

Gap Analysis between Expected and Achieved Competency in Independent Practice of Under Graduate Radiographers In India

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Abstract

Objectives: Radiographers are the back bone of the radiology and Imaging department as the production of good diagnostic value medical image is based on the skill of the radiographer. Radiography graduates learn in college and hospital does not necessarily give them the skills they need for their job. This paper addresses the issue of the gap between theory and practice in the radiography profession in the light of literature and makes some recommendations accordingly to close the gap.

Methods: A quantitative study design using a Google form questionnaire consist of closed end questions was used to assess the gap between the expected and achieved competence in independent practice of Indian radiographers. Data was analyzed using the Statistical Package for the Social Sciences Version 14.0 (SPSS). Ninety four (356) undergraduate radiographers participated in the study from various institutions of India.

Results: This study reveals it is quite evident that the gap between learning opportunities within the given radiography curriculum and opportunity for practicing the learned skills in different environment does exist and has its strengths as well as areas that can be improved.

Conclusion: There are planning available to overcome this problem, which focus on the revision of the existing radiography curriculum and having a meaningful link between the education and the practice areas.

Keywords: Gap analysis, Under Graduate Radiographers, Curriculum, Expected competence, Achieved competence

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I. Introduction

Radiographers plays a vital role in health care industry particularly in the medical diagnostics^[1]. To maintain a proper balance between theory and practice, a radiographer, has to be updated with current knowledge and practice in the field^[2]. This paper addresses the issue of the gap between theory and practice in the radiography profession in the light of literature and makes some recommendations accordingly to close the gap.

Clinical training for the radiographers describes the practice of assisting a student to acquire the required knowledge, skills and attitudes in practical settings such as Medical college, Hospitals, health service clinics, field work sites to meet the standards defined by a university degree structure or Atomic Energy Regulatory Board, the professional accrediting or licensing board for Radiographic studies in India. Radiography graduates learn in college and hospital does not necessarily give them the skills they need for their job. There is a necessity for involving the main competencies including communication skills, reflective thinking, managerial skills and interpersonal skills and in the curriculum^[7-9]. If these competencies are displayed, and training is feasible, then the graduates will realize the requirement and prepare towards the expected level of achievement in the radiography field. The radiography curriculum should improve the link between local practices and global trends in the field of radiography and imaging technology and transform the learning to comprehensive care. We are about an hour to respond to the new profile of radiographers and so in need of the following changes:

- logical action steps instead of movement repetition in performance.

- systematic education and reflective practice to replace exam - oriented bookish training
- authentic assessment in the place of subjective assessment
- exemplary performers instead of average performers and
- COMPETENCY-BASED RADIOGRAPHY EDUCATION to replace discipline based, quota supported radiography education.

II. Materials And Methods

This study is carried over in 2 phases. In the first phase Competency to be included in the gap analysis of Radiographers is analyzed by need analysis method^[3]. In the second phase Achievement gap analysis between expected and achieved competence in independent practice is analyzed by qualitative analysis.

Phase 1. Competency to be included in the gap analysis of Radiographers

Need analysis in this work is planned to:

- Determine the lacunae in existing curriculum to address the radiography students' progress towards competency.
- Collect information about specific issues that hinders the standards of Indian radiography education system.
- To identify the difference between learning opportunities within the given curriculum and opportunity for practicing the learned skills

The Need analysis is carried over with the following steps^[3-6]

- FGD with experts.

We conducted a Focus Group Discussion with the subject experts and faculties of radiography along with the reporting radiologists to analyze the key competencies of the radiographers in the current scenario.

- Learner profile

We reviewed the profile of 100 undergraduate radiography students and collected information about their learning style, reading materials, preferred training methods, co-curricular activities, group activities and peer teaching, perspectives about assessment feedback and their expectations in radiography and learning requirements.

- Desk review of existing syllabus and assessment methods.

Compared and contrasted the merits and shortcomings of existing syllabus

- Literature survey

Different instructional designs followed in radiography and their inference.

- Informal interviews

Interviews with radiography graduating students to identify their confidence level in independent practice.

