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HARCUS, J <<http://orcid.org/0000-0001-5790-2994>>, HIZZETT, K <<http://orcid.org/0000-0002-1818-2995>>, CLARKSON, Melanie <<http://orcid.org/0000-0003-3052-5230>> and SNAITH, B <<http://orcid.org/0000-0002-6296-0889>>

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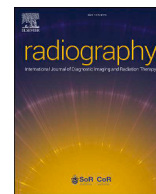
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Advancing practice radiography education in the UK: An analysis of themes from higher education programmes

J. Harcus^{a,*}, K. Hizzett^a, M. Clarkson^b, B. Snaith^{a,c}

^a University of Bradford, Bradford, UK

^b Sheffield Hallam University, Sheffield, UK

^c Mid Yorkshire Teaching NHS Trust, Wakefield, UK



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ABSTRACT

Introduction: The development of radiographers to the enhanced, advanced and consultant levels relies on appropriate post-registration education to develop capabilities across four pillars of practice. In an evolving landscape, higher education institutions (HEIs) need to ensure provision is viable, meets demand, and aligns with professional frameworks. This study aimed to scope the current UK post-registration radiography provision to support advancing practice and explore future directions and challenges in delivery.

Methods: The multi-method qualitative study comprised two stages. Content analysis was undertaken of online information pertaining to programmes. Semi-structured online interviews were undertaken with HEI representatives from programme teams. Content and frequency analysis of education provision and thematic analysis of interviews using Braun and Clark's methodology was undertaken.

Results: 49 post-registration radiography programmes, at 25 HEIs, were identified during content analysis. Ultrasound, projectional radiograph reporting, and breast imaging were well provided for, yet options in radiotherapy, nuclear medicine, and DXA were limited, especially outside of England. 16 (64 %) of HEIs were represented at interview and four key themes were identified; sustainability and viability of provision, fragmentation of provision, ambiguity of levels of practice and accreditation, and addressing the four pillars of practice.

Conclusion: HEIs have identified significant challenges to viability of provision, placing programmes at significant risk. Saturation of some areas of practice, uncertain funding streams, and low student numbers were perceived to present a challenge to the sustainability of UK post-registration radiography education. The provision, and how it meets the requirements of the advancing practice workforce, presents a very mixed picture.

Implications for practice: Without a sustainable and collaborative approach to post-registration radiography education, support for the future advancing practice workforce is under threat, particularly in some discipline areas.

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Introduction

Demand for imaging and oncology services has been increasing for many years,^{1,2} and with it the opportunity for radiography professionals to advance their practice. Underpinned by national and profession-specific career frameworks^{3–7} radiography has continued to develop new capabilities and roles to support the optimal care for patients and deliver effective services. Despite clear standards^{3–7} underpinning the educational preparation for,

and capabilities at, the enhanced, advanced and consultant levels of practice, collectively termed advancing practice, there still remains uncertainty and inconsistency as to how these levels are interpreted and applied in practice.

Whilst terms advanced and consultant have been widely used for several years, enhanced is a relatively newer concept^{5–9} but is expected to make up a higher proportion of the workforce.^{8,9} Both enhanced and advanced practice lie along the same continuum but differ in terms of degrees of autonomy and complexity of decision making. Different education qualifications and frameworks define them, with advanced being considered a higher level of practice than

* Corresponding author.

E-mail address: j.harcus@bradford.ac.uk (J. Harcus).

enhanced, yet how widely the education provision supports the development of different levels, and how this viewed in practice, is unknown.

The development of radiographers in advancing practice is reliant on appropriate post-registration education to develop capabilities across the four pillars of practice.^{1,2} Higher education institutions (HEIs) need to ensure provision is viable, meets demand, and is fit for purpose. However, despite the enhanced level being represented in the latest edition of the College of Radiographers (CoR) Education and Career Framework (ECF),³ and in the Career and Progression Framework for Sonographers,¹⁰ there is no clarity on how current education provision meets demand nor expectations, and there is little evidence to assess the effectiveness of preparing the advancing practice workforce.

