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OPINIONS AND PREFERENCES REGARDING THE DIAGNOSIS OF FROZEN SHOULDER: A SURVEY CONDUCTED IN SEVERAL EUROPEAN COUNTRIES

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ABSTRACT – ***Objective:*** A universal definition or standardized diagnostic criteria for frozen shoulder is still lacking, and surprisingly, one of the most used definitions does not incorporate the concept of pain. The aim of this study is to obtain insights into the current opinions regarding the diagnosis of frozen shoulder in Europe.

Subjects and Methods: An online survey with 31 items was distributed through personal email invitations and posts in relevant social media groups. Three hundred nine healthcare professionals from 17 European countries shared their opinions on a 5-point Likert scale.

Results: 78% of respondents (strongly) agreed on the definition that includes both shoulder pain and motion restriction and 80% supported the endeavor to obtain a consensus definition. The categorization into primary or secondary frozen shoulder remained controversial, and no preferential classification into developmental stages was identifiable. No definitive conclusions could be made regarding the use of X-ray, ultrasound, and magnetic resonance imaging (MRI) in the diagnosis. For our respondents, the diagnosis of a frozen shoulder remains a clinical diagnosis obtained in a multimodal way, combining active and passive shoulder range of motion with specific clinical tests.

Conclusions: This survey study gives a multidisciplinary insight into the current clinical preferences for diagnosing frozen shoulder. Supported by this new data, we advocate using, from now on, the definition of frozen shoulder that integrates pain as a defining feature.

KEYWORDS: Frozen shoulder, Adhesive capsulitis, Bursitis, Diagnosis, Physical examination, Survey.

INTRODUCTION

Frozen shoulder (FS) is a prevalent disorder affecting 3-5% of the general population, with higher rates in individuals with diabetes, thyroid disorders, or Parkinson's disease[1-3]. In recent qualitative studies[4,5], patients with FS illustrated their pain experience with words such as "excruciating", "debilitating," or "horrible". Surprisingly, one of the most commonly used definitions for FS does not incorporate the concept of pain[6]. A universal definition or standardized diagnostic criteria for frozen shoulder are unavailable and much needed to improve communication and management of patients[7,8]. The opinions and preferences of healthcare workers who are experienced in managing patients with frozen shoulders are mandatory to guide the elaboration of a common diagnostic ground. Back in 1934, Codman[9] described frozen shoulder as "difficult to define, treat, and explain". Advances in understanding its pathophysiology and treatment have been made but its clinical course remains protracted and challenging[7,10,11]. Today, FS is managed by healthcare professionals from different disciplines, including orthopedic surgeons, rheumatologists, physical and rehabilitation medicine (PRM) specialists, physiotherapists (PTs), and pain physicians. While some distinguish between frozen shoulder and adhesive capsulitis[12,13], most use these terms interchangeably[14,15]. Major scientific societies[6,16] recommend using the designation "frozen shoulder" over "adhesive capsulitis" due to the lack of true adhesions. Diagnosis relies on medical history and clinical examination[1,14,17]. Pain often radiates diffusely, worsens at night, and increases with unguarded movements[18]. Loss of passive shoulder range of motion (ROM) is a hallmark feature, with thresholds of a 50% reduction compared to the contralateral shoulder frequently cited, though consensus on diagnostic standards remains elusive[19-21]. A recently published systematic review[22] showed that there is no set of scientifically validated clinical diagnostic tests for FS. The American Shoulder and Elbow Surgeons (ASES)[6] define frozen shoulder as restricted motion without significant radiographic findings, while Cho et al[14] emphasize pain and a minimum symptom duration of one month[14]. Previous surveys[6,14,23-26] conducted in Korea, Japan, Italy, India, the USA, and other regions reflect diverse and sometimes conflicting perspectives.

This study aims to gather insights into opinions and preferences for diagnosing frozen shoulder across Europe. Physicians from various specialties and physiotherapists with expertise in shoulder pathology were invited to participate in a web-based survey.

SUBJECTS AND METHODS

The study used a cross-sectional online survey design with a convenience sample of healthcare professionals who treat patients with frozen shoulder. Participants were reached by sending email invitations to personal contacts of the researchers and professional organizations, as well as by posting QR codes in relevant social media groups (LinkedIn). Members of the following scientific and professional societies were invited to participate: Royal Belgian Society of Physical and Rehabilitation Medicine, Axxon, European Society of Physical and Rehabilitation Medicine, European Society for Shoulder & Elbow Rehabilitation (EUSSER), Société Française de Médecine Physique et de Réadaptation (SOFMER), European Society for Surgery of the Shoulder and the Elbow (ESSSE), Deutsche Gesellschaft PRM (DGPRM). The first invitation was sent in September 2023, and the link was accessible for a total of 8 months, after which no further responses were analyzed. Given that the link was largely diffused on the web and through e-mail, it was not possible to identify non-respondents. No financial or other compensations were provided to respondents. All submitted surveys were analyzed, regardless of the number of questions answered. Results always state the number of responses obtained for each question.

