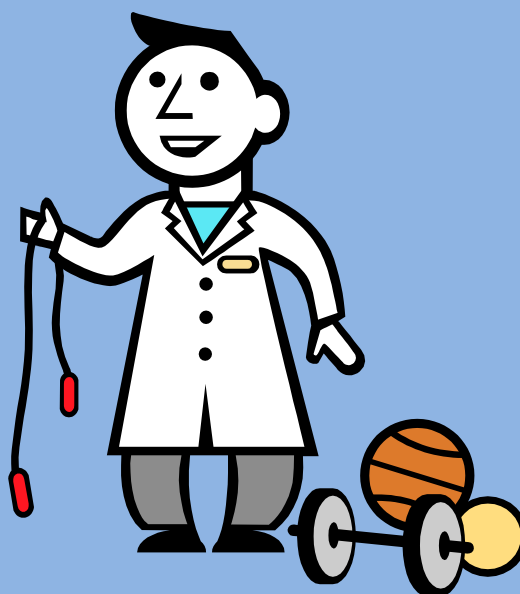


Robot Assisted Training for the Upper Limb after Stroke

RATULS

Enhanced upper limb therapy 1: **Programme overview**



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1. Purpose of this document

This document gives an overview of the enhanced upper limb therapy programme being used in the RATULS study. It is intended to serve as a reference and resource guide for clinicians delivering the enhanced upper limb therapy programme.

2. Introduction

The RATULS study is a three group multicentre randomised controlled trial to determine whether robot assisted training improves upper limb function after stroke. Robot assisted training is being compared to i) an enhanced upper limb therapy programme consisting of repeated practise of everyday activities using the arm and ii) usual NHS rehabilitation. Stroke patients with reduced arm function who wish to take part in the trial are randomly assigned to either robot assisted training, enhanced upper limb therapy or usual NHS rehabilitation.

The RATULS enhanced upper limb therapy programme consists of task-orientated practice aimed at participant-centred goals. It has been designed to facilitate upper limb function, reduce learned non-use of the affected arm and reduce arm impairments that are commonly found in people who have had a stroke.

The programme has been developed from upper limb therapy programmes used in the Botulinum Toxin for the Upper Limb after Stroke (BoTULS) trial^[1, 2] and the Repetitive Arm Functional Tasks after Stroke (RAFTAS) project^[3].

3. Summary of the enhanced upper limb therapy programme

The RATULS enhanced upper limb therapy programme consists of three 45 minute therapy sessions per week for 12 weeks. One hour has been allocated for each session to allow for set-up, preparation and completion of study documents. The total number of therapy sessions per participant is 36. In each therapy session, participants practise activities to work towards their upper limb rehabilitation goals. Upper limb rehabilitation goals are selected at the initial therapy session and reviewed/adjusted at sessions 12 (end of week 4) and 24 (end of week 8).

Types of goals/activities

To facilitate delivery of the RATULS enhanced upper limb therapy programme, a list of potential goals and a description of suggested activities for each goal, has been prepared. Whilst it is anticipated that this will cover many participant choices, it is acceptable for alternative goals and activities to be determined and used the discretion of the local therapist. The prepared goals/activities cover washing; dressing; eating and drinking and 'other' categories.

Types of practice

Activities are divided into two types: 'whole-task' or a 'part-task'. Whole-task activity practice consists of practising all of the components of the task in sequence. Part-task activity practice consists of practicing a specific part of a task. Part-task practice is appropriate if a participant has difficulty with a specific part of a task as it will enable them to focus on this particular aspect independently to completing the task as a whole. The 'whole-task' and 'part-task' activities prepared for RATULS are described in a series of flowcharts which show how to complete each activity step by step. Choice of a whole-task or part-task activity for each goal will be dependent on participant ability. Following accomplishment of a 'part-task' activity participants progress to practise the next 'part-task' activity in the step by step flowchart. Should a 'whole-task' activity be accomplished before a goal review session, the flowcharts include suggestions for adaptations to the activities for further practice.

Intensity of practice

To achieve functional improvement after stroke, a few hundred repetitions are required each session^[4]. Therefore, in this study we should aim – where possible – to include a few hundred repetitions in each session.

What is a repetition?

- For whole task practice, completion of the whole task (from the beginning to the end of the flowchart) counts as one repetition, i.e. from the start position to a return to the start position or to completion of the task (if different from the start position).
- For part task practice completion of the *component* of the task counts as one repetition.

(Note: a continuous task (e.g. walking while carrying a plate) should be interpreted as a discrete task for the upper limb and repetitions should be counted as such (e.g. picking a plate up, carrying it and putting it down again = 1 repetition).

Working through each session

At the initial therapy session, up to four upper limb rehabilitation goals of importance to the participant will be agreed and the activities to practise to achieve these goals subsequently determined. Participants will then undertake a brief warm up consisting of gentle stretching of the upper limb, prior to practice of the chosen activities. The order to practise the activities and the time to spend on each activity will be at the discretion of the therapist and participant according to the participant's rehabilitation priorities.

At the second and subsequent therapy sessions, following a brief warm up (if necessary), practice of the selected activities will continue, with the order to practise and time to spend on each activity being at local discretion. At therapy sessions 12 (end of week 4) and 24 (end of week 8), progress towards goals will be reviewed. If the participant has achieved a goal, a new goal will be set and a new activity to practise selected. If the participant is finding a goal or activity too challenging or they are experiencing other problems, an alternative will be chosen.

At the final therapy session (36, end of week 12), practice of activities will continue but part of the session will also be dedicated to 'summing up' with feedback to the participant about progress over the programme and advice about maintaining upper limb function in the longer term. There will also be an opportunity for participants to give views on the therapy programme.

4. Enhanced upper limb therapy staff roles and responsibilities

The enhanced upper limb therapy programme is intended to be delivered by therapists appointed or seconded to work with a RATULS study centre team.

It is intended that day to day therapy sessions are delivered by a therapy assistant with supervision and advice from a senior therapist. The senior therapist is also responsible for regular participant reviews.

Senior Therapist:

The senior therapist is responsible for:

- Week 1 (session 1):
 - Initial assessment, goal setting and activity choice
 - Supervision of the warm up stretching (if necessary)
 - Supervision of initial activity practice.
- Week 4 and 8 (sessions 12 and 24):
 - Evaluation of progress
 - Upper limb reassessment and review of goals.
 - Setting new goals (where appropriate)
 - Choosing new activities to practise (where appropriate).
- Week 12 (session 36):
 - Giving feedback about progress
 - Giving advice about maintaining upper limb function in the longer term.
- Supervision and support for the therapy assistant throughout the programme
- Completing relevant sections of the enhanced therapy programme paperwork
- Ensuring that the enhanced upper limb therapy programme is delivered as per protocol.

Therapy Assistant:

The therapy assistant is responsible for:

- Day-to-day enhanced upper limb therapy sessions
- Reporting any concerns about participants to the senior therapist
- Acting on advice given by the senior therapist
- Completing relevant sections of the enhanced therapy programme paperwork
- Ensuring that the enhanced upper limb therapy programme is delivered as per protocol.

5. RATULS enhanced therapy summary diagram



6. Other important points about the RATULS enhanced therapy programme

The RATULS enhanced upper limb therapy programme is based on the following principles:

It should be:

- Relevant for participants
- Challenging
- Achievable
- Promote long-term benefits (as opposed to short term performance benefits)
- Engaging
- Standardised in terms of treatment principles, while the content should allow some tailoring to individual participants' goals and abilities.

It is acknowledged that the programme is somewhat prescriptive and that a personal, tailor-made programme would be more representative of normal clinical practice. However, within the context of this research project, the benefits and drawbacks of an individual approach had to be balanced against the need to avoid potential confounding variables and also to record the therapeutic input in sufficient detail to enable replication of the study. Therefore, principles of the programme have been standardised, whilst leaving sufficient opportunity for specific task requirements to be fine-tuned to the capabilities and goals of each individual participant.

