

# Radiography students' and recent graduates' perceptions of the skills they acquire during their undergraduate degree programme

*J. Pettit<sup>1</sup>, Y. Hodgson<sup>2</sup> & I. Williams<sup>1</sup>*

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## Abstract

**Background:** There are increasing demands on universities from prospective students, future employers, taxpayers and government to demonstrate the value of their courses. While there has been a focus on improving student learning gains and outcomes, little research is undertaken on student perceptions of necessary knowledge and skills. No studies have evaluated radiography students' perceptions of professional skills gained during their undergraduate degree.

**Method:** Final-year radiography students and recent graduates completed a questionnaire that evaluated their gains in professional skills. A 4-point Likert scale was used to evaluate seven professional skills.

**Results:** Thirty-three final-year students and 25 recent graduates participated. Students gave positive ratings for confidence and improvement in the seven skill domains evaluated. Two skills, "medico-legal and ethical" and "identification of significant findings", received significantly lower ratings compared to "patient care" ( $p = 0.038, 0.001$ ), "procedural" ( $p = 0.001, 0.001$ ) and "technical knowledge" ( $p = 0.005, 0.001$ ). Overall, students felt less confident in all skills compared to their view of the importance of the skill. There were no significant differences between student ratings of skills' importance versus future relevance in their career. Also, no significant difference was found in importance ratings between final-year students and recent graduates.

**Conclusion:** This study found that positive student importance ratings in seven domains of professional skills aligned with the perceptions of recent graduates. Curriculum areas that may require strengthening are medico-legal and ethical skills, and identification of significant findings.

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1 Department of Medical Imaging and Radiation Sciences, Faculty of Medicine, Nursing & Health Sciences, Monash University

2 School of Biomedical Sciences, Faculty of Medicine, Nursing & Health Sciences, Monash University

## Correspondence

Associate Professor Yvonne Hodgson  
School of Biomedical Sciences  
Faculty of Medicine, Nursing & Health Sciences  
Monash University  
Clayton, NSW 38000  
Australia  
Tel: +61 3 9905 9713  
Email: yvonne.hodgson@monash.edu

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**Keywords:** student perceptions; learning; diagnostic radiography; curriculum development.

## Introduction

Recent demands on universities to demonstrate the value of their degree programmes have arisen from prospective students, future employers, taxpayers and governments, with the latter being driven by accountability of funding (Nusche, 2008). With changes in technology, economics and politics in the workplace, the responsibility to produce graduates who have a strong discipline knowledge and a range of generic skills has shifted to universities. Generic skills valued by employers include communication, time management, problem solving, teamwork and lifelong learning (Archer & Davison, 2008). Many universities have mapped the development of these generic skills to the learning outcomes within their degree programmes to assure prospective students and employers that they are producing work-ready graduates (McNeil, Scicluna, Boyle, Grimm, & Jones, 2012; Prosser, 2004; Spencer, Riddle, & Knewstubb, 2004).

The learning outcomes (LOs) of a degree are an indication of what the student will know and the skills they will be able to demonstrate at the conclusion of their studies (Adams, 2004; Zlatkin-Troitschanskaia, Pant, & Coates, 2016). The impact of LOs occurs at three levels: firstly, at a local level, where they directly influence the degree programme and modules of study within the university or institution (Adams, 2004); secondly, at a national level, where they verify the qualifications framework and quality assurance regimes, and verbalise industry requirements (Adams, 2004); and thirdly, at an international level, where they provide a framework for the recognition of qualifications and transferability in the global market (Adams, 2004; Zlatkin-Troitschanskaia et al., 2016).

Radiographers are healthcare professionals who perform medical imaging procedures and interpret these images for diagnostic and medical management purposes (ASMIRT, 2013). With an ageing population, there is a greater need, than previously, for radiographers and for broadening their role to include the interpretation of images and reporting of significant findings to the attending physician/radiologist (ASMIRT, 2013; Hardy & Barrett, 2004; Smith & Baird, 2007). It will also be more critical that interprofessional healthcare teams are used more effectively to achieve improved patient outcomes (Smith, Yelder, Ajibulu, & Caruana, 2007).

