



Research article

Impact of a simple informative leaflet on Brazilian doctors' attitudes towards active surveillance of thyroid microcarcinomas

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ARTICLE INFO

Keywords:

Active surveillance
Microcarcinoma
Low-risk thyroid cancer

ABSTRACT

Introduction: Active surveillance (AS) is increasingly recognized as an appropriate strategy for selected patients with papillary thyroid microcarcinomas (PTMC). However, some factors, including physician-related ones, hinder its widespread adoption.

Methods: To explore the prevailing barriers and the impact of information on attitudes towards AS implementation, we developed a questionnaire that was completed before and after reading a simple information leaflet by 317 doctors working in different work environments. This leaflet provides information about the overdiagnosis of PTMC, the concept of AS, results of early studies, and main advantages and disadvantages of AS.

Results: We observed a greater resistance to AS among male physicians who were more likely to maintain the initial recommendation for surgery or referral to a head and neck surgeon than female physicians (77 % vs. 46 %, $p = 0.01$), regardless of their medical specialty. Fear of disease progression and of the patient losing follow-up were the main concerns. Reading the educational material significantly increased the number of physicians who endorsed AS as an initial approach to PTMC without risk factors from 14 % to 34 % ($p < 0.001$). This change in attitude was even more significant when doctors were confronted with a case of PTMC in an elderly patient. Gender, medical specialty, age range and academic environment were the factors that were determinants on the influence of the informative leaflet on the decision-making. The leaflet also increased the number of doctors who considered themselves capable of dealing with this patient profile; however, 17 % declared that the place where they worked would not be able to meet the need for periodic assessments and necessary examinations. This was particularly true for the 20 % of the professionals working in rural areas.

Conclusion: A simple educational leaflet with basic information presented via social media increased the number of Brazilian physicians who endorsed AS for PTMC management and proved to be a facilitating tool for understanding and accepting it. Our results suggest that this method can be easily extended to larger population.

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Received 9 January 2024; Received in revised form 17 August 2024; Accepted 30 August 2024

Available online 2 September 2024

2405-8440/© 2024 Published by Elsevier Ltd.

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1. Introduction

The incidence of papillary thyroid microcarcinomas (PTMC), tumors less than 10 mm in diameter, has increased in recent years, especially due to greater accessibility to sensitive imaging tests [1–3]. The high burden and economic impact of overdiagnosis of these cases has led to the proposal of less invasive measures, such as active surveillance (AS) [4,5]. Studies carried out initially in Japan and later in other countries such as Korea, USA, Italy, Colombia, Argentina and Brazil itself showed convincing data that prove that AS is a safe and effective alternative in appropriately selected patients with PTMC [6–14]. Ito, Y. et al. even advocate in favor of AS as the first line of care for patients with PTMC [7]. AS has been incorporated into the guidelines of many societies, including the Brazilian Society of Endocrinology and Metabolism, as a viable therapeutic strategy for carefully selected patients, mainly based on their age, general health status, and the likelihood of adequate follow-up [4,15–17]. However, an appraisal of the low-risk papillary thyroid cancers treated from 2000 to 2018 in the USA showed that nonsurgical management did not increase to the extent expected after 2015 ATA guidelines publication [18]. Many physicians still advocate thyroid lobectomy as the preferred approach, citing logistical obstacles to routine adoption of AS for patients with PTMC, especially in low- and moderate-income areas [19].

A series of factors that drive treatment decision making have been identified. Barriers to implementing AS are associated with both physicians and patients. Physician-related challenges encompass inadequate medical knowledge, concerns about safety, lack of essential infrastructure, limited experience in managing this patient profile, skepticism about the literature on AS, fear of disease progression, apprehension about legal consequences, and the fear of losing track of follow-up [20–24]. A qualitative study on barriers and facilitators for implementing AS in low-risk PTMC carried out in the USA identified the doctor as the main difficulty factor [20]. Physicians' beliefs about fear of disease progression and their own ability to offer and carry out AS, as well as fear of patients being lost to follow-up, were predominant factors. Lack of training and proficiency in shared decision-making, limited experience in conducting AS, and discomfort in discussing this topic were also reported [20,21]. Several studies show that the vast majority of doctors recognize that AS is an appropriate treatment option, although it is underutilized in practice [21–23].

Patient-related obstacles include insufficient clarification about AS from physicians, fear of disease progression, the need for family support, and difficulties in maintaining follow-up [6,20–22,24,25]. It is becoming increasingly clear that doctors and patients should be better educated to improve the implementation of this management modality [26].

A national survey of endocrinologists and head and neck surgeons conducted in the USA reports that 70 % of 345 respondents stated that pamphlets, videos, or other means of information about AS would increase the likelihood of offering it to the patient [22]. In fact, social media is becoming an essential part of people's lives around the world, including healthcare providers [27]. In an increasingly digital world, information from these channels has gained importance in medical education, influencing perceptions and attitudes that are reflected in decision-making [28].

It is necessary to identify the existing barriers to the implementation of AS, which directly contribute to its low acceptance in Brazil [29,30]. Also, it is imperative to develop and implement comprehensive educational strategies aiming to increase awareness, understanding, and acceptance of AS as a viable and effective treatment option for low-risk PTMC.

The present study aimed to identify the most prevalent barriers to AS implementation in different Brazilian real-world settings and assess the impact of a simple informative leaflet on physicians' attitudes concerning the management of low-risk PTMC.

2. Methods

2.1. Development of leaflet and questionnaire

A leaflet about AS was meticulously prepared by our team. This leaflet, presented in [Appendix A](#), summarized the knowledge obtained from a review of the main publications on AS in PTMC, providing information on the overdiagnosis observed in recent decades, the concept of AS and information on the first studies carried out in the Japan and later in other countries around the world, including statistical data from these studies, patient's prognosis on AS and AS main advantages and disadvantages [6–14]. The leaflet was extensively discussed and reviewed by the authors until consensus was reached. To optimize its understanding, the leaflet was tested in face-to-face interviews with ten people with different levels of education (incomplete and complete high school, undergraduate and postgraduate) and from different medical and non-medical professions.

