Comparison and critical evaluation of rehabilitation and home-based exercises for treating shoulder stiffness: Prospective, multicenter study with 148 cases

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KEYWORDS
Stiff shoulder; Treatment; Rehabilitation; Home program; Pain management; Adhesive capsulitis; Frozen shoulder; Complex regional pain syndrome; Protocol; Patient education

Summary

\textbf{Introduction:} The goal of this study was to evaluate the effectiveness of individual exercises performed as classic rehabilitation or a home program on the clinical progression of patients with shoulder stiffness. Based on this information, the secondary goal was to develop a new rehabilitation protocol.

\textbf{Patients and methods:} This prospective, comparative series included 148 cases of shoulder stiffness. There were three treatment groups: T1: classic rehabilitation performed below the pain threshold (58 cases); T2: home program with provocation above the pain threshold (59 cases); T3: home program supervised by a physical therapist (31 cases). The execution, pain level and time spent doing each exercise were compiled for each work session — every day for the first 6 weeks, then every week up to 3 months. Clinical (Constant score) and range of motion evaluations were performed at enrolment, week 6 and month 3. Changes were compared between groups; correlation tests were used to analyse the effectiveness of each exercise during each session.

\textbf{Results:} Other than physical therapy and balneotherapy, classic rehabilitation exercises had a negative effect on clinical progression during the first 3 to 5 weeks ($P<0.05$), but this did not

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Introduction

Implementing a rehabilitation protocol requires that a series of rehabilitation exercise sessions, which change and evolve over time, be performed by a therapist and applied to a patient.

Exercise choices, application methods and on-going adaptation to the patient are components of an interactive process that is difficult to formalize because of the multiple variables involved (pain, working time, patient characteristics, etc.) [1]. Results are mainly determined by the therapist’s expertise and the patient’s participation and receptiveness [2].

Generic prescriptions are typically used, but these only provide an outline of the protocol to follow. The details of each session, thus true treatment implementation, cannot be controlled, which explains the significant variability in the results reported with identical programs [3–6].

The treatment value of each rehabilitation exercise used by our patients is not well understood and often seems to be poorly mastered by the therapists responsible for patient care [7,8].

The role of active patient participation in the treatment during home programs is also poorly defined, which makes its impact on treatment difficult to assess [3–7,9].

Treatment of shoulder stiffness is a textbook case involving the surgeon, therapist and patient in a treatment process that is often drawn out, has uncertain results, and is directly related to patient education and the rehabilitation performed [2,10–12]. Much work has been performed on this subject. The diverging conclusions reveal how difficult it is to formalize rehabilitation protocols for the treatment of shoulder stiffness [13–18].

The goal of this study was to evaluate the importance of each rehabilitation and home program exercise, along with the effect on the clinical progression of stiff shoulders, to better define the rehabilitation conditions for our patients, particularly the role of home programs.

Based on this information, the goal was to propose a clear, reproducible, traceable, standardized protocol for the rehabilitation of stiff shoulders so that our treatment prescriptions can be precise enough to ensure the desired outcome and provide surgeons making decisions about potential surgery with the knowledge that rehabilitation management has been optimized.

Patients and methods

This comparative, prospective multicentre study enrolled 148 patients with shoulder stiffness and involved surgeons, rehabilitation physicians and physical therapists.

Inclusion criteria were a significant reduction in passive range of motion (passive antepulsion below 150° vs 180°, passive external rotation below 40° vs 60° and reduction in internal rotation) relative to the healthy, contralateral side. Clinical evaluation of passive range of motion was performed through standardized goniometer measurements with the scapula immobilized [12,19,20]. All patients with shoulder stiffness were enrolled, independent of the treatment received before this study. Patients were excluded if they had been operated on for shoulder stiffness, had degenerative bone diseases (non-anatomical reduction, osteoarthritis, internal fixation), and had fractures less than 3 months old or non-consolidated fractures.

