Informing radiography curriculum development: The views of UK radiology service managers concerning the 'fitness for purpose' of recent diagnostic radiography graduates

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Abstract

Introduction: Recent years have seen significant changes in the way medical imaging services are delivered, rapid changes in technology and big increases in the number and ranges of examinations undertaken. Given these changes the study aimed to critically evaluate the fitness for purpose of newly qualified diagnostic radiography.

Method: The study employed a grounded theory approach to analyse the interviews of 20 radiology managers from a range of medical imaging providers across the UK.

Results: Four key themes emerged from the analysis. These were: curriculum content and structure review; diversification in the role of the radiographer; professionalism and coping and the reformation of career structures.

Conclusion: The results indicate the role of the radiographer is now quite nebulous and challenge radiology managers and educators to design curricula and career structures which are better matched the role of the radiographer in the very rapidly changing technological, organisational and social contexts of modern society.

Keywords: Radiography, Curriculum, Development, Managers, Service, Graduates.

Introduction

When preparing a radiography curriculum in the UK, one of the first touchstones for any planning group is inevitably the Health and Care Professions Council (henceforth HCPC) standards of proficiency for radiographers[1], which must be achieved by any student in order to become registered. The current standards, first published in 2003 and revised in 2007, require registrants to be able to perform '…the full range of standard imaging techniques and standard contrast examinations, including those undertaken on service users suffering from acute trauma.'[1] Additionally, they require that registrants be able to perform a standard CT head examination, while also having the capacity to *assist* with other forms of CT examination, MRI, ultrasound and nuclear medicine procedures. These regulatory standards, in conjunction with stalwart historical trends in professional practice itself, have prospectively resulted in many contemporary undergraduate radiography programmes focusing chiefly upon developing student competence in projection radiographic imaging, perhaps at the expense of other imaging modalities[a].

While the HCPC standards have not changed significantly since their initial publication, a simple examination of current NHS medical imaging workload data and case mix[2,3] reveals that real-world medical imaging practice itself is undergoing a period of sustained change. Substantial increases in the number of examinations undertaken using cross-sectional imaging modalities are widely reported. For example, the number of MRI examinations conducted in England grew by 220% between 2004 and 2014[2]. There have also been conversant increases in the number of CT examinations, currently showing an annual growth rate of 10% per annum, and Ultrasound (a 5.3% annual expansion)[2], while the

[a] One need only review prospectuses for undergraduate diagnostic radiography programmes around the UK for corroboration of this assertion.

most recent reliable figures indicate that the frequency of PET/CT examinations rose by 14% between 2008 and 2012[3]. Radiography programmes which remain fundamentally grounded in the development of projection radiographic imaging skills may increasingly find themselves out-of-step with the demands of the workplace. This is prospectively disadvantageous for both new graduates and their employers in the short-to medium terms, as extensive on-the-job training may well be necessary before a freshly-qualified professional can actually be deemed fully competent to handle the demands of working in a modern medical imaging department.

Given the development of radiography into evolving areas of practice, Thomas at al.[4] describe an approach to the effective development of medical education curricula, the first step of which always involves identification of current problems and a general needs-assessment. This centrally involves (a) a critical analysis of the current context, and (b) a wide review of extant services. Regarding (a), in particular, the specific requirements of patients, healthcare professionals and educators themselves become of key concern. To develop an effective and (immediate) future-proof curriculum, it is crucial to develop an unambiguous, evidence-based understanding of the practical experience of pertinent agents within a defined contemporary social and structural healthcare milieu. This knowledge will then be central in informing the subsequent stages in the planning process.

Against a context of the rapid and ongoing reconfigurations in the delivery of UK care services[5], thus, the manifest aim of this enterprise, in line with the first step of the approach advocated by Thomas et al.[4], is to seek key informants' understandings of graduate fitness for purpose. By exploring the experiences of radiology service managers in the UK, the investigative model is designed to concurrently open-up debates and deepen understanding of current workplace issues, with a view to positively informing the work of curriculum development groups.

