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Treatment of Shoulder Disorders

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Treatment for shoulder disorders in primary care: generalisability, course, and prognostic indicators

Learning Objectives

Upon successful completion of this course, you will be able to:

- List predictors of long term prognosis in patients treated for shoulder pain in primary care.
- Identify the course of shoulder symptoms
- List the prognostic indicators for various types of shoulder pain
- Identify the most important aspects of the assessment of the painful shoulder
- Identify the available treatment s for the various types of shoulder pain
- List the incidence, spectrum of disease and relation to general health of shoulder disorders in primary care.

ABSTRACT

Objective: To investigate predictors of long term prognosis in patients treated for shoulder pain in primary care.

Methods: Data were taken from two pragmatic randomized clinical trials investigating the effectiveness of conservative treatments for shoulder pain presenting to primary care. Shoulder pain severity, disability, and perceived recovery measured in the long term (UK, 18 months; Netherlands, 12 months) were considered as outcome measures. Prognostic indicators measured before randomization was determined by linear regression (pain severity and disability) and logistic regression (perceived recovery).

Results: 316 adults with a new episode of shoulder pain were recruited (UK, n = 207; Netherlands, n = 109). In multivariate analysis, greater shoulder disability at follow up was associated with higher baseline disability score, concomitant neck pain, and a gradual onset and longer duration of shoulder symptoms. Pain scores at follow up were higher in women and in those with longer baseline duration of symptoms and higher baseline pain or disability scores. Being female, reporting gradual onset of

symptoms, and a higher baseline disability score each independently reduced the likelihood of perceived recovery.

Conclusions: The results suggest that there is no long term difference in outcome between patients with shoulder pain treated with different clinical interventions in different clinical settings, or having different clinical diagnoses. Baseline clinical characteristics of this consulting population, rather than the randomized treatments which they received, were the most powerful predictors of outcome. Whether this highlights the need for earlier intervention or reflects different natural histories of shoulder pain is a topic for further research.
E Thomas [1], D A W M van der Windt [2], E M Hay [1], N Smidt [2], K Dziedzic [1], L M Bouter [2], P R Croft [1]

Abbreviations: NRS, numerical rating scale; RCT, randomized controlled trial; SDQ, shoulder disability questionnaire; VAS, visual analogue scale

Shoulder problems are common, with up to 47% of adults in the general population reporting such symptoms in a one year period.[1] In terms of presentation to general practice, the annual consultation rate for new episodes of shoulder pain is approximately 1%.[2] The current evidence from both observational studies[3–5] and randomized clinical trials in primary[6–8] and secondary care[9,10] suggests that many sufferers have an unfavorable long term outcome, irrespective of treatment. Identifying those groups of individuals with shoulder pain who have poor long term outcome would have several advantages, including the ability to advise individual patients on their likely course.

The objectives of this analysis were threefold: first, to investigate the generalisability of the findings from two trials by determining clinical heterogeneity across the two studies in terms of participants, interventions, and outcome; second, to determine the course of shoulder complaints in the complete sample over the follow up period; and third, to investigate potential prognostic indicators for poor long term outcome, using data collected before randomization.

METHODS

This study used data from two recently completed, pragmatic randomized clinical trials investigating the effectiveness of conservative treatments for shoulder pain presenting to primary care.[6,7]

Interventions

The trial by Van der Windt *et al*[6] compared the effectiveness of a local intra-articular injection (by a posterior route) of 40 mg triamcinolone acetonide and a course of physiotherapy, in 109 participants presenting to primary care in and around Amsterdam with a new episode of painful stiff shoulder (capsular syndrome).

The trial by Hay *et al*[7] compared the effectiveness of a subacromial local corticosteroid injection of 40 mg of methylprednisolone and 4 ml 1% lignocaine (lidocaine) and a course of community based physiotherapy. This study was based in North Staffordshire and randomized a total of 207 participants attending their general practitioner (GP) with a new episode of shoulder pain. In contrast to the trial of

Van der Windt *et al*, the participants in the Hay trial had a broad range of shoulder problems without focus on a particular diagnosis.

Study population

In both studies, consecutive patients consulting in primary care for shoulder pain were eligible for recruitment. The following inclusion criteria were applied in both studies: age 18 years and over, ability to complete questionnaires in the relevant languages, and able to give informed consent. Exclusion criteria in both studies included: bilateral symptoms, contraindication to the treatments being evaluated, recent treatment with either a corticosteroid or physiotherapy, and previous surgery, dislocation, or fracture in the shoulder area. However Hay *et al*[7] additionally excluded patients who had consulted their GP with shoulder pain during the preceding 12 months.

In both studies, patient characteristics and potential prognostic factors were recorded by a research nurse at an initial visit before randomization. Demographic and clinical characteristics included age, sex, duration of current shoulder complaint, and use of painkillers.

Outcome measures

Both studies assessed the following: disability associated with the shoulder pain; pain severity during the day; and participants' perception of the outcome. This information was collected at three follow up points: short term (six weeks in the UK, seven weeks in the Netherlands), mid-term (six months in both studies), and long term (18 months in the UK, 12 months in the Netherlands). However, there were minor differences between the two studies in terms of the scaling used in these three outcome measures.

Different shoulder disability questionnaires (SDQ) were used in the two studies (SDQ-UK[11] and SDQ-NL[12]). To record the pain severity, Van der Windt *et al*[6] used a 0–100 visual analogue scale (VAS), while Hay *et al*[7] used a 10 point numerical rating scale (NRS). To standardize these two outcome measures across both studies, measurements from the Hay study were transformed to 0–100 scales, where 100 indicates maximum pain or disability. The SDQ-UK comprises of 23 areas in which shoulder disability is assessed—for example, fastening clothing, reduced role in household jobs. To put this transformed 0–100 scale of disability into context, four points on the 0–100 scale would be approximately equal to the addition of one more area in which the participant reported difficulty on the original 23 item version of the SDQ-UK.

To rate person perceived recovery from baseline, both studies used a Likert scale, with 5 points for the Hay study and a 6 point scale for the Van der Windt study. Here, the scores from both studies were standardized by dichotomizing to two groups into (i) those who had not improved or had worsened ("unchanged", "worse", "much worse"), and (ii) those who had improved ("recovered", "improved" (UK); "recovered", "much improved", "somewhat improved" (Netherlands)).

Statistical analysis

We investigated differences between the two study populations regarding demographic and clinical characteristics collected at baseline. Summary data were calculated—proportions for categorical variables and means and standard deviations for numerical variables. For categorical data, difference in proportions and their associated 95% confidence intervals were calculated; for numerical data, mean differences and their associated 95% confidence intervals (CI) were calculated. Differences between the two study populations with regard to baseline pain and disability scores were also calculated: first, the unadjusted mean differences and 95% confidence intervals; second, the adjusted mean differences and

95% CI, allowing for any differences in the demographic or clinical characteristics between the studies (linear regression).

Comparisons of the course between the two trials, and between the two treatment groups within the trials, were made. Univariate and multivariate analyses were used to investigate the associations between potential prognostic indicators and outcome in the long term. For each of the three outcome measures examined (disability, pain, and perceived recovery) different models were built, with the model being parameterized to determine factors associated with a poor outcome—that is, a higher score for disability or pain (linear regression) and not improving or worsening (logistic regression). The variables "country" (Netherlands, UK) and "treatment" (injection, physiotherapy) were included in all models as covariates. All putative prognostic factors showing a univariate association with the outcome at issue ($p<0.10$) were put forward into a multivariate analysis (backward elimination ($p<0.10$)) to determine a group of factors that were independently associated with a poor outcome. We chose this cut off of $p<0.1$ to represent significance rather than the more conventional, but no less arbitrary, value of 0.05, the use of which has been shown to fail to identify factors known to be of importance.[13] Analyses were carried out using Stata 7.0.[14]

RESULTS

Study populations

In all, 203 patients were referred from the 60 participating GPs in the trial based in the Netherlands and 109 (53.7%) were randomized (56 to physiotherapy and 53 to corticosteroid injection). Reasons for exclusion were: diagnosis of capsular syndrome could not be confirmed (n = 73), no consent (n = 6), not eligible (n = 10), or they had recovered (n = 5).[6] In the study by Hay *et al*,[7] 207 of 237 patients (87.3%) referred to the trial by the participating GPs were randomized (103 to physiotherapy and 104 to corticosteroid injection). Reasons for exclusion were no consent (n = 12), not eligible (n = 11), or they had improved (n = 7).

Table 1 presents the baseline demographic and clinical characteristics and measurements for both studies at baseline. The two studies were similar with respect to mean age, proportion of women, proportion with the dominant side affected, and onset of current symptoms. However, participants in the trial of Van der Windt *et al* reported a significant longer duration of current symptoms, a higher percentage of concomitant neck pain, and a lower percentage of recent use of painkillers. With respect to baseline measures of pain and disability, differences were apparent between the trials. Disability scores were significantly higher in the Dutch study, while conversely pain scores were significantly higher in the UK trial. After adjusting for demographic and clinical characteristics, the difference in pain severity between the two studies was reduced. However, the difference in disability scores persisted after this adjustment.