7. Enhanced upper limb therapy documents

This Enhanced upper limb therapy 1: Programme overview manual is part of a series of documents developed to describe the RATULS enhanced upper limb therapy programme. The other documents in this series are:

- Enhanced upper limb therapy 2: How to deliver the programme
- Enhanced upper limb therapy 3: Warm-up stretches, goal choices and activity flowcharts

8. RATULS co-ordinating centre

For further information please contact the RATULS co-ordinating team:

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This enhanced upper limb therapy manual has been produced by Dr Helen Bosomworth with input from Miss Lianne Brkic, Mrs Lydia Aird, Dr Lisa Shaw and Professor Frederike van Wijck.

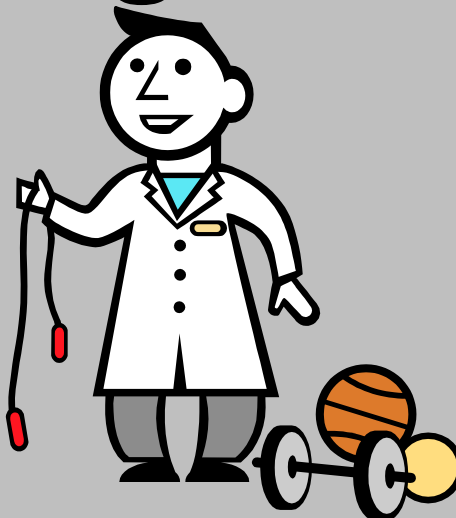
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Robot Assisted Training for the Upper Limb after Stroke

RATULS

Enhanced upper limb therapy 2: **How to deliver the programme**



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1. Purpose of this document

This document describes how to deliver the enhanced upper limb therapy programme being used in the RATULS study. It is intended to serve as a reference and resource guide for clinicians delivering the enhanced upper limb therapy programme. For a summary of the RATULS enhanced upper limb therapy programme, see 'Enhanced upper limb therapy 1: programme overview'.

2. Initial therapy session (session 1)

The first session of the enhanced upper limb therapy programme covers an initial assessment followed by goal setting/activity choice and initial therapy. It should be carried out by a senior therapist in conjunction with a therapy assistant.

2.1. Introduction

The therapy session should begin with a description of what will be involved in the RATULS enhanced upper limb therapy programme.

2.2. Assessment

A standard upper limb assessment should be completed to establish motor impairment and other neurological deficits that may impact on the participant's upper limb function. The therapist should pay particular attention to:

- Selective movement
- Passive range of movement
- Muscle tone
- Proprioception
- Sensation
- Compensations
- Pain
- Coordination
- Associated reactions

In addition, any inattention should be noted.

A discussion of the participant's upper limb rehabilitation needs and identification of important goals should follow. Up to four rehabilitation goals should be agreed.

Suggested goal choices can be found in 'Enhanced upper limb therapy 3: warm up stretches, goal choices and activity flowcharts'. Whilst it is anticipated that this goal list will cover many participant choices, it is acceptable for alternative goals to be set at local discretion by the senior therapist.

Following agreement of up to four goals, activities to practise should be determined. For goals chosen from the enhanced therapy list, associated 'whole-task' and 'part-task' activity choices are provided in step by step flowcharts. Whole-task activity practice consists of practising all the components of the task in sequence. Part-task activity practice consists of practising a specific part of a task. Part-task practice is appropriate if a participant has difficulty with a specific part of a task as it will enable them to focus on this particular aspect independently to completing the task as a whole. Choice of a whole-task or part-task activity for each goal is therefore dependent on participant ability. If any activities within the whole-task or part-task flowcharts are not suitable for a participant, they can be adapted at the discretion of a senior therapist.

If a goal is chosen which is not included within the enhanced therapy goal list, it will be necessary for a senior therapist to give appropriate advice on activities to practise for this goal, to the therapy assistant.

2.3. Warm-up stretching

Gentle stretching of soft tissues and mobilisation of joints can be performed, if necessary, to focus attention on the affected upper limb prior to practising rehabilitation activities. However, as the focus of the therapy sessions should be activity practice working towards the participant goals, warm-up stretching should be kept to a minimum. Example warm up stretches can be found in 'Enhanced upper limb therapy 3: Warm-up stretches, goal choices and activity flowcharts'. Different stretches may be used at the discretion of a senior therapist. Warm up stretches should be demonstrated to both the participant and the therapy assistant.

2.4. Core treatment

A short therapy session to introduce both the participant and the therapy assistant to the tasks the participants will be working through in the following 4 weeks, should next be undertaken.

The senior therapist should ensure that both the therapy assistant and participant are familiar with the tasks by demonstration and supervision of practice. In this session and other subsequent therapy sessions, the order to practise the selected tasks and the time to spend on each task are at local discretion and according to a participant's rehabilitation priorities.

During activity practice, the number of repetitions of each task need to be counted and recorded.

What is a repetition?

- For whole task practice, completion of the whole task (from the beginning to the end of the flowchart) counts as one repetition, i.e. from the start position to a return to the start position or to completion of the task (if different from the start position).
- For part task practice completion of the *component* of the task counts as one repetition.

(Note: a continuous task (e.g. walking while carrying a plate) should be interpreted as a discrete task for the upper limb and repetitions should be counted as such (e.g. picking a plate up, carrying it and putting it down again = 1 repetition).

Number of repetitions should be recorded within the 'Enhanced upper limb therapy: participant goal and therapy record'.

Can stretching count as activity practice?

If a 'stretch' is embedded into an active task (e.g. reaching out to touch/ grasp an object), the repetitions of that stretch/task should be recorded as activity practice. However, if a stretch is passive (i.e. this is not a voluntary, active action on behalf of the patient but a manoeuvre undertaken by the therapist) this does not count as activity practice and the repetitions should NOT be recorded.

In the RATULS enhanced upper limb therapy programme, the senior therapist goal review sessions are at the end of week 4 (session 12) and end of week 8 (session 24). This means that appropriate guidance regarding progression of therapy will need to be provided for a therapy assistant delivering the therapy sessions three times per week.

Where activities to practise have been chosen from the 'Enhanced upper limb therapy 3: warm up stretches, goal choices and activity flowcharts', the activities are designed such that following accomplishment of a 'part-task' activity participants progress to practise the next 'part-task' activity in the step by step flowchart. Should a 'whole-task' activity be accomplished before a goal review session, the flowcharts include suggestions for adaptations to the activities for further practise and progression. If a goal is chosen which is not included within the enhanced therapy goal list, it will be necessary for the senior therapist to give appropriate advice on activities to practise and how to progress therapy, to the therapy assistant.

In addition, the following should be considered and appropriate guidance given regarding practising activities over the next four weeks:

For each activity, once the participant knows what to do and they demonstrate a basic ability, try to make the activity more engaging and stimulating, e.g. by:

- Including *variations* in the task (e.g. different sizes and shapes of objects, different start-and end positions, different speeds). This is known as variable practice. Variable practice enables the participant to translate what they learn during therapy sessions more easily to a wider range of activities of daily living (ADL).
- Doing tasks in a *different order* within a therapy session. So rather than doing five repetitions of one activity followed by five repetitions of another task and so on (known as blocked practice), mix up the order in which the participant undertakes each task (known as random practice). This may seem counter-intuitive, but random practice encourages deeper learning. Random practice also allows for a more 'real-life' situation where the order of events is more

likely to be mixed rather than blocked. This enables better translation of what a participant has learned during therapy into ADL.

Ensure the programme is sufficiently intensive. To achieve functional improvement after stroke, a few hundred repetitions are required each session^[1]. Therefore, in this study we should aim – where possible – to include a few hundred repetitions in each session.

2.5. Summary and feedback

This should consist of a participant's own evaluation of their performance followed by therapist feedback. This discussion is to encourage a participant to think about what they have learned, and what they need to focus on in the next session.

