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A survey of South African Radiographers' and Radiologists' opinions on role extension for radiographers

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Abstract

Role extension for radiographers in South Africa is driven by the need to improve service delivery challenges and the radiographers' need for professional recognition. The two areas earmarked for role extension are injection of contrast media and reporting on radiographs. This study was conducted to determine the willingness of diagnostic radiographers to extend their roles and gather the opinions of radiologists regarding this role extension. A quantitative, descriptive, exploratory and cross-sectional study was conducted. A sample of 300 radiographers and 30 radiologists was taken from a population of 7771 radiographers and 885 radiologists as per the Health Professions Council of South Africa register (HPCSA). Survey Monkey was used for making questionnaires accessible to all participants. The level of significance was fixed at 5%. Sixty-eight percent of radiographers agreed in principle to injection of contrast media and only 25.5% agreed to provide a written report on the interpretation of radiographs. Eighty percent of radiologists agreed in principle to radiographers injecting contrast media and only 11.6% agreed to radiographers providing a written report on the interpretation of radiographs. The participants gave an average response of 74.4% on the need for radiologists to take responsibility for the adverse reactions that may results from injecting contrast media. Radiographers and radiologists supported the need for further education and training and role extension for injecting contrast media. There is concern over the 'no one' response as to who performs radiologists' work and how this impacted on service delivery.

Keywords: Role extension, radiography, injection of contrast media, image interpretation.

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Introduction

The need for role extension for diagnostic radiographers in South Africa (SA) has been a point of discussion from as far back as 2006 (Williams, 2006). The two main areas that needed the attention of the Radiography and Clinical Technology (RCT) Board of the Health Professions Council of South Africa

(HPCSA) were role extension to injection of contrast media and reporting on radiographs by radiographers. The Board has published articles and guidelines advising radiographers to limit their professional acts to their scope of practice. Despite these guidelines, radiographers continued to report that they were being pressurised to practise outside their scopes.

An article in the RCT Newsletter of 2010, addressed the concerns and questions of radiographers regarding contrast media procedures, such as the performance of Barium Sulphate procedures and the administration of iodine-based contrast media (Daries, 2010). Radiographers in KwaZulu-Natal hosted a workshop on 12 September 2010 to address the matter (Professional Board for Radiography and Clinical Technology, 2013). The board further established the Role Extension Task Team to address these issues. A panel discussion on Role Extension took place during the Radiological Society of South Africa's (RSSA)/Society of Radiographers in South Africa's (SORSA) Imaging Congress in 2011. The RCT Board chairperson presented two papers; one paper was on 'Injecting Contrast Media' and the other on 'Reporting on Images'. The RCT Board later published an article in the HPCSA Bulletin (Professional Board for Radiography and Clinical Technology, 2011) stating that there was no institution accredited for the education and training of radiographers to inject contrast media in South Africa. It was emphasised that the employers should not pressurise radiographers to perform outside their scope. The RSSA acknowledged the fact that it was outside the scope of a diagnostic radiographer to inject iodinated contrast media. The RSSA further suggested that if the radiographer was asked to inject contrast media, the radiologist or referring clinician should be in the immediate vicinity to provide service to the patient in case of an emergency (Radiology Society of South Africa, 2013).

Two major factors that motivated this study were the shortage of radiologists and the radiographers' desire to be recognised for the additional services they were rendering in clinical practice. The motivation for extending the role of radiographers related to the need to enhance the status of the profession. According to the HPCSA register, there were 885 radiologists and 7771 radiographers in October 2013. The shortage of radiologists had the following impact on service delivery in medical imaging departments; a) patients were waiting longer for radiology procedures; b) radiographic examinations were not being reported on; c) some radiographers in both private and state hospitals were expected to perform professional acts outside their scope and d) non-accredited in-house training programmes were being offered to radiographers.