Methods

A Straussian model of Grounded Theory[5] (henceforth SGT) was adopted as the core framework herein, an established qualitative approach within healthcare research that facilitates close-detail analysis with a view to building cohort-specific theories that hold over the quality of data collected [6]. The value of this approach has, to date, been expounded in a range of radiography-related studies[7,8], and has also produced practice-relevant findings elsewhere in healthcare education[9,10].

Participants

Ethical approval was granted by the researchers' governing institution to recruit participants and execute the study as described herein. All activity relating to data collection, handling and dissemination remained in strict accord with these conditions. N=20 department heads (male=5; female=15) were recruited through an opportunity sample, whereby an invitation-to-interview was sent out to department heads across the UK, and those that agreed to take part within the temporal and fiscal restraints of the project were included. These participants worked (geographically) across N=20 trusts. Within the sample, N=19 worked within the public sector and N=1 within the private. Conditions of ethical approval delimit any further elucidation of participant demographics, on account of potential identifiability within a professional community.

Data Collection

A semi-structured interview (SSI) was developed by both authors, drawing on current literature and the practical experience of the first author, an experienced clinical and academic radiographer. As Silverman[11] and Rhodes et al.[12] note, and as well-illustrated by

some recent studies in the radiography domain[13-15], SSIs are optimally suited to allow for analytic comparison between cases without stifling the emergence of topical "novelties" (i.e. pertinent issues originally unanticipated by the researchers). All interviews were conducted by the first author, by phone, and audio-recorded at that point. Transcription was then conducted by an experienced transcriber, who was also signed within the ethical standards of the project, and both authors reviewed all transcripts against original sound files to establish that they provided a clear account of what was said.

Analysis

In line with a SGT approach, close attention was paid by both authors to the fine detail of the transcripts, rather than simply addressing the overarching thematic matters that might arise within a traditional (Glasserian) model of GT[16], or a more formal model of thematic analysis[17]. Core textual codes were initially developed by the first author, and then reviewed by the second. Both authors further addressed how these codes might inform higher level (axial) codes; the final emergent themes were then developed through a principle of triangular consensus validation [14], in which a third academic skilled in qualitative research reviewed and evaluated the entire process[b]. All input was incorporated into the analysis presented below.

Trustworthiness

As noted above, and with reference to the business of handling data, the key concerns identified by Yardley[18] were observed. For example, *sensitivity to context* in this corpus is maintained through only making statements about the specific, rather than the general, when addressing the data at hand. *Transparency and coherence*, meanwhile, is evidenced in the

[b] As noted in the paper's acknowledgements.

data diagrams below; the process of initial codification to thematic discussion is not made unclearly, nor without direct evidential support (in the form of direct quotation).

Results

The analysis of the data from the participant interviews revealed four broad global themes:

1) Curriculum content and structure;
2) Diversification in the role of the radiographer;
3) Professionalism and coping, and;
4) Reformation of Career Structures.

Each of these themes is considered in turn below, supported by graphical models which demonstrate the process by which initial codes were grouped into axial sub-themes and, ultimately, the global themes noted. It should be noted that these charts demonstrate the range and depth of the themes, but do not quantify the number of responses[c].

Curriculum content and structure review

The first major theme to emerge from the participant feedback was pertinent to the design of current and future radiography curricula. Of particular relevance here was the participants' attention to critical and interpersonal skills. Participants foregrounded a graduate's ability to

[c] To do so would be to equate statistical rates of occurrence of a theme with its importance, which is anathema to this order of investigation[20].

source and utilise evidence, and their capacity to show leadership abilities, over a need to retain propositional knowledges around anatomy, medical terminology and physics.

