



Barriers in education and professional development of Belgian medical imaging technologists and nurses working in radiotherapy: A qualitative study

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ABSTRACT

Introduction: Radiotherapy (RT) professionals are not officially recognised or have formal education in many countries, with RT being often a very short component of a broader programme. This study aims to investigate Belgian stakeholders' perspectives regarding existing barriers and solutions for the education and professional development of Radiation therapists (RTT) which regroups medical imaging technologists (MIT) and nurses working in RT.

Methods: Nine experts with vast experience in RT were invited to be interviewed; eight participated (4 heads of the RT departments, 2 school representatives, 2 national society's representatives). A semi-structured questionnaire was used. The first two authors open-coded all interviews using thematic analysis.

Results: Five themes and eleven sub-themes were drawn from the analysis. Belgian MIT and nurses in RT perform the same roles, but have different educational backgrounds. The barriers in education and professional development are related to law, education landscape, economics, social-cultural context, politics and professional identity. The main difference between the French and Dutch-speaking parts of the country were at the education level. The proposed solutions included modifying the legislative framework surrounding the RTT profession, setting up financial support, formalizing the educational requirements and increasing professional awareness. Future strategies might include the development of advanced roles and responsibilities.

Conclusions: Current law, educational landscape and lack of economic support were the main barriers identified. Except for the educational background, no fundamental differences were found between nurses and MIT in the French and Dutch-speaking parts. Perspectives for both professional groups are linked to future legislative and financial actions, the stakeholders involved and a clear strategic vision. In the upcoming years, increased responsibilities and the creation of a master's degree should be foreseen.

Implications for practice: Regulation of RTT profession and education and an increase in RT-specific training must be implemented in Belgium to ensure professional development and optimized treatment delivery.

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Introduction

The technological advancements seen in Radiotherapy (RT), promoted the adoption of new paradigms, including a change in the educational model of the professionals.^{1,2} Radiation therapists (RTT) is commonly defined as the professional directly responsible for administering RT to cancer patients. The role of the RTT encompasses the safe and accurate delivery of the prescribed radiation dose.² Depending on national policy,^{3,4} this may include treatment preparation and planning, treatment delivery, physical and psychosocial patient care during and post-treatment, including evaluation of side-effects.²

Nevertheless, the training required to profess as a RTT varies significantly across countries. In some countries, these are highly skilled professionals with a recognised diploma or degree (e.g. Canada and United Kingdom),^{5,6} whereas in others they might only receive in-service training without formal recognition from a separate entity as it is the case in Belgium.⁷

Nurses or diagnostic radiographers were the first professional groups involved in RT treatments.^{8,9} However, RTTs are nowadays a recognised profession under the ESCO (European Skills, Competences, Qualifications and Occupations) professions framework with its own body of knowledge and skills, separate from nursing and diagnostic radiographers.¹⁰

As RT evolved in complexity, the number of RTTs and other RT-specialised professionals (e.g. physicists and dosimetrists) grew exponentially.^{8,11} However, this growth rate has lately stagnated and decreased.¹² The main factors have been the increasing number of patients per RTT and treatment unit,¹² as well as the limited number of national-accredited educational programs for RTTs, resulting in the inability to recruit and retain students in RT.^{13,6}

In many countries, the RTT profession is either not officially recognised, not regulated at all or the regulation does not specify the professionals' roles, responsibilities, or specific education.^{1,14,15} Often there is also no formal registration process in place.¹⁴ RT education is frequently a very short component of a broader programme (e.g. France, Belgium, Poland, Finland) such as diagnostic imaging, nursing or a technical discipline (e.g. Medical Imaging Technologists (MIT)).^{14–16} The academic content is limited, and clinical training experience may be only a few weeks.^{2,14}

The Belgian Royal Decree of 1967¹⁷ which legally regulates the professionals working in RT, states that this work may only be carried out by nurses. One argument for allocating this task to nurses is that they are already involved in the care of oncology patients and that they have knowledge of anatomy and pathology.¹⁸ In 2009, a royal decree¹⁹ defined medical imaging as a paramedical profession. Later, in 2015, another royal decree²⁰ defined the basic rules on the exercise of the paramedical professions.

