Physiotherapy for patients with shoulder pain in primary care: a descriptive study of diagnostic- and therapeutic management

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INTRODUCTION

Shoulder complaints are the third most common musculoskeletal complaint [1, 2]. The annual incidence of shoulder pain in the Netherlands is about 34 patients per 1000 [3]. About 10% of the patients presenting in physiotherapy practice have shoulder complaints [4]. In a Dutch study, 76% of these patients were referred by their general practitioner, 12% by a medical specialist and 12% accessed the physiotherapist without a referral [4]. About 50% of patients with shoulder pain in primary care have symptoms for more than six months [5, 6].

Frequently mentioned causes of shoulder pain in primary care are rotator cuff disease (subacromial impingement syndrome), glenohumeral disorders, acromioclavicular joint disease or referred neck pain [7]. Rotator cuff diseases are the most common cause of shoulder pain. The incidence is estimated to be 85% of the total population with shoulder pain in primary care, although more than one clinical diagnosis is made in 77% of the patients [8].

Most clinical tests are not valid in making a confident statement for pathology in patients with shoulder complaints [9, 10]. In the Netherlands physiotherapists increasingly use diagnostic ultrasound to assist their clinical decision-making, but the impact and specific aims of this diagnostic tool remain unknown [11, 12].

The most widely used interventions for patients with shoulder complaints are exercises, mobilization and/or massage [4, 13]. Current conclusions from (systematic) reviews describe moderate evidence for the effect of exercise therapy, manipulative therapy and NSAIDs (non-steroidal anti-inflammatory drugs) [14-16]. Physiotherapeutic interventions (exercise therapy and joint mobilizations) show a favorable outcome for patients with shoulder complaints [13, 15, 17, 18]. Several studies have shown good outcomes of non-operative management for patients with subacromial impingement syndrome [15, 19-21]. Despite physiotherapy treatment, in many patients (40%) the disability and physical impairments persist for over a year after the first symptom experience [6].

In The Netherlands, there is a Clinical Guideline for General Practitioners (GP) for the management of patients with shoulder pain and an evidence statement released by the Dutch Physiotherapist Society for patients suspected of having subacromial pain [22, 23]. Both the guideline and the evidence statement classify patients with non-specific shoulder pain into three subgroups: 1) pain during abduction (complaints arising from the subacromial space), 2) passive restricted range of motion (complaints arising from the glenohumeral joint) and 3) painful abduction and restricted passive range of motion (instability, complaints from the acromioclavicular joint or the neck).

To date, knowledge about the diagnostic strategies and therapeutic intervention(s) applied in primary care is limited [13, 24]. There is a lack of information on characteristics of physical examination and treatment in physiotherapy practice [4, 6].

Given the lack of clinical information for patients with various shoulder complaints in primary care, we aim to gain insight into current physiotherapy management, diagnostic- and treatment strategies. Gaining insight into current physiotherapy management may help guide further research and health care decisions.

METHODS.

Study design

This study was a prospective cohort study with a follow-up of 26 weeks in physiotherapy practice of patients with non-specific shoulder complaints. Primary aims of the ShoCo-DiP study were to evaluate physiotherapy care and prognostic factors in patients with shoulder pain. Secondary aims were to assess the inter-rater reliability of diagnostic ultrasound (US) between physiotherapists (PTs) and radiologists, and to assess whether patient characteristics of those who receive US differ from those who do not receive US. Details of the study design are published elsewhere [25]. The Medical Ethics Committee of the Erasmus Medical Center approved the study protocol (MEC-2011-414). In the current manuscript, the focus is on the description of PT care (diagnostic and therapeutic management) in the first 12 weeks of management and reported recovery after 12 and 26 weeks.

Physiotherapists & Patients

In total 125 physiotherapists from the South West region of the Netherlands participated in the study and they recruited patients, either referred by their GP or through direct access, from November 2011 until November 2012. Patients with shoulder pain were eligible when they were 18 years or over and adequately understood the Dutch language. Exclusion criteria were: patients with serious pathologies (infection, cancer or fracture), shoulder surgery in the past 12 months or diagnostic imaging techniques (musculoskeletal ultrasound, magnetic resonance imaging or radiography) performed on the shoulder in the past 3 months.