In Australia, radiographer training is typically undertaken as a combination of university study (3–4 years) and clinical work placements. The specific skills and capabilities that students must attain during their training are prescribed by the Medical Radiation Practice Board of Australia (MRPBA). These capabilities cover five domains: (i) professional and ethical conduct, (ii) communication and collaboration, (iii) evidence-based practice (EBP) and professional learning, (iv) radiation safety and risk management and (v) practice in medical radiation science, and provide a framework for curriculum development (MRPBA, 2013). The standards inform government bodies about best practice in the profession, support registration and licensing, and provide guidance to students entering the profession and practitioners returning to the profession (ASMRIT, 2013).

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***Students' perceptions of their learning gains***

Although there has been a focus on aligning LOs from undergraduate degrees to national standards, there has been a lack of research into student perceptions of whether they acquire these skills and values (Burke, Jones, & Doherty, 2005). The Course Experience Questionnaire (CEQ) has been widely used to gather information from recent graduates about the quality of degree programmes, universities and the overall student experience (Ramsden, 1991). While the CEQ gives a good overview of the whole university experience, it is not discipline specific and is of limited value when it comes to improving individual undergraduate degree programmes. Student questionnaires designed and administered by faculty give better indications of the overall satisfaction of students than compulsory evaluations administered by central university centres or external bodies (Denson, Loveday, & Dalton, 2010). The information obtained from faculty student questionnaires can provide valuable insights for academic staff and can inform and drive curriculum development.

Student questionnaires are a quick and inexpensive method of providing information about the experience of students and the skills they have gained from their degree (Matthews & Hodgson, 2012). Some studies have found student self-reported gains to be unreliable (Bowman, 2011; Bowman & Seifret, 2011), claiming that students have a tendency, particularly early in their degree, to reflect on skills they gained at high school or to be biased in the rating of their learning gains (Bowman, 2011; Bowman & Seifret, 2011). While it is important to acknowledge external factors that affect the reliability and validity of results from a questionnaire or measuring tool (Annan, Tratnack, Rubenstien, Metzler-sawin, & Hulton, 2013), this does not negate the importance of using them. According to Scriven (1988), the majority of university students are sufficiently mature, and as end users of the system, are in a good position to give valid and reliable judgements of their learning gains and experiences. This view is supported by other researchers who claim that student evaluations are the most valid and reliable method of evaluating university programmes and provide important information for prospective students (Douglass, Thomson & Zhoa, 2012; Marsh, 1987; Ramsden, 1991).

A whole of degree programme approach has been used to evaluate final-year science students' perceptions of the science-specific skills they gain from their undergraduate science degree (Matthews & Hodgson, 2012). For the discipline of radiography, although there has been a strong emphasis on prescribing national skills and capabilities, and the accreditation of tertiary degree programmes, there are few studies that have evaluated radiography students' perceptions of the specific radiographic skills and capabilities they gain from their undergraduate radiography degree.

***Aims***

This study aims to evaluate final-year radiography and medical imaging (RMI) students and recent graduates (within 4 years) perceptions of the skills they believe they have acquired during their undergraduate degree. The skill set surveyed was based on the professional capabilities defined by the professional bodies (ASMIRT, 2013; MRPBA, 2013) (see Table 1). The specific research questions were:

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1. What perceptions do final-year radiography students have of their professional skills close to graduation?
2. Are there gaps between the importance students assign to these skills and (i) their improvement within the programme, (ii) their confidence in performing the skills and (iii) their perception of how much they will use them after graduation?
3. Is there a correlation between the final-year students' perceptions of professional skills, demographic groups (gender, age), GPA and intentions to undertake research in their future career?
4. Do recent graduates' perceptions of the importance of the professional skills differ from those of final-year students?

Based upon the standards articulated by the professional bodies (MRPBA and ASMIRT), the study hypothesised that the degree programme would have an inclusive curriculum producing students who are confident in the professional skills and that there would be alignment between the students' perceptions of the importance of these skills, their improvement and confidence in performing the skills, and the value of these skills for their future career. In keeping with other studies (Payne & Glaspie, 2013; Varsavsky, Matthews & Hodgson, 2013), we hypothesised that there will be no statistical correlations across demographic groups and GPA, or any differences between recent graduates and final-year students' perceptions of the importance of professional skills.