Table 1 Patient characteristics at baseline in two randomized controlled trials on the treatment of shoulder disorders in primary care

	Van der Windt *et al*[6] (n = 109)	Hay *et al*[7] (n = 207)	Difference (NL–UK) (95% CI)	Adjusted difference (95%CI)*
Demographic characteristics				
Age (years)	58.8 (10.5)	57.5 (13.4)	1.3 (–1.6 to 4.2)	
Women	58 (53.2%)	110 (53.1%)	0.07% (–11.5% to 11.6%)	
Clinical characteristics at baseline				
Duration of shoulder complaint (weeks)	27.6 (40.4)	12.5 (15.5)	15.2 (8.9 to 21.4)	
Dominant side affected	43 (39.5%)	97 (46.9%)	–7.4% (–18.8% to 4.0%)	
Concomitant neck pain	56 (51.4%)	81 (39.1%)	12.2% (0.7% to 23.7%)	
Painkillers in last 48 hours	30 (27.5%)	146 (70.5%)	–43.0% (–53.4% to –32.6%)	
Acute onset of symptoms	24 (22.0%)	58 (28.0%)	–6.0% (–15.9% to 3.9%)	
Baseline measures of outcome				
Pain during the day	48.7 (22.1)	56.6 (24.6)	–7.9 (–13.4 to –2.3)	–4.1 (–10.3 to 2.1)
Shoulder disability score	69.4 (18.0)	47.4 (19.7)	22.0 (17.5 to 26.5)	25.6 (20.6 to 30.5)

Values are n (%) of participants or mean (SD).

*Linear regression analysis of mean differences (95% confidence intervals) after adjustment for all demographic and clinical characteristics in the table.

Course of shoulder symptoms

Despite a significant difference in improvement rates in the short term for the Dutch trial (difference = 17.6% (95% CI, 5.0% to 30.3%)), the pattern of improvement rates was similar over the longer term both between countries and between treatments within countries (table 2).

Table 2 Patient perceived outcome since baseline

	"Improvement" since baseline			
	Van der Windt *et al*[6] (n = 109)		Hay *et al*[7] (n = 207)	
	Injection	Physiotherapy	Injection	Physiotherapy
Short term follow up	50 (96.2%)	44 (78.6%)	69 (72.6%)	77 (78.6%)
Mid-term follow up	44 (84.6%)	47 (87.0%)	80 (82.5%)	82 (85.4%)
Long term follow up	46 (93.9%)	46 (83.6%)	66 (86.6%)	75 (92.6%)

Values are n (%).

Figure 1 presents the course of "severity of shoulder disability" for each intervention, separately. At the long term follow up point (12/18 months), a decrease in disability score from baseline was seen for almost all participants (90.1%), regardless of treatment or country. The course of participants who received a corticosteroid injection was slightly more favorable in the short term for the Dutch trial, but in the mid- and long term both treatment groups were similar. The course for the two treatment groups from the UK trial were almost identical. Comparing the data from the two countries, combining the treatment groups, the average disability scores fell by 68% in the UK trial compared with 57% in the Dutch trial. Hence, despite a lower long term disability score in the UK trial, the change from baseline was similar in both trials, as the Netherlands trial had a greater mean disability score at recruitment. A similar pattern to that observed for disability was seen for pain severity during the day (fig 2). Again, despite different mean scores at baseline, the UK participants having higher scores, all four treatment groups had substantially improved at long term follow up.

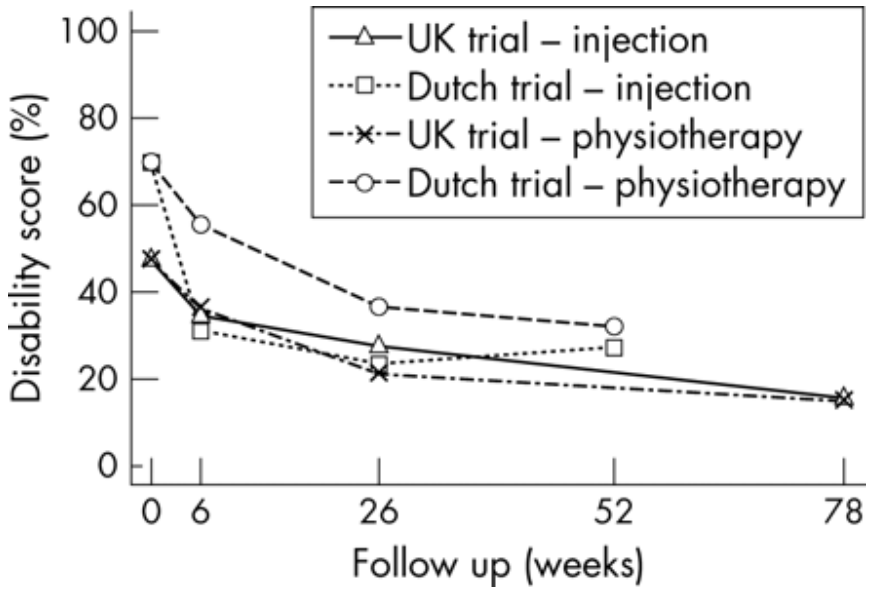

Figure 1 The severity of shoulder disability at baseline and during follow up for each intervention individually.

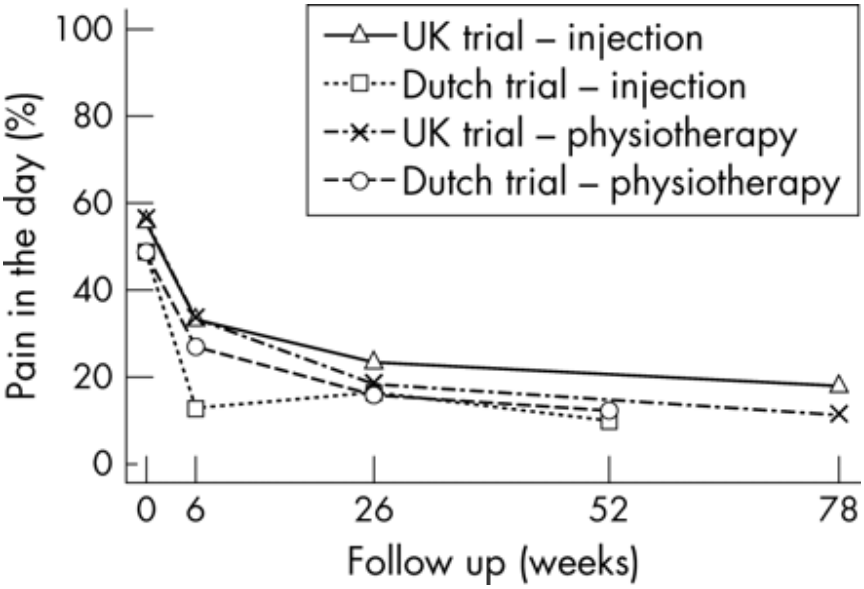

Figure 2 The severity of shoulder pain during the day at baseline and during follow up for each intervention individually.

Prognostic indicators

Disability score at long term follow up

In the univariate analysis, after adjusting for country and treatment, the following were all associated with higher disability score at long term outcome: concomitant neck pain, gradual onset of symptoms (that is, over a few weeks), longer duration of symptoms at recruitment, and higher baseline pain and disability scores (table 3↓). In the multivariate analysis, concomitant neck pain, a gradual onset of symptoms, longer duration of symptoms at recruitment, and higher baseline disability score each increased the long term disability score (R^2 = 23.7%).

Table 3 Prognostic indicators of the severity of shoulder disability at long term follow up (n = 264): univariate and multivariate linear regression analyses

Prognostic indicator*	Univariate analysis		Multivariate analysis	
	Mean difference	95% CI	Mean difference	95% CI
Age group (years)				
20 to 50				
51 to 58	6.78	–2.94 to 16.5		
59 to 67	3.36	–6.38 to 13.1		
68 to 85	11.06	1.07 to 21.0		
Male sex	3.90	–2.89 to 10.7		
Duration of shoulder pain at baseline (per month)	0.52	0.05 to 1.00	0.52	0.08 to 0.95
Involvement of dominant side	3.04	–3.85 to 9.92		
Concomitant neck pain	10.70	3.94 to 17.5	6.57	0.21 to 12.9
Gradual onset	6.66	–1.19 to 14.5	7.77	0.53 to 15.0
Use of painkillers in previous 48 hours	3.55	–3.74 to 10.9		
Baseline disability (per point)	0.52	0.36 to 0.67	0.52	0.36 to 0.68
Baseline pain in day (per point)	0.18	0.04 to 0.32		

*Adjusted for country and randomized treatment.

CI, confidence interval.

At baseline, the mean disability score was 55 points on a scale of 0–100. By long term follow up this had reduced to a mean of 21 points. A substantial effect on follow up disability score was attributable to the presence of concomitant neck pain at baseline and to a gradual onset of the shoulder symptoms, with each of these factors being linked to an approximate 7 point increase in the follow up disability

score among participants with these characteristics compared with those without. This is equivalent to having two additional areas of limited everyday functioning reported on the SDQ-UK. Longer duration of symptoms at baseline also increased disability score at follow up; comparing two participants, alike in all other respects, each extra month of recorded duration would increase the follow up score by 0.5 points. Not surprisingly, higher disability at baseline led to a higher score at follow up; this is equivalent to stating that for each two additional areas of limited everyday functioning recorded at baseline, one would be retained at follow up.

Pain severity during the day at long term follow up

In the univariate analysis, after adjusting for country and treatment, the following were associated with higher pain severity in the day at long term outcome: male sex, longer duration of symptoms at recruitment, and higher baseline pain and disability scores (table 4↓). In the multivariate analysis, being male, having a longer duration of symptoms recorded at baseline, and the severity of both baseline pain and disability scores each independently increased the long term pain scores (R^2 = 9.22%).