Data collection

Data was collected from both the PTs and the patients using digital questionnaires. Patient- and clinical characteristics were measured, and patients received follow-up questionnaires after 6 and 12 weeks concerning recovery. Characteristics (age, sex, work experience and/or specialization) of the PTs were reported before the start of the study. Physiotherapists reported their daily management at 3, 6 and 12 weeks in terms of clinical hypotheses after patient history (max. 3) and physical examination, initial clinical diagnosis, the use of diagnostic ultrasound (US), pathologic findings on US, changes in

clinical diagnosis after US and initial therapeutic management of the patient. Whenever a treatment plan changed during follow-up, the PTs reported the reasons for change and treatment goal(s).

Outcomes

Diagnostic process

We predefined a set of possible clinical diagnoses based on literature and consensus: subacromial impingement, internal impingement, glenohumeral instability, SLAP lesion, biceps tendinopathy, frozen shoulder, acromio-clavicular or sterno-clavicular joint pathology, sprain or strain, triggerpoints in the muscles of the shoulder and neck, muscular hypertension/hypotension, cervical-thoracic pathology or no clear clinical diagnosis.

Diagnostic US

The following pathological findings were listed: tendinopathy, calcification, full thickness/partial thickness tears, biceps tendon rupture, biceps halo, bursitis, subacromial impingement, glenohumeral discontinuity, acromion discontinuity, labrum tear/SLAP, capsular thickening, and rotator cuff atrophy.

Treatment process

Physiotherapists estimated patient's the prognosis at baseline (full recovery, clinical relevant reduction of complaints, stabilizing complaints or not estimable) and also reported their treatment of choice. Possible interventions were categorized into: information/advice, exercise therapy, massage, manual joint mobilization/manipulation, extracorporeal shockwave therapy (EST), transcutaneous electrical nerve stimulation, trigger point therapy, taping/bracing or posture correction. Each follow-up moment PTs could report whether 1) treatment was ended (additional information about number of treatments and reasons), 2) if any changes in planned treatment interventions were made and 3) if patients remained under treatment without any changes in treatment since baseline.

Recovery

Recovery status of the patient was measured with the Global Perceived Effect scale (GPE). The GPE uses a 7-point Likert scale indicating whether the patient's condition had improved or deteriorated since the start of their treatment. The outcome was dichotomised into "recovered" and "not recovered", with " recovered" defined as "completely recovered" or "much improved" [26-28]. The GPE is validated for patients with musculoskeletal complaints [29].

Statistical Analysis

Descriptive analyses were conducted using SPSS 22.0 statistical software. Descriptive statistics included patient's clinical and symptom characteristics, physiotherapists' characteristics, information from history taking, physical examination, utility of diagnostic ultrasound, treatment plan, average treatment period, possible changes of treatment plan since initiation at baseline, recovery or referrals to other (para)medical care.

Descriptive statistics were presented in mean scores for continuous data with a normal distribution. In all other cases, median scores and the interquartile range (IQR) were used. Hypotheses after patient history were categorized according to the guidelines (complaints arising from pathology/dysfunction in: 1) the subacromial space (subacromial impingement, internal impingement & sprain/strain), 2) glenohumeral joint (glenohumeral joint instability, frozen shoulder, biceps tendinopathy & SLAP), 3) acromioclavicular (AC)/sternoclavicular (SC) joint, 4) cervico-thoracic spine and 5) other and presented in a scaled rectangle diagram [30]. The number of missings were reported with all data.

RESULTS

Physiotherapists (n=125) were mostly men with a mean age of 39. Of all physiotherapists 50% (51/102) were specialized in manual therapy, and 37% (38/102) were trained to use diagnostic ultrasound. The response rate of the physiotherapists was 94% (366/389) at baseline and 93% (362/389) after 12 weeks.

A total of 389 patients with a mean age of 50 years (standard deviation of 13) were included (see Table 1 for baseline characteristics). After 26 weeks 70% (272/389) of patients had returned one or more follow-up questionnaires. No significant differences in baseline characteristics were found between the responders and non-responders.

Clinical diagnosis.

