

Educational Booklet for Patients and Health Care Professionals in the Field With Focus on Ensuring the Completeness of Radiation Therapy Treatment



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ABSTRACT

Keywords:
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The present work presented an educational booklet aimed at oncology radiation therapy health professionals focused on treatment completion. The booklet was made in Portuguese and English using the Adobe Illustrator software and are available for free in our own website made on the free platform 123site. The methodology for the booklet was made by literature review and by the experience of 5 professionals. The booklet was submitted to an evaluation at four universities in São Paulo, through a questionnaire applied to students and professors. The results shown that 27.06% confirmed that the booklet have a light visual reading and, in parallel, 80.00% considered the booklet as very informative. 100% judged the booklet is important for professionals working in radiation therapy. Professionals believe they have a responsibility to educate patients (67.06%) and also think they should provide emotional support (76.47%). 98.82% thought that booklets can help the patient complete the treatment. The results obtained were positive in relation to the booklet in their visual part, but even better in the results regarding the content. The material is available at <https://61a704c4a40aa.site123.me/>.

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Introduction

A resource for the socialization of scientifically created knowledge in the field of health, health education (HE) is described as a body of knowledge and activities geared toward the prevention of disease and the promotion of good health. It is mediated by multidisciplinary teams with the goal of enhancing procedures that degrade a community's and its residents' quality of life. HE aids in

promoting positive attitudes and behaviors (Grippio & Fracoli, 2008).

Educational materials are produced in hospitals to educate patients and professionals. They help with maximizing care quality giving extra confidence to professionals and in helping patients ease their fears. Printed educational materials have been utilized to encourage professionals to aid in patients' self-care while also enhancing patients' knowledge, contentment, and adherence to therapy. The educational materials have the ability to improve professionals' education and ultimately the quality of care (Oliveira et al., 2014).

Most materials developed are rarely evaluated. Demir et al. (Demir et al., 2008) reviewed 59 items of written patient education literature. Twenty-five of these were booklets, 16 were A4-sized pages of plain paper, and 16 were brochures. Low marks were

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given for the educational materials' suitability in terms of content, illustrations, indexing, visuals, and contrast in writing style; excellent marks were given in terms of instruction level, learning, motivation, and cultural suitability.

Oliveira et al. (Oliveira et al., 2014) described the validation process of an educational booklet for healthy eating in pregnancy using local and regional food. The methodology involved the construction of the educational booklet, validation of the educational material by peers and pregnant women. The validation process was conducted by 22 physicians and nurses and 20 pregnant women. Five items were considered relevant by the colleagues and the overall evaluation by pregnant women was positive.

One of the fields with the most hectic routines is the radiation therapy department. External beam radiation therapy (EBRT) is characterized by having the X-ray radiation being produced by a machine placed outside the body. The radiation dose is carefully delivered through several sequential days (up to 40) in order to kill cancer. The process must not be interrupted because it will result in tumor cells repopulation having the possibility of hampering the treatment outcome (Abdel-Wahab et al., 2017; World Health Organization, 2018).

There are many reasons why patients abandoned EBRT treatment. Among those are pain from side effects, transport difficulties, disbelief that the treatment will work, mental stress, body fatigue, among others (Sibeoni et al., 2018). Treatment interruption is extremely dangerous to the patient which can land himself in a worse situation. Barton et al. reported the effects of treatment time and treatment interruption on a laryngeal tumor after radical radiation therapy, demonstrating that there was accelerated cancerous cell repopulation due to interruption intervals in treatment days (Barton et al., 1992).

Healthcare professionals have an important role in ensuring treatment completeness. Patients do not always have extensive knowledge about their disease since the amount of information they receive in a short period of time can become confusing and inefficient. Knowing how to deliver information is extremely important in this area. A patient who has the support of the medical team when answering questions, educating, and providing support is more likely to complete the treatment (Sibeoni et al., 2018). According to Koelling et al. (Koelling et al., 2005), a total of 1 hour of teaching patients through educators may be enough to achieve better clinical outcomes about self-care and their overall health.

Training the professionals to aid patients with the goal of treatment completeness is imperative and is achieved through a multidisciplinary trained team (Mazzuca, 1982). Concepts discussing radiobiology and the best way to deliver information and emotional care can have a great impact on the patient treatment adherence.

