Radiographers’ experiences on learning arenas, learning needs and lifelong learning in the radiography profession

Abstract Purpose: This study aims to qualitatively explore radiographers’ learning needs and to better understand important learning arenas for radiographers in order to promote lifelong learning (LLL). Lifelong learning and continuing professional development (CPD) are both activities and catalysts for exploring the learning needs of radiographers. Investigating radiographers’ learning needs and the location for best learning is important in order to effectively utilise current and future CPD programmes and directives. Methods: Six radiographers working in a public Norwegian medical imaging department (MID) took part in the study. A combination of individual interviews and a focus group were used. Grounded Theory (GT) was used to qualitatively explore the learning needs and learning arenas important to these radiographers. Results: The radiographers defined their workplace as the best learning arena. On-the-job training, knowledge sharing through peer practice and interdisciplinary collaboration were important in the learning process. The radiographers placed a strong importance on technical sub-specialising in modalities as well as reflecting on the completeness in the radiographic role. The need for a better merge between theoretical education and applied radiographic practice was identified. Conclusion: Experiential learning was found to be central to the radiographers’ learning. The learning needs of the radiographers embraced specialisation as well as the theoretical domain and there was evidence that the rapid technological pace impacted upon the radiographers’ sense of achievement, motivation and adequacy. The participating radiographers acknowledged the necessity of lifelong learning, but also called to attention the importance of collegial guidance, interprofessional collaboration and feedback in creating a reflective practitioner.

Keywords: CPD, learning arenas, learning needs, lifelong learning, radiographer, reflective practitioner.

Introduction

Medical imaging departments (MID) are experiencing widespread technological innovation and changing healthcare boundaries that demands radiographers to acquire new knowledge and skills in many areas.1 The demand for radiography services worldwide has increased, especially in line with aging populations such as in Norway and Australia, and radiographers’ work has become more complex as their role has changed. More specifically it entails new work roles, both imaging and professional, new ways of communicating and new responsibilities.2

Lifelong learning (LLL), role extension and changing roles of radiographers have been discussed in the literature, particularly in the areas of digital imaging, image display and image interpretation.3,4 The age of DICOM and PACS has also shifted the boundaries in patient information and image data and a more complex system of referral, communication and responsibility has ensued.5,6 Interdisciplinary teamwork is more important than ever before as often collegial networks are conducted through electronic mediums. Multidimensional changes in the radiography work process have lead to extended learning needs in order to be abreast of the ever changing technology and increased responsibility.7,8

Both LLL and continuing professional development (CPD) are activities and catalysts for exploring the learning needs of radiographers. Investigating radiographers’ learning needs and the location for best learning is important in order to effectively utilise current and future CPD programmes and directives. This study aims to qualitatively explore radiographers’ learning needs and to better understand important learning arenas for radiographers in order to promote LLL.

In a study by Henwood, Yielder and Flinton8 it was found a general ambivalent attitude towards CPD existed among radiographers and the authors identified a number of barriers explaining low rates of participation in CPD. Lack of recording of CPD activity was highlighted along with poor staffing levels and marginal employer support. Henwood and Tacket9 also found the supporting components of facilitation and external influence important for effective CPD and described the CPD process as complex, dynamic and centred on the individual. They showed that radiographers in general were unaware of the holistic concept of CPD.

Kolb10 defines learning as “the process whereby knowledge is created through the transformation of experience” and that learning contains two basic dimensions. The first is perception, which is further divided into two aspects; apprehension and comprehension. The second dimension is transformation, whereby what is perceived can be transformed into knowledge in two different ways, either by reflective observation (as an introvert process) or active experimentation (as a more extrovert process). Kolb explains that combining these...
Table 1: Questions for individual radiographer interviews.

1. The radiography work field
   - Can you describe your normal workday?
   - What do you experience in your workday?

2. Changes in the radiography profession
   - Can you describe your perception about changes in the profession?
   - How do you experience change?
   - In what way does the change affect you?

3. Professional expertise
   - How do you perceive your own professional expertise?
   - What are your needs regarding development of professional expertise?

4. Educational needs, training requirements
   - Can you describe your educational needs or training requirements?
   - Where do you experience learning the most?
   - How do you meet these needs?

5. Management
   - What are your experiences of management acknowledging and acting on your learning needs?

6. The future of radiography
   - How do you see the work as a radiographer in the future?
   - Do you think you will see a demand for more specialisation in the radiography profession?
   - How do you think this demand will be met in the future?

