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An investigation into academic career pathways across Radiography education centres internationally

M. Zanardo [a, *], L. Rainford [b], A. McGee [b], A. Dowley [c], J.P. McNulty [b], C. Buissink [d], M. O'Connor [b]

[a] Department of Biomedical Sciences for Health, Università degli Studi di Milano, Via Mangiagalli 31, 20133 Milan, Italy
[b] Radiography and Diagnostic Imaging, School of Medicine, University College Dublin, Dublin, Ireland
[c] School of Medicine, University College Dublin, Dublin, Ireland
[d] Department of Medical Imaging and Radiation Therapy, Hanze University of Applied Sciences, Groningen, the Netherlands

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ABSTRACT

Introduction: Robust academic pathways are critical to support of radiography faculty within third level education. As the profession of Radiography grows its' research activity, it is important that academic opportunities meet the needs of the profession. The purpose of this research was to investigate current academic career pathways across radiography education centres internationally.
Methods: An online survey was developed and administered to radiography academics and clinical/academic staff members internationally. The survey questions (n = 28) include demographic data; teaching and research requirements; academic promotion criteria; identification of the challenges and benefits of being an academic, including equality, diversity and inclusion (EDI) matters.
Results: A total of 175 responses were obtained (6 continents and 39 countries), with a variety of experience levels amongst academics that primarily held permanent work contracts. Regarding the highest qualifications held, 31.4% (n = 55) had a Doctorate and 45.7% (n = 80) a Master's degree, and most respondents were employed as academic lecturers (40.6%; n = 71), with 17.7% (n = 31) employed at professorial level. The minimum time requirement to achieve a permanent contract was variable, ranging from no delay (5.7%; n = 10) to more than 10 years (12.6%; n = 22). Doctorate qualification is currently not necessary in order to career progression for 126 (72%) respondents, while 52% (n = 91) provided specific research requirements. 106 (60.6%) respondents indicated that their institution has EDI policy.
Conclusion: This study has captured details related to academic pathways across international radiography education centres. Whilst some heterogeneity exists, there are numerous differences impacting standardised academic career opportunities for Radiography academics. These may challenge academic career opportunities and discourage those interested in an academic career.
Implications for practice: The profile and educational background of these academics has been highlighted as well as the perceived barriers and advantages of a career in academic.

Introduction

Radiography as a profession has changed considerably over the past two decades in response to evolving technology, healthcare service demands and amendments to educational and regulatory frameworks.[1] This has led to the development of advanced practitioner roles, increased scholarly activity, and further academic career opportunities.[2–5] Diagnostic and therapeutic radiography is a relatively young academic profession with considerable variability in radiography education and scope of practice across different countries.[6,7] A study by McNulty et al. (2015) highlighted significant differences in radiography programmes across Europe in terms of course content and duration.[2] Later, the European Federation of Radiographer Societies (EFRS) carried out a body of work to harmonise radiography education and qualification frameworks across Europe.[8] EFRS members agreed that the benchmark entry

* Corresponding author. Department of Biomedical Science for Health, Università degli Studi di Milano, Via Mangiagalli, 31, 20133 Milano, Italy.
E-mail addresses: moreno.zanardo@unimi.it (M. Zanardo), louise.rainford@ucd.ie (L. Rainford), allison.mcgee@ucd.ie (A. McGee), anna.dowley@ucdconnect.ie (A. Dowley), jonathan.mcnulty@ucd.ie (J.P. McNulty), c.buissink@pl.hanze.nl (C. Buissink), michelle.oconnor@ucd.ie (M. O'Connor).

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level to the radiography profession in Europe should be a European qualification framework (EQF) Level 6 (Bachelor's) degree and core learning outcomes for such were established. Furthermore, the EFRS published a white paper on the future of the profession with regards to radiographer education, research, and practice between 2021 and 2031 which highlighted the need for further education opportunities for radiographers.[2,9] The EFRS stipulate that advanced practitioners require at least a master's degree, and consultant practitioners a doctorate degree to provide the education needed for their future research work.[9]

Health Education England created a framework and provided dedicated research fundings streams to support clinical academic careers across healthcare professions.[3] Across Europe and internationally, such academic clinical pathways need further development.[2] In 2015, only 14.6% of European higher education institutions (HEI) offering undergraduate radiography programmes also offered doctoral level postgraduate programmes.[2] Limited access to doctoral programmes is an educational barrier for clinical and academic radiographers.

