

An investigation into breast imaging as part of the undergraduate (UG) education of diagnostic radiography students in the UK.

Introduction

Diagnostic imaging continues to undergo significant developments in response to social, economic and political influences. Fast evolving technology and increased demand for radiographic services in many patient pathways has allowed the role of the diagnostic radiographer to develop with diversity of career options and the opportunity for role extension, advanced and consultant practice¹. Radiography graduates are required to possess a wider range of skills than ever before². Higher Education Institutions (HEIs) are faced with the task of delivering a curriculum to adequately prepare students for the tasks often associated with first held posts and thereby satisfying a plethora of key documents^{3,4,5,6,7}. At the same time students require exposure to specialist areas of radiography to promote an equal and positive perception of all areas of the profession and facilitate informed career planning. Commensurate with an evolving workload and workforce, established practices are changing. Radiographers no longer necessarily undertake several years of 'general' radiography before undertaking more specialist roles, often with the opportunity to embrace increased scope of practice and skill mix.

Opportunities for career progression in breast imaging are documented^{8,9}. Ferris investigated specialism within diagnostic radiography in 2009 and considered how specialist areas of practice, including mammography are viewed by radiographers. Those surveyed saw potential future opportunities in specialist areas⁹. However there was also a perception of exclusivity and restricted practice which could make succession planning problematic.

Reports of shortages in the mammography workforce are not a new phenomenon. It was discussed alongside increased workload in 2001⁸. Now more than 16 years into the UK breast screening programme, the incidence of breast cancer continues to increase with nearly 54,000 women diagnosed in 2013¹⁰. The current pilot age extension if implemented will increase the number of women screened from 8 to 10 million¹¹. In addition the symptomatic service has seen a rise in the number of referrals for benign breast disease and

the 'worried well'. Despite this sustained increase in workload, the workforce faces crisis across all four tiers. In a recently published national radiographic workforce survey 65% of respondents reported failure to recruit to mammographer posts ¹². In addition almost 25% of consultant radiographers are due to retire in the next five years, 50% in the next 10 years. Similarly approximately 21% of breast radiologists are due to retire in the next 5 years and 38% in the next 10 years ¹³. Continued recruitment of radiographers into this specialism, retention of staff and upskilling into advanced roles is crucial to the continued provision of breast imaging services ¹⁴.

This study arose from local frustration regarding the lack of under graduate (UG) student placements in breast imaging within the authors' locality and the potential impact this may have on recruitment to the specialism and general perception of breast imaging. There is also anecdotal evidence suggesting variation in academic content of UG radiography courses relating to mammography/breast imaging across the UK. The primary aim of this study was to investigate the extent of breast imaging education within UK UG diagnostic radiography curricula and identify any reasons associated with variation in this provision.

The objectives of the study were:

- To find out how much time is spent on breast imaging, both academically and in clinical placement as part of the UG radiography curriculum
- To determine if this differs from other specialist areas of diagnostic imaging and what the drivers are for these differences
- To establish who teaches undergraduate breast imaging curriculum to students
- To determine if the availability of placement and specialist lecturers influences the time spent on breast imaging
- To investigate parity between male and female students

Methodology

A grounded theory approach was used where themes and concepts were extracted from study data acquired in the form of a survey ¹⁵. Initially both quantitative and qualitative data were collected using an electronic questionnaire to establish the extent of breast imaging education within UK UG diagnostic radiography curricula.. The questions were designed by the researchers to address the aim and objectives of the study. It was distributed using on line Survey monkey™ (Appendix 1), and was initially sent to two HEIs to test for content validity. No subsequent changes were made.

The questionnaire was then distributed to course leaders at all 24 HEIs across the UK that offer the BSc(Hons) Diagnostic Radiography course. In an attempt to improve the response rate, the study was introduced to the Heads of Radiography Education group prior to distributing the questionnaire. A follow-up reminder email was also sent out a few weeks after the initial request.