The Ethics Committee of the Universitair Ziekenhuis Brussel, Belgium (internal ref. EC2023-194) approved this study on 15/09/2023. Before answering the survey, participants were asked to provide elec-

tronic consent to participate. Responses were anonymous. Respondents could review and change their answers by clicking the Back button.

Preparation, Construction and Distribution of the Survey

The survey was created by our research team, which comprises health professionals from different disciplines, including physical and rehabilitation medicine specialists, shoulder surgeons and physiotherapists with a large experience in shoulder pathology, as well as health researchers with experience in surveys. To construct this survey, the team drew on its experience with surveys published in different fields[27-29], on previously published surveys regarding frozen shoulder[6,14,25,26,30-32] and on a recent systematic review[22] of the diagnostic value of physical examination tests in frozen shoulder published recently. The specific content of all 31 questions was debated and approved by members of the team with clinical experience in the management of frozen shoulder.

An online survey (**Appendix 1**) was designed using the Qualtrics^{XM} survey tool (Qualtrics, Seattle, WA, USA). The web-based questionnaire consisted of 31 questions: eligibility and domain of expertise (8); current definitions of frozen shoulder (7); definitions of limitation of motion and use of clinical tests (7); questions on the classification of frozen shoulder (4); use of imaging studies in the diagnosis of frozen shoulder (3); one question on the necessity to obtain a consensus; and finally, a text box with an open-ended question. The questionnaire consisted of various question types, including demographic, multiple-choice, Likert 5-point scale, yes/no, and one open-ended question aimed at gathering alternative opinions, ongoing related research, and future research directions. Questions Q27-29 were duplicated from the survey published in 2020 by Cho et al[14].

Statistical Analysis

Descriptive statistics were computed. Qualtrics^{XM} software was used for frequency counts in closed-ended questions. The open-ended textbox was analyzed by one author (M.S.) and verified by a second author (S.H.) using thematic analysis to identify patterns, themes, and sub-themes within the data. The primary focus of this analysis was to identify alternative opinions, ongoing related research, and areas for future research.

Chi-square tests were used to examine differences in prevalence between professional groups with regard to the definition of frozen shoulder, the limitation of range of motion, the use of clinical tests and imaging studies and the classification of frozen shoulder. Statistical analyses were undertaken using SPSS for Windows, version 24.0.1 (IBM Corp., Armonk, NY, USA), and statistical significance was set at $p < 0.05$.

RESULTS

Three hundred and nine respondents (at least partially) from 17 European countries filled out the survey between September 25th, 2023, and April 26th, 2024. Their demographic and professional characteristics are presented in Table 1. Slightly more than half of the respondents were from Belgium, and the details of their country of residence are depicted in Figure 1. Respondents' average duration of clinical experience was 17.1 ± 21.4 years, and 60.6% of respondents had a special interest in frozen shoulder. A mean of 7.6 ± 6.4 frozen shoulder patients were treated per month by the respondents. Just over half of all respondents were physiotherapists (54%), while 26.5% were physical and rehabilitation medicine (PRM) specialists. Other medical specialists (n = 32) participating in this survey were: orthopedic surgeons (5.8%), general practitioners (4.2%), rheumatologists (3.2%), endocrinologists, radiologists, and internal medicine and pain physicians.

Respondents' Characteristics

Work settings of respondents can approximately be grouped into three thirds: private practice (37.2%), group practice or specialized/private clinic (31.3%), and general or academic hospital (32.4%) (Table 2). Age or experience was quite similarly distributed among all professions (Table 2), and 60.8% of respondents declared to have a special interest in frozen shoulder.

Table 1. Medical specialty and country of residence of survey respondents.

Country	Total	Physical and Rehab Medicine	Rheumatology	Orthopedic Surgery	Physical Therapy	Other
Belgium	180	37	5	11	114	13
Serbia	47	14	2		19	12
UK	14				13	1
Portugal	13	11		1		1
France	12	10	2			
Luxemburg	12			1	11	
Netherlands	10			2	8	
Italy	5	1	1		1	2
Montenegro	4	1		1		2
Bosnia and Herzegovina	3	3				
Germany	2			2		
Slovenia	2	2				
Spain	1	1				
Sweden	1				1	
Lithuania	1					1
Greece	1	1				
North Macedonia	1	1				
Total number espondents	**309**	**82 (26.5%)**	**10 (3.2%)**	**18 (5.8%)**	**167 (54.0%)**	**32 (10.4%)**

Respondents' Opinions on the Diagnosis of Frozen Shoulder (Tables 2-4, Figure 2)

More than three-quarters of respondents (77.6%) agreed or strongly agreed on the definition of frozen shoulder that mentions pain (Q9), and only 63.7% on the definition put forth by the AAOS in 1995, which does not mention pain (Q10). The preference for the definition with pain was significant: χ^2 (1, N = 311) = 12.0314, *p*-value = .000523. 63.5% of respondents (strongly) agreed with Q9 as well as with Q10. This may indicate that they did not have a preference between both definitions. 5.1% of respondents who (strongly) agreed with Q9 disagreed with Q10, indicating that they prefer to have pain present in the definition of frozen shoulder. 4.7% of respondents who (strongly) disagreed with Q9 agreed with Q10, indicating that, for them, the presence of pain should not be part of the definition.