Study design and methodology

For this study, grounded theory (GT), a qualitative inquiry, was used to interpret the social phenomena from the perspective of the participants – that is the world of radiography from the viewpoint of the radiographer. We chose GT methodology using the Strauss and Corbin tradition, in which the areas to be explored are investigated with minimal influence of established theories in order to create an emergent data set, such as interview transcripts, that is free from bias. Grounded theory has the ability to create a substantial theory, model or key concepts based on the empirical data and with its theoretical foundation in the sociological theories on symbolic interactionism, it is an ideal methodology to use where the primary is collected through interactive interviews and focus groups.

In this study six radiographers from a large public hospital MID in Norway participated in an individual interview and a focus group. The two data sets were then merged and coded to build the core categories and framework. The Norwegian Social Science Data Service (NSD) approved the study. An information meeting was held in the MID and a purposive sampling method was used to achieve a representative sample of radiographers for both the individual interviews and also the focus group. The participant selection criteria are shown in Table 3.

Semi-structured interviews were used to explore knowledge about the participants’ world as working radiographers. The interview questions can be seen in Table 1. Each interview was transcribed and analysed using selective coding and constant comparative analysis before the next interview was carried out. Thus the data set and questions were constantly evolving and testing new themes and directions as per the central tenet of grounded theory.

All the individual interviews were completed, thematically coded and analysed before the focus group took place. The focus group interview was carried out with five of the six participants because one of the participants was prevented from participating at very short notice. The focus questions were derived from the interview responses and centred on competence and working relations between radiographers. Table 2 shows the focus group questions.

The rationale for including a focus group rests the ability to observe interaction between the participants, such as spontaneous responses and opposing opinions. Additionally, the interaction between the researcher and the individual member of the group often decreases as discussion between participants’ increases and in this way the influence of the researcher is less than in an individual interview. The focus group interview in this study was transcribed, coded and analysed to contribute to the theoretical saturation of the categories/themes developed from the individual interviews. To secure anonymity, participants were given a fictitious name in the reporting process and these radiographers will be known as “Emma”, “Sophie”, “Trond”, “Josie”, “Anita” and “Charles”.

Participant selection

The criteria for selection of participants were constructed to give breadth and diversity to the small sample. Six radiographers volunteered and all were suitable in the study’s selection criteria. In the participant range were two male and four female radiographers, their ages spanned 25–45 years in even increments, they had between 1–10 years of work experience and worked as day or night shift workers. The participants worked with different imaging modalities and in different professional roles within radiography; however they all contributed to diagnostic image production as clinical radiographers.

Results and discussion

Central to the interview and focus group responses were the expressed individual learning needs of radiographers due to technological and professional/academic changes. Two central categories, or key concepts, emerged through the coding process. First, the concept of “important learning arenas”, and second, “learning needs”. “Learning needs” was the most complex,
Table 4: Concepts and sub-concepts with supporting quotes from the interview transcripts.

