and 15/66 (23%) to arbitration decision making (giving a third opinion or 'casting vote') in discordant double reading. No further data, about the type of cases or the respective roles of radiography and radiology professions in these processes were collected.

Fig. 2 shows how many radiographers had sole responsibility for making diagnostic decisions about mammographic appearances (single opinion MIIR) and how many shared diagnostic decision making responsibility with another practitioner (double opinion MIIR) for each clinical indication. Of all participants responding to this question 96% (46/48) were involved in 'double opinion' MIIR. Approximately half (20/39, 51%) participants involved in MIIR beyond low-risk screening cases undertook 'double opinion' MIIR. A higher percentage of respondents who participated in MIIR beyond low-risk screening cases ('mixed cases' sub-group) were involved in 'single' MIIR, taking full responsibility for diagnostic decision making without the involvement of a radiologist, in comparison to the overall participant group (16/39, 41%; 16/48, 33% respectively).

Of the 66 participants, 46 (70%) provided additional information about their double opinion MIIR practice; 22/46 (48%) indicated that the other reader was always a doctor and 23/46 (50%) that the other reader may be a doctor or radiographer. In view of the variety of case mix configurations of individual respondents (Table 3) it was impossible to determine any trends in responsibility sharing between the professions for the separate clinical indications. The respondent (ID 3627) who always double read with another radiographer clarified this to be in the context of training other radiographers, stating she normally 'single' read cases covering a department that did not have any breast radiologists.

Timing of decision making

Fig. 3 illustrates how the timing of MIIR varied across respondents and across clinical indications. Not unexpectedly, all screen (first and second) reading was performed 'cold' once clients had left the department, and all assessment cases and single read symptomatic cases were interpreted 'hot' whilst clients/patients were present. Although one or two respondents 'hot' reported FH and AS cases, most often as single reader or when giving the first opinion in double reading, it was more common for these cases to be reported 'cold'.

Of particular interest some symptomatic MIIR occurred 'cold', by implication after patients had left rapid-access 'one-stop' clinics. This was most prevalent where radiographers were double, particularly second, reading. Several respondents added further comments which highlighted how practice varied both within and across services and might even vary across patients attending the same clinic:

Table 2
Image interpretation practices of UK radiographers.

Image interpretation and reporting practice	All respondents n = 48	'Mixed cases' sub-group n = 39
Annotate images considered abnormal (red dot)	9 (19%)	8 (21%)
Make informal verbal comments about images to practitioner officially interpreting images	16 (33%)	13 (33%)
Make informal written comments about images to practitioner officially interpreting images	14 (29%)	12 (31%)
Make a dichotomous (normal/abnormal) judgement about images	39 (81%)	28 (72%)
Pre-screen/filter images for practitioner officially interpreting images	9 (19%)	6 (15%)
Categorise images to indicate suspicion of malignancy on 5-point scale	32 (67%)	24 (62%)
Producing free text report to describe examination findings	25 (52%)	24 (62%)

Table 3
Shared responsibility for double reporting.

Case mix of respondent	The other reader is always a doctor (n = 22)	The other reader may be a doctor or a radiographer (n = 23)	The other reader is always a radiographer (n = 1)	Total
Screen reading only	9	5	–	**14**
Screen reading & Family History (FH) cases	4	8	–	**12**
Screen reading and Annual Surveillance (AS) cases	2	–	–	**2**
Screen reading, FH & AS	2	1	–	**3**
Screen reading, FH & symptomatic cases	–	3	–	**3**
Screen reading, AS & symptomatic cases	–	1	–	**1**
FH & symptomatic cases	1	1	–	**2**
AS & symptomatic cases	1	–	–	**1**
FH, AS & symptomatic cases	1	–	1	**2**
All cases	2	4	–	**6**
Total	**22**	**23**	**1**	

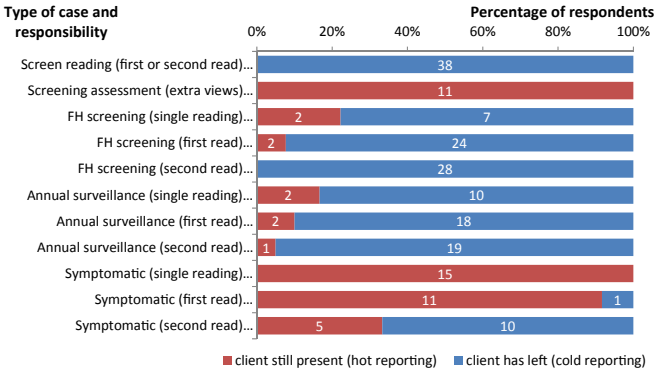

Figure 3. Timing of MIIR.