Almost nine out of ten respondents (88.7%) found that frozen shoulder is characterized by functional restriction in both active and passive shoulder motion. 71.3% stated that frozen shoulder can be classified into primary and secondary types, but almost 1 out of 4 (23.8%) remained neutral to this classification. Table 4 presents the respondents' opinions on the following elements of clinical examination for frozen shoulder. Almost all respondents always compared the ROM to the contralateral side (98.5%). Eyeballing (50.2%) and goniometer (30.7%) were by far the most common tools used to measure ROM. More than one-third (38.5%) of surveyed clinicians used special orthopedic tests, and two-thirds (66.4%) classified frozen shoulder into specific stages when diagnosing. Identifying a more painful than stiff or stiffer than painful stage was useful for two-thirds of respondents (67.7%). A large majority (70.2%) agreed that frozen shoulder and adhesive capsulitis share the same meaning.

In the process of diagnosing frozen shoulder (Table 3), physicians used ultrasonography significantly more (45.1%) compared to X-ray (32.3%; $p = 0.0402$) or magnetic resonance imaging (MRI) (17.3%; $p < 0.00001$). Finally, our respondents largely supported the endeavor to obtain a consensus definition for frozen shoulder (79.7%).

DISCUSSION

The present survey compiled the opinions of a diverse panel of experts (different medical specialties, physiotherapists, etc.) from a wide range of European countries to investigate current diagnostic