<table>
<thead>
<tr>
<th>Categories and sub categories</th>
<th>Supporting quotes</th>
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<tbody>
<tr>
<td>Important learning arenas</td>
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|                               | “I learned a lot through post graduate studies; still I have to use it actively to keep it up to date. Through work I learn something every day. Something new emerges all the time.” (Josie)  
|                               | “where it is learning in action in a way” (Josie)  
|                               | “when you are confronted with it, you have to figure it out.” (Anita)  
|                               | “If you practice, you learn where you are, through your work. In a way, this is learning itself, the natural way of learning” (Trond)  
| Learning needs                | “As I learn more, I feel that when I have learned something properly, I want to go deeper into it. The more I learn, the more it creates further learning needs.” (Anita)  
| On-the-job training and keeping current | “Yes, because you can’t keep up you know… the technique changes faster than you can manage to follow” (Trond)  
|                               | “The new CT machines that we got now, they are built in a new way, new technology that is unfamiliar… concerning both image acquisition and processing” (Josie)  
|                               | “Not one day passes, without me learning something new in PACS” (Emma)  
| Sub-specialising              | “There is no good situation nowadays real; there are many stressing factors that will be less conspicuous if we specialise” (Sophie)  
|                               | “I think it would be wise to specialise, as a radiographer you need to strengthen one area to be in control” (Josie)  
|                               | “It gets more exiting the more you immerse yourself in the different areas, so I can see, there is no way around, we need to become more specialised” (Sophie)  
|                               | “It is extreme… it concerns everything… it is very difficult to keep up with everything.” (Trond)  
|                               | “but we are not accustomed to spending time on training or education in our department” (Sophie)  
| Collegial knowledge sharing   | “We are obligated to tell if we get tips and tricks.” (Josie)  
|                               | “In the beginning I learned the most from my working partner; she taught me different important tricks” (Charles)  
|                               | “The production of images gives a great satisfaction, at the same time as you have communication with patients and colleagues all the time” (Sophie)  
|                               | “To be a part of a team, many professions in a team are exiting. You get to know a lot of people. Obtain an insight in how other professionals understand the work and have a common goal” (Josie)  
|                               | “small workgroups that can work together and discuss, I learn a lot from that” (Anita)  
| Interdisciplinary collaboration| Before when you collected your images …you could talk to the radiologists, or other radiographers, today you don’t have the same opportunity” (Anita)  
|                               | “I depend on the communication with the radiologists to feel safe in my everyday role in a way… our radiologists have a lot of expertise that we have to use to increase our own” (Sophie)  
|                               | “They are never present at the CT laboratory any more… I have the impression that they sat there, and did their work, on the laboratory, just a few years ago” (Emma)  
|                               | “Communication [between radiographers and radiologists] is always sensible” (Trond)  

having four subcategories of “on-the-job training and keeping current”, “sub-specialising”, “collegial knowledge sharing” and “interdisciplinary collaboration”. Results and the discussion will be presented category by category, followed by the conceptual framework explaining the relationships between categories in this study. Table 4 shows the categories and sub-categories with the most important supporting quotes from the interview transcripts.

Core category: important learning arenas

Generally, the radiographers felt that their workplace provided a strong learning environment. The combination of patient contact, working with other radiographers and the daily juggling of commitments and pressures allowed the radiographers to continuously learn through experience. Josie considered she learned the most in her daily work; “where it is learning in action in a way… through work I learn something every day. Something new emerges all the time.” Anita said she learned most in daily life, especially in situations where she had to judge various aspects, weighing the pros and cons; “when you are confronted with it, you have to figure it out.” Trond learned most effectively when he was able to be active and participation was important and he noted; “If you practice, you learn where you are, through your work. In a way, this is learning itself, the natural way of learning”.

The radiographers in the study said that they learned the most through own personal experiences and overall the workplace was defined as their best learning arena. This is consistent with Kolb’s theories on experiential learning, especially the structural dimension of experience, and with Rogers who find experiential learning the most significant. The participants could relate strongly to the concept of experience based knowledge and made an association to evidence based practice. Marshall, Punys and Sykes reported that 95% of radiographers sampled believed that CPD was important or very important in radiography and that the preferred CPD activity was a combination of print-based, e-learning and internet based material. This is not consistent with our
study findings. The radiographers in this study did not name the activities found by Marshall, et al. as important concerning their learning needs despite the majority having completed postgraduate studies in radiography.

The radiographers in this study did provide simple reflection on their experiences as adult learners and the need to be able to transpose theory from formal academic radiography learning into applied radiography practice. The importance of reflective knowledge is essential for CPD and the need for both theoretical and practical based competence in radiography has been discussed in the literature and is supported by the findings of this study.26,27

Core category: learning needs

The radiographers were asked to reflect their professional learning needs and in turn discussed different workplace aspects, such as on-the-job training, a need to update knowledge, modality specialisation and peer and interdisciplinary teamwork and collaboration. This core concept is therefore divided into four sub categories to illustrate their distinctive characters. Generally, the learning needs of the participants varied according to their work experience in years and personal variations with Anita noting “We have a wide range of learning desire”.

Sub concept: on-the-job training and keeping current

A continuous need for updating skills in the radiography work field was expressed by the participants. CT and digital imaging was the most frequently discussed topic; “the new CT machines that we got now, they are built in a new way, new technology that is unfamiliar… concerning both image acquisition and processing” (Josie). All six radiographers explained their learning needs were affected by the ever-changing technology and/or software change; “Yes, because you can't keep up you know… the technique changes faster then you can manage to follow” (Trond). The radiographers felt it difficult to be satisfied with their expertise when using new equipment; “Not one day passes, without me learning something new in PACS” (Emma).