An iterative, inductive approach was utilised whereby initial results from the questionnaires were analysed and used to formulate questions for follow up telephone interviews with course leaders who had consented to this on submission of their responses. Those interested in being interviewed were asked to indicate their willingness as part of the questionnaire. The interviews were scheduled to last for an hour and were semi-structured, the aim being to explore the themes identified from the questionnaires ^{16, 17}. The questions used in the follow up telephone interviews are in Appendix 2.

In addition to this and in order to broaden the perspective of the study, interviews were also carried out with 2 other stakeholders; a current third year student radiographer who had been offered her first post in mammography and a recently qualified member of staff who had also taken her first post in breast imaging. These additional participants were asked about their perspectives on their exposure to breast imaging as a specialism as part of the UG course.

The qualitative data including stakeholder responses were analysed using a thematic analysis, and the quantitative data analysed for trends ¹⁸. Themes were categorised and

coded ¹⁹. Through constant comparative analysis and theoretical coding, the chosen methodology provided a structured approach to the topic.

Every stage of the research verification process was systematically conducted. The researchers had sufficient confidence in the rigour of the data analysis process to ensure that the emerging themes were strongly evidenced by all of the data sources (questionnaires and interviews).

Findings were validated by examining all of the data from the study to test the findings.

Results were confirmed by using data from different sources to give them authority ²⁰. An audit trail was used to record how data were collected and conclusions were reached ²¹.

The researchers also kept a research journal which recorded the timing of data collection and a reflexive account of the study. All the follow up interviews were subject to member checking to verify the findings ²¹. Transferability of the results was achieved by providing a thorough description in order to contextualise the data. This allows the reader to make inferences about contextual similarities ²².

Ethical approval was obtained from University Campus Suffolk. All data remained anonymous with each HEI being numbered. Any data collected were stored securely in a locked filing cabinet and on a password protected computer. Data were only viewed by the research team. The project was guided by ethical principles. Information provided by the participants was fully anonymised and at all times confidentiality was maintained.

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Results

19 of 24 (79%) HEIs responded to the questionnaire.

Academic teaching in breast imaging ranged from 3-25 hours over the 3 year course.

19 (100%) of respondents incorporated breast related anatomy/physiology and breast imaging physics /equipment during the core teaching within year 1 and year 2 of the course.

Any further incorporation of mammography related topics varied, often described by

respondents as an overview. These included mammography technique, the screening pathway, communication, psychological wellbeing and role extension. One HEI reported a debate in year 3 about the screening age.

Compared to other specialties 10 (53%) HEIs spent less time on mammography with 12 (63%) citing the HCPC standards of proficiency as the reason. Reasons for locally driven academic curriculum content included:

- *'Commensurate with the roles they are likely to have (Breast imaging is not usually chosen by newly qualified radiographers)'*
- *'This is a specialist area. Not included in the role of the newly qualified radiographer. They are more interested in general'*
- *'Breast imaging is a narrower area of imaging anatomically so it needs less time in terms of technique'*

There was a general consensus of *'difficulty fitting it all in'* (curriculum content).

11(65%) HEIs sent students on mammography placements. The range of length of placements was between 2 days and 2 weeks. Reported influences for this included; availability of expert teaching and relationship with clinical departments.

- *We have some trouble with the clinical departments saying they 'don't know what to do with students'. They don't see the value of having students and don't have time to spend with them'. An attitude not exclusive to breast imaging but sometimes stops students going at all*
- *Some students are less keen to go and some units are less keen to have them*
- *It happens on an ad hoc basis driven by time. There are no practice competencies for mammography so it tends to be overridden by other specialties*

2 (12%) HEIs sent females only, so male students in these institutions did not experience breast imaging. One HEI described this as being an inherited situation from a previous course leader and was unsure why. Other reasons for disparity were

- *'Most of our clinical placement departments don't want to have male students so for parity none are sent - male or female'*

- *'3 out of 7 clinical placements won't allow male students but females go anyway'*