After the complete need analysis it is concluded that the gap analysis between learning opportunities within the given curriculum and the learned skills of practicing radiographers should include the following competencies

- Investigation form evaluation and facilities readiness.
- Patient care
- Equipment operation and maintenance
- Patient positioning
- Radiation safety and MRI safety
- Image processing (Conventional, CR & DR) and Image evaluation

Phase 2. Achievement gap analysis between expected and achieved competence in independent practice

Achievement gap refers to the inequitable or unequal distribution of education results. The gap analysis is a qualitative process to identify the difference between learning opportunities within the given curriculum and opportunity for practicing the learned skills in different environment with appropriate evidences. An open ended self assessment questionnaire through the google form was distributed to 400 radiography graduates who are graduated with the existing curriculum from various part of India. An introductory cover letter was provided for the respondents to introduce the researcher. The purpose and the proposes benefits of the study were explained to the participants. The confidentiality of the participant is assured. Some of the respondent completed the Google form within the same day. Some respondent takes more time to respond. The radiographer who responded and submit the form are taken as inclusion and others are considered as exclusion.

The questionnaire contains two section. Section A consisted of demographic data and in section B we developed a close ended questionnaire to analyze the reason for difficulties in performing those procedures with the following responses.

1. I am trained and confident in performing task independently
2. I am trained and but not confident in performing task independently
3. I am trained in theoretical aspect but not clinically trained
4. I am not trained(both theory and clinical aspects)

The data are collected and analyzed using statistical package for social science (SPSS) and presented using frequency tables and percentage. The pie chart representing the percentage of the responses also given.

III. Results

The Google form was sent to 400 radiographers and 356 response are received giving a response rate of 89%. The study found that the male respondent were 212 (59.6%) while the female respondent were 144 (40.4%).

SEX

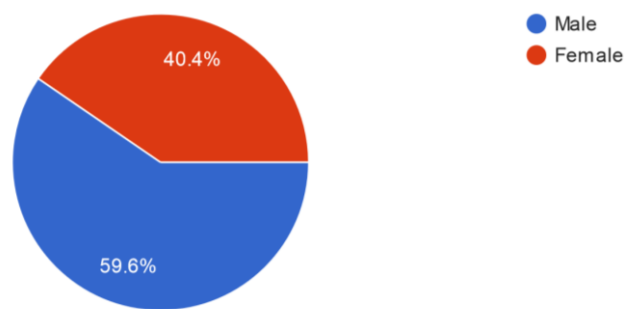


Figure 1. Demographic details(Sex) of the responses.

YEAR OF COMPLETION (UG Radiography course)

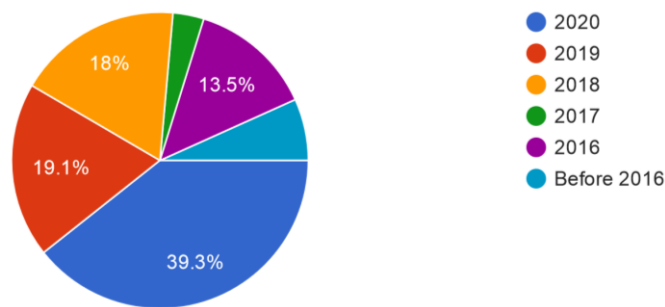


Figure 2. Shows the year of completion of the UG Radiography course.

Regarding the year of completion the study found that the frequency is more for the year 2020, and it was noted as 140 (39.3%) followed by 68 (19.1%) in the year 2019. The number of respondent who completed the undergraduate radiography course in the year 2018 was found to be 64 (18%) and in the year 2017 it was 12 (3.4%), the least of all. From the data we found that only 48 (13.5%) persons completed in the year 2016 and 24 (6.7%) persons completed before 2016.

RESPONSES FOR THE RADIOGRAPHIC COMPETENCIES

1. Investigation form evaluation and facilities readiness.

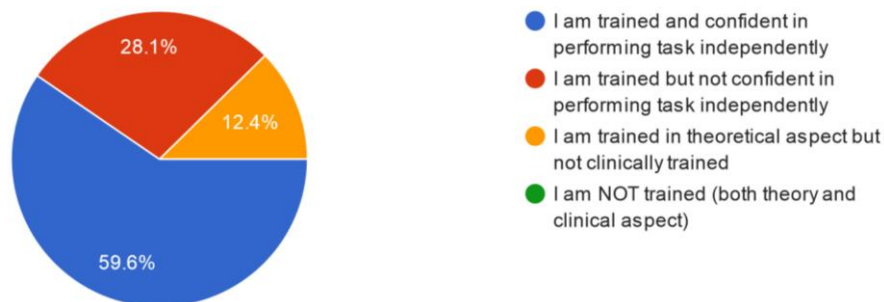


Figure 3. Shows the responses for the competency- Investigation form evaluation and facilities readiness.