It is important that radiography educators achieve doctoral level qualifications to ensure the profession maintains comparable education and research standards, which are available to graduates from all the other healthcare professions.[2] Indeed, receiving a Doctorate Degree (PhD or equivalent) and completing one or more post-doctoral years is generally required to cover a traditional "academic role".[10] Post-doctoral positions often include high-level research skills, teaching and other educational activities, with professionals thus needing to achieve a full academic profile prior to their first lecturer post.[11,12] By 2031, it is expected that Heads of Academic Radiography Departments on appointment to their posts will hold a doctoral level qualification.[9] Some universities require academic staff to hold a Master's Degree (MSc or equivalent), EQF level 7, and/or a Doctorate (PhD or equivalent), EQF level 8 in order to progress within the academic career pathway.[13,14] Little is known about the academic career trajectory in Radiography internationally, inclusive of diagnostic/medical imaging, radiotherapy and nuclear medicine options; dependent upon national programme norms. This research therefore aimed to identify Radiography academic career pathways to include: educational background, career progression, skills, and knowledge, factors contributing to their success and the challenges in their academic careers.

Materials and methods

Ethical exemption was granted by the host institution University College Dublin (Rainford LS-E-21-127) for this anonymous survey. Informed consent was obtained prior to survey completion and participation was voluntary. No incentive was offered for participation.

Survey design and administration

An online survey was administered using Google Forms (https://docs.google.com/forms) to enable widespread distribution and ease of data collection.

Survey questions (n = 28) included questions related to country of practice, personal academic experience and qualifications, including pre-requisites of attaining a permanent contract. Information was also sought as to whether postgraduate radiography programmes and PhD research opportunities were offered within their HEI. Staff titles used in the survey were based on the League of European Research Universities to facilitate standardisation of responses and a link to title categorisation was included.[15] Specific research requirements to be employed as a: Senior Researcher/Senior Lecturer/Associate Professor were sought. Whether respondents had an academic clinical contract was investigated as were clinical experience requirements to teach. Challenges in undertaking and progressing their academic career and the main advantages of becoming an academic radiographer were sought. All survey questions are listed in Supplementary Table 1.

Survey distribution

Distribution was initially through personal contacts in academic institutions across all continents via a snowballing technique and was also distributed using a virtual link at the International Society of Radiographers and Radiation Technologists (ISRRT) World Congress 2021. The survey took approximately 15 min to complete. All responses were anonymous, and participants confirmed they were participating on a voluntary basis and a radiography academic (diagnostic/medical imaging, radiotherapy, nuclear medicine) or clinical academic staff member.

Data analysis

Descriptive statistics were used to summarise participant demographics, criteria for academic promotion, challenges and benefits of a career in academia. Chi squared tests identified any significance in the variance between academic qualifications held and academic position and also between academic qualifications and job contracts (hourly/temporary/permanent). Cramer's V indicated the strength of association and a p-value of ≤ 0.05 determined statistical significance.

Results

A total of 175 valid responses were obtained from a total of 39 countries, as demonstrated in Table 1. The frequency of responses per country is outlined in Table 2, which includes countries from which four or more respondents contributed to the study.

Undergraduate student cohort sizes varied across the educational institutions, with the majority (27.4%; n = 48) working with student cohorts >200 (Table 3). While the majority of higher educational institutions offered postgraduate programmes in the specialist imaging modalities (56.6%; n = 99), a smaller number of institutions facilitate Doctoral-level study for radiographers (48.6%; n = 85).

