The decision-making skills of Brazilian physical therapists for patients with red flags

Capacidade da tomada de decisão dos fisioterapeutas brasileiros para pacientes com bandeiras vermelhas

Thayse Cassaniga[1], Marcelo Pandolfo[1], Débora Ewelyn Scheidt[2], Carlos Emílio Ladeira[3], Clóvis Arlindo de Sousa[2], Marcelo Anderson Bracht[1]

https://doi.org/10.5935/2595-0118.20240014-en

ABSTRACT

BACKGROUND AND OBJECTIVES: The red flags screening purpose is to ensure that signs and symptoms that raise suspicion of serious diseases are being considered during the assessment, assisting physical therapists in their clinical decision process. Brazilian physical therapists are autonomous and can act as first contact professionals in the management of musculoskeletal disorders, therefore, they need to know how to recognize, screen and refer patients with red flags for better therapeutic management. The objectives of this study were to verify whether Brazilian physical therapists can recognize and manage patients who presented red flags, compare professionals' skills regarding different academic degree levels and clinical experience and identify which factors can influence the results.

METHODS: A cross-sectional and quantitative research was conducted, collected from an online questionnaire. The target audience consisted of Brazilian physical therapists who have clinical experience in the management of patients with musculoskeletal disorders. Participants filled demographic data and made clinical decisions based on six clinical cases created by the authors, based on the literature, and reviewed by three experts. Data were analyzed using descriptive statistics, the Chi-square test of independence and logistic regression.

RESULTS: The study analyzed 384 answers from Brazilian physical therapists with clinical experience in musculoskeletal conditions. Brazilian physical therapists, in general, have not shown to be able to properly recognize and manage the clinical cases involving red flags, with 23.2% of the sample performing appropriate management for medical conditions, 53.9% for emergency conditions and 61.8% for medical conditions with associated musculoskeletal dysfunction. More years of clinical experience and post-professional education did not positively influence the outcomes. Higher academic degrees (Doctorate) can influence positively on the management of non-emergency medical conditions.

CONCLUSION: Brazilian physical therapists who work with patients with musculoskeletal disorders perform poorly in identifying red flags in hypothetical clinical cases.

Keywords: Ambulatory care, Decision making, Differential diagnosis, Primary Health Care, Referral and consultation.

RESUMO

JUSTIFICATIVA E OBJETIVOS: O objetivo da triagem de bandeiras vermelhas é garantir que sinais e sintomas que levantam suspeitas de doenças graves sejam considerados durante a avaliação, auxiliando os fisioterapeutas no seu processo de decisão clínica. Os fisioterapeutas brasileiros são autônomos e podem atuar como profissionais de primeiro contato no manejo de distúrbios musculoesqueléticos, portanto, precisam saber reconhecer, rastrear e encaminhar pacientes com bandeiras vermelhas para melhor manejo terapêutico. Os objetivos deste estudo foram verificar se os fisioterapeutas brasileiros conseguem reconhecer e tratar pacientes que apresentavam bandeiras vermelhas, comparar as habilidades dos profissionais com diferentes níveis de formação acadêmica e experiência clínica e identificar quais fatores podem influenciar os resultados.

Thayse Cassaniga – https://orcid.org/0000-0002-6303-9506;
Marcelo Pandolfo – https://orcid.org/0000-0002-8309-7957;
Débora Ewelyn Scheidt – https://orcid.org/0000-0002-8554-2954;
Carlos Emílio Ladeira – https://orcid.org/0000-0003-2887-962X
Clóvis Arlindo de Sousa – https://orcid.org/0000-0001-5049-5345;
Marcelo Anderson Bracht – https://orcid.org/0000-0002-0611-6106.

1. Blumenau Regional University, Department of Physical Therapy, Blumenau, SC, Brazil.
2. Blumenau Regional University, Postgraduate Program in Collective Health, Blumenau, SC, Brazil.
3. Nova Southeastern University, Department of Physical Therapy, Fort Lauderdale, Florida, United States of America.

Submitted on May 19, 2023.
Accepted for publication on January 17, 2024.
Conflict of interests: none – Sponsoring sources: none

HIGHLIGHTS

- Brazilian physical therapists have limitations in screening patients with red flags in outpatient clinics, which may be a limitation in clinical practice in primary care.
- Having more clinical experience and having postprofessional education in orthopedic or sports physical therapy do not positively influence the correct management of red flag conditions.
- A higher academic degree level can influence positively on the management of non-emergency medical conditions.

Associate editor in charge: Thais Cristina Chaves
https://orcid.org/0000-0002-6222-4961

Correspondence to:
Marcelo Anderson Bracht
E-mail: mbracht@furb.br

MÉTODOS: Uma pesquisa transversal e quantitativa foi realizada, coletada através de um questionário online. O público-alvo consistiu em fisioterapeutas brasileiros com experiência clínica no manejo de pacientes com disfunções musculoesqueléticas. Os participantes preencheram dados demográficos e tomaram decisões clínicas com base em seis casos clínicos criados pelos autores, com base na literatura, e revisados por três especialistas. Os dados foram analisados por estatísticas descritivas, pelo teste qui-quadrado de independência e por regressão logística.
RESULTADOS: Foram analisadas 384 respostas de fisioterapeutas brasileiros com experiência clínica em disfunções musculoesqueléticas. Os fisioterapeutas brasileiros, em geral, não demonstraram ser capazes de reconhecer e manejar adequadamente os casos clínicos que envolvem bandeiras vermelhas, com 23,2% da amostra realizando manejo adequado para condições médicas, 53,9% para condições de emergência e 61,8% para condições médicas com disfunção musculoesquelética associada. Mais anos de experiência clínica e educação pós-profissional não influenciaram positivamente os resultados. Graus acadêmicos mais elevados (Doutorado) podem influenciar positivamente no manejo de condições médicas não emergenciais.
CONCLUSÃO: Fisioterapeutas brasileiros que atuam com pacientes com disfunções musculoesqueléticas apresentam um mau desempenho na identificação de bandeiras vermelhas em casos clínicos hipotéticos.
Descritores: Assistência ambulatorial, Atenção primária à Saúde, Diagnóstico diferencial. Encaminhamento e consulta, Tomada de decisões.