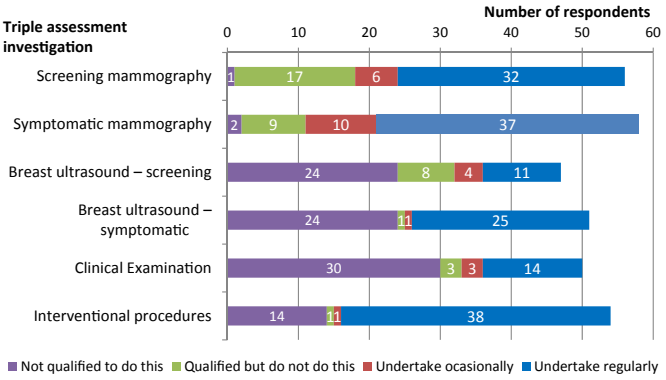

Figure 4. Involvement in triple assessment examinations.

'*I run fast tracks with no radiologist. My report goes straight back to the surgeon and the patient is given results. Reports (with my name on) are verified by a radiologist at a later date.*' (ID 4090)

'*Symptomatic single reading is performed for clinically P1–2 patients once they have left the dept. P3–5 cases are reported whilst they are in the department.*' (ID 0626)

'*Second read of symptomatic patients is done at the time if available, but cold if not.*' (ID 8272)

'*If possible symptomatic mammograms are double reported during rapid-access clinic, however quite often it's not possible and they are single reported.*' (ID 6985)

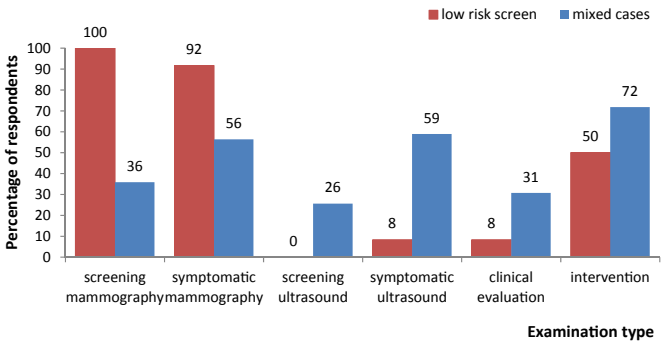

Figure 5. Other examinations performed regularly by respondents.

Triple assessment and the multidisciplinary team

Recognising that mammography is part of the wider process of breast 'triple assessment' the survey asked respondents if they performed and interpreted any other diagnostic breast examinations. One respondent specifically commented that:

'*Most of my symptomatic reporting is done alongside performing breast ultrasound, ultrasound reporting and biopsy*' [ID 4090].

The numbers of participants qualified and undertaking mammography image acquisition, ultrasound or clinical examinations and tissue sampling are summarised in Fig. 4. Fig. 5 shows that higher percentages of the 39 participants involved in MIIR beyond low-risk population screening cases ('mixed cases' subgroup) undertook additional triple assessment examinations and procedures on a regular basis in comparison to the (n = 12) respondents involved only in low-risk screening MIIR. Conversely, lower percentages of respondents involved in MIIR beyond low-risk population screening cases undertook screening and symptomatic mammography image acquisition on a regular basis.

When asked if they were involved in the breast care multidisciplinary team (MDT) and attended MDT meetings, most (54/56; 96%) participants confirmed MDT meeting attendance for continuing professional development (CPD) purposes. Most participants agreed (21/51; 41%) or strongly agreed (20/51; 39%) that 'participation in MIIR enhances my status with other members of the breast care MDT'; 7/51 (14%) respondents had no strong feeling about this statement and 3/51 (6%) disagreed.

