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# Curricula, attributes and clinical experiences of radiography programs in four European educational institutions

C. Sá dos Reis [a, b, *], J.A. Pires-Jorge [c], H. York [d], L. Flaction [c], S. Johansen [e, f], S. Maehle [e]

[a] Medical Radiation Sciences, Curtin University, Perth, Western Australia, Australia
[b] Escola Superior de Tecnologia da Saúde de Lisboa/Instituto Politécnico de Lisboa (ESTeSL/IPL), Portugal
[c] Haute École de Santé Vaud/University of Applied Sciences and Arts Western Switzerland (HES-SO), Switzerland
[d] University of Hertfordshire, Hatfield, United Kingdom
[e] Oslo and Akershus University College of Applied Sciences, Faculty of Health Sciences, Norway
[f] Department of Oncology (AKB), Division of Cancer Medicine, Surgery and Transplantation (KKT), Oslo University Hospital (OUS), Norway

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ABSTRACT

*Introduction:* The aim of this study was to compare radiography curricula, teaching/learning strategies, skill development, clinical practice outcomes and research development delivered by four European educational institutions.
*Methods:* This study was carried out in two phases: the first focused on curricula analysis; the second involved online questionnaires to ascertain data from two key-informants: students who had recently completed their bachelor thesis and teaching-staff. Questionnaires were designed to capture teaching and learning strategies, skill acquisition and outcomes of clinical practice and research. Descriptive statistics and thematic analysis were performed according to the nature of the questions.
*Results:* The European Credits Transfer System dedicated per core subject area (natural sciences, clinical practice, research, imaging technology, humanities) differed between institutions. Students classified technical, practical and communication skills as the most important, teaching-staff highlighted also critical thinking. The students defined as "very good" their experience in radiography (58.5%) and computed-tomography (45%). Magnetic resonance imaging practice was considered "Average" by 53% of the UK-students and "Good" by the other European students (40%). According to 71% (55/78) of the students, research work contributed to the development of critical/reflective thinking.
*Conclusions:* The four radiography programs presented variations in curricula, contact-hours, clinical experience and outcomes. Research units allowed the participant-students to develop their critical thinking capabilities. The outcomes from clinical practice differ across the institutions, mainly due to differences in background and access to specialities. Further work is necessary to assess the real impact of different radiography programs on professional and academic mobility across Europe.


## Introduction

Radiography training across Europe aims to graduate students who have gained the understanding to manage professional autonomy and accountability, the capability to develop good professional relationships, personal and professional skills and who can demonstrate an ethical and knowledgeable understanding of the profession[1–3] Secure application of radiographic and/or radiotherapeutic practice is also expected, developing knowledge and skills, while maintaining or improving the health and well-being of the patient.[1–3] However, there are variations in radiographers' roles and training requirements in response to national policies, needs and traditions amongst European countries. These can have an impact on the transferable attributes acquired during training, affecting students and professional staff mobility within the European labour market. Efforts have been made to align the systems of tertiary education in Europe. The European Qualifications Framework (EQF) benchmarking documents for radiographers at level 6 (Bachelors) and 7 (Masters), based on the World Health Organization European Region guidelines have been developed over recent years.[4–6] This is also echoed in the European Federation of

* Corresponding author. Medical Radiation Sciences, Curtin University, GPO Box U1987, Perth, Western Australia, 6845, Australia.
*E-mail address:* claudia.sadosreis@curtin.edu.au (C. Sá dos Reis).

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Radiographer Societies (EFRS) constitution[7] aiming towards the development of European standards to guide initial and post-graduate education, professional practice, and so harmonizing and facilitating the free movement of radiographers in Europe.

Several studies have been conducted[8–11] to investigate the impact of these documents and requirements, namely to verify the alignment and quality of the radiography programs across Europe. In a study carried out by McNulty et al.[12] it is reported that full alignment across all European radiography programmes has not yet been achieved. Their results[12] showed radiography bachelor programmes varied between 3 and 4 years duration, qualified practitioners to practice in one discipline (radiography) or multiple disciplines (radiography, nuclear medicine and/or radiotherapy). Another study, Akimoto et al.,[13] compared Europe with Japan and highlighted the freedom in most universities in Europe to determine their own curricula and examinations, promoting variability in curricula between and within countries. While in Japan, the curricula follow central government guidelines and are centrally assessed via a national radiography examination, ensuring curricula are more homogeneous. This promotes easier mobility of students and radiographers inside the country.[13] Lundvall et al. (6) report that in Europe radiography education has combined both diagnostic imaging and radiotherapy in some cases and was originally delivered in connection with nursing in some Scandinavian countries. Caruana and Placed[14] found that radiography education curricula in Europe had adopted different approaches regarding the content: a) wide scope of coverage of projection radiography and narrow scope in CT; b) wide scope of coverage of projection radiography and a focus on a single additional imaging modality; c) coverage of all available imaging modalities. These differences influence the possibility of international collaboration between the European radiography educational institutions.[14] To make international collaborations and mobility possible, a better alignment between radiography programs across Europe is necessary. For that reason, it is important to investigate in more detail the core areas of programs, and expected clinical practice and competences. Therefore, the aim of this study was to compare radiography curricula, teaching and learning strategies, skills and outcomes of clinical practice, research and patient care as delivered by four European educational institutions. Furthermore, this study combined the perspectives from students and teaching-staff to include all parties involved in the process.