History taking: After history taking 48% (174/365) of patients had a suspected subacromial impingement as primary hypothesis, 14% (51/365) was rated with shoulder pain due to a cervical or thoracic dysfunction, 8% (29/365) was rated with a frozen shoulder, 5% (17/365) with glenohumeral joint instability and 4% (13/365) with AC/SC joint pathology (Table 2). As PTs could give a maximum of three hypotheses, the overlap between clinical hypotheses is presented in figure 1. In 92 patients the PT suspected either a subacromial impingement or pathology in the glenohumeral joint, and for 52 patients the PT suspected a subacromial impingement or pathology in the cervical-thoracic spine after history taking.

Physical examination: Frequently used specific test for a suspected subacromial impingement were Neer's Sign (177/241, 73%), Hawkins-Kennedy Test (193/241, 80%),

Table 1. Patient characteristics

	Total (n= 389)
Gender, men (%)	170 (43)
Age, mean (SD)	50 (13)
Duration in weeks, med (IQR)	12 (6-26)
History of shoulder pain (yes, %)	158 (40)
Onset (%)	
Sudden onset	118 (33)
Slow onset	246 (67)
Cause (%)	
Traumatic	79 (21)
Work related	132 (36)
Unclear	128 (35)
Other	29 (8)
Dominant side affected (Yes, %)	224 (57)
Shoulder surgery in the past (yes, %)	16 (4)
Corticosteroid injection (yes, %)	32 (8)
Medication (yes, %)	183 (47)
Comorbidity (yes, %)	236 (60)
Level of education:	
high school diploma or less	239 (65)
higher degree	127 (35)
Work	261 (67)
NRS, med (IQR)	6.0 (4-7)
SPS, med (IQR)*	18 (15-21)
SDQ, med (IQR)	62.5 (44-81)
EQ5D Tariff, med (IQR)	0.83 (0.77-0.87)

SD Standard Deviation, Med Median, IQR Interquartile Range, NRS Numeric Rating Scale, SDQ Shoulder Disability Questionnaire, EQ5D EuroQol-5 Dimensions, SPS Shoulder Pain Score
*The shoulder pain score consists of 6 pain symptoms questions together with the NRS

Empty/Full Can (204/241, 85%) and Painful Arc (154/241, 64%). For glenohumeral joint instability, the tests most frequently used were the O'Brien (25/54, 46%), the Relocation Test (38/54, 70%), the Apprehension Test (39/54, 72%), the Biceps Load 1&2 (12/54, 22%) and a Sulcus Sign (14/54, 26%). In the case of suspected AC joint pathology, the acromioclavicular joint play test (73/88, 83%) was most frequently used [31].

In 22% (73/333) of the patients, the physiotherapists changed the primary hypothesis after physical examination, but no specific patterns in these changes were found. After physical examination 39% (122/316) were diagnosed with subacromial impingement, 17% (54/316) with shoulder complaints due to a cervical of thoracic origin, 9% (29/316)

with a frozen shoulder, 7% (24/316) with glenohumeral joint instability, 7% (21/316) with a sprain or strain and 5% (17/316) with AC/SC joint pathology (Table 2).

Table 2. Clinical diagnosis (%) after patient history, physical examination and/or diagnostic ultrasound

	Clinical hypothesis after patient history (n=365)	Clinical diagnosis after physical examination and/or US (n= 316)
Subacromial impingement	174 (48)	122 (39)
Internal impingement	24 (7)	18 (6)
GH joint instability	17 (5)	24 (7)
SLAP lesion	1 (0.3)	2 (1)
Biceps tendinopathy	12 (3)	8 (3)
Frozen shoulder	29 (8)	29 (9)
Cervical/thoracic origin	51 (14)	54 (17)
AC/SC origin	13 (4)	17 (5)
Sprain/strain	17 (5)	21 (7)
Triggerpoints	-	2 (0.5)
Muscular hypertension	3 (1)	1 (0)
No clear clinical diagnoses		2 (0.5)
Other	20 (5)	16 (5)

GH Glenohumeral, AC/SC Acromio-clavicular/sterno-clavicular, SLAP Superior labrum anterior posterior, US Diagnostic Ultrasound