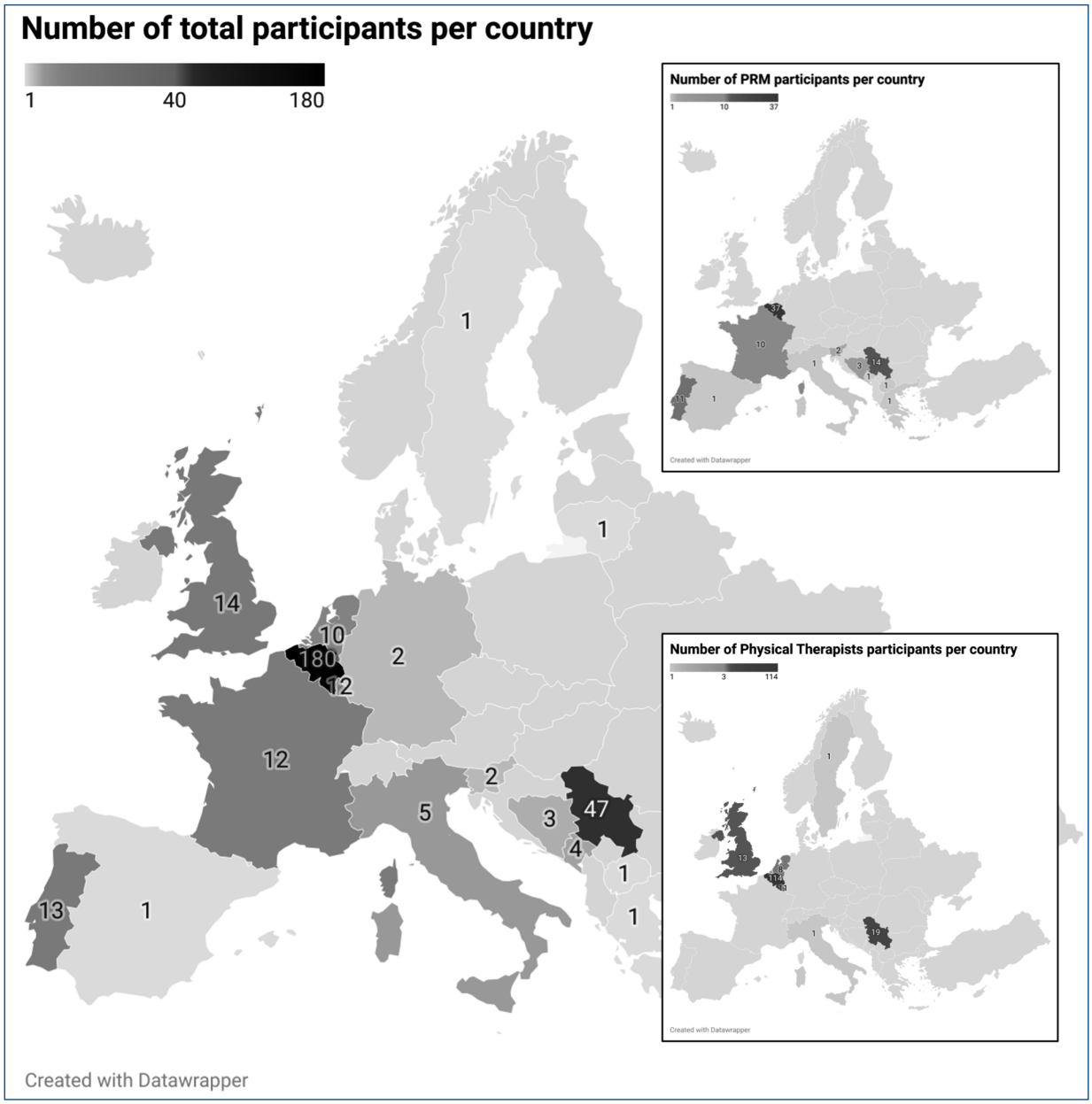

Figure 1. The larger map of Europe shows the country of residence for all respondents (all n = 309). The smaller maps show the country of residence of physicians specialized in PRM (n = 82) in the upper right corner and of Physiotherapists (n = 167) in the lower right corner. (Created on Datawrapper.de).

practices and viewpoints on frozen shoulder. Much research has been done into the pathophysiology and clinical management of frozen shoulder, but there is little consensus on how it should be diagnosed.

Previously published surveys on frozen shoulder have largely focused on single groups such as orthopedic shoulder surgeons[6,14,23-26,32] or physiotherapists[25], and one country[6,14,23,24,26,30-32]. This survey sought to gather a broader perspective across specialties and nations.

Defining Frozen Shoulder

The survey respondents preferred the definition of frozen shoulder described as: "*A self-limiting disease characterized by pain and functional restriction in both active and passive shoulder motion lasting more than one month, with unremarkable radiographic findings*". This definition emphasized the importance of pain in the condition's diagnosis, which has been supported by several qualitative studies[4,5,33,34] that

Table 2. Professional characteristics of respondents: eligibility criteria and domain of expertise.

Please indicate the type of healthcare institution where you are currently practicing		
Private practice	113	36.6%
Group practice	58	18.8%
Specialized clinic	24	7.8%
Private-owned hospital/clinic	16	5.2%
General hospital	63	20.4%
Academic hospital	35	11.3%
Please state how many years you have been practicing your profession		
0-5 years	57	18.4%
11-15 years	40	12.9%
16-20 years	36	11.7%
21-25 years	44	14.2%
26-30 years	28	9.1%
6-10 years	55	17.8%
> 31 years	49	15.9%

describe an “incredible pain experience” with expressions like “dropping me to my knees”. This intense and debilitating pain affects both physical and mental health, influencing patients’ sense of self and quality of life. Respondents strongly supported including pain in the definition (77.6%), which aligns with Korean surveys (84.5%) but contrasts with the AAOS definition, which excludes pain and is supported in previous surveys by varying percentages of Japanese (67%), Belgian/Dutch (80%), and American (82%) surgeons[6,14,25,26]. These findings advocate updating the ASES definition to incorporate pain, as previously suggested[7].

Categorization by Etiology and Developmental Stages

Categorizing FS by etiology (primary *vs.* secondary) and developmental stages remains contentious. Approximately one-quarter of respondents (23.8%) expressed neutrality regarding the primary-secondary distinction, reflecting broader ambiguities in clinical practice and literature. This aligns with findings from other studies[7,14,26]. Contemporary research[1,7,26] suggests limiting “frozen shoulder” to primary idiopathic cases to minimize confusion with secondary conditions such as post-surgical stiffness and avoid “adhesive capsulitis” as it may misleadingly imply adhesions.

Clinicians differed in their approaches to developmental stages, and no unified framework emerged from the survey. While traditional triphasic or quadriphasic staging models (e.g., freezing, frozen, thawing) dominate textbooks, their clinical applicability is increasingly questioned[7,11,17,35]. Many clinicians now recognize that FS does not follow a uniform temporal progression in all patients, challenging the validity of rigid stage-based models.

Clinical Examination and ROM Assessment

A cornerstone of FS diagnosis is assessing the ROM limitations. Respondents predominantly agreed that frozen shoulder is characterized by a restricted ROM in both active and passive movements (88.7%), as opposed to solely passive limitations (75.4%). This indicates that functional restrictions are universally present in frozen shoulder. Most respondents (98.5%) emphasized side-to-side ROM comparisons, accounting for individual variability, rather than relying solely on normative population values (57.5%)[1]. ROM was most assessed by visual estimation, also called eyeballing (50.2%), though the use of goniometers is gaining importance (30.7%). While visual estimation has high interobserver reliability, its accuracy is inferior to goniometer or markerless 3D camera measurements, which are more suitable for research purposes[36,37]. Clinicians prioritized assessing external rotation, the most severely affected direction of motion in frozen shoulder[1,23,25,30].

Table 3. Results of the survey: questions 9-16, 18, 23-25, 27-30.