Academic radiography workforce demographics

Females accounted for 59.4% of responses (n = 104), and male respondents 40.6% (n = 71). Most respondents were aged between 31 and 60 years of age, as indicated in Table 4. Academic experience varied; 67 respondents had less than 10 years' experience working in academic, 48 respondents had 10–20 years' experience, 33 respondents had 20–30 years' experience, and the remainder (n = 27) had greater than 30 years' experience working in academia. Respondents primarily held permanent work contracts (73.7%; n = 129), with the remainder holding temporary fixed

Table 1
Geographical spread of survey responses across continents.

Continent	Countries	No. Respondents (% Frequency)
Europe	21	103 (58.9%)
Asia	7	8 (4.6%)
Africa	7	25 (14.3%)
North America	2	14 (8.0%)
South America	1	4 (2.3%)
Australia	1	21 (12%)

Table 2
Frequency of survey responses per country with four or more respondents.

Country	No. of Respondents	Frequency
Australia	21	12.0%
Italy	16	9.1%
Ireland	14	8.0%
Canada	11	6.3%
Nigeria	10	5.7%
Portugal	10	5.7%
South Africa	10	5.7%
Netherlands	9	5.1%
Spain	9	5.1%
UK	9	5.1%
Finland	7	4.0%
Denmark	6	3.4%
Malta	5	2.9%
Switzerland	5	2.9%
Costa Rica	4	2.3%
Others	29	16.6%

Table 3
Undergraduate student radiographer cohort size.

Undergraduate Cohort Size	No. of Respondents (% Frequency)
>200	48 (27.4%)
151–200	17 (9.7%)
101–150	26 (14.9%)
51–100	38 (21.7%)
25–50	32 (18.3%)
≤24	12 (6.9%)
No response	2 (1.1%)

Table 4
Demographic age categories of respondents.

Age	No. of Respondents	Frequency
20–30 years	19	10.8%
31–40 years	51	29.1%
41–50 years	48	27.4%
51–60 years	42	24.0%
61–70 years	15	8.6%

contracts of up to five years (20.6%, n = 36) or being paid per hour (5.7%, n = 10).

Highest qualifications held by radiography academics

For the majority of respondents, the highest qualification held was a master's degree (45.7%; n = 80), with 31.4% (n = 55) qualified to doctoral level, 20.6% (n = 36) holding a bachelor's degree and 2.2% (n = 4) holding a postgraduate diploma or certificate. There was a statistically significant association between academic contract held and highest academic qualification, $\chi(12) = 209$, p = <0.001, with Cramer's V of 0.589 indicating a strong strength of association. The relationship between academic contracts and respondent qualifications is depicted in Fig. 1, with the greater proportion of Doctoral qualifications held by respondents who were in permanent academic contracts. Approximately one in five radiography academics on permanent contracts did not have any postgraduate qualifications. These academics were employed across fourteen different countries i.e., this trend was not associated with any individual country.

Academic positions held by radiography academics

Most respondents were employed as academic lecturers (40.6%; n = 71), with 29.7% (n = 52) holding a senior academic post and 17.7% (n = 31) employed at professorial level (Fig. 2). Of those in a full professor post, 58% were male (n = 18), five of whom had PhDs and 42% female (n = 13), seven of whom had PhDs.

Statistically significant association between academic position and highest academic qualification, $\chi(16) = 241$, p = <0.001, with Cramer's V of 0.548 indicating a strong strength of association. A greater proportion of those in senior lecturer positions held higher qualifications (MSc and PhD level) than those with full professorship, as illustrated in Fig. 3.

Respondents were approximately equally split between those having only academic responsibilities (49.1%; n = 86) and those whose role involved both academic and clinical commitments (50.9%; n = 89). In the case of the latter group, the majority (75%;

