

# A postgraduate qualification in the specialisation fields of diagnostic radiography: A needs assessment

J du Plessis, H Friedrich-Nel, F van Tonder

*Radiography, Faculty of Health and Environmental Sciences, Central University of Technology, Bloemfontein*

J du Plessis, BRad Hons, MAHES

H Friedrich-Nel, MRad, PhD HPE

*Higher Education Studies, University of the Free State, Bloemfontein*

F van Tonder, BA (Hons), MEd, PhD (Didactic/Curriculum Studies)

*Corresponding author: J du Plessis (duplesj@cut.ac.za)*

**Introduction.** Current education and training in radiography in South Africa does not address the need for training in the specialisation fields of diagnostic radiography sufficiently.

**Methods.** To address this problem, a needs assessment was conducted by means of quantitative questionnaires, qualitative interviews and a focus group discussion. The main aim of the needs assessment was to determine the need for a postgraduate qualification in the specialised fields of radiography. The possible structure of such a programme and the preferred mode of delivery were also investigated.

**Results.** The results of the study emphasise the need for structured postgraduate programmes in the different specialisation fields of diagnostic radiography.

**Conclusion.** Responding to this validated need for postgraduate qualifications in the specialisation fields in the profession, recommendations are made towards the development of such postgraduate programmes in the higher education framework in South Africa, promulgated in 2007.

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Over the past two decades, imaging in diagnostic radiography has experienced rapid advances in computer technology. These advances also apply to specialised imaging such as magnetic resonance imaging (MRI), computed tomography (CT), vascular interventional angiography (VIA) and mammography. Specialised imaging demands a high level of knowledge and skills since radiographers have to operate state-of-the-art, computerised imaging technology and interpret complex anatomical structures. These advances have increased the diversity of imaging examinations and associated imaging technologies and resulted in many radiographers being required to extend their individual scope of practice.<sup>1</sup>

The introduction of educational programmes on a postgraduate level offering specialised training will contribute to the vision of many South African (SA) universities of technology to be globally connected institutions focusing on the needs of southern African and African students to support graduates with skills and competencies in appropriate technologies.<sup>2</sup> The offering of further education in specialised imaging will also benefit other southern African countries such as Botswana, Namibia, Zambia and Malawi, also called the Southern African Development Community (SADEC) countries, as there are an increasing number of students applying at SA universities for further study, having acquired an

undergraduate qualification in their own country. Through appropriate education and training, value will be added to lifelong learning in the workplace to the benefit of the employer and the community at large. Diagnostic radiographers will thus have the opportunity to work towards a postgraduate qualification in the specialised fields of diagnostic radiography and not only in general diagnostic radiography.

The aim of the research was to survey qualified diagnostic radiographers (with a qualification in general diagnostic radiography) at the Central University of Technology, Free State (CUT) in Bloemfontein, SA, to assess whether there is a need for a postgraduate learning programme in the specialised fields of diagnostic radiography. Aspects included in the investigation were the need for diversification into specialisation field training, the structure and preferred modules to be included in a postgraduate learning programme and the mode of delivery preferred by the radiographers for such a postgraduate programme. Also investigated was the importance of role extension for future training purposes, and the desire among employers in the region to employ diagnostic radiographers with a formal postgraduate qualification in specialised imaging. The following section contextualises the need for further training as supported by the literature and elaborates in more detail the methodology followed to

accumulate the data. This is followed by a summary of the results, a brief discussion on the findings and recommendations for future implementation.

## Conceptual framework

In many countries the development of the role of the radiographer by acquiring postgraduate qualifications in specialised imaging has slowly progressed since the late 1980s. Currently it is common practice for radiographers in countries such as the United Kingdom (UK) and the United States of America (USA) to report on examinations such as barium studies, screening mammography studies and injuries of the skeletal system after having acquired a postgraduate qualification in pattern recognition. This development has been heavily directed, within both the clinical and academic environments, by radiologists acting as clinical teachers, mentors and advisors to academic course design and assessment.<sup>3</sup>

