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A nationwide survey of the current status of radiation oncology teaching in Spanish medical schools

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ABSTRACT

Background: The present study was designed to collect information on the current status of radiation oncology (RO) teaching in undergraduate medical schools in Spain.

Materials and methods: A cross-sectional survey was conducted with the support of the Spanish Society of Radiation Oncology (SEOR). An anonymous questionnaire was sent in two waves, one month apart, between January and June 2022, to all Medical Schools and affiliated Institutions having radiotherapy departments throughout the country. Data on load, curricular location of OR, the academic course (or courses) in which the subject of OR was taught, and teachers position were recorded.

Results: Responses were obtained from 26 of the 46 available Medical Schools (response rate 56.5%). The average number of theoretical classes was 13 (0–30), seminars: 4.5 (0–12) and hours of practical training 17 (0–60). The scientific content of RO was covered very evenly. Medical physics and radiobiology were taught with different extension in 24 medical schools (92.3%). Information on technological equipment, brachytherapy, indications, and clinical results was provided in all but one medical school. In 13 medical schools (50.0%) the contents of RO were taught in more than one course, but the distribution of RO teaching during the six years of undergraduate training was quite dispersed. The teaching staff included 4 full professors, 8 tenured professors, and 68 clinical associate professors. The average number of associate professors per medical school was 2.2. Also, the average number of full professors and tenured lecturers was 0.42 per medical school, although there were none in 16 centers.

Conclusions: The overall teaching content of RO in Spanish medical schools seems appropriate but actions to improve the heterogeneity in the curricular location of RO and the shortage of teachers should be implemented.

Key words: radiation oncology; teaching; Spain; education medical undergraduate; education; survey

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Introduction

Cancer remains a leading cause of mortality worldwide [1] and providing accessible and affordable high-quality cancer care for the wider population still remains an unmet need [2]. Although personalized cancer therapy is becoming increasingly achievable with advances in novel techniques to

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characterize tumors and the expanding repertoire of molecularly targeted therapies [3, 4], surgery, chemotherapy, and radiation therapy still remain the traditional pillars of cancer treatment. Radiation therapy is an important component of cancer therapy with approximately 50% of all cancer patients receiving radiotherapy during the course of their disease, contributing towards 40% of curative treatment for cancer [5]. Technological advances in modern radiotherapy equipment have transformed radiation delivery into cost-effective options with a good therapeutic index, minimizing the adverse effects [6–8].

The need for good and effective undergraduate and graduate teaching in radiation oncology (RO) has been recognized for many years. In 1968, Evans et al. [9] emphasized the important and large role of radiation therapy centers in graduate educational programs and indicated that radiation therapy must be presented to the student as a dynamic medical specialty. Identifying and separating the academic functions, resident training, graduate and undergraduate teaching, and research, from the patient care function were reported as the needs of academic radiology in the 1970s [10]. In later years, a number of studies have recommended implementing formal education in RO fundamentals during the core curriculum of medical school. In a survey about RO distributed to 7 medical schools in the United States, gaps in knowledge of medical students in oncological conditions for radiation therapy were identified, although medical students in the fourth year with RO rotation in medical school had better scores in all outcomes [11]. Another survey to explore teaching practices in RO across medical schools in Canada found an underrepresentation of RO teaching within undergraduate medical curricula [12]. An electronic survey sent to European academic teachers of RO in 19 countries showed that RO teaching to medical students was not uniform and undervalued during undergraduate education [13].

Limited teaching content of RO in medical schools associated with some lack of interest on the part of medical students in this discipline may affect the quality of patient care, and result in academic levels below the standards of professionals interested in obtaining a training position in the specialty of RO. In Spain, an analysis of undergraduate RO teaching in 2018 showed that the education was highly variable in terms of content (theory and practical training), number of credits, and the medical specialty and departmental affiliation of the professors [14]. Also, the Spanish Society of Radiation Oncology (SEOR) proposed quality indicators for continuous improvement of the quality of care in RO and elaborated proposals to improve undergraduate education [15–17]. Therefore, this study aimed to gather information on the current status of RO teaching in Spanish medical schools, with a special focus on scientific contents and characteristics of the teaching faculty.