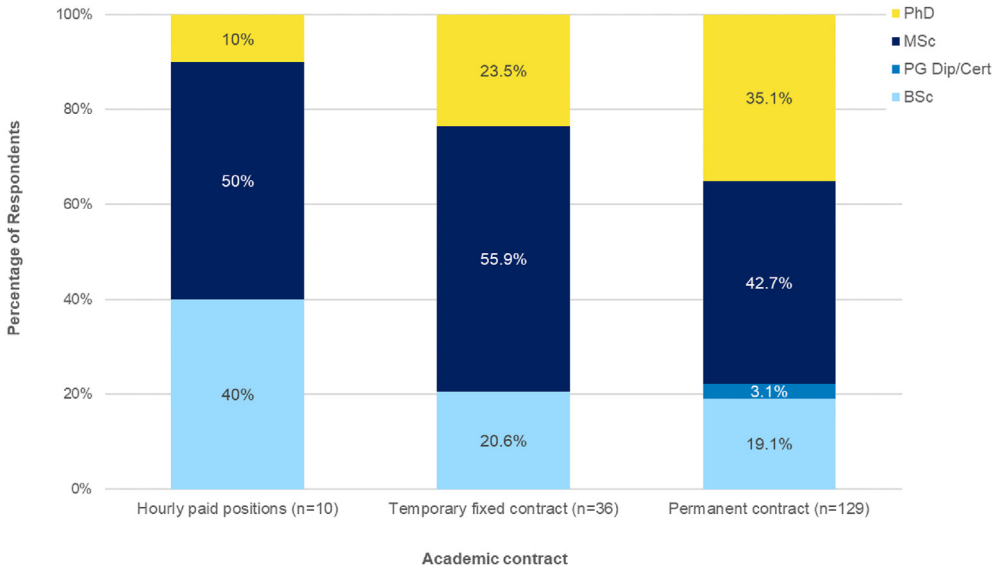

Figure 1. Highest qualifications held by academics with various types of work contracts.

n = 67) described spending at least half of their contracted time on their academic duties.

The overwhelming majority of respondents (84.6%, n = 148) confirmed that radiography was the professional background of the lead responsible for the management of the undergraduate Radiography programme (Fig. 4).

Academic career pathways in Radiography

The minimum time requirement to achieve a permanent contract was variable, some indicating no delay (5.7%; n = 10) while most indicated a 1-to-5-year time period was typical (53.7%; n = 94). Twenty-two (12.6%) responded that it would take ten years or longer to obtain a permanent contract, while others (13.1% n = 23) replied that it was impossible to estimate.

Most participants indicated no requirement for candidates to hold a Doctoral qualification in order to progress to a lecturer/researcher role in their institution (72%; n = 126). However, 52% (n = 91) of respondents indicated that specific research requirements were necessary to take up a position as a lecturer/researcher. The most common research requirements to take up an academic/research appointment are summarised in Table 5, with postgraduate qualifications (49.5%; n = 45) and evidence of research activity/output (46.2%; n = 42) being most notable. Countries in which all respondents indicated that a PhD was not needed for a lecturer contract included Canada, Denmark, Finland, Ireland, the Netherlands, and the United Kingdom whilst Malta (n = 5) stated that a PhD was required. In all other countries represented by more than four participants, there was mixed responses with regards to the requirement for a PhD.

For academic or research appointments at senior level, respondents reported a greater requirement for higher degree qualification to PhD level qualification (30.8%; n = 28) (Table 6). Professorial level, requirements extended beyond a PhD included; 10 plus publications in high impact journals, a track record of grant funding, supervision of PhD candidates, subject expertise, research leadership and international recognition.

Many respondents (60.5%; n = 106) acknowledged that clinical experience was required to teach undergraduate radiography students, with 1–5 years of clinical experience typically required (53.1%; n = 93). Similarly, for teaching specific imaging modalities at postgraduate level, respondents indicated that clinical experience (46.3%; n = 81) and a postgraduate qualification (53.1%; n = 93) in the modality are required. Difficulties encountered by participants in undertaking and progressing an academic career are summarised in Table 7. Advantages of undertaking an academic career are summarised in Table 8.

While 60.6% (n = 106) of respondents indicated that their institution has a policy on gender EDI, a considerable number (n = 59; 33.7%) were unsure regarding the existence of such a policy which are important in supporting academics in their pursuit of promotion and professional development.

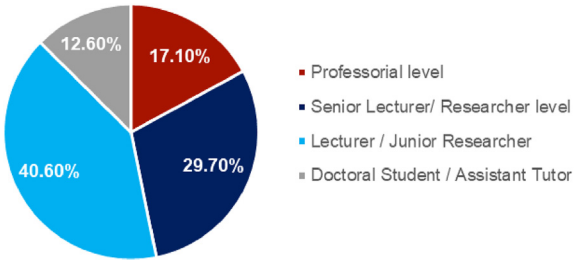

Figure 2. Academic positions held by respondents.