Research on radiographer role extension has been conducted worldwide. Reports from the United Kingdom (UK) reveal that radiographers' role has been extended to include image interpretation for accident and trauma cases (Hardy & Barret, 2004; Snaith & Hardy, 2008). The study by Moran and Warren-Forward (2011) indicated that radiographers in Australia were keen and ready to take up

the additional/extended roles. The following positive aspects of role extension were identified from the literature; a) the number of radiographic reports being issued had increased because radiographers were reporting; b) there was an efficient turnaround of the reports to the referring clinicians; c) radiographers' job satisfaction was reported to have improved and d) there was also an increase in remuneration (Moran & Warren-Forward, 2011). Image interpretation by radiographers was viewed by most clinicians as an extension of the clinical examination (Hardy & Barret, 2004). Ugwu, Egwu, Nwobi and Oluware (2009) further indicated that if remuneration was to accompany the expanded roles, this would improve the individual's social network and family circle without compromising efficiency in service delivery. The following negative impacts are reported in literature: a) threats of litigation; b) higher workloads for radiographers; c) possibility of higher recalls; d) lack of acceptance by the radiologists; e) the need for additional training, as well as pressure from the employers of the radiographers to comply. Of particular note was the fact that most radiographers, despite being ready to take up new roles, seemed reluctant to provide assessments (reports), independent of radiologists (Moran & Warren-Forward, 2011).

In a study conducted by SORSA in 2012, radiographers were of the opinion that accredited education and training programmes for the injection of contrast media should be offered to improve service delivery (Munro, Isaacs, Friederich-Nel & Swindon, 2012). The course should also include pharmacology. Gqweta (2012) highlighted that the SA undergraduate radiography programme already included basic image interpretation that enables the radiographer to provide an uncommitted verbal report on the radiographic appearances. In the UK, the undergraduate educational programme already included basic image interpretation skills but there was still a need for formalised training for radiographers to report on radiographs in SA (Gqweta & Naidoo, 2014). These findings are echoed by Hlongwane and Pitcher (2013) who indicated that radiographers have the potential to make a considerable contribution to service pressures in regional and district hospitals. SORSA suggested that further research should be conducted on all HPCSA registered radiographers across SA and gave permission for the RCT Board to use or adapt their questionnaire (Munro et al., 2012). The board adapted the SORSA questionnaire to include the opinions of the radiologists. The aim of this study was to determine the willingness of radiographers to take up additional responsibilities by extending their professional role and further to analyse the opinions of radiographers and radiologists regarding radiographers' role extension.

Methodology

Research design was quantitative descriptive, exploratory and cross-sectional. Questionnaires with closed-ended questions were used to gather quantitative data. An ordinal scale was also included to gather qualitative data. The objective was to reach a large population of registered radiographers and radiologists through email and electronic media, Survey Monkey. Based on HPCSA records, in October 2013 there were 7771 radiographers and 885 radiologists. Data were collected from a population of radiographers and radiologists. The statistician assisted with the determination of the sample size by using the nQuery Advisor statistical package. The level of significance of test was fixed at 5%. The percentage of radiographers showing interest in accepting additional professional responsibilities varied from 11% to 17%, as reported in literature (Snaith & Hardy, 2008; Ugwu et al., 2009; Moran & Warren-Forward, 2011). The power of study was set at 84%. By using the estimates above, the adjusted sample size of study for radiographers was 300 and for radiologists was 38. Participants were invited from all nine provinces of SA.

Research instruments

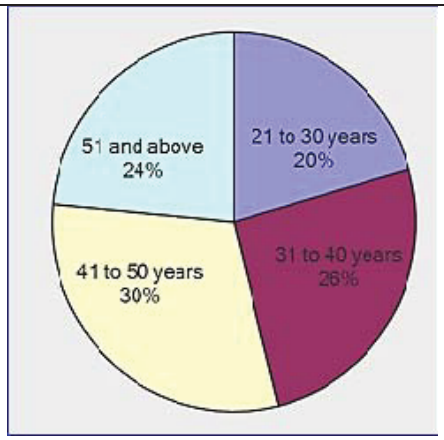
The questionnaire used by SORSA in 2012 was adapted. Based on the same format of the questionnaire, a new questionnaire was designed for the radiologists. The radiographers' questionnaire had 51 questions and the radiologists' had 44 questions. The questionnaires included questions on demographics (Parts A & B), and questions to elicit opinions and attitudes towards injection of contrast media as well as image interpretation were in parts C and D, respectively. Part E had an ordinal scale where radiographers were asked to indicate their levels of satisfaction with their current positions. Radiologists were asked to indicate their level of agreement with extending radiographers' roles to include image interpretation and injection of contrast media.