Statement on frozen shoulder	Opinion	(%)	Disagree opinion	Agree opinion
Frozen shoulder is a self-limiting disease characterized **by pain** and **functional restriction** in **both active** and **passive shoulder motion** lasting more than 1 month, for which radiographic findings of the shoulder joint are unremarkable. (Q9, n = 255)	Strongly disagree Disagree Neutral Agree Strongly agree	2.4% 9.0% 11.0% 53.7% 23.9%	11.4%	77.6%*
Frozen shoulder is a self-limiting disease characterized by **functional restriction** in **both active** and **passive shoulder motion** lasting more than 1 month, for which radiographic findings of the shoulder joint are unremarkable. (Q10, n = 256)	Strongly disagree Disagree Neutral Agree Strongly agree	1.6% 17.6% 17.2% 10.9% 52.7%	19.1%	63.7%*
Frozen shoulder is a self-limiting disease. (Q11, n = 257)	Strongly disagree Disagree Neutral Agree Strongly agree	3.5% 12.1% 19.1% 49.0% 16.3%	15.6%	65.4%
Frozen shoulder is a disease of the shoulder characterized by pain. (Q12, n = 256)	Strongly disagree Disagree Neutral Agree Strongly agree	5.1% 21.1% 18.8% 42.2% 12.9%	26.2%	55.1%
Frozen shoulder is a disease characterized by shoulder pain lasting more than 1 month. (Q13, n = 256)	Strongly disagree Disagree Neutral Agree Strongly agree	5.5% 20.7% 19.1% 40.6% 14.1%	26.2%	54.7%
Frozen shoulder is a disease characterized by functional restriction in both active and passive shoulder motion. (Q14, n = 257)	Strongly disagree Disagree Neutral Agree Strongly agree	0% 4.7% 6.6% 49.4% 39.3%	4.7%	88.7%
Frozen shoulder is a disease characterized by functional restriction in passive shoulder motion. (Q15, n = 256)	Strongly disagree Disagree Neutral Agree Strongly agree	2.7% 13.3% 8.6% 50.4% 25.0%	16.0%	75.4%

5-point Likert scale answers are represented in column (opinion %), while the disagree/agree opinion column includes both strongly disagree/agree and disagree/agree responses.
*Significant differences in response rate agree opinion between Q9 *vs.* Q10: χ^2 (1, N = 311) = 12.0314, *p*-value = .000523.

Continued

Table 3. ***(Continued).*** Results of the survey: questions 9-16, 18, 23-25, 27-30.

Statement on frozen shoulder	Opinion	(%)	Disagree opinion	Agree opinion
Limitation of motion is defined as limitation of more than 30 degrees in more than two directions (forward flexion, abduction, external rotation, or internal rotation. (Q16, n = 256)	Strongly disagree	1.1%	20.7%	55.2%
	Disagree	19.5%		
	Neutral	24.1%		
	Agree	49.4%		
	Strongly agree	5.7%		
Limitation of motion is defined as limitation of more than 50% in more than two directions (forward flexion, abduction, external rotation, or internal rotation) in comparison to the contralateral side. (Q18, n = 261)	Strongly disagree	2.3%	24.5%	55.9%
	Disagree	22.2%		
	Neutral	19.5%		
	Agree	44.4%		
	Strongly agree	11.5%		
Do you agree that frozen shoulder can be classified into primary and secondary types? (Q23, n = 265)	Strongly disagree	0.8%	4.9%	71.3%
	Disagree	4.2%		
	Neutral	23.8%		
	Agree	54.3%		
	Strongly agree	17.0%		
Do the two terms of adhesive capsulitis and frozen shoulder share the same meaning? (Q24, n = 265)	Strongly disagree	2.3%	17.4%	70.2%
	Disagree	15.1%		
	Neutral	12.5%		
	Agree	52.1%		
	Strongly agree	18.1%		
When diagnosing a frozen shoulder, is it useful for clinical purposes to identify two conditions: more painful than stiff or more stiff than painful? (Q25, n = 266)	Strongly disagree	1.1%	12.0%	67.7%
	Disagree	10.9%		
	Neutral	20.3%		
	Agree	47.4%		
	Strongly agree	20.3%		
Do you think that it is useful to obtain a consensus definition for frozen shoulder? (Q30, n = 246)	Strongly disagree	0.4%	4.9%	79.7%
	Disagree	4.5%		
	Neutral	15.4%		
	Agree	50.8%		
	Strongly agree	28.9%		

Continued

Table 3 *(Continued).* Results of the survey: questions 9-16, 18, 23-25, 27-30.