Discussion

This study is the first to investigate Radiography academic career pathways. A total of 175 responses were gathered from academic staff delivering Radiography education across 39 countries.

Academic career pathways in Radiography

Although PhD qualifications are desirable for a career in academia, over seventy percent of respondents indicated that PhD

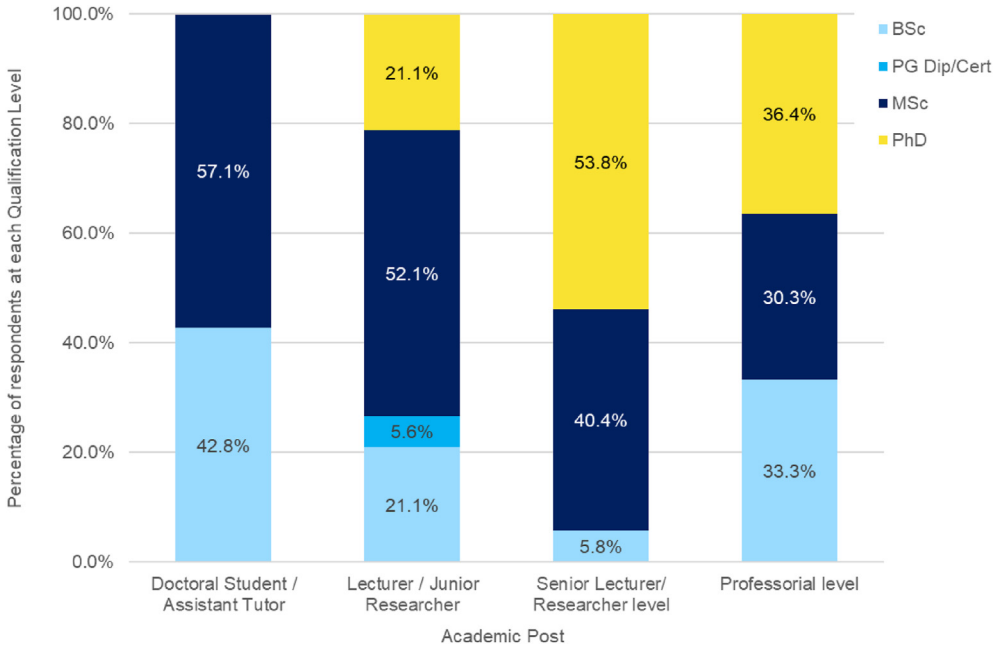

Figure 3. Qualifications held by respondents in each academic position.

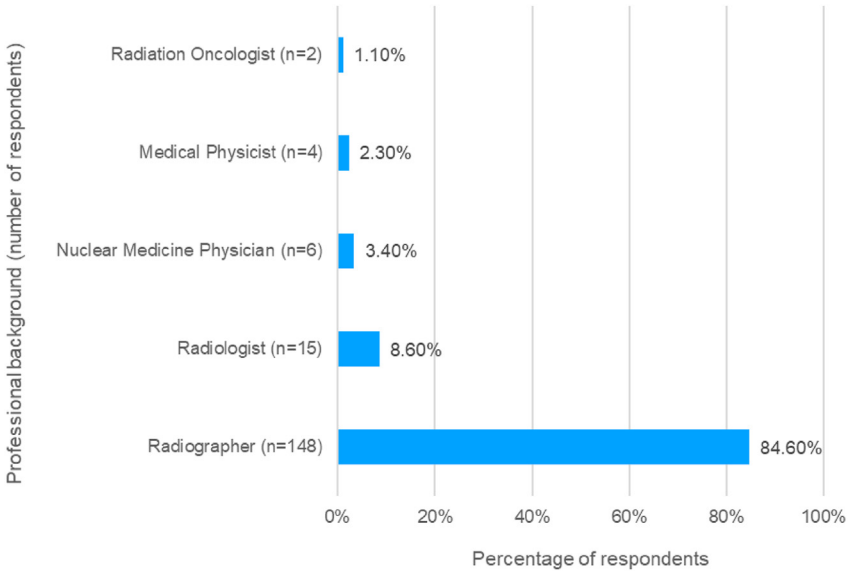

Figure 4. Professional background of the undergraduate programme lead.