FIGURE 1 AROUND HERE

This is not to propose that participants were not concerned about gaps in the knowledge of graduates in areas such as use of medical terminology, digital imaging and the setting of exposure factors. Incidents were indeed reported where a failure to recognise processing artefacts had, in turn, negatively impacted upon patient care. It was also widely recognised that projectional radiography was still the most frequently undertaken order of examination, and this should remain a key feature within curricula. Nevertheless, examinations by cross-sectional imaging modalities, such as CT and MRI, emerged as a dominant concern for participants when discussing what their new charges had been trained *in*, and its practical usefulness:

> **R9: '**I think there's still going to be that need for plain-film general radiography experience, but I think cross-sectional imaging- the demand for it is just going through the roof, and I think that that is probably one of the areas, that we're going to really see, and perhaps have to look at our staffing differently, because we're going to have to put more staffing in to support those areas.'

> **R16:** 'I mean, one thing that I've seen is that radiographers are moving out of general radiography more quickly than ever. Almost to the point where you start to question whether it's worth doing a radiography degree at all."

The need for structural reform in the way qualifications are delivered was widely determined to be an important consideration for future curriculum development. Participants sought the development of more focused educational pathways, such that they might be apposite for specific imaging modalities as used by specialist providers, or the private sector (e.g. PET/CT). Related to this was a proposed mandate that the practical aspects of any university-based radiography curriculum should be delivered by staff who are currently practicing clinicians, sensitive to real and nuanced changes in the healthcare environment.

Diversification in the role of the radiographer

The second major emergent theme, strongly interlinked with the first, emerged from the participants' concerns regarding the varied technological advances which have recently occurred within medical imaging, combined with evolving models of service delivery.

FIGURE 2 AROUND HERE

Wide variations emerged in the expected role of a new radiographer, from participants involves in different orders of organisation. It became clear that the workforce needs of the private healthcare service providers, specialising in cross sectional imaging, were very different from those of a medium sized district general hospital or those of an imaging unit setting within a large teaching hospital. It was reported that in one trust the wide variety of work within areas undertaking projectional radiography created difficulties in maintaining parallel competence in other modalities:

> **R17**: 'Because of the size of general radiography, and the complexity of general radiography, [the new graduates] actually found it quite difficult to maintain competence in more than one modality.'

Moreover, the practical impact of the diversification of the role, and issues concerning the practical skills-set of graduates, were reported to have necessitated the creation of bespoke training packages for newly qualified staff.:

> **R20**: 'We are very, very careful with our new graduates in terms of induction, so, for example, we have a twelve-week induction programme in which they are supernumerary. It's well established…..they go round all the clinical areas.'

Extensive induction programmes, preceptorship and in-house training were now taken to be defaults in enabling graduates to work within their scope of practice for a given clinical setting. This was also reported regarding graduates moving into a particular imaging modality. Three months of in-house training was often quoted as being the required minimum to enable them to work within a given scope of practice for that modality. Some individuals would subsequently go on to undertake postgraduate education within the modality concerned, but this was reported as the exception rather than the norm, especially in certain very busy areas such as CT.

Professionalism and coping

The third global theme developed from the data related to professionalism and the abilities of newly qualified radiographers to meet the demands and requirements of working in a contemporary medical imaging service.

FIGURE 3 AROUND HERE

In this domain, the participants typically voiced their views in a more emotive manner than elsewhere; ultimately, dispassionate analysis of the topic was commonly abandoned in the production of narratives around personally-held matters.

> **R9**: 'This is one of my real bugbears, professional standards and that's a very generic thing, and that isn't about, specifically about imaging needs and things like that, but it's about them understanding a professional side of a career in radiology and as a radiographer. [I]t's a vocation and it's something that you've got to have in you and you've got to be driven by that, you know, having an understanding of standards set by the profession, by the HCPC and about and from the Society, and an understanding that the patient comes first, and that really has to be driven. I think, particularly in light of everything that's going on, you know, on the back of the Francis Report and things like that, and I think that that should really be focused on that, you know, we're here because, we're here because of the patients.'