Table 4 Prognostic indicators of the severity of shoulder pain during the day at long term follow up (n = 264): univariate and multivariate linear regression analyses

Prognostic indicator*	Univariate analysis		Multivariate analysis	
	Mean difference	95% CI	Mean difference	95% CI
Age group (years)				
20 to 50				
51 to 58	–0.19	–7.67 to 7.30		
59 to 67	2.29	–5.29 to 9.87		
68 to 85	6.88	–0.81 to 14.6		
Male sex	6.06	0.83 to 11.3	5.77	0.74 to 10.8
Duration of shoulder pain at baseline (per month)	0.25	–0.13 to 0.62	0.30	–0.06 to 0.65
Involvement of dominant side	4.24	–1.08 to 9.56		
Concomitant neck pain	2.76	–2.56 to 8.08		
Gradual onset	3.32	–2.74 to 9.39		
Use of painkillers in previous 48 hours	3.43	–2.25 to 9.10		
Baseline disability (per point)	0.23	0.10 to 0.36	0.13	0.01 to 0.28
Baseline pain in day (per point)	0.19	0.08 to 0.29	0.15	0.03 to 0.26

*Adjusted for country and randomized treatment.

CI, confidence interval.

At baseline, the mean pain score was 54 points on a scale of 0–100. By long term follow up this had reduced to a mean of 13 points. Sex had a substantial effect on follow up pain score with men having scores 6 points higher than women. As seen for long term disability, pain severity scores at long term

follow up were higher for those with longer symptom duration at baseline; each additional six months of duration at baseline increased the pain score at follow up by approximately 2 points. Pain at long term follow up was associated with both baseline pain and disability score.

Perceived recovery at long term

Here, as the outcome measure is dichotomous—that is, recovered or not recovered—the results are presented as odds ratios (the odds of not recovering given presence of the risk factor compared with the odds of not recovering given the absence of the risk factor). In the univariate analysis, after adjusting for country and treatment, the following were all associated with a poor outcome ("not improving") at long term follow up: male sex, gradual onset of symptoms, longer duration of symptoms at recruitment, and higher baseline pain and disability scores (table 5). In the multivariate analysis, being male, reporting a gradual onset of symptoms, and higher baseline disability scores were independently associated with not recovering.

Table 5 Prognostic indicators of the perceived outcome of shoulder symptoms at long term follow up (n = 264): univariate and multivariate logistic regression analyses

Prognostic indicator*	Univariate analysis		Multivariate analysis	
	Odds ratio	95% CI	Odds ratio	95% CI
Age group (years)				
20 to 50	1.00			
51 to 58	0.79	0.24 to 2.60		
59 to 67	0.75	0.23 to 2.47		
68 to 85	1.50	0.51 to 4.45		
Male sex	2.35	1.03 to 5.31	2.57	1.10 to 5.94
Duration of shoulder pain at baseline (per month)	1.03	0.99 to 1.10		
Involvement of dominant side	0.90	0.40 to 2.00		
Concomitant neck pain	0.96	0.43 to 2.14		
Gradual onset	2.98	0.86 to 10.3	3.21	0.91 to 11.3
Use of painkillers in previous 48 hours	1.22	0.52 to 2.86		
Baseline disability (per point)	1.03	1.01 to 1.05	1.03	1.01 to 1.05
Baseline pain in day (per point)	1.02	1.00 to 1.03		

*Adjusted for country and randomized treatment.

CI, confidence interval.

Men compared with women, and those who reported a gradual compared with a sudden onset, were at a threefold increased odds of not recovering. For each additional point on the disability score at baseline, the odds of a poor outcome were increased by 3%; hence for two participants who were 10 disability

points apart at baseline, the one with the higher score would be 30% more likely to have persistent symptoms at long term follow up.

DISCUSSION

Comparing data from two large recent randomized clinical trials of shoulder pain in primary care gave us the opportunity to investigate the generalisability of these findings. Our analysis confirmed that, as expected from the inclusion and exclusion criteria, there were differences between the two study population in terms of their characteristics at entry to the trial. Despite these differences, however, the long term effect of treatment appears to be similar both within each trial and across both trials.

The group of prognostic indicators associated with each of the outcome measures examined differed with only one factor (disability score at baseline) common to each model. Disability, symptom duration and baseline pain level were the only factors to reach moderate to high evidence for predicting outcome in a recent systematic review of cohort studies.[15] Prognostic models are unsuitable for making inferences on interventions to improve prognosis and so the models derived here are suitable for predicting long term outcome only—that is, they cannot imply causality.

Some of the heterogeneity seen in the clinical characteristics of the two study populations partly reflects the different exclusion criteria and definitions of "shoulder complaint" used. For example, Hay *et al*,[7] unlike Van der Windt *et al*,[6] excluded patients who had previously consulted for the same shoulder problem in the past 12 months. However, for the majority of the Dutch participants, the consultation leading them into the trial was their first in that year period. Van der Windt *et al* attempted to assemble a group of patients with a single diagnosis (capsular syndrome). This differed from the more general definition of "shoulder pain" as used by Hay *et al*. The higher level of baseline shoulder disability and higher prevalence of concomitant neck pain seen in the Dutch trial could be related to the different diagnostic criteria used. Indeed, when a subgroup of UK participants with shoulder restriction (either in active abduction or external rotation) was compared to those without restriction, those with restriction had higher baseline disability scores. The shorter duration of symptoms at baseline in the UK participants is likely to reflect the requirement that participants should not have consulted with their affected shoulder in the previous 12 months.

It is curious that the Dutch participants had higher baseline disability but lower pain scores that the UK participants. This finding suggests that the shoulder disability questionnaires used are indeed measuring something other than pain. This is likely to be particularly so for the SDQ-UK, which includes various questions about the more general effects of shoulder pain on health status (for example, irritability and so on). By contrast, the SDQ-NL is more restricted in its content, including questions mainly focusing on the effect of pain on limitation of function. This finding has been reported previously, where a higher correlation was seen between the SDQ-UK and the EuroQol, a generic health outcome measure, than between the EuroQol and the SDQ-NL.[16]

There was no evidence from either study that local steroid injection conferred long term benefit. Local steroid injection offered some benefit in terms of improvement in short term pain and disability only in the Dutch trial. This difference between the trials might relate to different patient selection, different steroid preparations, or differences in injection techniques. For example, the majority (75%) of the

Dutch participants randomized to injection received two or three injections in the treatment period compared to one in the UK trial.

Pooling data from randomized trials potentially allows for the detection of important differences in secondary outcome measures for which the original trials were not individually powered to detect. In our study such analysis was hampered by a lack of consistency in the use of outcome measures. Although we attempted to standardize the two SDQs used in the trials, there appeared to be some differences relating to the content these two tools which compromises the validity of this approach.[16] Hence the authors agree that a consensus on a core set of outcome measures for shoulder pain in needed.[16,17]

Despite the clinical heterogeneity apparent in the two study populations, the overall findings of the two trials suggest that shoulder injection and physiotherapy are similarly effective in the long term at reducing both pain and disability in patients presenting to primary care with shoulder pain. The results of this analysis suggest that there is no long term difference in outcome between patients treated with different clinical interventions in different clinical settings, or having different clinical diagnoses. Baseline characteristics of the population (gradual onset, duration and severity of symptoms) were the most powerful predictors of outcome. This has important implications for future interventions for shoulder pain; whether it highlights the need for earlier intervention or reflects different natural histories of shoulder pain is a topic for further research. However, the percentage of the variance explained in the models is quite low, which means that there are other factors not included in the model (either measured or not measured) that may explain a further amount of the variability in outcome among patients with shoulder disorders.

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Shoulder pain: diagnosis and management in primary care

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Introduction

Compromised shoulder movement due to pain, stiffness, or weakness can cause substantial disability and affect a person's ability to carry out daily activities (eating, dressing, personal hygiene) and work.[w1] Self reported prevalence of shoulder pain is estimated to be between 16% and 26%; it is the third most common cause of musculoskeletal consultation in primary care, and approximately 1% of adults consult a general practitioner with new shoulder pain annually.[1] Occupations as diverse as construction work and hairdressing are associated with a higher risk of shoulder disorders. Physical factors such as lifting heavy loads, repetitive movements in awkward positions, and vibrations influence the level of symptoms and disability, and psychosocial factors are also important.[w1] Recent studies suggest that chronicity and recurrence are common.[2 3]

Common shoulder disorders exhibit similar clinical features, and the lack of consensus on diagnostic criteria and concordance in clinical assessment complicates treatment choices.[3 w2-w5] This review proposes an evidence based approach using a simplified classification of shoulder problems, incorporating diagnostic techniques applicable to a primary care consultation and a "red flag" system to identify potentially serious disease.

Sources and selection criteria

We incorporated the latest consensus from systematic reviews and publications identified by a literature search through Medline, CINAHL, AMED, the Cochrane Library (Central, CDSR, HTA, DARE), Clinical Evidence, Best Evidence, Embase, British Nursing Index, PEDro,[w6] Web of Science (social science and science citation indexes), and bmj.com. The search strategy included the terms "shoulder pain", "rotator cuff disorder", "rotator cuff tear", "frozen shoulder", and "primary care".