Table 5
Research requirements for lecturer or researcher academic appointment.

Research Requirements	No. of Respondents	Frequency
PhD	12	13.2%
MSc	33	36.3%
BSc	4	4.3%
Publications	15	16.5%
Evidence of Research Activity/Interest	27	29.7%

Table 6
Research requirements for Senior Lecturer/Researcher academic appointment.

Research Requirements	No. of Respondents	Frequency
PhD	28	30.8%
Publications	27	29.7%
PhD & Publications	16	17.5%
Research Output	13	14.3%
MSc	7	7.8%

Table 7
Summary of participants' perceptions of the difficulties in undertaking and progressing an academic career.

Criteria	No. of times selected
High Research activity requirements	84 (48.0%)
Difficulty maintaining clinical skills needed for teaching	74 (42.3%)
High teaching activity requirements	71 (40.6%)
Low salary	71 (40.6%)
Difficulty entering a PhD program	67 (38.3%)
Unclear radiography academic path	68 (38.9%)
Lack of recognition of clinical expertise	61 (34.9%)
Long career time	39 (22.3%)
Equality	13 (7.4%)
Diversity and Inclusion (EDI) issues	6 (3.4%)
English Language	1 (0.6%)

Table 8
Summary of participants' perceptions of the advantages of undertaking an academic career.

Criteria	No. of times selected
Have a chance to teach and mentor students	145 (82.9%)
Professional respectability	113 (64.6%)
Opportunities to collaborate	110 (62.9%)
Autonomy	99 (56.6%)
Clinical/academic role options	54 (30.9%)
Stability	50 (28.6%)
High Salary	27 (15.4%)
Travelling	23 (13.1%)

qualifications were not mandatory. As radiography remains a young academic profession, there are relatively few radiographers holding PhDs compared to other professions,[7–11] therefore such a pre-requisite would not be feasible. Doctoral study opportunities for radiographers may have been limited by the low number HEI's offering radiography doctoral studies. Only 14.6% of European HEI radiography departments offered doctoral programmes in 2015.[2] Whilst this study encapsulates a wider geographical region, findings suggest an improvement in access to doctoral studies over the past seven years with 48.6% of respondents indicating that their university offered radiography PhD programmes. Additionally, 56.6% indicated that their HEIs offer postgraduate programmes in the specialist imaging modalities. The EFRS highlighted the need to provide doctoral level education across Europe and anticipate that by 2031, clinical and academic radiographers in leadership roles will hold, or be in the process of gaining, a PhD.[9]

The minimum length of time to secure a permanent contract when transitioning from clinical into academia varied from no delay to more than 10 years, with a 1-to-5-year period reported by most respondents. This concurs with previous findings in the UK where periods of approximately 1–4 years were reported.[10] For HEIs requiring doctoral level qualifications, this may take much longer with academic radiographers typically spending 5–6 years undertaking a part-time PhD.[10] Approximately half of the respondents indicated that clinical experience in a specialist imaging modality along with a postgraduate qualification in that modality was required to lecture on a specialist imaging postgraduate programme. Clinical experience is important in enabling academics to bridge the theory-practice gap and provides stimuli for research.[16,17]

Research was flagged as an important pre-requisite for a career in academia. Postgraduate qualifications and greater research output were deemed necessary to progress from a junior lecturer to senior lecturer position. Furthermore, many implied that progression to professorial level extended beyond a PhD to include 10 plus

publications in high impact journals, a track record of grant funding, supervision of PhD candidates, subject expert. However only 36% of participants with professorship held a PhD qualification.

