

MD PhD programmes with relevance to imaging. Results from a European survey

European Society of Radiology (ESR)

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Abstract

Background Scientific research is an important part of radiology. PhDs for MDs are becoming increasingly important for an academic career. Developments in training for young radiologists show that the interest in completing a PhD programme with a focus on imaging is significantly increasing.

Methods It can be assumed that PhDs of relevance to imaging provide excellent training for later scientific work during radiology residency. To evaluate the situation for the availability of PhD programmes with relevance to imaging, a European survey was performed. In total, 100 universities and institutions from 24 European countries responded.

Results In 50.5 % of the responses the universities/institutions offer imaging-related PhD programmes. In 25.6 % of responses radiology departments run their own PhD programme. With regard to handling PhD and radiology training, the most common response was that a PhD is allowed in parallel to radiology training (38.9 %), should be completed partly (15.3 %) and must be completed first (8.3 %). The most common responses for the duration of PhD programmes were 3 years and 4 years (27.8 % each).

Conclusion In conclusion, the survey has shown that imaging-related PhD programmes are available for radiologists and that radiology departments should be encouraged and supported to develop their own PhD programmes. Finally, this survey may be the first step to develop an online database comprising all these PhD programmes throughout Europe, allowing easy access to this information.

Main messages

- *PhD programmes with relevance to imaging are becoming increasingly important for young radiologists.*

- *In Europe about half of the universities/institutions offer imaging-related PhD programmes; about a quarter of radiology departments run their own PhD programme.*
- *Where radiology departments have the appropriate facilities and staff they should be encouraged and supported to develop their own PhD programme.*
- *An online database comprising PhD programmes world-wide would be a useful tool for radiologists, allowing for easy access to this information.*
- *PhD programmes are a valuable asset not only for clinicians, but also for universities, institutions and individual radiology programmes alike.*

Keywords Medical degree · Medical education · MD · PhD · Radiology

Introduction

The combined Doctor of Medicine and Doctor of Philosophy MD, PhD degree is a dual doctoral degree for physician scientists granted by some medical schools. However, the exact title of the medical qualification varies from university to university and likewise between countries.

In the US, the MD, PhD degrees can be obtained through dual-degree programmes offered at some medical schools. The idea for an integrated training programme began at Case Western Reserve University School of Medicine in 1956 and quickly spread to other research medical schools. In 1964, the National Institutes of Health (NIH) developed a grant to underwrite some universities' MD/PhD programmes. Admission to a dual degree programme is not a requirement to receive MD and PhD degrees. An individual has the option to complete each degree separately through stand-alone programmes. However, the student is responsible for all medical school tuition and does not receive a stipend during their MD education. Furthermore, since

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stand-alone PhD training is not integrated with the medical training, students will usually take an additional 3–5 years to complete their PhD. A PhD may also be obtained by physicians during the residency training period. This combined research and graduate-level medical education is offered by a small minority of residency programmes. This additional education typically extends the residency period by 3 to 4 years [1, 2].

The difference between PhD programmes in America and Europe

PhD programmes in America

While PhD programmes in both America and Europe are highly distinguished levels of education, there are some differences to be aware of when applying to universities within these two continents. The admissions, funding and the length of a PhD programme vary from university to university, as well as from country to country. In the US, the PhD is typically the highest academic degree awarded by universities. In some cases, a master's degree may be required for a PhD programme; in other cases, a bachelor's degree is sufficient.

First, a student must usually complete a comprehensive examination or series of exams focussing more on the breadth of knowledge than depth. Some programmes require the candidate to successfully complete requirements in pedagogy (the study of teaching) or applied science (e.g., clinical practice or pre-doctoral clinical internship for programmes in clinical or counselling psychology).

Two to four years are usually required to undertake the relevant work and write up an original thesis/dissertation. In the social sciences and humanities, it is typically 50 to 450 pages in length, but requirements vary significantly between institutions. The candidate is then judged by an expert committee.

Completion of the programme usually takes 4 to 8 years of study after the bachelor's degree or 3 years (occasionally 2 years) for those with a master's degree PhD. Typically, programmes do not have the formal structure of undergraduate education; there may be compulsory elements to programmes, determined by the individual course of study and the university administering the programme. Therefore, the length of study to complete a PhD depends on the individual candidate and the nature of the thesis. Many US universities have set a 10-year limit for students in PhD programmes.