## Methods

To achieve the aims, the study was carried out in two phases. The first phase focused on curricula analysis, using an observation grid, to compare 4 European educational institutions:

- Oslo and Akershus University College of Applied Sciences (HiOA) Oslo, Norway (HiOA/NO)
- University of Hertfordshire (UH) Hatfield, United Kingdom (UK) (UH/UK);
- Haute École de Santé Vaud/University of Applied Sciences and Arts Western Switzerland (HES-SO), Lausanne, Switzerland (HES-SO/CH) and
- Escola Superior de Tecnologia da Saúde de Lisboa/Instituto Politécnico de Lisboa (ESTeSL), Lisboa, Portugal (ESTeSL/PT).

The comparison grid (Table 1) covered the core areas described in the official European benchmarking bachelor level documents and EFRS radiography benchmarking document,[3–5] including natural sciences, humanities and social sciences, imaging technology/applied imaging technology, clinical practice and research project in radiography. The number of European Credit Transfer and Accumulation System (ECTS) for each core element per semester was identified for the 6 semesters provided in Oslo, Hatfield and Lausanne and the 8 semesters required in Lisbon. The similarities and differences in curricula regarding theoretical and practical training were then explored.

The second phase involved the application of two questionnaires to key informants: one targeted students in their final academic year (3rd or 4th year depending on the country/program) and who had completed their bachelor thesis. The second questionnaire targeted the teaching-staff. A cover letter informing about the context of the study and its objectives accompanied the questionnaires.

Questionnaires were designed to collect detail about participants' and institutions' profile, expectations about the program, experience/clinical practice and patient care qualities. The questions were mainly closed-ended, except when it was necessary to explore the qualitative, in-depth aspects of expectations, experiences and future plans (Table 2). The closed-ended questions were aligned to rating scales to measure directions and/or depth of attitudes (Table 2).

Prior to distribution, the questionnaires were translated into the respective national languages and tested to verify that the translations (two ways) did not change the meaning, measurements and content. The suggestions raised during the testing period were incorporated, where appropriate, to improve and ensure the questionnaires validity. A pilot study was also conducted. Ten students and two teachers from each university were involved in the pilot study. The experiences from the pilot study were also incorporated and implemented to improve the questionnaires but the results were not included in the final study. The finalised questionnaires were delivered to the students as they completed their respective program and teaching-staff via a

**Table 1**
Observation grid to collect information regarding ECTS per core area, year and semester for each participating educational institution. (Educational institutions 1 – HiOA, 2 – UH, 3 –HES-SO, 4 – ESTeSL).

| | Natural sciences<br>Anatomy and physiology<br>Pathology/nosology<br>Biology/Microbiology<br>Biochemistry<br>Pharmacology and contrast media<br>Fundamental Physics and Physics for medical imaging (and radiation therapy)<br>Radiation biology and radiation protection | | | | Humanities and social sciences<br>Health and social Care services<br>Ethical and legal issues in health care<br>Psychology<br>Sociology<br>Professional Practice<br>Patient Care in Radiologic Sciences | | | | Imaging technology/applied imaging technology<br>Imaging equipment: design, components, functions<br>Data management in Health Care Radiology<br>Image acquisition, processing and evaluation Imaging (and treatment) modalities<br>Quality Control and Management<br>Safety in Radiographic Practice | | | | Clinical practice<br>Clinical Placements | | | | Research project in radiography<br>Scientific theories<br>Research methods<br>Bachelors thesis<br>Scientific paper | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Educational institution | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |
| Y Sem.1 | | | | | | | | | | | | | | | | | | | | |
| Y Sem.2 | | | | | | | | | | | | | | | | | | | | |
| ECTS (Total) | | | | | | | | | | | | | | | | | | | | |

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