INTRODUCTION

Red flags are defined as signs and symptoms that raise suspicion of some serious disease[1]. The purpose of red flag screening is to ensure that serious diseases are being considered during the assessment, so that these findings assist the physical therapist in making a clinical decision between providing care or referring to the appropriate professional[2]. The use of red flags should not replace clinical judgment and reasoning, but instead be used as an adjunct to the clinical decision-making process[3].
In Brazil, physical therapists have a 4 to 5-year bachelor's degree, with a minimum of 4,000 course hours, where they receive their academic and clinical training. They are autonomous professionals who can act as first contact professionals in the care of patients with musculoskeletal disorders. Therefore, it is necessary to know how to recognize, screen and refer patients with red flags for better therapeutic management[4,5]. More specifically, physical therapists working in the direct access system should be able to screen patients with disorders that require immediate medical attention (e.g. appendicitis, acute myocardial infarction) from patients who require medical appointment without physical therapy intervention (e.g. right shoulder pain with suspected liver disease, left lower back pain with suspected diverticulitis), or even patients who may need medical appointment associated with physical therapy intervention (e.g. patient with foot pain and suspected gout, patient with finger pain and suspected hyperparathyroidism)[6].
Previous studies have addressed the issue of physical therapists' knowledge in recognizing red flags and referring patients with these alerts for medical evaluation[3,7-9]. For example, a cross-sectional study found, from clinical cases, that physical therapists with orthopedic expertise were almost twice as likely to make correct clinical decisions for critical medical conditions or musculoskeletal conditions[9].
In Brazil, however, only one research was carried out that explored the screening and management of patients with red flags by physical therapists[10]. This cross-sectional study, which had as a secondary objective to determine whether physical therapists were able to recognize differential diagnoses of low back pain associated with yellow or red flags, indicated that participants were more likely to identify differential diagnoses related to yellow flags versus red flags[10].
Therefore, the objectives of this study were to identify whether Brazilian physical therapists could recognize and manage patients who had red flags for musculoskeletal disorders in out-patient clinics, as well as to compare the skills of professionals with different academic degree levels and clinical experience in this management. The hypothesis is that physical therapists who have higher academic degree levels and more clinical experience would have a better performance in identifying and managing patients with red flags.

METHODS

This study was a cross-sectional survey of Brazilian physical therapists. The study project was approved by the Human Research Ethics Committee (protocol number: CAAE 25995319.1.0000.5370).
On February 3, 2020, the instrument was evaluated by five physical therapists via email, comprehension and coherence were tested. Data collection started on March 16 and May 11, 2020. Data was collected online using the Google Forms® tool, with a self-applied and closed questionnaire, translated and adapted from previous research[9-13]. The completion of the questionnaire only started after the participant's acceptance. It consisted of ten demographic questions (related to age, gender, professional training and clinical experience) and six clinical scenarios based on cases described in the literature[14]. Based on each clinical case, the respondent was instructed to choose only one of the following alternatives as the most appropriate decision making: (a) refer the patient for immediate care; (b) refer the patient for medical appointment without physical therapy intervention; (c) provide physical therapy intervention and refer for medical appointment or (d) provide physical therapy intervention without referring for medical appointment. Three physical therapy experts reviewed the clinical decisions for each case as previously described in the literature[10,12,13]. A brief description of the clinical cases, as well as their adequate management, are shown in table 2. Further information about each clinical case can be found in the Appendix 1.

Participants

The study universe consisted of all 288.585 Brazilian physiotherapists, graduated, and registered at the Physical Therapy Registration Boards of the Brazilian states (CREFITO)[15]. The target audience consisted of physical therapists who have clinical experience in the management of patients with musculoskeletal disorders. Professionals could work on three spheres of care: primary, secondary or tertiary. The sample was estimated by sample calculation in 384 individuals (error margin of ±5% and confidence interval of 95%).

The inclusion criteria were: having a degree in physiotherapy, working in Brazil and being registered at CREFITO, with no minimal years of clinical experience. Exclusion criteria were: duplicate responses and invalid CREFITO registration numbers.

The participants were gathered through a series of campaigns on social media platforms (Instagram®, Facebook® and Linkedin®), containing a briefing on the study's objectives and a link to the questionnaire.

Variables

The main outcome analyzed was the number of correct answers for each question. Previous studies brought as predictors of correct clinical management the covariates of clinical experience, outpatient practice profile, high number of daily patients (≥15) and post professional education[12,16,17], therefore, for the present study, as confounding factors, the following were considered: academic degree level, post professional education and years of clinical experience.

Statistical analysis

The sample's demographic characteristics were presented in a table, using descriptive statistics for age, gender, academic degree level, post professional education, work environment and number of patients seen weekly. To fulfill the first objective, descriptive statistics were used for the total number of correct answers in the questionnaire sample (percentage), which were compared and discussed based on the existing literature.