In addition, we developed an online survey based on similar studies of AS program awareness and the literature on communicating medical information in order to assess the level of informed decision making regarding the management of thyroid nodules and the choice of AS [16,23,31]. The questionnaire, presented in [Table 2](#), was built on Google Forms®, a free access platform that collects information and sends it directly to a database. It was widely discussed and validated by our research team after being tested in in-person interviews with 10 doctors from different specialties, including clinical and surgical specialties, who were asked questions about the readability, clarity, understanding and layout of the leaflet. It consisted of eight comprehensive knowledge-based questions, including 6 multiple-choice questions in which only one alternative can be selected, one question (number 7) in which more than one alternative can be chosen, and another question (number 4) in which the respondent could justify its choice not to indicate AS as the first management option for PTMC. A brief initial identification portion was designed to collect respondents' demographic

information, their work environment, and frequency of seeing thyroid cancer patients. The questionnaire took no more than 10 min to complete.

2.2. Study population and data collection

This cross-sectional study involved 317 physicians representing diverse specialties from different parts of the country who provided verbal informed consent to participate due to the online format of the questionnaire. Data were collected between September 2021 and January 2022. Participants received an invitation to join health professionals' WhatsApp® groups that this study's developers were aware of. They were informed at the beginning of the research about the objective of the study and the estimated 10 min period of time needed to complete its three steps: answering the questionnaire, reading the leaflet and answering the same questionnaire again. Participants were free to withdraw from the questionnaire at any time. No personal identification data was requested or stored. The questionnaire was distributed via URL link through Google forms. Anonymous responses were stored electronically in Microsoft Excel 2016 and later transferred to RedCap®.

2.3. Ethical approval

This project was approved in September 2021 by the Ethics and Research Committee of the Irmandade da Santa Casa de Misericórdia de São Paulo (ISCMSP) and received approval under CAAE number 50675321.0.0000.5479.

Table 1
Physician demographics, professional and work characteristics.

	n (%)
Gender	
Female	217 (68)
Male	100 [32]
Range of age (y)	
20–30	98 [31]
31–40	127 [40]
41–50	54 [17]
51–60	23 [7]
>60	15 [5]
Main region of operation	
Southeast	104 [33]
South	0 (0)
North	0 (0)
Northeast	42 [13]
Midwest	1 (0)
Not Informed	170 (54)
Main operation area in the state	
Capital	261 (82)
Countryside	56 [18]
Professional cycle	
Resident/Specializing ^(a)	81 [26]
Specialist ^(b)	236 (74)
Main Specialty	
Endocrinology (clinical speciality)	145 (46)
Gynecology (clinical speciality)	35 [11]
Geriatrics (clinical speciality)	37 [12]
Head and neck surgery (surgical speciality)	37 [12]
Clinical oncology (clinical speciality)	22 [7]
Internal medicine (clinical speciality)	41 [13]
Main place of work	
Public service hospital/outpatient clinic	97 [31]
Private hospital/outpatient clinic	92 [29]
Own office	87 [27]
University hospital	41 [13]
Frequency of care for patients with thyroid cancer	
Daily	33 [10]
Weekly	84 [26]
Monthly	68 [21]
Rarely	132 (42)

^a Doctor that is attending the medical residency to become a specialist.

^b Doctor who has already completed medical residency or completed an internship and obtained proof of specialist title.

Table 2
Comparison between doctors' responses before and after reading the leaflet.

When do you order a thyroid ultrasound?	Pre-Leaflet (%)	Post-Leaflet (%)	p-value
As a routine exam.	56 [18]	62 [20]	0,398
Only for patients with thyroid cancer risk factors.	20 [6]	18 [6]	
Only if nodule is palpable on physical examination.	30 [9]	29 [9]	
Only for patients with risk factors for thyroid cancer or a palpable nodule on physical examination.	211 (67)	208 (66)	
In a patient with a thyroid nodule smaller than 1 cm, what is your management?	Pre-Leaflet (%)	Post-Leaflet (%)	p-value
I request a puncture if I consider that the nodule has suspicious characteristics.	172 (54)	166 (52)	0,694
I do not request a puncture, even if the nodule has suspicious characteristics.	76 [24]	103 [32]	
Referral to a specialist to assess the need for a puncture.	69 [22]	48 [15]	
A patient who had a thyroid nodule puncture with a Bethesda V or VI result (suspicious for malignancy or malignancy) arrives at your office. On ultrasound, the thyroid nodule is smaller than 1 cm, without aggressive characteristics, in other words, without signs of extrathyroidal invasion or lymph node metastasis. What is your conduct?	Pre-Leaflet (%)	Post-Leaflet (%)	p-value
I send it to the specialist without giving an opinion on the procedure.	86 [27]	29 [9]	<0.001
I recommend surgery as the first option and/or referral to a head and neck surgeon.	72 [23]	41 [13]	
I explain the two management possibilities, surgery or follow-up with active surveillance, without giving an opinion.	115 [36]	139 (44)	
I recommend active surveillance as the first option.	44 [14]	108 [34]	
If your answer to the previous item was not active surveillance as your first option, what would be the reason?	Pre-Leaflet (%)	Post-Leaflet (%)	
Fear of disease progression.	79 [25]	31 [10]	
Fear of legal proceedings.	14 [4]	12 [4]	
Fear of the patient losing follow-up.	92 [29]	87 [27]	
Does not apply, as I chose active surveillance in the previous question.	81 [26]	144 (45)	
Referral to specialist.	19 [6]	14 [4]	
Difficulty of follow-up.	3 [1]	3 [1]	
Free patient choice.	9 [3]	6 [2]	
Joint decision with the patient.	6 [2]	7 [2]	
Lack of security in the literature regarding active surveillance.	2 [1]	2 [1]	
Unfamiliarity.	6 [2]	3 [1]	
Insecurity on the part of the doctor.	2 [1]	2 [1]	
Others.	5 [2]	7 [2]	
If you were caring for an 80-year-old patient with thyroid microcarcinoma without aggressive characteristics, your management would be:	Pre-Leaflet (%)	Post-Leaflet (%)	p-value
Recommend surgery	17 [5]	4 [1]	<0.001
Consider ultrasound follow-up only if cardiovascular risk is high	49 [15]	30 [9]	
Indicate active surveillance with ultrasound, even if cardiovascular risk is low	251 (79)	283 (89)	
Considering a patient with low-risk papillary microcarcinoma, when would you consider active surveillance with ultrasound instead of surgery?	Pre-Leaflet (%)	Post-Leaflet (%)	p-value
In adult patients of any age	97 [31]	182 (57)	<0.001
Only in adult patients over 40 years of age	29 [9]	27 [9]	
Only in elderly patients over 60 years old	51 [16]	43 [14]	
Only in elderly patients over 80 years old	140 (44)	65 [21]	
Which characteristic do you consider most important for the indication of active surveillance, without surgery, in low-risk thyroid microcarcinoma?	Pre-Leaflet (%)	Post-Leaflet (%)	
Patient age	208 (66)	161 (51)	
Patient purchasing power	24 [8]	37 [12]	
Patient adherence to treatment	280 (88)	290 (91)	
Family support	78 [25]	85 [27]	
Do you feel safe and able to follow a patient with papillary thyroid microcarcinoma under active surveillance?	Pre-Leaflet (%)	Post-Leaflet (%)	p-value
Yes. I feel able/safe	130 (41)	172 (54)	<0.001
No, because I don't feel able to manage this patient profile	119 [38]	84 [26]	
No, because the place where I work would not be able to meet the need for periodic assessments and necessary exams	55 [17]	54 [17]	
No, because I do not agree with this way of managing the disease	13 [4]	7 [2]	

