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Education models used across Europe to train Therapeutic Radiographers/Radiotherapists: a cross-case study

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Abstract

Interviews with radiotherapy (RT) stakeholders were completed across four European countries to identify the educational models used across Europe and how they affect competencies of Therapeutic Radiographers/Radiotherapists (TR/RTTs).

The stakeholders identified the following educational models:

- *Programmes below European Qualifications Framework (EQF) level 6 (EQF4 or EQF5)*
- *RT-only BSc programmes (EQF6)*
- *Multiple-specialism BSc programmes (EQF6)*
- *RT-only apprenticeships (EQF6)*
- *Multiple-specialism BSc followed by an MSc (EQF6→EQF7)*
- *Integrated masters (EQF7)*
- *RT-only pre-registration MSc (EQF7)*
- *'Common trunk' model (EQF6 or EQF7)*

Each educational model has its set of advantages and disadvantages, but most models can be used to achieve the same essential competencies of TR/RTTs. Some models showed weaknesses in their ability to develop adequate RT competencies (low EQF level, low RT-specific content). Regulating the standards of practice at national level ensures that essential competencies are developed across all course programmes, improving the care to RT patients.

Keywords: *Education models; Radiotherapy; Therapeutic Radiographers; Radiotherapists; Competencies; Healthcare.*

1. Introduction

Cancer is still one of the most significant causes of mortality and morbidity worldwide, with an expected 2.7 million new cases and 1.3 million deaths in 2021 alone across the European Union (EU) (Joint Research Centre, 2021). Given that around 50% of all cancer patients undergo Radiotherapy (RT) at some point in their treatment journey (Barton et al., 2014), adequate education for staff administering these treatments is crucial.

The focus of this study was Therapeutic Radiographers/Radiotherapists (TR/RTTs), who are responsible for delivering radiation during radiotherapy treatments, planning and preparation of treatments, and follow-up of patients during and after treatments, among other roles. These tasks are often performed as part of a multidisciplinary team that includes medics, nurses, medical physicists, among other healthcare professionals.

Even though most graduates will practice in the country where they graduate, mobility of healthcare staff is greatly facilitated through the mutual recognition of qualifications between EU member-states: Directive 2005/36/EC (European Parliament & European Council, 2005). Additionally, EU citizens can obtain treatment care in any other member state (European Parliament & European Council, 2011). Therefore, TR/RTTs' education of each EU country is important for all EU citizens.

However, the education of TR/RTTs varies considerably across Europe regarding academic level (from EQF4 to EQF7), course duration (from 0.5 to 5 years), branches of radiography included in the courses (RT-only or multiple specialisms), and different percentages of the courses dedicated to RT (from 10% to 100%) (Couto et al., 2018, 2021; England et al., 2017; HENRE, 2008; Janaszczyk & Bogusz-Czerniewicz, 2011; McNulty et al., 2016).

The course characteristics used to train TR/RTTs impact the competency level (Couto et al., 2021; Sá dos Reis et al., 2018). In turn, the competency level of TR/RTTs impacts the quality of care provided to RT patients (Baeza, 2012; ICRP, 2000). However, this literature did not explore the impact of education models on the competency level of graduates and patient care. Therefore, this study aimed to identify the education models used across Europe and assess their impact on the competencies of TRs/RTTs.

2. Methods

A *cross-case study* method was used. The cases were distributed geographically (Gerring, 2007), which allowed collection of European stakeholders' perception of the impact of TR/RTTs' education models on competency, through several interviews. This can be classified as an *instrumental case study*, since the aim was to replicate the case studies across four countries (*theoretical replication*) to understand a bigger picture: the European-wide education of TR/RTTs.

2.1. Population, sampling and recruitment

This study's target population was constituted by all EU countries. The UK was included in the study, since the research started before Brexit. Four countries with extreme differences in terms of characteristics of the courses (e.g. duration and specialims), identified in a previous study (Couto et al., 2021) were selected (*maximum variation sampling*). Table 1 shows the variation in course characteristics of the countries included in this study.

Table 1. EU countries sampling

Country selected	Course characteristics of the countries included in the study
Finland (FL)	RT+MI*, <20% of the programme dedicated to RT, 3-year programme
Portugal (PT)	RT+MI (recently transitioned from RT-only), 4-year programme
Poland (PL)	RT+MI+EP*, programmes from EQF5 (2 years) to EQF7 (5 years)
UK (UK)	RT-only, >80% of the programme is dedicated to RT, various pathways available (Bachelor's degrees, apprenticeships, pre-registration masters' programmes)

*EP = Electrophysiology specialism; MI = Medical Imaging specialism; RT = Radiotherapy specialism; EQF = European Qualifications Framework

Six to nine stakeholders were interviewed in each country. They were invited by national professional associations linked with SAFE EUROPE project, an European-funded project (www.safeeurope.eu) and through social media to minimise sampling bias. Participants were chosen to include a mix of stakeholders with different roles, providing different points of view (*critical case sampling*): local and migrant TR/RTTs, clinical managers, RT lecturers, students, and representatives of the national professional associations.