Data collection and analysis

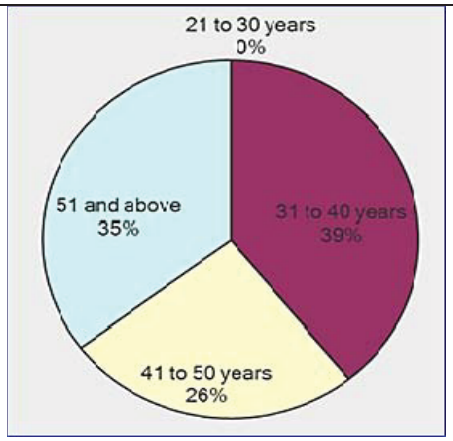
The data collection commenced following ethical approval that was granted by the Research Ethics Committee of the Faculty of Health at the University of Pretoria, number 428/2013. Questionnaires were made accessible to participants from March to May 2014 through Survey Monkey and the HPCSA website. The statistical package STATA was used for data capturing, editing and validation. Quantitative data analyses were conducted by using frequency tables, cross-tab analyses (Pearson's chi-square tests of association), one- and two-sample tests on the mean and proportions, binary logistic regression analysis, and factor analysis.

Results

Demographic information was collected to provide evidence of the total number and categories of participants in terms of a) age; b) provinces they reside in; c) years of clinical experience; d) place of employment; e) urban or rural residence as well as f) gender distribution. A total of 426 radiographers and 57 radiologists responded to the questionnaires. This number was greater than the numbers estimated using the nQuery Advisor, which were 300 and 38 for radiographers and radiologists respectively. Some participants did not respond to all questions; for this reason, for every figure and table presented the actual number of respondents is denoted 'n' (Figure 1).



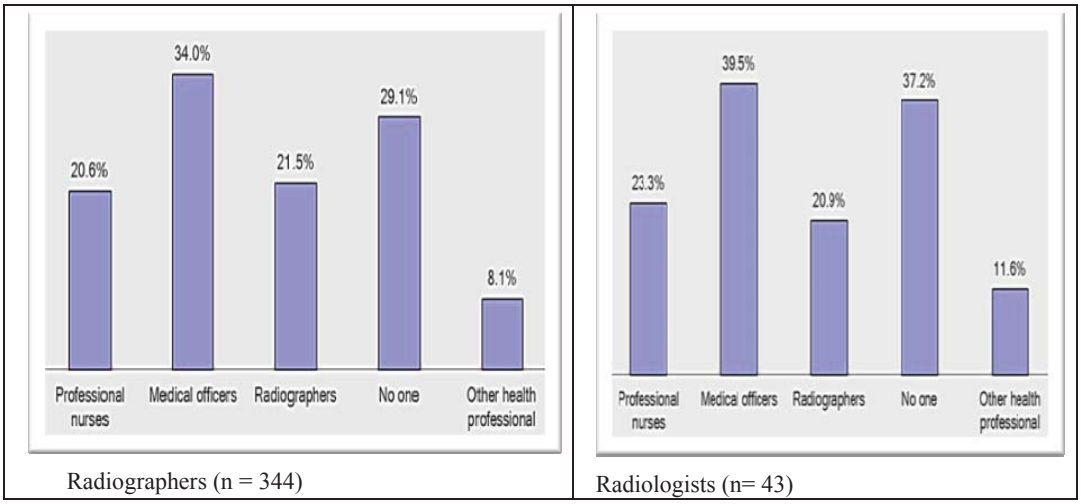
Radiographers (n = 391)



Radiologists (n = 51)

Figure 1: Total number of participants in their age categories

Statistics provided are in line with the duration of study for radiographers and radiologists, hence there are no radiologists below the age of 30 (Figure 1). Besides this age category, the distribution seems even for both groups of respondents. The questions on the injection of contrast media ranged from a) Do radiographers inject contrast media willingly or are they pressurised? b) Who injects contrast in the absence of the radiologists? c) Have radiographers undergone accredited training to inject contrast media? Responses indicated that different professionals, including radiographers, are involved in the injection of contrast media (Figure 2). Twenty-nine percent of radiographers and 37% of radiologists indicated that no one injects contrast media in institutions that do not have radiologists.