In SA, radiography training is currently offered at two traditional universities and seven universities of technology (UoTs) in conjunction with hospitals where students do their work-integrated learning (WIL) (experiential learning). Undergraduate education and training in diagnostic radiography at the UoTs is currently a three-year diploma qualification (at level 6 of the South African Qualifications Authority (SAQA)). This undergraduate qualification is structured to include all basic aspects of general diagnostic imaging. It also includes a substantial WIL component to gain competencies and skills in all general diagnostic procedures.<sup>4</sup> Most UoTs also offer a BTech degree in diagnostic radiography, radiation therapy and nuclear medicine (at level 7 of SAQA). The BTech degree in diagnostic radiography is structured for the student to acquire knowledge and skills in research methodology, management principles and practice and general diagnostic imaging procedures. The degree does not include any modules focusing on education and training in the specialisation fields such as MRI, CT, VIA or mammography and is thus presented as a general diagnostic qualification.<sup>4</sup> However, some UoTs offer training in ultrasound at BTech level. The Cape Peninsula University of Technology (CPUT) is currently the only institution offering a qualification in MRI, this only over the past few years. A CT course was started in 2006 at CPUT.<sup>5</sup> These two courses are not offered at BTech level but are accredited with the Health Professions Council of SA (HPCSA).

In contrast, many institutions abroad offer postgraduate training in the specialised fields of diagnostic radiography. The Confederation College in Ontario, Canada, offers a comprehensive two-and-a-half-year undergraduate programme, which prepares radiographers for entry into the profession. In addition, this college provides graduates with postgraduate opportunities to specialise in ultrasound, MRI and CT.<sup>6</sup> The College of Radiographers in the UK<sup>7</sup> offers a variety of postgraduate qualifications, up to doctorate level, in the specialisation fields of diagnostic radiography. Curtin University of Technology in Perth, Australia<sup>8</sup> presents a postgraduate course up to Master's level that extends the range of career options available for radiographers. This qualification provides an opportunity for senior positions in radiology departments to be awarded to radiographers who are able to demonstrate proven specialised academic and practical abilities.

A range of options is available to prospective students to cater for the variety of specialised categories (ultrasound, nuclear medicine) and specialisation

fields (CT and MRI). The University of Australia in Sydney presents a postgraduate course that aims to advance the knowledge, skills and attributes of medical radiation professionals in their field of specialisation. Prospective students choose from CT, MRI, advanced nuclear medicine, advanced radiation therapy, breast imaging, clinical studies, bone mineral densitometry and radiographic image interpretation (pattern recognition).<sup>9</sup> Midwestern State University in the USA offers a discipline-specific Master's degree in radiologic science (MSRS) with options for specialisation in CT and MRI.<sup>10</sup> The University of Teeside in the UK<sup>11</sup> presents a postgraduate course which includes radiographic studies and covers also contemporary issues in health and social care, vulnerable client groups, advanced imaging modalities such as CT, MRI, ultrasound and digital imaging technology, and research methodology.

The aforementioned training possibilities are only some of a wide variety available at training institutions for radiography abroad. In contrast, the current national curriculum, approved and accredited by the HPCSA and SAQA, offers Master's-level qualifications only in the form of a dissertation, in all the categories of radiography, as an exhaustive search of the web pages of training institutions in SA indicated.<sup>12</sup> No accredited, structured postgraduate qualification in the specialised fields could be found.

## Research methodology

A needs assessment was undertaken accumulating data by means of a quantitative questionnaire, qualitative interviews and a focus group discussion. The questionnaire was designed to evaluate current practices, knowledge and skills in the specialised fields of diagnostic radiography among diagnostic radiographers and to set these against an assessment of the education that is needed to meet current and forthcoming professional demands. The questionnaire consisted mainly of closed questions; a few open-ended questions were included. An interview guide was compiled for the personal interviews (radiographers and employers) and the focus group discussion, following analysis of the questionnaire results. The main aim of the few open-ended questions and of the questions set for the interviews and the focus group discussion was to support or clarify replies from the respondents to the questionnaires. The questionnaire was pilot-tested by participants who had a formal qualification in general diagnostic radiography; radiographers participating in the pilot study did not receive the final questionnaire.

## Study participants

The study was limited to diagnostic radiographers currently employed in Bloemfontein and Kimberley, including those in both the public and private sectors. Assistant radiographers (supplementary radiographers) were excluded from the research as their qualification level was unsuitable to access a postgraduate qualification. Qualified diagnostic radiographers currently doing their compulsory community service were included in the research. The names and contact numbers of 129 radiographers were obtained. After elimination of the assistant radiographers, a total of 120 diagnostic radiographers were included. Four employers and 10 diagnostic radiographers were selected to be interviewed. Participants for the focus group discussion were purposefully selected by the researcher, and

included three lecturers in the programme radiography at CUT, and four chief radiographers who were involved on a regular basis in the 'hands-on' training of diagnostic radiographers in the specialisation fields.

