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Research Article

Self-Reported Competence and Impact of Research Training among Medical Radiography Graduates from a Developing Country

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ABSTRACT

Introduction: Research output from radiographers in developing countries is generally low. This could be attributable to a lack of basic research skills. One way of improving this is research training for undergraduate radiography students. The objective of this study was to assess the self-reported competence of graduate radiographers regarding the research skills obtained during their undergraduate training, as well as the impact of this research training to their work.

Methods: A cross-sectional descriptive survey was sent to 70 radiography graduates who had received research training. Data from the radiography graduates were collected electronically using self-administered questionnaires. The questionnaire responses were tallied, counted, and analysis was carried out using MS Excel.

Results: The response rate of the radiographers was 71.4%. 70% of the radiographers were males, and 30% were females. 70% of the radiographers reported being competent in identifying a research problem, and 80% rated themselves as competent in formulating a research question. 44% reported being competent in appraising relevant literature, and 64% were able to formulate appropriate conclusions and recommendations from their research work. 76% of the radiographers were involved in some research activities in their places of work, and 50% of them expressed willingness to continue engaging in research activities.

Conclusions: Most of the graduate radiographers who participated in this study reported being competent in research skills attained, with over 50% willing to continue engaging in research activities.

Keywords: Radiography; research training

RÉSUMÉ

Introduction : Les résultats de recherches par les radiographes dans les pays en développement sont généralement rares, en raison d'un manque de compétences de base en recherche. Une façon d'améliorer cette situation est d'offrir une formation en recherche aux étudiants en radiographie. L'objectif de cette étude était d'évaluer les compétences en recherche que les radiographes diplômés disent avoir acquises pendant leur formation ainsi que l'incidence de cette formation en recherche sur leur travail.

Méthodologie : Il s'agit d'un sondage descriptif intersectionnel des diplômés en radiographie ayant reçu une formation en recherche. Les données ont été recueillies auprès des diplômés au moyen d'un questionnaire électronique autoadministré. Soixante-dix radiographes ont été contactés pour cette étude. Les réponses ont été compilées, comptabilisées et analysées dans un fichier MS Excel.

Résultats : Le taux de réponse des radiographes a été de 71,4%. Parmi les répondants, 70% étaient des hommes et 30% des femmes. Parmi les répondants, 70% se sont dits en mesure d'identifier un problème de recherche alors que 80% disent avoir la compétence nécessaire pour formuler une question de recherche. 44% des répondants disent avoir la compétence d'évaluer la documentation scientifique pertinente tandis que 64% étaient en mesure de formuler des conclusions et des recommandations appropriées à partir de leurs travaux de recherche. 76% des radiographes étaient toujours engagés dans certains travaux de recherche dans leur milieu de travail tandis que 50% d'entre eux se disent disposés à continuer de s'engager dans des activités de recherche.

Conclusions : La majorité des radiographes diplômés qui ont participé à cette étude disent posséder des compétences de recherche et plus de 50% d'entre eux sont disposés à continuer de s'engager dans des activités de recherche.

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Introduction

The generation of knowledge and provision of solutions to problems through active research has been reported to be a key function of universities [1,2]. Besides emphasizing postgraduate research, there is growing awareness of the need to teach research skills to undergraduate students as well [3–6]. Publishing and dissemination of research findings has been reported to be almost mandatory for masters and doctoral students [7]. This also needs to be emphasized for undergraduate students, especially in radiography, where research has now started being emphasized [8]. Undergraduate students in the programs where research is emphasized have expressed a higher degree of satisfaction with the content of the programs in addition to developing critical scientific writing skills [9–11].

In health sciences, there are still a limited number of researchers [12]. The development of undergraduate student research skills has been identified as one important intervention in addressing this decline [13]. Literature has also demonstrated that medical student participation in research has the potential to enhance engagement in research activities and contribute to knowledge creation and problem-solving, even after graduation [14–16]. However, despite the fact that undergraduate student research training may potentially enhance the interest of the students to engage in research, there is limited research about students' self-reported competency in research skills after training.

Training undergraduate students in scientific research skills has been reported to facilitate their smooth transition into postgraduate studies and also encourage them to identify problems and design appropriate solutions through research in their routine work practices [17]. Currently, there is a plethora of literature on undergraduate student research. However, most of this information comes from the more developed countries [18]. In addition, most of this research relates to medical students with little representation from the other health sciences disciplines, of which radiography is a part [19].