2.6. Study paperwork

Accurate completion of paperwork is a crucial part of research.

All sessions should be recorded in the document titled 'Enhanced upper limb therapy: participant goals and therapy record'. In addition, a second document entitled 'Enhanced upper limb therapy: activity flowchart for optional goals or activity adaptations' exists to record activities for optional goals and any adaptations to the pre-specified activity flowcharts (found in 'Enhanced upper limb therapy 3: warm up stretches, goal choices and activity flowcharts'). Section 6 below shows how these documents should be completed. In summary, the following must be documented for session 1:

- the (up to four) goals that have been selected
 - if a goal has been selected from the pre-specified list, please document this by its number as listed in 'Enhanced upper limb therapy 3: warm up stretching, goal choices and activity flowcharts' (e.g. D1).
 - If an alternative goal has been chosen ('optional goal'), this should be written out free text and labelled as 'OG 1' (optional goal 1). If more than one optional goal has been chosen these should also be written

out and then labelled as OG 2, OG 3, etc. For example: 'Using a knife and fork – OG1'

- whether whole-task or part-task activity practice has been chosen, for each goal
- where part-task practice has been chosen for a pre-specified goal, the start position on the relevant flowchart should be recorded (indicated by the number in the flowchart box e.g. W1.02 (see 'Enhanced upper limb therapy 3: warm up stretching, goal choices and activity flowcharts'))
- where an optional goal has been chosen details of the activities to practice, the starting task and tasks for progression should be recorded (this should be in the document entitled 'Enhanced upper limb therapy: activity flowchart for optional goal or goal adaptations')
- any adaptations to the pre-specified activity flowcharts which are being made (this should be in the document entitled 'Enhanced upper limb therapy: activity flowchart for optional goal or goal adaptations')
- any guidance about progression for the pre-specified activity flowcharts should be detailed in the session notes. Where an optional goal is being used or pre-specified activities have been adapted, progression guidance should be documented on the document entitled 'Enhanced upper limb therapy: activity flowchart for optional goals or activity adaptations'.
- the therapy record which includes
 - the goals worked on (record as D1, OG1, etc)
 - the number of repetitions of the task which has been practised for each goal. The total number of repetitions should be recorded.
 - the duration of the entire session
 - the duration of activity practice
 - the treating senior therapist's name, and signature
 - the date
 - a notes section to record any important aspects of therapy, e.g. if a participant has achieved a part-task activity and should commence at the next part-task in the flowchart in the next therapy session, this should be recorded here.

The 'Enhanced upper limb therapy: participant goal and therapy record' also includes an optional section to record an upper limb assessment, should this be useful to the senior therapist.

3. Four week and eight week review sessions (sessions 12 and 24)

Review sessions should be carried out at the end of week 4 (session 12) and the end of week 8 (session 24). The aim of the review sessions is to assess a participant's progress with the programme, and review goals and activities. The review sessions should be carried out by a senior therapist in conjunction with a therapy assistant.

3.1. Introduction

The session should begin with a discussion about progress towards the goals and practising the activities to date.

3.2. Reassessment

An upper limb reassessment should be completed to establish current motor impairment and other neurological deficits that may impact on the participant's upper limb function. The therapist should pay particular attention to:

- Selective movement
- Passive range of movement
- Muscle tone
- Proprioception
- Sensation
- Compensations
- Pain
- Coordination
- Associated reactions

In addition, any inattention should be noted.

A review of upper limb rehabilitation goals should take place. New goals may be selected if previous goals have been achieved, or existing goals may be modified e.g. increasing/decreasing difficulty. Activities choices should also be reviewed accordingly e.g. this may include change from part task practice to whole task practice.

3.3. Warm-up stretching

Gentle stretching of soft tissues and mobilisation of joints can be performed, if necessary, prior to practising rehabilitation activities. However, as the focus of the therapy sessions should be activity practice working towards the participant goals, warm-up stretching should be kept to a minimum. Stretches may be modified at the discretion of a senior therapist. Warm up stretches should be demonstrated to both the participant and the therapy assistant.

3.4. Core treatment

A short therapy session to introduce both the participant and the therapy assistant to the revised tasks the participants will be working through in the following four weeks, should next be undertaken.

The senior therapist should ensure that both the therapy assistant and participant are familiar with the tasks by demonstration and supervision of practice. Guidance on how to progress tasks over the next four weeks should also be given.

As previously, the order to practise the selected tasks and the time to spend on each task are at local discretion and according to a participant's rehabilitation priorities. Repetitions of tasks need to be counted and recorded.

3.5. Summary and feedback

This should consist of a participant's own evaluation of their performance followed by therapist feedback. This discussion is to encourage a participant to think about what they have learned, and what they need to focus on in the next session.

3.6. Study paperwork

The 'Enhanced upper limb therapy: participant goal and therapy record' and 'Enhanced upper limb therapy: activity flowchart for optional goals or activity adaptations' should be completed as appropriate.

The following must be documented:

- whether a participant has achieved their goals
- the (up to four) goals to work towards
- whole-task/part task activity choice (including completion of additional activity flowcharts using 'Enhanced upper limb therapy: activity flowchart for optional goals or activity adaptations' as appropriate)
- any further information/guidance (included in the session notes or on the activity flowchart for optional goals or activity adaptations).
- the therapy record which includes:
 - the goals worked on
 - the number of repetitions of the task which has been practised for each goal
 - the duration of the entire session
 - the duration of activity practice
 - the treating senior therapist's name, and signature
 - the date
 - any notes.

4. Final therapy session (session 36)

The final therapy session should be performed by a senior therapist in conjunction with a therapy assistant. The aim of this session is to conclude the RATULS enhanced upper limb therapy programme. It includes further activity practice followed by feedback and advice for the future.

4.1. Introduction

The session should begin with a discussion about progress towards the goals and practising the activities to date.

4.2. Warm-up stretching

As previously, warm up stretches can be performed where necessary before practising activities.

4.3. Core treatment

Final activity practice should take place focussing on any areas of particular importance to the participant. Suggestions for activities to practise at home or advice about further rehabilitation services can be made if appropriate. Advice about maintaining current upper limb function in the longer term should also be included.

4.4. Summary and feedback

A final feedback discussion should be held. This should include discussion of a participant's own evaluation of their performance and therapist feedback.

Feedback on the thoughts on the content and structure of the enhanced upper limb therapy programme is sought from the participant as part of the enhanced upper limb rehabilitation therapy log.

4.5. Study paperwork

The appropriate sections in the 'Enhanced upper limb therapy: participant goal and therapy record' must be completed.

The following must be documented:

- whether a participant has achieved their goals
- the therapy record which includes:
 - the goals worked on
 - the number of repetitions of the task which has been practised for each goal
 - the duration of the entire session
 - the duration of activity practice
 - the treating senior therapist's name, and signature
 - the date
 - any notes.
- feedback given to participant about progress over the programme
- further advice given regarding maintaining upper limb function (e.g. home exercises).

5. Therapy sessions

Excluding the sessions discussed above, there are 32 other therapy sessions within the enhanced upper limb therapy programme. These sessions are designed to be carried out by a therapy assistant but can be conducted by a qualified therapist according to local staff availability. The aim of these therapy sessions is to practise activities to work towards the goals selected at the initial therapy session or the therapy review sessions.

5.1. Introduction

At the beginning of each therapy session, the therapy assistant should review a participant's previous session notes as a reminder of the goals and activities selected and progress to date.

A discussion should be held regarding which of the selected goals/activities the participant would like to work on at this session. The order to practise each activity and the time to spend on each activity is according to local discretion. A participant need not practise the activities for all four chosen goals in each session.