We developed a professional booklet compiling important topics for EBRT treatment completeness. All materials are available for download in a free website. The booklet was then assessed by nurses, radiation technologist seniors and their professors. The results were evaluated by statistical analysis.

Materials and methods

Creation of the Booklet

The theoretical development of the professionals' booklet was carried out with the survey of topics of interest anchored in scientific articles, materials found in books, and the professional experience of specialists in the oncological radiation therapy sector. The search was carried out on article search sites such as PubMed, Embase, and Science direct, as well as on more comprehensive sites

such as Google Scholar. The specialists consulted have the following experience (Table 1).

All those involved read the selected material and together, in meetings that took place monthly during the period from 06/2021 to 02/2022, choose the topics that would be addressed.

The booklet was prepared with illustrations with light, instructive reading that provided basic information about radiation therapy and the importance of patients strictly following their treatment. It also included concepts of radiobiology and how the professional should behave to guide the patient, always focusing on the integrality of the treatment.

The graphic design of the booklet was carried out by Adobe InDesign and Adobe Illus-trator software. All illustrative images in the booklets were originally created and developed solely and exclusively for this work. Brochures can also be found in the support information section.

The methodology was inspired by the previous works published by: Oliveira (Oliveira de Almeida Marques da Cruz et al., 2016) that created educational manual for patients with head and neck cancer undergoing radiation therapy, using the theory of psychometry through a theoretical, experimental, and analytical basis; Daruich de Souza et al. that used experts experience to evaluate and create a protocol for pediatric chest radiography (Daruich de Souza et al., 2022); Vogel et al. that surveyed 135 breast cancer patients and emphasized the importance of baseline depression for later adjustment and revealed the value of doctor–patient contact (Vogel et al., 2009); and Barton et al. (Barton et al., 1992) that did a retrospective analysis of 1012 laryngeal squamous cell carcinomas that had undergone radical radiation therapy revealed a strong relationship between overall treatment time and local control with 59% relapsing in 5 years.

Instructional booklets or booklets are simple and easily accessible instruments, and can be used as a means of facilitating conversations and distributing information about cancer. The focus, in addition to providing support, is on the completion of the treatment, essential for the success of radiation therapy, and on highlighting to the professional their impact in the fight against cancer (Schleimer et al., 2020).

Topics Selected

Figure 1 summarizes the topics presented in the booklet.

When elaborating the topics, the promotion of knowledge, decision-making, and understanding the science involved were the focus. The selected topics help, for example, radiation biology, how to manage work stress, how to provide emotional support, among other important points.

The Website

The booklet is available for free download at <https://61a704c4a40aa.site123.me/> containing information along with all the bibliographic sources used for their preparation. The website, created in the free platform 123site, aims to make instructive

Table 1
Specialists' experience

Profession	Years of experience	Function
Radiation Technologist	10	Radiation therapy dosimetrist
Radiation Technologist	15	Radiation Oncology, Professor
Radiation Technologist	30	Tenured Professor, Radiation Oncology
Medical Physicist	15	Researcher, Tenured Professor
Nurse	10	Radiation Oncology

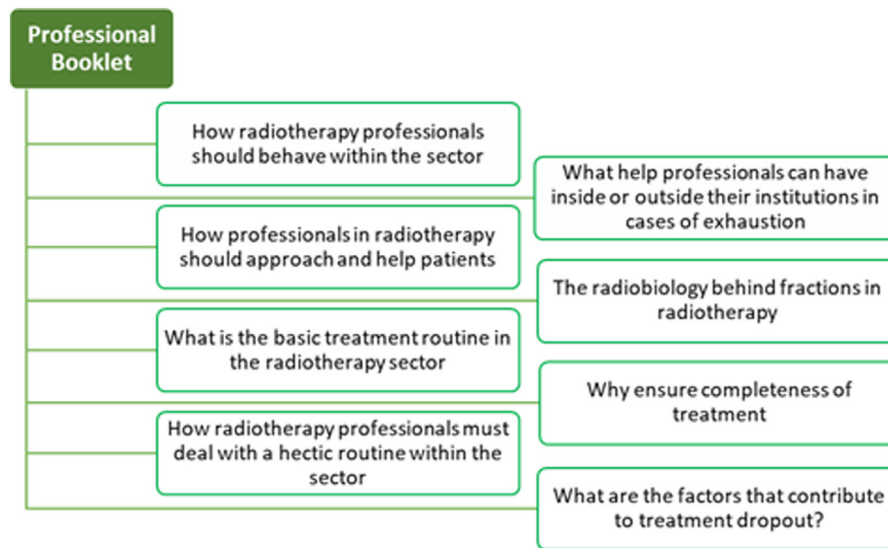


Figure 1. Booklet topics.

content available to all those interested. Both Portuguese and English versions are available in the same webpage.