.Follow up telephone interviews to further explore themes were conducted with the 5 course leaders who indicated their willingness to take part

There were 5 themes that emerged from the interviews:

1. Academic time given, interest and expertise of HEI staff in breast imaging
2. Placement experience in breast imaging
3. Networking and links between the HEI and breast imaging departments
4. Recruitment and newly qualified staff gaining first post in breast imaging
5. Disparity between male and female students

1. Academic time given, interest and expertise of HEI staff in breast imaging.

Academic time given to breast imaging varied between HEIs, the course leaders suggested that this might be due to all of the content that needs to be incorporated into the course.

- *"I think that the whole undergraduate syllabus is so jammed" (Interview with HEI 2).*
- *"There is much more on MRI, there's even more on nuclear med... we spend less time on it (mammography) than on MRI and nuclear med definitely" (Interview with HEI 4).*

It was also felt by course leaders that the variation in content between HEIs may be due to the interest and expertise of the lecturing staff in breast imaging. For example, the course leader from HEI 1 had worked as a mammographer before working at the HEI, so she did all of the breast imaging teaching. She suggested that before she was employed at the HEI there was little course content about mammography as a specialism, but due to her interest and enthusiasm things had changed. The course leader at HEI 2 suggested that:

- *"If there are mammographers on the team, it has a higher profile" (Interview with HEI 2).*

The course leaders from HEI 5 and HEI 1 agreed:

- *“I would say, I think it depends on the background of the team that’s in education, so if they’ve got a background in breast screening, they’re more likely to value it and therefore make sure the students are taught more on that” (Interview with HEI 5).*
- *“I would imagine it is possibly because of people’s specific interest themselves” (Interview with HEI 1).*

2. Placement experience in breast imaging.

Clinical placement experience in breast imaging varied too. Some students undertook placements in year 2, some in year 3 and some had no breast imaging placements. There was also a variation between placements for male students, with some male students having a breast imaging placement but a lot of males not permitted to go. Some HEIs had practice competencies for students to complete in breast imaging and others did not.

- *“there seems to be a regional variation about male students...or even a departmental variation about whether male students are allowed to observe or not” (Interview with HEI 1)*
- *“It is to do with cohort numbers and other placements that they go to, they can opt to do it (breast imaging) but it is a problem with numbers” (Interview with HEI 4)*
- *“there’s a difference between males and females, the females go for a week in the second year and the males don’t go, although some departments would be willing to have them there are some that are not, so you can’t make them go, if they won’t have them, and of it means we can’t have any competencies because we can’t assess female students on something that we wouldn’t assess male students on” (Interview with HEI 5)*

The student radiographer interviewed felt that more practice placement time was needed in breast imaging. She felt that more time was needed so that students could decide if this

was a possible career option. She had enjoyed the time spent in breast imaging and felt it was an important placement for all students. The newly qualified member of staff agreed. She said that “students only receiving a couple of days placement through the entire course is not enough time to gain as much insight into the department” Her time consolidated her wish to work in this specialist area because of the amount of patient contact and feeling she “could make a difference”

3. *Networking and links between the HEI and breast imaging departments.*

It was felt by all interviewed that having good links with a breast imaging department had an effect on the delivery of breast imaging content in the HEI and also on the practice placement experience for students.

- *“We have good links because I was a member of the team” (Interview with HEI 1)*
- *“We don’t really have a point of contact ... so students don’t really get a chance to experience it” (Interview with HEI 2)*
- *“We’re very lucky here as we have a breast imaging department at *** hospital which has been in place for years...the staff come in and deliver the teaching... we are very lucky to have that resource” (Interview with HEI 3)*
- *“We have a breast imaging consultant who is an ex-student and comes in to talk to the 3rd years” (Interview with HEI 4)*
- *“Networks are important, whether you’ve got people willing to come in and do breast screening for you” (Interview with HEI 5)*

The student radiographer also stressed the importance of enthusiastic staff who encouraged students to want to find out more about the specialism, this had sparked her interest.

