

Built on three pillars—descriptive analysis on the implementation of a Sarcoma Multidisciplinary Tumour Board at the National Cancer Institute of Paraguay

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Abstract

Background: Tumour boards are multidisciplinary meetings designed to improve therapeutic decision-making in oncology. Their relevance is particularly evident in rare and complex diseases such as sarcomas, where diagnostic heterogeneity and limited expertise pose significant challenges. This study aimed to describe the characteristics of cases discussed at the Sarcoma Tumour Board (STB) of the National Cancer Institute of Paraguay (INCAN) and to explore its perceived clinical and educational impact.

Methods: A descriptive observational study with two sequential components was conducted. First, a retrospective review of all consecutive sarcoma cases discussed at the STB between March and December 2025 was performed. Second, cross-sectional surveys were administered to specialist physicians and residents participating in the STB. Descriptive and inferential statistics were performed. Descriptive statistics were performed.

Results: Eighty-five patients were included (median age: 44.1 years and IQR: 31.8–58.3). Extremities were the most frequent tumour location (28.2%), and liposarcoma was the most common histologic subtype (14.1%). The STB modified the initial therapeutic plan in 65.4% of cases. Among 54 eligible specialists, 29 responded (53.7%). Most rated the STB as highly valuable for clinical practice (79.3% strongly agreed) and reported frequent modification of initial management (58.6%). However, logistical difficulties (86.2%) and insufficient institutional time allocation (75.9%) were commonly identified. Twenty-three residents responded; 65.2% strongly agreed that the STB contributed to their clinical training, and 56.5% reported a very high contribution to diagnostic and therapeutic reasoning.

Conclusion: The STB at INCAN was associated with a high frequency of therapeutic modifications and was perceived as clinically valuable. Despite operational constraints, it

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also demonstrated substantial educational potential. These findings provide regional evidence supporting the organisational strengthening of multidisciplinary sarcoma boards as both clinical and formative tools.

Keywords: *sarcoma, multidisciplinary team care, clinical decision-making, medical education, surveys and questionnaires, multidisciplinary tumour board meeting*

Introduction

Treatment of oncologic patients is an ever-growing task due to rapid evolution of scientific evidence and the continuous incorporation of new health technologies, all of which make therapeutic decision-making increasingly complex [1, 2].

In response, tumour boards (TBs), also known as multidisciplinary teams, were created to allow formal, interdisciplinary collaboration between different specialists, with the objective of reaching a consensus on the clinical management of oncologic patients [3].

In general terms, a TB is structured as a periodic meeting between specialists such as clinical oncologists, surgeons, pathologists, radiologists and other disciplines. They usually include a systematic report of clinical cases, a review of diagnostic studies, a discussion on therapeutic management and a documentation of the decision reached [4].

TBs became particularly relevant in the management of rare diseases, such as sarcomas. Sarcomas consist of a heterogeneous group of malignant neoplasms that originate from connective tissues, such as muscle, adipose tissue, nerves, blood vessels and bones. The incidence is approximately six cases per 100,000 inhabitants per year; this makes soft tissue sarcomas a challenge due to their low prevalence, complex diagnosis and the need for highly specialised care. These characteristics hinder not only timely diagnosis but also the development and implementation of adequate treatment as well, particularly in regions with structural limitations [5–7].

As a part of the field of implementation science, it has been proposed to distinguish different types of results, including those linked to acceptability, adoption, appropriateness, feasibility and sustainability of interventions, differentiating them from clinical outcomes and service outcomes. In this context, exploring professionals' perceptions could provide relevant information about the function and implementation of complex organisational strategies, such as sarcoma tumour boards (STBs) [8].

Various studies have demonstrated that the implementation of TBs is associated with greater adherence to evidence-based guidelines, improvements in the quality of therapeutic decisions and improved clinical outcomes [9]. Likewise, other studies have described the educational benefits, especially for resident physicians, who perceive these meetings as interdisciplinary learning opportunities and academic challenges [10].