In Belgium, there is unclear regulation pertaining to the roles of the RTT professionals.¹⁴ Even though through the Royal Decree of 22 December 2017, MITs can perform RT procedures,²¹ the law which defines the requirements for accreditation of RT departments (Royal Decree of September 2005²²) still stipulates that only nurses are the ones responsible for the delivery of RT treatments.

Additionally, some Belgian MIT educational programs have a very limited number of hours dedicated to RT.^{23,24} The inequality of the curriculum is also remarkable between the French and Dutch-speaking part of the country, with the latter one offering a more extensive RT programme.²⁴ Those differences are probably linked to the Belgian socio-economic and political structure, hindering a seamless national strategy.

The accuracy in treatment preparation and delivery is critical in modern RT, for example, intensity modulated techniques and

smaller margins are greatly affected by lack of accuracy with great consequences for tumour control and side-effects. Therefore, requiring a complex understanding of basic sciences and the interaction between the technology and patient care^{2,25} and demanding that the RTT's roles and responsibilities continue expanding.^{1,2} The latest clinical audits of Belgian RT departments identified that RTTs lack training and professional development.¹³ This is mostly due to lack of sufficient and dedicated training programs for staff working in RT: the Belgian law still stipulates that a nursing degree is required, which has no RT specific training (except for 60 h of radioprotection training).^{13,26} Some health schools, national societies, and hospitals offer training to minimise this issue. However, the absence of a legal framework to formalise RTT training remains a weak point, with the potential to affect patient care.¹³

Therefore, this study aims to investigate the current barriers in education and professional development of Belgian MIT and nurses working in RT in the French and Dutch-speaking parts of the country as well as future perspectives for both healthcare groups in RT. To the best of our knowledge, this is the first qualitative study which assesses this issue in a national-wide context.

Methods

Study design

A self-designed semi-structured questionnaire was used either face-to-face or online. This qualitative approach is optimal for exploring complex social interactions and sensitive topics. Moreover, qualitative research approaches can provide unique and valuable insights into perceptions, experiences and behaviors of participants.²⁷

The questionnaires were designed by the first author and reviewed by the second author and one national society representative independent from this study. The semi-structured format allowed respondents to share their views on other relevant issues not covered in the questionnaire and enabled a deep understanding of the barriers and solutions for the education of RTTs in Belgium.

Semi-structured interview

The questionnaire ([Appendix A](#)) was reviewed and validated by two experts in Sociology and Ethics of the Inholland University of Applied Sciences in the Netherlands. These experts were not familiar with the RT situation in Belgium to ensure impartiality and appropriateness of the tool to achieve the research aims.

The first part of the questionnaire collected the participants' professional background information. The second part collected participants' perceptions on the barriers, solutions and future perspectives regarding the education and professional development of nurses and MIT.

Sampling and recruitment

Nine Belgian experts with more than 10 years' experience in RT were asked to participate. Recruitment was done using a critical case sampling technique, consisting in a selection of a small number of key participants that are likely to yield the most information and impact on the development of knowledge.²⁸ One invitee did not reply, therefore, the eight participants (4 heads of the RT departments, 2 school representatives, 2 national societies representatives) included were four physicians, three nurses, and one physicist. Participants included in the study were involved in the RTT's education and were active members of at least one national

and international society. They were invited by email between the end of April and beginning of May 2021 and interviews were performed during May 2021.

Ethical considerations

The semi-structured questionnaire was sent before the interview, allowing for a reflective period. Participants provided verbal consent for the audio-recorded interviews and verbatim transcription.

During the verbatim transcriptions the names were removed to ensure the anonymity of the participants. Participants were informed that no identifiable information will be published in this paper and were reminded that the aim was to learn about their experiences and thoughts on the barriers to education and professional development in a supportive environment.

Analysis

Interviews were analysed for thematic content.²⁹ The first two authors extensively read and open-coded the eight interviews guided by a framework (Appendix B). The final coding was achieved through consensus between the two authors. The resulting codes were then shared and discussed with the rest of the research team (peer debriefing).³⁰

Results

After independent coding, discussions between the first two authors lead to a consensus regarding the final themes and sub themes as shown in Table 1. Each theme and subtheme are further detailed below with quotes from the participants to support the authors’ conclusions.