PhD programmes in Europe

In the UK generally there are no entrance examinations for PhD programmes, but as in North America an excellent academic record, strong references and funding are necessary. Furthermore, in the UK, PhDs are distinct from other doctorates. It is not necessarily the highest degree level—

there are higher doctorates such as DLitt (Doctor of Letters) and DSc (Doctor of Science). These degrees are granted on the recommendation of a committee based on a large portfolio of published research. Of particular note in the UK, upon graduation from medical school, candidates receive a Bachelor of Medicine, Bachelor of Surgery (or similar) degree. The qualification MD (Doctor of Medicine) is a higher qualification based on independent research and is similar to a PhD but specifically for clinicians. Historically, this was the more common option for clinicians; however, there has been a shift to more formal PhD programmes.

In the German-speaking countries of Middle Europe (Germany, Austria, Switzerland) for many years the so-called “habilitation” was the highest qualification for an academic career and could be achieved usually after postgraduate training in a specialty such as radiology. This habilitation is granted on the recommendation of a committee based on a large portfolio of published research and fulfilled education duties and on the positive response from several reviewers. The criteria for the positive acceptance of the habilitation vary considerably from university to university.

In recent years the importance of the habilitation has continuously declined in comparison to PhD studies and degrees based on the fact that, in non-German speaking countries in Europe and as described above in the US, the habilitation is unknown and scientific competition in the age of globalisation is becoming increasingly important.

Background

Scientific research is an important part of radiology and is becoming increasingly important since radiology is a very dynamic and technically challenging field. As mentioned above, PhDs for clinicians are becoming increasingly important in postgraduate education and for academic careers.

The recent developments in training for young radiologists show that the interest in completing a PhD programme with a focus on imaging is significantly increasing. Radiologists are keen to set their focus on training programmes combining radiology and imaging, as both topics are complementary to each other and very supportive for research purposes as well as for diagnosing and treating diseases. PhDs of relevance to imaging are excellent training for later scientific work during radiology training and may provide the basis for a later generation of scientists in radiology. They could additionally help to attract more radiologists to universities.

Up to now, the overall situation in Europe regarding PhDs for clinicians, in particular radiologists, with relevance to imaging was unclear.

The aims of this European survey were to obtain an overview of how many universities and institutions offer imaging-related PhD programmes in Europe, how many

radiology departments offer specific PhD programmes and how they handle students interested in PhDs.

Therefore, a web-based survey was used to identify PhD training programmes of relevance to imaging in Europe and to assess their accessibility. On a long-term basis, the overall objective of the survey is to develop an online database comprising all these PhD programmes throughout Europe, allowing easy access to this information.

Materials and methods

Identification of addresses for the questionnaire

A questionnaire, devised by ESR and EIBIR, was specifically distributed to reach experts and heads of designated imaging departments of research organisations, universities and hospitals including EIBIR Network members and ESR heads of radiology. In total, 1,334 experts in 52 countries were contacted including 27 European Union member states, 18 countries geographically considered as European countries and 2 countries using European legislation (Norway and Switzerland). Due attention was paid to ensure delivery to the most appropriate representatives to avoid duplication and to encourage response to the questionnaire.

Matrix and approach of the survey

An online questionnaire was produced using SurveyMonkey® online tools (<http://www.surveymonkey.com/>, SurveyMonkey.com, Palo Alto, CA, USA) to guarantee easy usability. Seven closed multiple choice questions were set up to give the respondent the opportunity to choose between a set of proposed answers. In addition, the responders were asked to add specific comments relevant to the survey topic.

Development of the structure of the questionnaire and elaboration of the questions

The questionnaire comprised 17 questions (the most important questions are marked in bold):

1. University/institution
2. Department
3. City
4. Country
5. Contact email in case of queries
6. **Does your university/institution offer any PhD programmes for MDs of relevance to imaging? (yes, no)**
7. Title(s) of programme(s)
8. Type(s) of programme(s)
9. Website(s)

10. **Does your radiology department run its own PhD programme(s)? (yes, no)**

11. Title(s) of programme(s)
12. Type(s) of programme(s)
13. Website(s)
14. **How does your institution want MDs to complete a PhD programme as well as training in radiology? (please indicate all that apply: not applicable; PhD must be completed first; PhD can be completed partly; PhD runs in parallel to radiology training; other)**
15. **How long does it take to successfully complete your PhD degree? (not applicable, 2 years, 3 years, 4 years, 5 years, other)**
16. What is the exact term for the academic title used for MDs with a PhD degree at your institution?
17. Do you have any further comments? If yes, please specify.