However, the educational potential of TBs does not necessarily equate to a structured educational strategy. TBs were not created with the goal of being teaching opportunities, but evidence suggests that they could become a relevant learning opportunity if the experience is intentionally designed as such and without losing its primary purpose. Recent studies have proven that, despite residents perceiving these meetings as useful for the development of clinical abilities (such as case presentations, oral communication, diagnostic image interpretation and interdisciplinary reasoning), their participation tends to be occasional, which highlights a gap between perceived value and the effective integration into daily practice. Hence, practical strategies have been proposed, such as brief feedback, increasing the residents' active participation and brief teaching interventions by specialists based on real cases discussed in the meeting, which could enhance the learning potential without transforming the TB into a formal class nor increasing specialists' workload [11, 12].

The objective of this study is to describe the characteristics of the patients presented in the STB organised by the National Cancer Institute of Paraguay (INCAN) between March and December 2025 and to explore the impact of these meetings in two complementary dimensions; its contribution to clinical decision-making from the perspective of the specialists who participate and its value as a learning opportunity for medical residents, specifically in the application of theoretical knowledge into real clinical cases.

Materials and methods

Study design

A descriptive observational study with two sequential components was conducted. The first component was a retrospective review of cases presented to the STB of the INCAN. The second component was a cross-sectional study based on surveys administered to specialist physicians and resident physicians participating in the INCAN TBs.

These components were designed to address complementary objectives: the registry analysis to describe clinical and process-related characteristics and the survey to explore participants' perceptions. Although both components were interpreted jointly at the discussion stage, they were analysed independently and were not formally integrated within a predefined mixed-methods analytical framework.

Clinical cases included

For the analysis, all consecutive cases presented to the STB of the INCAN between March and December 2025 were considered. The unit of analysis was the presentation to the STB. Only cases diagnosed with sarcoma and discussed once during the study period were included, and those corresponding to diagnoses not compatible with sarcoma were excluded.

The information analysed came from the official STB registry and was limited to the data available at the time of the case discussion, without incorporating subsequent clinical or follow-up information. Sociodemographic, clinical and tumour variables were collected, as well as dimensions related to the care process, the functioning of the STB and the timing of care.

Surveys of specialists and residents

The second component of the study consisted of administering structured surveys to specialist physicians and resident physicians who participated in the STB at the INCAN. Questionnaires were distributed to all professionals and residents who participated in at least one STB meeting during 2025. Participation was voluntary and anonymous.

The questionnaires were developed ad hoc by the research team and were not formally validated. However, items were created taking into account concepts derived from Implementation Science, particularly domains such as acceptability, feasibility and perceived utility, as described by Proctor *et al* [8].

Questions were structured as five-point Likert scales of agreement and frequency, as well as multiple-choice questions, some allowing single selections and others allowing multiple selections. The items of the questionnaire focused on the following domains: clinical decision-making, functioning of STB, interdisciplinary participation, implementation barriers and educational value. The full survey instruments are available as supplementary material (Tables S1 and S2).

An informal pilot test was conducted with STB members prior to implementation to assess clarity and relevance. The surveys were self-administered via an online platform (Google Docs; Google Inc., Mountain View, CA, USA), with a single submission during January and February 2026. Separate questionnaires were used for specialists and residents, and their responses were considered independently.

Data analysis

The analysis was performed using descriptive statistics. Categorical variables were summarised as absolute frequencies and percentages, and continuous variables as medians and interquartile ranges. In the case of the surveys, Likert-type items were analysed as ordinal variables and reported as frequencies per category, while multiple-choice questions were summarised using rankings based on the frequency of selection for each option. No statistical comparisons were made between specialists and residents. Data processing and analysis were carried out using RStudio 4.5.2 software.

Ethical considerations

The study was conducted using anonymised secondary data from the official STB registry and anonymous, voluntary surveys administered to healthcare professionals. No personally identifiable information was collected from patients or respondents.

Results

Cases discussed in the STB meetings

Eighty-five patients were discussed in the STB and were included. The median age was 44.1 (IQR: 31.8–58.3). The average patients presented per month were five, the maximum being in April with 13 cases and the minimum in December with two cases presented. Eighteen patients (21.2%) were presented to the STB after their first consultation to decide the initial treatment plan.