5.2. Warm-up stretching

Gentle stretching of soft tissues and mobilisation of joints can be performed, if agreed at the initial/ review sessions, to focus attention on the affected upper limb prior to practising rehabilitation activities. However, as the focus of the therapy sessions should be activity practice working towards the participant goals, warm-up stretching should be kept to a minimum. Example warm up stretches can be found in 'Enhanced upper limb therapy 3: Warm-up stretches, goal choices and activity flowcharts'.

5.3. Core treatment

Following warm up stretching (where appropriate), practise of selected activities should commence. The activity flowcharts in 'Enhanced upper limb therapy 3: Warm-up stretches, goal choices and activity flowcharts' or the 'Enhanced upper limb therapy: activity flowchart for optional goals or activity adaptations' should be used to guide practice. The flowcharts are designed as a therapy aid rather than a definitive instruction on how to provide therapy. Guidance and advice from the senior therapist should always be followed.

The following principles should also be considered when delivering therapy:

1. Demonstration

Explain a task to the participant and show them first what to do. Then ask them to undertake/ lead the task with their non-affected side. This is to ensure that the participant has a clear understanding of what to do before they start repeating it with their more affected side. This also enables the non-affected arm to "teach" the affected arm. Following this practise with the non-affected side, commence practice with the affected side.

2. Progressing practice

The RATULS enhanced upper limb therapy programme is split into three, 4 week therapy blocks. To enable participants to achieve the goals set at the beginning of a block, it is important to progress treatment; mindless repetition is not effective.

For part-task activities, once the part task has been accomplished, the participant should progress onto the next part-task in the flowchart.

For whole task activities, the flowcharts also include suggestions for modifications to the activities for further practice and progression.

In addition, the following should be considered:

For each activity, once the participant knows what to do and they demonstrate a basic ability, try to make the activity more engaging and stimulating, e.g. by:

- Including *variations* in the task (e.g. different sizes and shapes of objects, different start-and end positions, different speeds). This is known as variable practice. Variable practice enables the participant to translate what they learn during therapy sessions more easily to a wider range of ADL.
- Doing tasks in a *different order* within a therapy session. So rather than doing five repetitions of one activity followed by five repetitions of another task and so on (known as blocked practice), mix up the order in which the participant undertakes each task (known as random practice). This may seem counter-intuitive, but random practice encourages deeper learning. Random practise also allows for a more 'real-life' situation where the order of events is more likely to be mixed rather than blocked. This enables better translation of what a participant has learned during therapy into ADL.

3. Intensity of practice

Ensure the programme is sufficiently intensive. To achieve functional improvement after stroke, a few hundred repetitions are required each session^[1]. Therefore, in this study we should aim – where possible – to include a few hundred repetitions in each session.

4. Monitoring compensatory movements

It is important to monitor so-called “compensatory movements” during practice. These are movements that compensate for those that the participant finds difficult. The reasons why some movements may be difficult include muscle weakness, stiffness, pain or a mix of these. Compensatory movements are often unintentional and people are often unaware that they are “compensating”. Compensatory movements tend to be used in order to achieve a goal (e.g. reach for an object). Common compensatory movements when using the affected arm after stroke are:

- Moving the trunk forward or sideways when reaching. This may be due to difficulty lifting the arm forwards or sideways, and/or difficulty extending the elbow and/or wrist.
- Lifting the shoulder girdle on the affected side when reaching with the affected arm. The participant may attempt to complete a task by lifting the shoulder girdle instead of their arm.

Why is it important to monitor compensatory movements? When practising a task, it is not only about how many repetitions, but also about how well they are executed. In order to achieve the best outcomes, participants need to practise those movement(s) that they find difficult and minimise compensatory movements. Using compensatory movements may mean that a participant does not optimally practice the movement(s) they find difficult.

How to avoid compensatory movements? Before a participant starts to practise a task, it is important to remind them of the optimal posture for practice. Instructions such as “keep your body upright” (to avoid compensatory trunk movement), “keep your shoulders down” (to avoid compensatory shoulder girdle movement) may help. Should compensatory movements arise during practice, a participant should be made aware of these before they attempt again. In some cases, a task may need to be adapted (e.g. a shorter reach, a lighter object) if compensatory movements continue. However, some compensatory movements are likely to take place as practice is meant to be difficult, and with training they are likely to diminish.

5. Equipment

Many activities involve the use of functional objects (e.g. mug, comb, item of clothing). This enhances carry-over of the practice into real life. Where chosen activities require items individual to a participant, they should be asked to bring in their items to use (e.g. comb/brush, specific garments, adapted cutlery). More generic objects should be available in the routine therapy setting (including mugs, cups, containers etc.).

Recording activity practice

During activity practice, the number of repetitions of each task needs to be counted and recorded:

- For whole task practice, completion of the whole task (beginning to end of flowchart) counts as one repetition.
- For part task practice completion of the *component* of the task counts as one repetition.

- If a mixture of whole and part task practice is being used then count the repetitions as above and add the repetitions for each task together to give a total for that goal.

Can stretching count as activity practice?

If a 'stretch' is embedded into an active task (e.g. reaching out to touch/ grasp an object), the repetitions of that stretch/task should be recorded as activity practice. However, if a stretch is passive (i.e. this is not a voluntary, active action on behalf of the patient but a manoeuvre undertaken by the therapist) this does not count as activity practice and the repetitions should NOT be recorded.

5.4. Summary and feedback

At the end of each session, a participant should be asked for comments on their performance and the therapist should also give some feedback. This discussion is to encourage the participant to think about what they have learned, and what they need to focus on in the next session.

5.5. Study paperwork

Accurate completion of paperwork is a crucial part of research.

In the document titled 'Enhanced upper limb therapy: participant goals and therapy record' the following must be documented for each session:

- the therapy record which includes:
 - the goals worked on (record as D1, OG1, etc)
 - the number of repetitions of the task which have been practised for each goal. The total number of repetitions should be recorded.
 - the duration of the entire session
 - the duration of activity practice
 - the treating therapist/therapy assistant's name and signature
 - the date
 - in the notes section any important aspects of therapy should be recorded. E.g. if a participant has achieved a part-task activity and should commence at the next part-task in the flowchart in the next therapy session, this should be recorded here.

In therapy sessions 11, 23 and 35, participant progress should also be documented:

- whether whole-task or part-task activities have been practised
- the starting and finishing position on the part-task flowchart (if appropriate)
- whether each goal has been achieved

6. Senior therapist session summaries

6.1. Session 1: initial therapy session

[Total Duration: 60 minutes]

1. Introduction [5 minutes]
 - Description of RATULS enhanced therapy programme
2. Assessment [15 minutes]
 - Upper limb assessment
 - Goal setting and activity choice
3. Warm-up stretching (if necessary) [2-5 minutes]
 - Warm-up stretches and mobilisation of joints
4. Core treatment [30 minutes]

Activity practice

- Familiarise participant and therapy assistant with tasks
- Supervise activity practice

5. Summary and feedback [5 minutes]
 - Discuss participant's own evaluation of performance
 - Provide feedback
6. Study paperwork [throughout session]
 - Complete appropriate section of 'Enhanced upper limb therapy: Participant goal and therapy record' and, if relevant, 'Enhanced upper limb therapy: activity flowchart for optional goals or activity adaptations'.

6.2. Sessions 12 and 24: Review sessions

[Total Duration: 60 minutes]

1. Introduction

[5 minutes]

- Review of participant progress

2. Reassessment

[15 minutes]

- Upper limb assessment
- Goal setting and activity choice

3. Warm-up stretching (if necessary)

[2-5 minutes]

- Warm-up stretches and mobilisation of joints

4. Core treatment

[30 minutes]

Activity practise

- Familiarise participant and therapy assistant with tasks
- Supervise activity practice

5. Summary and feedback

[5 minutes]

- Discuss participant's own evaluation of performance
- Provide feedback

6. Study paperwork

[throughout session]

- Complete appropriate section of 'Enhanced upper limb therapy: Participant goal and therapy record' and, if relevant, 'Enhanced upper limb therapy: activity flowchart for optional goals or activity adaptations'.