Table 1. Shows the no. of responses for the competency- Investigation form evaluation and facilities readiness

<i>1. Investigation form evaluation and facilities readiness</i>	No. of Responses
I am trained and confident in performing task independently	212
I am trained but not confident in performing task independently	100
I am trained in theoretical aspect but not clinically trained	44
Grand Total	356

Regarding the investigation form evaluation and facility readiness, out of 356 respondent 212 (59.6%) are confident in performing the task independently. 100 (28.1 %) of the radiographers says that they are trained but not confident in performing the task independently while the 44 (12.4 %) radiographers say that they are trained in theoretical aspect but not in the practical aspect

2. Patient care

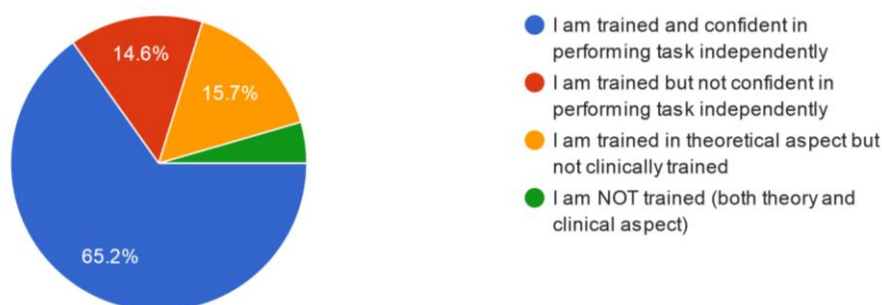


Figure 4. Shows the responses for the competency- Patient care.

Table 2. Shows the no. of responses for the competency- Patient care.

<i>2.Patient care</i>	No. of Responses
I am NOT trained (both theory and clinical aspect)	16
I am trained and confident in performing task independently	232

I am trained but not confident in performing task independently	52
I am trained in theoretical aspect but not clinically trained	56
Grand Total	356

Regarding the patient care, out of 356 respondent 232 (65.2 %) are confident in performing the task independently. 52 (14.6 %) of the radiographers says that they are trained but not confident in performing the task independently while the 56 (15.7 %) radiographers say that they are trained in theoretical aspect but not in the practical aspect. It is quite surprise that 16 (4.5 %) of the radiographers answered that they are not trained both in theory and practical.

3. Operation and maintenance

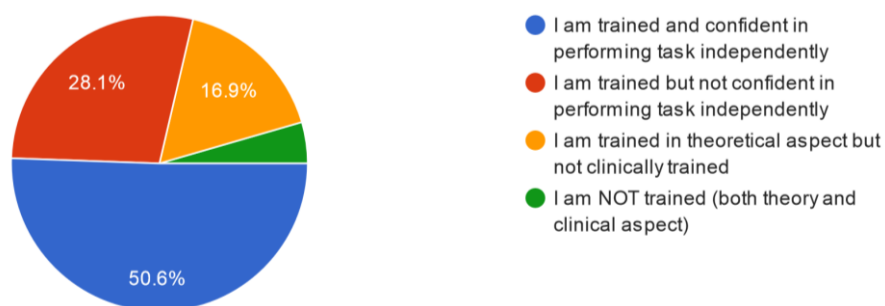


Figure 5. Shows the responses for the competency- Equipment operation and maintenance.

Table 3. Shows the no. of responses for the competency- Equipment operation and maintenance.

<i>3.Equipment operation and maintenance</i>	No. of Responses
I am NOT trained (both theory and clinical aspect)	16
I am trained and confident in performing task independently	180
I am trained but not confident in performing task independently	100
I am trained in theoretical aspect but not clinically trained	60
Grand Total	356

In the response of equipment operation and maintenance competence, out of 356 respondent 180 (50.6 %) are confident in performing the task independently. 100 (28.1 %) of the radiographers says that they are trained but not confident in performing the task independently while the 60 (16.9 %) radiographers say that they are trained in theoretical aspect but not in the practical aspect. 16 (4.5 %) of the radiographers answered that they are not trained both in theory and practical.