In one study that has been recently conducted in South Africa, the importance of incorporating research training in health sciences curricular was emphasized [13]. In relation to radiography, it has been reported that the profession has mostly been a consumer of research, and contributing less to research when compared with disciplines such as medicine and nursing [20]. Radiographers are being requested to actively engage in research related to the use of newly emerging imaging protocols and techniques. However, the number of radiographers engaged in research was reported to be low in one study conducted in the UK [21]. Limited research knowledge and skills among radiographers was reported to be one of the factors influencing their research output [22]. Subsequently, radiography, like many other allied health professions, has been significantly under-represented in health sciences and clinical research especially from the context of developing countries. This challenge

becomes even more problematic with the increasing global disease burden that requires interdisciplinary research teams to find solutions to community health challenges [23]. Achieving this thus requires research training early in undergraduate radiography training so as to equip students with the key research skills that would enable them contribute to evidence-based practices in their work contexts [24–26].

At Makerere University College of Health Sciences (MaKCHS) where this study was conducted, research training was introduced into the undergraduate radiography curriculum in 2009. The radiography programme runs for a period of 4 academic years. Besides modules in conventional radiography, ultrasound, CT, MRI, and fluoroscopy, there is a research module that is studied in the 4th year. The research module has components of problem identification, formulation of a research title, formulation of a research question and research objectives, conducting a literature review, research designs, sampling, data collection methods, data analysis, interpretation and presentation of findings, discussion of the key findings, formulation of appropriate conclusions and recommendations as well as referencing and research ethics. At the end of the 4th year, the students are required to submit a research report.

Despite research training being implemented, the self-reported competence of radiography graduates in research skills has not been previously explored at Makerere University. Therefore, in this article, we present findings from a study conducted at MaKCHS that was aimed at assessing the self-reported competence of radiography graduates. Self-reported competency has been chosen because the study relied on responses from the radiography graduates and how they rated their research skills.

Methods

Study Design

A cross-sectional descriptive study was conducted at MaKCHS between September 2017 and February 2018. The study targeted radiography graduates ($n = 70$) who had completed a research project during their undergraduate training. The contacts of the radiography graduates were obtained from multiple sources including the institutional records, Society of Radiography of Uganda, Uganda Allied Health Professionals Council, Twitter, Facebook, and from fellow graduates.

Data Collection

Data were collected using electronic, self-administered questionnaires distributed to the radiography graduates ($n = 70$). The questionnaire was an MS Word document and was e-mailed to the radiography graduates as an attachment. All the radiography graduates had active e-mail accounts and e-mail and telephone reminders were sent to them after every 2 weeks to complete and return the questionnaire. The questionnaire, developed by the researchers, was

first piloted with three radiography graduates to assess clarity of the questionnaire items. These graduates had completed their training at least in the previous 5 years, and they were based at the teaching institution. They were also actively involved in research and thus were best suited to assess the questionnaire items. The data collected included information on demographic characteristics of the radiography graduates, self-reported competence in research skills, current involvement in research activities, and future participation in research-related activities. The questionnaire had a total of 20 items. It took 3 months to collect the questionnaires that were included in the analysis.

Data Analysis

The questionnaire responses were tallied, coded, and counted. The information was then transported into MS Excel from where frequencies and percentages were calculated.

Ethical Considerations

The questionnaire was anonymous and no participant name was to be identified. Informed consent was obtained from the radiography graduates to participate in the study. Ethical clearance was obtained from the School of Medicine Research Ethics Committee.

Results

Seventy (70) questionnaires were distributed and 50 were eventually returned, resulting into a response rate of 71.4%.

Sociodemographic Profile of the Radiography Graduates

The demographics are summarized in [Table 1](#).

Self-Reported Competence in Research Skills

When asked to rate their competence in the various research skills, the radiography graduates rated themselves highly in the various components of the research process. [Table 2](#) summarizes the responses.

Table 1
Sociodemographic Profile of the Participants

Demography	N (%)
Gender	
Male	35 (70%)
Female	15 (30%)
Age distribution (y)	
20-25	5 (10%)
26-30	30 (60%)
31-35	10 (20%)
36-40	3 (6%)
41-45	2 (4%)
Employment status	
Employed in a clinical setting	45 (90%)
Employed in research institution	3 (6%)
Employed in both clinical setting and research institution	2 (4%)
Unemployed	0 (0%)

Current Involvement in Research Activities

The radiography graduates were also asked to state whether they were involved in some form of research activities in their practice. Most of them (76%, n = 38) reported to be involved in some form of research. The remaining 12 (24%) graduates were not to be involved in research activities at the time when the study was conducted. When asked to identify the research activities involved in, those who were involved in research (38 radiographers) indicated various research activities involved in. These are summarized in [Table 3](#).