With three decades since the move to degree qualification, radiographers have transitioned to the challenge of postgraduate study,¹¹ and a plethora of academic programmes have emerged across the UK to underpin career progression. These have supported the development of knowledge and skills and demonstrated a positive impact on individuals and service delivery.¹² There are both intrinsic and extrinsic factors influencing the decision of radiographers, and their employers, to pursue post-registration study¹³ and the financial aspects are a key factor alongside course availability.¹⁴ The levels of advancing practice are expected to be underpinned by formal education with the expectation to achieve a postgraduate certificate (PgCert) or postgraduate diploma (PgDip) to meet the enhanced level,¹⁵ a master's degree specific to their scope of practice at the advanced level.³ The consultant is expected to work at doctoral level,³ although there is acknowledgement of limited doctoral opportunities within the profession.¹⁶ Additionally it is recognised that simply possessing the academic qualification alone does not necessarily demonstrate the capability to work at a specific level of practice.

Whilst there is clear demand for post-registration radiography education, the challenges faced by higher education institutions in the UK have never been greater. Financial sustainability of providers is a real threat to programme and institutions¹⁷ so capacity for innovation is limited. Whilst there may be a clinical need for academic programmes to support enhanced, advanced and consultant level roles the ability of the higher education sector to deliver is unknown and national expectations for expansion of the advancing practice workforce might not necessarily be fulfilled without a sustainable education provision.

Part of a larger project exploring the evolving advancing practice workforce needs within imaging and oncology, this study aimed to scope current radiography post-registration education aimed at the enhanced, advanced or consultant level within the UK. Beyond understanding what is currently being delivered, it also aimed to identify areas of future planning and how programmes met the requirements for preparing the workforce for different levels of practice. A key objective was to identify what challenges to provision, including viability, are being experienced by HEIs. This study looks to fill a gap in understanding how well education provision aligns with both national workforce aspirations and needs.

Methods

This study adopted a qualitative multi-method exploratory design (QUAL → qual) to explore current post-registration radiography education in the UK. The two stages comprised:

1. Content analysis of existing programme provision
2. Online interviews with HEI programme teams

HEI ethical approval for the study was obtained prior to any data collection (E1234, approved on 6/8/24).

Stage 1 content analysis

Qualitative content analysis was conducted using open-access curriculum information, based on a previously published methodology,^{18,19} Data was obtained from websites of UK HEIs offering post-registration education across radiography disciplines, including diagnostic, radiotherapy, ultrasound, and nuclear medicine. Initial identification of relevant institutions was informed by databases from Health and Care Professions Council (HCPC), Society and College of Radiographers (SCoR), Consortium for the Accreditation of Sonographic Education (CASE) and NHS bodies.

Programme and module course pages were accessed to collect this open-access data. Two of the research team undertook the content analysis using a pre-formulated spreadsheet which was designed by the research team for data collection based upon the research aims and objectives. Information included the focus of programmes, academic award(s) level, and any references to the terms 'enhanced', 'advanced' and 'consultant' practice. Additionally, information related to external accreditation or approval with CoR, CASE, or NHS England's Centre for Advancing Practice (CFAP), and reference to relevant national and professional standards such as the ECF³ and the Multi-Professional Framework for Advanced Practice (MPF)⁴ was included. The purpose of the content analysis was to look for frequency of this specific information across HEIs and not in-depth analysis of curricula.

Across the UK, many HEI institutions offer 'general' advanced clinical practice (ACP) programmes which radiographers of all disciplines may access; however, these typically lack radiography-specific content. Therefore, this project focused exclusively on programmes offering radiography-specific provision. Programmes centred on a single pillar of practice, such as research or practice education, were also excluded as the project focused on development of radiographers in advancing practice across all pillars.

Stage 2 interviews

Following the identification of relevant contacts in stage 1, professional and programme leads from HEIs were invited to participate in semi-structured online interviews using a pre-designed interview guide. Informed consent was required prior to interview. The interviews were conducted online on Microsoft Teams and, with the permission of the participant, recorded and transcribed verbatim. Two members of the research team (JH,KH) undertook half of the interviews each.