We found six published systematic reviews of interventions for shoulder disorders and one health technology assessment systematic review of diagnostic tests for the assessment of shoulder pain.[4-10] A topic search within Clinical Evidence identified the section "Shoulder pain."[11] We identified and critically appraised other key publications in peer reviewed journals that were relevant to primary care or published since the latest systematic reviews.[w7]

Summary points

Mixed shoulder disorders are common, and over-differentiation of diagnostic categories does not alter largely conservative management in primary care

Self help advice, including relative rest and attention to occupational, sporting, or other physical contributory factors, should be offered as well as analgesics

The evidence for common interventions such as steroids and physiotherapy is relatively weak

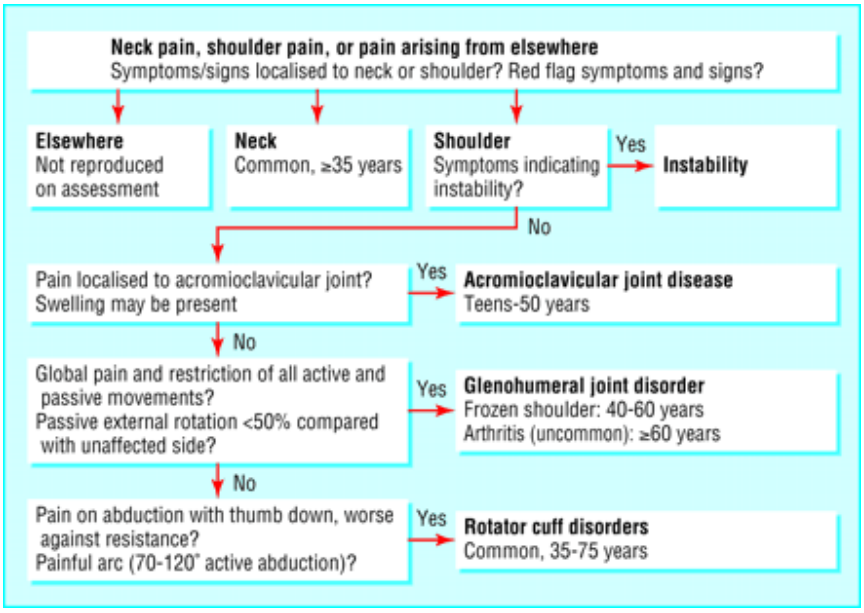
Physiotherapy may reduce repeat primary care consultations for rotator cuff disorders, and steroid injections have a marginal short term effect on pain

Poorer prognosis is associated with increasing age, female sex, severe or recurrent symptoms at presentation, and associated neck pain

Surgery should be considered when conservative measures fail

Assessment of the painful shoulder

Diagnosis should be pragmatic and based on a clinical assessment (box 1) that groups patients according to the most common presentations in primary care (figure). An overcomplicated approach to diagnosis is unlikely to alter early conservative management in primary care.[12]



Diagnosis of shoulder problems.

The four most common causes of shoulder pain and disability in primary care are rotator cuff disorders, glenohumeral disorders, acromioclavicular joint disease, and referred neck pain (box 2).

One primary care study that used standardized clinical tests for shoulder disorders found rotator cuff tendinopathy in 85% of patients, but in 77% of patients a clinical diagnosis of more than one shoulder problem was made—for example, tendinosis and impingement (57%); tendinosis, impingement, acromioclavicular disease, and adhesive capsulitis (6%).[13] Blood tests and radiography are indicated only if there are "red flag" indicators such as symptoms and signs of systemic disease (weight loss, generalized joint pains, fever, lymphadenopathy, new respiratory symptoms); history of cancer; or concerning local features such as a mass lesion or bony tenderness or swelling (box 3).

Rotator cuff disorders (age 35-75)

Rotator cuff tendinopathy is the most common cause of shoulder pain. An occupational history may reveal heavy lifting or repetitive movements, especially above shoulder level.[w1] Although related to activity, it often occurs in the non-dominant arm and in non-manual workers. Evidence suggests genetic susceptibility in some families.[w8] Wasting may be present on examination; active and resisted movements are painful and may be partially restricted, whereas passive movements are full, albeit painful. Although a painful arc is neither specific nor sensitive as a clinical sign, its presence reinforces the diagnosis of a rotator cuff disorder.[14]

A rotator cuff tear is usually strongly indicated by the history: traumatic in young people and atraumatic in elderly people (related to attrition from bony spurs on the undersurface of the acromion or intrinsic degeneration of the cuff). Partial tears may be difficult to differentiate from rotator cuff tendinopathy on examination; weakness in resisted movement may occur in either condition. Several studies have suggested that no correlation exists between symptoms and loss of function in the presence of full thickness supraspinatus tears, that tears of the lower rotator cuff may lead to inability to rotate beyond 20°, and that partial and full thickness tears are commonly found during imaging of asymptomatic people.[15-17] The "drop arm test" may be used to detect a large or complete tear (a high specificity and low sensitivity for this test was reported in a secondary care population).[14]

Box 1: History and examination of the shoulder joint

History

- **Onset, characteristics, and functional impact of shoulder pain?**
- **Dominant/non-dominant hand?**
- **Is pain at rest, on movement, or both?**
- **Is pain present at night?**
- **Does the pain affect sleeping position?**
- **Any neck, thoracic, or other upper limb pain?**
- **History of acute trauma, shoulder pain, or instability (joint dislocates or concern that might dislocate during certain movements)?**
- **Occupation and sporting activities?**
- **Other joints affected?**
- **Systemic symptoms of illness (fever, weight loss, rash, respiratory symptoms)?**
- **Significant comorbidity (diabetes; stroke; cancer; respiratory, gastrointestinal, or renal disease; ischemic heart disease; psoriasis)?**
- **Current drug treatment and adverse drug reactions?**

Examination

- **Examine neck, axilla, and chest wall**
- **Assess range of movement of cervical spine**
- **Inspect shoulders for swelling, wasting, and deformity**
- **Palpate sternoclavicular, acromioclavicular, and glenohumeral joints for tenderness, swelling, warmth, and crepitus**
- **Compare power, stability, and range of movement (active, passive, resisted) of both shoulders**
- **Look for painful arc (70-120° active abduction)**
- **Test passive external rotation**
- **"Drop arm test": patient lowers abducted arm slowly to waist**

Box 2: Causes of shoulder pain

Pain arising from the shoulder

- **Rotator cuff disorders: rotator cuff tendinopathy, impingement, subacromial bursitis, rotator cuff tears**
- **Glenohumeral disorders: capsulitis ("frozen shoulder"), arthritis**
- **Acromioclavicular disease**
- **Infection (rare)**
- **Traumatic dislocation**

Pain arising from elsewhere

- **Referred pain: neck pain, myocardial ischemia, referred diaphragmatic pain**
- **Polymyalgia rheumatica**
- **Malignancy: apical lung cancers, metastases**

Box 3: Red flag indicators

- **History of cancer; symptoms and signs of cancer; unexplained deformity, mass, or swelling:? tumor**
- **Red skin, fever, systemically unwell:? infection**
- **Trauma, epileptic fit, electric shock; loss of rotation and normal shape:? unreduced dislocation**
- **Trauma, acute disabling pain and significant weakness, positive drop arm test:? acute rotator cuff tear**
- **Unexplained significant sensory or motor deficit:? neurological lesion**

Glenohumeral disorders (adhesive capsulitis: age 40-65, median 50-55; osteoarthritis: ≥60)
Adhesive capsulitis ("frozen shoulder") and true glenohumeral arthritis are often preceded by a history of non-adhesive capsulitis symptoms, are characterized by deep joint pain, and restrict activities such as

putting on a jacket (impaired external rotation). Adhesive capsulitis is more common in people with diabetes and may also occur after prolonged immobilization. On examination global pain is present, along with restriction of all movements, both active and passive.

Acromioclavicular disease (teenage to 50)
Acromioclavicular disease is usually secondary to trauma or osteoarthritis; dramatic joint dislocation can occur after injury (teenage to 30 years). Pain, tenderness, and occasionally swelling are localized to this joint, and there is restriction of passive, horizontal adduction (flexion) of the shoulder, with the elbow extended, across the body. Acromioclavicular osteoarthritis may also cause subacromial impingement.

Referred mechanical neck pain (common)
Typically there is pain and tenderness of the lower neck and suprascapular area, referred to the shoulder and upper limb area; shoulder movement may be restricted. Movement of the cervical spine and shoulder may reproduce more generalized upper back, neck, and shoulder pain. Upper limb paraesthesia may occur.[18] Treatment is with relative rest and analgesia, and return to normal activities should be encouraged. Physiotherapy may be helpful.

Treatment

A functional holistic approach to shoulder pain, including adequate analgesia, is important to motivate patients and encourage rehabilitation. However, the evidence for common primary care interventions, including steroid injections, is relatively weak.[6] The general practitioner should decide whether the pain is arising from the shoulder; if it is from elsewhere, the patient should be treated and referred appropriately.

If the pain is arising from the shoulder, is it due to a rotator cuff disorder or a glenohumeral joint problem? For both these shoulder disorders, analgesics should be recommended (ideally paracetamol; non-steroidal anti-inflammatory drugs should be used intermittently as second line if no contraindications exist), activity should be encouraged, and written information provided (for example, the Arthritis Research Campaign's patient leaflet).