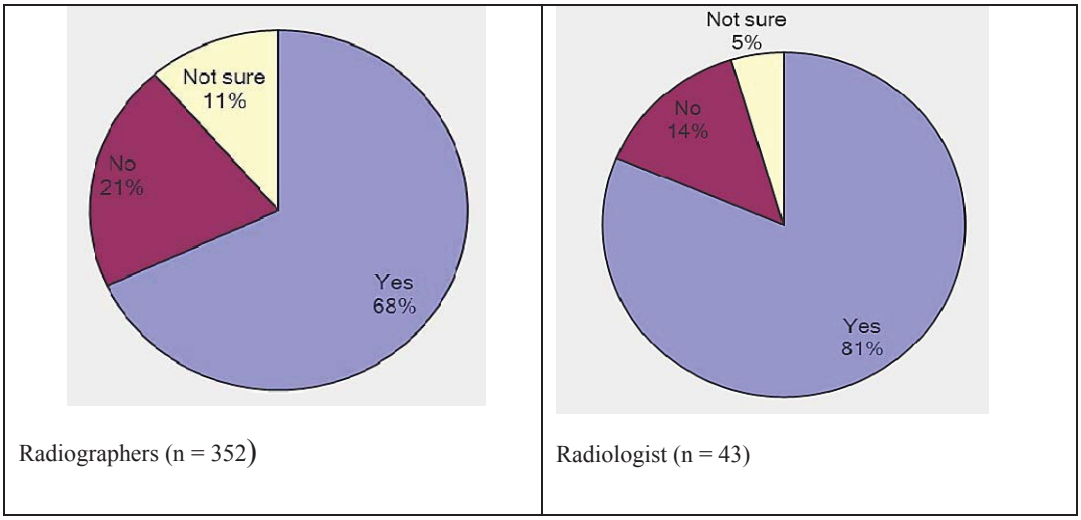


Radiographers (n = 344)

Radiologists (n= 43)

Figure 2: Responses on who injects contrast media in institutions that do not have radiologists.

Radiographers and radiologists were in principle supportive of role extension into injecting contrast media (Fig 3). With regard to the need for radiologists to retain responsibility for managing possible reactions to contrast media, similar responses (74%) were obtained from both groups of participants.



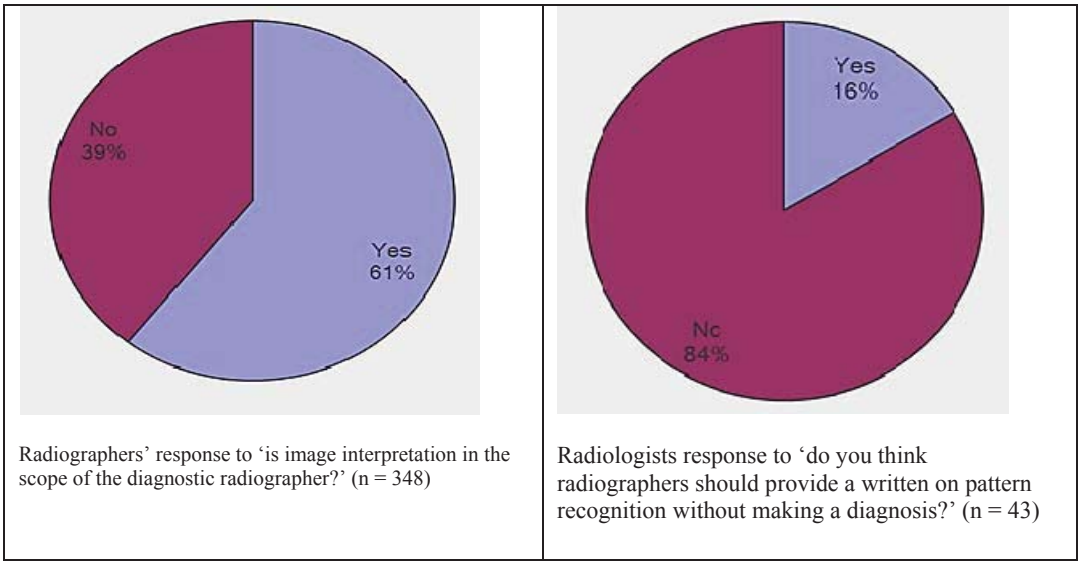
Radiographers (n = 352)