2.2. Semi-structured interviews

The semi-structured interview guide was designed based on results from previous research (Couto et al., 2018, 2021) and literature review. Open-ended questions allowed participants to discuss their educational background, the educational models used to train TR/RTTs, and its impact on graduates' competency and patient care.

The first interview, in Lisbon, November 2019, was performed face-to-face at a national conference. The following interviews were performed online due to COVID-19 restrictions.

2.3. Thematic Analysis and Rigour

The analysis started with a *line-by-line coding* to minimise researcher biases' influence on the data interpretation (Gibbs, 2020) and finished using an *elaborative coding*, which elaborates previous themes into the final thematic framework (Saldaña, 2013).

Several methods were used to improve rigour and trustworthiness: triangulation of sources, negative case analysis, member checking, peer debriefing, and researcher reflexivity were completed (FitzPatrick, 2019; Johnson, 1997; Robson, 2002). The results obtained were compared with previous results and published literature (*triangulation*) (Flick, 2020). The results were discussed with the SAFE EUROPE consortium and with three RT experts from a European professional organisation prior to publication as part of *peer debriefing*.

2.4. Ethical considerations

The Institute of Nursing and Health Research Ethics Filter Committee at Ulster University, UK, granted permission for this study. Participation was voluntary, confidentiality was guaranteed, an information letter was provided two weeks in advance and consent was collect on the day of the interview. Data was saved in password-protected computers.

3. Results and Discussion

Twenty-seven stakeholders were interviewed across four countries. Data saturation was achieved well before the completion of all interviews.

"Patient care and safety" was a main theme emerging from the analysis, mostly influenced by graduates' competencies. In turn, "competency level" was also identified as a main theme, which depends on the educational model used to train TR/RTTs. The subthemes related to the educational model were: EQF level, programme duration, specialisms, RT-specific training and regulation.

The main concerns identified by stakeholders were programmes at academic levels below EQF6 and courses with little RT-specific content that allow graduates to practice the TR/RTT profession. When courses do not include enough RT-specialisation, students graduate with competencies below the expected level for the roles taken. Without the RT-specific underpinning knowledge and practical training, graduates cannot take responsibility for RT tasks or perform them autonomously safely.

It is acknowledged that graduates can develop these competencies after graduation. However, the essential competencies must be acquired at the end of the degree that gives access to the profession. Otherwise, patient safety is compromised. According to the Bologna process, the EQF6 is the level that provides access to the profession (Cowling, 2008), but this varies widely across Europe.

The educational models and corresponding countries were discussed by the stakeholders are identified below. Note that some countries, such as the UK and Poland, have more than one educational model that gives access to the profession:

- Programmes below EQF6 (EQF4 or EQF5) – Germany, Poland and Spain
- RT-only BSc programmes (EQF6) – Portugal (before 2014) and the UK
- Multiple-specialism BSc programmes (EQF6) – Portugal (after 2014), Finland, and Malta
- RT-only apprenticeships (EQF6) – UK
- Multiple-specialism BSc followed by an MSc programme (EQF6 → EQF7) – Poland
- Integrated masters (EQF7) – no country identified by stakeholders
- RT-only pre-registration MSc (EQF7) – UK
- 'Common trunk' model (EQF6 or EQF7) – The Netherlands

The most common model is the traditional **Bachelor's (BSc) degrees at EQF6**. In very few countries these programmes are RT-only, while in most countries RT training is shared with other specialisms. In multi-specialism programmes, RT is mostly taught together with Medical Imaging (MI) and in rare instances with Electrophysiology (EP). Some multi-specialism programmes have very little RT content, a major concern for the stakeholders: "*you know a little bit of everything, but you don't know everything about one thing*" (FL2); "*There were like 20 [credits in radiotherapy] when whole school [programme] was 210 [credits]"* (FL5).

It was clear that '*there's always bias to the models that you know*' (UK1), referring to the traditional BSc programmes. This bias provides decision-makers with the safety of using well-established models but hinder the use of alternatives that could be more efficient and efficacious. The alternative models are discussed below.