One aspect of the professional role of the radiographer which was highlighted as an area of particular importance was related to the ability of graduates to think beyond the function of their own department or work area, and to consider the impact of their actions or inactions upon the wider organisation and how this could impact upon patient care and efficiency.

> **R20**: 'It's about pre-empting about processes, so if someone's going to have a pacemaker inserted, there's always- more than likely, there's going to be a chance that they're going to need a chest x-ray afterwards; so what are we going to do to set that up?'

Motivation was a topic that generated many responses from the managers. There was a degree of frustration expressed generated from having to chase individuals to undertake activities which were seen as core to role and professional activities such as mandatory training or reflecting upon critical incidents:

> **R15**: 'I think one of the main things for me is about the level of autonomy that, some of the staff have now. I don't feel that they're quite as self–sufficient as they used to be. I think there's a level of having to be spoon fed and not taking ownership for their own competence and professional development.'

The importance of good communication and empathy skills was further emphasised as a prerequisite for good patient care and effective service delivery by virtually all of the respondents. Interviewees also valued highly motivated individuals who went out of their way in the performance of their role:

> **R1:** I'm not interesting in them scanning, I want to know they can talk to people…'

> **R20**: 'The difference, I think, is someone that's got good communication skills, good eye contact, the ability to appreciate somebodies perspective and empathise with them and demonstrate that empathy, offer support, you know, someone that walks past a patient that perhaps has been sitting there for ten minutes and goes, 'actually he's been sat there a while; I wonder if he wants a newspaper?', and goes up and picks up that newspaper; somebody that walks down the corridor and picks up a piece of paper that's rubbish on the floor, not just step over it.'

Related to this were issues about newly qualified staff having difficulty in maintaining a work life balance brought about by the need to work shift patterns brought about by the move to 24/7 working within medical imaging services. This was linked to the pressures staff have to face within their role and wider societal issues such as child care:

> **R9**: 'Well, things like, you know, the demands of the job, of them having an understanding of the demands of the job, that actually they do have to work weekends and bank holidays, it's like a shock sometimes to some of them that come in'.

> **R16**: 'I suppose resilience, really, being able to cope with an increasingly high pressure environment in terms of the demands placed on individuals. We see a lot of burn-out of staff these days……we ought to develop people so that they're prepared for what they are coming into and know how pressured an environment it can be, and how to cope with that.'

Interviewees felt that undergraduate programmes should have 24/7 working fully integrated into clinical placement rotas and the expectations and resilience of graduates to cope with working under the pressures imposed by their role and society in general was an issue which needed to be addressed. Related to this was the value placed upon radiography graduates who had gained experience from previous work, either in a healthcare role or another unrelated role prior to or during their radiography education (e.g. radiographic assistant). The experience gained therein often led to the accelerated development of many of the skills, attitudes and beliefs required for their role within medical imaging.

Reformation of Career Structures

The final global theme identified was related to career structures and how this was impacting upon training capacity and future opportunities for graduates.

FIGURE 4 AROUND HERE

It was reported that historical career structures and pay banding within certain imaging modalities such as cross-sectional imaging were causing distortions and barriers which were impacting upon the ability of the newly qualified radiographers to perform their role and develop in the future:

> **R7**: The band fives do a rotation which covers a 24 hour service in plain film and CT. Then when they're sixes they then specialise in plain film, CT, angios, MR…'

> **R10**: 'What's happening here, and I'm sure we're not alone, is that general radiography is constantly being drained to furnish the staff for the MRI, CT, intervention, so we end up with the junior radiographers doing some of the most complex work.'

The issues generated from the statements reported above were further developed by some into a critical analysis of current education and career structure arrangements:

> **R17**: 'I personally think that we need to make each of the modalities, equal to one another, as opposed to thinking general radiography is something which is on the decline because it isn't, it's, it's a modality in its own right.'