## Methods

### *Research design*

This is a case study designed to collect quantitative data from final-year students and recent graduates on their perceptions of the skills they have gained from a 4-year RMI degree. Two online questionnaires administered through SurveyMonkey (SurveyMonkey.com) were used to collect data. A web link to the Radiography Student Skills Inventory (RSSI) was made available to fourth-year students via the university learning management system (Moodle). A web link to the Radiography Graduate Skills Inventory (RGSI) was sent to recent graduates via the chief radiographer's network of clinical placement sites.

### *The surveys: RSSI and RGSSI*

The RSSI and RGSSI questionnaires were based on a validated survey used for science students, the Science Students Skills Inventory (SSSI) (Matthews & Hodgson, 2012). The questions were modified to include the radiography-specific skills defined by the professional bodies (MRPBA and ASMIRT). The questionnaires consisted of six closed questions covering seven professional skills (Table 1). The questions were:

1. "Please indicate your level of improvement in the following skills as a result of your RMI degree"
2. "How important is it to have the following skills as a result of your RMI degree"

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3. “To what extent were the following included in the RMI degree”
4. “To what extent do you feel confident in the following skills as a result of the medical imaging degree”
5. “To what extent do you feel clinical placement has contributed to developing the following skills”
6. “To what extent do you think the following skills will be relevant in your future career”.

Two final questions asked participants about their career intentions (leadership, further study and research participation) and which aspects of the job they enjoyed (patient interaction, technical aspects or mixture of the two). A 4-point Likert scale was used to prompt participants to give a definitive answer (Kember & Ginns, 2012). The RGSI was identical to the RSSI with the exception of two additional questions asking graduates in which year they graduated and how many years of clinical experience they had.

**Data analysis**

Respondents with missing data were excluded from the analysis. Non-parametric statistical tests were performed on the data using IBM SPSS Statistics v20. A Friedman test was performed to look for statistical differences between students’ perceptions, followed by a series of Wilcoxon signed-rank tests to calculate the statistical differences (study aim 1 and 2). Spearman’s rank-order correlation was performed to analyse the correlation between demographic groups and students’ perceptions of their professional skills (study aim 3). A Mann-Whitney U test was performed to identify any statistical differences between the graduates’ and final years’ perceptions of the importance of the professional skills (study aim 4).

Table 1  
*Radiography Professional Skills as They Were Presented in the Surveys (RSSI and RGSI)*

<b>PK</b>	<b>Radiographic procedural knowledge</b> (patient positioning, radiation protection, use of contrast media, use of standard precautions)
<b>TK</b>	<b>Radiographic technical knowledge</b> (knowledge of different modalities, exposure factors and physics of medical imaging, applying ALARA principles)
<b>ME</b>	<b>Medico-legal and ethical knowledge</b> (keeping up to date with current medico-legal issues, engages in ethical decision making, duty of care to the patient)
<b>CS</b>	<b>Communication</b> (communicating effectively with patients and staff, ability to explain procedures and dangers of ionising radiation, build rapport with patient)
<b>SF</b>	<b>Identification of significant findings</b> (ability to recognise anatomy and pathology and communicating significant or abnormal findings to reporting doctor)
<b>TW</b>	<b>Collaborative team work</b> (professional working relationships with other healthcare professionals, recognise appropriate time to seek assistance)
<b>PC</b>	<b>Patient-centred care</b> (identifies and acknowledges patient’s needs, modifies procedure to accommodate patient, respectful and empathetic approach, cultural awareness)