Interviews firstly aimed to verify the accuracy of information collected during the content analysis (stage 1) to add rigour to this stage. Interviews then proceeded to clarify the current status of programmes, including those that had been suspended or discontinued and to identify any new provision in the process of approval. The interviews further explored current educational offerings, how programmes addressed the requirements of advancing practice, and the challenges affecting their viability and sustainability.

Data analysis

Content analysis data was analysed by two of the research team to look at frequencies of data according to the pre-determined criteria to provide an overview of the current provision as of August 2024. Affirmation of content was performed in interviews for participating HEIs and this information updated as appropriate where there were discrepancies. Thematic analysis of anonymised interview transcripts was undertaken using the Braun and Clarke

methodology²⁰ Stages 1–3 of thematic analysis; familiarisation of the data, generating the initial codes, and searching for themes was undertaken by the respective researcher who undertook the interview. Stages 4–6; reviewing the themes, defining and naming themes, and writing the report was undertaken collaboratively between the research team.

As a part of the wider commissioned project representatives from HEIs were invited to attend a one-day in person workshop held in November 2024. The workshop focussed on discussing the delivery of education across all three levels of advancing practice. In particular, attendees were asked to consider how HEIs can support educational needs related to the non-clinical pillars and consultant practice. This workshop, though not specifically part of this research, was a way to affirm the themes identified in stages 1 and 2 of the project, though was not specifically used as an additional data collection method.

Results

Stage 1 – content analysis

Based upon publicly available information, 49 distinct post-registration programmes in both diagnostic and therapeutic radiography disciplines were identified across 25 HEIs, providing a snapshot of the UK's provision as of August 2024. Ultrasound ($n = 18$) and clinical reporting ($n = 15$) were the most frequently offered programmes, alongside 17 other diagnostic pathways including image acquisition within modalities such as CT and MRI. Post-registration provision for therapeutic radiography was identified at only seven HEIs (Fig. 1).

Certain disciplines showed minimal advertised post-registration provision, DXA was offered at only one institution, while nuclear medicine (NM) at just three. Post-registration education in the devolved nations was also relatively sparse, particularly outside of clinical reporting and ultrasound (Fig. 1).

References to 'advanced' practice were commonly found in programme information, appearing in 29 programmes (59 %). In contrast, enhanced and consultant-level practice was mentioned far less frequently, with only 5 (10 %) and 6 (12 %), respectively. Several programmes used more general terminology such as 'higher level', 'advancing practice' or 'extended scope of practice'. Reference to key national frameworks was limited, the MPF⁴ was

cited in only 5 instances (10 %), and the ECF³ just once. At the time of data collection, only two education providers, one in diagnostic and another in therapeutic radiography, were accredited by NHSE's CfAP.²¹

Many institutions adopted a flexible approach to curriculum design, commonly offering work-based learning modules that allow students to select a clinical focus, alongside a 'pick and mix' model for module selection to develop their own study plan. This effectively enables students to 'build' a personalised award rather than follow a fixed programme structure.

Programme and module content was found to be heavily weighted toward the clinical pillar, with significantly less emphasis on the other pillars of practice particularly education. Research elements were generally only explicitly integrated at the MSc level, with limited reference in PgCert or PgDip awards. Leadership content was more frequently included and offered as either a core or optional module.

Stage 2 - interviews

Sixteen (64 %) of the 25 HEIs offering post-registration radiography education participated in interviews, with representation from all four UK nations and across both diagnostic (including ultrasound) and therapeutic disciplines. The interviews confirmed the accuracy of the information gathered during the content analysis stage. Importantly it identified there were three projection radiography reporting programmes (including two in the devolved nations) which had been forced to remove or pause provision because of viability issues. One HEI indicated they were looking to further develop their provision in projection radiography reporting, however.

Four key interview themes, sub-themes, and codes, were identified during thematic analysis (Table 1).

