Table S1. Supporting information: content, bibliographic justification and validity values of the questionnaire screens

Next, the design and content of the questionnaire, the scientific argumentation that justifies it and the validity values of each of the screens in the final validation test with 250 patients are presented. The most important contributions of the pilot tests and rounds of improvement have been noted in *italics*.

| Screen no. | Picture | Bibliographic justification | Accurate/validity values |
|-----------|---------|----------------------------|--------------------------|
| 1-4       | [Application instructions] | The first screens of the application were designed to explain the content and utility of the application and to introduce the basic instructions for its correct use.¹². | - |
| 5-28      | [Exclusion criteria. Sociodem. and pathological variables] | These screens were designed to exclude patients who were not candidates for evaluation by the application. Also questions about the urgency criteria to refer and the sociodemographic and descriptive pathology variables were asked. | - |
| 29-30     | Regarding the pain in the shoulder (not neck): Does it appear or increase when you move the head? When you move the head does pain appears in the area indicated in the drawing? | The reproduction of pain in the limb was evaluated by moving the neck in different directions with the aim of aggravating the compression of the nerve root. The appearance or increase of pain in the shoulder with the movement of the neck, and not of the shoulder girdle, points to the presence of pathology of cervical origin.¹³. Forced active flexion and extension (until the end of movement) obtains an LR⁺ of 2.70 and exacerbates pain in patients with radiculopathy. Other movements that are used to increase the radicular condition are the rotation and the inclination of the head with or without compression by means of the Spurling test, which is recommended for the radicular assessment.¹⁴. The use of other orthopaedic tests (abduction test, etc.) or the analysis of paresthesias was rejected due to the high error rate observed in the pilot tests and the difficulty on the part of the patients to understand what was requested of them. A trend was observed among patients to answer in relation to pain in the cervical area (and not in the shoulder) on screen 29. This conflict was resolved by designing a new screen that insisted on this aspect (screen 30). | Accurate: 88.4% Sn: 92% Sp: 88% LR⁺: 7.8 LR⁻: 0.1 |
| 32        | Do you suffer all these features? More than 65 years Progressive loss of movement in recent years Continuous, painful, audible crunches by other people and present in all the movements of the shoulder Only mark “Yes” if you present all the features | In the absence of reliable orthopaedic tests, we asked about the usual symptoms of this condition, insisting on the features that differentiate it from the rest: progressive decrease of active and passive mobility associated with insidious-onset pain with no relation to a traumatic history, presence of crackles in the shoulder, and having an advanced age.⁶,⁸. | Accurate: 84% Sn: 84% Sp: 84% LR⁺: 5.2 LR⁻: 0.2 |
Table S1. Continued 1

| Screen no. | Picture | Bibliographic justification | Accurate/validity values |
|------------|---------|-----------------------------|--------------------------|

| 33 | | This screen was used to classify patients according to the most outstanding and relevant clinical features of the most prevalent musculoskeletal shoulder pathologies: |
|----|---------|-------------------------------------------------|--------------------------|
|    | | The selection of **Group 1** (shoulder dislocation sensation) was considered for the suspicion of shoulder instability. Patients with shoulder instability have a sensation of loss of joint congruence or apprehension at extreme movement positions. |
|    | | The selection of **Group 2** ("presence of functional impotence due to lack of strength") suggests the presence of cuff muscle tear. In complete tears of the rotator cuff muscle, the main sign of loss of integrity is strength deficit. Patients with massive tears exhibit a significant and relevant loss of external rotation (in 0° of abduction) and of abduction. The presence of pain was not evaluated because its pattern does not exhibit significant differences to those reported in subacromial impingement or cuff injuries of lesser severity. |
|    | | The selection of **Group 3** ("presence of stiffness or blockage") points towards a capsular pattern. Capsular syndrome manifests as a significant deficit in active and passive mobility in all planes of movement. Stiffness or loss of mobility in the shoulder is one of the primary complaints in these patients. |
|    | | The selection of **Group 4** (report of pain during shoulder movement) points towards pathologies where the presence of mechanical pains predominates over the symptoms exhibited in the previous groups. Pain in the shoulder is one of the symptoms most reported by patients with subacromial impingement/rotator cuff tendinopathy and acromioclavicular arthropathy. The screening among these pathologies was performed with a new sequence of questions (location and type of pain, provocative manoeuvres, etc.). |

| 34 | | Has your shoulder ever popped out from its position (has it ever dislocated)? |
|----|---------|-------------------------------------------------------------------------------|--------------------------|
|    | No | Yes | To suspect the presence of instability, Somerville analysed a number of questions regarding patient history: "Have you ever dislocated your shoulder?", "Does your shoulder dislocate with daily activities?", and "Do you ever experience the feeling that your arm is out of place (it dislocates)?"; they obtained an LR+ of 4.05 and LR- of 0.30; LR+ of 5.44 and LR- of 0.74; and LR+ of 2.22 and LR- of 0.44, respectively. |

| 35 | | Can you pop out your shoulder from its position yourself? |
|----|---------|-------------------------------------------------------------------------------|--------------------------|
|    | No | Yes | Among those who answered "yes" to the first question "Have you ever dislocated your shoulder?", a second affirmative answer to "Can you get your shoulder out of place?" obtained an LR+ of 2.67 for multidirectional instability. |