		All respondents (n = 262)			Only MD's (n = 133)		
Statement on frozen shoulder	**Opinion**	**(%)**	**Disagree opinion**	**Agree opinion**		**Disagree opinion**	**Agree opinion**
Do you use plain radiography in diagnosing frozen shoulder? (Q27)	Strongly disagree Disagree Neutral Agree Strongly agree	36.6% 22.5% 20.2% 12.2% 8.4%	**59.2%**	**20.6%***	21.1% 25.6 21.6 18.0% 14.3%	**46.6%**	**32.3%***

*All respondents *vs.* MD: χ^2 (1, N = 395) = 6.54, p = .01054

		All respondents (n = 262)			Only MD's (n = 133)		
Statement on frozen shoulder	**Opinion**	**(%)**	**Disagree opinion**	**Agree opinion**		**Disagree opinion**	**Agree opinion**
Do you use ultrasonography in diagnosing frozen shoulder? (Q28)	Strongly disagree Disagree Neutral Agree Strongly agree	30.9% 19.5% 22.9% 18.3% 8.4%	**50.4%**	**26.7%***	11.3% 20.3% 23.3% 29.3% 15.8%	**31.6%**	**45.1%***

*All respondents *vs.* MD: χ^2 (1, N = 395) = 13.52, p = .00024

		All respondents (n = 262)			Only MD's (n = 133)		
Statement on frozen shoulder	**Opinion**	**(%)**	**Disagree opinion**	**Agree opinion**		**Disagree opinion**	**Agree opinion**
Do you use magnetic resonance imaging in diagnosing frozen shoulder? (Q29)	Strongly disagree Disagree Neutral Agree Strongly agree	39.2% 28.5% 19.0% 11.0% 1.9%	**68.1%**	**12.9% NS**	24.8% 35.3% 22.6% 14.3% 3.0%	**60.2%**	**17.3% NS**

All respondents *vs*. MD: NS χ^2 (1, N = 395) = 1.33, p = .24864.

Table 4. Results of the survey: questions on clinical examination of frozen shoulder.

	Statement on frozen shoulder	Yes	No
Q17	I compare limitation in range of motion to the contralateral side (Q17, n = 261)	98.5%	1.5%
Q20	I compare limitation in range of motion to healthy subjects' norms (related to age, gender, global hypermobility...) (Q20, n = 261)	Yes	No
	If YES, multiple answers possible	57.5%	42.5%
	External rotation	61.7%	
	Abduction	39.5%	
	Internal rotation	26.1%	
	Forward flexion	14.6%	
	No opinion	2.7%	
Q21	How do you normally measure the range of motion of the shoulder, for example abduction of the arm? (Q21, n = 261)		
	Eyeballing	50.2%	
	Goniometer	30.7%	
	Digital inclinometer	6.5%	
	I usually don't measure ROM	6.9%	
	Other technique, please specify:	5.7%	
Q22	When diagnosing a frozen shoulder, do you use other special orthopedic/clinical tests? (Q22, n = 260)	Yes	No
	If YES, please specify if you use the following special orthopedic/clinical tests:	38.5%	61.5%
	Coracoid Pain test	45.8%	
	DTPER	67.9%	
	Shrug sign	44.4%	
	Modified Neer sign	57.5%	
	Other, please specify	30.4%	
Q26	Do you classify frozen shoulder in a specific stage at the time of diagnosis? (Q26, n = 265)	Yes	No
	if YES, please specify if you use this stage/phase:	66.4%	33.6%
	Freezing stage	72.7%	
	Frozen stage	89.7%	
	Thawing stage	60.7%	
	Painful phase	71.4%	
	Stiff phase	71.6%	
	Recovery phase	68.2%	
	Inflammatory phase	62.8%	
	Mechanic phase	36.0%	

Distension Test in Passive External Rotation (DTPER).

There was no clear consensus on specific clinical tests or patterns of ROM restriction, with the Distension Test in Passive External Rotation (DTPER), Coracoid Pain Test (CPT), and Modified Neer Test (MNT) being the most frequently employed. Of these, DTPER and CPT have demonstrated excellent sensitivity and specificity in diagnosing frozen shoulder, while the MNT is more relevant for ruling out subacromial impingement[22]. These results indicate that diagnosing frozen shoulder is a multimodal process, combining clinical examination with specific tests[12,17].

Imaging Techniques in Frozen Shoulder Diagnosis

Imaging plays a supplementary role in diagnosing frozen shoulder, helping rule out other pathologies, or identifying suggestive abnormalities, while X-rays must remain unremarkable[1,12]. The primary utili-