Regarding the anatomical location of the primary tumour, the most frequent presentation was extremities with 28.2% ($n = 24$), trunk with 21.2% ($n = 18$), retroperitoneum with 16.5% ($n = 14$) and abdomen with 15.3% ($n = 13$); the remaining locations registered included head and neck, pelvis and viscera, and were grouped as “other sites” 18.8% ($n = 16$). Regarding the histologic subtypes, the most frequent were liposarcomas 14.1% ($n = 12$), chondrosarcoma 10.6% ($n = 9$) and synovial sarcoma 10.6% ($n = 9$). The full classification can be observed in [Table 1](#).

Regarding the final recommendation of the STB, the treatment plan suggested was systemic treatment 57.6% ($n = 49$), radiotherapy 21.2% ($n = 18$), surgery 16.5% ($n = 14$), diagnostic revision 15.3% ($n = 13$), close follow-up 9.4% ($n = 8$) and palliative care 2.4% ($n = 2$).

Table 1. Clinical characteristics of the STB cases.

Histological subtype	%	<i>n</i>
Liposarcoma	14.1%	12
Chondrosarcoma	10.6%	9
Synovial sarcoma	10.6%	9
Myxofibrosarcoma	8.2%	7
Undifferentiated sarcoma	7.1%	6
Desmoid tumour	7.1%	6
Undefined at time of presentation	7.1%	6
Rhabdomyosarcoma	5.9%	5
Leiomyosarcoma	5.9%	5
Pleomorphic sarcoma	4.7%	4
TMVNP	4.7%	4
GIST	3.5%	3
Epithelioid sarcoma	3.5%	3
Solitary fibrous tumour	1.2%	1
Osteosarcoma	1.2%	1
Kaposi sarcoma	1.2%	1
Ewing sarcoma	1.2%	1
Giant cell tumour	1.2%	1
Chordoma	1.2%	1