Drivers and barriers to involving radiographers in MIIR

The final section of the survey sought participant opinion about issues raised in the existing literature about radiographer involvement in MII. Twelve (18%) of the 66 participants did not respond to

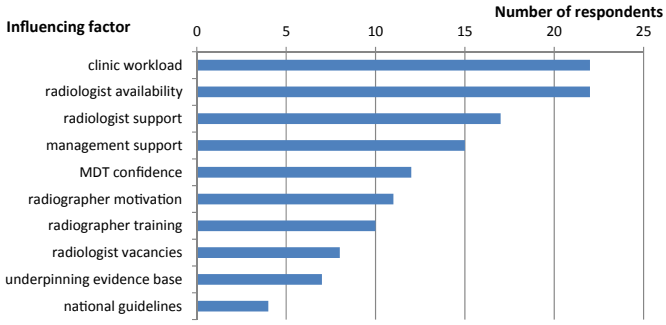

Figure 6. Factors influencing radiographer involvement in symptomatic MIIR.

the question about factors that might drive, or present a barrier to, radiographer involvement in MIIR. The four most common factors considered to influence whether radiographers participated in MIIR were 'radiologist availability' (38/54, 70%), funding for training (35/54, 65%), management support (33/54, 61%) and radiographer motivation (30/54, 56%). Fifty-three (88% of 66) participants indicated what factors they considered to represent barriers to radiographer participation in MIIR. The most common barriers were considered to be 'not enough work' (38/53, 72%), 'have enough radiologists' (23/53, 43%) and 'lack of funding', for promotion (18/53, 34%) or training (16/53, 30%).

The main factors participants considered to influence whether radiographers were involved in *symptomatic* MIIR are summarised in Fig. 6. Ambiguous wording of this question meant it was not possible to establish if the factors were considered to be positive or negative influences, acting as drivers or barriers to MIIR involvement.

Finally, participants were presented with a series of specific statements about radiographer performed MIIR and asked to indicate their level of agreement on a Likert scale (1 = strongly disagree, 2 = disagree, 3 = no strong feeling; 4 = agree, 5 = strongly agree), see Table 4.

Discussion

National policy drivers to reduce cancer morbidity and mortality[15,16] and year-on-year increases in imaging examination requests[17] have placed increased demand on the specialist 'medical' imaging workforce. Increases specifically in breast imaging workload may result from the introduction of new technologies,[18,19] cancer risk-related demographic change,[19,20] expansion of screening programmes,[4,5,20] increased compliance with screening[21] and mandatory 'double' screen reading.[22]

In the UK, radiologist workforce shortages and increased demand for breast imaging are predicted to continue[17] with potential vacancy rates for breast radiologists of approximately 15% in combined screening and symptomatic units and slightly higher (19%) in units only providing symptomatic services.[23] The most recent radiology workforce census figures demonstrated 'breast' in the top three radiology specialties experiencing recruitment difficulties with 57% advertised specialist breast posts failing to attract an appointable candidate.[24] RCR census data also suggested that 23% of the breast radiology workforce would retire in the next 5 years[24] and this would likely increase vacancies further, to 22% in combined services and to almost 30% in symptomatic-only units.[23]

Extension of the radiographer's role to incorporate image interpretation and reporting plays a vital role in diagnosis and management of disease.[25] In their independent review of radiologist training requirements, the Centre for Workforce Intelligence considered that the boundaries and overlaps between medical and non-medical imaging professions needed continual review and suggested that radiographers should continue to take on more responsibility for interpreting and reporting routine examinations so that radiologists could concentrate on reporting more complex investigations.[26] Successful deployment of radiographers with MIIR skill beyond low-risk screening cases is a potential solution to breast radiology workforce shortages.[27]

This survey demonstrated that UK radiographers are already involved in interpreting and reporting mammography images across the full spectrum of clinical indications.

Table 4
Radiographer opinions about previous research findings.