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***Ethics***

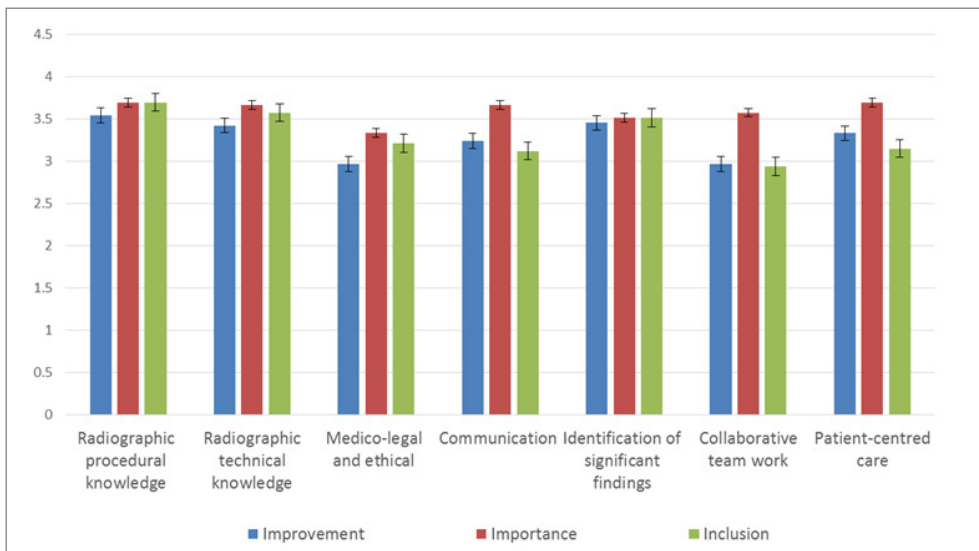
Students and graduates who participated in the research gave their consent by answering yes to the first question in the survey, which explained the aims of the research project and asked the participants to consent. Only students who answered yes to the consent question were able to complete the survey. This study was approved by the Monash University Human Research Ethics Committee (200900/269.00.C5/2009).

**Results**

Fifty-seven final-year radiography students were invited to complete the RSSI. Thirty-six students gave consent and completed the survey (63% response rate); three survey responses were removed due to non-completion ( $n = 33$ ). Sixty-one recent graduates, who had completed their studies within the preceding 4 years, responded to the survey request, however 16 were removed due to non-completion. The remaining 45 were selected for inclusion in the analysis.

***Student perceptions of their skills***

The mean values for students' perceptions of improvement, importance, inclusion, confidence, clinical contributions and future relevance of each professional skill are shown in Figures 1 and 2.



*Figure 1.* Mean values of 4th-year students' perceptions of their improvement in, the importance of and the inclusion of the professional skills as a result of the RMI degree.

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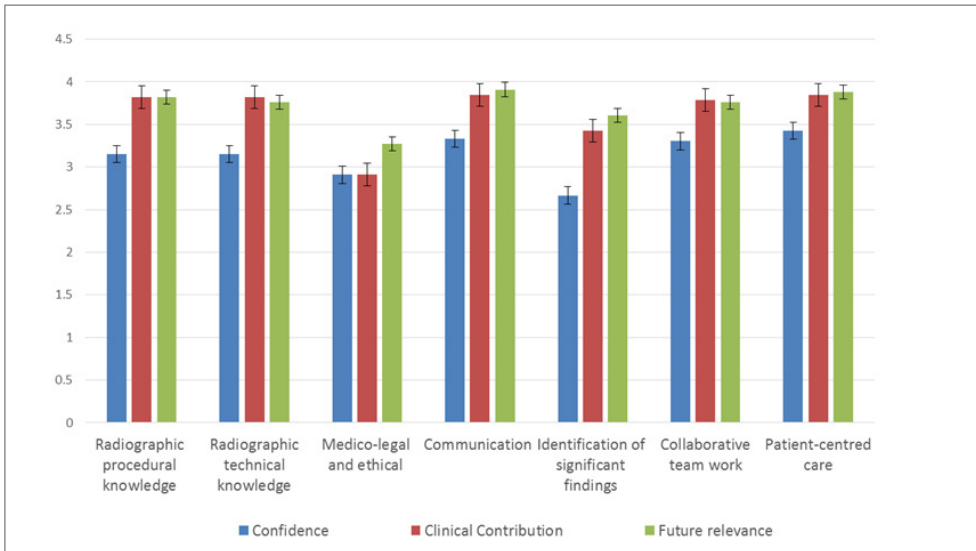


Figure 2. Mean values of 4th-year students' perceptions of confidence in, clinical contribution and future relevance of the professional skills as a result of the RMI degree.