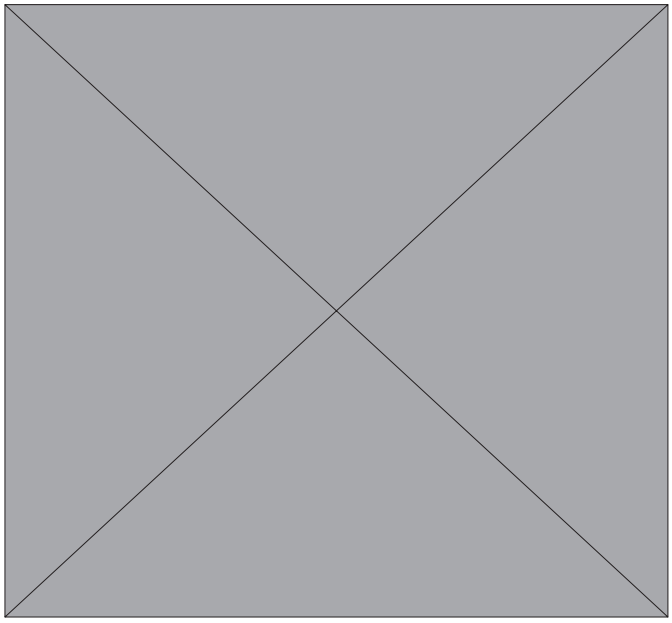

Figure 1. Scaled rectangle diagram showing the overlap for selected clinical hypothesis (max 3 per patient) by physiotherapists after patient history. Colors show the base color for each clinical hypothesis.

Diagnostic ultrasound (US).

A diagnostic US was performed in 31% (n=122) of all patients. In 92% (109/122) of these patients the US was performed before, or instead of, physical examination; in 38% (41/109) of these patients, the PT chose not to perform a physical examination anymore. In 34% (42/122) of all patients the reason to use a diagnostic US was that the PT expected this would lead to a more specific clinical diagnosis, and in 13% (16/122) that it would help the PT in selecting the most appropriate intervention. In 12% of the patients (15/122) the PTs used the US findings to confirm their initial diagnosis and in another 11% (14/122) to better inform the patient about their complaints. The results of the US were: a tendinopathy of the rotator cuff in 57% of the patients (70/122), a calcification of the rotator cuff in 38% (46/122), a partial thickness tear of the rotator cuff in 20% (24/122) and a full thickness tear of the rotator cuff in 5% (6/122) (table 3). Pathological findings were most frequently detected in the supraspinatus tendon.

The PTs assumed that the use of diagnostic US resulted in a better prediction of the integrity of tendon tissue in 51% of patients (62/122), a more specific exercise therapy in 42% (n=51), a better advice and better assessment of prognosis for 48% (59/122), more specific home exercises for 35% (43/122), behavior change in 33% (40/122) and an indication for EST in 16% (19/122) of the patients. Only in 11% (14/122) the results of US led to a hands-off policy and in 7% (8/122) the PTs stated that the use of diagnostic US had no consequence for the treatment plan.

In 16% (19/122) of the patients who had a diagnostic US the consequence of diagnostic US resulted in a referral to the general practitioner. Only 8% (21/267) of patients without a diagnostic US were referred (back) to their GP. These patients were mostly suspected with calcific tendinitis of the supraspinatus in 42% (8/19) and tendinopathy of the supraspinatus in 42% (8/19). Overall, the clinical diagnosis changed in 29% (35/122) of the patients after diagnostic US. In 31% (11/35) of these cases, the diagnoses changed from various diagnoses to a sprain (trauma) or strain.

Treatment plan

Baseline

At baseline, physiotherapists estimated full recovery in 50% (161/323) of the patients and a clinically relevant reduction of complaints in another 47% (152/323) within the estimated treatment period. Physiotherapists estimated full recovery for 80% (43/54) of patients with shoulder pain due to a suspected cervical or thoracic dysfunction. Estimated recovery was lower in all other diagnostic categories. The longest treatment period (>26 weeks) was estimated for patients with a suspected frozen shoulder.