The Evaluation

The website <https://626609ec9820c.site123.me/> was created for the evaluation of the professional's booklet. The website contains the booklet for download and the link to a Google Forms containing the following questions. The questionnaire was built based the experts experience and on other relevant scientific works to the topic, such as:

- Eardley (Eardley, 1988) work that created and evaluated a booklet for patients and their worries during radiation therapy. It was discovered that patients' thirst for knowledge stemmed from the fact that they rather approached a variety of staff members, including technologists, social workers, clerks, cleaners, and porters, rather than inquiring to the most "expert" sources of information, such as doctors, and nurses.
- Jefford et al. (Jefford et al., 2005) convened a focus group, after which a draft booklet was created and looked over by patients and experts. For evaluation, 24 patients and 32 professionals received a redesigned booklet and a questionnaire by mail. The final decision-making guide, a 100-page document, underwent additional revisions. The questionnaire was completed by 22 professionals (69%) and 17 patients (71%). It was rated "informative" by professionals (95%), "written in a pleasing style" (95%), and "easy to understand" by professionals (91%).

Next, the questionnaire is presented.

The results from the form were imputed in MS Excel for statistical analysis.

Results and discussion

Booklet Topics

There are a number of effects that occur when radiation reaches the human body and these are related to the intensity, energy and matter penetration capacity, and the ionization potential of atoms.

As for cancer radiobiology, the last decades of research focused on discovering and exploring personalized tumor characteristics

with a focus on increasing the applicability and benefits generating less toxicity in normal tissue (Fukunaga et al., 2021). Over the years, radiation therapy continues to evolve and generate new innovative strategies, ranging from studies that investigate the mechanisms of tumor biology (Gonzalez Castro et al., 2021), dose reduction to healthy tissue (Armstrong et al., 2021), to the promotion of new guidelines related to the therapeutic decision (Ziu et al., 2021; Robin et al., 2021), personalized therapies (Aristei et al., 2021) and support to the patient and team (Kelly et al., 2022). These "human" innovations can be considered unconventional, but they contribute a lot to make health services work more efficiently, adapting

Evaluation of the Radiation Therapy Booklet Form

Introductory text: Thank you very much for participating in this evaluation. This questionnaire was developed for a survey carried out within the Professional Master's Degree in Radiation Technology in Health Sciences of the Nuclear and Energy Research Institute –IPEN-CNEN/SP and is optional. The results obtained will be used for academic purposes only, and will be kept anonymous. Please do not search the internet for answers to questions, as the purpose of the questions is to assess your opinion. This survey will take 5 minutes of your attention. Thank you for participating! Contact e-mail: avaliacaocancer@gmail.com.

Question 1: Are you a professor or student?

Response: 1-Professor 2-Student.

Question 2: What did you think of the booklet regarding the visual part?

Response: 1-5 grading, 1 being light reading and 2 being heavy reading.

Question 3: What did you think of the booklet in terms of content?

Response: 1-5 grading, 1 being little informative and 2 being very informative.

Question 4: Do you think the content shown is important for professionals working in radiation therapy?

Response: Yes, or No.

Question 5: Do you think it's your responsibility to educate patients?

Response: Yes, No, or No, but we end up doing it anyway.

Question 6: Do you think it's your responsibility to give emotional support to patients?

Response: Yes, No, or No, but we end up doing it anyway.

Question 7: Do you think booklets can help patients complete their radiation therapy treatment?

Response: Yes, or No.

If you want, leave a comment and/or suggestion.