Materials and methods

A cross-sectional survey study was conducted with the support of the SEOR, with the primary objective of assessing the current status of RO teaching in medical schools throughout Spain. Between January and June 2022, a questionnaire was sent to the medical schools having radiotherapy facilities in which undergraduate teaching activities are carried out. The questionnaire was sent by e-mail through the secretariat of the SEOR (Spanish Society of Radiotherapy and Oncology) together with a cover letter addressed to the head of the department in which the purpose of the study was fully explained and his/her participation was kindly requested. The same questionnaire was delivered in two waves, one month apart, in order to collect the maximum number of responses. The questionnaire was anonymous and participation in the study was free and unpaid.

The questionnaire was divided into three sections, including the teaching load, curricular location of OR, the academic course (or courses) in which the subject of OR was taught, and data on teachers. In the section on teaching load, the hours of theoretical classes, seminars, and practices were recorded, as well as the distribution of contents, including medical physics, radiobiology, technological equipment, brachytherapy, indications of OR, and clinical results. The second section focused on curricular location, the academic course or courses in which OR teaching took place were registered. Finally, in the third section, the number of professors and their distribution by teaching positions (assistant, associate, tenured, full professor) were evaluated.

Duplicate questionnaires were removed. Data obtained were recorded and processed using Microsoft Excel. Descriptive statistics are presented.

Results

Of the 46 public medical schools, 25 responses were collected in the first delivery wave and 1 in the second, with a total of 26 completed questionnaires (response rate 56.5%). The distribution of RO services from which responses were obtained was quite homogeneous, although, in 3 of the total 17 autonomous regions, responses could not be obtained. These 3 autonomous regions were those less populated, with one or two RO services only.

Teaching load

The average number of hours devoted to RO classes was 13 (range 0–39) and the average number of seminar hours was 4.5 (range 0–12). There were no seminars in 10 medical schools. The average number of internship hours was 17 (range 0–60). In four medical schools, practical hours ranged between 40 and 60, probably because it referred to the total number of hours devoted to teaching both medical oncology and radiation therapy. The teaching load of different teaching modalities is shown in Figure 1. The scientific content of RO was covered very evenly. Medical physics and radiobiology were taught with different extensions in 24 medical schools (92.3%). In all but one medical school, data on technological equipment, brachytherapy, indications, and clinical results were provided.

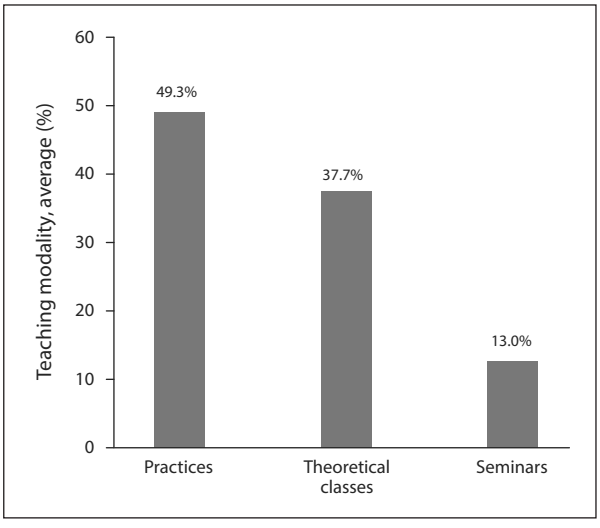

Figure 1. Average percentages of the different teaching modalities in radiation oncology

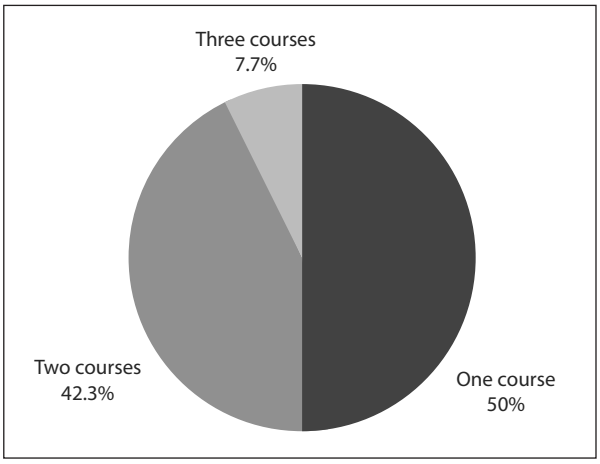

Figure 2. Average of medical schools teaching radiation oncology in one, two, or three academic years