Future Participation in Research Activities

When asked to respond as to whether they were interested in actively getting involved in research in the future, 25 (50%) respondents stated that they would be interested. 10 (20%) of the participants were not sure if they would like to get involved in research activities and the remaining 15 (30%) stated that they were not interested in getting involved in future research activities.

Satisfaction with Research Training Received

All radiography graduates who participated in the study reported being satisfied with the research training received during their undergraduate training. They agreed that the training was relevant to their practice. For those radiography graduates who engaged in research activities, they reported that most research components received during their undergraduate training were significant in assisting them to continue engaging in research. However, all the participants reported having limited time to carry out their research project due to a crowded curriculum that requires them to attend to clinical practice, lectures, tutorials, and other learning activities. This leaves limited time to conduct their research projects.

Discussion

Most of the radiography graduates who participated in the study were relatively young, aged between 20 and 35 years. This is most likely due to the fact that radiography training at degree level at Makerere University has not been in existence for long. The degree programme started in 2001, which is relatively recent when compared with the other health sciences disciplines at the University.

All the radiography graduates who participated in the study were employed, although many were found to be working in clinical settings. The demand for graduate radiographers, not only in Uganda, but also globally, is high [11]. In Uganda where this study was conducted, there are only two institutions that training radiographers at degree level, with Makerere University the leading training institution. Only a few radiographers can be trained at any given time, meaning that the number of radiographers graduating is far much lower than the current demand for this cadre of health

Table 2
Self-Reported Competence in Various Research Skills

Research Skill	Not Competent n (%)	Somewhat Competent n (%)	Competent n (%)	Very Competent n (%)
Identification of a problem that requires a solution	0 (0%)	10 (20%)	35 (70%)	5 (10%)
Formulation of a research topic	0 (0%)	8 (16%)	30 (60%)	12 (24%)
Formulation of a research question	0 (0%)	6 (12%)	40 (80%)	4 (8%)
Formulation of specific objectives	0 (0%)	4 (8%)	26 (52%)	20 (40%)
Ability to appraise literature	0 (0%)	28 (56%)	22 (44%)	0 (0%)
Identification of suitable research design	0 (0%)	20 (40%)	30 (60%)	0 (0%)
Ability to analyze data	0 (0%)	35 (70%)	10 (20%)	5 (10%)
Ability to summarize findings clearly	0 (0%)	10 (20%)	15 (30%)	25 (50%)
Ability to formulate appropriate conclusions and recommendations	0 (0%)	8 (16%)	32 (64%)	10 (20%)
Ability to identify limitations in one's research	0 (0%)	7 (14%)	40 (80%)	3 (6%)
Ability to identify issues that need further research	0 (0%)	18 (36%)	30 (60%)	2 (4%)
Ability to reference correctly	0 (0%)	12 (24%)	30 (60%)	8 (16%)

professionals. This perhaps explains the finding that all the radiography graduates were employed.

Regarding research skills, most of the radiography graduates rated themselves as being competent, although this competence varied across the various research skills (Table 2). This is a positive observation. Although research training for radiography students has been in existence for some time in the more developed countries [8,10], research skills training in radiography has just started receiving critical attention in many developing countries [11]. To advance the radiography profession, there is a need to equip radiographers with research skills that can enable them to contribute to not only evidence-based radiography practice, but also to the generation of knowledge and solutions that advance the profession [20–22]. The fact that radiography graduates in this study felt competent in the research skills acquired can probably be a starting point towards achieving this. It is from having a well-grounded foundation in scientific research training that one can then start expecting radiographers to actively get involved in research activities that are likely to advance the profession. The radiologists have often been driving research and knowledge generation in the field of imaging with radiographers only playing a supportive role [21]. However,

although multidisciplinary and collaborative scientific research needs to be promoted, there is a need for radiographers to lead research teams in research themes that relate to radiography.