How the radiotherapy professional should behave within the sector^(1,2,3)

The role of the technician/technologist is fundamental during the different stages of treatment, which aims at centered and humanized care with a focus on patients. The technician/technologist actively participates in several stages throughout the patient treatment process, from the simulation performed in the computed tomography equipment, through the manufacture of accessories (for example molding of masks) for guaranteeing reproducibility, quality and patient comfort, to the analysis and verification of data, and the Linear Accelerator daily dose delivery performance.

REMINDER: Training and qualification as a professional are essential for such an important service that demands diverse responsibilities and broad functionality within the sector. Make sure you always keep studying. Follow updates from class entities and new treatment protocols.



will be a direct impact on the quality of care provided to patients.

WARNING: If you believe that you fit into this type of situation, seek information at your institution about interventions or other possibilities that exist within occupational medicine and you will be guided on what to do and who to turn to for professional follow-up.

To relieve exhaustion, the recommendation to practice physical activities, or hobbies to be carried out outside work, aimed at the body or mind, helps to combat stress relief.

ALTERNATIVE ACTIVITY TIP: The practice of yoga or guided meditation has shown great results in the effectiveness of reducing stress and increasing compassion and satisfaction. It also helps to combat cases of Burnout Syndrome, decreasing self-demand, increasing resilience, and contributing to emotional stability.

The Radiobiology behind fractions in radiotherapy^(15,16)

Several types of radiation are used in the treatment of cancer. The most prevalent are electrons, X-rays, and gamma rays.

There are a number of effects that occur when radiation hits the human body. They are related to the intensity, energy, penetration capacity, and the ionization potential of atoms. Basically, radiation interacts with target atoms in two ways. They are:

Direct effect: when radiation directly interacts with important molecules such as DNA, which can cause genetic mutation or even cell death.

What is the basic treatment routine in theradiotherapy sector^(5, 6, 7, 8)

1. Instruct the patient to arrive on time for all treatment sessions and to be alert when his number or name is being called.
2. Inform them that the environment is safe and that they can ask questions and clear up their doubts whenever they feel the need. If you don't know an answer, don't be ashamed! Say you will study and learn it for the next session.
3. Show the facilities to the patient, so he can be familiarized with it.
4. Make it clear that the staff of technicians/technologists, physicists, and physicians will accompany the first day of treatment to make the necessary adjustments before starting the first session.
5. Inform to the patient the importance feeling as relaxed as possible when entering the room and, especially, during the positioning process. He must feel comfortable so everything goes well and don't take so long, so that he also doesn't feel tired.
6. Make it clear that when the patient is positioned at the treatment bed, he will not be able to move anymore, otherwise the process will have to be started again.
7. Tell them not to be scared by the size of the machine and that



and directly linked to the success of the treatment.

Example of how active species are formed by excitation and ionization processes and their time scale.

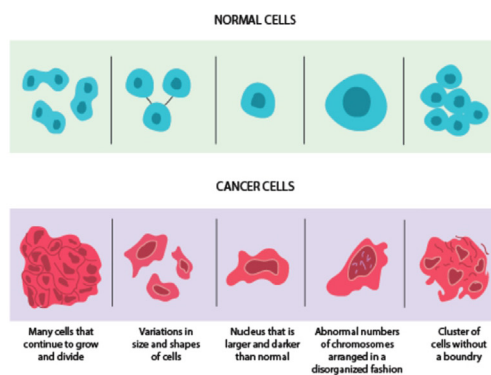


Figure 2. Examples from the professionals' booklet. *Reproduced with permission from IPEN Terezine Arantes Ferraz Library .

radiation therapy services to the specific situations that are characteristic of the hospital and the region (Shahrabi Farahani et al., 2021).

The most common types of radiation used in the treatment to combat cancer are electrons, x-rays, and gamma rays. When radiation interacts with target atoms, it occurs in 2 ways:

- Direct effect: when radiation directly interacts with important molecules such as DNA, which can cause genetic mutation or even cell death (Burns & Sims, 1981).

- Indirect effect: when radiation interacts with water molecules causing radiolysis (through changes occurring in water by the absorption of high energy radiation). This causes the water molecule to break, generating highly reactive species inside the cells, forming compounds that will attack the cell's DNA and/or cause cell death (Catchside, 1948; Grosch, 1965).

Studying these processes can lead to an improvement in the effectiveness of the treatment, and in radiation therapy, a balance is sought between harming abnormal cells and avoiding side effects.