2.4. Statistical analysis

We employed the IBM SPSS Statistics 20 program for all statistical analyses. The Wilcoxon signed-rank test was used to evaluate the consistency or changes in responses before and after reading the leaflet. In addition to presenting descriptive statistics, the results were compared across various subgroups based on participants' demographics and medical specialties. The χ^2 test was performed to examine differences among subgroups. To evaluate the impact of the leaflet in reducing fear of disease progression and to evaluate the main determinants for AS indication, the McNemar test was performed. This comprehensive approach facilitated a nuanced exploration of potential variations in responses based on demographic factors and medical specialties. All reported p-values are two-sided, with $p < 0.05$ considered as significant.

3. Results

3.1. Physician demographic characteristics

There was a notable predominance of female doctors, constituting 68 % of the total participants, as shown in Table 1. The majority of respondents were young and worked in capitals in the Southeast of Brazil, which is compatible with the current demographics of doctors in the country. The majority of participants had specialized training, with the most prevalent specialty being endocrinology, a fact certainly influenced by the WhatsApp groups reached by the research team. Unfortunately, some Brazilian regions were under-represented, a fact that may also be related to the composition of the research team.

3.2. Management of thyroid nodules

The intention to proceed with cancer screening in a micronodule was evaluated using the following question: When do you order a thyroid ultrasound? Table 2 shows that, as expected, reading the leaflet did not change responses regarding what doctors believed was appropriate in thyroid cancer diagnosing. In fact, the leaflet was not intended to change such attitudes, although it emphasized the role of imaging ordering in the raising prevalence of thyroid nodules. Notably, despite guidelines not to investigate micronodules except in