The interview/focus group data demonstrated a number of challenges concerning the pace of technological change. The radiographers felt it difficult keeping up-to-date and that often learning one new skill prompts additional questions or avenues for learning. The learning needs expressed included aspects that implicate both close (practical) and distant (theoretical) learning methods.29 In essence, radiographers need to learn both through experience at work and through a more theoretical approach, for instance in post graduate studies or critical analysis of professional literature. The evidence in this study showed that the radiographers’ work requires them to keep up with technical developments that move in diverse directions in different modalities as well as the underlying theoretical foundations. The participating radiographers worked in all modalities, with the exception of MRI, and they felt it necessary to be experienced and up-to-date on this range of equipment.

Sub concept: sub-specialising

Sub-specialising in a particular modality was addressed as a complex issue by the radiographers. There was a dichotomy of role; on the one hand new knowledge about a modality was welcomed but it was generally agreed that the pace of technology made it difficult to be fluent in every modality. The need for sub specialising tended to be closely associated with particular modalities with Josie saying; “I think it would be wise to specialise, as a radiographer you need to strengthen one area to be in control” and Anita pointing out “everything turns more and more confined and specialised”.

The increasing need for sub-specialising was defined by the radiographers as the expectation of the MIDs to provide an effective imaging service as well as have expertise in use of a range of high technical equipment. As a consequence, the radiographers in the study acknowledged that their roles had become extended and with additional responsibilities. As Trond said; “A radiographer of today… in the perfect world… he is supposed to take all kind of pictures, skeletal, CT, MRI and at the same time understand how and when to change and alter to optimise different pictures… on all the modalities… but we see that it is not possible”. Four of the six radiographers had completed postgraduate studies and their motivation for doing was related to the need of higher education to effectively use new imaging modalities.

In Norway, the term “sub-specialising” is linked to the technical use of different diagnostic modalities and all six radiographers agreed on this definition. This is distinct from the organ focus that seems more common in Europe.29 There is no established national CPD programme for radiographers in Norway and the postgraduate studies offered mainly focus on modalities.

This study concludes that radiographers are defined in their learning by their technical expertise rather than a holistic approach and the question arises: is the focus on modality training a conscious or unconscious decision by the radiographers or radiography academia?

The results of this research show that the radiographers felt a need for special skills on all modalities but that was rarely possible. According to Schein29 it is important for the learning process to have experience outside of the workplace in order to ensure a broader frame of reference for practice and to be able to theorise learning. Thus the need for specialising through post graduate education, as experienced by the radiographers in this study, could indicate a need to increase professional expertise through extended higher education and professional literature in order to make a stronger link between theoretical knowledge and their clinical experience on the specific modalities.26 Sub-specialising through postgraduate studies, which focus on modalities, can give the theoretical confirmation or validation the radiographers felt needed.10

The radiographers felt it was difficult to act with professional responsibility as health care workers in a wider “radiographic field”; and stated that they request more narrow and defined areas to show professional liability. Modalities can then easily be defined as such areas. The empirical data imply specialising might be wise; the debatable question then is whether the diagnostic modality focus is the best course of action when it comes to specialising. The disadvantage of a sub-specialising with modality focus is the possibility of splitting the radiography group and this concerns some of the participants “The body is whole in a way” (Anita). A matter to give attention while thinking of sub-specialising is “subcultures” or modality teams29. Subcultures/teams in the different modalities as resources to create innovation and learning should be encouraged, however the importance of keeping in mind what radiographers have in common, must not be forgotten. It is essential to get all the modality teams to work together in the patients’ best interest and the radiographers in this study expressed a need for more managerial structure or systems to increase this potential.

Sub concept: collegial knowledge sharing

The radiographers described that they often work in pairs; “in the beginning I learned the most from my working partner; she taught me different important tricks” (Charles). The participants believed that there should be a more streamlined system for sharing professional knowledge, especially access to colleagues with superior skills and knowledge. Additionally it was articulated that sharing expertise with peers was a responsibility that radiographers should take on more freely; that it “is in everybody’s best interest” (Emma). The participants also described working closer as a team.
in comparison to before the period of digitalisation or PACS. Generally, the radiographers all felt they have expertise in various fields and were able to disseminate their knowledge to improve imaging quality as a whole; “The production of images gives a great satisfaction, at the same time; you have communication with the patients and colleagues all the time” (Sophie).