The cellular response to the damage produced by radiation depends on different factors that include the type of cell, type of damage, phase of the cell cycle, among others (Hong et al., 2005).

For this reason, radiation therapy uses dose fractionation protocols, through daily fractions, since tumor cells are created from a carcinogenic process with the accumulation of mutations with impaired antitumor gene activation. These cells have a rapid capacity for cell division, forming a tumor mass that impairs the functioning of the organ in which it is found. This mass activates a process called angiogenesis causing blood vessels to branch to feed the tumor. These nutrients diffuse to the center of the mass, causing the outer parts to have more water and oxygen than the inner parts. Thus, the more water the tissue has, the more radiolysis occurs, more damage radiation causes (Fowler, 2001).

Thus, for the patient just starting radiation therapy treatment it first aims to deliver radiation to reach and eliminate the most oxygenated and hydrated cells of the tumor located superficially. The less oxygenated cells undergo a natural process of reoxygenation and tumor rehydration, becoming more sensitive and facilitating their elimination during the delivery of the next fraction. This process is then repeated day after day through dose fractionation allowing the elimination of the tumor. At the same time, this fractionation modality also allows normal, healthy tissue that has received some percentage of radiation dose to also recover. Fractionation and its correct compliance are very important factors and are directly linked to the success of the treatment (Fowler, 2001).

Next a few sample pages of the booklet are shown (Figure 2). Due to space issues, the entire document can be found in supporting information or for download in the website.

How the Education of Professionals Generates Results

Health professionals need to maintain good communication with patients, which is essential to ensure quality treatment and care. It is necessary that these professionals seek empathy and improve their communication skills, since effective communication can generate well-being, thus directly reflecting on the completeness and success of the treatment (Bridge & Carmichael, 2014).

A professional is not always fully prepared for this type of communication with the patient. In addition to not having been trained to support emotional and educational issues, health professionals often do not have time to deal individually with each patient. The workload can often be very fair and can lead to ineffective and insubstantial communication (Schmale et al., 1983).

Radiation therapy is recognized as an essential component in the oncology care line, but there is still a lack directly related to human resources focused on the health area (Schmale et al., 1983).

Most institutional organizations are bureaucratic and do not always prepare their professionals for continuing education training through assistance focused on humanization and care centered on the radiation therapy sector. Health professionals often assume the role of educator, teaching their patients so that they know the purpose of the treatment, its benefits, how to deal with the disease and rely on a support network willing to listen to them through care and attention (Frick et al., 2007).

Statistical Analysis

After the Google Form was made available, students from the Radiation Technology and Nursing courses at Santa Casa de Misericórdia, Universidade Nove de Julho, Universidade São Camilo, and Faculdade Inaci, all located in São Paulo, Brazil, evaluated the work. A total of 100 students and 20 professors responded the questionnaire. The results can be found in Table 2.

Table 2
Results of questionnaire

Number of responses	
Student	100
Professor	20
Results	
What did you think of the booklet regarding the visual part?	
1—light read	27.06
2	21.18
3	21.18
4	11.76
5—heavy read	18.82
What did you think of the booklet in terms of content?	
1—little informative	1.18
2	0.00
3	2.35
4	16.47
5—very informative	80.00
Do you think the content shown is important for professionals working in radiation therapy?	
Yes	100.00
No	0.00
Do you think it's your responsibility to educate patients?	
Yes	67.06
No	4.71
No but	28.24
Do you think it's your responsibility to give emotional support to patients?	
Yes	76.47
No	0.00
No but	22.35
Do you think booklets can help patients complete their radiation therapy treatment?	
Yes	98.82
No	1.18

The professional' booklet sought to present the themes in a light way, focusing on topics that facilitate the professional' role on supporting the patient with a focus on ensuring the completeness of the treatment. The central objective of the booklet, in addition to mainly providing complementary education, was to present the topics in the most objective way possible, considering the professionals' daily routine. The booklet also shows the public the high degree of excellence and responsibility that these professionals need to have. Above all, humanized treatment, teamwork, and a multidisciplinary vision are essential for the patient to feel supported. Part of this professionalism includes guiding and clearing doubts that public and family members might have.

