



Current provision and challenges for paediatric radiotherapy in Romania: A survey by the SIOP Europe QUARTET project

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ABSTRACT

Introduction: Significant differences in outcome and survivorship in childhood cancer still exist across Europe, with poorer results in eastern regions. We aimed to map the provision of paediatric radiotherapy in Romania, identifying the key future requirements and main challenges.

Methods: An online survey supported by SIOP Europe was distributed to all 33 (13 public, 20 private) radiotherapy departments operating across Romania. The questionnaire contained 22 open-ended and multiple-choice questions, exploring resources, clinical trial participation, patient referral practice, and Radiotherapy Quality Assurance (RTQA).

Results: Nineteen centres (58%) responded to the survey, ten of which treat children and seven having designated radiation oncologists for paediatric patients. While access to advanced photon techniques is high (16/19 with IMRT/IMAT), only six centres report availability of general anaesthesia. Participants agree that challenges include a lack of national/regional specialised paediatric radiotherapy centres, limited access to mentors or training opportunities, and availability of robust multidisciplinary tumour boards. Only one centre reports participating in paediatric radiotherapy clinical trials; likely attributable to a lack of national trial infrastructure and poor local engagement. Physicians in 16 centres refer children for proton therapy but find the long waiting time and laborious paperwork difficult. Sixteen responders considered paediatric RTQA essential; agreeing that a (inter)national RTQA programme is needed and would benefit patients.

Conclusions: While advanced radiotherapy techniques are widely available for children in Romania, the lack of centralised and harmonised practice, scarce training opportunities, underdeveloped clinical trial infrastructure, and laborious proton referral process highlighted by the survey, describe a complex landscape. Future improvements are required, including establishing strategic national and international multi-stakeholder collaborations.

1. Introduction

Cancer in children is fortunately rare, but the effective treatment of malignancies in this cohort is very challenging. Whilst there is an intent to reduce the use of radiotherapy for paediatric patients, there are many clinical entities where radiation is required to achieve the

best local control and chance of cure. The potential risks and toxicities of paediatric radiotherapy need to be considered for every child, particularly late effects including secondary malignancies. A high-quality treatment plan will aim to carefully balance tumour control and morbidity outcomes, in an individualised way that adheres to current best standards.

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Clinical trials offer patients the chance to access the latest treatments and more standardised care, so enrolment of patients in clinical trials is highly encouraged for paediatric cancer patients. QUARTET (Quality and Excellence in Radiotherapy and Imaging for Children and Adolescents with Cancer across Europe in Clinical Trials) is a SIOP Europe project aiming to improve radiotherapy treatments in children and adolescents by reducing the risk of local recurrence and long-term toxicity through prospective quality assurance [1].

Significant differences in outcome and survivorship in childhood cancer still exist across Europe, with poorer results observed in the eastern part of the continent, estimated to be around 10–20% difference in outcomes [2–5]. One contributing factor may be radiotherapy access and practice in countries where there are more limited resources, or a lack of specialised centres with multidisciplinary teams [3,6]. As emphasised by the SIOP Europe Strategic Plan [7], action needs to be taken in order to reduce the existing disparities, optimise outcomes (including the quality of survivorship), and improve patient care in those areas.

Romania is an eastern-European country with an estimated population of 19 million, with 709 thousand children under the age of 15. Approximately 400 new paediatric cancer patients are diagnosed each year and the reported median 5-year survival rate is 69% [4,5,8]. The healthcare services are delivered by both public and private healthcare providers, however paediatric oncology is practiced only in public hospitals, with 13 paediatric oncology units functioning in 9 cities across the country (Fig. 1). Nonetheless, paediatric radiotherapy is also delivered in some private clinics, with most radiotherapy procedures for children being covered by the public health insurance.

In order to evolve, a clear understanding of the current situation must be acknowledged. With this in mind, we undertook an overview of the paediatric radiotherapy landscape in Romania – focusing on available resources, RTQA (Radiotherapy Quality Assurance) methods, clinical trial participation, and patient referral practice as well as possible challenges. The expected outcome of this survey is to describe the current status of paediatric radiotherapy (RT) in the country and to raise awareness for this special patient population among Romanian and other European radiation oncology professionals.