Radiologist (n = 43)

Figure 3: Responses to 'do you agree in principle to role extension - Injection of CM

Statements on role extension to image interpretation and report writing by radiographers ranged from a) Are you aware that image interpretation was in the scope of a radiographer? b) Radiographer may only provide a verbal report on the work performed by him or her to the person making the request, as well as c) asking participants to choose among the suggested training that should be offered for radiographers. Sixty one percent of radiographers were aware of what statements a) and b) referred to. Eighty four percent of radiologists indicated that radiographers should not provide a written report on image interpretation, even when they are not making a diagnosis (Figure 4). The percentages of 'no

responses' to questions on image interpretation were noticeably higher, 18.5% for radiographers and 29, 8% for radiologists.



Radiographers' response to 'is image interpretation in the scope of the diagnostic radiographer?' (n = 348)

Radiologists response to 'do you think radiographers should provide a written on pattern recognition without making a diagnosis?' (n = 43)

Figure 4: Responses to image interpretation and report writing by radiographers

For the question related to who interprets radiographs in the absence of the radiologists, 67% of radiographers and 47% of radiologists indicated that medical officers play this role. Thirteen percent of radiographers and 38% of radiologists indicated that 'no one' provided the reports. Regarding suggestions for the training programs for radiography role extension, 71% of radiographers and 77% of radiologists indicated their support for a three month post graduate education and training for injection of contrast media. Differences in the opinion between radiographers and radiologists were noted for image interpretation and reporting on images. Sixty five percent of radiographers indicated their support for a 12 month education and training program with 85% of radiologists not supporting.

Cross tabulation analysis was performed to determine the degree of support for radiographer role extension. Values of the dependent variable of study, Y (support for potential role extension), were defined as follows:

$$\text{Support for potential role extension} = \begin{cases} 1 \ \textit{if yes} \\ 2 \ \textit{otherwise} \end{cases}$$

For radiographers, Pearson's chi-square tests of association were performed between values of variable Y and each of the 10 factors that are known to affect support for potential role extension. At the 5% level of significance, two-way associations are characterized by large observed chi-square values ranging from 15.3 to 261.1 and p-values that are smaller than 0.05. Regarding group proportions towards role extension, two categories of radiographers are presented (Table 1). Category 1 consists of radiographers who are in support and

category 2 consists of radiographers who do not support the idea of role extension for radiographers.

Table 1: Group proportions with regard to role extension by radiographers (n=426)

Factors significantly associated with support for potential role extension	Support for role extension (n1=234)	No support for role extension (n2=192)
Support for role in contrast media injection	Yes: 216 (92.31%) No response: 1 (0.43%)	Yes: 30 (15.63%) No response: 97 (50.52%)
Support for role in image interpretation	Yes: 222 (94.87%) No response: 5 (2.14%)	Yes: 50 (26.04%) No response: 98 (51.04%)
Belief that the interpretation of images is in the scope of a diagnostic radiographer	Yes: 86 (36.75%) No response: 1 (0.43%)	Yes: 51 (26.56%) No response: 77 (40.10%)
Prior experience in injecting contrast media	Yes: 127 (54.27%) No response: 2 (0.85%)	Yes: 85 (44.27%) No response: 71 (36.98%)
Formal training on injecting contrast media	Yes: 219 (93.59%) No response: 5 (2.14%)	Yes: 112 (58.33%) No response: 74 (38.54%)
Having been compelled to inject contrast media before	Yes: 148 (63.25%) No response: 6 (2.56%)	Yes: 89 (46.35%) No response: 71 (36.98%)
Capacity for doing the radiologists' job in their absence	Radiographers: 36 (15.38%) No response: 10 (4.27%)	Radiographers: 19 (9.90%) No response: 72 (37.50%)
Nature of employment	Full time: 195 (83.33%) No response: 0 (0.00%)	Full time: 116 (60.42%) No response: 53 (27.60%)
Years of clinical experience	10 or less: 161 (68.80%) No response: 1 (0.43%)	10 or less: 115 (59.90%) No response: 35 (18.23%)
Level in state institution	Hospital: 98 (41.88%) No response: 124 (52.99%)	Hospital: 47 (24.48%) No response: 137 (71.35%)