Three treatment populations (T1, T2, T3) were defined:

- population treated with classic rehabilitation below the pain threshold [2]. T1 (58 cases): this was the reference treatment for the study. Classic rehabilitation below the pain threshold was performed by a physical therapist/massage therapist three to five times per week for 6 weeks to 5 months and supervised by a rehabilitation physician or surgeon. Pain level on the Visual Analogue Scale (VAS) had to be maintained below 6. The exercises evaluated were scapular massage, neck-back massage, overall passive mobilization, analytical passive mobilization, Sohier joint centering method, scapulothoracic mobilization, assisted active mobilization, physical therapy, balneotherapy and electrotherapy [21,22];

- population treated through a home program. T2 (59 cases) — home program only with provocation above the pain threshold: The home program was not supervised. The patient was told to go beyond the pain threshold (VAS > 6) and asked to perform the most intense work possible by 5 to 10 mm steps through the day, until a flexible shoulder was obtained. This program was to be followed for a minimum of 6 to 12 weeks. The exercises consisted of simple movements that were based on activities of daily living with the goal of regaining normal range of motion [23] (Appendix 1). The exercises were named by the patients. These exercises involved exercises to improve posture ("Mirror"),...
a decoaptation exercise ("Cowboy"), depressor muscle work ("Gymnast"), assisted active self-mobilization and antepulsion (lying and standing "Assisted elevation") and internal rotation ("Chicken") and external rotation ("Thumb");

- T3 (31 cases): home program supervised by a physical therapist with provocation above the pain threshold (VAS > 6) and recommendations for daily, progressive home program identical to T2, but combined with one to three sessions with a physical therapist for 6 to 12 weeks [2–23].

Each participating centre focused on using the treatment approach that they were most familiar with, without changing the typical implementation or patient instructions.

To evaluate the effect of each rehabilitation and home program exercise on daytime pain, night-time pain, discomfort, morale, and passive range of motion, the patient was monitored in three ways:

- by the surgeon: the surgeon performed clinical and radiological assessments at study enrolment, then after 6 weeks and 3 months of treatment. This assessment included medical history, associated injuries, risk factors, disease history and treatment methods before enrolment. The clinical evaluation was performed with goniometer measurements and the Constant Shoulder Score [24];
- by the rehabilitation physician and/or physical therapist: the feasibility (impossible, possible, easy), pain (severe, average, slight), performance time (minutes) (Appendix 2) for each exercise were evaluated with a visual analogue scale (0 to 10);
- by the patient: during each classic rehabilitation session, the patient used a Visual Analogue Scale to evaluate his/her status that day based on daytime and night-time pain (0: no pain; 10: worst possible pain), disability (0: no disability; 10: worst possible disability) and morale (0: lowest possible morale; 10: best possible morale). Patients in the home program populations (T2, T3) assessed the same subjective criteria as above and also evaluated the feasibility, pain level and performance time of each home program exercise using a Visual Analogue Scale (Appendix 3).

The rehabilitation and home program evaluation sheets were filled out each day for the first 6 weeks, then each week during the next 6 weeks for patients performing the home program only (T2) and each rehabilitation session for patients participating in the classic rehabilitation program (T1). Patients in the supervised home program group (T3) were evaluated on all the criteria during each rehabilitation session.

An online database was developed so that each rehabilitation site could capture data online (Carl biostatistic™). Statistical analysis involved a comparison of the day-to-day subjective change in the pain, disability and morale criteria, a comparison of the 6-week and 3-month Constant scores and measurement of the range of motion (Anova, t-test, Chi², with P < 0.05 considered as significant). The effect of each exercise in the rehabilitation sessions and home program on daytime pain, night-time pain, disability and morale criteria, along with the clinical and range of motion follow-up were evaluated with simple regression tests or bivariate correlations each day for the first 6 weeks, then every week up to 3 months (P < 0.05 considered as significant).

Results

The average age of the 148 patients enrolled, in this study, was 50 years (range 18—67); women represented 57% of the cases; the dominant side was affected in 65% of cases. The stiffness appeared spontaneously in 56% of cases, with an average duration of 11 months (range 5 to 23). No significant differences between the three populations were found on the radiological follow-up criteria.

Comparison of weekly progression in the three populations

Clinical progression based on the Constant score (Fig. 1) showed a slow, continuous, relatively consistent change up to the third month in the function of patients treated with the classic rehabilitation program (P < 0.05). Patients using the home program only had better and faster recovery in their first 6 weeks (P < 0.05), but their progression then became more erratic, even negative. The group using the supervised home program had a better and more consistent progression during the first 3 months (P < 0.05).

Average passive antepulsion was 136° (range 63°—172°) for the classic rehabilitation program, 147° (range 45°—170°) for the home program and 155° (range 57°—162°) for the supervised home program; at 3 months, these values were 135° (range 45°—175°), 122° (range 51°—175°) and 155° (range 65°—170°), respectively.