Rotator cuff disorders (including possible minor tears)
Rotator cuff disorders should be treated initially with relative rest of the shoulder. The patient should return to normal activity or temporarily modified work as soon as possible,[w1] within the limits of the disability and pain. Overall, systematic reviews and more recent studies suggest equivalent short term benefit for physiotherapy (incorporating supervised exercise) and steroid injections in the management of shoulder disorders.[6 7 10] In a primary care population with undifferentiated shoulder disorders, participants allocated to a physiotherapy treatment group were less likely to re-consult with a general practitioner than were those receiving steroid injections alone.[12]

A single recent study reported that a subacromial injection of xylocaine was as effective as steroid plus xylocaine in all disease specific outcome measures at two weeks, with follow-up of participants at six, 12, and 24 weeks.[w9] Some practitioners recommend larger volumes of injection of up to 10 ml, as a theoretical benefit of hydrodilatation of the subacromial bursa exists. However, inadequate evidence is available on evaluating outcomes with variation in volume injected.[19] Therefore, subacromial corticosteroid injections, up to 10 ml in volume, should be considered for short term pain relief and to facilitate rehabilitation. If the initial response is good, the injections should be repeated up to three

times, at six weekly intervals. No evidence exists to show that steroid injections are either harmful or beneficial in the presence of a rotator cuff tear, so they should be avoided if the drop arm test is positive.[5] [w10]

Glenohumeral disorders

Traditional teaching is that the natural history of a frozen shoulder is recovery by two years; however, symptoms may persist for three years or more in some cases, particularly in patients with diabetes mellitus. Corticosteroid injections (intra-articular, anterior approach) may be of benefit in reducing pain in the early phase.[10] No evidence exists to show that physiotherapy alone is of benefit for adhesive capsulitis; when the joint is very painful, movement is distressing and may well be counterproductive.[7] Intra-articular corticosteroid injections and physiotherapy, starting one week after the injection, may be of short term benefit.[20] However, in this study, intra-articular injection was done as a guided technique using fluoroscopy, limiting the generalisability of these findings to primary care.

Additional educational resources

Professional resources

- **Arthritis Research Campaign. In Practice Series 4. Hazleman B. *Shoulder problems in general practice* (available by post and at www.arc.org.uk/about_arth/med_reports/series4/ip/6502/6502.htm)—one of a comprehensive series of musculoskeletal educational leaflets for general practitioners; well written and consistent with patient information**
- **Nuffield Orthopaedic Centre, Oxford (www.oxfordshoulderandelbowclinic.org.uk)—has a clinical algorithm for assessment linked to a management plan, physiotherapy guidelines for perioperative treatment for surgical interventions, and information for patients**
- **Carr AJ, Hamilton WH, eds. *Orthopaedics in primary care*. 2nd ed. Butterworth Heinemann, 2005—includes instructions for, and free downloadable video clips of, shoulder injection techniques and case study diagnosis and management; each draft chapter was reviewed and revised by the authors with a group of general practitioners**
- ***Frozen shoulder (adhesive capsulitis)*. BMJ Learning (www.bmjlearning.com)—an online learning module, including a short test and a certificate to include in a personal development plan**

Resources for patients

- **Arthritis Research Campaign. *The painful shoulder* (patient leaflet available by post and at www.arc.org.uk)—helpful for self management before going to a general practitioner; also mentions neck pain as a possible cause of shoulder pain**
- **NHS Direct (www.nhsdirect.nhs.uk)—most informative for "frozen shoulder;" no separate information on rotator cuff disorders or surgical interventions**

Acromioclavicular disorders
Acromioclavicular disorders usually resolve with rest and simple analgesia, unless significant traumatic dislocation is present. If symptoms persist, a local steroid injection may help.

Biopsychosocial and complementary interventions

Individual psychosocial factors such as a passive coping style, fear of movement, and general psychological distress influence the risk of chronicity of symptoms in low back and neck pain. Therefore, targeted interventions to alter these and any occupational factors have also been suggested for shoulder disorders.[w1] A systematic review, however, concluded from the little evidence available that no evidence showed that multidisciplinary biopsychosocial rehabilitation is better than "usual care" in the management of shoulder problems in adults of working age.[9]

The only complementary therapy widely reported on is acupuncture. The studies identified by systematic review were small and methodologically diverse and provided little evidence to either support or refute the use of acupuncture for shoulder disorders.[5 8] The authors concluded that acupuncture may improve pain and function in the short term (two to four weeks).[8]

Further investigation

Ultrasound examination and magnetic resonance imaging have been reported as useful diagnostic tools in secondary care and may increase the specificity of diagnosis.[3 21 22 w2] However, early access to these investigations is unlikely to improve management of a heterogeneous group of shoulder disorders that should usually be managed conservatively and for which surgical intervention (informed by sophisticated imaging techniques) is rarely indicated. Structural abnormalities may be present in asymptomatic patients,[15] and thus early investigation may paradoxically increase referral rates to specialists.[w11]

Referral criteria

The patient should be referred to an orthopaedic specialist if there is

- Pain and significant disability lasting more than six months, despite attention to occupation or sporting factors and, if indicated, physiotherapy and steroid injections
- History of instability ("Has your shoulder ever partly or completely come out of joint?" "Are you worried that your shoulder might slip on certain movements?") or acute, severe post-traumatic acromioclavicular pain
- Diagnostic uncertainty or red flag criteria summarized in box 3.

Patient's perspective

My (right) shoulder problem started about six months ago; I think it was after I had been in a really awkward position while helping to care for my father. It became gradually more painful and was affecting my sleep; then I could not lift my arm up, nor could I put it behind my back. I could wear only clothes with front fastenings, and not if I had to use pressure, as it was painful to turn my arm inwards. When I needed to go to the toilet, I could not unfasten my trousers or pull clothes down quickly.

I am right handed, and everyday activities such as brushing my teeth or eating are still difficult and painful and take longer. When I am driving, it is painful to look over my right shoulder and to put the seat belt on. I was wary of going out if the paths were icy, because if I slipped I automatically put my right hand out, which was excruciating. Work is affected because I use computers; using the mouse becomes uncomfortable and makes my hand ache. I had had a frozen shoulder before, three years ago (the other arm); it was less painful and righted itself in about 18 months. This time I decided to go to a physiotherapist. I have been four times now; he has used acupuncture and lots of soft tissue and joint mobilizing techniques, and I have exercises to do. The pain around my shoulder has gradually lessened, and although the movement is unchanged, I am confident it will come back.

F, a 50 year old woman with shoulder pain

Future developments and surgical interventions

Surgery has a place in the management of emergencies such as unreduced dislocation, infection, and traumatic acute rotator cuff tear. Its role is less clear in frozen shoulder, for which some surgeons advocate manipulation under anesthesia and arthroscopic release.[23] A recent study found equivalent results for graduated supervised physiotherapy programs and arthroscopic decompression for patients with rotator cuff disease.[24] For significant persistent disability associated with impingement and rotator cuff tear, surgery may be effective at relieving pain and restoring function in patients who have failed conservative treatment. However, published studies typically involve small numbers of participants with limited long term follow-up.[5] Controversy exists regarding the management of mildly symptomatic small rotator cuff tears. Arguably, small tears should be repaired to relieve symptoms and to prevent progression to larger tears, which are associated with high levels of disability, but little evidence exists to support this view. For resistant acromioclavicular joint pain, an arthroscopic excision of the distal clavicle is an effective low risk procedure. Surgery remains the mainstay of management for most cases of recurrent shoulder instability; those cases that do not need surgery will need specialist physiotherapy and can be difficult and resistant problems. The management of osteoarthritis and rheumatoid arthritis has improved considerably in recent years, and joint replacement surgery, as with other joints, provides relief of pain for end stage disease.

Conclusions

Shoulder pain is a common and important musculoskeletal problem. Management should be multidisciplinary and include self help advice, analgesics, relative rest, and access to physiotherapy. Steroid injections have a marginal short term effect on pain.

Poorer prognosis is associated with increasing age, female sex, severe or recurrent symptoms at presentation, and associated neck pain. Mild trauma or overuse before onset of pain, early presentation, and acute onset have a more favorable prognosis.[3 25 w12] No evidence exists to show that early orthopaedic intervention improves the prognosis for most rotator cuff or glenohumeral disorders. Surgery should be considered when conservative measures fail.

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Diagnosis and relation to general health of shoulder disorders presenting to primary care

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Abstract

Objectives. To prospectively evaluate the incidence, spectrum of disease and relation to general health of shoulder disorders in primary care.

Methods. Patients presenting with shoulder pain to two large general practices in the Cambridge area over a 1-month period were invited to participate. After consulting their general practitioner, patients were administered a demographic information questionnaire, a shoulder pain and disability index (SPADI) and a short form 36 (SF-36) health survey. Subsequent review in a clinic held by a rheumatology registrar every 2 weeks was undertaken.

Results. The sex- and age-standardized incidence of shoulder pain was 9.5 per 1000 (95% confidence interval 7.9 to 11.2 per 1000). Rotator cuff tendinopathy was found in 85%, signs of impingement in 74%, acromioclavicular joint disease in 24%, adhesive capsulitis in 15% and referred pain in 7%. On the SPADI the mean disability subscale score was 45 (95% confidence interval 41 to 50) and the mean pain score was 58 (95% confidence interval 53 to 62) (range 0 to 100). Evaluation of general health status using the SF-36 showed the difference between population norms and those with shoulder pain was significant in six of the eight domains, being especially marked (greater than 20 point reduction) for emotional role, physical function and physical role.