4. *Recruitment and newly qualified staff gaining 1st post in breast imaging.*

During the interviews the course leaders were asked about recruitment into breast imaging from their students asking: How many of your graduates have gone into BI in the last 5 years?

The responses were variable, but it appeared that some HEIs regularly had graduates going straight into breast imaging for first posts. The general feeling amongst respondents was that there were more graduates going straight into specialist areas including breast imaging. There was however, some disagreement about this. This was noted by the course leader from HEI 5:

- *“Sometimes they (the radiographers) don’t want them (the students) to go straight into breast screening because they think they should have to do 2 years as a band 5 radiographer before they have that opportunity” (Interview with HEI 5)*

The student radiographer also talked about this. She had received a mixed response from radiographers about her decision to go straight into breast imaging. Some staff members were really pleased for her and encouraging, whilst others felt that everyone should work in general radiography for a few years before specialising.

5. Disparity between male and female students.

There were differences in the experiences male and female students had in practice placements in breast imaging. The drivers for this were primarily from the recipient breast unit incorporating initial willingness to accept students at all and if so subsequent variation in accepting male and female students equally

- *there seems to be a regional variation about male students.....or even a departmental variation about whether male students are allowed to ...observe or not*
- *none of the placement hospitals would allow male students*
- *the females go for a week in the second year and the males don’t go.....although some departments would be willing to have them there are some that are not*

Discussion

Delivery of undergraduate radiography training is informed by several key documents, notably the HCPC – ‘standards of education and training’⁴ and ‘standards of proficiency’³. They embody a guidance framework for UG academic and clinical radiography education such that national standards are upheld and similar course content is delivered across the UK. The detail of course delivery including time allocated to different topics both in the academic and practice setting is devolved to individual HEIs. This includes the use of expert lecturers about specialist subjects including breast imaging. The SCoR endorse this as producing a diverse workforce with a healthy variety of strengths and knowledge²³.

The high response rate to our questionnaire, from 79% of course providers nationally, enables an accurate representation of current UG radiography training and results confirm the influence of the HCPC competencies for newly qualified radiographers on core course content. The diverse exposure to any additional academic and clinical mammography is also evidenced in our results. Perhaps we should question if this is entirely a good thing. It may be a missed opportunity in fully engaging students in some of the specialist areas of radiography such as mammography which in turn could promote positive perception and enough of a knowledge base to consider it seriously as a career option. Henderson suggested in 2012 that those working in radiography education must be responsive to service needs, ensuring that student radiographers are made aware of all of the opportunities that exist within the radiography profession. Also that practitioners need to be both fit for practice and fit to take practice forward²⁴.

The majority of new graduate radiographers will embark on a general radiography post including working shifts and out of hours²⁵. This enables consolidation of undergraduate learning with time to mature professionally and develop areas of particular interest for future career progression. Historically, specialising early on in a radiography career was discouraged. This was the case in mammography where it was thought the necessary communication skills and empathy required for this sensitive work were not developed enough in young, newly qualified staff. Some of the responses in this study demonstrate this

channel of thought still exists and was expressed in the interview with the student radiographer. However, multiple drivers within the clinical workforce such as the move from diploma to degree course, Agenda for Change and skills mix (all of which promote a more mature, reflective workforce) has created a shift in thinking such that employers place more of an emphasis on individual characteristics displayed by applicants on application and at interview ²⁶. These are used as indicators for suitability rather than length of qualification and age. Following agenda for change some departments successfully recruited newly qualified radiographers to the profession, the added incentive of addressing staff shortages in an aging specialist workforce encouraged other centres to follow suit and this is now common practice. In addition a percentage of radiography students are 'mature' i.e. not post sixth form age at entry and anecdotally more likely to specialise early in their career ²⁷. It remains to be seen what effect the impending removal of student bursaries may have on this ²⁸.