Curricular location of RO

In 13 medical schools (50%) the contents of RO were taught in more than one course, one basic and one clinical (Fig. 2). The distribution of RO teaching during the six years of undergraduate training was quite dispersed, particularly in medical schools in which RO was taught in more than one course (Fig. 3). The majority distribution is 4^{th} and 5^{th} (4 centers) and 3^{rd} and 5^{th} (3 centers) although we also find almost all the possible options: 3^{rd} and 6^{th}: 1, 1^{st} and 5^{th}: 1, 3^{rd} and 4^{th}: 1, 1^{st}, 2^{nd} and 5^{th}: 1, 2^{nd} and 4^{th}: 1 and 2^{nd}, 4^{th} and 6^{th}: 1. In the faculties in which the OR contents are taught

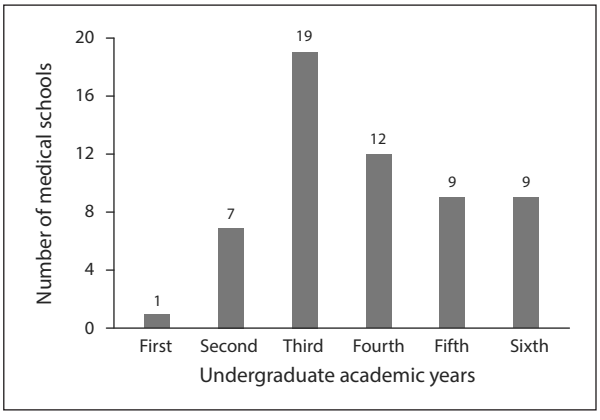

Figure 3. Number of medical schools and curricular location of radiation oncology in the different academic years

in a single course (50.0%) there is also dispersion so that in the third year it is taught in 6 centers, in fourth in 1, in fifth in 2 and in sixth in 4.

Teachers

Among the 26 centers that completed the survey, the teaching staff included 4 full professors, 8 tenured professors, and 68 clinical associate professors. The average number of associate professors per medical school was 2.2 (range 0 to 6 per service). Also, the average number of full professors and tenured lecturers was 0.42 per medical school, although there were none in 16 centers.

Discussion

In the present survey, we achieved a response rate of 56.5% despite the delivery of the questionnaire in two successive waves separated by one month and having had the logistic support of the SEOR. One recognized difficulty of surveys is the percentage of responses. Thus, for example, a 38% response rate was achieved in the European survey involving 87 university hospitals from 19 countries [13]. In a national overview of RO teaching in Germany [18], 35 university hospitals were approached and 24 departments returned completed forms. The response rate of this study is one of the highest reported among similar studies published in the literature. In a study of medical schools in Canada, only 6 of 14 medical schools participated, and the response rate for all final-year medical students was 17% [12]. The authors attributed the limited interest of final-year medical students in RO to reduced teaching of this subject during their medical career.

Teaching the contents of RO presents a series of peculiarities. Unlike specialties related to systems, organs, or apparatus, the specialty of RO is nosological and technological. It deals primarily, although not exclusively, with the treatment of cancer in very different primary sites and, therefore, uses radiation therapy and, when appropriate, adjuvant drugs. Therefore, it has components of Oncology and Radiology and finds its bases on Radiophysics, Radiobiology, and Radioprotection. Given the incidence and prevalence of cancer in so many different locations and that a minimum of 50% of cancer patients will need radiotherapy during the course of the disease, it seems logical to consider that future doctors must have some knowledge of the indications and results of this therapeutic modality. The problem arises in finding the right location in the curriculum. In this respect, in our country, RO is incorporated into the area of knowledge of "Radiology and Physical Medicine" (code 770), and the main topics derived from it, called General Radiology (or with similar names), is compulsory and endowed with 6 ECTS credits in most medical schools.

The present findings show the lack of uniformity of RO teaching in the curricular location. Half of the medical schools taught OR over 2 years: basic and general contents in the 3rd academic year, and specific clinical topics usually in the 4th or 5th academic year. By contrast, in medical schools in which RO is taught in a single academic year, the options were mostly divided between the 3rd and the 6th academic years. At the University of Barcelona, for example, RO is taught over 2 academic years, including basic and technological aspects together with a practical program (e.g., simulation, dosimetry) within the subject of General Radiology in the 3rd academic year. Theoretical teaching and practices focused on clinical aspects of RO within a joined subject of Medical Oncology are given in the 5th academic year.