6.3. Session 36: Final therapy session

[Total Duration: 60 minutes]

1. Introduction [5 minutes]

- Review progress from previous session (session 35)
- Discuss activities to practise this session

2. Warm-up stretching (if necessary) [2-5 minutes]

- Warm-up stretches and mobilisation of joints

3. Core treatment [30 minutes]

Activity practice

Continue activity practice

4. Summary and feedback [20 minutes]

- Review goals and progress over entire programme
- Discuss participant's own evaluation of performance over entire programme
- Provide advice on longer term maintenance of upper limb function (e.g. home based exercises, local facilities)

5. Study paperwork [throughout session]

- Complete appropriate section of 'Enhanced upper limb therapy: Participant goal and therapy record'

7. Therapy assistant session summaries

[Total Duration: 60 minutes]

1. Introduction

[5 minutes]

- Review progress from previous session
- Discuss activities to practise this session

2. Warm-up stretching (if agreed at initial/review session) [2-5 minutes]

- Warm-up stretches and mobilisation of joints

3. Core treatment

[45 minutes]

Activity practice

Continue activity practice

4. Summary and feedback

[5 minutes]

- Discuss participant's own evaluation of performance
- Provide feedback

6. Study paperwork

[throughout session]

- Complete appropriate section of 'Enhanced upper limb therapy: Participant goal and therapy record'.

Please note: for session 11, session 23 and session 35, participant progress should also be recorded. (In: 'Enhanced upper limb therapy: Participant goal and therapy record' section 'goal setting and review documentation', page 3)

8. Recording therapy - participant goal and therapy record

Accurate completion of paperwork is a crucial part of research. The data recorded in the paperwork is necessary to describe the treatment participants receive during this therapy programme. This will be used to compare the dose of therapy received by participants in the enhanced therapy group and the robot-assisted training group.

Two documents are used to record the therapy programme:

1. Enhanced upper limb therapy: participant goal and therapy record.
2. Enhanced upper limb therapy: activity flowchart for optional goals or activity adaptations.

Document 1: Enhanced upper limb therapy: participant goal and therapy record.

Each participant will have a therapist-held participant goal and therapy record (figure 1).

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Robot Assisted Training for the Upper Limb after Stroke

RATULS

**Enhanced upper limb therapy:
Participant goal and therapy record**

Participant ID Study centre number

Participant ID: [][][][][] Study centre number: [][]

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Figure 1: Front page of the participant goal and therapy record

The following information should be entered at each session (figure 2):

- the session number
- the date
- the goals worked on (record as D1, OG1, etc)
- the number of repetitions of the task which have been practised for each goal
- the duration of the entire session
- the duration of activity practice
- the treating therapist/therapy assistant's name and signature

There is also a notes section which should be used to document important parts of a session which are not collected in the information described above. For example, if a participant has achieved a part-task activity and should commence at the next part-task in the flowchart in the next therapy session, this should be recorded here.

In addition, the participant ID should be added on each page.

Therapy record					
Participant ID: <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>					
Session number: _____ Date: ____/____/20____ Session duration: ____mins	Goal 1	Goal 2	Goal 3	Goal 4	Session notes
	Repetitions	Repetitions	Repetitions	Repetitions	
	Therapist name: _____		Signature: _____	Duration of activity practice: ____mins	
Session number: _____ Date: ____/____/20____ Session duration: ____mins	Goal 1	Goal 2	Goal 3	Goal 4	Session notes
	Repetitions	Repetitions	Repetitions	Repetitions	
	Therapist name: _____		Signature: _____	Duration of activity practice: ____mins	
Session number: _____ Date: ____/____/20____ Session duration: ____mins	Goal 1	Goal 2	Goal 3	Goal 4	Session notes
	Repetitions	Repetitions	Repetitions	Repetitions	
	Therapist name: _____		Signature: _____	Duration of activity practice: ____mins	
Session number: _____ Date: ____/____/20____ Session duration: ____mins	Goal 1	Goal 2	Goal 3	Goal 4	Session notes
	Repetitions	Repetitions	Repetitions	Repetitions	
	Therapist name: _____		Signature: _____	Duration of activity practice: ____mins	

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Figure 2: Example therapy session page of the participant goal and therapy record

An example of the completed paperwork is shown in figure 3.

Therapy record						
Participant ID: 53414						
Session number: 1 Date: 04/08/2015 Session duration: 60 mins	Goal 1	Goal 2	Goal 3	Goal 4	Session notes: For goal F1 practice progressed from position F1.03 to F1.04	
	W2	F1	OAG-Using a knife	PCI Brushing hair		
	Repetitions	Repetitions	Repetitions	Repetitions		
	95	85	78	102		
	Therapist name: HELEN BOONWORTH		Signature: [Signature]	Duration of activity practice: 45 mins		
Session number: Date: / /20 Session duration: mins	Goal 1	Goal 2	Goal 3	Goal 4	Session notes:	
	Repetitions	Repetitions	Repetitions	Repetitions		
	Therapist name:		Signature:	Duration of activity practice: mins		
Session number: Date: / /20 Session duration: mins	Goal 1	Goal 2	Goal 3	Goal 4	Session notes:	
	Repetitions	Repetitions	Repetitions	Repetitions		
	Therapist name:		Signature:	Duration of activity practice: mins		
Session number: Date: / /20 Session duration: mins	Goal 1	Goal 2	Goal 3	Goal 4	Session notes:	
	Repetitions	Repetitions	Repetitions	Repetitions		
	Therapist name:		Signature:	Duration of activity practice: mins		

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Figure 3: Example of a completed therapy record for one session

At the initial therapy session and sessions 12 and 24, the upper limb assessment can be documented (figure 4): This is located on pages 16, 17 and 18 of the document.

Upper limb assessment			
Upper limb assessment to be completed by senior therapist			
Session number: _____			
Side of body affected by current stroke: _____			
Prompts:			
• Selective movement	• Muscle tone	• Proprioception	• Pain
• Passive range of movement	• Compensations	• Associated reactions	
Shoulder		Wrist	
Elbow		Hand	
Inattention / other comments:			

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Figure 4: Example of the upper limb assessment record.

Goal choices and selection of whole-task/part-task practice plus goal attainment are recorded on page 3 'goal setting and review documentation' section (figure 5).

Goal setting and review documentation																
Participant ID: <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>																
Session 1	Goal 1				Goal 2				Goal 3				Goal 4			
Week 1 Initial session	Whole (tick)	Part (tick)	Current Position	Part of task (? / ?)	Whole (tick)	Part (tick)	Current Position	Part of task (? / ?)	Whole (tick)	Part (tick)	Current Position	Part of task (? / ?)	Whole (tick)	Part (tick)	Current Position	Part of task (? / ?)
Session number:	Goal 1				Goal 2				Goal 3				Goal 4			
	Current Position		Part of task (? / ?)		Achieved (Y/N)		Current Position		Part of task (? / ?)		Achieved (Y/N)		Current Position		Part of task (? / ?)	
Progress since week 1																
Session number:	Goal 1				Goal 2				Goal 3				Goal 4			
	Week 1 Goal 1 Achieved (Y/N)				Week 1 Goal 2 Achieved (Y/N)				Week 1 Goal 3 Achieved (Y/N)				Week 1 Goal 4 Achieved (Y/N)			
Week 4 Review session	Whole (tick)	Part (tick)	Current Position	Part of task (? / ?)	Whole (tick)	Part (tick)	Current Position	Part of task (? / ?)	Whole (tick)	Part (tick)	Current Position	Part of task (? / ?)	Whole (tick)	Part (tick)	Current Position	Part of task (? / ?)
Session number:	Goal 1				Goal 2				Goal 3				Goal 4			
	Current Position		Part of task (? / ?)		Achieved (Y/N)		Current Position		Part of task (? / ?)		Achieved (Y/N)		Current Position		Part of task (? / ?)	
Progress since week 4																
Session number:	Goal 1				Goal 2				Goal 3				Goal 4			
	Week 4 Goal 1 Achieved (Y/N)				Week 4 Goal 2 Achieved (Y/N)				Week 4 Goal 3 Achieved (Y/N)				Week 4 Goal 4 Achieved (Y/N)			
Week 8 Review session	Whole (tick)	Part (tick)	Current Position	Part of task (? / ?)	Whole (tick)	Part (tick)	Current Position	Part of task (? / ?)	Whole (tick)	Part (tick)	Current Position	Part of task (? / ?)	Whole (tick)	Part (tick)	Current Position	Part of task (? / ?)
Session number:	Goal 1				Goal 2				Goal 3				Goal 4			
	Current Position		Part of task (? / ?)		Achieved (Y/N)		Current Position		Part of task (? / ?)		Achieved (Y/N)		Current Position		Part of task (? / ?)	
Progress since week 8																
Final session	Goal 1				Goal 2				Goal 3				Goal 4			
	Week 8 Goal 1 Achieved (Y/N)				Week 8 Goal 2 Achieved (Y/N)				Week 8 Goal 3 Achieved (Y/N)				Week 8 Goal 4 Achieved (Y/N)			