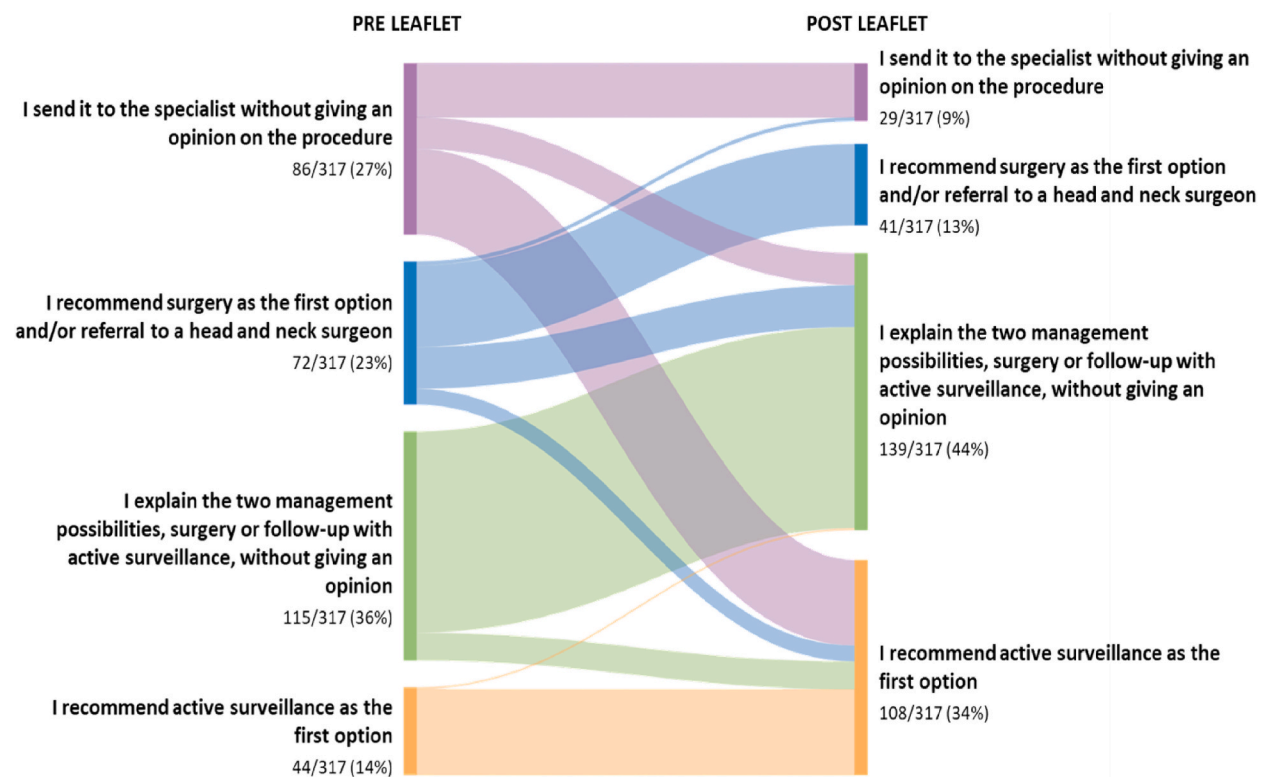


Fig. 1. Impact of the leaflet's presentation on physicians' attitudes towards the management of a Bethesda V or VI thyroid micronodule without signs of aggressiveness.

specific cases, and well-known robust evidence against routinely ordering thyroid ultrasound, a substantial number of physicians still include this examination in routine check-up tests [15,32–34].

Following international guidelines, 24–32 % of the physicians do not request a fine needle aspiration cytology (FNAC) for nodules with less than 1 cm of diameter. However, 54 % still investigate micronodules. Subgroup analysis revealed a notable change among doctors aged 41 to 50 who would initially request FNAC if the micronodule presented suspicious characteristics: 14 % changed their stance to not request it after reading the leaflet (p-value: 0.025). The same was observed in the group of doctors aged 20–30: 48 % would request cytological analysis, but 17 % of them decided to not request FNAC after reading the leaflet. Also, 30 % of the doctors in this age range would initially refer the patient to a specialist but 34 % of them felt confident to recommend FNAC after reading the leaflet (p-value: 0.006) (Data not presented).

3.3. Management of thyroid microcarcinoma

Concerning the management of a malignant or suspicious for malignancy nodule measuring less than 1 cm without aggressive characteristics (question 3), only 14 % of the participants endorsed AS as the primary option, while 36 % opted to explain the two management possibilities without providing a direct opinion to the patient. Following exposure to the informational leaflet, these figures increased significantly to 34 % and 44 %, respectively (p-value <0.001) as shown in Fig. 1.

Additional subgroup analyzes revealed that male physicians were more likely to maintain the initial recommendation for surgery or referral to a head and neck surgeon than female physicians (77 % vs. 46 %, p-value: 0.01), regardless of their medical specialty. However, the leaflet had a notable impact on the endocrinologists: 33 % out of the endocrinologists who initially recommended surgery (33 %), changed their opinion and began to explain the two possible management approaches without giving a specific opinion to the patient (p-value <0.001). Similarly, 17 % out of the head and neck surgeons who initially recommended surgery (32 %) went on to explain both treatment options. Furthermore, 10 % of the surgeons who previously explained the treatment types without offering an opinion (56 %), began to endorse AS as the primary option (p-value: 0.046). Although the leaflet had a significant impact across all specialties, the influence on head and neck surgeons was somewhat smaller, regardless of sex, with 88 % of male surgeons and 77 % of female surgeons maintaining surgical recommendations.

As presented in table 3, younger doctors, especially the ones working in academic environments, were more influenced by the informational leaflet, although it had a significant impact on decision-making perspectives across the various age groups and