Therefore, for the radiography profession and radiographers to continue growing independently outside the wings of radiologists, there is a need to emphasize research being conducted and led by radiographers themselves [11]. In this way, radiographers can engage in active research and participate in not only generating new knowledge to advance the radiography profession, but also contribute to the much needed evidence-based radiography practice in the clinical setting. Achieving this, however, requires research training for students before they become professionals. It is only through research training early during their undergraduate training that one can start to inculcate research skills into the future radiography professionals. It is these skills that are likely to enable them to become part of a critical pool of radiographers with knowledge and skills to conduct research and advance the profession.

The consumption of knowledge and evidence-based practices in radiography and imaging from research conducted by radiologists has arguably stagnated the radiography profession. This situation is even worse in developing countries where there are only few radiographers engaged in research. For example, most radiography-related research that has been published comes from Europe and America with limited contribution from developing countries, especially those from sub-Saharan Africa. It is highly likely that many radiographers from developing settings have not only limited resources to conduct quality research, but also may have limited research skills [25]. From this study, it can be suggested that with research training, many of the radiographers would graduate with the needed research skills.

Some radiography graduates who participated in this study continued to get involved in some form of research activity at their places of work (Table 3). For example, research aimed at improving work practices, supervision of student research projects, and engaging in multidisciplinary funded research activities were some of the research initiatives that were

Table 3
Student Research Activities

Research Activity	Number of Respondents (of 38 Respondents) n (%)
Operations research to improve routine work practice	30 (78.9%)
Radiography-related clinical research	3 (7.9%)
Multidisciplinary research with other professions	5 (13.2%)
Writing projects	3 (7.9%)
Drafted at least one manuscript	5 (13.2%)
Published at least one article	0 (0%)
Presentation of research findings, eg, at a conference, workshop, or meeting	15 (39.5%)
Supervision of students research projects	10 (26.3%)

identified. This is also a step in a positive direction because it demonstrates that after research training, the radiography graduates can independently identify problems in their context and seek solutions through the research process, thus contributing to evidence-based work practices. This active involvement in research initiatives is evidence that perhaps the research training received enabled the radiography graduates to engage in these activities.

Despite the fact that one cannot solely attribute the reported research competency to the training received, it can be argued that the research skills attained during training partly contributed. This can further be explained by the fact that all the radiography graduates reported being satisfied with research training received and had put the research skills into practice.

This study has provided some insight that research training to undergraduate radiography students can have positive aspects that can contribute to future engagement in research among radiography graduates. The fact that radiography graduates were able to apply the research skills attained to conduct research that is aimed at addressing problems at their work places should not be overlooked. This form of action research aimed at improving work practices was reported to be limited in the radiography profession [10]. It can thus be suggested that receiving research training can most likely promote this form of research, which is very significant in promoting the profession. In addition, it is also a positive finding to observe that a good number of radiography graduates were involved in supervising other students, dissemination of research findings, and writing research projects.

Despite these positive outcomes, the study has some limitations. First, it was carried out with radiography graduates from only one institution and it was a self-reported assessment. Self-reporting can sometimes result in cognitive bias where respondents overestimate their competence due to illusory superiority. This calls for more research in other settings with many other radiographers who have received research training. Second, this study would perhaps have been more rigorous if it included interviews or focus group discussions so as to collect more rich descriptions and opinions from the radiographers themselves. Therefore, more exploratory qualitative studies exploring this issue are recommended. Finally, although our findings provide an indication that the research training received by the radiography graduates may have contributed to their eventual engagement in research activities, we cannot attribute this to solely the training received. Some other factors may have contributed to this as well. Therefore, there is a need to conduct longitudinal studies (pre- and post-research training) to assess the long-term impact of research training to radiography graduates to ascertain if such training actually contributes to the advancement of the radiography profession in terms of both knowledge and work practices. We further suggest further studies looking the correlations between self-reported competence in research skills, engagement in research activities, and contribution to the advancement of the profession.

Conclusion

From this study, most of the radiography graduates rated themselves as being competent in the research skills obtained during their training. Some of them were still engaged in research activities in their work places and some demonstrated interest to continue engaging in research in the future.

Footnotes

Contributors: A.G.M. conceptualized the idea, designed the study, and participated in data collection, analysis, and article writing. F.B. participated in analysis and article writing.

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Ethics approval: The questionnaire was anonymous and no participant name was to be identified. Informed consent was obtained from the radiography graduates to participate in the study. Ethical clearance was obtained from the School of Medicine Research Ethics Committee.

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