Conclusion. Shoulder pain, most commonly due to rotator cuff tendinopathy, is associated with significantly reduced health when measured by both specific and generic means. Effort towards prevention and early intervention in these complaints is warranted.

KEY WORDS: Shoulder pain, Primary care, Diagnosis, SF-36, SPADI

Introduction

Soft tissue disorders are common, disabling and a strain on health-care resources. Shoulder pain has been found to be the second most frequent acute musculoskeletal complaint presenting in general practice and the third most common site of musculoskeletal pain in the community [1]. In addition, neck/shoulder disorders are a frequent cause of work absenteeism accounting for around 18% of all claims for sickness benefits in Scandinavia [2].

There is increasing interest in defining the disability associated with shoulder disease and its resultant handicap due to a paucity of information regarding the impact of such disorders on general health status. This study was designed to estimate the incidence, spectrum of disease and relation to general health of shoulder complaints presenting to primary care where these disorders are most frequently encountered.

Full ethical approval was granted for this study by the Addenbrooke's Hospital Ethics Committee, Cambridge and informed patient consent was obtained from all participants.

Patients and methods

Over a 12-month period patients who presented to their primary care physician with an episode of shoulder pain were recruited to two general practices in the Cambridge area (17 000 patients with a mean adult age representative of a typical UK practice). These patients were then referred to a 'rapid access' rheumatology clinic held within the practices by a rheumatology registrar every 2 weeks. A single rheumatology registrar (AO) trained in shoulder examination undertook all the assessments and a diagnosis was made based on the clinical evaluation. The diagnostic categories employed were drawn from widely accepted clinical tests for specific shoulder lesions, including those recommended by Cyriax [3] and the Southampton examination schedule [4] (Table 1).

TABLE 1. Tests for examination of the shoulder

Test	Description
Empty can test (supraspinatus)	The shoulder is abducted to 90° then internally rotated and brought into 30° forward flexion by the examiner, with thumb pointing downwards. The patient abducts the arm against the examiner's resistance
Resisted external rotation (infraspinatus and teres minor)	External rotation resisted with the patient's arm at the side, externally rotated 20° and the elbow flexed to 90°
Lift off test (subscapularis)	The dorsal aspect of the hand is placed on the ipsilateral buttock and the hand is then lifted off the buttock by 1–2". The hand is then lifted further against the resistance applied by the examiner
Yergason's test (long head of biceps)	With the arm by the side and the forearm flexed to 90° the forearm is supinated against resistance
Speed's test (long head of biceps)	With the elbow fully extended and the arm in 30° of flexion further flexion is resisted by the examiner
Hawkins–Kennedy impingement test	With the patient standing the arm is abducted to 90° and forward flexed to 45°. The arm is then forcibly internally rotated
Acromioclavicular joint assessment	With patient seated the examiner passively adducts the arm at 90° abduction across the chest. Alternative test: with the patient standing the examiner passively adducts the extended arm in front of the body
Drop arm test (rotator cuff rupture)	The examiner passively abducts the arm to 90° with subsequent active adduction

The assessment included a full history of shoulder pain, the completion of a demographic information questionnaire, a shoulder pain and disability index (SPADI) [5] and a short form-36 health survey (SF-36) [6] followed by a physical examination including special tests for shoulder disorders (Table 1). A diagnosis was recorded and treatment or further investigation as deemed appropriate by the investigator was undertaken. The history included questions regarding shoulder pain at night or whilst doing overhead activities, any associated pins and needles, neck pain, previous shoulder pain and whether there had been any previous treatment such as with non-steroidal anti-inflammatory drugs (NSAIDs), corticosteroid injections or physiotherapy. The examination included assessment for deformity, tenderness, painful arc and passive external rotation. In addition, an assessment was made of the integrity of the rotator cuff muscles (supraspinatus, infraspinatus and subscapularis) according to the criteria of Cyriax [3], and assessment of the long head of biceps. Furthermore, assessment was made for signs of impingement and acromioclavicular (AC) joint disorder.

A diagnosis of rotator cuff tendinosis was made if, on stressing the rotator cuff by applying a resistive force, the patient complained of pain in one or more portions of the rotator cuff. A diagnosis of rotator cuff tear was made if weakness elicited by applying a resistive force was found in one or more of the rotator cuff muscles [3]. A complete rupture was diagnosed if there was minimal active movement but intact passive movement. Bicipital tendonitis was diagnosed if there was a history of anterior shoulder pain with specific tenderness in the bicipital groove supported by specialized tests for this lesion (Speed's and Yergason's tests). Adhesive capsulitis was diagnosed if there was global restriction of all shoulder movement both passive and active with external rotation reduced by at least 50% compared with the normal side in the absence of bony restriction [7]. In patients with global restriction of shoulder movement plain X-ray was used to exclude degenerative disease. Impingement was diagnosed with a positive Hawkins–Kennedy test [8]. Fibromyalgia was diagnosed if the patient fulfilled the American College of Rheumatology criteria [9] and other soft tissue lesions were diagnosed in the presence of specific tender spots over the shoulder musculature (deltoid, axillary or periscapular) without fulfilling the criteria for fibromyalgia.

Pathology of the AC joint was diagnosed if there was local pain and tenderness in the region of the AC joint, a high arc of pain (development of pain upon abducting the arm >120°) was present or if any of the tests for AC joint disease were positive (Table 1). Primary osteoarthritis of the glenohumoral joint was confirmed radiologically. Referred pain from the neck was diagnosed if there was a history of pain radiating from the cervical spine into the appropriate dermatome (C5/6) with or without restricted cervical spine movement.

The SPADI, a validated measure [10], was utilized to assess shoulder-specific disability alongside the SF-36 questionnaire which has been utilized to measure general health in a variety of medical conditions. The SPADI questionnaire consists of five pain and eight disability items each measured on a visual analogue scale (range 0 to 100), where 0 represents no pain or disability and 100 represents maximal pain or disability. Pain and disability subscales are calculated as the mean of the corresponding items. The SPADI total scale is calculated as the simple average of the pain and disability subscales.

The results obtained from the SF-36 were compared with those obtained from the Health Survey for England (HSE) 1996 [11]. This survey was carried out nationally on a population of over 16 000 people aged over 16 yr. The sample was drawn randomly using postcodes and the participants completed the SF-36 as a self-completion questionnaire. Other population studies have been carried out in England using SF-36 to produce population norms, including the British Omnibus Survey 1992 [12] and The Oxford (Central England) Healthy Life Survey 1991–1992 [13], but the HSE study matched our sample most closely in terms of age distribution. The examination was carried out blind to the results of the SPADI and SF-36.

Statistical analysis

The annual incidence of shoulder complaints was defined as the number of cases presenting for review by the registrar in the 12 months of the study divided by the number of adults recorded on the list of the practices. The method of direct standardization was used to standardize the incidence of shoulder complaints to the sex and age distribution of England and Wales in 2002 [14] using age groups 18–44, 45–54, 55–64, 65–74 and 75 and over. A 95% confidence interval for standardized incidence was calculated using the method of weighted sums of Poisson parameters in combination with the χ^2 method [15]. The same methods were used for the incidence of diagnoses. Internal consistency of the

SPADI subscales was assessed using Cronbach's alpha coefficient and interpreted as ‘very good’ for coefficients in the range 0.80 to 0.90 [16].

Age-specific normative mean scores with standard errors for each SF-36 domain were obtained from the Health Survey for England [11]. These were applied to the age distribution of the study sample to obtain an overall normative mean score with its standard error for each domain. The observed and normative mean scores were compared using an unpaired two-sample *t*-test stratified by age group, using the age-specific means and standard errors in the two studies. Partial correlation adjusting for age was used to assess the strength of association between the specific SPADI measure and the general SF-36 pain domains. Confidence intervals for correlation coefficients were obtained using the Fisher transformation method [17].

Results

Over a 12-month period 131 patients were reviewed comprising 69 men (53%) and 62 women (47%) resulting in a sex- and age-standardized incidence of 9.5 per 1000 (95% confidence interval 7.9–11.2 per 1000). It was estimated that the proportion of eligible patients not referred to the rapid access clinic was less than 10% of the total number. The precise number of ‘missed’ cases was undetermined, however, due to difficulty in establishing true numbers retrospectively from medical record diagnoses.

The mean age of the patients was 57 yr (range 18–87 yr) with a median duration of symptoms at review of 10 weeks (range 1–208 weeks). The right shoulder was affected solely in 72 (55%) patients, the left solely in 50 (38%) and both in 9 (7%). A precipitating incident was reported by 41 (34%) patients, no relation to trauma was reported by 47 (38%) patients and 35 (29%) didn't know. Rotator cuff tendinopathy was found in 112 (85%) patients, impingement in 97 (74%), acromioclavicular joint disease in 31 (24%) patients, adhesive capsulitis in 20 (15%) patients and referred pain in 9 (7%) (Table 2). In 77% of patients more than one diagnosis was made (Table 3).

TABLE 2. Diagnoses made by researcher: composition and incidence

Diagnosis	Total number[a] (percentage) of subjects	Standardized incidence[b] per thousand (95% CI)
Any shoulder complaint	131 (100%)	9.5 (7.9–11.2)
Rotator cuff tendinopathy	112 (86%)	8.1 (6.7–9.8)
Impingement	97 (74%)	6.7 (5.4–8.2)
Acromioclavicular disease	40 (31%)	2.9 (2.1–3.9)
Adhesive capsulitis	20 (16%)	1.4 (0.9–2.2)
Referred pain	8 (6%)	0.6 (0.2–1.1)

[a]Some subjects were given more than one diagnosis.