Theme 1: sustainability and viability of provision

Participants reporting a degree of market saturation in projectional radiography reporting and ultrasound but three programmes in these areas had recently been paused or suspended due to viability concerns around learner numbers. In contrast, there was a notable gap in provision for radiotherapy, DXA and

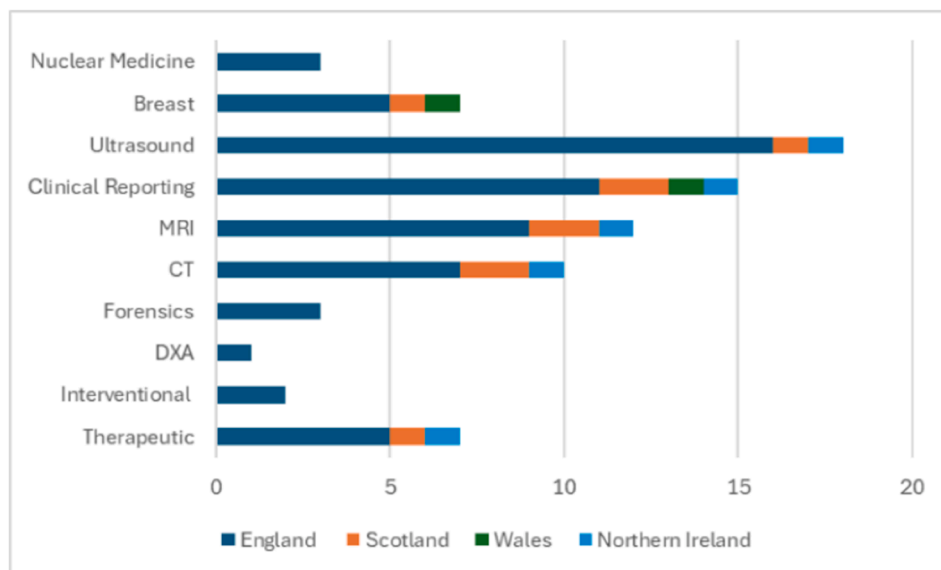


Figure 1. Number of programmes offered by country.

Table 1
Results of thematic analysis.

Extracted Theme	Sub Themes (and Codes)
1 Sustainability and viability of provision	<p>1.1 Market demand/possible saturation in established pathways</p> <ul style="list-style-type: none"> • Prevalence of ultrasound provision; still in demand • Potential saturation of projection radiography reporting; declining demand for MSK reporting leading to suspension of programmes <p>1.2 Gaps in provision</p> <ul style="list-style-type: none"> • Limited radiotherapy-focussed and tumour-site pathways • Minimal DXA provision and nuclear medicine education • Reporting pathways beyond projection radiography not well provisioned <p>1.3 Financial viability driving provision</p> <ul style="list-style-type: none"> • Minimum student numbers more tightly enforced by HEIs • “Bums on seats” narrative • Only modules/routes essential to practice supported • Students not progressing beyond minimum requirements • Advancing practice routes not viable due to lack of funding • Backfill a consideration when sending trainees • Lack of devolved nation support <p>1.4 International students bolstering programmes</p> <ul style="list-style-type: none"> • Increasing reliance on international recruitment to support UK market • Level/content to suit international markets; not necessarily UK advancing practice requirements
2 Fragmentation of provision	<p>2.1 Reliance on generic/multi-professional ACP routes</p> <ul style="list-style-type: none"> • Accredited multi-professional ACP may be seen as default, especially in radiotherapy • Offers inadequate profession-specific clinical content • Supplementary discipline-specific modules required; beyond MSc <p>2.2 Work-based learning modules more commonplace</p> <ul style="list-style-type: none"> • Negotiated learning contracts and bespoke clinical focus modules • Work-based learning, minimal clinical academic content <p>2.3 “Pick-and-mix” programme structures</p> <ul style="list-style-type: none"> • Modular accumulation of credit leading to personalised awards • Defined progression routes less common • Lack of progression to MSc; doing the minimum for role
3 Ambiguity around levels of practice and accreditation	<p>4.1 Inconsistent use of practice terminology</p> <ul style="list-style-type: none"> • Overuse of “advanced” • Underuse of “enhanced” • Alternative language, less appropriate terminology “higher level”, “extended scope” <p>4.2 Misalignment between award level and role level</p> <ul style="list-style-type: none"> • Lack of recognition that academic level and practice level are not the same • PgCert perceived as endpoint • MSc not valued by employers/trainees in many instances <p>4.3 Lack of consultant-level pathways</p> <ul style="list-style-type: none"> • Absence of defined educational routes • Expectations for doctorate not understood • Call for HEI collaboration <p>4.4 Accreditation</p> <ul style="list-style-type: none"> • Ultrasound curriculum limited across 4 pillars • NHSE centre for advancing practice requirements and RPL considerations • NHSE CfAP practice not widely considered/applied
4 Addressing the four pillars of practice	<p>3.1 Clinical competence as the primary objective</p> <ul style="list-style-type: none"> • Getting them qualified to do the task • Clinical skill acquisition over role development across pillars and true advancing practice • Funding/support restricted to clinical modules <p>3.2 Lack of engagement with non-clinical pillars</p> <ul style="list-style-type: none"> • Leadership often core but only at higher levels of award or optional • Research limited to MSc level • Education pillar poorly articulated <p>3.3 Misconceptions regarding development in non-clinical pillars</p> <ul style="list-style-type: none"> • Critical writing and engaging with literature denotes research • Being a student is the same as education development • Implicit/implied inclusion and not made explicit or assessed <p>3.4 Potential solutions</p> <ul style="list-style-type: none"> • Portfolio-based assessment • Pillar integration through assessment