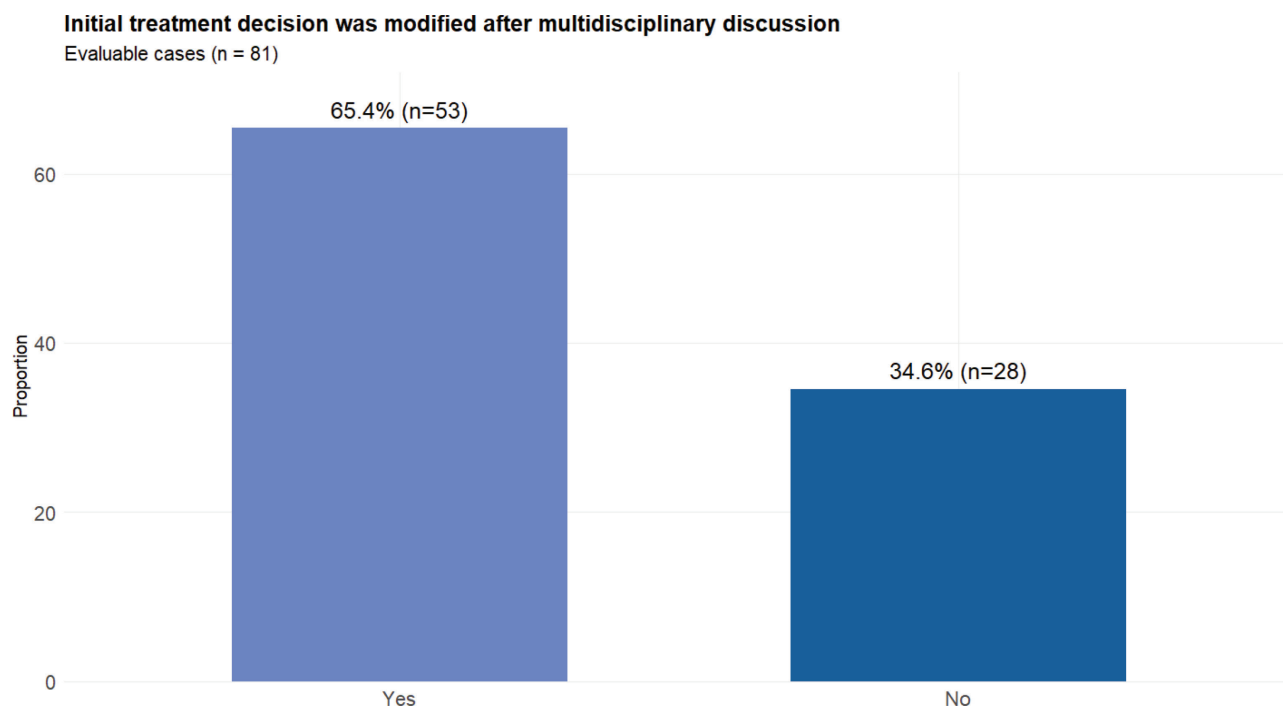


Figure 1. Treatment modification after STB discussion.

Figure 1 shows the proportion of cases presented where the initial treatment plan proposed before presenting to the STB was modified following the meeting.

Finally, at the median follow-up time, which was 29.6 months, 96.5% ($n = 82$) patients were still alive and 3.5% ($n = 3$) had died.

Specialist physician survey responses

Out of 54 physicians who participated in the STB, 29 were included, which represent a response rate of 53.7%.

The specialty that participated the most was clinical oncology with 41.4% ($n = 12$). The groups that had 0–2 and 3–5 years of experience as specialists represented 31.0% ($n = 9$) each. Regarding participation in the STB, 51.7% ($n = 15$) claimed to have presented at least one case in the past 3 months. This information is summarised in Table 2.

When asked about the value of the STB in clinical practice, 79.3% ($n = 23$) strongly agreed, 13.8% ($n = 4$) agreed and 6.9% ($n = 2$) strongly disagreed. Regarding the suitability for addressing the complexity of cases, 86.2% ($n = 25$) strongly agreed, 6.9% ($n = 2$) agreed and 6.9% ($n = 2$) strongly disagreed.

Concerning clinical decision-making, 55.2% ($n = 16$) reported a very high improvement and 44.8% ($n = 13$) a high improvement. Respondents considered that initial clinical management was frequently modified for 58.6% of the surveys ($n = 17$) and on some occasions for 37.9% ($n = 11$).

Regarding the meetings' functioning, clinical information was considered sufficient or entirely sufficient by 96.6% ($n = 28$), and overall functioning was rated as completely agree or agree by 89.7% ($n = 26$). Recommendations were rated as clear or very clear by 89.6% ($n = 26$).

Table 2. Characteristics of STB participants.

Demographic	Category	(%)	n
Total		100%	29
Specialty	Clinical oncology	41.4%	12
	Surgical oncology	27.6%	8
	Pathology	10.3%	3
	Other	20.7%	6
Years as specialist	0–2	31.0%	9
	3–5	31.0%	9
	6–10	20.7%	6
	11–15	10.3%	3
	>15	6.9%	2
Time participating in STB	>12 months	75.9%	22
	7–12 months	17.2%	5
	<3 months	3.4%	1
	3–6 months	3.4%	1
How often they participate in STB	Weekly	41.4%	12
	Occasionally	34.5%	10
	Biweekly	17.2%	5
	Monthly	6.9%	2
Presented a case in the past 3 months	Yes	51.7%	15

Concerning the operational aspects, logistical difficulties were reported on some occasions or frequently by 86.2% ($n = 25$), and the time assigned by the institution for these meetings was considered insufficient or totally insufficient by 75.9% ($n = 22$). The sustainability of the STB overtime was rated with agreement or complete agreement by 86.2% ($n = 25$).

According to the specialist physicians, the learning opportunities for residents during STB meetings were considered to be very high by 72.4% ($n = 21$) and high by 27.6% ($n = 8$).

Figure 2 shows the distribution priority areas for improvement mentioned by the specialists.

Resident physician survey responses

Out of the 50 residents who were invited to participate in the STB meetings, 23 were included (46%) and 87.0% ($n = 20$) mentioned that they had presented at least one patient case to the STB.

Regarding their perception of the meetings' contribution to clinical training, 65.2% ($n = 15$) expressed full agreement, while 17.4% ($n = 4$) indicated agreement and 17.4% ($n = 4$) expressed full disagreement.