The cross tabulation results showed that support by radiologist for radiographer role extension was significantly associated with the first three of the nine variables (Table 2). At the 5% level of significance, large chi-square values and p-values that are much smaller than 0.05 are observed.

Table 2: Cross-tab analyses for radiologists (n=57)

Factors significantly associated with support by doctors for potential role extension	Observed chi-square value	P-value
Support for role extension in image interpretation	42.3767	0.000
Support for role extension in contrast media injection	11.6651	0.001
Belief that interpretation of images is in the scope of a diagnostic radiographer	11.2321	0.001
Belief that an injecting radiographer should receive formal training before injecting contrast media	3.2548	0.071
Belief that radiographers can give opinion on radiographic images	1.8119	0.178
Prior experience of requesting radiographers to injecting contrast media	1.8119	0.178
Support for a radiographers injecting contrast media alone	0.8454	0.358
Past experience of witnessing the rejection of an opinion given by a radiographer on image interpretation	0.7179	0.397
Agreement in principle to role extension for radiographers.	0.0650	0.799

In performing the frequency proportions for radiologists who participated in the study, two categories of participants were identified as for radiographers. Category 1 had 14 participants who were in support and category 2 had 43 participants who were not in support of radiographer role extension. Major differences existed among radiologists who were in support of role extension to interpret radiographs, contrast media injection and the fact that image interpretation is already within the scope of the radiographer.

Discussion

Considering the number of registered radiographers and radiologists as per HPCSA records, it would appear that the response rate was too low. Literature has reported low response rate as being the disadvantage of using questionnaires and Survey Monkey as data collection instruments (Williams, 2009). It was, however, reassuring to note that the estimated number of participants (300 for radiographers and 38 for radiologists) as was determined using nQuery Advisor, was exceeded. Results and information gathered from this study are in line with previous studies conducted to determine radiographers' willingness to take up additional roles and responsibilities (Hardy & Barret, 2004; Snaith & Hardy, 2008; Munro et al., 2012). The study demonstrated a lower support for radiographer role extension by radiologists than what was reported in previous studies. Regarding radiographers' skills to report on radiographs, Gqweta and Naidoo (2014) demonstrated that participating radiographers were able to identify abnormalities on radiographs but lacked the skill to accurately describe their findings. The findings from this study are in support of the recommendation for further education and training for radiographers in image interpretation

(Hlongwane & Pitcher, 2013; Gqweta & Naidoo, 2014). The research results are further in line with the outcomes of the panel discussion that took place during the RSSA/SORSA conference in 2011.

In relating the findings of the current study to service delivery in the medical imaging departments, the study confirmed the findings from Munro et al (2012) that SA radiographers have been practising outside their professional scopes by injecting contrast media. Of concern to the researchers was the number of 'no responses' which were translated into 'no support' for role extension which were markedly high on questions that related to image interpretations. The other concern related to 'no one' answers given to who injected contrast media or interpreted radiographs in institutions that do not have radiologists. 'No one' responses could be translated to mean that there is a delay or no delivery of service to the patients.