Prevailing opinion of respondents	Statement	Strongly agree (5)	Agree (4)	No strong feeling (3)	Disagree (2)	Strongly disagree (1)	Average score
Tend to agree or strongly agree	Those participating in MIIR should have a formal qualification	44	6	0	0	0	4.9
	I am motivated to participate in MIIR	34	16	0	0	0	4.7
	Participation in MIIR increases my job satisfaction	31	20	0	0	0	4.6
	Participation in MIIR warrants advanced practitioner status	29	20	1	0	0	4.6
	Radiographer involvement in MIIR is cost effective	28	19	3	0	0	4.5
	I volunteered to be involved in MIIR	31	15	1	1	2	4.4
	Radiographer involvement in MIIR enhances teamwork	20	29	2	0	0	4.4
	Participation in MIIR improves my morale	18	27	5	1	0	4.2
	My participation in MIIR is recognised and valued	22	22	4	2	1	4.2
	Participation in MIIR enhances status with other MDT members	20	21	7	3	0	4.1
	Participation in MIIR enhances my status within my department	15	23	13	0	0	4.0
Tendency to agree or express no strong feeling	Participation in MIIR should be restricted to selected individuals	10	23	13	4	1	3.7
	Participation in MIIR enhances my status with clients/patients	6	16	23	4	1	3.4
	Participation in MIIR enhances the patient experience	3	21	21	4	1	3.4
Responses evenly split between agree and disagree	Participation in MIIR is stressful	4	22	14	10	0	3.4
	I was re-graded/promoted when I started to undertake MIIR	15	14	0	11	10	3.3
	My skills are underutilised – I would like to interpret and report a wider variety of mammography examinations	13	11	8	13	6	3.2
	All mammographers should participate in a red dot type system	4	11	21	15	0	3.1
	My MIIR skills are under-utilised – I would like more sessions	6	16	7	18	3	3.1
	I received a pay increment when I started to undertake MIIR	9	15	4	12	10	3.0
No strong feeling	All mammographers should participate in image commenting	1	10	29	10	1	3.0
No strong feeling or tendency to disagree	It was difficult to get involved in MIIR	5	7	11	21	5	2.7
	All mammographers should be trained to participate in formal image interpretation and reporting	2	3	16	24	6	2.4
Disagree/strongly disagree	I spend too much time undertaking MIIR	0	2	4	29	15	1.9

Extrapolating the caseload data into annual estimates, it appeared that 82% (32/39) of participants involved in screen reading had the potential to exceed the original NHSBSP annual requirement of 5000 cases for maintaining competence.[28] With the most recent guidance allowing a combination of screening and/or symptomatic cases[29] all but 2 respondents had the potential to meet the 5000 case competence threshold. Similarly, the data suggested that just less than 64% (14/22) of the participants involved in symptomatic MIIR had the potential to exceed the recommended number of 500 symptomatic cases per annum.[30] Seven of the 8 participants who appeared not to be meeting this threshold were involved in double reading symptomatic cases and thus did not taking sole responsibility for diagnostic interpretation. The exception, participant ID 0626, had an estimated annual symptomatic caseload of 420; she undertook 780 cases per month across the full spectrum of clinical indications and this extrapolated to a total annual MIIR caseload of over 9000 cases.

The MIIR roles of the radiographers in this study were diverse and there was a variety of ways in which they shared responsibility for mammography-based diagnostic decision making with radiologists and other radiographers. The survey data suggested that there might be differences in the characteristics and practices of radiographers involved only in low-risk screen reading and those involved in a wider range of MIIR but this requires further investigation. The variety of job titles across the Band 8 participants might reflect differences in their clinical and managerial roles and responsibilities but might also reflect differences in role and responsibility expectations and different professional cultures across organisations – again this is worthy of further investigation.

Conclusion

United Kingdom radiographers are contributing to the interpretation and reporting of mammography images across the full range of clinical indications. Adding to the limited current body of knowledge, the data presented in this paper give a broad snapshot of the characteristics of such radiographers and their working practices.

The study results highlight how roles and responsibilities vary across organisations, practitioners and mammography examinations and identify some of the factors which might influence radiographer role development in MIIR beyond involvement in NHSBSP screen reading.

The findings of this survey provide a platform for further investigation of radiographer involvement in MIIR to explore and explain why practice varies and arguably more importantly to explore the consequences of such variation for imaging professionals, service providers and service user experience and outcomes. There appears to be a suitable population of departments and practitioners in the UK to make such research viable and worthwhile.

Conflict of interest statement

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