For the analysis of the second objective, related to the association between rate of correct answers per question (outcome variable) and the years of experience, academic degree level and postprofessional education in orthopedic and sports physical therapy (dependent variables), the Chi-square test of independence (Pearson's Chi-square) was performed, with 0.05 as the significance level. The main outcome was grouped as a dichotomous variable (correct or incorrect answers). The data referring to years of clinical experience was empirically grouped into four intervals of 5 years of experience, for a more homogeneous distribution of information. Information on academic degree levels was divided into 3 groups (bachelor's degree, master's degree, and doctoral degree). Data related to postprofessional education was transformed into a dichotomous variable, grouping postgraduate and specialist titles in orthopedic and sports physiotherapy.

The odds ratio (OR) and the 95% confidence interval between the number of correct answers for each question and the independent variables years of experience, academic degree level and postprofessional education were estimated with crude and adjusted analyses by using logistic regression. A p value ≤ 0.05 was considered significant. The Statistical Package for Social Sciences (SPSS) 23 software for Windows was used.

RESULTS

In the period between March 16 and May 11, 2020, 391 responses were obtained, of which 7 responses were excluded, 4 for duplicate response (same CREFITO registration number) and 3 for invalid CREFITO registration numbers.

Table 1 presents the demographic characteristics of the sample. In relation to postprofessional education, for research purposes, only postgraduate degrees and specialist titles in areas related to orthopedic and/or sports physical therapy recognized by the Brazilian Federal Registration Board (COFFITO - *Conselho Federal de Fisioterapia*) were considered. As a result, a total of 150 people was classified as having postprofessional education in related areas.

Table 1. Demographic characteristics of the sample

Characteristics	Total	
	n	%
Age, mean (SD)	32.30	±7.60
Gender, male/female	180/204	46.87%/53.12%
Graduation year, mean (SD)	2011	±6.83
Years of clinical experience, mean (SD)	7.66	±6.46
Academic degree level		
Bachelor degree	321	83.59%
Master's degree	50	13.02%
Doctoral degree	13	3.38%
Postprofessional education*, yes/no	150/234	39.06%/60.93%
Orthopedics clinical experience, yes/no	366/18	95.31%/4.68%
Job configuration		
Outpatient	354	92.18%
Inpatient	35	9.11%
Teaching	46	11.97%
Others	33	8.59%
Frequency of patients per week		
10 or less	75	19.53%
Between 11 and 20	95	24.73%
Between 21 and 30	80	20.83%
Between 31 and 40	50	13.02%
41 or more	72	18.75%
Academic area	12	3.12%
Job configuration (MS patients)		
Between 0% and 25%	18	4.68%
Between 26% and 50%	33	8.59%
Between 51% and 75%	94	24.47%
Between 76% and 100%	232	60.41%
Academic area	7	1.82%

% = percentage related to the overall sample; SD = standard deviation; MS = musculoskeletal; *In related areas: orthopedics and sports physical therapy; Job configuration (MS patients), proportion of patients with musculoskeletal disorders of professionals who responded to the survey.

Table 2 shows a simplified description for each clinical scenario, as well as the referral considered adequate and the percentage of correct management. For the general population of the sample, the mean number of appropriate referrals was 3.1±1.4. To help analyze the data in relation to the sample in general, the six clinical cases were separated into three levels of complexity. In clinical cases related to non-critical medical conditions with musculoskeletal involvement (scenarios 2 and 6), participants made correct clinical management decisions 61.85% of the time, while for non-critical medical conditions (scenario 1), participants took correct decisions 23.20% of the time and, for emergency medical conditions (scenarios 3, 4 and 5), participants made correct clinical management decisions 53.99% of the time. Additionally, for emergency medical conditions, there was high rate of referrals for medical services of any complexity, emergency or not (98.17%, 92.97% and 94.53%, respectively). Of these, however, 14.84%, 25.78% and 15.88%, respectively, would undergo physical therapy intervention associated with medical referral despite the red flags indicating a serious condition.

Table 3 presents the number of appropriate and inappropriate answers for each clinical scenario according to the academic degree level, postprofessional education in orthopedics and/or sports physical therapy and years of experience of the participants. When analyzing these characteristics using the chi-square test of independence, it was observed that there is an association only between the first clinical scenario and the academic degree level [$X^2(1) = 8.237$; $p \leq 0.016$], which means that having a higher academic degree level (Doctoral degree) was significant for better management. For the other clinical cases, however, there was no significant association ($p > 0.05$). When evaluating the association between the presence or absence of postprofessional education in orthopedics and/or sports physical therapy

Table 2. Appropriate decision making for each clinical scenario.

Clinical Scenario	Brief Case Description	Adequate Response	Adequate Managements
Scenario 1	Hepatic dysfunction causing non-MS right shoulder pain	Refer to medical care without PT intervention	23.2%
Scenario 2	Lateral MS elbow pain and gastrointestinal dysfunction	Refer to medical care and provide PT intervention	58.9%
Scenario 3	Renal disorder causing LBP	Refer to emergency care	53.1%
Scenario 4	Stroke mimicking cervicogenic headache	Refer to emergency care	46.4%
Scenario 5	Appendicitis mimicking hip muscle injury	Refer to emergency care	62.5%
Scenario 6	Plantar fasciitis and signs of unstable diabetes	Refer to medical care and provide PT intervention	64.8%

MS = musculoskeletal; LBP = low back pain; PT = physical therapy.