The survey was started in mid-April 2012 and was terminated by the end of July 2012.

Results

Participation of European countries

In total, 100 responses from universities/institutions in 22 European countries were received. Most responses were from Germany (13), Italy (13), Spain (12), the Netherlands (11), the UK (9) and Austria (8). Other participating countries included Belgium, Czech Republic, Denmark, Estonia, France, Hungary, Israel, Lithuania, Montenegro, Norway, Poland, Romania, Switzerland, Turkey and Ukraine.

Responses to the most important questions

Does your university/institution offer any PhD programmes for MDs of relevance to imaging? See Fig. 1a.

Titles of the programmes are shown in Fig. 1b.

Does your radiology department run its own PhD programme(s)? See Fig. 2.

For the titles of programmes, see Fig. 3.

How does your institution want MDs to carry out a PhD programme as well as training in radiology? See Fig. 4.

How long does it take to successfully complete your PhD degree? See Fig. 5.

Discussion

Scientific research has a long and vital role in the development of radiology, and its importance and value to the specialty must not be underestimated. The finest research in the field has resulted in numerous Nobel prizes, from Roentgen

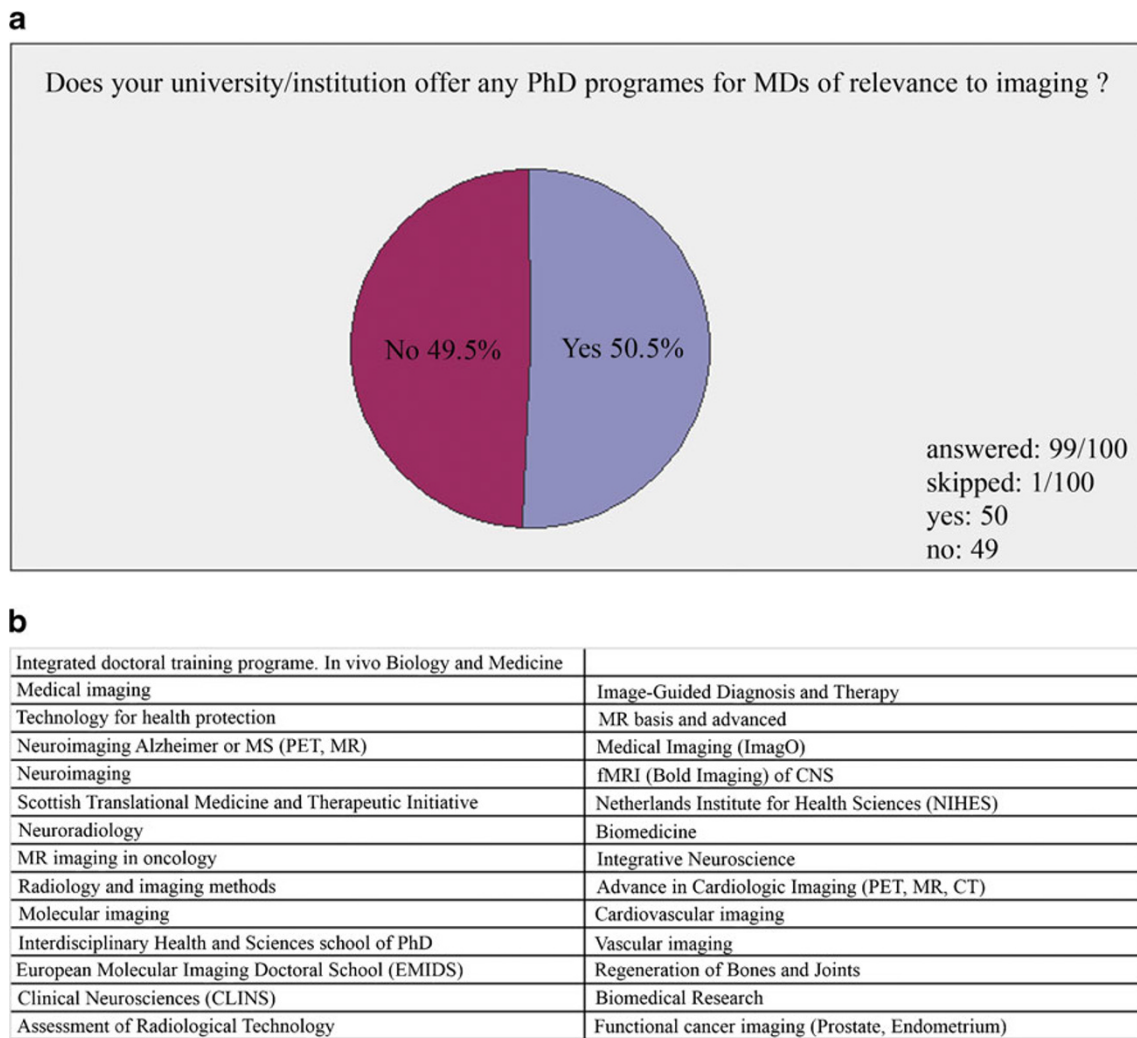


Fig. 1 **a** Response to question about whether the university/institution offers any PhD programmes for MDs of relevance to imaging; 99 of 100 answered the questions, with 50.5 % answering yes and 49.5 % no. **b** Titles of programmes with relevance to imaging

(radiography) in 1901, to Cormack and Hounsfield (CT) in 1979, to Lauterbur and Mansfield (MRI) in 2003, covering the categories physics, chemistry, and medicine or physiology [3]. Nonetheless, over many years there have been challenges to recruit and retain clinicians for academic posts.