The PTs chose a variety of interventions but most commonly gave advice (331/365, 91%) and exercise therapy (296/365, 81%) (Table 4). The aims for exercise therapy were to improve muscle functions of the rotator cuff and improve stability function of the

Table 3. Findings on US

	US (n=122)
No structural pathology	9 (7)
Not interpretable	2 (2)
Tendinopathy:	70 (57)
Biceps	15 (12)
Supraspinatus	45 (37)
Infraspinatus	4 (3)
Subscapularis	6 (5)
Calcification:	46 (38)
Biceps	2 (2)
Supraspinatus	34 (29)
Infraspinatus	4 (3)
Subscapularis	6 (5)
Full thickness tear:	6 (5)
Supraspinatus	5 (4)
Infraspinatus	-
Subscapularis	1 (1)
Partial thickness tear:	24 (20)
Supraspinatus	20 (16)
Infraspinatus	-
Subscapularis	4 (3)
Biceps tendon rupture	2 (2)
Biceps halo	7 (6)
Bursitis	13 (11)
Subacromial impingement	20 (16)
Arthritis/Arthrosis of AC joint	12 (10)
Glenohumeral discontinuity	4 (3)
Acromion discontinuity	2 (2)
Labrum tear/SLAP	2 (2)
Capsular thickening	1 (1)
Rotatorcuff athrophy	3 (2)
Other	3 (2)

scapulo-thoracic joint. A smaller portion of the PTs chose transcutaneous electric nerve stimulation (TENS) (5/365, 1%), massage (27/365, 7%) and tape/bracing techniques (54/365, 15%). For patients with a suspected subacromial impingement syndrome, 92% (112/122) of the patients received advice and exercise therapy. For patients with a suspected cervical or thoracic dysfunction, the preferred treatment strategy was advice (50/53, 93%) and manual mobilization/manipulation of the spine (49/53,

Table 4. Planned PT interventions

PT interventions	Total n=365	Patients with SI n=122	Cervical / thoracic origin n=53	Frozen shoulder n=29	GH instability n=24
Information/advice (%)	331 (91)	112 (92)	50 (93)	29 (100)	20 (83)
Exercise therapy (%)	296 (81)	112 (92)	36 (67)	18 (62)	23 (96)
Massage (%)	27 (7)	5 (4)	11 (20)	4 (14)	-
Manipulation/ mobilization (%)	208 (57)	57 (47)	49 (91)	23 (79)	6 (25)
Shockwave (%)	39 (11)	29 (24)	1 (2)	-	-
Transcutaneous Electric stimulation therapy (%)	5 (1)	-	-	2 (7)	-
Trigger point therapy (%)	32 (9)	11 (9)	5 (9)	3 (10)	2 (8)
Taping/bracing (%)	54 (15)	29 (24)	-	-	11 (46)
Posture correction (%)	7 (2)	2 (2)	3 (5)	-	-
Other (%)	25 (7)	4 (3)	3 (5)	3 (10)	1 (4)

PT Physiotherapy, GH Glenohumeral, SI subacromial impingement

91%). Patients with frozen shoulder also received mostly advice (29/29, 100%) and manual joint mobilization of the shoulder or cervical spine (23/29, 79%).

Follow-up

At 6 weeks, 41% (118/285) of patients reported to be recovered, 57% (152/269) at 12 weeks and 60% (164/272) at 26 weeks.

In total, 12% (44/362) of the patients ended treatment at 3 weeks, 29% (109/373) at 6 weeks and 59% (214/363) at 12 weeks. Of 69% (148/214) of all patients that ended treatment within 12 weeks the physiotherapist decided to stop treatment because treatment goals had been achieved; 13% (27/214) of the patients had stopped the treatment themselves, 10% (21/214) had been referred to their general practitioner, and 5% (11/214) had been referred to another health care professional. The referral rate in the first 3 weeks was higher compared to later follow-up moments.

Figure 2 shows the course of recovery for each follow up moment per diagnostic category. The subgroup of patients with frozen shoulder worsened during follow-up. At 6 weeks most patients with a subacromial impingement syndrome (SIS) had recovered. For patients with SIS, 41% (36/88) reported being recovered at 6 weeks. Patients with SIS, who reported no recovery, 73% (38/52) were still under treatment after 6 weeks and 50% (17/34) after 12 weeks.