Academic radiography workforce demographics

Most respondents were employed as junior academics, with fewer holding a senior academic (29.7%) or professor posts (17.7%). There was reasonable spread across the age groups 30–40, 40–50 and 50–60 with just 8.6% of the academic workforce surveyed over the age of 60. The age profile of the workforce is important in terms of succession planning. Respondents were approximately equally split between those having only academic responsibilities (49.1%) and a mix of academic and clinical commitments (50.9%). In the case of the latter group, the majority described spending at least half of their contracted time performing academic duties, which could impact their ability to maintain clinical skills required for the delivery of high-quality teaching.

Thirty-one percent of respondents held PhD qualifications. Higher qualification levels appear to contribute to job security in academia, with 35.1% of academics on permanent contracts holding PhDs, compared to 23.5% of those on temporary fixed contracts and 10% of those on hourly contracts. Insufficient numbers of doctorate level academics may impact on the pool of potential PhD supervisors.[10,18] By 2031, the EFRS anticipate that Heads of Academic Radiography Departments in Europe on appointment to their posts will hold a doctoral level qualification.[9]

Interestingly, of those in a full professor post, 18 were male (58%), five of whom had PhDs and 13 were female (42%), seven of whom had PhDs. Generalisable assumptions are not possible as only 31 Radiography professors responded however potential gender imbalance with respect to appointment to higher positions in academia has been identified across other healthcare professions and warrants consideration in a traditionally female dominant profession.[19,20]

Perceived barriers and advantages of a career in academia

The greatest barriers to a career in academia perceived by academics in this study were high research activity requirements (n = 84), difficulty maintaining clinical skills needed for teaching (n = 74), high teaching activity (n = 71), low salary (n = 71), unclear academic pathways (n = 68) and difficulties entering a PhD program (n = 67). Many universities operate on a 40-40-20 workload model with 40% of workload related to teaching, 40% research and 20% administration and service.[21] However research has highlighted that high undergraduate teaching loads undermine professional satisfaction amongst academics.[22] Teaching and assessment workload mean the 40-40-20 workload model is often not feasible within the academic environment, with academics spending much more time teaching and assessing students than engaging in research.[23] Achieving a balance is important as research has been highlighted as one of the key factors positively influencing promotion and job satisfaction in academia.[22]

The variation in undergraduate student cohort sizes in radiography education can also impact the quality of education, with smaller class sizes being linked to better academic performance.[24] Larger class sizes can pose challenges for educators, including limited opportunities for individual interactions and reliance on traditional teaching methods due to overwhelming responsibilities.[25]

It is hoped this study will enhance awareness of the radiography academic pathway. Mentorship from senior academic staff, as well as protected time for research, is needed to assist academic staff undertaking PhDs.[26] Clinical academic programmes similar to those in the UK should be facilitated across other countries to enable clinical radiographers to engage in PhD studies.[3,23] Furthermore, radiographers should made aware of PhD opportunities and research funding opportunities.[5,27,28] Opportunities to teach and mentor students (n = 145), professional respectability (n = 113), opportunities to collaborate (n = 110) and autonomy (n = 99) in academic roles were deemed the greatest advantages associated with a career in academia. A greater number of respondents highlighted advantages of a career in academia than perceived barriers, which is a positive finding.

One-third of the survey respondents were unsure about the existence of a policy on gender equality, diversity, and inclusion in their institution. This indicates a lack of awareness or communication about important institutional policies. Institutions should ensure that policies on these issues are clearly communicated and accessible to all staff, and consider implementing measures such as regular training or communication initiatives to improve awareness and understanding of such policies.

Study limitations

The survey dissemination was spread by “word of mouth” and at the occasion of the ISRRT World Congress 2021 which could have caused selection bias. Moreover, our survey was distributed online and may have been more accessible to individuals from certain regions or countries with greater internet access. In any case, we believe that the number of responses obtained is sufficiently heterogeneous and international to make the results of this survey generalisable. Secondly, the survey relied on self-reported data, which may be subject to response bias or inaccuracies. Respondents' interpretations of the survey questions and their individual perspectives could influence their responses. Furthermore, the study focused primarily on quantitative data, which may limit the depth of understanding of the experiences and perspectives of radiography academics. To overcome these limitations, future studies could consider a larger sample size, a wider range of recruitment strategies, and more targeted recruitment to ensure a more representative sample. Additionally, future studies could use more qualitative approaches to supplement the quantitative data and provide deeper insights into the experiences and perspectives of radiography academics. Despite these limitations, we believe that our findings can provide valuable insights into the current state of radiography education worldwide.