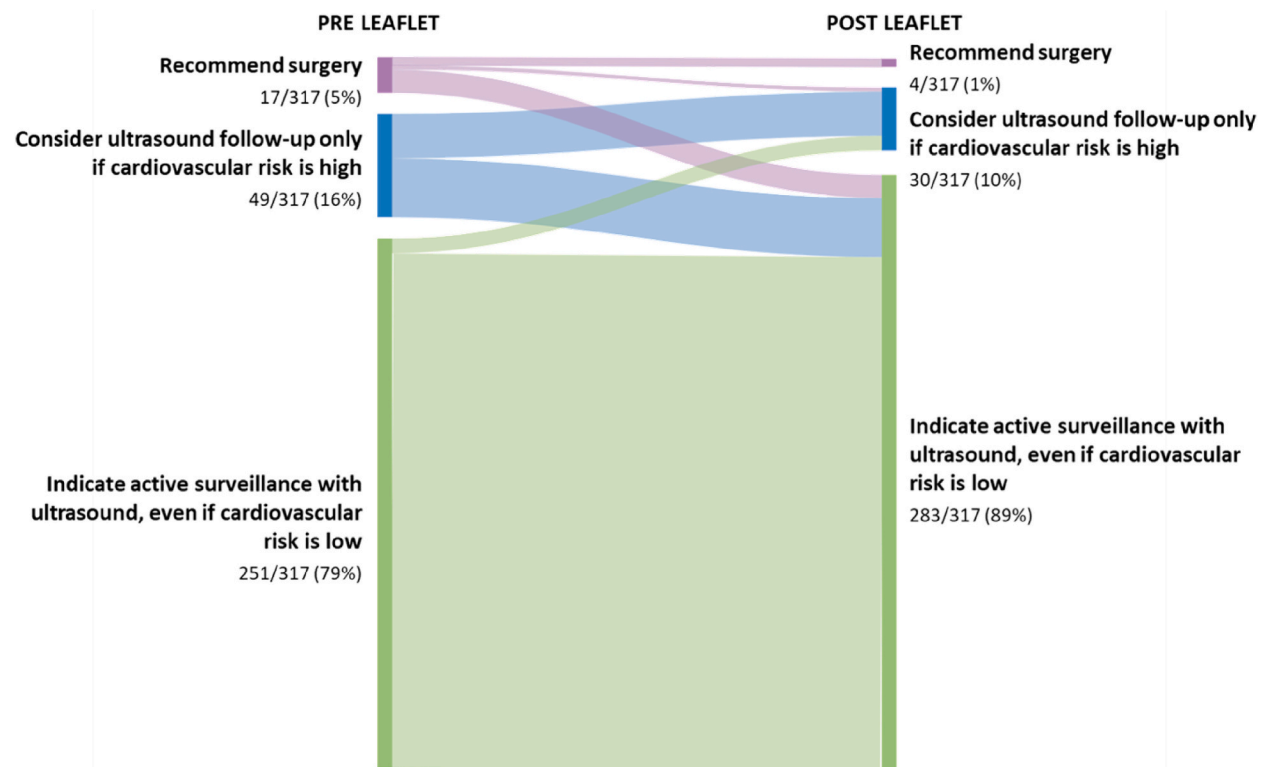


Fig. 2. Impact of the leaflet’s reading on physicians’ attitudes towards the management of a Bethesda V or VI thyroid micronodule without signs of aggressiveness in a patient over 80 years old.

specialties as demonstrated in table 3. Only 7 % of doctors over 40 years old indicate AS vs. 17 % of younger doctors (p-value: 0.015). These percentages rise to 14 % and 42 % respectively (p-value <0.001). The leaflet changed the responses of 31 % of younger doctors versus 8 % of doctors over 40 years old (p-value <0.001). Furthermore, 44 % of doctors working in University Hospitals indicated AS after the leaflet, compared to 30 % of other professionals (p value: 0.014).

3.4. Barriers to active surveillance

In question 4 related to doctors' justification for not indicating AS as the first option for the management of a potential PTMC without aggressive characteristics, reading the leaflet made the concern on disease progression fall from 25 % to 10 % (p-value <0,001), but did not affect significantly the fear for patients' loss during follow-up. Post-leaflet, for doctors between 51 and 60 years old and >60 years old, the fear of loss of follow-up represented 43 % and 33 % of responses, respectively, and for professionals working in the capital and in the countryside, these rates represented 26 % and 34 % respectively.

When the physicians were confronted to the management of PTMC in elder patients (question 5), surgical option dropped from 5 % to only 1 % and, after the leaflet reading, 89 % of the physicians opted for AS regardless of cardiovascular risk (Fig. 2). Only four physicians maintained their recommendation for immediate surgery.

The leaflet had an important influence on the management of older patients. 65 % of doctors who initially would recommend surgery changed their stance to indicate AS, even in cases of low cardiovascular risk (p-value <0.001) as shown in Fig. 2. Also, 57 % of doctors who would only recommend AS in the presence of high cardiovascular risk began indicating AS irrespective of cardiovascular risk (p-value <0.001). Additional significance was noted among female doctors: 93 %, compared to 82 % of male doctors, tended to recommend AS regardless of cardiovascular risk after reading the leaflet (p-value = 0,005)

The leaflet was impactful also in terms of age criteria for recommending AS (question 6). There was an increase from 31 % to 57 % in those who would recommend it for adults of any age. Among doctors who initially indicated AS only for individuals over 80 years old, 46 % started recommending AS for adults of any age (p-value <0.001). Additionally, 33 % of the doctors who initially suggested AS for individuals over 60 years old also began recommending it for adult patients of any age (Fig. 3).

Question 7 allowed the analysis of the factors considered more important for the indication of AS, indicating that patient adherence to treatment (91 %), followed by patient age (51 %) are the most important concerns after the leaflet reading. Doctors >60 years old considered especially the age of the patient (80 % of the responses) as a determinant factor. The leaflet did not impact the physicians' management option significantly, except for the patient's age criteria (p-value <0.001).

In question 8, which concerns the physician's ability to monitor a patient with PTMC under AS, there was a notable 29 % shift

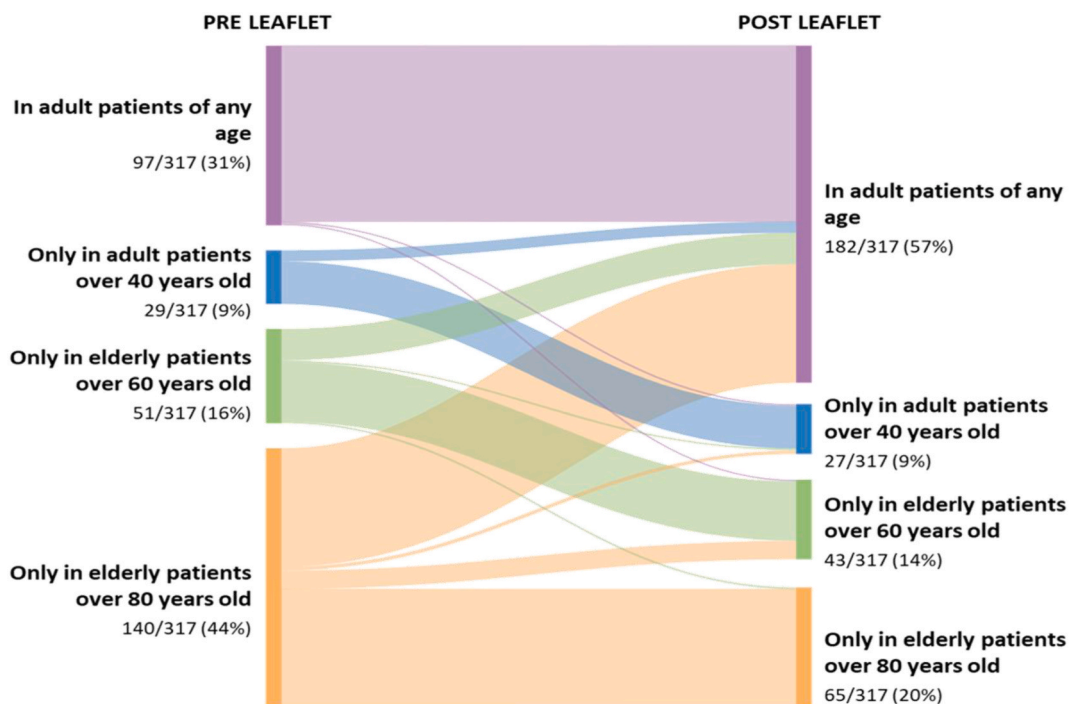


Fig. 3. Impact of reading the information leaflet on medical decisions regarding the appropriate age for indicating active surveillance in PTMC without signs of aggressiveness.

among physicians who initially felt unprepared to handle these cases but now express confidence (p-value <0.001). Furthermore, 7 out of the 13 doctors who initially disagreed with this type of treatment of the disease changed their response.