Table 3 – Influence of the studied variables on the answers of the cases

Variables		Academic degree level				Postprofessional education*			Years of experience					
		Bachelor's n (%)	Master's n (%)	Doctoral n (%)	X² Statistic Z/p	No n (%)	Yes n (%)	X² Statistic Z/p	≤ 4 n (%)	5 to 9 n (%)	10 to 15 n (%)	≥ 15 n (%)	X² Statistic Z/p	Total n (%)
Case 1	Correct	68 (21.2)	14 (28.0)	7 (53.8)	8.237/0.016 †	53 (22.6)	36 (24.0)	0.094/0.760 †	37 (22.3)	22 (24.2)	13 (21.3)	17 (25.8)	0.491/0.921 †	89 (23.2)
	Incorrect	253 (78.8)	36 (72.0)	6 (46.2)		181 (77.4)	114 (76.0)		129 (77.7)	69 (75.8)	48 (78.7)	49 (74.2)		295 (76.8)
Case 2	Correct	191 (59.5)	26 (52.0)	9 (69.2)	1.604/0.449 †	143 (61.1)	67 (44.7)	1.260/0.262 †	109 (65.7)	53 (58.2)	31 (50.8)	33 (50.0)	6.954/0.073 †	226 (58.9)
	Incorrect	130 (40.5)	24 (48.0)	4 (30.8)		91 (38.9)	83 (55.3)		57 (34.3)	38 (41.8)	30 (41.8)	33 (50.0)		158 (41.1)
Case 3	Correct	170 (53.0)	26 (52.0)	8 (61.5)	0.032/0.819 †	122 (52.1)	82 (54.7)	0.235/0.628 †	85 (51.2)	49 (53.8)	33 (54.1)	37 (56.1)	0.516/0.915 †	204 (53.1)
	Incorrect	151 (47.0)	24 (48.0)	5 (38.5)		112 (47.9)	68 (45.3)		81 (48.8)	42 (46.2)	28 (45.9)	29 (43.9)		180 (46.9)
Case 4	Correct	146 (45.5)	26 (52.0)	6 (46.2)	0.739/0.691 †	111 (47.4)	67 (44.7)	0.282/0.595 †	73 (44.0)	39 (42.9)	30 (49.2)	36 (54.5)	2.802/0.423 †	178 (46.4)
	Incorrect	175 (54.5)	24 (48.0)	7 (53.8)		123 (52.6)	83 (55.3)		93 (56.0)	52 (57.1)	31 (50.8)	30 (45.5)		206 (53.6)
Case 5	Correct	200 (62.3)	32 (64.0)	8 (61.5)	0.058/0.971 †	143 (61.1)	97 (64.7)	0.493/0.483 †	101 (60.8)	54 (59.3)	42 (68.9)	43 (65.2)	1.830/0.608 †	240 (62.5)
	Incorrect	121 (37.7)	18 (36.0)	5 (38.5)		91 (38.9)	53 (35.3)		65 (39.2)	37 (40.7)	19 (31.1)	23 (34.8)		144 (37.5)
Case 6	Correct	208 (64.8)	31 (62.0)	10 (76.9)	1.010/0.604 †	151 (64.5)	98 (65.3)	0.026/0.872 †	102 (61.4)	63 (69.2)	40 (65.6)	44 (66.7)	1.719/0.633 †	249 (64.8)
	Incorrect	113 (35.2)	19 (38.0)	3 (23.1)		83 (35.5)	52 (34.7)		64 (38.6)	28 (30.8)	21 (34.4)	22 (33.2)		135 (35.2)

n, count of individuals included in this association, with their respective percentage. X^2 Statistic, Chi-square test. Z, Result of Chi-square test. † Statistical significance $p<0.05$

* related to orthopedics and sports physical therapy

with the responses of the six cases, the Chi-square test of independence showed that there is no significant association between these variables (p>0.05). Additionally, no significant association between the years of experience and the responses of the six clinical cases (p>0.05) was found.

Table 4 shows the logistic regression between correct answers adjusted by the professionals' characteristics. The first clinical scenario remains statistically significant for doctoral academic level, independent of age, gender and other professional characteristics.

DISCUSSION

This is the first study to be carried out with Brazilian physical therapists working with musculoskeletal patients whose main objective was to explore the skills to recognize and manage patients with red flags. Overall, the sample population had a low rate of appropriate referrals (51.48% ± 15.37%) when compared to Swiss (67.1%)[18], American (79%, 67.7% and 73.3%)[9,19,20] and German physical therapists (53.3%)[21], which demonstrates

Table 4. Logistic regression between correct answers, adjusted by professional's characteristics.

Cases	Variables	OR	CI (95%)	p-value**
Case 1	Academic degree level			
	Bachelor degree	1		
	Master's degree	1.50	(0.53 - 1.97)	0.260
	Doctoral degree	4.84	(1.50 - 15.64)	0.008
	Years of experience			
	≤ 4	1		
	5 to 9	1.02	(0.53 - 1.97)	0.95
	10 to 15	0.84	(0.34 - 2.07)	0.70
	≥ 15	1.1	(0.37 - 3.27)	0.86
	Postprofessional education*			
	No	1		
	Yes	1.01	(0.61 - 1.68)	0.957
Case 2	Academic degree level			
	Bachelor degree	1		
	Master's degree	0.96	(0.50 - 1.85)	0.902
	Doctoral degree	2.21	(0.63 - 7.77)	0.216
	Years of experience			
	≤ 4	1		
	5 to 9	0.74	(0.41 - 1.33)	0.310
	10 to 15	0.53	(0.25 - 1.11)	0.092
	≥ 15	0.55	(0.21 - 1.43)	0.220
	Postprofessional education*			
	No	1		
	Yes	0.92	(0.59 - 1.43)	0.710
Case 3	Academic degree level			
	Bachelor degree	1		
	Master's degree	0.93	(0.50 - 1.75)	0.825
	Doctoral degree	1.42	(0.45 - 4.48)	0.546
	Years of experience			
	≤ 4	1		
	5 to 9	1.14	(0.65 - 2.02)	0.643
	10 to 15	1.19	(0.57 - 2.48)	0.637
	≥ 15	1.47	(0.58 - 3.73)	0.414
	Postprofessional education*			
	No	1		
	Yes	1.12	(0.72 - 1.72)	0.62
Case 4	Academic degree level			
	Bachelor degree	1		
	Master's degree	1.22	(0.65 - 2.30)	0.542
	Doctoral degree	0.84	(0.25 - 2.79)	0.769
	Years of experience			
	≤ 4	1		
	5 to 9	0.90	(0.51 - 1.59)	0.711
	10 to 15	1.02	(0.49 - 2.10)	0.963
	≥ 15	1.13	(0.44 - 2.93)	0.804
	Postprofessional education*			
	No	1		
	Yes	0.85	(0.55 - 1.31)	0.47
Case 5	Academic degree level			
	Bachelor degree	1		
	Master's degree	1.00	(0.52 - 1.90)	0.992
	Doctoral degree	1.06	(0.32 - 3.47)	0.923
	Years of experience			
	≤ 4	1		
	5 to 9	1.07	(0.60 - 1.92)	0.813
	10 to 15	1.92	(0.89 - 4.15)	0.098
	≥ 15	2.17	(0.85 - 5.51)	0.105
	Postprofessional education*			
	No	1		
	Yes	1.21	(0.78 - 1.89)	0.399
Case 6	Academic degree level			
	Bachelor degree	1		
	Master's degree	0.84	(0.44 - 1.62)	0.611
	Doctoral degree	1.58	(0.40 - 6.20)	0.510
	Years of experience			
	≤ 4	1		
	5 to 9	1.38	(0.77 - 2.46)	0.277
	10 to 15	1.11	(0.52 - 2.37)	0.784
	≥ 15	1.16	(0.46 - 2.98)	0.751
	Postprofessional education*			
	No	1		
	Yes	0.98	(0.63 - 1.53)	0.924