NM, highlighting an area of unmet need. Key causes for this were identified, particularly outside of England, including a lack of funding and support for backfill during training. In contrast, whilst there is a requirement for other areas (such as CT colonography, MRI/CT reporting) demand is not necessarily sufficient to justify the development of new academic programmes. This is also mirrored in other areas such as radiotherapy and interventional procedures.

“It’s just not sustainable ... We can’t run the modules with just one student, so we’ve shelved it ... they’re still sitting there. If there was funding to become available again”

Programme Lead, HEI1

It was also highlighted that adapting content aimed at advancing practice to suit the requirements of international

students had changed the level at which provision was being delivered, however, the international market was essential to ensure viability of programmes.

"those international bums on seats [are] propping up the home [UK] bums on seats, sadly ..."

Programme lead, HEI1

Theme 2: fragmentation of provision

Interviewees highlighted challenges related to the sustainability of programmes with common obstacles included limited funding for trainees and poor progression within their roles beyond the PgCert or PgDip level. These factors have contributed to the closure of several courses and hindered the development of post-registration education pathways.

"people management in the NHS don't always see benefit if someone studies full masters."

That is a difficulty and a shame for the profession"

Head of Department, HEI5

Within England, participants also noted that modular or 'pick and mix' programme structures may fail to meet accreditation requirements set by NHSE, particularly in terms of coherence and alignment with practice frameworks, although it was noted funding tends to follow modular, rather than programme, patterns of study.

"How am I going to meet the requirements of the skills I need from that specific radiotherapy element that I'm not getting through my [generic] ACP course, so quite a few are doing a combination of the ACP plus us"

Programme Lead, HEI2

Theme 3: ambiguity around levels of practice and accreditation

There is a lack of clarity and confidence in articulating the different levels of practice. Some institutions described their programmes as being already 'full', leaving little room to incorporate additional content. Ultrasound programme leads in particular suggested that CASE requirements posed constraints on curriculum flexibility. A few participants questioned the need for programme changes, if their current offerings were perceived as successful, expressing uncertainty about aligning with the evolving expectations of enhanced and advanced practice.

"I don't think we really routinely tick that advanced level box, but that's partly a conscious decision ... We need to focus our attention on turning out as many sonographers as we can"

Programme lead, HEI3

"I still don't think it is [reporting] advanced level. It is an enhanced skill and that tends to be where the reporting radiographers stop. We get very few reporting radiographers that come on to do their MSC"

Postgraduate lead, HEI4

Theme 4: addressing the four pillars of practice

A strong focus on the clinical pillar of practice was apparent in programme design, however, the integration of the remaining pillars; leadership, education and research varied significantly across the institutions. A recurring theme was the limited integration of non-clinical pillars into clinically focused modules. While some programmes offered dedicated leadership or research modules, some had misconceptions that student engagement with critical writing and evidence-based learning alone would address the non-clinical components.