Notably, post-leaflet, 17 % of physicians stated that AS was not feasible in their workplace, where there would be no way to perform regular assessments and order necessary tests. This is particularly true for the 20 % of professionals working in rural areas and 16 % in urban areas.

4. Discussion

There has been increasing acceptance of AS among physicians as a way to treat prostate, breast, and other low-risk malignancies in recent years [35,36]. AS has also been accepted as an alternative to immediate surgery for asymptomatic PTMC in many countries and has been included in recent guidelines from different societies [15–17]. However, despite its advantages, such as cost-effectiveness for the healthcare system and the avoidance of surgery- and radiation-related risks, the adoption of this approach for thyroid cancer remains controversial in some countries, including Brazil [19,24].

In this study, we took advantage of the fact that there are many doctors, mainly in the Southeast and Northeast regions of Brazil, who are part of social media groups interested in thyroid diseases, to identify barriers and evaluate the impact of information about AS on the management of PTMC. The respondent cohort is likely representative of our real world, since initial responses indicated that thyroid ultrasound is still a routine practice for 20 % of Brazilian doctors, contributing to the overdiagnosis of PTMC and to the high thyroid cancer burden in Brazil [5]. Also, 52 % of doctors continue to request a fine-needle aspiration cytology on micronodules even after reviewing the informative leaflet, and 23 % recommend surgery as the first approach to a PTMC. A study conducted in 134 Japanese institutions found that even in the country that pioneered AS method, 51.5 % of surgeons recommended FNAC for nodules larger than 5 mm, 27.8 % for nodules larger than 10 mm, and 13.4 % for suspicious nodules regardless of their location and size [26]. Both the American and the European Thyroid Associations do not recommend the biopsy of nodules ≤ 1 cm in the absence of extrathyroidal extension or lymph node involvement at US. However, ATA 2015 guidelines changed physicians' procedures mostly in academic institutions, "suggesting an opportunity to expand guideline-based care in the community setting" [37].

Resistance to recommending AS as the primary treatment option for low-risk PTMC was evident in our analysis. Only 14 % of doctors would recommend AS, but that number increased to 34 % after reviewing the informative folder. Additionally, there was an increase from 36 % to 44 % of doctors who began to explain the two management possibilities to their patients. Sugitani et al. also found similar trends, identifying that 38.8 % of the interviewed doctors did not provide medical advice on the best treatment for the patient, and only 31.3 % recommended AS [26].

We also observed resistance among male doctors to adhere to AS with 77 % of those who recommended surgery maintaining their response after reviewing the leaflet, compared to 46 % of female doctors, regardless of specialty (p-value: 0,01). There was also less impact of the leaflet on head and neck surgeons who, in addition to being less likely to offer AS, also tend to maintain their opinion. A questionnaire applied to doctors in the USA showed that 38.4 % of endocrinologists preferred AS vs. 17.5 % of surgeons [22]. This lower propensity of surgeons to offer AS was also described in the only Brazilian study published to date [29]. In this study, there was also greater resistance among doctors aged over 40 years to recommend AS as the first option. Furthermore, the leaflet shifted physician's opinion on 31 % of younger doctors compared to just 8 % of older doctors (p-value < 0.001). These data are compatible with those found by Hughes et al., who demonstrated that doctors not performing AS include those with more years of practice (≥ 10 years) and a greater patient volume [21].

The information leaflet was particularly useful in indicating AS in patients of different age ranges. According to Brito et al., the ideal patient is over 60 years old and has other comorbidities; appropriate patients are aged 18–59 years, with a strong family history of papillary thyroid carcinoma and/or with potential childbearing, and those under 18 years are inappropriate [38]. Rosario et al. suggest AS for patients over 40 years of age [39], considering that younger patients have an 8.9 % clinical progression rate, while those between 40 and 60 years old have a 3.5 % rate of progression, and those over 60 years old have the lowest rate of progression [40]. Thus, age is an important risk factor in predicting disease progression during active surveillance. Although there is no contraindication for carrying out AS in younger patients, it should be noted that they have a greater chance of disease progression, and for this reason, age must be taken into account for decision-making.

Fear of disease progression and fear of loss to follow-up were the main Brazilian doctors reported concerns regarding AS. Reading the information leaflet reduced the fear of disease progression, but not the fear of the patient losing follow-up, a factor that may be related to doctors' lack of self-confidence in this relatively new procedure that is still poorly implemented in our country. More than a quarter of the respondents confessed not feeling able to manage this patient profile. In fact, there are difficulties in accessing quality imaging exams and challenges in maintaining follow-up at the recommended frequency, especially in our public services and in rural areas. Furthermore, the low educational level of patients in these areas makes it difficult for them to understand the risks and benefits of AS [6]. This fact was also observed in Japan: 64.1 % of patients residing in the seven largest metropolitan areas in the country chose AS vs. 37 % of patients residing in other areas [26]. In this study, 17 % of doctors reported it was impossible to perform AS due to a lack of necessary infrastructure to carry out periodic assessments and necessary exams.