OR = odds ratio; CI = Confidence Interval; p value = Statistical significance ≤0.05; * related to orthopedics and sports physical therapy; ** adjusted for gender, age and independent variables (academic degree level, years of experience, postprofessional education).

a clear deficiency in the education of Brazilian physical therapists to act in first contact.

The present study's data showed that approximately 46% of the sample did not correctly refer the three patients in need of emergency care. This is of great concern, as it indicates that a significant part of the physical therapists did not know how to identify red flags, differentiate signs and symptoms of systemic origin from musculoskeletal conditions, or have adequate clinical reasoning according to the evaluation findings. However, the present study's results were noticeably superior to the findings of another similar study carried out in Brazil, in which few physical therapists (24.8%), even with a high level of expertise in orthopedic physical therapy, were able to correctly handle a clinical case of red flags for low back pain[10].

Possibly, the first clinical case had the lowest rate of correct management (23.2%) due to the sample's lack of knowledge about the mechanisms of visceral disorder that can trigger shoulder pain, which are multisegmental innervation and put direct pressure on the diaphragm. Connections of the sympathetic fibers of the biliary system with the celiac and splenic plexuses synapse with adjacent phrenic nerve fibers can produce referred pain in the right shoulder. An irritation of the diaphragm by pressure from the liver can refer sharp pain to the right shoulder, since the shoulder is innervated by the same spinal nerves that innervate the diaphragm[14]. Thus, it is important that individuals with shoulder pain are screened for possible visceral pain involvement[14]. This mechanism is not mentioned in decision-making instruments for shoulder pain in primary care[22], which, combined with other factors, may contribute to the population's lack of knowledge on the subject. This was the only case in which having a higher academic degree level was significant for better management, which may be due to the greater complexity of the condition.

As far as it is known, the present study was the only one carried out in Brazil to report the relevance of the academic degree level for the correct clinical management of cases with red flags. This was also the subject of a previous study[19], which failed to find this association with final year clinical doctoral students in physical therapy (DPT). One more study[23] also aimed to evaluate the skills of third-year DPT students to identify and adequately treat red and yellow flags through clinical cases. Participants in this research had greater success in managing patients with red flags, following the recommendations of clinical practice guides in 85.19% of responses. They justify that this good performance is because there is an emphasis on clinical reasoning instruction for these students in the evaluation and diagnosis process.

The present study calls into question whether this issue is being addressed in post-graduation courses programs or advanced academic degree levels in Brazil, given that there was worse results in clinical scenarios with medical emergencies. In cases of need for emergency referral in the present study, it is likely that the participants did not pay attention to classic signs that, combined with other symptoms, deserve greater attention or referral to other professionals, such as changes in pulse, temperature and blood pressure[14,23].

When the clinical cases were separated into three degrees of complexity (emergency, non-emergency and non-emergency medical cases with musculoskeletal demand), a previous study[9] found that participants made a correct management decision in 87.3% of musculoskeletal cases, 87.8% for non-critical medical cases, and 79% for critical medical conditions. The present study's results corroborate such findings regarding performance on questions with musculoskeletal complaints, in which physical therapists made correct decisions more often in the management of hypothetical patients with musculoskeletal problems and were less frequently correct in making decisions that required medical referral.

Although physical therapists identified the presence of red flags for medical conditions, seen by the high rate of medical referral, they were not able to differentiate signs and symptoms that require emergency referral. In addition, a considerable portion would perform Physical Therapy care in these patients. This is worrying, as the lack of awareness of the severity of the problem exposes both the patient and the physical therapist to potentially serious risks. However, the present results showed higher rates of referrals or additional PT interventions than a previous study[5], in which 93.4% of physical therapists would refer the patient to a physician and 43.9% of these would provide intervention in addition to the referral.