The role of Belgium MIT and nurses in RT

Same roles but different educational backgrounds

The Belgian context is complex because both nurses and MITs hold the same “RTT role”. However, nursing programmes do not have mandatory RT education, and the number of hours dedicated

to RT for MITs courses varies considerably between programmes. These two professional groups present different strengths and weaknesses that complement each other. Nurses lack the technological background that is stronger among MITs, while MITs lack the patient care competencies stronger amongst nurses.

“For nurses, (...) there is no compulsory internship in Radiotherapy, but the possibility is open. There are few theoretical courses. I think its two hours. (...) So, there is a lack of knowledge in terms of technicality and imaging modalities (...). Whereas for MIT, (...) the number of hours of Radiotherapy courses, depends on the schools and the duration of the training courses as well. (...) there is a lack of knowledge, but more at the level of the management of side effects.”(National society representative)

Barriers in education and professional development of nurses and MIT working in RT

Law

The current law is the main barrier for both professional groups’ education and professional development and explains why the situation in Belgium had not progressed much in the past years. Firstly, there is no mandatory RT education besides the 60-h radiation protection training.

“(...) The problem was that it did not evolve any further, precisely because the law which defines the requirements for accreditation of Radiotherapy departments imposed two nurses and nobody else.” (School representative)

“(...) radiation protection training which is, I would say, the only formal aspect.” (RT head of department)

Secondly, there is conflicting legislation. On one side, the law imposes that two nurses per machine are legally required for accreditation purposes. While another law formally authorizes MITs to practise RT.

“There is a law concerning technologists in which it is clearly stated that a technologist can work in Radiotherapy (...) but there is another law, (...) which says that for a Radiotherapy service to be accredited and for the hospital to receive its accreditation, two nurses per machine are required” (National society representative)

Education landscape

Current education is not sufficient for any of the two professional groups. Both take considerable time to become autonomous when they start working, relying on the employer to finish their RT education. Because nurses and MITs have different educational background, their RT training needs are different. Furthermore, only a very limited number of MITs and nurses chose to work in RT.

“We [RT departments] have to do internal training to start with” (RT head of department)

“(...) for the nurses, it is not sufficient [education] because there is no specific mandatory training (...). For the technologists is different because they come with a training within their studies.

Table 1
Coding list.

Themes	Sub-themes
The role of Belgium Medical Imaging Technologist (MIT) and nurses in Radiotherapy	Same roles but different educational backgrounds
Barriers in education and professional development of nurses and MIT working in RT	Law Education landscape Economic context Social-cultural and/or Political context Lack of professional identity Education
Differences between French and Dutch-speaking part of the country	
Solutions	Modifications to the law and financial support Education requirement and collaborative projects Increase professional awareness Development of responsibilities and advanced roles
Future strategies	

So they have a better background in the technology and the imaging, but they are not nurses (...). So, we clearly have to define something better.” (**RT head of department**)

“(…) for Flanders, about 40 students [MIT] who get a degree every year (...) maybe five students a year for the Radiotherapy departments, it's very, very little.” (**School representative**)

Economic context

In the current context, there is no financial incentive encouraging MITs and nurses to follow a post-graduation in RT. In the absence of financial incentives and mandatory educational RT programmes, only a very limited number of RTTs are inclined to develop the knowledge and competencies.

“There is IFIC [Institute of Classification of Functions], which gives a scale of 14 to technologists and nurses, and even if they are specialised, they do not have a higher scale. So that doesn't motivate people to train” (**National society representative**)

“MITs and nurses depend on the nursing management in hospitals and it happens quite often that the nursing management is reluctant to pay for staff training. I think they do not have enough budget (...)” (**School representative**)

Another issue is the financial reimbursement system for education programs hindering an adapted educational offer that fits current educational need and the limited hospital financial budgets for MITs and nurses continuous professional development (CPD).