Figure 5: Example of the goal setting and review documentation.

At the initial session, and sessions 12 and 24 (week 4 and week 8 review respectively), the goal choice and type of activity practice should be recorded. The following should be documented:

- the (up to four) goals that have been selected
 - if a goal has been selected from the pre-specified list, please document this by its number as listed in 'Enhanced upper limb therapy 3: warm up stretching, goal choices and activity flowcharts' (e.g. D1).
 - If an alternative goal has been chosen ('optional goal'), this should be written out free text and labelled as 'OG 1' (optional goal 1). If more than one optional goal has been chosen these should also be written out and then labelled as OG 2, OG 3, etc. For example: 'Using a knife and fork – OG1'.
- whether whole-task or part-task activity practice has been chosen, for each goal.
- where part-task practice has been chosen for a pre-specified goal, the start position on the relevant flowchart should be recorded (indicated by the number in the flowchart box e.g. W1.02)
- for part task practice it is optional to record how many parts of a task exist and where the participant should begin on that task. E.g. if a task has 5 parts and the participant should begin on part 2 then for the initial session 'part of task' is 2/5.

An example of the completed paperwork is shown in figure 6.

Goal setting and review documentation																
Participant ID: 53414																
Session 1	Goal 1				Goal 2				Goal 3				Goal 4			
Week 1 Initial session	W2 - Washing hands				F1 - Drinking from mug				CG1 - using knife				PC1 - Brushing hair			
	Whole (tick)	Part (tick)	Current Position	Part of task (? / ?)	Whole (tick)	Part (tick)	Current Position	Part of task (? / ?)	Whole (tick)	Part (tick)	Current Position	Part of task (? / ?)	Whole (tick)	Part (tick)	Current Position	Part of task (? / ?)
	✓					✓	F1.03	1/8	✓					✓	PC1.02	2/6
Session number:	Goal 1				Goal 2				Goal 3				Goal 4			
Progress since week 1	Current Position		Part of task (? / ?)		Current Position		Part of task (? / ?)		Current Position		Part of task (? / ?)		Current Position		Part of task (? / ?)	
Session number:	Goal 1				Goal 2				Goal 3				Goal 4			
Week 1 Review session	Week 1 Goal 1 Achieved (Y/N)				Week 1 Goal 2 Achieved (Y/N)				Week 1 Goal 3 Achieved (Y/N)				Week 1 Goal 4 Achieved (Y/N)			
	Whole (tick)	Part (tick)	Current Position	Part of task (? / ?)	Whole (tick)	Part (tick)	Current Position	Part of task (? / ?)	Whole (tick)	Part (tick)	Current Position	Part of task (? / ?)	Whole (tick)	Part (tick)	Current Position	Part of task (? / ?)
Session number:	Goal 1				Goal 2				Goal 3				Goal 4			
Progress since week 4	Current Position		Part of task (? / ?)		Current Position		Part of task (? / ?)		Current Position		Part of task (? / ?)		Current Position		Part of task (? / ?)	
Session number:	Goal 1				Goal 2				Goal 3				Goal 4			
Week 4 Review session	Week 4 Goal 1 Achieved (Y/N)				Week 4 Goal 2 Achieved (Y/N)				Week 4 Goal 3 Achieved (Y/N)				Week 4 Goal 4 Achieved (Y/N)			
	Whole (tick)	Part (tick)	Current Position	Part of task (? / ?)	Whole (tick)	Part (tick)	Current Position	Part of task (? / ?)	Whole (tick)	Part (tick)	Current Position	Part of task (? / ?)	Whole (tick)	Part (tick)	Current Position	Part of task (? / ?)
Session number:	Goal 1				Goal 2				Goal 3				Goal 4			
Progress since week 8	Current Position		Part of task (? / ?)		Current Position		Part of task (? / ?)		Current Position		Part of task (? / ?)		Current Position		Part of task (? / ?)	
Final session	Week 8 Goal 1 Achieved (Y/N)				Week 8 Goal 2 Achieved (Y/N)				Week 8 Goal 3 Achieved (Y/N)				Week 8 Goal 4 Achieved (Y/N)			

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Figure 6: Example session 1 completed goal setting and review documentation.

At sessions 11, 23, and 35, participant progress should be recorded to assist with the next review session. This is progress since week 1, progress since week 4 and progress since week 8 respectively. The following should be documented:

- where part-task practice was chosen for a pre-specified goal, the current position on the relevant flowchart should be recorded (indicated by the number in the flowchart box e.g. W1.02)
- for part task practice It is optional to record how many parts of a task have been completed. E.g. if a task has 5 parts and the participant has begun on part 2 (as specified in their goal setting session) but has progressed to part 4 then 'part of task' is 4/5.
- whether each goal has been achieved

An example of the completed paperwork is shown in figure 7.

At the review sessions (12 and 24), in addition to the goal setting information described above (page 29), achievement of goals from the previous four weeks should be recorded. An example of the completed paperwork is shown in figure 8.

Goal setting and review documentation																
Participant ID: 53414																
Session 1	Goal 1				Goal 2				Goal 3				Goal 4			
Week 1 Initial session	W2 - washing hands				F1 - Drinking from mug				O1 - using knife				PC1 - Brushing hair			
	Whole (tick)	Part (tick)	Current Position	Part of task (? / ?)	Whole (tick)	Part (tick)	Current Position	Part of task (? / ?)	Whole (tick)	Part (tick)	Current Position	Part of task (? / ?)	Whole (tick)	Part (tick)	Current Position	Part of task (? / ?)
	✓				✓		F1.03	1/8	✓				✓		PC1.02	2/6
Session number: 11	Goal 1				Goal 2				Goal 3				Goal 4			
Progress since week 1	Current Position		Part of task (? / ?)		Current Position		Part of task (? / ?)		Current Position		Part of task (? / ?)		Current Position		Part of task (? / ?)	
	/		Y		F1.086		8/8 Y		-		N		PC1.05		5/6 N	
Session number:	Goal 1				Goal 2				Goal 3				Goal 4			
Week 4 Review session	Week 1 Goal 1 Achieved (Y/N)				Week 1 Goal 2 Achieved (Y/N)				Week 1 Goal 3 Achieved (Y/N)				Week 1 Goal 4 Achieved (Y/N)			
	Whole (tick)	Part (tick)	Current Position	Part of task (? / ?)	Whole (tick)	Part (tick)	Current Position	Part of task (? / ?)	Whole (tick)	Part (tick)	Current Position	Part of task (? / ?)	Whole (tick)	Part (tick)	Current Position	Part of task (? / ?)
Session number:	Goal 1				Goal 2				Goal 3				Goal 4			
Progress since week 4	Current Position		Part of task (? / ?)		Current Position		Part of task (? / ?)		Current Position		Part of task (? / ?)		Current Position		Part of task (? / ?)	
Session number:	Goal 1				Goal 2				Goal 3				Goal 4			
Week 8 Review session	Week 4 Goal 1 Achieved (Y/N)				Week 4 Goal 2 Achieved (Y/N)				Week 4 Goal 3 Achieved (Y/N)				Week 4 Goal 4 Achieved (Y/N)			
	Whole (tick)	Part (tick)	Current Position	Part of task (? / ?)	Whole (tick)	Part (tick)	Current Position	Part of task (? / ?)	Whole (tick)	Part (tick)	Current Position	Part of task (? / ?)	Whole (tick)	Part (tick)	Current Position	Part of task (? / ?)
Session number:	Goal 1				Goal 2				Goal 3				Goal 4			
Progress since week 8	Current Position		Part of task (? / ?)		Current Position		Part of task (? / ?)		Current Position		Part of task (? / ?)		Current Position		Part of task (? / ?)	
Final session	Week 8 Goal 1 Achieved (Y/N)				Week 8 Goal 2 Achieved (Y/N)				Week 8 Goal 3 Achieved (Y/N)				Week 8 Goal 4 Achieved (Y/N)			