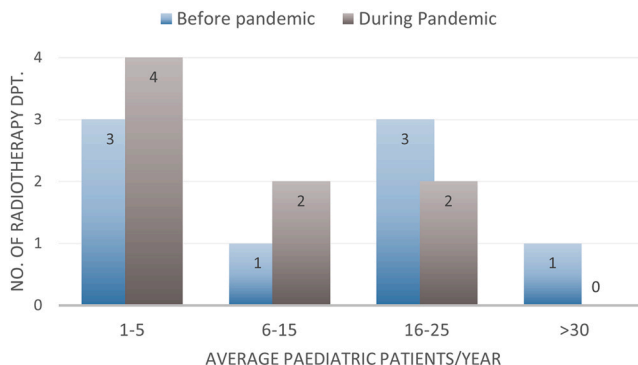


Fig. 2. Average number of paediatric patients treated per year in each centre, before 2020 and during 2021–2022 (the pandemic years); NO = number, DPT = department.

2. Materials and methods

A survey was distributed by SIOP Europe via e-mail in April-May 2022 to radiation oncologists working in all 33 (13 public and 20 private) radiotherapy departments functioning in Romania in 2021 (Fig. 1). The questionnaire contained 22 open-ended or multiple-choice questions. The multiple-choice questions had a diverse design: single-option, multiple-option, and levels of dis/agreement. Questions also included facility for further clarification, comments, and/or personal opinions.

3. Results

We received 21 responses from 19/33 centres. Where multiple responses from a single centre were received, only one was included in the analysis, resulting in a response rate of 58%. Responses were submitted by 6/13 public and 13/20 private centres.

Ten centres (53%) reported treating children, with an average workload of 1–5 children per year; (Fig. 2); In the 3 public centres, 2 reported treating between 16 and 20 children per year before the

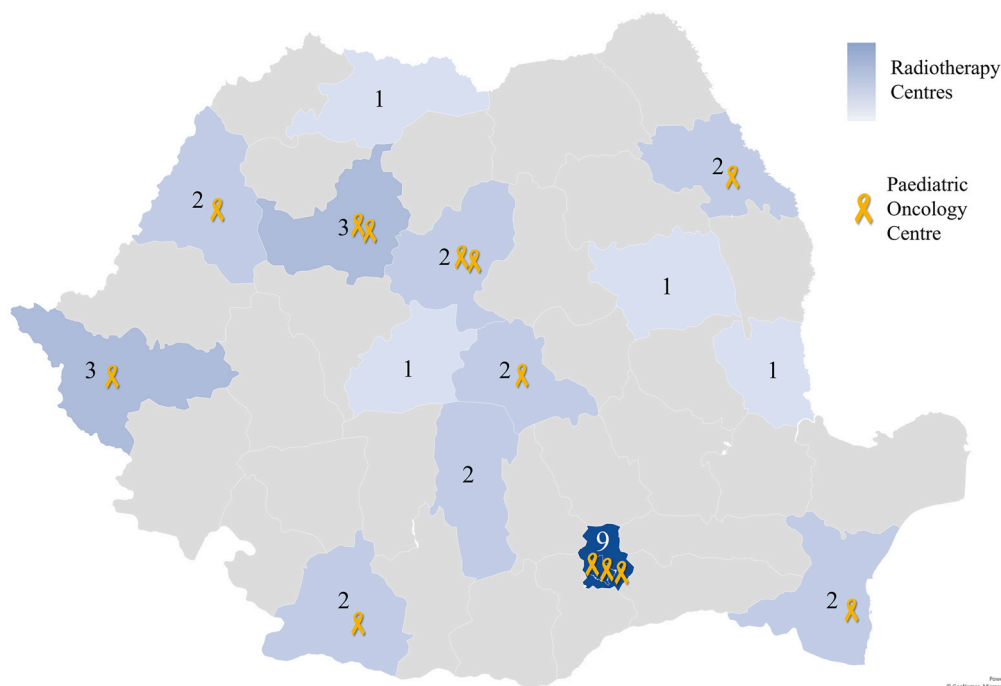


Fig. 1. Radiotherapy Centres in Romania-2021- Map of Romania showing the distribution of all radiotherapy centres opened and functioning in 2021 (Bucharest and Ifov county are reported together, 9 centres); RT = radiotherapy.