R3: ‘we should look to building that (projection radiography) as more of a lifelong career for people and not just the stepping stone that a lot of people see it as today.’

R7: ‘I mean we’re desperate in cross-section, and we tend to backfill from plain film but plain film aren’t able to backfill when we’re poaching their staff so it’s, you know, we definitely need to train more radiographers.’

Finally, the workload pressures that currently exist, shortages of radiologists and changes in ways services are or will be delivered were seen by managers as powerful drivers for change:

R6: ‘So, say intervention, our radiographers do a lot more nursing techniques; they can do sedation on patients and they do a lot of- you know, they take bloods and that sort of thing. So it’s very much a team rather than radiographers and nurses; there’s a lot of interchanging of roles’.

The above statement indicates the continuing opportunities that exist for radiographers to expand their role into new areas, but also into new work environments linked to care pathways which may not currently exist within the traditional radiology department. Educators should therefore consider how future curricula will effectively prepare graduates to undertake these roles.

Discussion

The increase in the diversity of work now undertaken within medical imaging, and the huge expansions in number of examinations undertaken within cross sectional imaging, must be seen as key drivers for shaping future curriculum development. The evidence above indicates that the role of the graduate radiographer is now in a flux state. Currently education is mainly

focussed around a specific order of professional duty namely projectional radiography & CT of the head. However, graduates now enter their first post in a manner defined by the particular department, role function or employer. Newly qualified radiographers work within a particular scope of practice defined by their particular role. The competences developed in their pre-registration training may be used in that role or new competences may need to be developed by extensive induction and preceptorship to match that role.

The findings described above indicate that the latter was prevalent within cross sectional imaging. A newly qualified graduate may go on to work in this field, and may never use competences developed in projectional radiography again. This questions, to some extent, the value of an in-depth competence development within projectional radiography, though it should be recognised that is still the most commonly used of all the imaging modalities[3]. It should be noted here that there has been a reduction in the numbers of rooms available for projectional radiography clinical placements which has been brought about by Direct Radiography systems replacing Computed Radiography systems[19]. This should be contrasted with the expansion of other modalities which now often outnumber the rooms dedicated to projectional imaging. To maximise the efficient use of clinical education capacity there may be a need for employers and educators to work closely together than ever before in shaping graduates for particular roles thus promoting the efficient use of scare clinical education resources. This cannot happen easily however without the development of career structures to match roles and that a variety of entry points/grading bandings exist within all of the modalities.

The results indicate that a new model of radiography education should be developed and tested in practice in order to meet the rapidly evolving needs of imaging services. It is proposed that such a model provides graduates with the threshold competences in the most commonly carried out projectional radiographic procedures & CT head within the first two

years of the programme in order to meet the regulatory requirements. This would be accompanied with a defined experience and relevant core competence achievement in other modalities such as MRI and Radionuclide Imaging. The third year of the programme could then mainly focus upon one area of practice e.g. projectional radiography, CT or MRI determined by student preference, clinical placement availability and employer needs.

If a graduate chose ultimately not to work within their third year specialist area they could still undertake preceptorship, in house training or post graduate study to match their scope of practice within their first post and subsequent career. In essence this matches the current situation in the UK though at the moment there is one common start point. The advantage of the proposed new model is that it opens up a much greater number, range and scope of clinical placements at a time when there is a chronic shortage of placement resources available to educators.

Issues relating to motivation, professionalism, communication, graduate career expectations and coping with the pressures of the modern health service were of particular concern to managers. The reasons for this are unclear but issues related to the marketisation of education and healthcare could be contributory factors or indeed wider societal changes or generational differences. Educators should therefore give serious consideration to the inclusion of topics such resilience training and stress management within curricula. This could be coupled with an expansion of areas such as effective communication and more clearly defining career and professional expectations. Together these may enable graduates to become more aware themselves and the wider issues which impact upon them and the services they deliver.