Conclusion

This study has captured the career pathways of radiography academics working in Radiography education centres internationally at this current time. Whilst there is some heterogeneity among academic careers across different countries there remains substantial differences which could potentially impact upon radiography academic careers. In summary, the key points of this research are:

- There is a need for a more clear and consistent approach to academic career progression in radiography across different institutions and countries. Academic career progression in radiography appears to be inconsistent across different institutions and countries, as demonstrated by the varying qualifications, experience requirements, and contract structures reported in this study. This lack of consistency could create confusion for those interested in pursuing an academic career and may hinder the recruitment and retention of talented individuals. Therefore, there is a need for a clear and consistent approach to academic career progression in radiography that

outlines the necessary qualifications, experience, and expectations for academic roles, regardless of the institution or country. This will help to ensure that all radiographers who aspire to an academic career have a clear understanding of the requirements, and that institutions can establish and maintain a pipeline of talent for the future.

- Institutions should strive to provide opportunities for postgraduate study, including PhD-level study, for radiographers who wish to pursue an academic career, and increase the visibility and promotion of doctoral pathways within the field. Offering postgraduate programs in specialist imaging modalities and facilitating PhD-level study for radiographers can help to foster a pool of competent and knowledgeable individuals who can contribute to the growth and development of the field. Moreover, institutions should provide financial support and incentives for radiographers who wish to pursue postgraduate education, as this can be a significant barrier for many individuals. It is also important for institutions to collaborate with other academic institutions and professional organizations to facilitate access to postgraduate programs and opportunities for academic development.
- Dedicated research time needs to be ensured within institution workload models.Radiography academics identified high academic workloads, which may impact their ability to maintain their clinical skills and clinical credibility. Strategies should be developed to ensure that radiography academics are given adequate support to maintain their clinical expertise.
- A better understanding of the role of key professionals, such as radiologists, radiation oncologists, nuclear medicine physicians, medical physicists, and radiography leads, in facilitating the academic advancement of radiographers is needed. Future research could focus on identifying the most effective strategies for collaboration between these healthcare professionals and academic institutions to facilitate the academic advancement of radiographers
- To ensure inclusivity, institutions should ensure that they have clear policies on gender equality, diversity, and inclusion and that these policies are communicated effectively to staff. By promoting gender equality, diversity, and inclusion, institutions can ensure that they attract and retain talented and motivated radiographers from a wide range of backgrounds, which can help to improve the quality and effectiveness of academic programmes in radiography.

Authors' contributions

MZ, LR, JPMN and CB were responsible for the study conceptualisation and design. MZ, LR, JPMN and MOC participated in the organisational and technical phases. All authors drafted and revised the manuscript. The authors read and approved the final manuscript.

Ethics approval and consent to participate

Ethical exemption was granted by the host institution University College Dublin for this anonymous survey (Rainford LS-E-21-127).

Informed consent was obtained before to access to the survey (mandatory: “By accepting and continuing, I confirm that I have been duly informed about the study and I agree to participate. I understand the purpose and nature of this study and I am participating voluntarily. I understand that I can withdraw from the study at any time, without any consequences”). Participation was completely voluntary.

Consent for publication

Informed consent was obtained before to access to the survey (mandatory: “By accepting and continuing, I confirm that I have been duly informed about the study and I agree to participate. I understand the purpose and nature of this study and I am participating voluntarily. I understand that I can withdraw from the study at any time, without any consequences”).

Availability of data and materials

The data that support the findings of this study are available on request from the corresponding author.

Conflict of interest statement

All authors declare that they have no competing interests directly related to this study. LR is member of the Radiography International Advisory Board, while JPMN is the Editor-in-Chief of Radiography. Therefore, they were not involved in any way in the revision, review, and decision process.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.radi.2023.07.010.

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