Regarding the postprofessional education and years of clinical experience variables, no statistical difference was found in all clinical cases studied. Three studies carried out with American physical therapists were able to find a greater probability of correct management (approximately 2 times greater) when the individual had a specialization in orthopedic or sports physical therapy[5,9,24]. Another study found that physical therapists with 20 years or more of clinical experience were 3.98 (95% CI 1.03, 15.4) times more likely to correctly refer a patient who had no improvement in symptoms after 30 days of conservative treatment compared to clinicians with less than 10 years of experience[16]. The multifactorial presentation and the complex integration of signs and symptoms presented in the scenarios could lead to experience years not always being a positive factor in the decision making process[25,26].

Possible strategies to improve the recognition of red flags include expanding the discussion on the topic throughout the undergraduate course by inserting it into specific disciplines, as well as creating continuing education programs so professionals who are outside of college can update their knowledge. Constant professional updating based on guidelines can also improve the ability of Brazilian physical therapists to recognize red flags and consequently improve professional care in primary care. In a review of clinical practice guidelines focused on low back pain[27], clinical implications were reported. Of the 16 guidelines found, all made recommendations for referral to a specialist. Among the conditions, recommendations were found for suspected cancer, infection, cauda equina syndrome, spondyloarthritis, spinal fracture, referred pain of visceral origin and abdominal aortic aneurysm. In addition

to the guidelines for conditions commonly found in the physical therapist's routine practice, there are other more specific guidelines to help the professional to have a rationale for differential diagnoses and clinical decision making, such as the guideline from the International Federation of Orthopedic Manual Physiotherapists[1].

Finally, the development of review-of-systems screening tools to be used by physical therapists can also favor professional practice in a direct access setting, such as the Optimal Screening for Prediction of Referral and Outcome (OSPRO)[2] to screen for red and yellow flags in orthopedic physiotherapy care settings. In this way, there are several ways in which the profession can strengthen and update itself to have greater security in the demand of patients with musculoskeletal disorders who are assisted by direct access. Through clinical reasoning of risk factors, history and physical examination, physical therapists should proceed with careful evaluation of the findings in order to determine if a red flag finding is indeed present that warrants referral, giving that a lot of situations give false-positive red flags[28].

The data contained in the present study showed a lack of prepare of Brazilian physical therapists to properly screen and manage patients with red flags. This may be due to Brazilian higher education institutions and postprofessional education programs not preparing professionals correctly. Other studies, however, demonstrate that the deficit is not exclusive to Brazilian physical therapists and affects other nationalities, to a lesser or equal magnitude.

The present sample of Brazilian physical therapists has not shown capacity to properly recognize and manage clinical cases involving red flags. Having more clinical experience and having postprofessional education in orthopedic or sports physical therapy did not positively influence the correct management of red flag conditions. A higher academic degree level can influence positively on the management of non-emergency medical conditions[29].

LIMITATIONS OF STUDY

The way in which participants were reached (through social media) may have biased the study findings, screening a specific subgroup of physical therapist. Thus, the study may not have reached the desired sample of professionals specialized in the areas of interest - orthopedics and sports. Due to limitations in the construction of the questionnaire, it was also not possible to determine the country region of the professionals.

CONCLUSION

Based on these findings, Brazilian physical therapists have limitations in screening patients with red flags in outpatient clinics, which may be a limitation in clinical practice in primary care. Therefore, strategies are needed to change this situation (e.g. postprofessional education programs, change in undergraduate and specialization curricula, guidelines for evaluation and screening for red flags).

Future research could develop a better way to filter the type of postprofessional education, to reach the target audience with greater precision. In addition, future studies should collect and use the region of the country as a variable to verify if there are regional differences in the training of physical therapists. Finally, it is possible to extend the research to other areas of physical therapy.

APPENDIX 1. DETAILED DESCRIPTION OF CLINICAL SCENARIOS

Clinical scenario 1: The patient is a 35-year-old Caucasian female presenting right shoulder pain. She comes to see a physical therapist through direct access. She has not seen a physician in over six months. The patient plays 90 minutes of evening tennis and then eats chicken wings with friends 3 times per week. Right shoulder pain comes on 2 hours after she plays tennis, and the pain gets better 5 hours after she stops playing tennis. Review of system shows that she has had belching, nausea, and vomiting twice in the last 2 weeks. Past Medical History: high cholesterol. Drugs: Lipitor.

Vitals: BP 120/80 mmHg, Pulse 70. Temperature: 99 °F. Active shoulder flexion and abduction were both slightly restricted at end-range (5 degrees) with pain in the right rib cage. Passive glenohumeral ROM was within normal limits. Resisted right shoulder isometric muscle testing was painful and strong into abduction, flexion, extension, internal and external rotation, but it did not reproduce the patient's symptoms. Tenderness was noted bilaterally on the supraspinatus tendon. Abdominal screening: tenderness on palpation was noted on the right upper abdominal quadrant and reproduced right shoulder pain, but no rebound tenderness was noted.

Clinical scenario 2: The patient is a 31-year-old Caucasian female. She comes to physical therapy through direct access with insidious left lateral elbow pain that increases with her work duties. She has not seen a physician in over 12 months. She reports her left elbow pain has become progressively worse in the last 3 months. She reports gripping activities with left hand and even writing or holding a cup of coffee hurts. Past Medical History: generalized anxiety disorder and depression. Drugs: Prozac and Xanax. Review of systems: she has had new episodes of abdominal pain, bloating, and nausea in the last 4 weeks.

Physical examination: Vitals: BP 115/75 mmHg, pulse 70, temperature: 98.5°F. Resisted isometric wrist extension reproduced left elbow pain. Simultaneous elbow extension and pronation with wrist flexion reproduced left elbow pain. Tenderness on palpation noted on the left lateral epicondyle. Abdominal screening: tenderness noted on the left abdominal quadrant, but no rebound tenderness noted.