Daytime pain (Fig. 2) was quickly below “average” for the three populations, although the home program only group had the most daytime pain and the supervised home program group has the least. Night-time pain quickly diminished in the home program only group, then was at the upper end of average (but not significantly different) up to the third month when the supervised home program group still had less pain at this point (P < 0.05) (Fig. 3). Reduction in the daily disability was not significantly different between the three populations except after 3 months, when the supervised home program group had better results (P < 0.05) (Fig. 4). Weekly evaluation of the morale in the three populations did not reveal significant differences (Fig. 5).

Effect of each exercise on weekly clinical progression during the first 6 weeks

Evaluation of the effect of each exercise on the follow-up criteria allowed “useful” exercises to be defined as those having a significantly positive impact (P < 0.05), "useless" exercises as those without a significant effect and “deleterious” exercises as those having a significant negative effect (P < 0.05) on the corresponding follow-up criteria.
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Figure 1  Comparison of changes in function using Constant score. Y-axis has Constant score (out of 100); x-axis is the week of treatment.

Figure 2  Comparison of changes in daytime pain. Y-axis shows the pain intensity (10 is maximum pain); x-axis is the week of treatment.

Figure 3  Comparison of changes in night-time pain. Y-axis shows the pain intensity (10 is maximum pain); x-axis is the week of treatment.

Figure 4  Comparison of changes in disability. Y-axis shows the disability (10 is maximum disability); x-axis is the week of treatment.
Effect of classic rehabilitation exercises
Analytical passive mobilization had a negative effect on pain and function up to the fifth week, and then was effective in improving function. The Sohier joint centering method had the same effect, but became effective starting in the fourth week. Neck-back massage had the same result as the Sohier method. Proprioceptive work had a negative effect during the first 3 weeks. Electrotherapy had a negative effect the first week, a neutral effect during the second week and then was effective starting in the third week; balneotherapy was useful immediately (P < 0.05). All of the correlations for the group treated with the classic rehabilitation program are given in Fig. 6.

At week 6, clinical and goniometer assessments showed a negative effect of scapular massage, analytical passive mobilization (P < 0.05), and no effect of neck-back massage, active mobilization and muscle strengthening. Overall passive mobilization and scapulothoracic massage improved forward flexion (P < 0.05) and the overall function score (P < 0.05). The effect of the other techniques at 6 weeks could not be evaluated.

Effect of the home program exercises
Exercises for shoulder lowering, decoaptation and balancing immediately had a significant positive effect (P < 0.05), with this effect being directly related to work time (P < 0.05). Elevation exercises increased daytime pain (P < 0.05) in direct relation with exercise time (P < 0.05) but reduced night-time pain starting in the second week (P < 0.05). Night-time and daytime pain had a separate profile in the home program only group. At week 6, clinical and goniometer assessments showed that all the home program exercises had a positive effect (P < 0.05) except for the decoaptation work (''Cowboy''), depressor muscle exercise (''Gymnast'') and external rotation (''Thumb''); these changes occurred despite a negative effect of the elevation exercises beyond the pain threshold (P < 0.05).

Effect of the supervised home program
Adding supervision to the home program exercises led to better morale (P < 0.05) but did not have a greater positive impact in the first 6 weeks. However, a positive impact was observed at the third month on overall function based on the Constant score (P < 0.05), pain and passive range of motion (P < 0.05).

Effect of each exercise beyond the first 6 weeks
Follow-up using the Constant score allowed weekly function from the sixth week to the third month to be evaluated,
which provided a better assessment of the overall effect of the different protocols (Fig. 1). Analysis of correlations between exercises and the day-to-day impact no longer had any statistical significance beyond the sixth week, because of disparity between centres and significant loss of data that was not collected for patients who were less motivated to do the home program.

Discussion

Studies evaluating the treatment potential of rehabilitation and home program exercises are rare [4–6,9,11,17,25], making it difficult to prescribe specific protocol that would result in reliable, appropriate, and optimal rehabilitation.