Accurate: 79.3%
Sn: 93%
Sp: 74%
LR+: 4.2
LR-: 0.1

Accurate: 96%
Sn: 100%
Sp: 94%
LR+: 16
LR-: 0

Accurate: 98%
Sn: 100%
Sp: 98%
LR+: 47
LR-: 0
Table S1. Continued 2

| Screen no. | Picture | Bibliographic justification | Accurate/validity values |
|------------|---------|------------------------------|--------------------------|
| 36         | Place the arm as the image and bring the hand back as to throw a ball very far. What do you feel? | To assess the anterior instability, the apprehension test has the highest LR+ values among the tests with this aim and the only one that does not contain a null value in its confidence interval\(^{16}\). This test (assessing the sensation of apprehension, not pain) places the range of LR+ values between 3.46 and 20.20, and LR- between 0.02 and 0.44\(^{17-19}\). For its performance, it requires 90° abduction and a maximum external rotation with the elbow flexed at 90°\(^{18}\). The patient is asked about the “sensation of apprehension” because it has been argued that the “sensation by the patient that the shoulder is going to come out of place” presents more satisfactory reliability values than the evaluation of pain\(^{19}\). For self-assessment using a computer system, this test has been adapted to be self-administered by the user. It was observed that the users answered in relation to the pain and not to the sensation of apprehension. Therefore, two more response options were included that would allow the users to express the presence of pain; nevertheless, only the presence or absence of apprehension was analysed. | Accurate: 75.5%  
Sn: 92%  
Sp: 70%  
LR+: 3.1  
LR-: 0.1 |
| 37         | Next screens ask you if you can or cannot perform certain movements | In the pilot tests, a tendency to answer in relation to pain and not to the test requested was observed, so this issue was insisted on in the following prototypes. Discrimination on the part of the patient was also improved between the pain and the possibility or not of carrying out the requested movement, including two more response options that would allow the presence of pain to be noted, although afterward only the ability to perform the movement or not was taken into consideration. | Accurate: 80%  
Sn: 89%  
Sp: 78%  
LR+: 4.0  
LR-: 0.1 |
| 38         | As the image, try elevate the arm to the line and take it down slowly. | The drop arm test is a test with high specificity, which translates into relevant LR+ values between 2.41 and infinity (specificity of 100%). It is preferred for the confirmation of complete tears of the rotator cuff because its values are more significant in these injuries than in those of lesser severity\(^{17,20-22}\). To perform the test, the patient is asked to raise the arm to 90° abduction and then slowly lower it again. The test is positive if the patient is unable to perform it and/or the limb drops\(^{23}\). | Accurate: 73%  
Sn: 88%  
Sp: 67%  
LR+: 2.7  
LR-: 0.2 |
| 39         | As the image, can you elevate the arm as if you wanted to hold a torch and maintain for 10 seconds? | The drop sign test presents a relevant LR + of 2.94, 3.20, 4.59 and infinity (specificity of 100%) for the complete tear of the rotator cuff and more specifically for the infraspinatus tendon\(^{18,24,25}\). In the study of Miller, an LR- of 0.30 was also obtained. The starting position of the test is 90° of abduction in the plane of the scapula with the elbow at 90° of flexion and complete external rotation of the shoulder. The test is considered positive if the patient cannot maintain this position\(^{25}\). | Accurate: 73%  
Sn: 88%  
Sp: 67%  
LR+: 2.7  
LR-: 0.2 |
| Screen no. | Picture | Bibliographic justification |
|------------|---------|-----------------------------|
| 40         | ![Image](image_url) | To evaluate the tear of the external rotator muscles, in particular the infraspinatus muscle, the performance of the infraspinatus muscle strength test (IMST) is recommended. In this test, the patient is requested to perform a resisted external rotation with the elbow flexed 90° with the shoulder adducted and neutrally rotated. The test can be considered positive if weakness or incompetence of the affected limb is observed with respect to the contralateral limb. For this test, studies provide relevant values that place the LR+ between 2.17 and 9.78 and the LR- between 0.30 and 0.50. Accurate: 69.8% Sn: 94% Sp: 60% LR+: 2.4 LR-: 0.1 |
| 41         | ![Image](image_url) | To assess the tear of the internal rotator muscles, the use of the lift-off test is proposed. In this test, if the patient is incapable, it is considered positive. This test obtained relevant LR+ values between 3.13 and infinity (sensitivity of 100%) and LR- between 0.10 and 0.50 for the suspicion of subscapular injury. A meta-analysis that analyses its reliability produces an LR+ of 16.47. Accurate: 71.2% Sn: 95% Sp: 66% LR+: 2.8 LR-: 0.1 |
| 42         | ![Image](image_url) | Next screens will ask you for the breadth of movement in both arms. Do not ask for the pain. You have to be rigorous to respond if “It has” or “it doesn’t have” the same range of motion regardless of the pain that it produces. |