[b]Directly standardized incidence is obtained by applying the sex- and age-specific incidence rates from the study to census population data (see Patients and methods). Study numerators for any shoulder complaint by age group in males (*m*) and females (*f*): 18–44 (*m* = 20, *f* = 9), 45–54 (*m* = 12, *f* = 12), 55–64 (*m* = 18, *f* = 22), 65–74 (*m* = 13, *f* = 12), 75+ (*m* = 6, *f* = 7) with corresponding study denominators 3306, 3087, 1180, 1199, 1040, 1029, 689, 708, 542, 815 and census denominators (thousands) 9900, 9922, 3350, 3406, 2863, 2945, 2066, 2325, 1486, 2513.

TABLE 3. Number of diagnoses

Diagnosis	Number
Tendinosis + impingement	75 (57%)
Tendinosis only	21 (16%)
Tendinosis + impingement + acromioclavicular disease + adhesive capsulitis	8 (6%)
Tendinosis + impingement + adhesive capsulitis	2 (2%)
Tendinosis + impingement + referred pain	6 (5%)
Acromioclavicular disease + adhesive capsulitis	4 (3%)
Impingement only	1 (1%)
Impingement + acromioclavicular disease + adhesive capsulitis	4 (3%)
Impingement + acromioclavicular disease	1 (1%)
Referred pain only	2 (2%)
No diagnosis	6 (5%)
Total	131 (100%)

In the study sample, the SPADI pain and disability subscales were observed to have a very good level of internal consistency (Cronbach's alpha coefficients of 0.81 and 0.90, respectively). The mean disability subscale score was 45 (95% CI 41–50) and the mean pain score was 58 (95% CI 54–62) with a total SPADI of 52 (95% CI 48–55) (maximum score 100) **[**10**].**

Our sample was compared with the norms on all the domains of the SF-36 and the differences in means were calculated, weighting the sample to compensate for age differences (Table 4). This showed a difference over all age groups between the HSE sample and our sample which was significant in six of

the eight domains, being particularly marked for emotional role in addition to physical function and physical role. In the domains of general health and mental health the difference between the samples was not significant. We also compared the difference in different age groups and showed that shoulder pain has a greater effect on quality of life in the younger age groups, particularly in the way people can perform their physical, social and emotional roles within society. The unsigned partial correlation coefficient, adjusting for age, between the SPADI index and the SF-36 physical function was 0.41 (95% CI 0.24–0.55); and with SF-36 bodily pain was 0.57 (95% CI 0.43–0.68).

TABLE 4. General health as measured by SF-36[a] domains: comparison between the study and age-matched normative data[b]

SF-36 domain[a]	Observed mean score	Normative[b] mean score	Difference in means (95% CI)	*t*-test *P* value
Physical function	65	76	–9.1 (–13.1 to –5.0)	<0.001
Physical role	37	75	–37.6 (–44.6 to –30.7)	<0.001
Bodily pain	37	74	–37.7 (–40.9 to –34.4)	<0.001
General health	66	67	–0.8 (–4.5 to +2.9)	0.67
Vitality	53	62	–8.6 (–12.5 to –4.6)	<0.001
Social role	76	84	–8.0 (–12.6 to –3.4)	<0.001
Emotional role	58	83	–23.4 (–31.1 to –15.6)	<0.001
Mental health	73	76	–3.2 (–6.7 to +0.2)	0.07

[a]123 subjects provided complete data for all SF-36 domains.

[b]The normative score is obtained by applying the age-specific mean scores from the HSE to the age distribution in the study: 18–44 (*n* = 28), 45–54 (*n* = 21), 55–64 (*n* = 37), 65–74 (*n* = 24), 75+ (*n* = 13).

The large difference between study subjects and the HSE was not accounted for by past medical history. Cases with a significant past medical history did not differ from those without a past history by more than a mean of 5 points on any subscale. As the majority of patients had been given more than one diagnosis the impact of individual conditions on the SPADI and SF-36 could not be estimated accurately due to the confounding effects of a combined diagnosis. The SPADI and SF-36 scores, however, showed no significant difference depending upon the diagnosis using two broad categories (tendinosis with or without impingement or a combined group including ACJ, adhesive capsulitis, referred pain with or without tendinosis and/or impingement) (Table 5, Fig. 1).

TABLE 5. (a) SF-36 scores for diagnosis of rotator cuff with or without impingement and other diagnoses

	Rotator cuff	Other diagnoses	Difference in means	*t*-test *P* value
Physical function	67.91	63.4	4.51	0.44
Role function	38.46	29	9.46	0.28
Bodily pain	37.16	32.52	4.64	0.30
General health	67.75	60.28	7.47	0.18
Vitality	54.95	49.6	5.35	0.33
Social function	77.20	71.5	5.70	0.28
Emotional role	63.74	46.67	17.07	0.09
Mental health	73.05	69.44	3.61	0.44

TABLE 5. (b) SPADI scores for diagnosis of rotator cuff with or without impingement and other diagnoses

	Rotator cuff	Other diagnoses	Difference in means	*t*-test *P* value
SPADI pain	58.44	62.04	–3.60	0.43
SPADI disability	45.71	49.675	–3.97	0.49
SPADI total	52.08	55.8575	–3.78	0.44

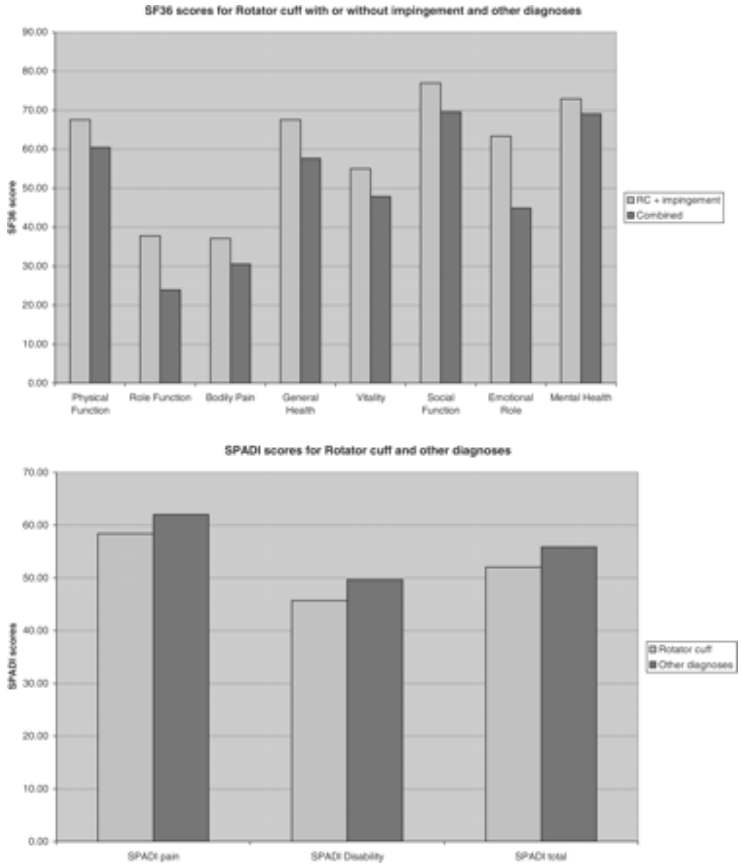

FIG. 1. Comparison of SPADI and SF-36 scores for patients with rotator cuff disease and other shoulder disorders.

Eighty eight per cent of patients in this study complained of sleep disturbance as a consequence of their shoulder pain.

Discussion

This study undertaken in primary care follows work performed previously by Vecchio *et al*. [18] showing the prevalence and spectrum of shoulder disease in the community. The incidence of shoulder pain we found is comparable with that obtained in previous studies [19, 20] although a higher incidence has been found elsewhere [21]. Nevertheless, pain in the shoulder region, regardless of aetiology, is associated with significant morbidity.

With age the frequency of musculoskeletal disorders increases; the prevalence of disability has been estimated to be as high as 50% in those aged 75 or over [1, 22–24]. Functional impairment of the shoulder at initial presentation has also been found to be associated with poorer long-term outcome [25].

Our sample represents a true cross-section of shoulder pain in society as we enrolled any patient with shoulder pain regardless of possible aetiology. As a consequence patients may have been included where the symptoms were not directly originating from shoulder pathology.

Difficulty with case definition [26] and lack of an adequate classification system plagues shoulder research. In the face of the lack of a universally accepted approach to clinical evaluation of the shoulder, we used widely accepted clinical tests for specific disorders that are commonly used in clinical practice. We have shown that several of these tests are reproducible between observers [27]. The validity of tests for shoulder pain, however, remains unclear and research efforts focused on this pivotal issue are required. Given the weakness of classification, this study has utilized those case definitions which have been tested by us and other groups and therefore represent the currently accepted standard for the study of various clinical shoulder disorders.

The median time taken for our patients to seek medical advice was 10 weeks. It would appear that many people are willing to accept pain and disability at least in the short to medium term before presenting for an opinion. Two previous studies and a survey have shown that the elderly do indeed suffer from significant pathology and disability and that it is under-recognized [28–31]. Many accept their symptoms as an inevitable part of getting older. Most resultant disabilities were reflected in activities such as bathing, dressing and toileting. This was reflected in our study with the most problematic areas being placing objects on a high shelf, washing one's back and carrying heavy objects.