Conclusion

The study was delimited to focus only on radiographer role extension in image interpretation and injection of contrast media. These are not the only areas into which diagnostic radiographers may extend their roles, as seen in the UK and Australia (Snaith & Hardy, 2008; Moran & Warren-Forward, 2011). The study demonstrated that radiographers and radiologists support radiographer role extension to inject contrast media in principle. Recommendations were made for additional postgraduate education and training to be considered for three to six months to include pharmacology, basic life support and cardiopulmonary resuscitation. Some radiographers felt that radiologists should retain responsibility for the possible adverse reactions that may result from iodinated contrast media. The radiographers and radiologists however demonstrated differences of opinions with regards to radiographer role extension to image interpretation and reporting on radiographs. SA radiographers seem to be eager and willing to take up this additional role and associated responsibilities. Radiologists' views were contrary to this.

Based on the findings of this study, the RCT board recommends that role extension for radiographers to inject contrast media and report on the interpreted radiographs should be addressed as a matter of urgency by all stakeholders. There is need to address the service delivery challenges, ensure full utilisation of the radiographers' skills and knowledge and also enhance the status of the radiography profession. The engagement between radiographers and radiologists should continue. The RCT board should continue with research on radiography role extension to include ultrasound, radiation therapy and nuclear medicine disciplines.

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References

Creswell, J. (2014). *Research Design. Qualitative, Quantitative and Mixed Methods Approaches* (4th ed). California, United States of America: Sage Publications.

Daries, V. (2010). Radiographers and Needle Placement. *RCT NEWS*. Newsletter of the Professional Board Radiography and Clinical Technology. HPCSA. 3. Accessible from Mr Emmanuel Chanza.EmmanuelC@hpcsa.co.za

Gqweta, N. (2012). Role Extension: The needs, perceptions and experience of South African Radiographers in Primary Health Care. *South African Radiographer*, 50(1), 22-26.

Gqweta, N. & Naidoo, S. (2014). Chest image interpretation: The current skills of diagnostic radiographers in eThekwini health district of KwaZulu-Natal. *Global Journal of Radiology and Therapeutic Radiography*, 2(2), 7-17.

Hardy, M. & Barrett, C. (2004). Interpretation of trauma radiographs by radiographers and nurses in the UK: A comparative study. *British Journal of Radiology,* (77), 657-661.

Hlongwane, S.T. & Pitcher, R.D. (2013). Accuracy of after-hour 'red dot' trauma radiograph triage by radiographers in a South African regional hospital. *South African Medical Journal*, 103(9), 638-640.

Moran, S. & Warren-Forward, H. (2011). Assessment of the willingness of radiographers in mammography to accept new responsibilities in role extension: Part one. Quantitative analysis. *Radiography*, (17), 270 - 274.

Munro, L., Isaacs, F., Friedrich-Nel, H. & Swindon, L. (2012). An analysis of the need for accredited training on the administration of intravenous contrast media by radiographers: Results of the online survey. *South African Radiographer*, 50(2), 27-34.

Professional Board for Radiography and Clinical Technology (2011). Is injecting contrast medium within the scope of diagnostic radiography? *HPCSA, The Bulletin*, 54.

Professional Board for Radiography and Clinical Technology minutes, *HPCSA*, (2013). Accessible via Board Manager, Mr E Chanza at 012 3399339 or EmmanuelC@hpcsa.co.za

Radiology Society of South Africa (2013). Policy statement on medical practitioners other than radiologists supervising contrast injections. Accessible via RSSA on 011 794 4395, 011 794 4317 or radsoc@iafrica.com

Snaith, B. & Hardy, M. (2008). Radiographer abnormality detection schemes in the trauma environment-an assessment of current practice. *Radiography*, (14), 277-281.

Ugwu, A.C., Egwu, O.A., Nwobi, I.C. & Oluware, N.O. (2009). Occupational stress among radiographers: The Impact of sonongraphy responsibility. *Internet Journal of Medical Update*. 4(1), 3-6.

Williams, I. (2006). Professional role extension for radiographers. *South African Radiographer,* 44(2), 14 -17.

Williams, I. (2009). Reporting trauma and emergency plain film radiographs: Radiologists' support for role extension of South African radiographers. *South African Radiographer*, 47(1), 15-17.