During the treatment period, the PTs changed the treatment plan in 16% (58/365) of the patients and 3% (11/365) the PT changed the treatment plan twice. Reasons for changing the treatment plan were because of the absence of progression (in 38% (22/58) of the patients), a change in the course of the disease (in 26% (15/58)) or unforeseen dysfunctions (in 17% (10/58)).

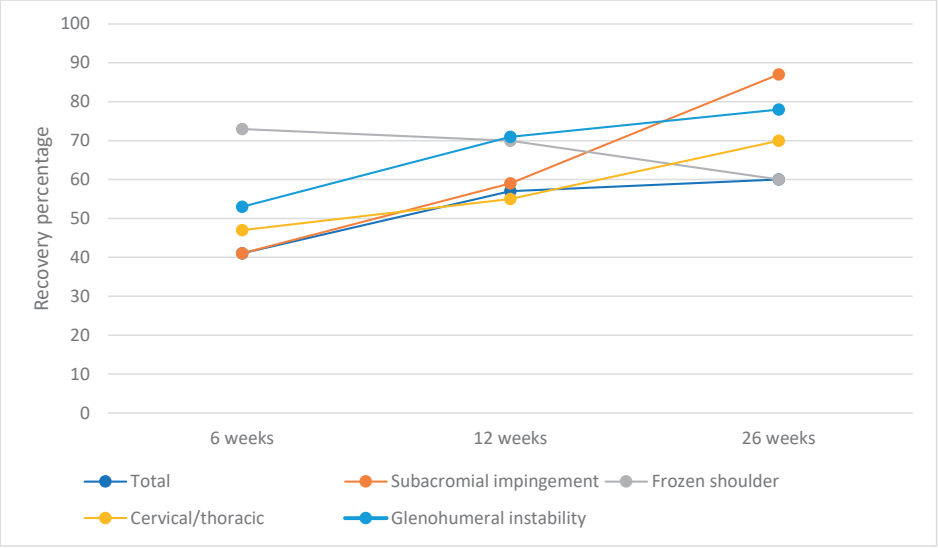

Figure 2. Percentage of recovery (GPE) per diagnostic category for all follow-up moments.

Overall, the median number of treatment sessions was 7 (IQR 6). When treatment stopped between 0 and 3 weeks, the median number of sessions was 4 (IQR 3). Between 3 and 6 weeks the median was 6 (IQR 4). Between 6 and 12 weeks the median was 7 (IQR 5).

DISCUSSION

Main findings

Physiotherapists (PTs) suspected subacromial impingement and complaints due to a cervical/thoracic origin to be the cause of their shoulder pain in most patients. In 31% of patients, diagnostic US was used. Pathologies most frequently found using US were in the supraspinatus tendon. Almost all patients received information and advice by their PT. Patient with suspected subacromial impingement, besides advice, received exercise therapy most frequently and patients with cervical thoracic originated shoulder pain received mostly manipulation/mobilization. About 33% of the patients stopped treatment within 12 weeks with a median number of treatment sessions of 7. After 26 weeks 60% of patients reported being recovered.

Comparison with existing literature

Patient demographics were similar to populations described by other studies [4, 32, 33]. The mean duration of complaints before seeking help for their shoulder complaint was

relatively long but comparable with another observational study from the Netherlands [4]. We found a median time of 12 weeks before seeking help, which might be a valuable time-period in which PTs can advise patients to reduce the chance of chronicity.

No previous cohort study collected descriptive data concerning the diagnostic process of the PT and the related interventions used. The most frequent clinical hypothesis found in this study was subacromial impingement. Also, other primary care studies described subacromial impingement to be the most common cause of shoulder complaints [34-37]. The scaled rectangle diagram (figure 1) showed the greatest overlap/concomitance between the formulated hypothesis subacromial impingement and cervical/thoracic originated shoulder pain. Subacromial impingement is probably caused by multiple factors and sometimes suggested to be a secondary complaint [38, 39]. Literature suggests that targeting adjunctive regions (cervical and thoracic spine) of the shoulder has beneficial effects and thus might be related to subacromial impingement possibly causing PTs to believe that the cervical region is related to subacromial impingement syndrome [39-41]. Similar to our study, a survey amongst physiotherapists in the United Kingdom, concluded that advice and exercise were administered the most in patients with rotator cuff disease [42].