4. Patient positioning

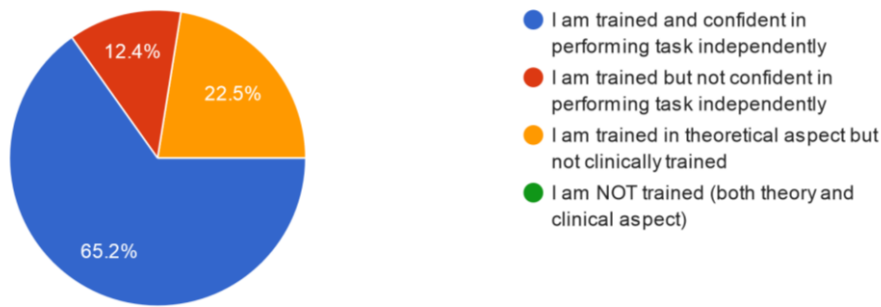


Figure 6. Shows the responses for the competency- Patient positioning.

Table 4. Shows the no. of responses for the competency- Patient positioning.

4.Patient positioning	No. of Responses
I am trained and confident in performing task independently	232
I am trained but not confident in performing task independently	44
I am trained in theoretical aspect but not clinically trained	80
Grand Total	356

Regarding the patient positioning which is the major competency, out of 356 respondent 232 (65.2 %) are confident in performing the task independently. 44 (12.4 %) of the radiographers says that they are trained but not confident in performing the task independently while the 80 (22.5 %) radiographers say that they are trained in theoretical aspect but not in the practical aspect.

5. Radiation safety and MRI safety

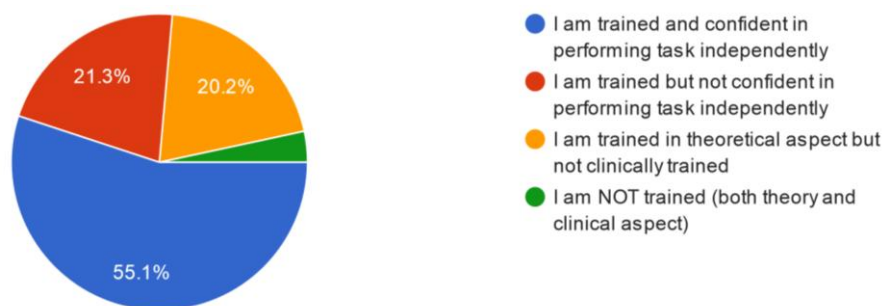


Figure 7. Shows the responses for the competency- Radiation safety and MRI safety.

Table 5. Shows the no. of responses for the competency- Radiation safety and MRI safety

5.Radiation safety and MRI safety	No. of Responses
I am NOT trained (both theory and clinical aspect)	12
I am trained and confident in performing task independently	196
I am trained but not confident in performing task independently	76
I am trained in theoretical aspect but not clinically trained	72

Grand Total

356

Regarding Radiation safety and MRI safety, out of 356 respondent 196 (55.1 %) are confident in performing the task independently. 76 (21.3 %) of the radiographers says that they are trained but not confident in performing the task independently while the 72 (20.2%) radiographers say that they are trained in theoretical aspect but not in the practical aspect. It is quite surprise that 12 (3.4%) of the radiographers answered that they are not trained both in theory and practical.

6. Image processing (Conventional, CR & DR) and Image evaluation

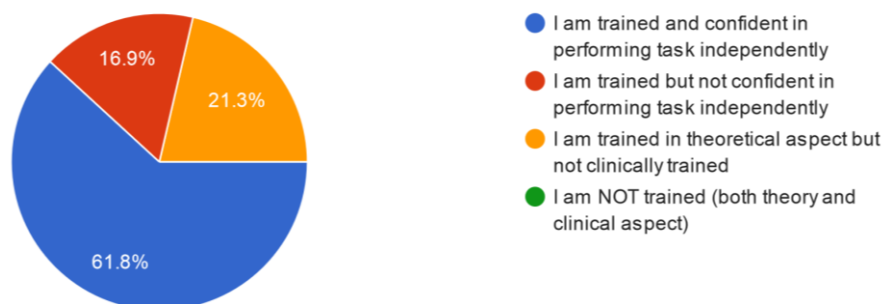


Figure 8. Shows the responses for the competency- Image processing and Image evaluation.

Table 6. Shows the no. of responses for the competency- Image processing and Image evaluation

<i>6. Image processing (Conventional, CR & DR) and Image evaluation</i>	No. of Responses
I am trained and confident in performing task independently	220
I am trained but not confident in performing task independently	60
I am trained in theoretical aspect but not clinically trained	76
Grand Total	356

Regarding the image processing and image evaluation, 220 (61.8 %) respondent are confident in performing the task independently. 60 (16.9 %) of the radiographers says that they are trained but not confident in performing the task independently while the 76 (21.3%) radiographers say that they are trained in theoretical aspect but not in the practical aspect.