Our simple leaflet, with basic information on AS presented via social media, proved to be a facilitating tool for understanding and

accepting AS, modifying the perception and attitude towards AS, and alleviating fears of progression among a significant number of physicians from different specialties and different work environments. It was more impactful in younger physicians who worked in academic settings. Gender, medical specialty, age range, and academic environment were the factors that were determinants on the influence of the informative leaflet on the decision-making regarding surgical indication for PTMC.

Our results suggest that this method can be easily extended to a large population. The leaflet itself emphasizes that not all low-risk PTMC are candidates for AS, and this approach should only be undertaken by experienced medical teams in specialized services with the capacity and infrastructure to meet the recommended frequency of assessments.

However, our study has some limitations. It focused on the Southeast and Northeast regions of Brazil, and it is crucial to understand the acceptance and challenges of following up with this patient profile in other regions of the country. The geographical diversity within Brazil may introduce variations in healthcare practices, infrastructure, and patient characteristics that could impact the applicability of the study findings to other regions. Furthermore, it is important to recognize the limitations associated with the methodology. The questionnaire was administered through an online form, and as such, the integrity of the data could not be completely confirmed. The online survey format may introduce a risk of response bias, as participants might be inclined to provide answers they perceive as socially desirable or aligning with professional norms. This potential bias should be considered when interpreting the results, and future research efforts could explore alternative methods, such as in-person interviews or a combination of data collection approaches, to enhance data reliability and validity. Furthermore, we did not assess the sustainability of the leaflet effect, which requires a new questionnaire survey after a certain period of time.

In conclusion, our study demonstrated that a simple leaflet, with basic information on AS presented via social media, can be a facilitating tool for understanding and accepting AS as an alternative for PTMC, modifying the perception and attitude towards AS, and alleviating fears of progression among a significant number of physicians from different specialties and different work environments in Brazil. We believe that this method can be easily extended to a large population.

Conflicts of interest

The authors declare no conflicts of interest.

Data availability statement

The data was not deposited in a publicly available repository, but was included in the article/sup. material/referenced in the article. The data are also in RedCap® database.

CRedit authorship contribution statement

Fernanda Barbosa Duarte: Writing – review & editing, Writing – original draft, Visualization, Validation, Supervision, Software, Resources, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Fernanda Nascimento Faro:** Writing – review & editing, Writing – original draft, Visualization, Validation, Supervision, Software, Resources, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Laura Sterian Ward:** Writing – review & editing, Writing – original draft, Visualization, Validation, Supervision, Software, Resources, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Adriano Namó Cury:** Writing – review & editing, Writing – original draft, Visualization, Validation, Supervision, Software, Resources, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Carolina Ferraz:** Writing – review & editing, Writing – original draft, Visualization, Validation, Supervision, Software, Resources, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Rosália do Prado Padovani:** Writing – review & editing, Writing – original draft, Visualization, Validation, Supervision, Software, Resources, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization.

Declaration of competing interest

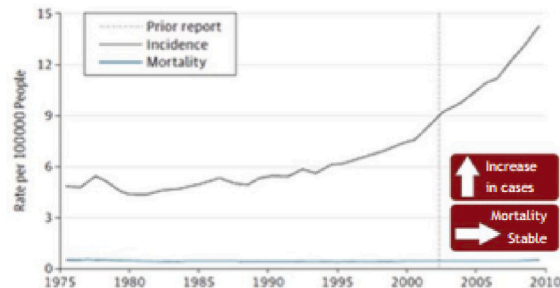
The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix A

DID YOU KNOW that the number of people with **THYROID CANCER** has been increasing significantly in recent years?

In Brazil, nearly 2,000 men and 12,000 women receive a diagnosis of thyroid cancer each year, making it the 5th most common cancer in women.

The good news is that, despite this increase in thyroid cancer cases, there has not been an increase in the number of deaths from the disease.



01 Why are we seeing more cases of thyroid cancer?

The main reason is easier access to imaging tests, such as ultrasound and tomography.

The improvement in the quality and precision of devices allows the visualization of increasingly smaller tumors.



These tumors smaller than 1 cm are called thyroid microcarcinomas. They are generally non-aggressive and tend to grow slowly without causing any problems throughout life.

02 "If my tumor is less than 1 cm and was discovered by chance, **DO I NEED TO HAVE SURGERY?**"

To answer this question, Japanese doctors began to monitor these small tumors without performing surgery.

This monitoring is called **active surveillance**. To qualify for surveillance, the nodule must meet certain criteria.

Patients must also commit to attending medical appointments and undergoing recommended tests according to medical guidance at a specified frequency.

Once active surveillance is chosen, surgery will only be recommended if the tumor grows or starts to show signs of aggressiveness during the follow-up.

03 And did it work in Japan? YES

There are already over 1,200 patients with thyroid microcarcinoma monitored for up to 20 years without surgery.

To date, there has been NO CASE of death from the disease or distant metastasis (meaning the tumor did not spread to other parts of the body in any patient).

In approximately 90% of these cases, the tumor remained stable, the same size, and showed no signs of aggressiveness.

Patients who needed surgery after a follow-up period did not experience setbacks in the progression of the disease. No patient developed metastasis or disease persistence.

In other words, the majority of patients undergoing active surveillance do not require surgery, and those who do need it fare well, even if the surgery is performed later.

04 And outside of Japan? YES

Following Japan's example, other countries have started implementing active surveillance for low-risk thyroid microcarcinoma patients.

The results have been similar to those in Japan.

Countries with active surveillance studies include: Japan, South Korea, Italy, the United States, Colombia, Argentina, and Brazil.



05 Can any patient undergo active surveillance?

No! The recommendation must be individualized, and the selection of patients should be made by the medical team.

Active surveillance should preferably be conducted by specialized doctors and services.

IN SUMMARY, how about comparing the advantages and disadvantages between active surveillance and surgery for low-risk thyroid microcarcinoma patients?