Table 1
Human resource in the responding radiotherapy centres.

	RO	MP	RTT
Total no. (19 centres)	107	91	193
Median no./centre	5	3	10
Range	1–20	2–12	3–20
Designated to paediatrics	7	3	1

* No. = number, RO = radiation oncologist, MP = medical Physicist, RTT = Radiotherapist.

pandemic, with a decrease in patient numbers during the pandemic years (2020–2021); one centre was treating 1–5 children per year before 2016, then resumed paediatric radiotherapy activity. By comparison, private centres reported a steady (3 centres) or increased (2 centres) level of paediatric radiotherapy activity during the COVID-19 pandemic. The centres treating children generally follow SIOP or SIOP Europe study protocols.

3.1. Resources

There are 36 radiotherapy machines across the 19 responding departments, with a median of two treatment machines (range 1–4) per centre. Regarding human resources, a total of 391 health care professionals (radiation oncologists, medical physicists, radiotherapists) work in the 19 responding centres (Table 1).

Available technical resources are shown in Fig. 3: advanced radiotherapy techniques are widely available, with only 3 (all public, non-paediatric treating) centres without access to IMRT/IMAT. Brachytherapy is available in seven departments, two of which use it for paediatric patients. Sedation and anaesthesia during radiotherapy is available in less than half of the interviewed centres, with only one centre reporting using anaesthesia in children and another reported that implementation is underway. Fifteen centres report on referring patients to other centres when anaesthesia is required.

3.2. Patient referral

Proton referrals were performed by 84% of the responders. When asked what criteria they considered when deciding to refer a child for proton therapy, all the radiation oncologists (strongly/) agreed that the patient diagnosis (tumour type and location) is considered. Patient

prognosis and performance status are also important factors, followed by the (maximum) waiting time between diagnosis and the patient receiving the treatment. Respondents were neutral or disagreed on patient location/residence and socio-economic status being important factors to consider. The main challenges encountered were time-related (the long waiting period) (n = 12), followed by the paperwork burden (n = 11), and budgetary issues or difficulties in communicating with the reference proton centres (n = 10 each). Patient-related challenges concerned patient selection (n = 7) and patient compliance or preference (n = 6). When brachytherapy is required, 32% of centres refer patients to another national centre and 42% refer internationally.

3.3. Workflow and quality assurance

Fourteen centres make clinical decisions within a multidisciplinary tumour board (MDT) (9 for all paediatric patients, 3 for some paediatric patients). There are seven centres which do not participate in MDT discussions. MDT participants are mostly radiation oncologists (n = 10), radiologists (n = 7), paediatric oncologists (n = 6), and psychologists (n = 5). Other centres also include paediatricians, pathologists, neurosurgeons (n = 3), paediatric surgeons and geneticists (n = 2), and medical oncologists (n = 1). Eighteen centres use internal peer review for paediatric and adult patients. The majority (n = 16) discuss the radiotherapy plan, the delineation (n = 15) and the dose prescription (n = 14). Other aspects reviewed may include patient specific RTQA (n = 14), radiotherapy indication (n = 12), and simulation details (n = 12). The specialists contributing to, or observing, the peer-review process were the radiation oncologist (n = 17), medical physicist (n = 17), radiotherapist (n = 9), and residents in training (n = 1). Eighty-four percent of responders consider paediatric RTQA and peer review essential, 11% think it is ideal and feasible, whereas 5% consider it ideal but not feasible. Regarding shared expertise to discuss cases, 68% consider they have access to such resources. Eighty-nine percent of physicians believe that a national RTQA programme is needed, and all considered that a European or international RTQA platform would be beneficial, 95% declaring they would participate in a centralised QA platform if it was available (Fig. 4).