**Skill improvement**

Over 90% of students agreed that they had improved in five of the seven skills (Table 2) during their degree programme. Fewer students felt that they had improved in medico-legal and ethical (ME) (82.4%) and in teamwork skills (TW) (70.6%). Students rated these two skill areas significantly lower than procedural knowledge (PK) ( $p < 0.001, 0.002$ ), technical knowledge (TK) ( $p < 0.005, 0.012$ ), significant findings (SF) ( $p < 0.005, 0.018$ ) and patient care (PC) ( $p < 0.038, 0.007$ ). Students felt that they had improved the most in their PK (94.2%). This was significantly different from ME ( $p < 0.001$ ), CS ( $p < 0.028$ ), TW ( $p < 0.002$ ) and PC ( $p < 0.040$ ).

Students were significantly more confident about their PC skills (94.0%) (see Table 2) compared to PK ( $p < 0.013$ ), TK ( $p < 0.020$ ), ME ( $p < 0.002$ ) and SF ( $p < 0.001$ ). Fewer students felt confident in ME skills (75.8%), which was rated significantly lower than CS ( $p < 0.004$ ), TW ( $p < 0.005$ ) and PC ( $p < 0.002$ ). Students were least confident (63.6%) in their ability to identify SF, and this was significantly lower than confidence in PK ( $p < 0.001$ ), TK ( $p < 0.001$ ), CS ( $p < 0.001$ ), TW ( $p < 0.001$ ) and PC ( $p < 0.001$ ).

When comparing the gap between importance of skills and improvement in skills (Figure 1), there were no statistical differences for SF, PK and TK. However, students' felt significantly less improved in ME ( $p < 0.019$ ), CS ( $p < 0.015$ ), TW ( $p < 0.001$ ) and PC ( $p < 0.005$ ) compared to the rating of the importance they gave these skills. Students felt less confident in all skills, PK ( $p < 0.001$ ), TK ( $p < 0.001$ ), ME ( $p < 0.009$ ),

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CS ( $p < 0.048$ ), SF ( $p < 0.001$ ), TW ( $p < 0.050$ ) and PC ( $p < 0.053$ ) compared to the rating of importance they gave each skill (Table 3). There were no significant differences between the students’ perceptions of importance and future relevance for the seven professional skills.

Table 2

*Students’ and Graduates’ Agreement With Professional Skills Improvement and Gain in Confidence as a Result of the RMI Degree (n = 33 students, n = 25 graduates)†*

	Professional Skills Improvement			Gain in Confidence		
	Students	Graduates		Students	Graduates	
	Agree/agree strongly n (%)	Agree/agree strongly n (%)	p-value	Agree/agree strongly n (%)	Agree/agree strongly n (%)	p-value
Procedural (PK)	31 (94.0)	25 (100.0)	0.47	29 (87.9)	24 (96.0)	0.81
Technical (TK)	30 (91.1)	25 (100.0)	0.08	32 (97.0)	24 (96.0)	0.41
Medico-legal (ME)	27 (82.4)	21 (84.0)	0.22	25 (75.8)	21 (84.0)	0.49
Communication (CS)	30 (91.2)	17 (68.0)	0.48	32 (97.0)	21 (84.0)	0.34
ID significant findings (SF)	32 (97.0)	21 (84.0)	0.43	21 (63.6)	22 (88.0)	0.43
Teamwork (TW)	24 (70.6)	19 (77.0)	0.37	32 (97.0)	21 (84.0)	0.34
Patient care (PC)	31 (94.0)	21 (92.0)	0.62	31 (94.0)	24 (96.0)	0.34

† Mann-Whitney U test showed non-significant relationships

Table 3

*Students’ and Graduates’ Agreement With Importance of Professional Skills and Future Career Relevance (n = 33 students, n = 25 graduates)†*

	Professional Skills Importance			Future Relevance		
	Students	Graduates		Students	Graduates	
	Agree/agree strongly n (%)	Agree/agree strongly n (%)	p-value	Agree/agree strongly n (%)	Agree/agree strongly n (%)	p-value
Procedural (PK)	32 (97.0)	25 (100.0)	0.81	33 (100.0)	25 (100.0)	0.27
Technical (TK)	32 (97.0)	24 (96.0)	0.41	33 (100.0)	25 (100.0)	0.70
Medico-legal (ME)	31 (93.9)	23 (92.0)	0.49	27 (81.8)	23 (92.0)	0.44
Communication (CS)	30 (90.1)	21 (84.0)	0.34	33 (100.0)	25 (100.0)	0.43
ID significant findings (SF)	32 (97.0)	25 (100.0)	0.43	31 (93.9)	25 (100.0)	0.23
Teamwork (TW)	32 (97.0)	20 (64.0)	0.34	33 (100.0)	23 (92.0)	0.42
Patient care (PC)	31 (93.9)	21 (84.0)	0.34	33 (100.0)	25 (100.0)	0.42