IV. Discussions

Out of 400 radiographers 356 participants responded to this questionnaire. Results were analyzed

Table 7. Shows the no. of responses for all the noted competencies with percentage

Question	Reason	Response	Percentage
1. Investigation form evaluation and facilities readiness	I am trained and confident in performing task independently	212	59.6
	I am trained and but not confident in performing task independently	100	28.1
	I am trained in theoretical aspect but not clinically trained	44	12.4
	I am not trained(both theory and clinical aspects	0	0.0
2.Patient care	I am trained and confident in performing task independently	232	65.2
	I am trained and but not confident in performing task independently	52	14.6
	I am trained in theoretical aspect but not clinically trained	56	15.7

	I am not trained(both theory and clinical aspects	16	4.5
3.Equipment operation and maintenance	I am trained and confident in performing task independently	180	50.6
	I am trained and but not confident in performing task independently	100	28.1
	I am trained in theoretical aspect but not clinically trained	60	16.9
	I am not trained(both theory and clinical aspects	16	4.5
4.Patient positioning	I am trained and confident in performing task independently	232	65.2
	I am trained and but not confident in performing task independently	44	12.4
	I am trained in theoretical aspect but not clinically trained	80	22.5
	I am not trained(both theory and clinical aspects	0	0.0
5.Radiation safety and MRI safety	I am trained and confident in performing task independently	196	55.1
	I am trained and but not confident in performing task independently	76	21.3
	I am trained in theoretical aspect but not clinically trained	72	20.2
	I am not trained(both theory and clinical aspects	12	3.4
6.Image processing (Conventional, CR & DR) and Image evaluation	I am trained and confident in performing task independently	220	61.8
	I am trained and but not confident in performing task independently	60	16.9
	I am trained in theoretical aspect but not clinically trained	76	21.3
	I am not trained(both theory and clinical aspects	0	0.0

From the above table we have a cumulative view on the response of the radiographer regarding the gap analysis.

The response of "I am trained and confident in performing task independently" is consider to be the "confident " category. The other responses are grouped together and considered to be under the category "Not confident". The table below shows the percentage of confident and Not confident in the selected radiographic competencies of a practising radiographer.

Table 8. Shows the percentage of confident and not confident responses

Radiographic Competence	Confident (%)	Not confident (%)
Investigation form evaluation and facilities readiness.	59.6	40.4
Patient care	65.2	34.8
Equipment operation and maintenance	50.6	49.4
Patient positioning	65.2	34.8
Radiation safety and MRI safety	55.1	44.9
Image processing (Conventional, CR & DR) and Image evaluation	61.8	38.2