"[it] focuses on the standard sonographer, getting them qualified"

Programme lead, HEI3

"The education side, of course, they're being educated themselves on the modules"

Head of Department, HEI5

Discussion

In summary of the outcomes from the two stages of the project there were four key overlapping themes considered for discussion when scoping the current post-registration radiography education provision.

Sustainability and viability of provision

In comparison to other professions the market for post-registration radiography provision within the UK is relatively small, however, in areas such as reporting, breast, CT/MRI, and ultrasound there is a relatively large portfolio of education (particularly in England, [Fig. 1](#)). With saturation and diversification of traditional advancing roles such as projection radiography reporting towards other areas such as cross-sectional reporting means even established provision in these areas may become less viable. In particular, the demand for musculoskeletal radiograph reporting was reported to have waned, with at least three programmes stating they have suspended their provision whilst a review is conducted on sustainability. This was not specifically reporting in other prevalent areas such as ultrasound or breast.

HEIs are facing extreme challenges in ensuring viability of provision with increasing pressure to ensure minimum student numbers for programmes to run.^{14,17} Funding restrictions across nations means some regions and countries cannot access funding from NHS bodies and there was concern that this means that clinical departments are unable to support trainees. Viability is further exacerbated in devolved nations due to the smaller population size in comparison to England, reflected by the limited breadth of provision identified. HEIs noted increasing reliance on international or non-radiography students to support course viability, however shared learning causes challenges due to different expectations and required capabilities. It was noted that where students working outside of the UK or radiography access this provision then this affected the level at which content was delivered which may not meet advancing practice requirements.

Fragmentation of provision

As is highlighted, UK diagnostic students typically do not progress past PgCert/PgDip level because the benefit of a full MSC

(or completion of non-clinical modules) is often not valued by trainees or employers, whereas, international students typically complete a full MSc which is clearly seen as more favourable by HEIs. It is slightly different in radiotherapy where there is apparently more progression to MSc in advanced practice roles, though because dedicated provision is limited it often requires students to access more generic multi-professional ACP programmes and then have to undertake additional study in discipline specific modules to meet role requirements. The development of advanced practice roles in radiotherapy internationally far exceeds similar roles in diagnostic disciplines so it may be worthwhile exploring international student opportunities in radiotherapy to increase the potential market.

Sustainability of programmes will inevitably influence programme design and provision that can be offered. In many cases there are clearly defined routes towards a qualification, with a set path to follow. Whereas some HEIs use more of a “pick-and-mix” approach to a qualification to help increase programme viability rather than having several named routes as smaller student numbers are under scrutiny by their institutions. Additionally, several institutions utilise clinically focused work-based learning modules which allow a student to gain academic credit through the development of skills within an area of practice not available in the taught module provision. This seems to be a common approach to addressing more unique roles such as cross-sectional reporting, radiotherapy tumour-specific roles, or interventional procedures. Whilst the more clearly labelled “does what it says on the tin” modules such as musculoskeletal reporting, or abdominal ultrasound, clearly define the capabilities which can be achieved, the role of “negotiated,” or “work-based learning modules” can support capability development in less common areas of practice. Without the more prescriptive national standards seen in ultrasound or projection radiograph reporting,^{22,23} for example, these modules allow flexibility and increased viability to provide a market for a broader range of roles, however, how these are perceived or understood by potential students or managers must be considered if a specific outcome is demanded. They do lack the specific taught learning which may be demanded by trainees and employers and put more focus on departments to support staff learning in practice.