ACTIVE SURVEILLANCE	ADVANTAGES	Saves the patient from surgery and its potential risks. Spares the patient from using thyroid hormone for the rest of their life.
	DISADVANTAGES	Requires frequent medical follow-up. The patient may need surgery in the future.
SURGERY	ADVANTAGES	It is a definitive form of treatment.
	DISADVANTAGES	Risk of surgery complications, such as voice changes, hoarseness, and parathyroid injury causing temporary or permanent changes in calcium levels. When surgery removes the entire thyroid, the patient needs to take thyroid hormone for the rest of their life.

. (continued).

Table 3

Analysis of the characteristics of subgroups of doctors in relation to the factors that influence the indication of active surveillance and surgery as the first option in microcarcinomas without signs of aggressiveness.

Indication of AS before and after the leaflet												
	Pre Folder				Post Folder				Shifted Opinion (only for those who didn't indicate AS pre folder)			
	No	Yes	p-value	1/OR (IC95 %)	No	Yes	p-value	1/OR (IC95 %)	No	Yes	p-value	1/OR (IC95 %)
Age Group			0,015				<0,001				<0,001	
≤ 40 years old	187 (83 %)	38 (17 %)		2,91 (1,19 - 7,15)	130 (58 %)	95 (42 %)		4,44 (2,33 - 8,45)	129 (69 %)	58 (31 %)		5,07 (2,21 - 11,67)
> 40 years old	86 (93 %)	6 (7 %)			79 (86 %)	13 (14 %)			79 (92 %)	7 (8 %)		
Gender			0,758				0,196				0,151	
Female	186 (86 %)	31 (14 %)		1,12 (0,56 - 2,24)	138 (64 %)	79 (36 %)		1,4 (0,84 - 2,34)	137 (74 %)	49 (26 %)		1,59 (0,84 - 2,99)
Male	87 (87 %)	13 (13 %)			71 (71 %)	29 (29 %)			71 (82 %)	16 (18 %)		
Medical Specialty			1,000				0,807				1,000	
Endocrinologist	127 (88 %)	18 (12 %)		1,17 (0,37 - 3,69)	119 (82 %)	26 (18 %)		1,13 (0,43 - 2,98)	119 (94 %)	8 (6 %)		1,04 (0,21 - 5,16)
Surgeon	33 (89 %)	4 (11 %)			31 (84 %)	6 (16 %)			31 (94 %)	2 (6 %)		
Medical Specialty			0,566				0,015				0,011	
Surgeon	33 (89 %)	4 (11 %)		1,37 (0,46 - 4,09)	31 (84 %)	6 (16 %)		2,96 (1,19 - 7,34)	31 (94 %)	2 (6 %)		5,52 (1,28 - 23,72)
All Others	240 (86 %)	40 (14 %)			178 (64 %)	102 (36 %)			177 (74 %)	63 (26 %)		
Academic Work Environment*			0,058				0,014				0,052	
No	194 (89 %)	25 (11 %)		1,87 (0,97 - 3,58)	154 (70 %)	65 (30 %)		1,85 (1,13 - 3,03)	154 (79 %)	40 (21 %)		1,78 (0,99 - 3,21)
Yes	79 (81 %)	19 (19 %)			55 (56 %)	43 (44 %)			54 (68 %)	25 (32 %)		

Indication of surgery before and after leaflet												
	Pre Folder				Post Folder				Shifted opinion (only for those who indicated surgery pre folder)			
	No	Yes	p-value	1/OR (IC95 %)	No	Yes	p-value	1/OR (IC95 %)	No	Yes	p-value	1/OR (IC95 %)
Age Group			<0,001				<0,001				0,435	
≤ 40 years old	187 (83 %)	38 (17 %)		2,88 (1,67 - 4,99)	205 (91 %)	20 (9 %)		3,03 (1,55 - 5,92)	18 (47 %)	20 (53 %)		1,45 (0,57 - 3,72)
> 40 years old	58 (63 %)	34 (37 %)			71 (77 %)	21 (23 %)			13 (38 %)	21 (62 %)		
Gender			0,343				0,011				0,010	
Female	171 (79 %)	46 (21 %)		1,31 (0,75 - 2,27)	196 (90 %)	21 (10 %)		2,33 (1,2-4,54)	25 (54 %)	21 (46 %)		3,97 (1,35 - 11,7)
Male	74 (74 %)	26 (26 %)			80 (80 %)	20 (20 %)			6 (23 %)	20 (77 %)		
Medical Specialty			0,938				0,303				0,180	
Endocrinologist	97 (67 %)	48 (33 %)		0,97 (0,45 - 2,1)	117 (81 %)	28 (19 %)		1,55 (0,67 - 3,57)	20 (42 %)	28 (58 %)		3,57 (0,7-18,1)
Surgeon	25 (68 %)	12 (32 %)			27 (73 %)	10 (27 %)			2 (17 %)	10 (83 %)		
Medical Specialty			0,133				0,015				0,043	
Surgeon	220 (79 %)	60 (21 %)		1,76 (0,84 - 3,71)	249 (89 %)	31 (11 %)		2,97 (1,32 - 6,73)	29 (48 %)	31 (52 %)		4,68 (0,94 - 23,18)
All Others	25 (68 %)	12 (32 %)			27 (73 %)	10 (27 %)			2 (17 %)	10 (83 %)		
Academic Work Environment*			0,017				<0,001				0,003	
No	161 (74 %)	58 (26 %)		2,16 (1,14 - 4,1)	181 (83 %)	38 (17 %)		6,65 (2-22,1)	20 (34 %)	38 (66 %)		6,97 (1,74 - 27,88)
Yes	84 (86 %)	14 (14 %)			95 (97 %)	3 (3 %)			11 (79 %)	3 (21 %)		

* Physicians who work as Residents, specializing or whose main place of work is a University Hospital.

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