The treatment groups in this study had fairly similar results based on the clinical and goniometry follow-up at 6 weeks and 3 months, even though the exercises and their implementation were different. Classic rehabilitation techniques were on average not very effective, however their benefit was long-lasting although limited, which is consistent with published data [4,6,9,17,26]. Home program exercises led to a quick improvement, particularly in night-time pain, but this improvement was inconsistent and short-lived on most of the criteria after 6 weeks. Supervision of this home program allowed the protocol to be optimized and to reinforce the home program starting at the sixth week, which is consistent with studies performed on the complimentary nature of rehabilitation techniques and home programs [4,5,25,27].

The intensity of the work performed in all the elevation movements with provocation above the pain threshold explains the longer persistence of daytime pain in the home program group, which was expected [5,7,11,28,29]. This pain has a negative effect during the day the exercise was performed but had a positive effect on function, pain and passive recovery during the clinical and goniometry assessments at week 6. This shows the validity of performing work beyond the pain threshold, since it had a positive effect on night-time pain and eventually function. This could be attributed to fast recovery of the sliding planes and flexibility [29,30], muscle strengthening [5,11,31,32,33] and the virtuous circle of reduced pain brought on by functional recovery, even if partial, which allows the shoulder to be used in a more physiological manner [5,27,34,35].

The analysis of failures in this series was difficult because only a few weeks of follow-up were available. There were no complications related to exercise implementation.

We believe that this study sheds light on the effectiveness of each rehabilitation exercise for shoulder stiffness and allows us to propose a practical, progressiv e rehabilitation protocol, which still uses physical therapy and balneotherapy [7,36], and mostly relies on the common assumption that rehabilitation and home program exercises are complimentary to each other [5,6,10,25,27,37,38] and the important role played by patient education and patient involvement [39].

Independent of previous care and when the rehabilitation protocol starts, we propose the following:

- weeks 1 to 3: after patient education, the patient starts an intensive home program and is allowed to go beyond the pain threshold within reason. These exercises are to be split up and spread out during the day. A 5- to 10-minute-long session every half-hour is considered a necessary and sufficient base, in most cases, if the exercises are performed correctly. The patient is supervised by a knowledgeable physical therapist, which is aware of when the patient goes beyond his/her pain threshold. The role of the physical therapist is that of a coach who supervises, improves and optimizes the home program exercises while adding in physical therapy and balneotherapy modalities and potentially light massage to relieve pain;
- weeks 3 to 6: the patient continues with the home program while working with a massage therapist/physical therapist who progressively introduces classic rehabilitation exercises, starting with scapulothoracic mobilization, then active mobilization and overall passive mobilization;
- starting after 6 weeks of treatment and provided that the patient is actively contributing to his/her recovery, all of the classic rehabilitation exercises can be used with the patient.

We feel that this protocol can improve treatment of shoulder stiffness, although new clinical studies will be required to validate this approach. Giving the patient a booklet to record their work (exercises performed and working time) could be a useful tool to optimize and monitor the work performed by the patient, and would complement the analytical physical therapy treatment charts that surgeons require from physical therapists when treating their patients.

Conclusion

When classic rehabilitation exercises are used in the context of staying below the pain threshold, they have a negative effect during the first weeks of treatment, except for physical therapy and balneotherapy. Home programs that go beyond the pain threshold are quickly effective in terms of night-time pain management; they are better accepted and allow for a faster recovery than classic rehabilitation programs during the first weeks, but then have limitations. Supervision of the home program by a physical therapist optimizes the home program work and makes it more reproducible; classic rehabilitation exercises are then progressively introduced, which ensures better results.

A protocol such as the one proposed here, which combines in a coordinated, progressive and complementary manner the most effective classic rehabilitation techniques and home program exercises and lets the patient work beyond his/her pain threshold should lead to better results during rehabilitation for shoulder stiffness. Monitoring of the work performed by the patient can be formalized using a traceable medium, in addition to regular reports prepared by the physical therapist, and provides surgeons with a fact-based, objective follow-up of the effectiveness of their rehabilitation prescriptions.

Disclosure of interest

The authors declare that they have no conflicts of interest concerning this article.
Appendix 1. Home program exercise sheets

SHOULDER HOME PROGRAM

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There are four exercise phases:

1 - Essential preparation exercises: «Cowboy» and «Mirror»

If these exercises are not performed correctly, the other exercises will not help you. The Mirror exercise will show you how to stand normally with your shoulders lowered and how to lift your arm without shrugging your shoulder. The Cowboy exercise will help you relax, eliminate pain, and prevent poor postures that could add to your shoulder stiffness. It can be performed anytime, but especially before the exercises in the next phase.