“When you organise 20 credit courses, you can ask for very little subsidy from the region, from the French community. We are entitled to 10,000 euros in subsidies in the first year, 5,000 in the second year and 3,000 in the third year and then nothing (...). So you need enough students in this kind of training to pay for it themselves (...), so this model doesn't work and, as a result, we are forced (...) to stay with a 60 credit model. Because when it's a 60 credit bachelor's degree, the French community provides funding of 5,500 euros per registered student.” (**School representative**)

Socio-cultural and/or political context

The country's political structure is fragmented into communities, regions, and federal entities. This is clearly a limiting factor towards rapid change and development; new regulations must follow a difficult path to get approved and implemented across the different regulatory regions. This is complexified by the existence of 3 national languages and different national societies, hindering a national harmonisation.

“We have a very complicated federal state with many, many, ministers (...) when you want a new regulation, you have such a difficult path to follow with so many different rules and paths (...)” (**RT head of department**)

“For the RTT, there is not a national society, that is separate Flanders and Wallonia, so there is two half weights.” (**School representative**)

Language is also a barrier to access foreign CPD modules which often occur in English. Additionally, there is a mindset difference

between younger graduates, often inclined to further their training, contrary to older colleagues.

“The other obstacle, unfortunately, is the language because in Radiotherapy, there is a lot of training when there are international training offers” (**National society representative**)

“There is also a cultural problem with nurses and MITs, young people, they want to train and continue to train throughout their lives. The people in place are more often reticent. “I know enough about this. (...) If they are not obliged to do so, they are not very motivated.” (**School representative**)

The aspiration of working in RT might also be motivated by the comfortable working hours and not a real wish to work in the field.

“(…) until recently, the most important motivation to work in Radiotherapy was the comfortable working hours that you didn't need to work on the weekend and at night (...)” (**RT head of department**)

Interviewees also identified several professional limiting factors such as the current underuse of MIT potential, nurses lobbying the access of RT to MITs, shortages of workforce, lack of professional visibility and the very few career opportunities that exists for RTTs working in RT.

“(…) when they [MITs] just start working in the field, often they are not evaluated on the things they are trained for. They are evaluated on the things that are historically grown into a department.” (**School representative**)

“I think that there are structural brakes partly linked to the professional syndicates on the nursing side, for example there is a syndicate which blocks quite strongly the recognition of technologists for Radiotherapy. (...)I also believe that there is a lack of knowledge on the part of the authorities of the Radiotherapy-specific work for technologists and nurses.” (**RT head of department**)

“(…) all over Belgium they have a shortage of qualified Radiotherapy staff and so when they have a team there, they can't even afford to release people to go and train because there is such a lack of staff.” (**School representative**)

Lack of professional identity

Some participants highlighted that professionals working in RT should be recognised as a separate professional identity, regardless of their previous background in nursing or MIT. This includes establishing professional title for these professionals and a clear definition of their roles and responsibilities. This lack of professional identity was also associated with a poorer perception of the profession. Together with the small number of professionals, this reduced the investment in their professional development. As such, the development of this professional group might have been masked by other professional groups.

“It's not yet part of the Belgian culture to say that we're going to give these people a name, a special name for people qualified as Radiotherapy nurses or Radiotherapy technologists.” (**School representative**)

“(…) the respect for nurses but also for technologists as lowered a lot (...) we have to work as professional identity and that's

really hard in Belgium because there is no clear professional identity” (**School representative**)

“(…) we are a very small group, very few physicians (…) compared to the number of physicians in Belgium (…), it’s not a high-level priority.” (**RT head of department**)

Differences between French and Dutch-speaking part of the country

Education

Five of the participants’ replies focused on the French part of the country. However, the majority (5 participants) agreed that there are no fundamental differences for both parts of the country regarding nurses and MITs education as they both are not fully competent when they start to work. However, two other participants (schools representatives) identified differences in the MITs education. The remaining participant was not aware of the situation in Dutch speaking part of the country.

Nevertheless, the Dutch-speaking part of the country offers more RT credits in the MIT’s bachelor’s degrees compared to the French-speaking part. Few postgraduate courses have been organized for nurses and MITs in both parts of the country. After September 2020, the Dutch part of the country started a postgraduate course with 20 RT credits, whereas the French part has developed a RT specific one-year module (two-year part-time) accessible to nurses and MITs.