Concerning the case discussions' contribution to diagnostic and therapeutic reasoning, 56.5% ($n = 13$) answered that STBs provided a very high contribution, 26.1% ($n = 6$) provided a high contribution and 17.4% ($n = 4$) provided a moderate contribution.

Finally, the residents answered that comments and clarifications with educational purposes were always given by 65.2% ($n = 15$) and frequently given by 34.8% ($n = 8$) during STB meetings (Figure 3).

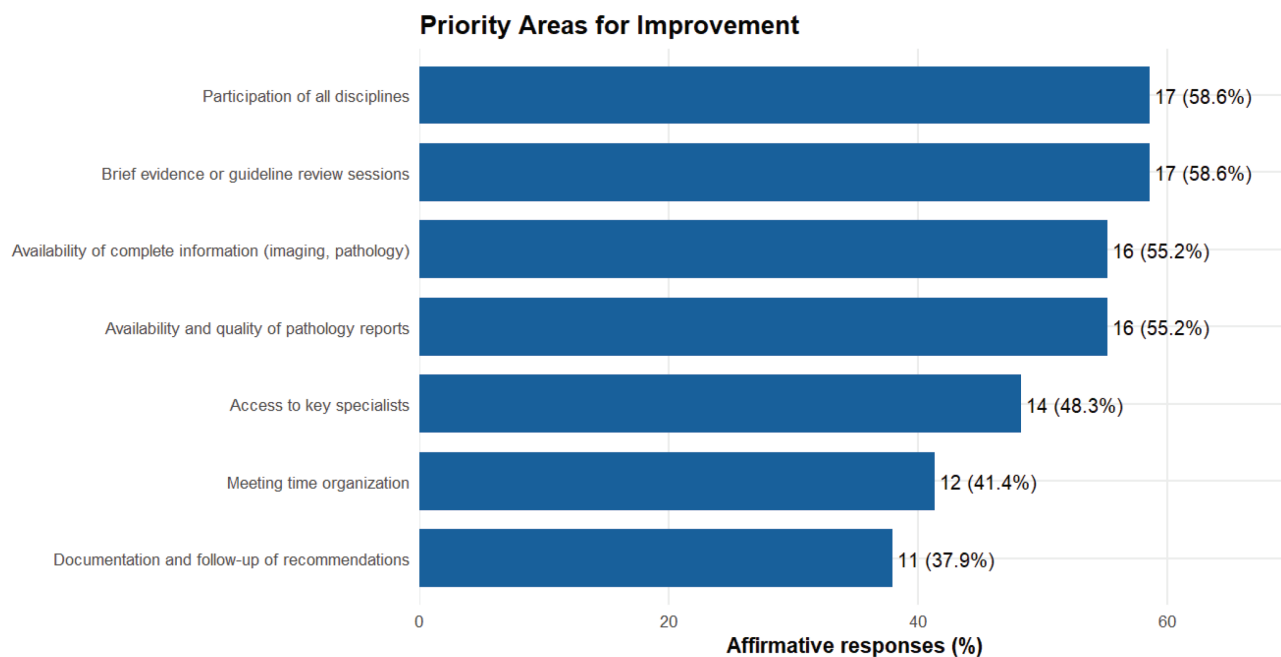


Figure 2. Areas for STB improvement – specialists' perceptions.