2 - Gentle exercises to increase or maintain muscle awareness: «Gymnast» and «Assisted active elevation»

These are used to mobilize the shoulder while limiting muscular contraction and protecting any repaired tendons.

3 - Natural mobilization exercises: «active elevation», birdy, and movements in front of a mirror

These exercises will help you relearn muscle synchronization and avoid poor posture when lifting up your arm.

4 - Exercises to incorporate into daily living: «Dangling arms», «Chicken» and «Thumb».

«Home exercise program – daily patient education»

Main principles:

The shoulder is a fragile, mechanically complex joint. If the joint does not move normally, normal sensations are lost and painful reflex reactions occur that can something be impossible to control (complex regional pain syndrome). A joint is made to be moved. If it is not moved through its full range of motion, it will quickly develop adhesions, which can then take months to release.

Pain will occur in a shoulder that does not have full flexibility. Since the joint no longer functions naturally, rotation becomes abnormal, rubbing against the acromion causes pain and muscles quickly lose strength.

The pain-stiffness vicious circle occurs if joint mobility is not maintained through continuous exercises or if an existing poor reflex posture results in blocking and lifting of the shoulder, even if the patient is often not conscious of this posture. This instinctive posture is a protective shoulder reflex that often starts well before surgery. Although a challenging condition, it must be addressed. For each exercise, it is absolutely necessary to keep the shoulder down.

Continuous work by the patient throughout the day is needed to ensure that the shoulder does not stiffen up and that reflex postures do not develop. Home exercise programs are based on patient education. Caregivers provide education so that the patient understands, becomes aware and manages the pathology by himself or herself.

The exercises in this document have multiple goals:
- avoid poor reflex postures,
- avoid stiffness and keep the shoulder flexible,
- keep as much muscle strength as possible,
- protect, gently revive, and then naturally add muscle mass to repaired muscles.

Practical advice:

Pain should not restrict the exercises except if it leads to a poor reflex posture of the shoulder that must be eliminated (Cowboy exercise) before starting other exercises.

Pain will go away when rotation returns to normal, since rubbing against the acromion will be progressively reduced. Each patient, supervised by the massage therapist / physical therapist, must find a balance between «trying to hard» and needlessly being in pain, and «not trying hard enough» that will result in progressive stiffening, which once in place will need many months to resolve, independent of how successful the surgical procedure was.

Work sessions must be short and as frequent as possible. In return, if the exercises are performed correctly and often enough, the shoulder will become fully functional with normal strength and flexibility as soon as dynamic shoulder re-centering returns.
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PREPARATION EXERCISE: GOOD SHOULDER POSITION DURING MOVEMENT

« MIROIR »

1- Stand in front of a mirror
2- Keep your head straight, try to make yourself taller by lifting your chin and lowering your shoulders.
3- If possible, lift both arms equally while keeping your shoulders low and your chin raised.

« COW BOY »

1- Sit on a chair with your legs apart. Put your healthy arm on the knee of the non-injured side.
2- Let your injured arm hang between your legs.
3- Your shoulder must be completely relaxed and hanging freely.
4- Slowly lean forward until your injured arm is vertical and your fingers nearly touch the ground.
5- WAIT until your shoulder is completely relaxed (a few seconds). Make circular movements (go in circles) and swing your arm side-to-side and front-back.
6- Once you feel the desired effect, lift yourself back up making sure that your shoulder stays down.

This exercise will provide pain relief and should be performed as needed depending on your pain level.

EXERCISES TO REVIVE MUSCLES: ASSISTED MUSCLE WORK

«GYMNAST »

1- Sit on a chair, with the palm of both hands placed on each side of the chair in front of your hips.
2- Pull your shoulders back and stick out your chest.
3- Gently press down into the palms of your hands. (hold for 6 seconds, repeat 5 times).

CAUTION: If you had rotator cuff repair surgery and your doctor gives the go-ahead, the pressure on the palms of your hands can be progressively increased until your buttocks are unloaded and then completely lifted off the chair.