Both initial questionnaire responses and emergent themes from the interviews demonstrated that any inclusion of mammography in addition to core topics in year 1/2 was positively influenced by either HEI staff having expertise or past experience of mammography or clinical experts providing guest lectures. The authors have first-hand experience of this in their local HEI with 4 students out of a cohort of 49 taking up mammography posts in the last year following expert clinical input into the undergraduate programme.

Good links between HEIs and clinical departments were reported as influential to the organisation of student placements.

- *"It is about a personal link...because interestingly enough breast screening itself it tends to be a fairly closed environment and it is about having that link." (Interview with HEI 1)*
- *"We have a breast imaging department locally which we have strong links with and that agreement has been in place for years." (Interview with HEI 3)*

Positive engagement appeared to encourage students into mammography posts

- *“good links with academic speakers and clinical placements makes a difference”*
(Questionnaire response)
- *“It is about a personal link...because interestingly enough breast screening itself it tends to be a fairly closed environment and it is about having that link.”* (Interview with HEI 1)
- *“We’ve got 8 placement sites so having a relationship with all of them is quite difficult, they are quite different departments with regards to how much importance they place on education perhaps and how they want to be involved”* (Interview with HEI 5)

The diversity of allocated time is a cause for concern, in particular in relation to the attitude of some clinical departments to receiving students generally and male students in particular. The NHS breast screening programme does not advocate employing male mammographers due to the sensitive nature of the work and semi remote working on mobile screening vans^{29, 30}. However, women in the symptomatic setting are seen by male multidisciplinary team members and indeed some countries such as the Netherlands now employ male mammographers whilst others are studying women’s attitudes to this possibility^{31, 32}. Whilst we do not necessarily advocate any change to current UK working, there will be multiple occasions when male radiographers, whatever their area of work, will encounter women who are undergoing the breast cancer pathway. Some form of clinical knowledge base about what this involves may enhance their treatment of and empathy towards their patient so attending a mammography clinical placement as a student should be encouraged. In addition professionals working in this specialist area should recognise the importance of engaging with the future workforce.

Workforce challenges continue with recent publications citing shortages of both mammographers and breast radiologists¹². Several national multidisciplinary taskforces are being set up to address the crisis. Funding is an issue throughout the imaging workforce including mammography. Whilst this may not be easy to resolve these results highlight ways we can use current tools available to effect change and this may positively affect the mammography workforce with potentially little impact on the rest of the HEI course provision.

Recommendations

We fully recognise the pressures faced by HEIs in delivering the advocated curriculum within the academic timeframe, We suggest expert academic input in year 2/3. Anecdotally 1-2 hour sessions in addition to core content already covered in years 1 and 2 is sufficient to engage students, ideally before they enter clinical placement. It is hoped this would be minimally disruptive to current course provision.

It would be useful to ascertain the quality and structure of breast imaging placements.

One respondent commented that learning outcomes associated with clinical placement may be useful as without them it *gives people a message that it's not that valuable because there are no competencies in their practice assessment documents'* (Questionnaire response). We would endorse this and suggest that a minimum of 1 week placement is required to enable an informed perception of the specialism.

It would be interesting to explore student's views on mammography UG education and the outcome of the findings of this study. Another area for future work would be to collate responses from the breast imaging workforce to find out why they chose to work in this specialism and initially what attracted them.

Limitations

One limitation is that, in agreeing to be interviewed, the 5 interviewees may be positively biased towards radiography. A further limitation is that student perspectives were not collected and considerably more data to support this work could have been gained from student responses.

Conclusion

This study provides a structured overview of breast imaging education delivered as part of the UG radiography training throughout the UK. Variation in UG exposure to both academic teaching and clinical placements has been demonstrated which may have an influence on student perception of the speciality. Inclusion of specialist teaching beyond the core course

content and learning outcomes for both male and female students during clinical placement may go some way to address this. The results of the study could inform further research and assist the CoR and clinical breast units in implementing strategies to influence the future breast imaging workforce.

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