In general, Spanish students mostly have more extensive RO training as compared with academic curricula from other countries. In a study of the opinion of 3rd-year medical students at the University of Málaga (Spain), 91.5% agreed that RO is an important component of medical education and expressed their interest in expanding their knowledge on the subject [19]. On the other hand, in the Canadian survey, 65% of students received less than 2 hours of teaching on RO and 25%, none [12]. In the present study, the minimum number of teaching hours was 3, and this referred to a single medical school. In the survey of medical students carried out in the United States [11], the authors conclude about the lack of general knowledge of basic concepts of RO, even the presence of misconceptions, but noted that students who had simply made a rotation in a RO service had significantly improved their knowledge. In a further study of 49 RO departments in the United States, 20 departments (40.8%) reported that at least one faculty member participated in a curricular educational session

on an oncology-related topic, but only 12 (24.5%) of these sessions were focused specifically on RO [20]. Interestingly, in a survey of the curriculum content of RO among all 24 Australian and New Zealand medical schools, at least 50% of faculties did not offer formal RO teaching to all students and, when offered, students' exposure to RO was often less than 5 days over the entire course [21]. Studies have consistently reported the heterogeneity and limited presence of RO teaching in undergraduate students [11–13, 20, 21]. A review of the published literature pertaining to RO in undergraduate medical education based on seven studies showed the paucity of evidence in this area and it is concluded that teaching RO should be mandatory for all students and it is recommended to impart knowledge relevant to general practitioners rather than detailed information relevant only to oncologists [22]. Moreover, a recent study in the UK on the broadest field of oncology, in which the responses of 166 students from 22 centers were analyzed, showed the limited interest of students in the subject and the lack of exposure to RO and called attention to the need of deep rethinking of the teaching of oncology and radiotherapy [23]. In a study of fourth-year medical students at Boston University School of Medicine, after exposure to a structured didactic program in oncology, 32% of the students pursued advanced training in RO [24]. However, the lack of training in RO in the curricula of medical faculties may have detrimental consequences for the training of residents in radiotherapy and also in their choice of specialty after completing their university studies [25].

In 2016, within the framework of the SEOR and its working group of universities, we conducted a similar survey, with data from 40 centers [14]. The average proportion between the different teaching modalities included 44.4% of theoretical classes, 14.8% of seminars, and 40.8% of practices. In comparison with the present results, there is a decreasing trend of theoretical classes in favor of practical teaching. In relation to the curricular location of RO, data reported in 2016 were similar to the present study, with teaching concentrated in one academic year in 55% and 50% of medical schools, in two academic years in 37.5% and 42.3%, and in three years in 7.5% and 7.5%, respectively. There was an increase in teaching RO in two academic years, one with basic content followed by clinical topics, a distribution that has been fully supported [26].

Regarding the teaching staff, there is very little information in the literature, and, in general, it seems that teaching is done by clinical specialists but the hypothetical deficit of teachers has not been evaluated. The analysis of the European centers [13] cited a mean of 3.8 (standard deviation 3.3) (range 0–12) teachers per center involved in RO teaching, but specialists in medical oncology and other disciplines participated in 31% of institutions. Our results show that in Spain there is a shortage of teachers in RO, especially in terms of career or permanent teachers. Associate professors and teaching collaborators assumed the greatest weight of teaching, in particular practical classes. The problem is general in Health Sciences since the replacement rate (not extension) of holders and professors is about 150 per year and, with difficulty, it is covered in 50%. In the area of Radiology and Physical Medicine, there is an added problem of the shortage of accredited associate professors to compete for tenured professor positions.

Conclusion

The current status of RO teaching in undergraduate medical schools in Spain appears to be superior to that reported in other countries, which may be explained by the presence of Radiology and Physical Medicine as a compulsory core subject and the fact that clinical rotations take place in RO services of university-affiliated medical centers.

However, heterogeneity in the curricular location and the extension of RO teaching has been documented, with a general shortage of teachers. On the other hand, there is a correct homogeneity in the teaching contents. The optimization of curricular location (better in two courses, one pre-clinical and one clinical) and the homogenization of the contents, mainly with greater uniformity in the extension of teaching time and the theoretical/practical ratio, are objectives to be achieved in the near future.

Conflict of interest

The authors declare that they have no conflict of interest.

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