It was evident that some, particularly therapeutic radiographers, access programmes aimed at wider multi-professional audiences because they are unable to access other relevant options. These ‘generic’ programmes often do not fulfil the profession-specific clinical requirements of radiographers working at the advanced practice level, therefore, trainees are required to undertake additional learning as either additional post-registration modules or informal education opportunities, to fulfil their requirements. In addition, it was acknowledged that restrictions on recognised prior learning (RPL) for accredited programmes mean often other learning cannot be incorporated into the MSc award²⁴ so individuals have to effectively go beyond an MSc which might not be seen as desirable by employer or trainee. A lack of local and/or discipline-specific accredited routes can contribute to this so development of further frameworks focused on areas of practice, such as has been seen recently in radiotherapy,^{25–27} might necessitate more dedicated provision. There must be consideration, however, that increasing the number of dedicated programmes would further dilute what is an already small market and further exacerbate viability challenges which have already been identified.

Ambiguity around levels of practice and accreditation

Whilst ‘advanced’ was a commonly utilised term in programmes and award titles and information, ‘enhanced’ was

relatively rarely referenced. This may reflect the relatively new development of the term,^{8,9} compared to advanced which has been in use since the early 2000’s. Its recent inclusion in relevant frameworks^{3,10,14} means it may yet take a few years for providers to develop programmes through standard approval and reapproval processes. Since projections from the work of Leary^{8,9} are that the enhanced practice workforce will greatly outweigh that of the advanced/consultant, the demand and provision for clearly defined programmes at the enhanced level should ultimately reflect this, though currently appears not to. Similarly, though demand is expected to be smaller, there is nothing clearly defined for the education and development of consultant radiographers. A range of generic doctoral opportunities exist but it is not clear how these necessarily prepare an individual for consultant practice.

Whilst the advanced term is widely utilised the content and level of study is not necessarily indicative of the level at which graduates would work at the point of graduation since academic level of study and level of practice are not necessarily the same. Someone may hold an MSc but not necessarily meet the requirements of advanced practice on graduation.^{3–7} There needs to be clearer articulation in academic award titles and supporting information of the relevant level of practice it is preparing someone for, and how this aligns to relevant benchmarks, as reference to national or profession specific frameworks^{3–7} is uncommon. There appeared to be limited interest for England-based HEIs in seeking accreditation of advanced practice programmes with the CfAP, though CASE/CoR approval was universally in place (as applicable). Since only CfAP accreditation will lead to the award of an advanced practice digital badge,²¹ and therefore an individual’s accreditation as an advanced practitioner, a large proportion of programmes need to consider this if they are to be recognised as offering an ‘advanced practice’ qualification. This would help add consistency but also more clearly signpost how the education provision will meet individual and organisational needs. There were concerns, however, raised about how advice from the CfAP on RPL might limit the options for routes, particularly ‘pick-and-mix’ pathways and modules on offer.²² It may mean that more dedicated routes would be required so that students have to follow a defined programme of study which in turn, again, affects viability.

Addressing the four pillars of practice

It is clear that greatest emphasis is placed on the clinical pillar. This is perhaps understandable and expected due to the nature of roles and apparent demand from clinical practice, however, the other pillars cannot be undervalued, not least that four pillar working is expected at all levels of practice.^{3–7} From the interviews the other pillars are often not regarded by service as important, and trainees may only be funded or supported to undertake relevant clinical modules. Findings from this study perhaps mirror literature surrounding the application and perception of advancing roles in clinical practice too,^{28–33} with further education around expectations perhaps clearly required.

Progression to full MSc is relatively uncommon, in diagnostic in particular, unless there is a defined ‘advanced’ role (by NHSE in England) or the student is prepared to self-fund, which is uncommon.^{13,14} Where there are very specific guidelines for educational delivery and design, such as through CASE for ultrasound or the RCR/SCoR guidelines for projection radiograph reporting,^{22,23} these have been cited as part of the challenge to “squeeze” more content in and that this may reduce the opportunities to integrate the other pillars.