4- During this exercise, do not go beyond your pain threshold to make that any surgical repair that was performed is not damaged.
1. Lie on your back, preferably on a hard surface with your head flat. Make your knees. 
2. Make sure that your back is flat and that your shoulder stays low (be aware of this during the entire time you are performing the exercise). 
3. Before lifting up your arm, pretend that your arm is completely asleep. Relax. 
4. Make sure that the elbow of the injured arm is extended with the palm facing up before starting the movement. 
5. Take the wrist of the injured arm with your other hand and pull it towards your foot. 
6. Use your healthy arm to slowly lift up your injured arm. Keep your elbow straight. Your “asleep” injured arm does not participate in the movement; it should feel heavy, like it is paralyzed. 
7. Go as far back as possible and try to touch back behind you with the palm facing up. 
8. Rest a few seconds in maximum extension. 
9. To return to the starting position, bring the injured arm back while pushing against the healthy arm, which provides resistance. This return motion must be slow, controlled and resisted by the other arm up to where the injured arm is back at the starting position. When you are lowering your arm, it is no longer asleep since it pushes against the other hand.

**NATURAL MOBILIZATION EXERCISES**

1. Lie on your back, preferably on a hard surface with your head flat. Bend your knees. 
2. Make sure that your back is flat and that your shoulder stays low (be aware of this during the entire time you are performing the exercise). 
3. Make sure that the elbow of the injured arm is extended with palm facing up before starting the exercise. 
4. Without assistance, lift your arm as far as possible towards the back until it touches the mattress, with the palm facing up. 
5. Rest a few seconds. 
6. Return to the starting position by pushing against your healthy arm, which provides resistance.

When you can easily perform this exercise lying down, start doing it while sitting down or standing up:

1. Stand with your back straight against the wall and your knees slightly bent. 
2. Bring both arms up backwards as far as possible. 
3. Rest a few seconds. 
4. Return to the starting position by pushing against

**“BIRDY” variation: same movement but spread your arms.**
**DAILY EXERCISES: MUSCLE AND RANGE OF MOTION WORK**

### 「DANGLING ARMS」
1. Any time you walk (without a brace).
2. Before starting off, relax your neck then let your arm hang down and pull your shoulder back on your injured side.
3. When you are walking, try to feel your shoulder dangling naturally with your arm hanging like it was asleep.
4. Do not lift your shoulder by pushing in your elbow against your trunk when you encounter an obstacle or when you use your hand.

### 「CHICKEN」
1. Perform this any time you are seated.
2. Cross your arms across your stomach and let your elbows drop to your sides.
3. Slowly move your elbows forward without moving your hands.
4. Drop your elbows again.

### 「THUMB」
1. Perform this any time you are seated.
2. Let your arm drop to your side with elbow extended.
3. Let your arm really relax and hang.
4. Slowly turn your thumb towards the inside until it faces backwards.
5. Wait a few seconds.
6. Return to the starting position (thumb facing slightly forward).
7. Slowly turn your thumb towards the outside this time until it faces backwards.
8. Repeat as many times as you want.
Appendix 2. Rehabilitation monitoring sheet

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<td>How to fill out this sheet:</td>
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<td>1 - Pain, discomfort, morale: put a number between 0 and 10 (0 = No pain or discomfort, 10 = morale at its lowest)</td>
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<td>Performance: Impossible, choose &quot;I&quot;; Possible, choose &quot;P&quot;; Easy, choose &quot;E&quot;</td>
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<td>Time: Work time in minutes (total)</td>
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### Appendix 3. Home program monitoring sheet

**Patient first name, last name, file No.:** [Patient name and file number]

**GROUP:** [Home program group]

**HOME PROGRAM MONITORING SHEET**

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<thead>
<tr>
<th>Week 1-2</th>
<th>Week 3-4</th>
<th>Week 5-6</th>
<th>Week 7-8</th>
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**Notes:**

- **Pain:** Use a scale of 0-10 to rate pain.
- **Discomfort:** Use a scale of 0-10 to rate discomfort.
- **Moral:** Use a scale of 0-10 to rate morale.

**Exercises:**

- **Mirror:** Perform mirror exercises.
- **IP E:** Perform IP E exercises.
- **SP:** Perform SP exercises.
- **NP:** Perform NP exercises.
- **LP:** Perform LP exercises.
- **Assisted elevation:** Perform assisted elevation exercises.

**Evaluation:**

- **Normal elevation:** Evaluate normal elevation.
- **Abduction:** Evaluate abduction.
- **Dangling arms:** Evaluate dangling arms.
- **Chicken:** Evaluate chicken exercises.
- **Thumb:** Evaluate thumb exercises.

**Comments:**

[Additional comments or notes space for further observations.]
References