It is apparent that one cannot rely on simple outcome measures for shoulder assessment. Range of movement (ROM) as a measure is inadequate as the majority of people in the community with self-reported shoulder pain do not have widespread restriction of movement [32]. Pain scores alone are also inadequate to assess the severity of shoulder disease and impairment [19, 33].

We utilized the Shoulder Pain and Disability Index (SPADI), a disease-specific index, to ascertain how shoulder pain affects an individual in primary care. Internal consistency was observed to be very good in this cohort. Its main weakness is the omission of questions pertaining to pain interfering with sleep, which was found to be one of the most common problems in these patients [5, 10, 33]. A question on sleep disturbance was included in our study and was also found to be an extremely common problem (88%). SPADI scores were high in our patients and are similar to those obtained when used in a similar setting [10].

The SF-36 health survey was used to ascertain the general health of patients with shoulder pain. The SF-36 health survey has been validated and may be suitable as an outcome measure for routine use

within the National Health Service (NHS) [34–37]. There is some evidence that the SF-36 may be more sensitive than the modified Health Assessment Questionnaire (HAQ) at detecting disability associated with shoulder disorders [1]. The great majority of patients scored lower than healthy norms and equivalent to patients with other medical conditions as has been shown previously [38, 39]. This is an interesting finding as none of the health status parameters of the SF-36 directly assesses shoulder function. Most astounding is that shoulder disease ranked in severity with conditions such as congestive cardiac failure, acute myocardial infarction, diabetes mellitus and clinical depression. These patients, however, had well-defined shoulder conditions and had been assessed in an orthopaedic clinic [39]. It is important to remember, however, that the prognosis of shoulder disorders is favorable compared with life-threatening illnesses such as cardiac failure, and the impact on general health may be much less if expressed in terms of quality-adjusted life years or disability-adjusted life years. Although our patients presented with shoulder disorders their overall poor general health status may not entirely be a consequence of this.

Badcock *et al*. [33] highlighted the importance of a disability measure as patients' psychological health was related to pain only by its association with disability. We did not specifically look at this issue; however, this is of paramount importance as psychological well-being has a large impact on the general well-being of individuals.

Generic health questionnaires, such as the SF-36, are generally insensitive to specific disorders and therefore need to be combined with specific questionnaires, e.g. SPADI. The age-adjusted correlation between the SPADI and the domains of the SF-36 relating to pain were significantly lower than 0.7, indicating that the general SF-36 and the specific SPADI measures each explain less than 50% of the variability in responses recorded in the other measure. By using these two measures, comparisons can be made between different conditions as to the effectiveness of intervention upon the illness. It is imperative that this model be used in order to address medical illnesses that have the greatest impact on patients in order to tailor appropriate therapy. Furthermore, as resource allocation is limited, comparisons must be made between medical conditions in order to budget accordingly. This could be made possible by use of generic health measures.

A further difficulty of the classification systems and diagnostic criteria we employed and which is generally used in shoulder research is the lack of mutual exclusiveness. This is a problem with not only the diagnostic criteria but also with the underlying pathology. For example, it is challenging to assess any other pathology of the shoulder in the presence of adhesive capsulitis.

Clinics held in the community may be one of the best ways to maximize health-care allocation. In a study we have undertaken [27] delegation of assessment of shoulder pain to allied health staff, including nurses, may be possible. Many conditions can therefore be dealt with in primary care thereby reducing the out-patient waiting list. Van der Windt *et al*. [40] found that only 10% of patients who presented to general practice with shoulder pain were referred for specialist opinion. Patients who cannot be easily assessed or those who re-present could then be referred for specialist opinion.

Conclusion

Our study, conducted in primary care, suggests that shoulder pain is associated with significantly reduced health when measured by both shoulder-specific and generic means. The most frequent diagnoses were lesions of the rotator cuff with or without signs of impingement. Management should

focus on prevention and early intervention in these complaints.

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Treatment for Shoulder Disorders Exam

Select the best answer to each of the following items. Mark your responses on the Answer Form.

1. Shoulder problems are common, with up to _____% of adults in the general population reporting such symptoms in a one year period.

a. 28

b. 47

c. 67

d. 87

2. In the first study reported on in this course, to rate person perceived recovery from baseline, both studies used a _____ scale, with 5 points for the Hay study and a 6 point scale for the Van der Windt study.

a. Klein

b. Likert

c. Van Derheight

d. None of the above

3. In that same study, Despite a significant difference in improvement rates in the short term for the Dutch trial (difference = 17.6% (95% CI, 5.0% to 30.3%)), the pattern of improvement rates was similar over the longer term both between countries and between treatments within countries.

a. True

b. False

4. In the univariate analysis, after adjusting for country and treatment, the following were/was associated with higher pain severity in the day at long term outcome: _____.

a. male sex

b. longer duration of symptoms at recruitment

c. higher baseline pain and disability scores

d. All the above

5. In the same study, men compared with women, and those who reported a gradual compared with a sudden onset, were at a _____increased odds of not recovering. For each additional point on the disability score at baseline, the odds of a poor outcome were increased by 3%; hence for two participants who were 10 disability points apart at baseline, the one with the higher score would be 30% more likely to have persistent symptoms at long term follow up.

a. slight

b. twofold

c. threefold

d. fivefold

6. In that same study, the researchers stated that comparing data from two large recent randomized clinical trials of shoulder pain in primary care gave us the opportunity to investigate the generalisability of these findings. Our analysis confirmed that, as expected from the inclusion and exclusion criteria, there were differences between the two study population in terms of their characteristics at entry to the trial. Despite these differences, however, the long term effect of treatment appears to be similar both within each trial and across both trials.

a. True

b. False

7. There was no evidence from either study that local steroid injection conferred long term benefit. Local steroid injection offered some benefit in terms of improvement in short term

pain and disability only in the Dutch trial. This difference between the trials might relate to: _____.

a. different patient selection

b. different steroid preparations

c. differences in injection techniques

d. All of the above

8. The same researcher also report that Despite the clinical heterogeneity apparent in the two study populations, the overall findings of the two trials suggest that shoulder injection and physiotherapy are _____ effective in the long term at reducing both pain and disability in patients presenting to primary care with shoulder pain.

a. not

b. rarely

c. similarly

d. None of the above

9. Compromised shoulder movement due to pain, stiffness, or weakness can cause substantial disability and affect a person's ability to carry out daily activities (eating, dressing, personal hygiene) and work. Self reported prevalence of shoulder pain is estimated to be between 16% and 26%; it is the _____ common cause of musculoskeletal consultation in primary care, and approximately 1% of adults consult a general practitioner with new shoulder pain annually.

a. most

b. third most

c. fifth most

d. eighth most

10. Common shoulder disorders exhibit similar clinical features, and the lack of consensus on diagnostic criteria and concordance in clinical assessment complicates treatment choices.

a. True

b. False

11. In the second study reviewed in this course, they found that _____.

a. The evidence for common interventions such as steroids and physiotherapy is relatively weak

b. Self help advice, including relative rest and attention to occupational, sporting, or other physical contributory factors, should be offered as well as analgesics.

c. Surgery should be considered when conservative measures fail

d. All of the above

12. The four most common causes of shoulder pain and disability in primary care include _____.

a. rotator cuff disorders

b. acromioclavicular joint disease

c. referred neck pain

d. All of the above

13. In the second study reviewed in this course, in cases of confirmed shoulder pathologies blood tests and radiography are indicated only if there are "red flag" indicators such as_____

a. symptoms and signs of systemic disease

b. history of cancer

c. concerning local features such as a mass lesion or bony tenderness or swelling

d. All of the above

14. Rotator cuff tendinopathy is the most common cause of shoulder pain. An occupational history may reveal heavy lifting or repetitive movements, especially above shoulder level.

a. True

b. False

15. Acromioclavicular disease is usually secondary to trauma or osteoarthritis; dramatic joint dislocation can occur after injury (teenage to 30 years). _____ are localized to this joint, and there is restriction of passive, horizontal adduction (flexion) of the shoulder, with the elbow extended, across the body. Acromioclavicular osteoarthritis may also cause subacromial impingement.

a. Pain

b. Tenderness

c. Occasionally swelling

d. All of the above

16. With referred mechanical neck pain, typically there is pain and tenderness of the lower neck and suprascapular area, referred to the shoulder and upper limb area; shoulder movement may be restricted. Movement of the cervical spine and shoulder may reproduce more generalized upper back, neck, and shoulder pain. Upper limb paraesthesia may occur. Treatment is with _____.

a. relative rest

b. physiotherapy

c. analgesia

d. All of the above

17. A functional holistic approach to shoulder pain, including adequate analgesia, is important to motivate patients and encourage rehabilitation. However, the evidence for common primary care interventions, including steroid injections, is relatively weak.

a. True

b. False

18. With glenohumeral disorders, corticosteroid injections (intra-articular, anterior approach) may be of benefit in reducing pain in the early phase. No evidence exists to show that physiotherapy alone is of benefit for adhesive capsulitis; when the joint is very painful, movement is distressing and may well be counterproductive

a. True

b. False

19. Acromioclavicular disorders usually resolve with rest and simple analgesia, unless significant traumatic dislocation is present. If symptoms persist, a local steroid injection may help.

a. True

b. False

20. The patient should be referred to an orthopaedic specialist if there is _____.

a. diagnostic uncertainty or red flag criteria

b. history of instability

c. pain and significant disability lasting more than six months

d. All of the above

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