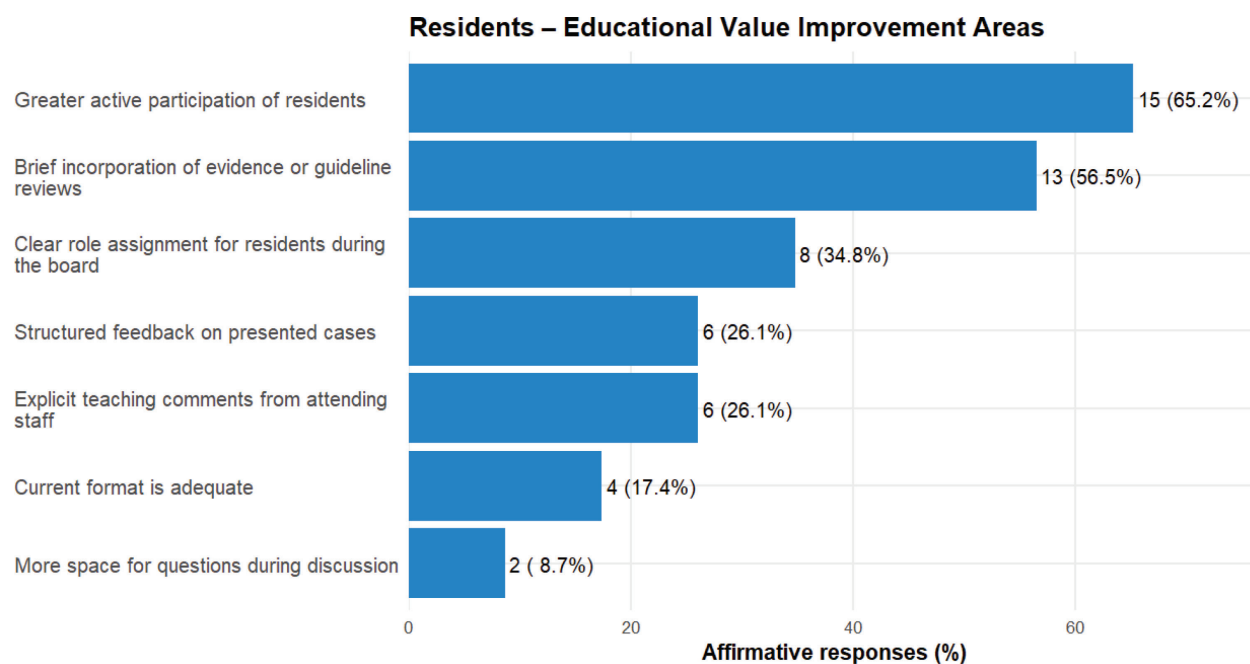


Figure 3. Areas for STB improvement – residents' perceptions.

Discussion

This study describes the characteristics of cases presented and discussed at the STB meetings at INCAN and explores the impact from three perspectives: an objective analysis of the therapeutic decision-making, the specialists' perceived impact and the educational benefit for the residents who participated.

The results showed that in 65.4% of cases presented at a meeting, the initial therapeutic approach proposed by the treating physician was modified, demonstrating how essential these meetings are for the management of cancer patients.

This coincides with international publications; systematic reviews have concluded that TBs are associated with greater diagnostic precision, changes in tumour staging and therapeutic modifications that better align with clinical guidelines [3]. Previous studies have documented that the presence of TBs is correlated with better therapeutic plans for the patient and a greater adherence to evidence-based guides. Therefore, the proportion of modifications observed in our study is consistent with international reports that describe these adjustments following interdisciplinary discussion [1].

The next aspect of our analysis was the impact of the STB perceived by the specialist physicians, which was rated as having high clinical utility. However, operational obstacles were identified, such as institutional time constraints and logistical difficulties, which highlight the tension between the clinical and educational value of tools such as TBs and the structural challenges affecting their long-term sustainability.

This phenomenon has already been explored by different authors [13–16]. Soukup *et al* [17] have shown that the functioning of TBs depends on favourable organisational conditions, such as designated time and institutional support. When these spaces are not formally integrated into the institution's agenda, participation tends to depend on the individual physicians' efforts, which could hinder sustainability over time, even when it is recognised as a useful clinical tool [13].

The final pillar of our analysis was the educational benefits identified by resident physicians, including improvements in clinical reasoning and a better understanding of the multidisciplinary approach needed for treating sarcomas, suggesting the educational value of these meetings.

However, TBs were not originally designed as teaching mechanisms, but evidence suggests that they can acquire significant educational value if the meetings are intentionally designed without losing their clinical value. Among the pedagogical strategies proposed in the literature, certain approaches, such as structured feedback, a sense of belonging within an academic community and discovery learning, allow residents to apply theoretical concepts and transfer what they have learned to concrete situations [11, 17]. These environments promote retention of theoretical knowledge and strengthen competencies in medical decision-making.