3.4. Clinical trial participation

Five centres report previous participation in adult radiotherapy clinical trials and three centres currently participate. Only one centre

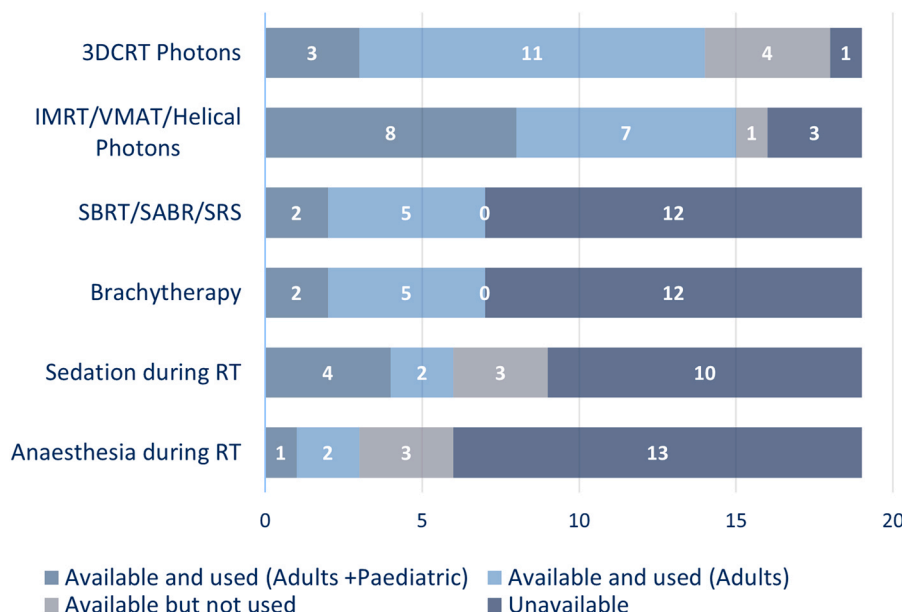


Fig. 3. Available technical resources- access to radiotherapy treatment techniques including sedation/anaesthesia facilities among radiotherapy departments. 3DCRT = 3D conformal radiotherapy, IMRT = Intensity Modulated Radiotherapy, IMAT = Volumetric-Modulated Arc Therapy, SBRT = Stereotactic Body Radiotherapy, SABR = Stereotactic Ablative Radiotherapy, SRS = Stereotactic Radiosurgery, RT = Radiotherapy.

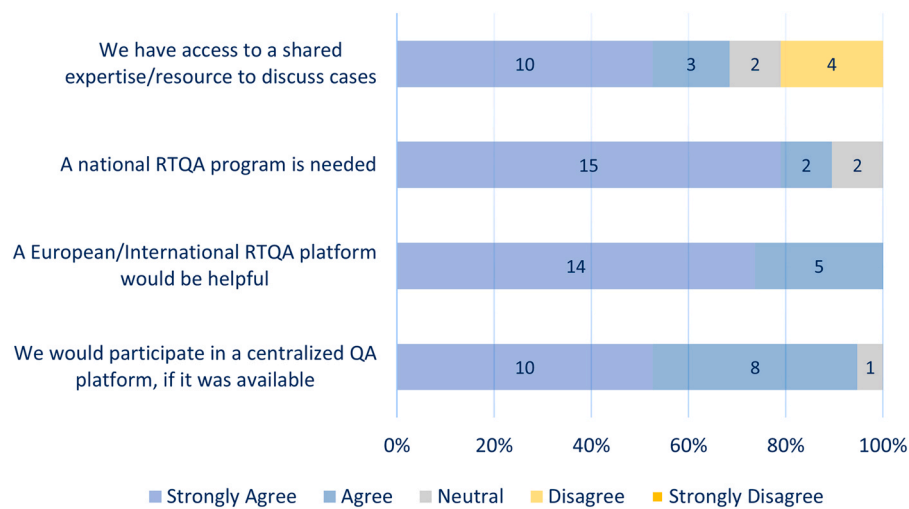


Fig. 4. Patient-specific quality assurance and peer review-responder’s level of agreement regarding centralised patient specific RTQA, including peer review for paediatric radiotherapy; QA = Quality Assurance, RTQA = Radiotherapy Quality Assurance.