## Data analysis

The researcher coded the questionnaire data, appropriate questions were grouped together and data were entered into Microsoft Excel. Open-ended questions were summarised using a thematic approach. The interviews and focus group discussion were recorded, transcribed and summarised.

## Results

Summaries from the results were used to describe the demographic data of the respondents, the profile of the organisations within which the respondents were employed, the position of the respondents in the organisations, the educational and professional background of the respondents, and respondents' perceived needs for further education in the specialisation fields of diagnostic radiography. Of 54 radiographers in private practice, 22 responded (40.7%) while 41 of 66 (62%) practitioners in the public service responded, giving an overall response rate of 53.4%.

The majority of the respondents (62.5%) were in possession of a three-year National Diploma in Diagnostic Radiography (Fig. 1). The highest level of educational achievement among the respondents was an honours or BTech degree in diagnostic radiography (7.9%). Only 6 (9.4%) of the respondents indicated that they were involved in further studies. All radiographers who indicated that they were engaged in further studies (9.4%) are currently enrolled for a BTech degree in diagnostic radiography. Only two of the ten radiographers who participated in the interviews are currently enrolled for further study and none of the four chief radiographers participating in the focus group was enrolled for further study. The lack of motivation to enrol for further study among radiographers participating in the interviews and in the focus group discussion can be summarised as follows: 'The limited promotion opportunities in the profession, as it is currently structured, together with the lack of acknowledgement through better remuneration are the main impacting factors on the reluctance of radiographers to enrol for further studies. Also impacting negatively on radiographers' motivation to study further, is the employers' reluctance to allow radiographers to take study leave to attend classes.'

However, personal interviews with the four employers suggested that wrong perceptions may exist among the radiography workforce in the Free State and Northern Cape region. Three employers indicated a willingness to offer a radiographer higher remuneration if the radiographer could handle more responsibilities as a result of an additional qualification. Employers stated that they were in need of highly trained radiographers who could be trusted to successfully handle difficult examinations in general radiography and especially in the specialised imaging modalities. The shortage of radiologists in our country, which was confirmed in the interviews with the four employers, seems to be the main motivating factor. Only one of the employers was not particularly interested in employing radiographers with further qualifications; this employer, by implication, gave high priority to the financial aspect of the practice.

The four employers indicated staff shortages as the major reason for their unwillingness to relieve staff from work to attend classes. They indicated that any radiographer absent from duty in order to attend classes had a huge

impact on service delivery and patient throughput. This inevitably impacts heavily on the business financially, especially in the private sector. However, all four employers indicated recognition of the value of a properly trained staff member who would be able to handle additional responsibilities successfully and a willingness to allow study leave on condition that not too many staff members applied for it at the same time.

An unexpected constraint to further study, which was not addressed in the questionnaire, surfaced during the interviews with the 10 selected radiographers and was confirmed by all the participants in the focus group discussion. This was the lack of real initiatives by the CUT to develop courses for radiographers for further study.

The results depicted in Fig. 2 confirm that only 5% of the respondents had received additional academic education (AAE) in one or more of the specialisation fields. The vast majority of radiographers in the study received additional training from a product specialist (PPS) and/or a senior radiographer (PSR) (Fig. 2). In the questionnaire survey, 17% of the respondents indicated that they had attended some workshops or seminars

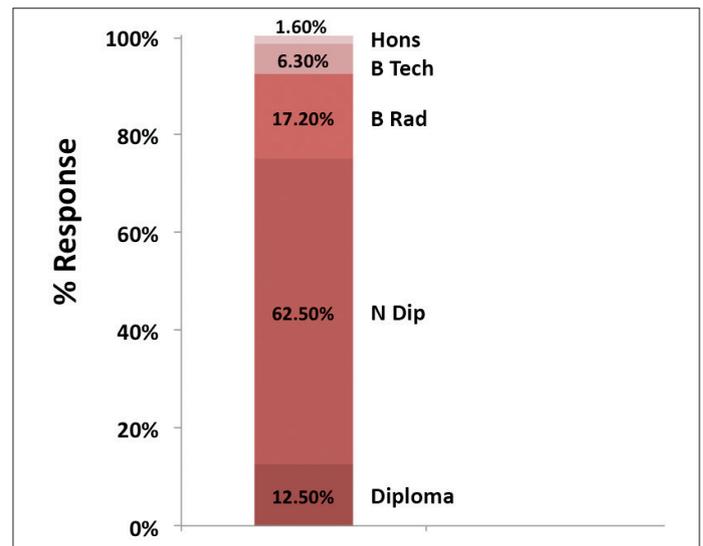


Fig. 1. Percentages of current qualifications of the respondents.