Global cancer burden continues to increase worldwide, with marked disparities between high-income and transitioning countries, placing additional strain on health systems in low- and middle-income countries (LMICs) and highlighting the need for resource-adapted cancer care strategies [18]. This challenge is particularly relevant in sarcoma care, where optimal management requires treatment in specialised high-volume centres with multidisciplinary expertise. However, access to specialised sarcoma reference centres remains limited in many LMICs, where oncologic care is frequently concentrated in a small number of tertiary institutions. This decentralisation may contribute to delays in referral and treatment initiation, particularly among patients referred from outside the capital [19, 20]. Within this context, TBs may play an important role not only in therapeutic decision-making but also in facilitating timely specialist evaluation and improving coordination between treating physicians and referral centres, which could be essential to ensure appropriate and timely treatment planning [21].

Building on these structural and organisational challenges, the relevance of our findings becomes particularly evident in Latin American settings, where published evidence on TBs remains limited and reports describing multidisciplinary teams dedicated to the management of rare diseases such as sarcomas are even scarcer [22]. In this context, our study contributes to expanding regional knowledge on the implementation, clinical impact and educational value of TBs in public oncology institutions.

From a clinical perspective, our results suggest that multidisciplinary discussions could have a relevant role in the structured revision of diagnostic and therapeutic decisions. Furthermore, there are aspects that have been prioritised by the various parties involved and that can serve as facilitating factors to adapt our experience in public institutions in the region. On the other hand, we identified logistical obstacles, which include the insufficient time allocated by the institute for these meetings. This underscores the need for directors to create practical strategies that implement cultural change and promote TBs as an essential part of patient-centred care [23].

Finally, we must recognize the limitations of our study. The descriptive character of the analysis does not allow causal inferences between the recommendations given during the STB meetings and the clinical outcomes, and the lack of long-term follow-up data prevents assessment of survival or disease control benefits. Additionally, the surveys were developed ad hoc and were not formally validated. Moreover, the study was conducted in a single centre, which limits the generalizability of our findings.

Ultimately, the results presented in our study, in conjunction with the international literature referenced, call attention to the actual challenge, which is not proving the value of TBs but ensuring that these meetings are properly organised. From the specialists' perspective, the main issue is the need to prioritize the organisation of the meetings, ensuring protected time allocated by the institution with adequate logistical support. Meanwhile, the challenge regarding the residents is focused on promoting their participation and implementing targeted strategies needed to make the meetings more educational. This would require defining a specific role within the meetings, implementing brief feedback and teaching interventions within the real patient cases discussed. Integrating these strategies without compromising the clinical utility of TBs may transform multidisciplinary meetings into not only a clinical decision-making tool but also a meaningful educational environment.

Conclusion

The STB has shown a high frequency of modifying clinical decisions after interdisciplinary discussions. The findings of the patient registry demonstrate the importance of structured revision when taking into consideration diagnostic and therapeutic decisions when treating rare and complex pathologies. From the perspective of medical participants, the meetings were considered useful for both clinical and educational purposes. Finally, the results provide local evidence regarding how TB functions in Paraguay and highlight their clinical relevance and organisational requirements.

List of abbreviations

INCAN, Instituto Nacional del Cáncer (National Cancer Institute); STB, Sarcoma Tumour Board; TB, tumour board.

Conflicts of interest

The authors declare that they have no conflicts of interest relevant to the content of this article. No financial relationships, commercial affiliations or personal interests influenced the design, execution or reporting of this study.

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Supplementary materials

Table S1. Questionnaire for specialists.