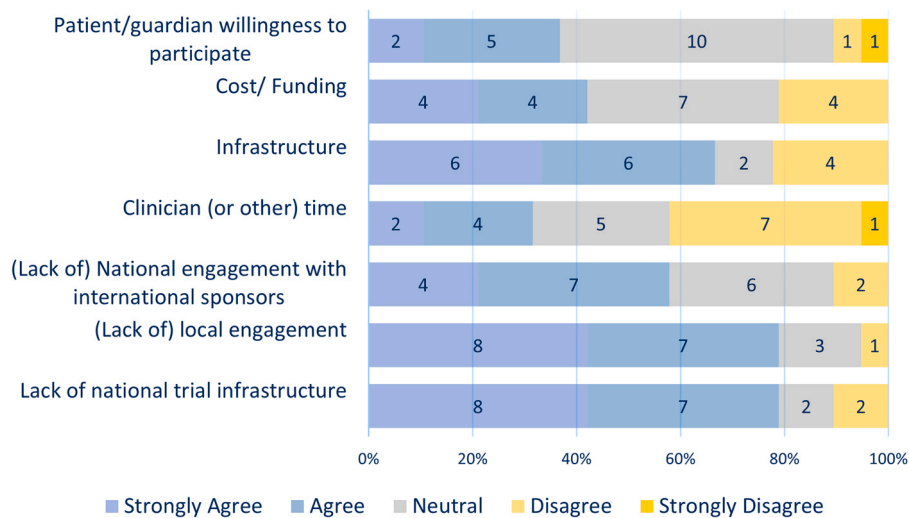


Fig. 5. Challenges in paediatric clinical trial participation – levels of agreement.

reported participating in paediatric clinical trials including radiotherapy. The main challenges in paediatric clinical trial participations are reportedly a lack of national infrastructure and local engagement. Clinician time, patient/guardian willingness to participate, and cost issues are not considered barriers by most participants (Fig. 5). Seventy-nine percent of responders refer paediatric patients to another national centre (16%) or another centre abroad (63%) for clinical trial enrolment.

3.5. General challenges

An overwhelming majority (89%) of radiation oncologists highlighted the lack of national or regional specialised centres for centralised treatment of children as an issue. The status and availability of national guidelines, lack of uniform practice, with the absence of a national RTQA programme were also considered important by 84% of respondents. Other issues highlighted included the absence of mentors and training opportunities in this field (84%). Many clinicians (79%) consider that paediatric radiotherapy brings high responsibility and high risk, associating this with a fear of malpractice. Sixty-eight percent of the radiation oncologists believe that access to clinical trials and to international reference networks for expert opinion are important aspects of paediatric radiotherapy, although some (5% and 26%, respectively) disagree with these being actual challenges. Other barriers

that medical professionals come across when treating children are the status and/or availability of tumour boards (68%) and the proton referral process (63%). However, while 68% of respondents agree that resources such as budget, reimbursement mechanisms, infrastructure, and equipment are important factors in delivering optimal care, 15% were neutral and 10% disagreed. Some responders emphasised that adequate numbers of appropriately trained staff and designated paediatric radiotherapy specialists are the most valuable resource, but that further improvement in their availability in Romania is required.

4. Discussion

Provision of sustainable and effective cancer services in any country, to any population of patients, requires a clear understanding of the national treatment healthcare infrastructure, financial support and reimbursement mechanisms, distribution of services and expertise, and access to clinical trials [9–11]. Paediatric oncology provision in eastern European countries have been previously described, identifying discrepancies in outcomes, variations in access to specialised services for children and adolescents, and unequal use and distribution of expertise [3,6,12–14]. To our knowledge, this is the first initiative to assess the landscape of paediatric radiotherapy in Romania.