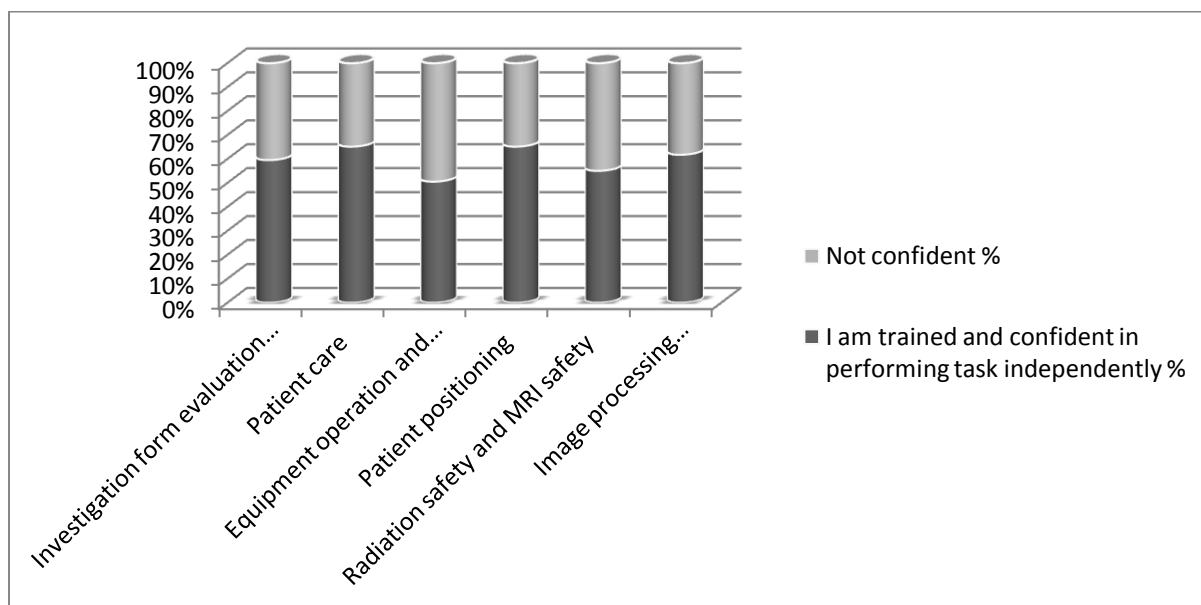


Figure 9. Shows the cumulative response for all the noted competencies.

Regarding the first radiographic competency, " investigation form evaluation and facility readiness", out of 356 respondent 59.6% of the radiographers are confident in performing the task independently. Others(40.4%) are not confident for various reasons.

Considering the second radiographic competency, "Patient care", out of 356 respondent 65.2% of the radiographers are confident in performing the task independently. Others(34.8%) are not confident for various reasons.

In the analysis of the radiographic competency, " Equipment operation and maintenance", out of 356 respondent 50.6% of the radiographers are confident in performing the task independently. Nearly fifty percentage of radiographers (49.4%) are not confident for various reasons.

Regarding the fourth radiographic competency, " Patient positioning", which is considered as a core one, out of 356 respondent 65.2% of the radiographers are confident in performing the task independently. Others(34.8%) are not confident for various reasons.

Considering the radiographic competency, " Radiation safety and MRI safety", out of 356 respondent 55.1% of the radiographers are confident in performing the task independently. 44.9% of the radiographers are not confident for various reasons.

Regarding the competency, " Image processing (Conventional, CR & DR) and Image evaluation", out of 356 respondent 61.8% of the radiographers are confident in performing the task independently. Others(38.2%) are not confident for various reasons.

The results of this study reveals that the radiography graduates who are practising are not fully confident in performing the noted radiographic competencies. There are many reasons which includes that they are not trained in the practical aspect. Some of them are trained in both theory and practical aspect but not confident in doing the task individually. So , it is quite evident that the gap between learning opportunities within the given radiography curriculum and opportunity for practicing the learned skills independently. To fill this gap we suggest the following recommendations.

During the assessment of the degree programme both written work and performance on practical placements should also incorporate. This leads to the radiography graduates to have an integrated theoretical learning with practical experience. Many authors have suggested that integration will only be achieved if the faculty members who are teaching the theory classes should closely involved in supervision of students in the clinical setup. (Edwards, 2002).

Another suggestion is employing joint appointments from the area of practice. The intermittent periods of work role exchanges between educators and clinicians and clinical update in practice can also be utilized by the radiography profession. We can consider the model of rotation posting between two faculties. In this model the two radiographic faculties who involves, one in clinical practice and the other in education, who exchange jobs for a short period of time, is a comparatively very useful in radiography education. The aim of this model is to improve student learning and to facilitate useful links between theory and practice for the radiography graduate. Hence, the exchange occurs between the education institute and the hospital area where students are posted for clinical training.

Schools of Radiography can follow the current models of teaching and learning which promote the self directed approach and the problem-based learning approach. These models of curriculum enhance critical thinking in the radiography students and make them more independent in the working environment. The assessment criteria of the curriculum can also integrate case based scenarios and practical example so that theory is tied up with the radiography practice.

There is also need to promote continuing radiography education and in-service education programs for radiographers to enable them to stay current with the changes in radiography and imaging practices. Due to the rapid advancement in imaging technology there is more need that change in radiographic practice should initiate with change in the educational curriculum of the radiography programmes. Thus, the faculty of radiography should initiate change in the curriculum with a focus on changing and improving radiography and imaging technology practice.

V. Conclusion

Thus, overall, it is quite evident that the gap between learning opportunities within the given radiography curriculum and opportunity for practicing the learned skills in different environment does exist and has its strengths as well as areas that can be improved. There are planing available to overcome this problem, which focus on the revision of the existing radiography curriculum and having a meaningful link between the education and the practice areas

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5. CONFLICT OF INTEREST: The author declare that there is no conflict of interest at any stage of this research.

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