Academic clinical medicine has evolved differently across the world, and the models in the USA, UK and German-speaking countries have been highlighted here. However, many clinicians give greater priority to lifestyle and earning potential than opportunity for research when choosing a career path [4]. As a result, in many countries there is a perceived decline in research activity in radiology, which may or may not be real. To address this perceived decline, many universities and/or governments are attempting to implement new initiatives and policies that both encourage and facilitate clinical academic careers [5–7]. On the other hand, the current economic climate in many

European countries means there is a squeeze on budgets for research, education and training, which presents its own set of challenges.

As institutions seek to formalise clinical academic training through structured pathways with greater transparency, the role of PhDs for clinicians has become more important in their education [8]. The implementation of formal research training complements standard clinical training and provides the basis for future clinical academia [9].

The survey carried out received 100 responses from 22 countries covering all corners of Europe and indicated that approximately 50 % of universities/academic institutions surveyed offer some form of PhD programme with relevance to imaging and 25 % of radiology departments offer an imaging-relevant PhD programme within the department. These results are encouraging and higher than anticipated; however, these rates should be interpreted with caution, as it is likely that there

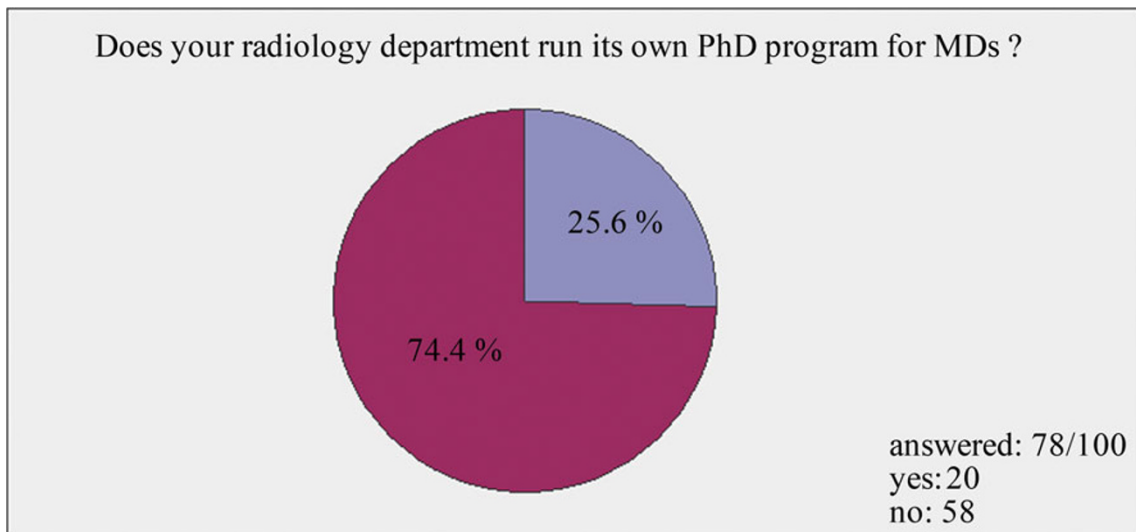


Fig. 2 Answer to whether the radiology department runs its own PhD programme(s); 78 of 100 answered the questions, with 25.6 % answering yes and 74.4 % no

is some selection/responder bias with institutions actively offering PhD programmes or seeking to develop them in the future being more likely to respond positively. Therefore, it is likely that the rate across all universities/academic institutions in Europe is lower than 50 % and likewise the rate in radiology departments is probably lower than 25 %.