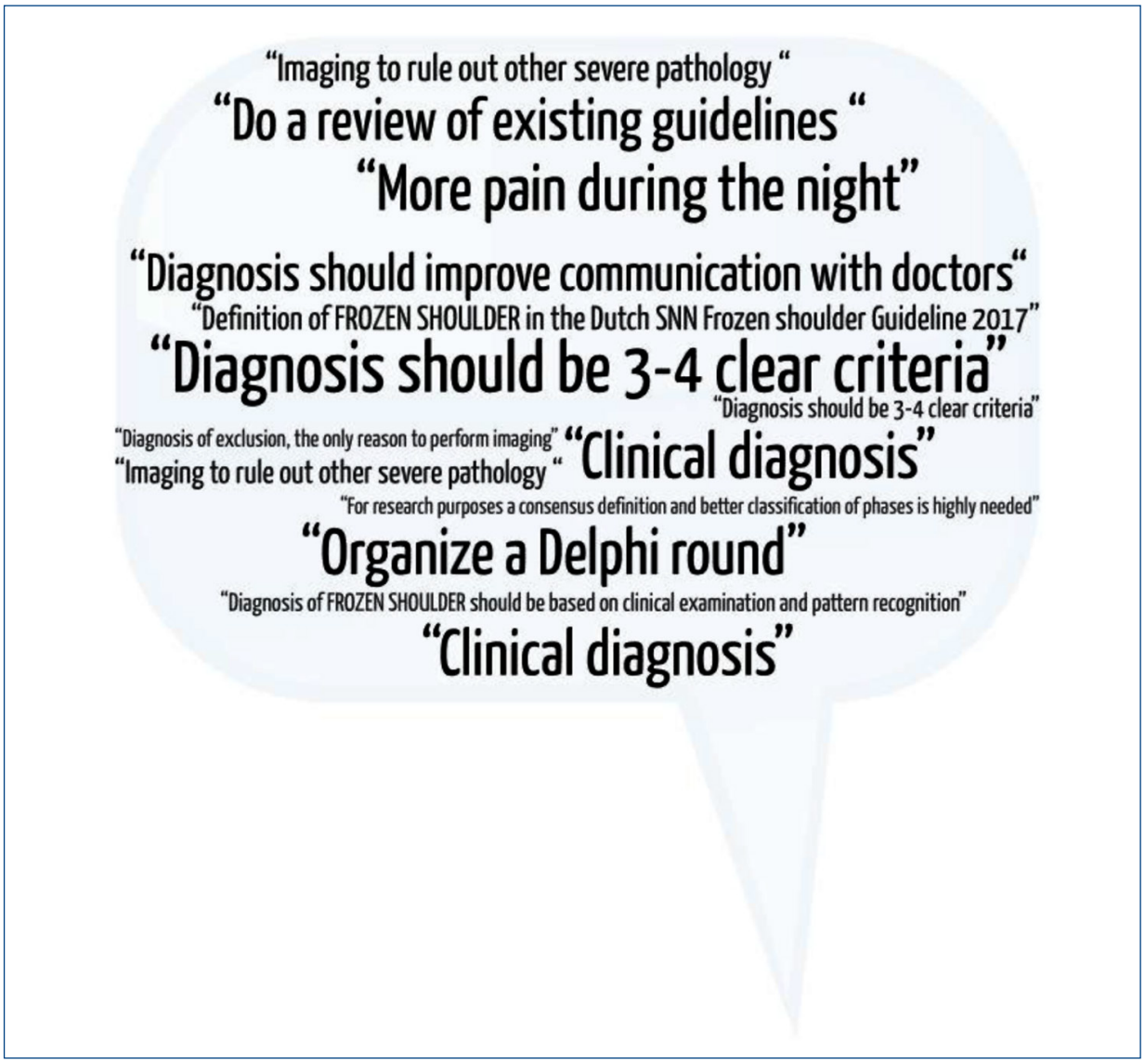

Figure 2. Q31: List of the open-text comments that are deemed most representative of all comments left by the respondents.

ty of plain radiographs lies in their ability to differentiate between FS and glenohumeral osteoarthritis or calcific tendinosis as alternative causes for the patient presenting shoulder pain[38]. Only 20.6% of respondents reported using X-rays, with higher usage among physicians (32.6%). This is significantly lower than the 72-90% reported in previous surveys[14,23,25], potentially reflecting differences in medical specialties and educational or cultural contexts. It should also be noted that in some European countries, physiotherapists have the possibility to prescribe imagery, whereas in others, they do not. For example, in the United Kingdom, within the musculoskeletal context of practice, requests for diagnostic imaging form part of the comprehensive physiotherapy assessment of a patient's presenting condition and may be required in order to reach a differential diagnosis and/or to rule out other serious medical pathology[39]. Ultrasound was used by 45.1% of responding physicians, a notable increase from previous studies, potentially due to its growing accessibility in point of care[40]. In their 2017 consensus statement, the European Society of Musculoskeletal Radiology[41] recommends using ultrasound if other imaging techniques are not appropriate (evidence level B). Among physicians, MRI usage at 17.3% was significantly higher than the 2% reported in a 2016 study[25]. MRI is particularly used in patients with mild clinical symptoms who could be misdiagnosed with conditions such as rotator cuff injuries, calcific tendinitis, glenohumeral and acromioclavicular arthritis, bursitis, bicipital tenosynovitis, superior labrum anterior and posterior (SLAP) or other labral lesions[38,42,43]. While MRI arthrography and MRI with intravenous contrast may offer higher sensitivity and/or specificity for certain imaging

features of adhesive capsulitis, these techniques are less frequently utilized due to their more invasive nature[42,44,45]. The formulations of our questions do not allow us to confirm the opinion voiced in the survey of Pandey et al[23] that MRI should be preferred over ultrasound (US) to establish, if needed, the diagnosis of frozen shoulder. Current scientific literature[1,12,38,41,46,47] does not provide clear-cut guidelines on whether to use MRI or US if a clinician wants to confirm the clinical diagnosis of frozen shoulder, but authors such as Picasso et al[43] have recently proposed an evidence-based protocol for imaging evaluation of FS.