“(…) I don’t see any difference [education]. I have the experience of both sides (…)” (**RT Head of department**)

“(…) I cannot answer precisely. I have the feeling that the culture of training there is more advanced, with more programs into schools and, with more involvement of the VVRO [Flemish national society] in the North part of the country.” (**RT Head of department**)

“For the nurses from the beginning, we had nothing. At the end of the 90s, the head nurse in Leuven started with a postgraduate program (…). That was a two years program. (…) Since September of last year, we have a new postgraduate program for the nurses over one year. So 20 ECTS which allows us to give education to the nurses” (**National society representative**)

“The Flemish TIMs (…) they have a lot of Radiotherapy and when they come out of the three-year bachelor’s degree in medical imaging, they can work in Radiotherapy straight away, they are well trained (…). We [French schools] put in 3 or 4 credits for Radiotherapy. They have 30 or 40 credits (…) so we said to ourselves, we’re going to put a little Radiotherapy in the curriculum, but we’ll leave a year of specialisation.” (**School representative**)

Solutions

Law modification and financial support

Participants unanimously agreed that the legislation must be reviewed. The solutions included MITs being legally recognised as professionals allowed to work in RT and to introduce mandatory RT training into the legislation.

“Yes, it will help to have updated legislation. (…) introduce the recognition of MITs into the teams of Radiotherapy. (…) get recognised radiation oncology title and the additional financial incentive (…) and also to set up accreditation program for

maintaining the accreditation, which is, like it was done with oncology recognition [nurse specialisation]” (**RT head of department**)

Financial recognition for these specialised professionals, financial support for schools, and other collaborative projects were also deemed essential.

“(…) we really need governmental support to pay for the schools because there is not good that Belgium and Romania are the only ones not having such a program” (**RT head of department**)

“(…) with a specialisation degree, they are stronger to go to IFIC and ask for a higher scale for people who are specialised (…). one of the solutions, it would be to create the RTT profession in Belgium” (**School representative**)

Education requirement and collaborative projects

Compulsory RT-specific education in Belgium was deemed essential. Some participants defended an obligatory intensive course (bachelor’s degree), ensuring the professionals are immediately ready to work.

“What I want is people who come out from the school and who are ready to work independently in a radiotherapy department, then 20ECTs is not enough. Of course, it’s 60 ECTS we need. So it’s all a definition of what we want.” (**RT head of department**)

Others argued that, in a transitional phase, a post graduate course could offer the basis, combined with compulsory CPD of a number of hours per year. The latter is a step-by-step strategy.

“CPD [.] is the key to success. I mean, our three years education [Dutch TIM course], they are not plug-and-play, they have a basic level of knowledge, but you have to learn a lot as well. (…) So CPD is very important” (**School representative**)

One participant recommended that nurses or MITs have an extra year in RT with a final exam before practising (similar to Denmark).

“(…) a system like in Denmark where you have, like a fourth-year where you have 12 weeks of theoretical lessons. (…) then you go in practical period of 34 weeks. At the end, you have a big exam and when you succeeded you can work in the field of Radiotherapy.” (**National society representative**)

Irrespective of the solution proposed by the participant, in all cases, an increase in amount of RT-specific education was considered essential to the participants.

Increase professional awareness

The adoption of professional awareness strategies is crucial for a respected professional identity. The fusion or creation of one single national society might also help enhance these professionals’ recognition.

“(…) one of the solutions, it would be to create the RTT profession in Belgium (…) and create a common National Society for the whole of Belgium so that it gains more power” (**School representative**)

“When you see any news coverage on TV about Radiotherapy or medical imaging, you see the physicists, you see the doctors, and you don’t see the technologists. (…) In the collective

unconscious of the population, this profession does not exist. When they go to the Radiotherapy machine, they think that it is a doctor who is going to set them up in a scanner.” (**School representative**)

Future strategies

Development of responsibilities and advanced roles

Master's degrees might be on the horizon in Belgium. This degree would prepare the professionals for the increased RTT responsibilities observed in RT departments. A master's degree also motivates people to develop a career in RT. However, undergraduate programme must be well established first; if the current educational situation does not change, the country might face serious problems and cancer patients' safety might be compromised.