*Table S1. Continued 3*
| Screen no. | Picture | Bibliographic justification | Accurate/validity values |
|-----------|---------|-----------------------------|--------------------------|
| 43        | ![Image](image1.png) | The most limited active movement in CS is external rotation \(^2\). A deficit in passive mobility, and specifically in external rotation, is postulated as the distinctive sign that points towards the suspicion of SC and the difference from the rest of the most common shoulder pathologies \(^{13,33,34}\). It should be noted that a decrease in external rotation (or passive elevation) is not associated with a rotator cuff injury (partial or total tear) \(^1\). To evaluate external rotation, the patient is asked to move the hand away from the abdomen, with the elbow flexed 90°, preferably with the elbow touching the side of the trunk (0° degrees of abduction) \(^{13,34}\). | Accurate: 71.8%  
Sn: 96%  
Sp: 58%  
LR+: 2.3  
LR-: 0.1 |
| 44        | ![Image](image2.png) | The lack of rotation regarding to the other arm is due to...  
1. Lack of strength ("doesn't obey me"), but if the other arm assist it, you can rotate it as well as the arm healthy  
2. I feel a "lock" or "limit": If the other arm assist it, you cannot rotate it as well as the arm healthy  
[remember to place elbow glued to the body and in right-angle] | Accurate: 72.7%  
Sn: 91%  
Sp: 51%  
LR+: 1.9  
LR-: 0.2 |
| 45        | ![Image](image3.png) | Next screens will ask you for the breadth of movement in both arms  
Do not ask for the pain  
Yet have to be rigorous to respond if "It has" or "it doesn't have" the same range of motion regardless of the pain that it produces | The tendency of some patients to answer screens 46-48 in relation to pain and not to the test requested was observed, so this issue was insisted on. |
| 46        | ![Image](image4.png) | This screen asked about the typical pattern in these patients of excessive elevation of the shoulder to compensate for the deficit in elevation of the affected limb. | Accurate: 77.4%  
Sn: 96%  
Sp: 59%  
LR+: 2.4  
LR-: 0.1 |
Table S1. Continued 5

| Screen no. | Picture | Bibliographic justification | Accurate/validity values |
|------------|---------|-----------------------------|--------------------------|
| 47         | ![Image](image1.png) | The most limited active movement in SC is external rotation. A mobility deficit, specifically in external rotation, is postulated as the distinctive sign that points towards the suspicion of SC and the difference from the rest of the most common shoulder pathologies. It should be noted that a decrease in external rotation (or passive elevation) is not associated with a rotator cuff injury (partial or total tear). To evaluate external rotation, the patient is asked to move the hand away from the abdomen, with the elbow flexed 90°, preferably with the elbow touching the side of the trunk (0° degrees of abduction). | Accurate: 76.5% |
| Sn: 97%   | $p$: 56% |
| LR+: 2.2  | LR-: 0.1 |
| 48         | ![Image](image2.png) | A screen was included to rule out that the mobility deficit manifested by the user was active, which suggests the presence of a rotator cuff muscle tear. | Accurate: 70.4% |
| Sn: 95%   | $p$: 19% |
| LR+: 1.2  | LR-: 0.3 |
| 49-50      | ![Image](image3.png) | It was proposed to record the presence of pain during the night’s rest. In subacromial impingement and rotator cuff tendinopathy, pain intensifies at night with rest in bed and especially when the patient sleeps on the affected arm; however, the inability to sleep on the affected limb is not a sufficient criterion to confirm subacromial impingement. These questions that not obtaining conclusive results to discriminate between pathologies after testing in the different phases of the study were rejected. | Accurate: 87.3% |
| Sn: 87%   | $p$: 89% |
| LR+: 9    | LR-: 0.8 |
| 51         | ![Image](image4.png) | The pain caused by pathology in the acromioclavicular joint (AJ) is located in the upper region of the shoulder and specifically centred in the joint. They point directly to the joint when asked about the location of their pain and the majority of patients exhibit tenderness and local pain to palpation in this joint. Pain in subacromial impingement occurs mainly in the lateral or anterior aspect of the arm without irradiation beyond the elbow or in the posterior part of the shoulder or cervical area. It was observed that, due to anatomical proximity between upper and lateral/anterior part of the shoulder, some patients with SI/RCT indicated pain also in the upper part of the shoulder. This incidence was corrected by referring the patient to the SI/RCT outcome with the evaluation in screens 52-53. | Accurate: 87.3% |
| Sn: 87%   | $p$: 89% |
| LR+: 9    | LR-: 0.8 |
**Table S1. Continued**