The visual part of the booklet was evaluated from intensity ratings. Of the total professionals, 27.06% considered a light reading (intensity 1) and 18.82% evaluated as a heavy visual reading (intensity 5). As for the terms of content, 80% rated it as intensity category 5 (very informative) and 16.47% as intensity category 4. This was very positive feedback and a confirmation that the material would be useful for professionals. Although the topic is technical and sometimes tiring, most professionals recognized that the content presented in the booklet is of great value. All respondents consider the topic to be important.

Most respondents (67.06%) consider that patient education is part of their responsibility. Twenty-eight point two four percent believe that it is not their obligation to educate patients, but that is what ends up happening. The research carried out during the preparation and development of the booklet addresses precisely the fact that all health professionals involving medical staff, nurses, among others, think that they have no obligation to bring information, guidance, or basic education to patients. The professionals' booklet also serves aid in humanization practices, since a well-educated patient tends to contribute more and, more importantly,

complete the treatment diligently. Therefore, answering patient's questions contribute to a better-quality service.

The booklet focuses on gathering information, giving tips on how to approach the topic with patients, how to use hospital and external resources. 76.47% also think that it is the role of professionals is to give emotional support to patients. Delivering emotional support to patients is an important part of integrated humanization. Many times, they receive no training or have a structure company policy. The burden should not rest in one or two professionals but it should be provided by a multidisciplinary team, with protocols and training. For example, if a professional notice that a patient is depressed, they should provide the direct contact of treatment resources, with phone numbers and websites. Just telling the patient to seek help may not be enough. Knowing how to show the importance of treatment and explaining how important it is to perfectly followed the prescription, can increase the chances of success. Professional cordiality through education and humanization are part of the emotional support that helps patients (Frick et al., 2007; Hubert et al., 1997).

Ninety-eight point eight two percent of the votes consider that booklets can help patients to complete the treatment, showing that professionals recognize that the delivery of information, guidance, and basic education are fundamental in the fight against cancer. Once doubts about cancer and its treatments are clarified and resolved, the patient will become more oriented on the subject and have more confidence the treatment (Frick et al., 2007; Hubert et al., 1997; Gillan et al., 2014).

Although not the topic for the statistical evaluation, 30% of respondents wrote in the comments tab that they were also interested in help to develop a patient booklet, and praised the topics and layout.

Conclusion

This work developed an educational booklet on radiation therapy for professionals, addressing topics and concepts that contribute to treatment completeness. The adaptation of these booklets was thought and developed through the study of theory and approached lightly in both words and images with the purpose of educating with simplicity and quality about central issues on the fight against cancer. The material has the goal to support, gather information, and giving tips on how to approach the topic with patients. It is free and available for download.

This work contributes with the cancer patient' humanization. It also provides tolls for professionals to provide this type of differentiated care, through care, dedication, and passion.

The data obtained through the questionnaire showed that 80% of professionals considered that the information in the booklet is very informative. All respondents considered that the topics covered in the booklet are important, showing the importance of the information covered.

Every professional must know their role to understand that they are responsible for parts of patient education and information exchange, which should not be omitted when questioned. 67.06% of the votes believe it is their responsibility as a professional to guide the patient. When the subject is emotional aid, 76.47% of the votes agree is their duty, making it clear that professionals recognize that they must give emotional support to patients. 98.82% also stated is their role to help patients to complete the treatment.

This work aimed at professional education through instructive and constructive means, emphasizing the importance of recognizing the great value and impact they have on patients' lives. Education and emotional support are a fundamental part of a solid clinical body, which can be integral parts in providing a high-quality

service. All this contributes immensely to the completeness of the treatment in the fight against cancer.

In the future, we plan to write and evaluate a patients' booklet on the topic.

CRediT authorship contribution statement

Juliana de Macedo Tricarico: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Software, Validation, Visualization, Writing – original draft. **Gustavo Rico Freitas:** Data curation, Investigation, Validation. **Bergman Nelson Sanchez Munoz:** Data curation, Investigation, Validation. **Guilherme Oberto Rodrigues:** Data curation, Investigation, Validation. **Jade Simões Dos Santos:** Conceptualization, Software. **Carla Daruich de Souza:** Conceptualization, Methodology, Supervision, Validation, Visualization, Writing – original draft.

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