With these inequalities in mind, SIOP Europe launched the European Cancer Strategic Plan for Children and Adolescents in 2016

[2] which aims to equalise access to standard care, expertise, and clinical research. The SIOP Europe strategic plan was updated in 2021 [7] and retains these common themes of required improvement for cancer services for children and young people in Europe. To improve access to high-quality radiotherapy, the QUARTET project has provided a centralised resource of paediatric radiotherapy expertise and facilitates prospective RTQA for children and adolescents treated within European clinical trials [1]. Due to very limited participation in clinical trials in Romania, Romanian patients are unable to benefit from QUARTET, but survey participants showed complete support for a centralised RTQA platform, stating that they would participate in an RTQA initiative if one were available.

In order to facilitate service planning and improve care, reports such as the JARC recommendations [15] and ECCO position paper [9] are available. Such reports are most effective when translated into national guidance, for example the guidelines for paediatric radiotherapy in the United Kingdom [16,17], and in France [18] which consider the national and regional particularities of radiotherapy/healthcare provision. These survey results provide a clear overview of paediatric radiotherapy services and accessibility in Romania, including several areas of improvement.

There is indication that centralisation of services for rare diseases, such as cancers affecting children and adolescents, is advisable to ensure development and maintenance of experience [15,16,19]. Centralisation should be implemented in tandem with the use of regularly updated best-practice/consensus guidance, minimum standards for technical and human resources, engagement of professionals with continued professional development, and active research and/or collaborative networks [9,15,16]. Our survey has demonstrated that paediatric radiotherapy is currently not centralised in Romania, with 10/19 (53%) centres across the country, both public and private, treating children. However, respondents indicated a desire to move towards centralisation of paediatric radiotherapy. Most centres treat a low number of children, with only one centre reporting having over 30 paediatric patients per year in the pre-pandemic period. Only a few public centres (and no private centres) have a paediatric oncology ward in the same institution as the radiotherapy facilities, as recommended by several guidelines [17,20]. Yet, our survey identified a slight migration of patients from the public to the private sector during the pandemic, probably due to travel restriction or specific rules and regulations regarding hospital admission, prioritising urgent cases and other public health measures that were in place in the pandemic years (2020–2021). One of the main challenges reported by clinicians was the lack of national consensus guidelines and standardisation of treatment recommendations. An important first step towards harmonisation of clinical practice in both paediatric oncology and radiotherapy across the country is the first National Guideline for Diagnosis and Treatment of Children with Cancer [21] which was recently published as part of a project funded by a Norway-Liechtenstein-Iceland grant.

Participation in clinical trials can support the standardisation of care and safe implementation of new treatment techniques [22]. As is the case with many countries in eastern Europe, paediatric clinical trial infrastructure is underdeveloped and patient enrolment is low [6] with the majority of trials that run in the country targeting adult population and sponsored by pharmaceutical companies rather than academia. A way to facilitate clinical trial participation would be to engage with international working groups (e.g. SIOPE Clinical Trial Groups [23]) and sponsors, as well as to identify funding sources and simplify procedures.

Many children and adolescents cancer patients could potentially benefit from proton therapy as this can reduce the risk of long-term morbidity including secondary, radiation-induced, malignancies, in comparison to photon techniques [24–27]. There are no proton treatment facilities in Romania, therefore patients considered good candidates need to be referred internationally. Although the public health insurance in Romania would normally cover any associated treatment

costs, the proton referral process is rather complicated, leading to long, clinically inappropriate, waiting times. Likely barriers include a lack of national guidance on selection criteria, prohibitively complex paperwork, and poor communication with the treating centres.

These results therefore reinforce the proposal by Aapro et al [9] that barriers in research often result from the absence of sufficient information and/or multi-disciplinary, interoperable collaboration throughout the healthcare system.

5. Conclusions

Romanian clinicians encounter several challenges in paediatric radiotherapy. While advanced techniques and RT machines are widely available, the lack of centralised and harmonised practice, together with scarce training opportunities, underdeveloped clinical trial infrastructure and an intricate proton referral process delineate a complex landscape which calls for action to close the gap in patient care, compared to other European countries. Improved communication should be prioritised, incorporating contributions from all relevant specialists treating children and adolescents with cancer as well as other key stakeholders; engagement with European organisations and professional networks could create opportunities for strategic collaborations. This report could support future service planning to improve patient care and treatment quality in daily practice.

Declaration of Competing Interest

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