| Screen no. | Picture | Bibliographic justification | Accurate/validity values |
|------------|---------|-----------------------------|--------------------------|
| 52         | ![Picture](image) | Do you feel pain when you pet/touch the back of your opposite shoulder? | Pain in the AJ can be reproduced with horizontal adduction and all movements that put stress on the intra- and periarticular structures such as anteropulsion, retropulsion or maximum elevation. This pain can be reproduced by asking the patient to move the affected arm towards the contralateral shoulder. With respect to orthopaedic tests, tests based on forced horizontal adduction can be recommended for the evaluation of the AJ. The "cross-body adduction test" obtains sensitivity and specificity values close to 80% and LR+ of 3.67 and LR- of 0.29. The cross-body adduction test and the horizontal adduction test have LR- of 0.41 and 0.35 respectively, to discard injuries of the supraspinatus tendon. Both tests assess the pain forcing horizontal adduction with the elbow flexed. | Accurate: 90.1%  
Sn: 94%  
Sp: 68%  
LR+: 3  
LR-: 0.1 |
| 53         | ![Picture](image) | In the previous test, where do you feel pain? | In the pilot tests, it was observed that patients with SI/RCT initially indicated pain in the upper shoulder area, but in the horizontal adduction test (screen 52), they didn’t report pain around the AJ but in the typical area of SI/RCT. It is known that the test performed on screen 52 is also used to suspect SI/RCT when the pain appears in anterior or lateral area of the shoulder due of the impingement of subacromial space. Therefore, screen 53 was included to discern between AJ pathology and SI/RCT. To confirm AJ pathology, the pain had to be located in the area of the AJ. Conversely, if pain manifested on the lateral or anterior aspect of the arm (reference area for SI/RCT), the pain was classified as SI/RCT. | Accurate: 80.7%  
Sn: 82%  
Sp: 79%  
LR+: 4.6  
LR-: 0.2 |
| 54         | ![Picture](image) | Do you have pain when you elevate or take down the arm over the head? | The implementation in the questionnaire of different manoeuvres to provoke subacromial conflict was proposed. These sought to impinge the structures that run through the subacromial space (rotator cuff, bursa, etc.) by means of active or passive limb elevation with maximum internal rotation. The tests that were more easily adaptable for self-exploration using a computer application and were better understood in the different pilot tests were the "Yocum test" and the "Painful Arc test". Patients with SI/RCT will present painful symptoms between 70 and 120 degrees of abduction in the plane of the scapula during active elevation of the limb. The test that explores this event is the painful arc test, in which the patient is asked to perform a full active elevation of the limb in the plane of the scapula. The test is positive if the patient experiences pain between 60° and 120° degrees. This test obtained relevant LR+ values between 2.27 and 3.90, and significant LR- values between 0.20 and 0.41 for subacromial impingement and rotator cuff tendinopathy. | Accurate: 98.4%  
Sn: 100%  
Sp: 77%  
LR+: 4.3  
LR-: 0 |
| 55         | ![Picture](image) | Keep your hand over the opposite shoulder and lift the elbow all that you can. Do you feel pain at lift the elbow? (remember to keep your hand glued over the opposite shoulder all the time) | The impingement of the supraspinatus tendon between the acromion and the greater tuberosity begins at 30° of elevation of the humerus and progresses until reaching its peak at 90° of abduction with the humerus rotated internally. For this reason, most tests that assess subacromial impingement encourage impinging soft structures (cuff, bursa, etc.) by performing internal rotation movements in different elevation positions of the limb. The Yocum test requests elevation of the elbow with the hand of the affected extremity resting on the opposite shoulder, seeking the appearance of pain. This test presents relevant values LR+ of 8.75 and LR- of 0.33. | Accurate: 92.9%  
Sn: 96%  
Sp: 65%  
LR+: 2.7  
LR-: 0.1 |
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