The Alternative models at **EQF6** included **apprenticeships**. In this model, students join an educational programme led by the clinical department, who is responsible to develop their knowledge, skills and competencies. These models often include a partnership between a clinical department and an education institution. Given that clinical departments can employ graduates from other programmes without training costs, setting-up apprenticeships does not seem financially appealing. This model achieves the same standards as the traditional BSc programmes.

Another model includes **continuing the EQF6 programme into an EQF7**; either separate sequential programmes or as part of an integrated master's programme. In the former, students can start practising after the first cycle and enrol (or not) in the second cycle at a later stage. The latter is a continuous programme. These models were recommended in countries where the initial EQF6 programme was considered insufficient to practice RT (e.g. multi-specialism programmes lacking RT), requiring additional training to achieve essential RT competencies. In some countries, the EQF7 level is necessary since *'some activities […] we could do only when we have a Master's [EQF7]'* (PL5).

In **pre-registration Masters' (MSc) degrees**, BSc graduates of various backgrounds can join an RT-dedicated MSc programme that allows them to practice RT. These are shorter

than the traditional BSc programmes, often 2-year. However, since students developed many transversal skills in their initial programme, the MSc programme can focus on the RT-specific content, allowing graduates to achieve the '*the same standards of education and training*' (UK4) as traditional EQF6 BSc graduates. Some stakeholders highlighted that this pre-registration MSc do not equate to a specialisation MSc. The latter provides advanced skills, allowing TR/RTTs to perform advanced roles, while the former focuses on achieving the essential competencies to practice since *"they will only have, actually, two years [of RT training]"* (UK4).

Stakeholders also discussed a **"common trunk" model**. This term was previously used (Educator Preparation Committee, 2018) to describe programmes where students start in a "common trunk" but choose a specialisation branch at a certain point in their degree: *"for example, one last year, you can focus in radiotherapy"* (FL1). This model was extensively discussed in countries where RT-specific content was considered insufficient. The main advantage is that it efficiently uses resources during the "common trunk" but allocates enough time to develop essential competencies in the selected specialism. This model also allows TR/RTTs to develop more imaging competencies before specialising "*It would make sense to have a common trunk because we would increase the knowledge of MRI, CT… and then, yes, choose an option" (PT2).* This model seems appealing since it may be applied even if national regulations only allow for the traditional BSc programmes. However, regulation must be updated to clarify which specialisms/roles they can practice depending on the speciality they develop.

Even though stakeholders and European benchmarking documents (EFRS, 2018; ESTRO, 2014) recommend a minimum EQF6 to practice RT, some European countries still offer **EQF4 and EQF5 courses**. The EQF6 level ensures that graduates "manage complex technical or professional activities or projects, taking responsibility for decision-making in unpredictable work or study contexts" (European Parliament & European Council, 2008, p. 13) which is essential for the roles undertaken by TR/RTTs. Stakeholders identified a safety risk in low EQF programmes: "They have no knowledge of dosimetry, […] physics, they have no knowledge at all" (PT5); "[it would be] unthinkable that a [TR with EQF6] would do this error" (PT7). Therefore, the EQF6 are not recommended.

3.1. The role of regulation

With regulation of learning outcomes, different models can be used in the same country and achieve the essential skills to practise safely. While a lack of regulation of learning outcomes may result in variation of competencies between graduates, compromising patient care.

In the UK, three different educational models (EQF6 BSc, EQF6 apprenticeship, and EQF7 pre-registration MSc) are used. All achieve the essential learning outcomes determined by

the regulator and professional body. Nevertheless, beyond the essential competencies, *'there are still very much large differences'* (UK5), especially regarding advanced RT techniques.

On the other hand, the lack of regulation in other countries creates variation in graduates' competencies across the country: *'some universities focus more […] on diagnostic aspects or radiotherapy aspects'* (PL1). This may compromise patient safety since *"when education is different, we can't do the same thing"* (FL1). Even though stakeholders emphasised the importance of standardisation at the European level, closing this lack of standardisation at national level must be prioritised.

4. Conclusion

Most education models seem suitable to achieve the necessary competencies to practice RT safely. However, most countries legislate the structure of the training programmes in a strict manner, limiting education institutions to very specific education models. This regulation hinders the use of more alternative models. Although all models have advantages and disadvantages, courses below EQF6 and courses with insufficient RT-specific may not offer adequate competencies to practise safely.

If countries regulate the learning outcomes instead of the programme structure, it would give education institutions the flexibility to use models that could be more efficacious at developing the competencies and more efficient, by using less resources to achieve the goals.

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