Clinical scenario 3: The patient is a 43-year-old female self-referred to a physical therapy clinic with insidious onset of low back pain and left flank pain. She has not seen a physician in over six months. She has had these symptoms for 2 weeks. She cannot identify activities that worsen or improve her symptoms. The patient describes the pain as dull and cons-

tant. She sits all day. The patient pain does not radiate to the legs, it is located on the left side of the back between the left 9th rib and the left iliac crest. Drugs: birth control pills and Ibuprofen. Review of systems: she has felt burning sensation during urination for the last week and her urine color has turned cloudy and whitish in the last two days.
Physical examination: Vitals: BP: 140/90 mmHg, temperature 101°F, pulse 80 bpm. Restricted back range of motion (left rotation and left side-flexion). With the patient in prone, posterior-anterior pressure (spring test) applied over the left lower rib cage reproduced left low back and left flank pain. Costovertebral tenderness is present on the left lower rib cage from ribs 9 to 12.
Clinical scenario 4: The patient is a 53-year-old Asian-American male whose chief complaint is right retro-orbital headache. He comes to see a physical therapist through direct access. He has not seen a physician in over six months. He was treated previously for cervicogenic headache successfully with manual therapy. He can't relate any physical trauma to the onset of the headache. The headache started suddenly two days ago. The headache was a mild ache at first, then, it built up to become a severe pain within hours of the onset. The severe pain was constant, but it had not worsened over the last two days. Sunlight increased his symptoms and sunglasses helped to reduce it. The patient could not relate his symptoms to neck movements or posture. Previous medical history: hypertension.
Physical examination: slouching posture with a forward head and rounded shoulders when seated, neck Range of Motion was full and pain free, Temporomandibular Joint opened equally on both sides, upper extremity neurological screening was normal, tight pectoral muscles and weak scapular retractors, restricted atlanto-occipital flexion and bilaterally restricted atlanto-axial rotation, tenderness over the suboccipital muscles bilaterally (right worse than left). Palpation did not reproduce his symptoms. Cranial nerve testing showed that the right pupil was dilated, no response to pocket flashlight, patient's right visual field was diminished. Review of systems: no constitutional symptoms reported.
Clinical scenario 5: The patient is a 22-year-old male track and field athlete self-referred to physical therapy. He has not seen a physician in over 12 months. The patient is a specialist in the hurdles and has recently increased his training regimen. The patient believes he hurt his abdominal or right hip muscles. The patient reports sudden severe pain in the right lower abdominal quadrant post training/practice 2 days prior to the examination. He also reports that reaching, sit ups, fast walking, turning and bending worsen his symptoms. The patient also reports right groin pain. Review of system: complaints of right abdominal distention/swelling and vomiting in the last 24 hours.
Physical examination: Vitals: BP 130/85 mm HG, pulse 80, temperature (101°F). Pain with resisted isometric muscle testing for right hip flexors. Active and passive hip range of motion testing reproduced right hip and abdominal pain. Abdominal screening exam: tenderness on palpation and rebound tenderness noted on the right lower abdominal quadrant.
Clinical scenario 6: The patient is a 50-year-old obese Hispanic male self-referred to a physical therapy clinic with right heel pain. He has not seen a physician in over 12 months. The patient reports he has had heel pain for the past 3 weeks. He cannot explain how his symptoms started. Heel pain is worse in the morning when he wakes up. Heel pain worsens with prolonged standing and walking. He wears flat shoes. Previous medical history: hypertension, two urinary tract infections in the last 9 months. Review of systems: he reports dry mouth, increased urination, and increased thirst in the last 4 weeks.
Physical examination: Vitals: BP 135/85 mmHg, pulse 80, temperature: 98.5°F. Inspection: patient had supinated feet, opaque white nail beds, and decreased feet sensation in a glove like pattern bilaterally. Metatarsophalangeal joints had limited dorsiflexion 45 degrees bilaterally (with reproduction of heel pain on the right). Big toe metatarsophalangeal accessory motion restricted bilaterally. Tenderness on palpation was noted with reproduction of heel pain on the right medial tuberosity of the calcaneus.

AUTHORS' CONTRIBUTIONS

Thayse Cassaniga
Statistical Analysis, Data Collection, Conceptualization, Research, Methodology, Writing - Preparation of the original, Writing - Review and Editing
Marcelo Pandolfo
Statistical Analysis, Data Collection, Conceptualization, Research, Methodology, Writing - Preparation of the original, Writing - Review and Editing
Débora Ewelyn Scheidt
Statistical Analysis, Methodology, Writing - Review and Editing
Carlos Emílio Ladeira
Statistical Analysis, Conceptualization, Research, Methodology, Writing - Preparation of the original, Writing - Review and Editing, Supervision
Clóvis Arlindo de Sousa
Statistical Analysis, Project Management, Methodology, Writing - Review and Editing, Supervision
Marcelo Anderson Bracht
Statistical Analysis, Conceptualization, Project Management, Methodology, Writing - Preparation of the original, Writing - Review and Editing, Supervision

REFERENCES

1. Finucane LM, Downie A, Mercer C, Greenhalgh SM, Boissonnault WG, Pool-Goudzwaard AL, Beneciuk JM, Leech RL, Selfe J. International Framework for Red Flags for potential serious spinal pathologies. J Orthop Sports Phys Ther. 2020;50(7):350-72.
2. George SZ, Beneciuk JM, Bialosky JE, Lentz TA, Zeppieri G Jr, Pei Q, Wu SS. development of a review-of-systems screening tool for orthopaedic physical therapists: results from the Optimal Screening for Prediction of Referral and Outcome (OSPRO) Cohort. J Orthop Sports Phys Ther. 2015l;45(7):512-26.
3. Ferguson F, Holdsworth L, Rafferty D. Low back pain and physiotherapy use of red flags: the evidence from Scotland. Physiotherapy. 2010;96(4):282-8.
4. Conselho Regional de Fisioterapia e Terapia Ocupacional da 5ª Região (CREFITO-5). Manual de Especialidades da Fisioterapia. http://www.crefito5.org.br/wp-content/uploads/2017/08/Manual-Especialidades-Online.pdf/; 2020 Accessed 1 June 2020.