Question	Response options
Medical specialty	a) clinical oncology, b) surgical oncology, c) pathology, d) palliative care and e) radiation oncology
Years working as specialist:	a) 0–2, b) 3–5, c) 6–10, d) 11–15 and e) >15
Time participating in STB	a) <3 months, b) 3–6 months, c) 7–12 months and d) >12 months
How often do you participate in STB?	a) weekly, b) biweekly, c) monthly and d) occasionally
In the last 3 months, have you presented a case to the STB?	a) yes and b) no
Participating in the STB is valuable to me as part of my clinical practice:	1) strongly disagree, 2) disagree, 3) neutral, 4) agree and 5) strongly agree
STBs are an appropriate forum to address the complexity of patient management:	1) strongly disagree, 2) disagree, 3) neutral, 4) agree and 5) strongly agree
Cases are discussed with the clinical information necessary to make decisions:	1) strongly disagree, 2) disagree, 3) neutral, 4) agree and 5) strongly agree
The STB is well organised:	1) strongly disagree, 2) disagree, 3) neutral, 4) agree and 5) strongly agree
Recommendations are clear regarding which conduct to follow:	1) strongly disagree, 2) disagree, 3) neutral, 4) agree and 5) strongly agree
Discussing cases improves the quality of clinical decision-making:	1) strongly disagree, 2) disagree, 3) neutral, 4) agree and 5) strongly agree
The discussion of cases modifies the initial proposed treatment plan:	1) never, 2) rarely, 3) sometimes, 4) often and 5) always
Limited time, logistics, or incomplete information hinder operations:	1) never, 2) rarely, 3) sometimes, 4) often and 5) always
I have sufficient time, which is institutionally reserved, to participate in STB:	1) never, 2) rarely, 3) sometimes, 4) often and 5) always
I believe the STB is sustainable over time in its current format:	1) strongly disagree, 2) disagree, 3) neutral, 4) agree and 5) strongly agree
STB improves the integration of different disciplinary perspectives in decision-making:	1) strongly disagree, 2) disagree, 3) neutral, 4) agree and 5) strongly agree
STB plays a relevant role in the training of medical residents:	1) strongly disagree, 2) disagree, 3) neutral, 4) agree and 5) strongly agree
During the STB, the discussion is clearly coordinated:	1) strongly disagree, 2) disagree, 3) neutral, 4) agree and 5) strongly agree
Do the agreed treatment decisions translate into coordinated actions after the STB:	1) never, 2) rarely, 3) sometimes, 4) often and 5) always
What aspects of the STB would you consider priorities for improvement? Choose all that apply:	a) Meeting time organisation, b) availability of complete information (images, pathology), c) participation of all disciplines, d) availability and quality of pathology reports, e) access to key specialists, f) brief incorporation of evidence or guideline reviews, g) documentation and follow-up recommendations and h) current format is adequate

Table S2. Questionnaire for residents.

Question	Response options
Medical specialty	a) clinical oncology, b) surgical oncology, c) pathology, d) palliative care and e) radiation oncology
Residency year	a) R1, b) R2, c) R3, d) R4 and e) chief resident
How often do you participate in STB?	a) weekly, b) twice a month, c) once a month and d) occasionally
Have you ever presented a case to the STB?	a) yes and b) no
Participating in the STB contributes to my clinical training:	1) strongly disagree, 2) disagree, 3) neutral, 4) agree and 5) strongly agree
Discussions that take place in the STB help me to better understand the comprehensive approach to the patient:	1) strongly disagree, 2) disagree, 3) neutral, 4) agree and 5) strongly agree
Discussing cases in the STB contributes to my diagnostic and therapeutic reasoning:	1) strongly disagree, 2) disagree, 3) neutral, 4) agree and 5) strongly agree
I feel confident enough to participate whenever I have an idea to contribute to the discussion:	1) never, 2) rarely, 3) sometimes, 4) often and 5) always
During the STB, my contributions are heard and considered:	1) never, 2) rarely, 3) sometimes, 4) often 5) always
During the STB, comments or clarifications are made for educational purposes:	1) never, 2) rarely, 3) sometimes, 4) often and 5) always
I receive feedback on the cases I present:	1) never, 2) rarely, 3) sometimes, 4) often 5) always
The staff actively promotes resident participation during the discussion:	1) never, 2) rarely, 3) sometimes, 4) often and 5) always
Lack of time limits my ability to benefit from the STB:	1) never, 2) rarely, 3) sometimes, 4) often and 5) always
What changes would improve the STB's educational value? Choose all that apply:	a) Greater active participation of residents, b) more space for questions during the discussion, c) explicit teaching comments from attending staff, d) structured feedback on presented cases, e) brief incorporation of evidence or guideline reviews, f) clear role assignment for residents during the stb and g) current format is adequate