Recovery rate at 12 weeks was 44% and 60% at 26 weeks, which is similar to the previously reported recovery rates in the literature [5, 43, 44]. However, not all recovered patients received an equal amount of physiotherapy treatment.

Strengths and limitations

This is the first study that describes the daily management of physiotherapy in patients with shoulder pain. Furthermore, this study is the first that evaluates different treatment strategies based on clinical characteristics from patient history and/or physical examination.

The response rate for participants was 70% after 12 weeks of follow-up. Dropout rates in observational studies remain challenging and in order to prevent dropouts proper actions were described in the study protocol [25]. All participants were sent personal links to their e-mail address at the time of follow-up with 2 reminders and for patients without computers or Internet the questionnaire was sent on paper. The PTs were sent the questionnaires to their e-mail, and the response rate was 93%. Both PTs and patients were telephoned twice during the study period to keep dropout and loss to follow-up at a low level.

This study found a median complaint duration of 12 weeks at baseline. Complaint duration could be this long since there is a possibility that patients were seen by their GP, who could apply a wait and see policy, before referring to physiotherapy treatment. It was unknown whether patients used direct access or if they were referred by their GP.

The list of potential diagnoses used was developed based on the rationale of clinical experts. No protocols or standardizations on diagnostic categories, tests, or treatments were used due to the nature of the study, as we wanted to describe daily management.

Based on the literature we know that specific tests are not valid in making a confident statement for pathology, and therefore the possibility of error in the clinical diagnosis made by the PTs is a problem. However, even if strict criteria for subgroups are stated in advance, the interobserver agreement in classification of current used subgroups, and the clinical tests leading to their diagnosis is only fair to moderate (Kappa 0.2–0.6) [45]. This implies that the usefulness of the currently used subgroups is still hampered by the lack of reproducibility of the diagnostic criteria. On the contrary PTs have to deal with diagnostic uncertainties; Figure 1 shows the overlap of diagnostic categories indicating that physiotherapists do not work with one hypothesis. Another study in GP practice came to the same conclusion [46]. These uncertainties might contribute to the increased use of diagnostic ultrasound. Physiotherapists will use US for a variety of other reasons depending on their level of expertise, specialization or the complaint of the patient (ie biofeedback for low back pain). It is imperative that physiotherapists are allowed to utilize US to optimize the effectiveness of their interventions, but it should be determined how this tool can best benefit the patient.

A limitation of this study may be the generalization of the results. Dutch PTs were asked to participate in a cohort study for shoulder complaints collecting data about physiotherapy management. Secondary aims about diagnostic US were also mentioned. It was possible that PTs who were specialized or more interested in the use of US would be more likely to participate leading to a higher frequency of US scans resulting in a biased sample of physiotherapists in this study. Sampling bias was however taken into account by recruiting physiotherapists in different ways (emails to the network of PT from the applied university, emails to PT supervisors of students of the applied university, physically addressing PTs to participate in symposia and emails to the shoulder networks in the region).

The utilization of US might have been influenced by one of the original study purposes (namely: the inter-rater reliability of US between radiologists and physiotherapists) explaining the large number of ultrasonographers. The total number of PTs with an ultrasound machine was 44 (35%), which might be higher than average. A second US scan by the radiologist was only requested when PTs had reported performing an US scan, representing usual care. Physiotherapists were never asked to conduct an US scan. For one third of the cases, the physiotherapist changed their clinical diagnosis after diagnostic US and believed the complaints were due to a sprain (trauma) or strain like rotator cuff tears. The findings on US could then lead to an increase in the number of referrals to the GP. However, we did not collect data on further interventions if patients were referred to the general practitioner or orthopedic surgeon. There is a controversy regarding the management of rotator cuff tears. Whether these patients would be better off being referred to the GP or orthopedic surgeon is not clear. It might be argued that small tears should be repaired to relieve symptoms and prevent tear progression, but little

evidence exists to support this view. Another study has found good results for patients with partial or full thickness tears receiving physiotherapy [51]. Furthermore, pathologies seen on US might not be the cause of symptoms experienced by the patient [47, 48]. Findings on diagnostic US should be interpreted with caution as studies have found a high number of pathologies in asymptomatic shoulders. Reliability of diagnostic US between radiologists and physiotherapists is substantial for full thickness rotator cuff tears [49].