Conclusion

Educators and managers must be aware of the rapidly evolving nature of medical imaging. This sits within the context of the challenges and opportunities brought about from the changes in placement capacity, the reductions in projectional imaging clinical education resources and the significant increases in cross sectional or more specialist imaging modalities. New curricula should provide for a much greater utilisation of cross sectional imaging and more flexible study pathways to make the full use of the clinical education resources now available.

Increased pressures and changes in working practices require graduates to be resilient and have realistic expectations of their career. Coupled with this is the continuing need to produce graduates who are highly motivated, professional and who possess exceptionally well developed communication skills.

The current context demands an examination of what the role of a radiographer actually is and the expected competences of the radiography graduate of future. Changes in professional identity, student clinical placement capacity issues and mismatches between the two are embedded in broader patterns of socioeconomic change. We need to understand this a find fluid and flexible responses to these challenges that start with addressing identity.

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Figures

Figure 1

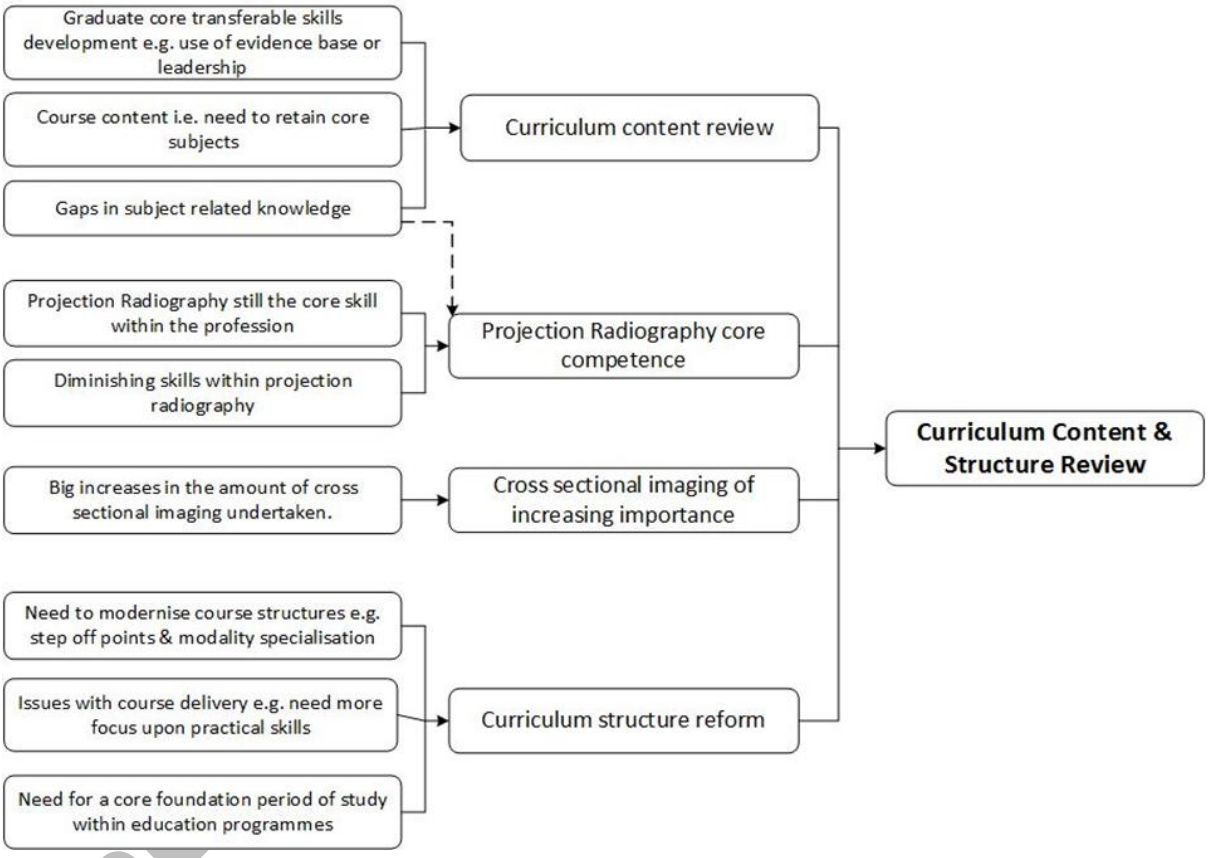

Figure 2

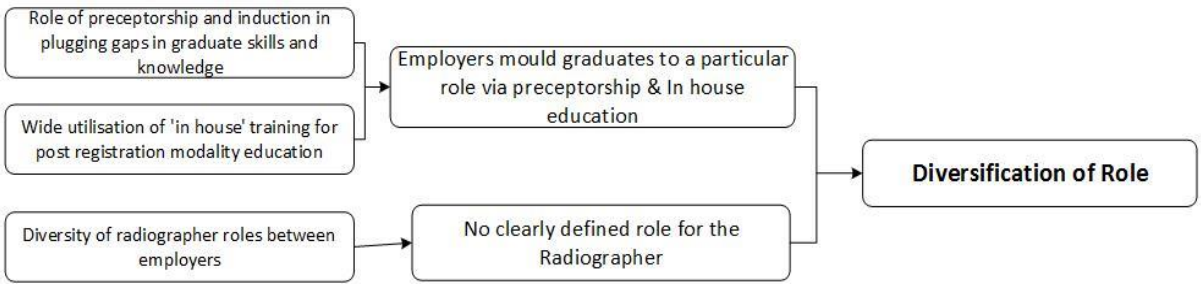

Figure 3

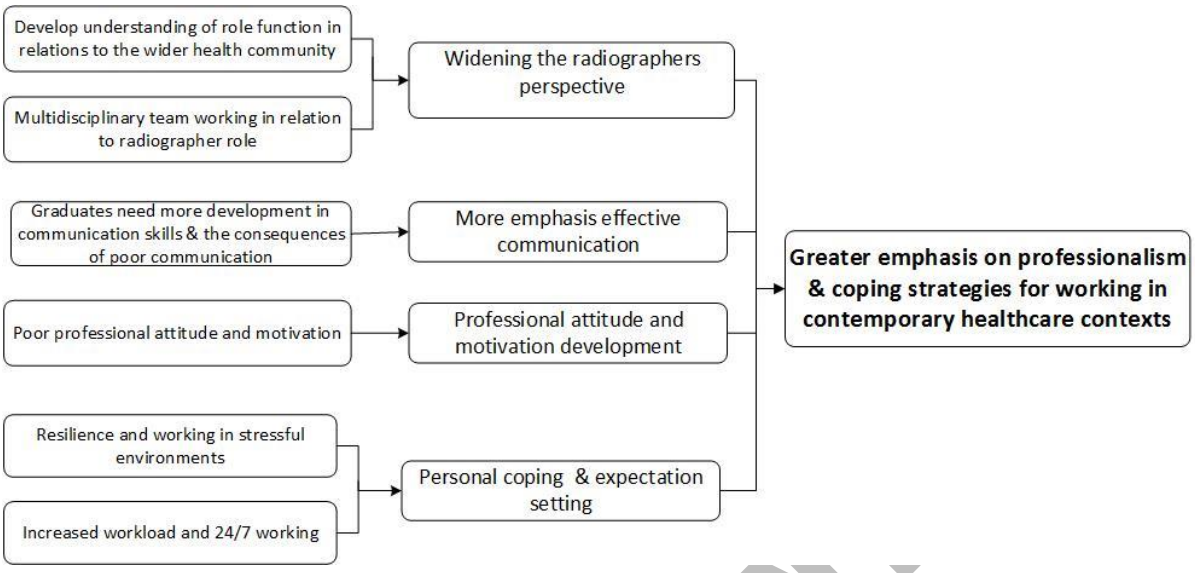

Figure 4