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Figure 7: Example session 11 (progress since week 1) completed goal setting and review documentation.

Goal setting and review documentation																
Participant ID: 53414																
Session 1	Goal 1				Goal 2				Goal 3				Goal 4			
Week 1 Initial session	W2 - Washing hands				F1 - Drinking from mug				CG1 - using knife				PC1 - Brushing hair			
	Whole (tick)	Part (tick)	Current Position	Part of task (? / ?)	Whole (tick)	Part (tick)	Current Position	Part of task (? / ?)	Whole (tick)	Part (tick)	Current Position	Part of task (? / ?)	Whole (tick)	Part (tick)	Current Position	Part of task (? / ?)
	✓					✓	F1.03	1/8	✓					✓	PC1.02	2/6
Session number: 11	Goal 1				Goal 2				Goal 3				Goal 4			
Progress since week 1	Current Position		Part of task (? / ?)		Achieved (Y/N)		Current Position		Part of task (? / ?)		Achieved (Y/N)		Current Position		Part of task (? / ?)	
	✓		✓		Y		F1.086		8/8		Y		✓		PC1.05	
Session number: 12	Goal 1				Goal 2				Goal 3				Goal 4			
Week 4 Review session	W2 - Washing hands				D1 - Closing a zip				CG1 - using knife				PC1 - Brushing hair			
	Whole (tick)	Part (tick)	Current Position	Part of task (? / ?)	Whole (tick)	Part (tick)	Current Position	Part of task (? / ?)	Whole (tick)	Part (tick)	Current Position	Part of task (? / ?)	Whole (tick)	Part (tick)	Current Position	Part of task (? / ?)
	✓				✓				✓					✓	PC1.05	5/6
Session number: 13	Goal 1				Goal 2				Goal 3				Goal 4			
Progress since week 4	Current Position		Part of task (? / ?)		Achieved (Y/N)		Current Position		Part of task (? / ?)		Achieved (Y/N)		Current Position		Part of task (? / ?)	
Session number: 14	Goal 1				Goal 2				Goal 3				Goal 4			
Week 8 Review session	W2 - Washing hands				D1 - Closing a zip				CG1 - using knife				PC1 - Brushing hair			
	Whole (tick)	Part (tick)	Current Position	Part of task (? / ?)	Whole (tick)	Part (tick)	Current Position	Part of task (? / ?)	Whole (tick)	Part (tick)	Current Position	Part of task (? / ?)	Whole (tick)	Part (tick)	Current Position	Part of task (? / ?)
	✓				✓				✓					✓	PC1.05	5/6
Session number: 15	Goal 1				Goal 2				Goal 3				Goal 4			
Progress since week 8	Current Position		Part of task (? / ?)		Achieved (Y/N)		Current Position		Part of task (? / ?)		Achieved (Y/N)		Current Position		Part of task (? / ?)	
Final session	Goal 1				Goal 2				Goal 3				Goal 4			
	Week 8 Goal 1 Achieved (Y/N)				Week 8 Goal 2 Achieved (Y/N)				Week 8 Goal 3 Achieved (Y/N)				Week 8 Goal 4 Achieved (Y/N)			

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Figure 8: Example session 12 (week 4 review session) completed goal setting and review documentation.

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[illegible]

Figure 9: Example of the final session feedback and advice documentation.

The blank activity flowcharts (see figure 10) should be used to document activities to practice for optional goals and can be used to show adaptations to the pre-specified activity flowcharts. In addition, there are spaces to include any further information or guidance that should be followed in the therapy sessions.

Figure 10: Example of an activity flowchart for optional goals or activity adaptations.

9. Participant attendance

The RATULS enhanced upper limb therapy programme is designed to be followed session by session. However, it is inevitable that some participants will be unavailable for some sessions.

If a participant misses a session, this can be 'made up' according to local capacity. For example, if a participant was due to attend session 10 on Wednesday but was unavailable, if capacity allowed, the participant could attend for session 10 on Thursday instead.

If capacity does not allow a session to be 'made up', the session is lost. If a session is lost, this should be documented using a 'did not attend record' (see figure 11).

RATULS Trial		Centre Number	Patient ID	Did not attend record
		<input type="text"/>	<input type="text"/>	
Robot Assisted Training for the Upper Limb after Stroke (RATULS)				
Did not attend record				
Patient ID	<input type="text"/>			
Robot assisted training	<input type="checkbox"/>			
Enhanced upper limb therapy	<input type="checkbox"/>			
Number of missed sessions	<input type="text"/>			
Reason for not attending (if known):				
<input type="text"/>				
<input type="text"/>				
<input type="text"/>				
<input type="text"/>				
<input type="text"/>				
<input type="text"/>				
Name <input type="text"/>		Date <input type="text"/> / <input type="text"/> /20 <input type="text"/>		
Signed <input type="text"/>				
RATULS Did not attend record v2: 22 nd May 2015				
Page 1 of 1				

Figure 11: Example of a did not attend record.

The only exception to this guidance is when a participant is unavailable to attend a scheduled 'review' session (session 12 or 24). In this case, if this session cannot be 'made up', the review session should be held when the participant can next attend and a later therapy session should be lost. This is because it will be necessary to conduct the review sessions to progress treatment.

10. Enhanced upper limb therapy documents

This Enhanced upper limb therapy 2: How to deliver the programme manual is part of a series of documents developed to describe the RATULS enhanced therapy programme. The other documents in this series are:

- Enhanced upper limb therapy 1: Programme overview
- Enhanced upper limb therapy 3: Warm-up stretches, goal choices and activity flowcharts

11. RATULS co-ordinating centre

For further information please contact the RATULS co-ordinating team:

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Or refer to the RATULS website: <http://research.ncl.ac.uk/ratuls/>

12. References

1. Birkenmeier, R.L., E.M. Prager, and C.E. Lang, Neurorehabil Neural Repair, Translating animal doses of task-specific training to people with chronic stroke in 1-hour therapy sessions: a proof-of-concept study. 2010. **24**(7): p. 620-35.

This enhanced upper limb therapy manual has been produced by Dr Helen Bosomworth with input from Miss Lianne Brkic, Mrs Lydia Aird, Dr Lisa Shaw and Professor Frederike van Wijck.