Strengths and Limitations

Our survey has several strengths, including its inclusion of a broad range of healthcare professionals across 17 European countries and its focus on diverse qualifications. Respondents had substantial experience in diagnosing and managing frozen shoulder, comparable to that of participants in earlier surveys[23,25,26,30-32]. Unlike previous surveys, this study allowed participants to provide nuanced answers to multiple aspects of the diagnostic pathway rather than agree or disagree with a single definition. However, limitations include potential communication barriers in the questionnaire and variations in the interpretation of certain questions, particularly regarding imaging use. In Europe, patients suffering from frozen shoulder can be diagnosed by physicians from various specialties, including PRM, orthopedics, rheumatology, and general practice. Our survey was distributed through multiple channels and targeted the most relevant medical societies in the field of shoulder care. While the survey captured diverse opinions, we cannot confirm its representativeness. Furthermore, although 54% of respondents were physiotherapists, only a small proportion were from the UK and the Netherlands. In these countries, physiotherapists with advanced training are permitted to diagnose FS and refer patients for imaging studies within the musculoskeletal context.

Implications for Clinical Practice and Future Research

This study reinforces the urgent need for a consensus definition of FS. More than a decade ago, Zuckerman and Rokito[6] reported that 85% of clinicians supported the pursuit of a unified diagnostic framework, a sentiment echoed by 79.7% of participants in this survey. Despite advancements in FS research, diagnostic inconsistencies persist, complicating interdisciplinary communication and patient management. Frozen shoulder presents significant diagnostic challenges for healthcare professionals, who must address patients' pain and restore functional status. The lack of a standardized definition hinders interdisciplinary communication and management. Patients describe living in a state of uncertainty that exacerbates the psychological impact of frozen shoulder and having a sense of relief when a Healthcare Professional (HCP) can confidently diagnose their frozen shoulder[4,5,33]. Early diagnosis could lead to more favorable outcomes. Future research should aim to establish a consensus definition and diagnostic criteria for frozen shoulder, incorporating the perspectives of diverse stakeholders. This would reduce biases in the literature and improve the quality of clinical studies. The insights from this survey provide a valuable foundation for future advancements in its management and understanding.

CONCLUSIONS

This survey offers a multidisciplinary perspective on the diagnostic practices for frozen shoulder (FS) among healthcare professionals across 17 European countries. Echoing calls from other researchers[7,23], our findings emphasize the importance of incorporating pain into the diagnostic definition of FS. The survey revealed indecision among respondents regarding the categorization of FS into primary or secondary origins and the description of its evolutionary phases. Our data do not allow any conclusions on the positioning of X-ray, ultrasound and magnetic resonance imaging in the diagnosis of frozen shoulder. Based on these findings, the authors recommend adopting a definition of FS that integrates pain as a defining feature. Future research should focus on developing and validating diagnostic criteria that combine graded pain identifiers, defined ROM thresholds, and specific orthopedic clinical tests standardized during physical examinations. Additionally, the diagnostic utility of imaging modalities warrants further investigation to clarify their role in the management of FS.

Conflict of Interest:

The authors have no conflicts of interest to declare.

AI Disclosure:

The authors declare that no artificial intelligence (AI) or AI-assisted technologies were used in the production of this manuscript, including the writing, editing, or generation of figures. All content is the original work of the authors, and the authors affirm that there is no plagiarism in the manuscript or associated figures.

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Authors' Contributions:

This study was designed by M.S, and S.M.H. The questionnaire was developed by M.S., L.G., M.M., B.V., L.D.B., B.F., O.D., S.M.H. The data were analyzed by M.S. and S.M.H., and the results were critically examined by all authors. M.S. had a primary role in preparing the manuscript, which was edited by L.G., L.D.B., and S.M.H. All authors have approved the final version of the manuscript and agree to be accountable for all aspects of the work.

Informed Consent:

Participants were informed about the purpose, duration of the survey, and the nature of the data collected in the invitation email. Prior to beginning the survey, they were asked, 'Do you consent to participate in this survey?'. Only those who answered 'yes' were allowed to proceed.

Ethics Approval:

The Ethical Commission of the Universitair Ziekenhuis Brussel approved this study on 15/09/2023 (EC-2023-194).

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Availability of Data and Materials:

The Steering Board has access to the pseudonymized final trial dataset. The datasets generated during and/or analyzed during the current study are available from the corresponding author upon reasonable request.

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