It was clear that leadership and research were often only considered to have been addressed if students progressed to PgD or MSc level. The education pillar was far less commonly

demonstrable in programmes and there was also a misunderstanding of what may constitute appropriate development, with a perspective that trainees by virtue of being in education and engaging in critical writing alone would address it. A clearer understanding of what is required within programmes to produce graduates who meet capabilities of advancing practice,^{3–7} across all pillars, apparently needs to be more clearly considered by HEIs. There are some programmes that have identified innovative ways to incorporate the four pillars into their provision including through their assessment strategies and portfolio development. Students can thus evidence activity across all pillars and ‘weave’ the non-clinical pillars into clinical modules and the overall programme.

It should be noted, there remains a requirement for leadership, managerial, practice educator and researcher roles; these are acknowledged within the NHSE enhanced schema,¹⁵ which may provide a future opportunity but currently there are limited pathways on offer. Whilst not specifically considered in this review these perhaps need to be better promoted to those looking to take on enhanced practice roles, particularly where the clinical pillar is not the main focus.

Limitations

There were challenges with engagement of identified potential participants at HEIs. This research coincided with unprecedented pressures on providers, however, we recognise there may be some nuances missing related to the perspectives of others. The content analysis stage was also limited by the quality and amount of information available on websites in the public domain, and that it was undertaken at a specific period of time and conclusions can only be inferred. It should be acknowledged, however, that potential customers (students or managers) seeking course detail may also struggle to find, and understand, information when researching staff development opportunities. Whilst the interviews aimed to provide more clarity, it needs to be recognized that content analysis provides a limited snapshot at a specific time.

Conclusion

Overall, the study demonstrated a lack of demonstrable evidence of how the requirements for enhanced, advanced and consultant practice are being addressed by postgraduate education in the UK. Stakeholders looking to support trainees may find that, currently, the education landscape is potentially confusing. There needs to be a clearer distinction between programmes and awards designed to prepare individuals for the enhanced and advanced level, and this needs to be consistent. Some of this lack of clarity may be as a result of a lack of understanding of the relevant requirements for education and accreditation for enhanced and advanced practice both within HEIs and clinical departments.

Within advancing practice the more established roles such as musculoskeletal radiograph reporting and ultrasound are clearly most widely supported, though there is concern (particularly in clinical reporting) that the demand may be levelling out or even decreasing given the suspension of some programmes particularly outside of England. Provision for other areas of advancing practice in the UK, particularly in therapeutic radiography, nuclear medicine, and non-traditional reporting roles are far less accessible. This is most likely to a lack of strategically organised and consistent demand to warrant course development in an environment where HEIs are under increasing pressure to ensure module and programme viability. HEIs are using negotiated or work-based learning modules to address demand in these areas, though clinical partners are perhaps more reticent or unsure about such

routes. The development of more robust guidance in these areas may in one aspect help to support provision in other areas of practice but may perhaps reduce the flexibility and diversity in programme design.

There is perhaps a need for HEIs to be more collaborative in terms of the provision offered, particularly in a time of unprecedented financial challenges. Historically education may have been driven by clinical demand but maybe now there is requirement for this to be the other way round.

Ethics approval and consent to participate

Ethics approval was granted by the Chair of the Humanities, Social and Health Sciences Research Ethics Panel at the University of Bradford on 5th August 2024 (UoB E1234).

Written informed consent was obtained by interview participants; all data collected was anonymised to be published in this article.

Availability of data

Data required for this study may be made available by the author(s) upon reasonable request.

Author contributions

JH - Conceptualisation, Methodology, Validation, Formal Analysis, Investigation,

Resources, Data Curation, Writing - Original Draft, Writing - Review & Editing,

Visualisation, Supervision, Project Administration, Funding Acquisition.

KH - Conceptualisation, Methodology, Validation, Formal Analysis, Investigation,

Resources, Data Curation, Writing - Original Draft, Writing - Review & Editing,

Visualisation,

MC - Conceptualisation, Writing - Original Draft, Writing - Review & Editing, Funding Acquisition.

BS- Conceptualisation, Writing - Original Draft, Writing - Review & Editing, Supervision, Funding Acquisition.

Generative AI use

Not applicable.

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Conflict of interest statement

None.

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Not applicable.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.radi.2026.103344>.

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