As the award of a PhD usually requires unique and state-of-the-art research, this understandably leads to huge variation in the nomenclature of course titles that we received through the survey. Additionally, it explains the large selection of additional programmes, or subspecialist fields, in which PhDs are undertaken. As such, no distinct pattern can be determined across the programmes respondents are involved with.

Medical imaging
Neurology
MRI in oncology
Radiology and imaging methods
Cardiovascular multimodality imaging
Neroradiology
Assessment of Radiological Technology
Neuroimaging
General Habilitation Programe
Image-Guided Diagnosis and Therapy
Physics in MSCT
PhD in Medical Imaging
Development of acquisition and processing techniques for diagnostic imaging
Image quality
PhD in interventional radiology simulation research
Musculoskeletal imaging
Oncology
Assessment of diagnostic and interventional imaging technology

Fig. 3 Titles of programmes run by Radiology Departments

Again, the variation in postgraduate medical training systems across Europe and in particular the requirements for specialist training in radiology are reflected in the response to question 14 regarding when radiology departments want a PhD to be undertaken. The most common response was that a PhD is performed in parallel to specialist training, but a small number of departments see a PhD as a criterion for obtaining a specialist training post. It is noteworthy that none of the respondents had gone through a MD-PhD intercalated degree at medical school, but such programmes have been shown to have a positive effect on progression to a clinical academic career [10].

With respect to the length of time required for a PhD programme, 3–4 years was most frequently cited. However, the survey did not clearly define an endpoint, and it may be that some respondents define the endpoint differently, such as when the experimental phase has been completed, completion of writing up the thesis or actual award of the degree following thesis submission and viva examination. Notably, many PhD candidates are expected to perform the necessary work parallel to specialist training, in which case we would anticipate a longer time being required to obtain a PhD, since 3–4 year full-time study is characteristic for PhDs in other scientific fields.

The title or qualification that clinicians receive upon completion of a PhD broadly follows the theme MD-PhD, but certain countries and institutions have unique nomenclature that does not directly translate, e.g. “Habilitation” has variable meanings between countries and has no directly comparable title in English. Differences in culture and the diverse historical developments of academia across the world, and in particular within Europe, mean that the day-to-day use and application of academic titles varies

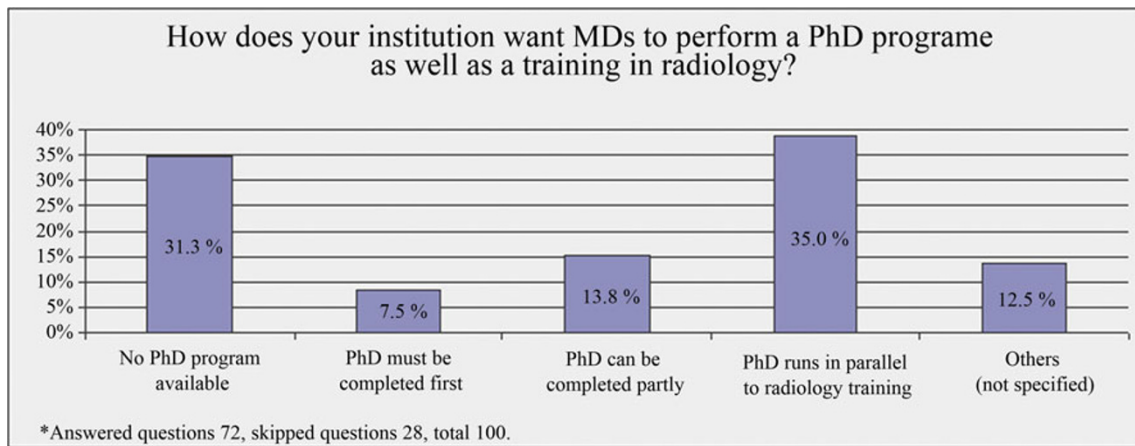


Fig. 4 Answers to question about how the institutions want MDs to carry out a PhD programme as well as training in radiology; 72 of 100 answered the question: not applicable 34.7 %; PhD

must be completed first 8.3 %; PhD can be completed partly 5.3 %; PhD runs in parallel to Radiology training 38.9 %; other 13.9 %

considerably. In some cases, this may be a reflection of the prestige attached to academic titles and the associated benefit it may provide in progressing through a hierarchical system or better salary, whilst in others it is simply a qualification for a career in research.