Learning through peer practice and active peer participation supports the workplace as an important learning arena. This study supports other research where participation and shared experiences are essential learning arenas such as that of Henwood and Taket who found radiographers focused on participation when completing CPD activities. The learning process within collegial guidance takes place between the participants and their shared experiences and this is true of radiographers working with other radiographer and radiographers working with student radiographers as found by Conway, Lewis and Robinson.

The radiographers in this study illustrated simple reflective patterns in their recollections of peer guidance and support. Collegial guidance as expressed by the radiographers in this study can operate as both as instrument and as a goal in the learning process. Sim and Radloff emphasise the incorporation of reflection into professional development programs both as a learning goal and strategy. As an instrument, the guiding radiographer can help other radiographers by imparting knowledge and experience plus encouraging open discussion and reflection upon workplace roles and learning. The goal from this is to create reflective radiography practitioners. The authors of this study believe greater reflective practice can be an effective way to address the major challenges in the medical radiation science profession in the areas of professional autonomy and accountability.

Sub concept: interdisciplinary collaboration

Interdisciplinary collaboration, mainly through communication between radiographers and other imaging professionals, was reported to have had changed with the introduction of PACS and impacted upon their learning. The radiographers in this study narrated that logistical changes accompanying PACS in the department have left a void of meeting places between radiographers, radiologists and other professionals. Even though radiographers defined themselves as the image quality experts in the MID, they lamented the feedback from the radiologist in the normal micro interaction regarding imaging in the central viewing area. One radiographer said: “I depend on the communication with the radiologists to feel safe in my everyday role in a way… our radiologists have a lot of expertise that we have to use to increase our own” (Sophie). The radiologists were also perceived as being more absent from the imaging suits and less likely to interact with the radiographers.

The sub concepts “collegial knowledge sharing” and “interdisciplinary collaboration” share a common theme in meeting places and knowledge sharing. The radiographers suggested establishing work or study groups that included radiologists. The radiographers felt they lacked interdisciplinary meeting places and dialogue and searched for new ones because they saw them as important arenas for feedback and learning. Kolb emphasises feedback as an important process for learning and this study showed that feedback had diminished and thus learning opportunities between radiographers and radiologists had declined too.

Conceptual framework: lifelong learning with emphasis on experiential learning

Based on the result of the six interviews and the focus group a central phenomenon or core category was found, as evidenced through the transcripts. The radiographers in this study placed a strong emphasis on learning in their workplace. Learning needs were expressed to be met more frequently in the near learning arenas, for example in the MID, than in the more distant areas, such as postgraduate education courses despite the participants having strong participation in such courses. The conceptual framework (Figure 1) is a model of the different learning needs and the core category, “Lifelong learning with emphasis on experiential learning” as described by the radiographers in this study. The different learning needs as components of the core category have distinctive characters. They are placed according to where the learning need is met, near or more distant from the core. Hence “collegial knowledge sharing”, “interdisciplinary collaboration” and “on-the-job-training and keeping current” are closer to the centre illustrating their importance in life long learning and “sub-specialising” is on the outer circle reflecting its more technical, less reflective domain as expressed by the radiographers in this study.

This study concurs with the study of Munro on nursing CPD in identifying learning through work as important for LLL and CPD. Marshall, et al. on the other hand found in their survey of radiographer CPD that e-learning and internet based material to be the most important area for learning. It is difficult to know the reason for this difference, but Marshall, et al. suggested that the work environment may influence the attitudes and experience of the respondents. Thus, work environment in other departments may be different from the one these participants were sampled, although the study centre and participating radiographers would be generally representative of Norwegian working conditions.

Conclusion

This study, while small, has provided an insight into radiographers’ learning arenas and learning needs. For lifelong learning to occur in the radiography profession, reflection and ability to adapt to workplace changes is necessary, especially as experiential learning is central to radiographers’ learning. It is also important that higher education, especially in the modalities, has scope for reflection rather than intense technical instruction. Overall, the radiographers in this study have articulated their experiences of feeling the squeeze between workplace learning, including CPD and specialisation, with that of maintaining a culture of sharing knowledge, collaboration and feedback.

References


Figure 1: Conceptual framework of radiographers’ learning arenas and learning needs.