† Mann-Whitney U test showed non-significant relationships



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Table 4

Final-Year Student: Correlation Between Demographics and Students' Perceptions Using a Spearman's Rank-Order Correlation

Question	GPA (r=, p=)	Age (r=, p=)	Gender (r=, p=)	Research intentions (r=, p=)
<b>Improvement</b>				
Procedural	0.19, 0.29	-0.17, 0.33	-0.02, 0.93	-0.10, 0.59
Technical	0.24, 0.18	-0.37, 0.03*	0.18, 0.30	-0.19, 0.28
Medico-legal	0.21, 0.24	0.10, 0.58	0.81, 0.66	0.23, 0.20
Communication	-0.27, 0.12	-0.32, 0.07	-0.18, 0.32	-0.06, 0.76
Significant findings	-0.24, 0.17	-0.24, 0.18	-0.21, 0.22	0.01, 0.96
Teamwork	-0.10, 0.58	0.02, 0.90	-0.15, 0.39	0.11, 0.53
Patient care	-0.03, 0.88	-0.12, 0.50	0.03, 0.89	-0.03, 0.89
<b>Importance</b>				
Procedural	-0.24, 0.17	-0.37, 0.03*	0.00, 1.00	-0.09, 0.62
Technical	-0.22, 0.21	-0.16, 0.38	-0.09, 0.63	0.16, 0.37
Medico-legal	0.29, 0.10	-0.01, 0.98	0.13, 0.47	0.32, 0.07
Communication	-0.09, 0.60	-0.20, 0.26	-0.15, 0.40	0.03, 0.86
Significant findings	-0.12, 0.49	-0.26, 0.14	-0.20, 0.26	0.05, 0.77
Teamwork	-0.22, 0.20	-0.19, 0.29	-0.16, 0.38	-0.21, 0.23
Patient care	-0.00, 0.99	-0.34, 0.05*	-0.14, 0.44	0.20, 0.27
<b>Inclusion</b>				
Procedural	-0.20, 0.28	-0.47, 0.01**	-0.23, 0.19	-0.06, 0.73
Technical	-0.17, 0.34	-0.40, 0.02*	0.03, 0.86	-0.00, 0.98
Medico-legal	0.33, 0.06	-0.01, 0.95	0.22, 0.22	0.08, 0.66
Communication	0.13, 0.47	0.16, 0.37	0.06, 0.74	0.02, 0.93
Significant findings	-0.06, 0.76	-0.35, 0.05*	-0.12, 0.49	-0.12, 0.52
Teamwork	0.20, 0.26	0.10, 0.57	0.13, 0.46	0.06, 0.73
Patient care	0.24, 0.19	0.02, 0.93	0.02, 0.91	0.18, 0.31
<b>Confidence</b>				
Procedural	0.07, 0.68	0.01, 0.95	0.03, 0.86	0.23, 0.19
Technical	0.04, 0.83	0.03, 0.86	0.04, 0.81	0.56, 0.00**
Medico-legal	0.20, 0.28	-0.06, 0.75	0.11, 0.56	-0.06, 0.74
Communication	-0.14, 0.43	0.05, 0.80	0.07, 0.69	-0.03, 0.89
Significant findings	0.22, 0.21	-0.03, 0.88	0.18, 0.31	0.12, 0.50
Teamwork	0.05, 0.76	-0.21, 0.23	0.20, 0.26	-0.03, 0.86
Patient care	-0.15, 0.41	0.11, 0.56	0.00, 0.98	0.10, 0.59
<b>Clinical contribution</b>				
Procedural	-0.34, 0.05	-0.16, 0.38	-0.14, 0.43	0.14, 0.43
Technical	-0.29, 0.10	-0.12, 0.52	-0.08, 0.68	0.18, 0.32
Medico-legal	0.14, 0.44	-0.12, 0.49	0.16, 0.36	0.02, 0.92
Communication	-0.17, 0.36	-0.39, 0.02*	-0.14, 0.43	0.11, 0.54
Significant findings	0.25, 0.17	-0.14, 0.44	0.20, 0.26	-0.13, 0.46
Teamwork	-0.11, 0.54	-0.48, 0.01**	-0.18, 0.31	0.17, 0.35
Patient care	-0.28, 0.11	-0.16, 0.38	-0.33, 0.06	0.32, 0.07
<b>Future relevance</b>				
Procedural	-0.40, 0.02*	-0.28, 0.12	0.00, 1.00	-0.12, 0.52
Technical	-0.33, 0.06	-0.56, 0.00**	-0.05, 0.78	-0.11, 0.54
Medico-legal	0.12, 0.50	-0.18, 0.33	0.00, 1.00	0.35, 0.05*
Communication	-0.41, 0.02*	-0.20, 0.28	0.00, 1.00	0.19, 0.28
Significant findings	-0.03, 0.85	-0.31, 0.08	-0.06, 0.75	0.13, 0.46
Teamwork	-0.24, 0.18	-0.19, 0.29	0.10, 0.58	0.12, 0.52
Patient care	-0.34, 0.05	-0.13, 0.46	0.07, 0.72	0.23, 0.21