“(…) a master degree yes, would be perfect (…) as the majority of people working in Belgium field aren't adequate at all. So I think we should start to get a basis well to get field changed and then a master would be nice” (**School representative**)

“(…) we are going to push more to lengthen the studies and go towards a master in medical imaging. We are moving towards this. We want to go towards a master's degree because the profession is becoming more and more complicated” (**School representative**)

“The fact of having expert or master titles is something that would allow someone who commits to this to say to themselves that I have a future in the profession (…)” (**School representative**)

“(…) if there is no formal training, it's always a risk to have some misunderstanding of the job by the persons who are in lack of training. Yes, so it's potentially an issue and a danger for the departments and for the safety of the patients.” (**RT head of department**)

Discussion

The barriers hindering education and professional development of Belgian nurses and MITs working in RT (here called RTTs) are related to the current legislation, educational landscape, economic, socio-cultural and political context, and a lack of professional identity. According to the participants, these barriers must be urgently tackled to improve the RTT profession in Belgium and provide patients with best care possible. Otherwise, the consequences might be an increased “shortage of qualified RT staff” and lack of training, which is “potentially an issue and a danger for the departments and for the safety of the patients”.

According to participants the most urgent barrier to be resolved is the legislation, more specifically by changing the law that defines the requirements for accreditation of RT departments. The lack of a uniform national regulation for RTTs' training leads to different education levels and graduates with different competencies (often at low levels), potentially leading to patient safety risks. A reform of the RTTs education can only happen after an adequate regulation of the professionals that can practice this profession. A new project of law to change the educational paradigm is under discussion. However, at the time of this study, the minimum compulsory education level was not yet defined.

The educational differences between nurses and MITs makes it difficult to develop a professional identity and increases the difficulty in finding a solution that meets the needs of RTT

professionals, patient safety and the demand for complex RT techniques in the different settings across the country.^{25,31}

Different mandatory educational models were suggested by the participants (RT-dedicated bachelor's or post-graduate RT course followed by mandatory CPD). They understand the importance of RT-dedicated training, but the urgent need for RTT personnel in Belgium requires shorter programmes.¹² Therefore, decisions regarding the ideal training of RTT professionals are complex. RT-dedicated bachelor's degrees can also be delivered in parallel with RT-dedicated post-graduate training (e.g. Italy) for nurses and MIT to ensure that enough RT-specialised professionals graduate every year.¹⁴ The regulation of the training requirements might be the key solution, ensuring that all graduates are competent to treat RT patients safely, irrespective of the education model.¹⁶

Given the complexity of modern RT, the International Atomic Energy Agency (IAEA)² states that recognition of the RTT profession and development of RT-dedicated education is paramount, agreeing with the participants. Moreover, the programmes should provide RTTs with the scientific theoretical foundation of the profession and enable them to synthesise, evaluate and apply their knowledge in a clinical setting. On graduation, the RTT should have reached the competencies to practice autonomously and effectively as a member of the RT team.^{2,31}

Due to increased professional demands, as mentioned by a school representative, the setup of a master's degree should be foreseen. RT is a medical speciality in constant development due to its strong link to technological innovations, offering a constant challenge and increased complexity.¹ Therefore, further education is vital to keep safe practice, good quality of care and untimely professional commitment and career progression.³² In France, a national study demonstrated that initial training is a foundation of knowledge that must be supported by additional and appropriate training within and outside the recruiting departments.³³ This same study³³ has contributed to the writing of a white book fundamental to allow professional guidance and funding actions.³⁴ The paper reflects all aspects of the RTT profession in RT.³⁴ An overview of the profession nowadays; what it will be tomorrow and, the opportunities to be seized in view of the technical and technological developments of RTT profession is explored.³⁴

An increase by 20%, from 35,000 to 42,000 annual RT treatment courses, is expected in Belgium by 2025.³⁵ The ESTRO-HERO survey has also put in evidence the type of the personnel delivering RT in Belgium, evaluated at 21 MITs vs 471 nurses in 2014.⁵ These figures need to be looked at keeping in mind that this high proportion of nurses have no mandatory RT education requirements even though some may have followed some post graduate courses or followed in-service training. On the other hand, MITs are only slowly seeping into the RT departments. Thereby, a strategy to efficiently educate more RTTs is of utmost importance.