5. Ladeira CE. Physical therapy clinical specialization and management of red and yellow flags in patients with low back pain in the United States. J Man Manip Ther. 2018;26(2):66-77.
6. American Physical Therapy Association (APTA). Guide to Physical Therapy Practice 3.0. http://guidetoptpractice.apta.org/content/1/SEC1.body/; 2014 Accessed 29 September 2019.
7. Boissonnault WG, Ross MD. Physical therapists referring patients to physicians: a review of case reports and series. J Orthop Sports Phys Ther. 2012;42(5):446-54.
8. Leerar PJ, Boissonnault W, Domholdt E, Roddey T. Documentation of red flags by physical therapists for patients with low back pain. J Man Manip Ther. 2007;15(1):42-9.
9. Jette DU, Ardleigh K, Chandler K, McShea L. Decision-making ability of physical therapists: physical therapy intervention or medical referral. Phys Ther. 2006;86(12):1619-29.
10. de Souza FS, Ladeira CE, Costa LOP. Adherence to back pain clinical practice guidelines by brazilian physical therapists: a cross-sectional study. Spine (Phila Pa 1976). 2017;42(21):E1251-E1258.
11. Li LC, Bombardier C. Physical therapy management of low back pain: an exploratory survey of therapist approaches. Phys Ther. 2001;81(4):1018-28.
12. Ladeira CE, Cheng MS, Hill CJ. Ladeira CE, Samuel Cheng M, Hill CJ. Physical therapists' treatment choices for non-specific low back pain in Florida: an electronic survey. J Man Manip Ther. 2015;23(2):109-18.
13. Ladeira CE, Cheng MS, da Silva RA. Clinical specialization and adherence to evidence-based practice guidelines for low back pain management: a survey of US physical therapists. J Orthop Sports Phys Ther. 2017;47(5):347-58.
14. Goodman CC, Snyder TEK. Diagnóstico Diferencial em Fisioterapia. 4ª ed. Rio de Janeiro: Elsevier, 2010.
15. Conselho Regional de Fisioterapia e Terapia Ocupacional da 10ª Região (CREFITO-10). Número de fisioterapeutas inscritos no Brasil em 2019. https://crefito10.org.br/portal/; 2019 Accessed 05 September 2019.
16. Learman KE, Ellis AR, Goode AP, Showalter C, Cook CE. Physical therapists' clinical knowledge of multidisciplinary low back pain treatment guidelines. Phys Ther. 2014;94(7):934-46.
17. Hendrick P, Mani R, Bishop A, Milosavljevic S, Schneiders AG. Therapist knowledge, adherence and use of low back pain guidelines to inform clinical decisions--a national survey of manipulative and sports physiotherapists in New Zealand. Man Ther. 2013;18(2):136-42.
18. Scheermesser M, Allet L, Bürge E, Stegen C, Nast I, Schämann A. Direktzugang zur Physiotherapie in der Schweiz. Physioscience. 2011;7:143-49.
19. Vaughn DW, Shoemaker MJ, Da Prato D, Murray KS, Huisen JV. The ability of final-year doctor of physical therapy students to make keep/refer decisions. J Phys Ther Educ. 2011;25:60-7.
20. Mount HE. Screening for medical referral: determining variables that influence accuracy [dissertation]. University of Alabama. 2012.
21. Beyerlein C. Direktzugang in der Physiotherapie–Wie entscheiden sich Physiotherapeuten im Management ihrer Patienten [dissertation]. Universitätsklinikum Ulm. 2010.
22. Eubank BHF, Lackey SW, Slomp M, Werle JR, Kuntze C, Sheps DM. Consensus for a primary care clinical decision-making tool for assessing, diagnosing, and managing shoulder pain in Alberta, Canada. BMC Fam Pract. 2021;22(1):201.
23. Bourassa M, Kolb WH, Barrett D, Wassinger C. Guideline adherent screening and referral: do third year Doctor of Physical Therapy students identify red and yellow flags within descriptive patient cases? a United States based survey study. J Man Manip Ther. 2023;31(4):253-260.
24. Bourassa M, Kolb WH, Barrett D, Wassinger C. Guideline adherent screening and referral: do third year Doctor of Physical Therapy students identify red and yellow flags within descriptive patient cases? a United States based survey study. J Man Manip Ther. 2023;31(4):253-260.
25. Childs JD, Whitman JM, Sizer PS, Pugia ML, Flynn TW, Delitto A. A description of physical therapists' knowledge in managing musculoskeletal conditions. BMC Musculoskelet Disord. 2005;6:32.
26. Riddle DL, Hillner BE, Wells PS, Johnson RE, Hoffman HJ, Zuelzer WA. Diagnosis of lower-extremity deep vein thrombosis in outpatients with musculoskeletal disorders: a national survey study of physical therapists. Phys Ther. 2004;84(8):717-28.
27. Aron A, Cunningham S, Yoder I, Gravley E, Brown O, Dickson C. Diagnostic momentum in physical therapy clinical reasoning. J Eval Clin Pract. 2023;1-9.
28. Ladeira CE. Evidence based practice guidelines for management of low back pain: physical therapy implications. Rev Bras Fisioter. 2011;15(3):190-9.
29. Ross MD, Boissonnault WG. Red flags: to screen or not to screen? J Orthop Sports Phys Ther. 2010;40(11):682-4.