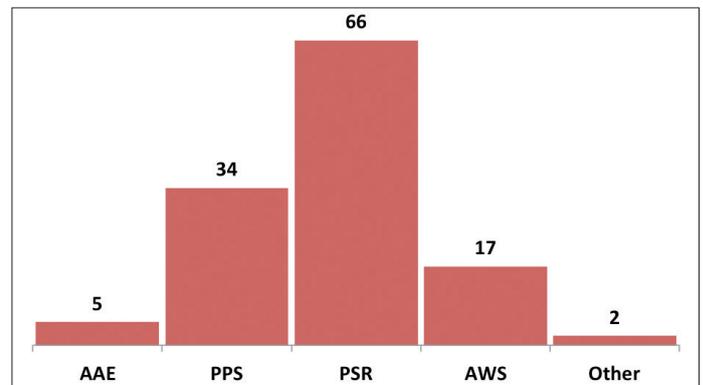


Fig. 2. Percentages of the type of training received in the specialisation fields. AAE = additional academic education; PPS = professional training by a product specialist; PSR = professional training by a senior radiographer; AWS = attendance of workshops and seminars.

to upgrade their knowledge and skills for working in the specialisation fields. Only 2% indicated that they had received other training in the specialisation fields, but did not specify the type of training.

Training in the specialisation fields by a PSR and/or PPS was confirmed by all the participants (10) in the interviews, who also indicated that they had had to wait 4 - 5 years before being trained, since seniority at the institution earned preference. This waiting period was confirmed and explained in the focus group discussion by the chief radiographers responsible for the training in the specialisation fields. According to these radiographers it is difficult to train more than one person at the same time in any of the specialisation fields due to the complexity of all interlinked aspects that must be addressed during training.

As can be seen from Fig. 3, 73% of the respondents preferred both academic education (AE) and professional education (PE) in the specialisation fields of diagnostic radiography. Three per cent of the respondents indicated that they prefer academic education only and 2% indicated that they prefer no education. During the personal interviews, the respondents indicated that their major reason for a preference for both AE and PE was the fact that radiography is a profession with a strong WIL (experiential learning) component. Without the necessary skills and competencies (contextual knowledge) to perform an examination, all the conceptual knowledge (attained via AE) would be worthless – the only worthwhile way to learn a skill is to apply contextual knowledge in practice (attained by PE).

Fig. 4 indicates that the bulk of the respondents (91%) opted for either part-time study (50%) or a blended learning model (41%). Only 3% of the respondents opted for full-time study and 6% for a distance-learning model. To clarify the educational concepts to the radiographers in clinical practice, the terms 'part-time study', 'blended learning' and 'distance learning' were explained as follows:

- part-time study applies to students who are employed full-time as radiographers and can attend classes only outside working hours, implying that the course is presented over a 2-year period instead of 1 year
- blended learning suggests that a variety of learning facilitation tools will be utilised such as formal classes (lectures), Internet-supported activities, electronic discussion forums, etc.
- distance learning indicates that students never have to attend classes since all learning material, including assessment, is delivered and managed electronically (Internet, etc.).

All participants in the interviews and focus group discussion opted for a blended learning model. The reason for their choice was that all of them were permanently employed diagnostic radiographers and most were married with families who depended on their income. Therefore, the only possible way for them to engage in further studies would be on a part-time basis. This explains the 50% vote for part-time study and the 41% vote for a blended learning model found quantitatively (Fig. 4).

As can be seen from the pie graph (Fig. 5), 83% of the respondents preferred a higher education qualification structured into different modules. Only 17% of the respondents opted for a purely research-based qualification on a Master's level. Personal interviews with the 10 selected radiographers

confirmed a choice of modules (electives), e.g. a year-long module respectively for two of the four specialisation fields (MRI, CT, VIA and mammography). They however agreed that the research dissertation should be compulsory for a Master's degree qualification.