All diagnostic subgroups, except patients with a suspected frozen shoulder, showed an improvement after 26 weeks. We are not sure whether these positive results could be attributed to the diagnostic subgroup or whether recovery was a reflection of the therapeutic intervention or the natural course of shoulder pain. However as might be expected from literature the complaint of patients with a suspected frozen shoulder got worse over time in the pain and stiffness stage [50]. A large group of patients were still not recovered after 12 weeks of treatment which might be attributed to the heterogeneous sample, the adherence of patients or the natural disease process.

Specific interventions were chosen in patients with subacromial impingement, cervical or thoracic dysfunction or frozen shoulder. Variability might exist on the exact interpretation of physiotherapeutic interventions. In the case of exercise therapy for subacromial impingement syndrome, specific exercises were not standardized.

During data collection, physiotherapists could select the physical examination tests based on the hypothesis, or multiple hypotheses, after patient history. Most physiotherapists formulated multiple hypotheses and therefore analyzing the tests used for each clinical diagnosis was impossible. Furthermore, we hypothesized that the decision for the interventions was primary based on the clinical diagnosis. However, patient preferences or other factors could have influenced these decisions. This study assumed that physiotherapists mostly use a patho-anatomical model to generate an early hypothesis. However new strategies, like the symptom modification procedure, use symptom provoking procedures to select whether treatment should focus on the glenohumeral joint, the scapula or the cervical/thoracic spine [51]. This procedure was proposed because clinicians recognized the complexity of making a definitive diagnosis and it might be that physiotherapists in the Netherlands already use this model in practice. However research for this new method of assessment is still unavailable.

Implications for practice

Subacromial impingement and complaints due to a cervical/thoracic origin were in most patients suspected to be the cause of their shoulder pain. Shoulder and neck pain often coincide together, but it's not clear whether PTs can distinguish between the two. The evidence statement for subacromial syndrome recommends exercise therapy (if there is sufficient mobility) and manual mobilizations (when absolutely necessary) [22]. This is consistent with observations in clinical practice for patients with subacromial impingement

who for the most part received exercise therapy. A small proportion chose interventions (TENS, massage and tape/bracing) not recommended by the evidence statement.

The evidence statement furthermore states that patients should be referred to the general practitioner or orthopedic surgeon if pain and activity levels did not improve [22]. Although we observed that 73% of patients with subacromial impingement, who had no or insufficient improvement, still received treatment after 6-12 weeks. This means that most patients were not treated according to recommendations from the evidence statement, which states referral to the GP when no improvement is seen after 6-12 weeks of physiotherapy. However, to date, there is no good evidence that referral to the GP, possible surgery, medications or injections are better than conservative management [52].

Implications for research

Our results show that PTs frequently use diagnostic US as a replacement for physical examination. The latest review of diagnostic tests in shoulder complaints described moderate accuracy for some shoulder tests but not yet validated by multiple studies [10, 53]. Whether US could assist diagnostic accuracy for the physiotherapist in primary care should be investigated by studying the combined effect of physical tests and US in large clinical trials.

This study describes physiotherapy care for patients with shoulder complaints. However, the exact reasons for the clinical decisions, like the number of treatments or the presumed prognosis, should be investigated further.

CONCLUSIONS

We observed that most patients were suspected of having subacromial impingement, or cervical thoracic originated shoulder pain. Exercise therapy and manual mobilizations were most frequently utilized and consistent with interventions recommended for patients with subacromial impingement syndrome. Diagnostic ultrasound was utilized in one-third of the patients and PTs expected that this would lead to a more specific clinical diagnosis, but the effect on patient recovery remains unknown. Modest differences for the choice of interventions were observed and consensus is required.

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