The diversity in educational systems between countries in Europe is highlighted when comparing them to North American educational systems, which are largely similar between states, and to Canadian educational systems. This means that there is greater consistency of entry requirements, requirements for the award of a PhD and nomenclature of qualifications across North America.

Two areas, which were beyond the scope of the survey but are relevant to both administrators within universities and radiology departments as well as individuals wishing to pursue a PhD, are funding mechanisms and entry/selection requirements. These issues are significant and often not properly appreciated by those who are not fully informed. The overhaul of the UK system in the mid 2000s [11] tried to implement a model aiming, at least partially, to address these problems; however, the success of these reforms will only become clear over the course of the next few years as the initial cohort completes their PhDs and specialist training before embarking on careers as independent academic clinicians.

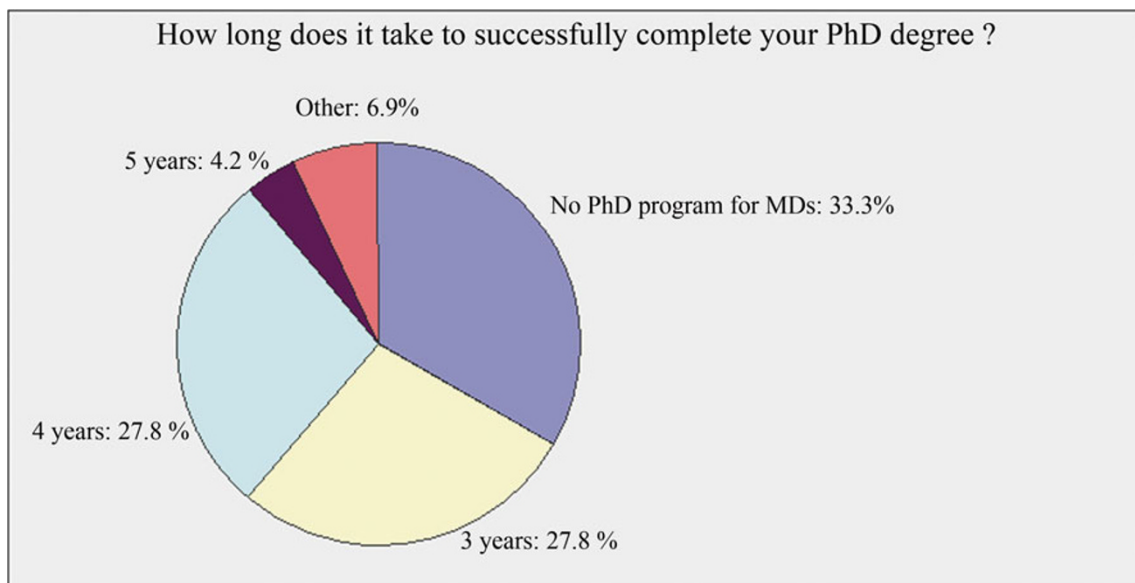


Fig. 5 Answer to the question about how long it takes to successfully complete your PhD degree; 72 of 100 answered: not applicable 33.3 %, 2 years 0.0 %, 3 years 27.8 %, 4 years 27.8 %, 5 years 4.2 %, other 6.9 %

The benefits of PhD programmes for clinicians and having clinicians with PhDs in radiology departments have been shown to include increased research activity, higher publication levels and enhanced funding [12]. Indeed, running a PhD programme can have a net positive financial impact on the host institution/department [13], although at present there is a lack of data on the effect of PhD programmes on recruitment and retention levels within academic radiology departments.

In summary, radiology has a strong tradition of pioneering research, with many Nobel Laureates. PhD programmes for clinicians are a valuable asset for universities, institutions and individual radiology programmes, with about half of the universities surveyed offering some form of imaging-related PhD and a quarter of radiology departments hosting their own PhD programme. These programmes play an important role in developing future clinical academics. Radiology departments with the appropriate facilities and staff should be encouraged and supported to develop their own PhD programme. Research training through PhD programmes with relevance to imaging will hopefully drive future developments in radiology.

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