The use of both a quantitative and qualitative mode of inquiry proved to be particularly valuable in the research reported here. Uncertainties from the questionnaire results were generally clarified and validated in the interviews and focus group discussion with the radiographers and the employers. Conclusions and recommendations regarding the way forward for a postgraduate learning programme in the specialisation fields in diagnostic radiography at the CUT are portrayed in the following section.

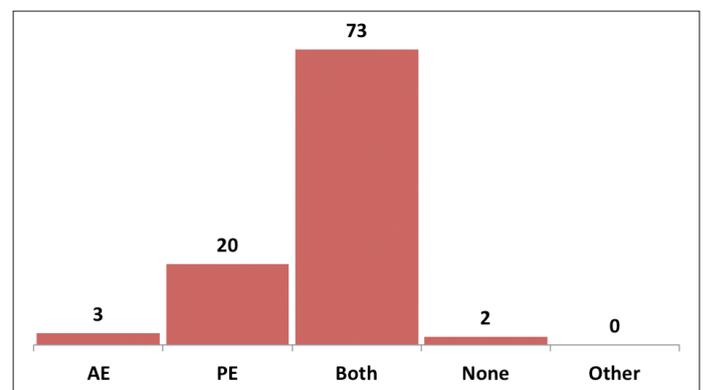


Fig. 3. Percentages of educational preferences in the specialisation fields. AE = academic education; PE = professional education.

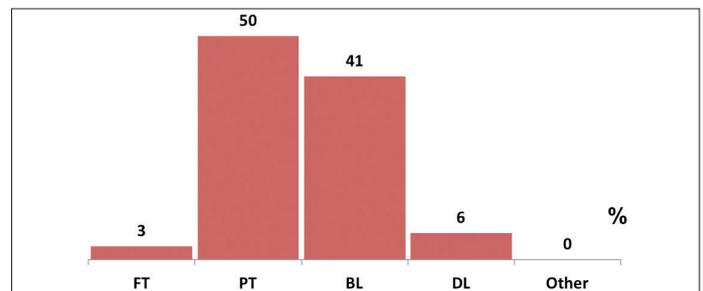


Fig. 4. Percentages for preferred mode of delivery. FT = full-time study; PT = part-time study; BL = blended learning; DL = distance learning.

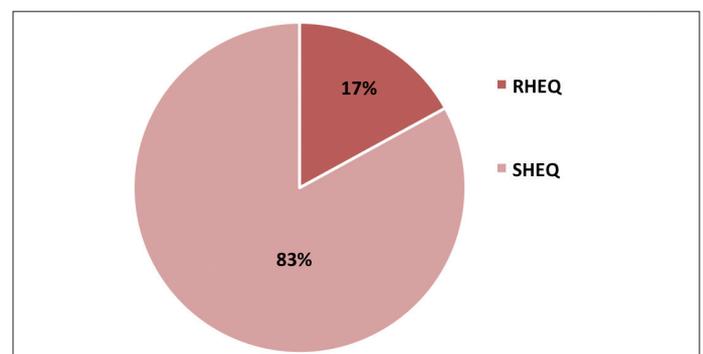


Fig. 5. Preferred structure of a future higher education programme. RHEQ = research higher education qualification; SHEQ = structured higher education qualification.

## Discussion and recommendations

The main aim of the research was to assess whether there is a need for a postgraduate programme in the specialisation fields of diagnostic radiography in the Free State and Northern Cape region of SA. From the literature it became apparent that such postgraduate training programmes are not widely offered by training institutions in SA, and in this study we established that all participating radiographers received only 'hands-on' training by a product specialist or a senior radiographer in the specialised modalities of radiography. Unfortunately the questionnaire did not make provision for gathering more information regarding the type of 'hands-on' training or the institution where training was achieved. This might be considered a limitation in the questionnaire. At undergraduate level, the student is furnished with a broad overview of the relevant factors that render students competent to practise general radiography. However, rapid advances in technology have stimulated an increasing realisation that, to be effective and competent in practice, radiographers need to pursue some form of postgraduate specialisation to stay abreast and to deliver quality imaging to their patients.

Results from the quantitative survey, as well as comments from the qualitative part of the survey, were generally in favour of postgraduate training in the specialisation fields of diagnostic radiography. In light of the recognition to obtain further training, the low educational achievement among diagnostic radiographers was explored in the interviews and focus group discussions. From the discussions it was clear that this situation can partly be ascribed to the lack of postgraduate educational opportunities in the region. In addition, significant constraints curtailing further training included staff shortages and the lack of rewards or incentives. The participants in the research sample firmly expressed their need for acknowledgement of achievement of further qualifications.