Appropriate training creates autonomous RTTs with increased responsibilities and safer practice.¹ Given that RTTs are ultimately responsible for safe and accurate delivery of RT treatments, failing to provide them with appropriate training may result in non-optimal treatments with a potential impact on the safety and quality of treatment received.¹ Therefore, authorities and decision-makers have a moral and ethical obligation towards the population to provide those professionals with adequate education.

Our results highlighted the consequences of a lack of recognition, status, and career structure of the RTT profession on the capacity to recruit and retain staff, resulting in RTT staff shortages. At the time of the study, almost every single Belgian RT department is hiring RTTs.³⁶ This staff shortage might directly impact optimal treatment and care.² Additionally, the recognition of foreign degrees is long (e.g. professionals with a degree outside European Union) and difficult even for professionals with a more solid RT

educational background.³⁷ This represents an additional difficulty to ensure an adequate workforce, especially since Belgium is competing with other countries who often offer easier recognition, and more attractive salaries and careers for the RTTs.

Financial support is essential for schools to be able to provide an adequate RT-dedicated education. At the moment, it is more beneficial for the schools to have RT as a small component inside the MIT programme, than having a separate programme. Financial incentives are also necessary to retain the professionals and to motivate them to progress professionally, such as career progression based on advanced training or CPD funding.

Recommendations for practice and further studies

The regulation of RTTs as an independent profession with clear roles, responsibilities and educational needs is the main barrier to the development of the profession. As such, this should be one of the most urgent barriers to be addressed.

Education programmes must increase the amount of RT-specific training to ensure competency to work in RT at the end of their programme, instead of relying on unstandardised on-the-job training, which may create safety concerns.

Further research is recommended to identify the best educational model to tackle the training of current nurses and MITs practising RT; and to train the future professionals. The possibility of different models running in parallel should not be discarded.

The authors recommend a creation of a task force group to conduce and evaluate the current and future needs of the Belgian RTT workforce. The writing of a white paper is of utmost importance to allow professional guidance and funding actions.

Study limitations

The study's main limitation was the small sample of interviewees: two French MIT schools were not interviewed, narrowing the perceptions of the MITs education in the country, possibly introducing selection bias. However, the national societies in both parts of the country were interviewed, reducing the impact of this bias. There is also a risk of recall bias since the data collected is based on the interviewees past experience that may not be applicable for certain aspects of current practice.

A potential limitation is although MIT educators were interviewed, the MITs were not.

The first two authors are RTTs working in Belgium and they are not independent from this study initiative. Therefore, this might have influenced interviewee's answers or the analysis; as such, this could be a possible study limitation.

Conclusion

Our results highlight the need for fast actions in the education and professional development of Belgian RTTs, given their critical role in treating RT patients.

The identified barriers in education and professional development are related to current legislation; the educational, economic, social-cultural and political context; and a lack of professional identity amongst RTTs. Except for the educational background (MITs and nurses have different RT training needs), the stakeholders did not identify other fundamental differences between nurses and MIT for both parts of the country.

One of the main issues is the lack of national regulation of the requirements for the training and recognition of RTTs. This must be addressed with a clear definition of the learning outcomes to be achieved in terms of knowledge, skills and competencies,

ensuring that all graduates are competent to treat RT patients safely. The proposed education models include RT-dedicated bachelor's degrees, mandatory RT-specific post-graduate, CPD, or Master's degrees. However, additional research is necessary to identify which of these models would better suit the needs of the RTT workforce.

Finally financial support as suggested by school representatives is essential, for schools to provide an adequate education level, but also to retain the professionals and to motivate them to progress professionally.

Conflict of interest statement

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.radi.2022.04.006>.

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