\* significant at the 0.05 level (two-tailed), \*\* significant at the 0.01 level (two-tailed)

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***Correlations in students' perceptions of skills and demographics***

The correlations between student demographics and students' skills perceptions are shown in Table 4. No correlations were found between gender and students' perceptions of skills or between student GPA and students' perceptions of professional skills except for the future relevance of PK ( $r = -0.40, p < 0.02$ ) and CS ( $r = -0.41, p < 0.02$ ), where there was a negative correlation. Similarly, there were no correlations between student's research intentions and students' skills perceptions, except for confidence of TK ( $r = 0.56, p < 0.00$ ) and future relevance of ME ( $r = 0.35, p < 0.05$ ), where there were positive correlations. There were a series of negative correlations with age, particularly for procedural skills, showing that older-age students provided less positive ratings (Table 4).

***Difference in graduates' and students' perceptions of the importance of the skills***

There were no statistical differences between the graduates' and final-year students' perceptions of the importance of each professional skill (Table 3).

**Discussion**

This study reports final-year radiography students' perceptions of the skills they gained across a degree programme. Students' perceptions can be used as a good indication of the quality of a degree programme and can provide invaluable information for curriculum development (Varsavsky et al., 2013). There has been research into medical students' perceptions of the skills that they believe they gain from their degree (Burke et al., 2005) but none in the area of radiography, making this study unique.

***Students' perceptions of their learning gains close to graduation***

This study found that students gave positive ratings to their improvement and confidence in all skills; although, some skills were rated lower than others. Students felt less confident and least improved in medico-legal and ethical skills. This skill was rated as the lowest for importance, future relevance, inclusion in the course and clinical placement contribution. This is disturbing given the fact that the guidelines set by the professional bodies clearly state that a professional radiographer should have a thorough knowledge of medico-legal and ethical issues and should be able to practise accordingly (ASMIRT, 2013; MRPBA, 2013). Studies performed with medical students in the UK also found that students were less confident in their medico-legal and ethics skills (Preston-Shoot & McKimm, 2011; Preston-Shoot, McKimm, Kong & Smith, 2011). These authors attribute this to a lack of curriculum time dedicated to its teaching and a neglect of this skill in the clinical setting. Varsavsky et al. (2013) found that final-year science students also gave ethical skills lower ratings of importance, improvement, inclusion, confidence and future relevance. Collectively, these studies indicate that the teaching and learning of ethical skills may be a problem across many professions.