The vast majority of participants opted for a structured qualification instead of a purely research-based qualification. These participants stated that they would like to have the option to study in the specialisation field/s of their choice. The participants also added their views on the preferred modules for a future programme. It was furthermore considered important by the participants in the interviews that WIL (experiential learning) be part of any postgraduate higher education programme.

Based on the results of the research the authors would like to suggest a number of recommendations that should be considered when planning provision of future higher education programmes in diagnostic radiography at the CUT:

- Both academic and professional training should form part of a future higher education programme (as indicated by 73% of the participants (Fig. 3)). Such a programme should be structured with a formal academic component (conceptualisation of knowledge) and a component to monitor the achievement of skills and capabilities (contextualisation of knowledge) in clinical practice. A portfolio of evidence might be feasible to assess the attainment of practical competencies and skills in specialised imaging.
- A future higher education programme should be structured with regular contact sessions (perhaps one per term), after which the student should work independently on assigned projects and the development of skills and competencies. All learning material should

be available online and electronic learning and assessment should be actively utilised.

- Since the majority of the participants (62.5%) in this study are in possession of a National Diploma in Radiography (level 6 on the Higher Education Qualifications Framework (HEQF)) with only 7.9% in possession of a BTech degree (level 7 on the HEQF), the following is recommended when planning provision of future higher education programmes in diagnostic radiography at the CUT:
  - An Advanced Diploma (level 7 on the HEQF)<sup>13</sup> in the specialisation fields as a stepping stone (progression) for radiographers in possession of a National Diploma qualification (level 6 on the previous HEQF). According to the HEQF<sup>13</sup> this qualification would offer an intensive, focused and applied specialisation which meets the requirements of a specific niche in the labour market, in this case the specialisation fields in radiography. Programmes offering this qualification would provide an Advanced Diploma graduate with a deep and systematic understanding of current thinking, practice, theory and methodology in an area of specialisation. It is therefore particularly suitable for continuing professional development.
  - A Postgraduate Diploma (level 8 on the HEQF)<sup>13</sup> in the specialisation fields to allow for vertical progression of radiographers in possession of a BTech degree (level 7 on the previous HEQF) and those who aspire to obtain a Master's qualification in radiography. The HEQF<sup>13</sup> designates this qualification for working professionals who wish to undertake advanced reflection and development by means of a systematic survey of current thinking, practice and research methods in an area of specialisation, in this case the specialisation fields in radiography. This qualification would demand a high level of theoretical engagement and intellectual independence. A sustained research project is not required, but the qualification might include conducting and reporting research under supervision.
  - A Master's degree (level 9 on the HEQF).<sup>13</sup> As the majority of the respondents in this study (83%, Fig. 5) chose a structured Master's qualification, the proposed Master's programme could comprise a coursework programme (modules), requiring a high level of theoretical engagement and intellectual independence, and a research project, culminating in presentation of a dissertation. In the latter case, a minimum of 60 credits (of the 180 credits) at level 9 of the new HEQF would be devoted to conducting and reporting research.<sup>13</sup> A number of electives could be offered at the discretion of the provider, depending on the number of credits allocated for each elective.

A Higher Certificate (level 5 on the HEQF)<sup>13</sup> and an Advanced Certificate (level 6 on the HEQF)<sup>13</sup> qualification are not recommended for radiographers with a National Diploma or BTech degree qualification, who aspire to progress vertically on their career path, as these two qualifications are respectively pegged at a lower (Higher Certificate) level than the current National Diploma (level 6) and a level lower (Advanced Certificate) than the current BTech degree (level 7).

The main limitation to this research is the inclusion of only a part of the radiography profession in SA (Free State and Northern Cape region) in the needs assessment. However, the possibility of attaining a postgraduate qualification was deemed by the majority of participating respondents as

necessary for progress in their own careers, as well as for the status of the profession as a whole. Furthermore, most participants in the qualitative section of the research were of the opinion that the study material and mode of delivery, if chosen with careful consideration, could be beneficial to their knowledge base and could help with the improvement of the quality of radiography services in SA and the SADEC countries to the community at large. Responding to the needs identified in this research, the current research-based Master's degree qualification might be effectively adjusted to accommodate our findings and therefore include options for specialisation in diagnostic radiography.

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