In the current study, radiography students felt least confident in the skill of identification of significant findings; however, they gave positive ratings for improvement, importance, clinical contribution, inclusion and future relevance of this skill. A possible explanation

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for this finding is that students have not yet had sufficient workplace experience to become confident in this skill. Identification of significant findings is a high-order technical skill that requires radiographers to interpret and recognise urgent cases, and convey the findings to the treating physician and radiologist so that the patient can receive prompt treatment. In the current RMI degree featured in this study, there is an emphasis on the teaching of this skill. However, in the Australian health environment, this skill is somewhat controversial, although there is a move to encourage radiographers to interpret the images they take. As of 2013, the MRPBA included the reporting of significant findings as one of their professional capabilities (MRPBA, 2013). Our study has highlighted this skill as an area of the curriculum requiring some attention. There needs to be an alignment of the teaching and, hence, the attainment of this skill with the current professional standards.

***Gaps between importance, improvement, confidence and future relevance***

Compared to the importance of development of skills, students felt they had less improvement in the skills of ME, CS, TW and PC. These skills are often referred to as generic skills and are typically associated with work/clinical settings. The radiography students in this study undertake integrated clinical placements each semester of their 4-year programme and, hence, have had a substantial amount of supervised clinical/work practice. Despite the best practice of integrating these clinical placements into the academic curriculum, it is possible that there is a discrepancy between what students actually experience during their clinical placements and that which is planned—as found in other studies (Dunphy, 2014). Our results comparing final-year students with recent graduates found that the discrepancy between the importance and improvement in these skills existed for both groups, indicating that more than 4 years of clinical practice may be required before radiographers have commensurate ratings for importance and improvement in these skills.

Students in this study were less confident in all seven skills compared to the importance they gave these skills. This may indicate that while students are aware of the outcomes they need to achieve as they progress through their degree programme, they do not feel they gain sufficient experience from their university studies and clinical placements. Work integrated learning (WIL), where the theory learnt in class is practised under supervision in the workplace (Dunphy, 2014; Trede, 2012), is a common component of healthcare degree programmes.

Finally, there were no statistical differences in the final-year students' perceptions of the importance of the skills and their future relevance, suggesting that students are fully aware of the skills they need to develop for their future careers. Furthermore, there was no statistical differences in the final-year students' and recent graduates' perceptions of the importance of the skills, which provides evidence that the current curriculum of the RMI degree is appropriate for preparing graduates for the expectations of the workforce.

***Study limitations***

The study consisted of only one cohort of students surveyed in the final year of their degree. Extending the survey over a number of years, and with several cohorts, would add to the reliability of the data. The response rate of the final-year students was

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only 63% (n = 36), which if higher, would also add to the reliability of the study. An important point to note is that the survey in the current study was administered to final-year students at the beginning of their final year, before they undertook a significant 26-week clinical placement. With the completion of their 26-week clinical placement still to come, it would have been interesting to re-survey the same group of final years to see if their perceptions of improvement and confidence in the set of skills they gain in a workplace environment increased.

The RSSI and RGSi surveys used in the study rely on self-reported gains and are not evidence of actual learning. However, self-reported gains can offer insight for curriculum development (Douglass et al., 2011). The method of collecting data from graduate students was a further limitation of this study. We were not able to calculate the response rate as we do not know how many graduates the survey was sent to. Due to ethical and time constraints, we were unable to contact the graduates directly and relied on the chief radiographer at each hospital to distribute the questionnaires.

### ***Future directions***

Further research could examine several areas. Firstly, the quantitative data collected could be further extended by the inclusion of qualitative data in the form of interviews and focus groups. Secondly, conducting the survey at the completion of all clinical placements in the degree programme would determine the extent to which clinical placements change the perceptions of improvement and confidence in each of the seven professional skills. Thirdly, research should be conducted into other undergraduate radiography courses to enable comparison with the findings of this study. Finally, further research could be conducted into employers' perceptions of the skills required by practising radiographers and the alignment of the skills students think they obtain as they undertake their undergraduate studies.

### **Conclusion**

This study collected radiography students' perceptions of the skills they gained from their RMI degree. It was found that students perceive improvement and confidence in all skills except for the areas of medico-legal and ethical, and identification of significant findings, highlighting areas in the curriculum for future improvement. Gaps were found in the students' perceptions of the importance of all skills and their improvement and confidence in these skills. There were no gaps between the improvement and future relevance of the skills. There were some correlations in students' perceptions and the demographics, which was an unexpected finding. Finally, no differences were found between the graduates' and final-year students' perceptions of the importance of the seven professional skills surveyed.

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