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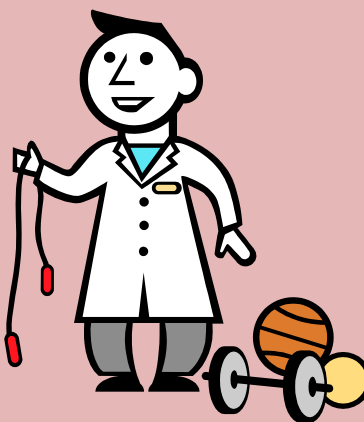
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Robot Assisted Training for the Upper Limb after Stroke

RATULS

Enhanced upper limb therapy 3: **Warm-up stretches, goal choices and activity flowcharts**



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1. Purpose of this document

This document describes example warm-up stretches, lists goal choices and provides activity flowcharts for the RATULS enhanced upper limb therapy programme. It is intended to serve as a reference and resource guide for clinicians delivering the enhanced upper limb therapy programme.

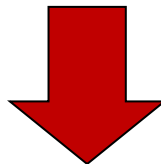
2. Warm-up stretches

Prior to practising activities in the RATULS enhanced upper limb therapy programme, gentle warm up stretching can be performed where necessary. A “warm-up” helps to focus attention on the affected arm, and stimulate sensation and proprioception by gently stretching soft tissues and mobilising the joints, before practising the rehabilitation activities. However, warm-up stretches should be kept to a minimum as the focus of the sessions should be on task specific activity practice.

The following stretches are given as a guide. Different stretches may be used if advised by a senior therapist. The therapy assistants must follow advice of the senior therapist.

Stretch 1 – this stretches down the full length of the participants arm.

1. Participant to place the affected hand flat on the table (palm down), with assistance from the therapist/ therapy assistant where necessary.
2. Therapist/ therapy assistant to take hold of the wrist of the affected arm.
3. Slowly slide the affected hand forwards on the table so that the elbow straightens out. The participant should not feel any pain.
4. Make sure the body remains still and the participant doesn't lean forward. Then relax.
5. Hold for approximately 20 – 30 seconds. Then relax.
6. Repeat as appropriate.



Stretch 2 - focuses on the participant's wrist and fingers

1. Participant to place the hand flat on the table in front with assistance from the therapist/ therapy assistant where necessary. Ensure the thumb is in abduction.
2. Therapist/ therapy assistant to slide the fingers of the unaffected hand under the fingers of the affected hand.
3. Make sure the participant's wrist stays on the table.
4. Slowly lift the participant's fingers up (keeping them straight). The aim is to bend the wrist backwards.
5. The participant should feel a gentle stretch down their fingers, palm and wrist. The participant should not feel any pain.
6. Hold for approximately 20 – 30 seconds. Then relax.
7. Repeat as appropriate.



3. Upper limb rehabilitation goal choices

The following rehabilitation goals are suggestions for use in the RATULS enhanced upper limb therapy programme.

Washing (W)

- W1.** Using a sponge/ flannel
- W2.** Washing hands/ face/ hair
- W3.** Cleaning teeth
- W4.** Hand care

Dressing (D)

- D1.** Closing a zip/ buttons
- D2.** Putting on a cardigan/ coat/ shirt
- D3.** Putting on a mitten/ glove
- D4.** Putting on socks/ shoes
- D5.** Putting on spectacles

Eating and Drinking (F)

- F1.** Drinking from mug/ glass
- F2.** Pouring from a bottle/ jug/ kettle
- F3.** Removing lids/ open containers

Other

Personal Care

- PC1.** Brushing hair

Functional Mobility

- FM1.** Opening doors with affected hand
- FM2.** Sit-to-stand using both hands

Optional goals

Whilst it is anticipated that the goal choices listed above will cover many participant choices, it is acceptable for alternative goals to be set at local discretion by the senior therapist.

If an alternative goal has been chosen ('optional goal'), this goal should be written out free text into the 'Enhanced upper limb therapy: participant goal and therapy record' and labelled as 'OG 1' (optional goal 1). If more than one optional goal has been chosen these should also be written out and then labelled as OG 2, OG 3, etc.

For example: 'Using a knife and fork – OG1'.

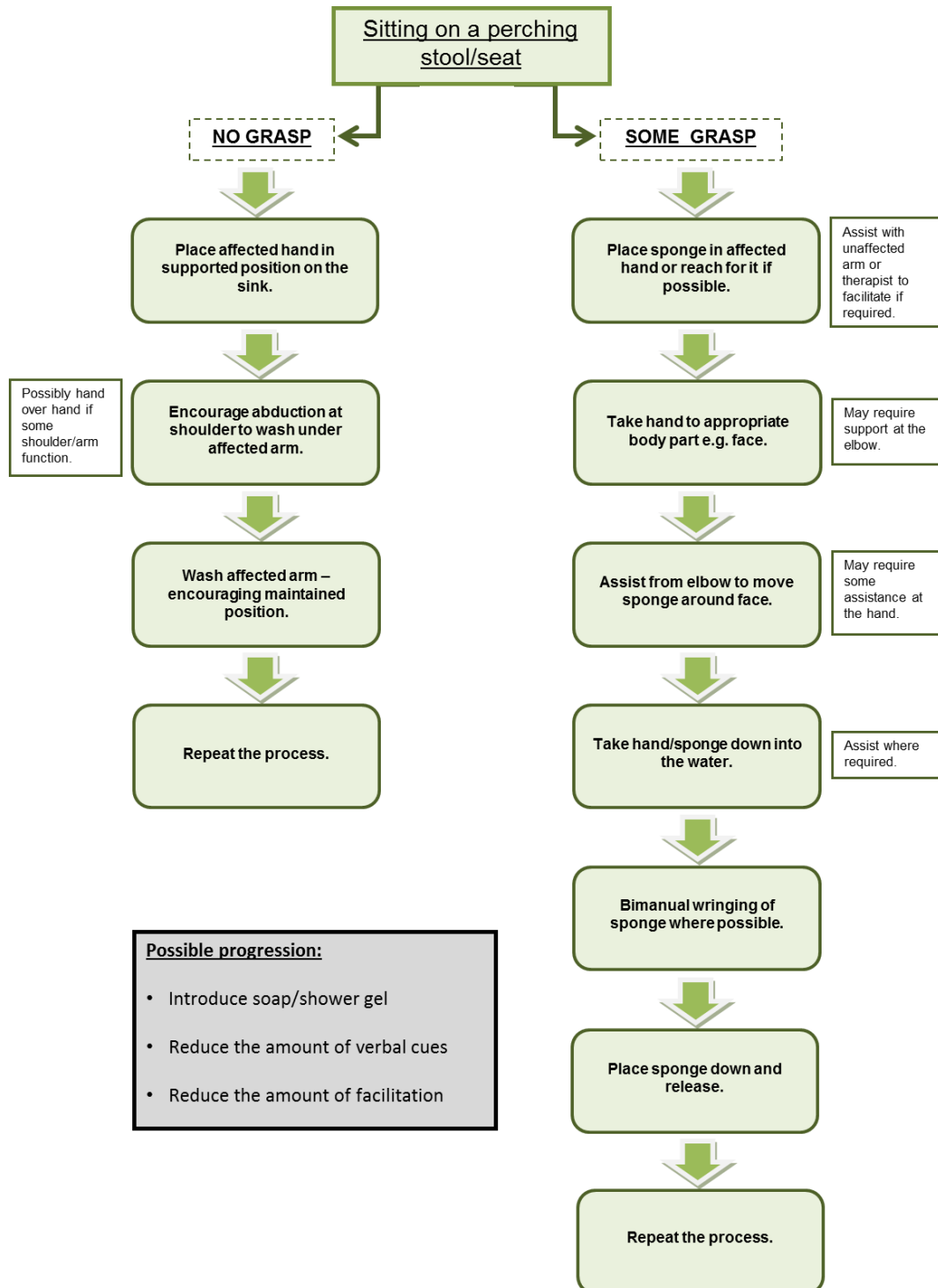
4. Activity Flowcharts

For each goal choice, two activity flowcharts are available. The first flowchart shows a 'whole-task' activity. The second flowchart, 'part-task' activities.

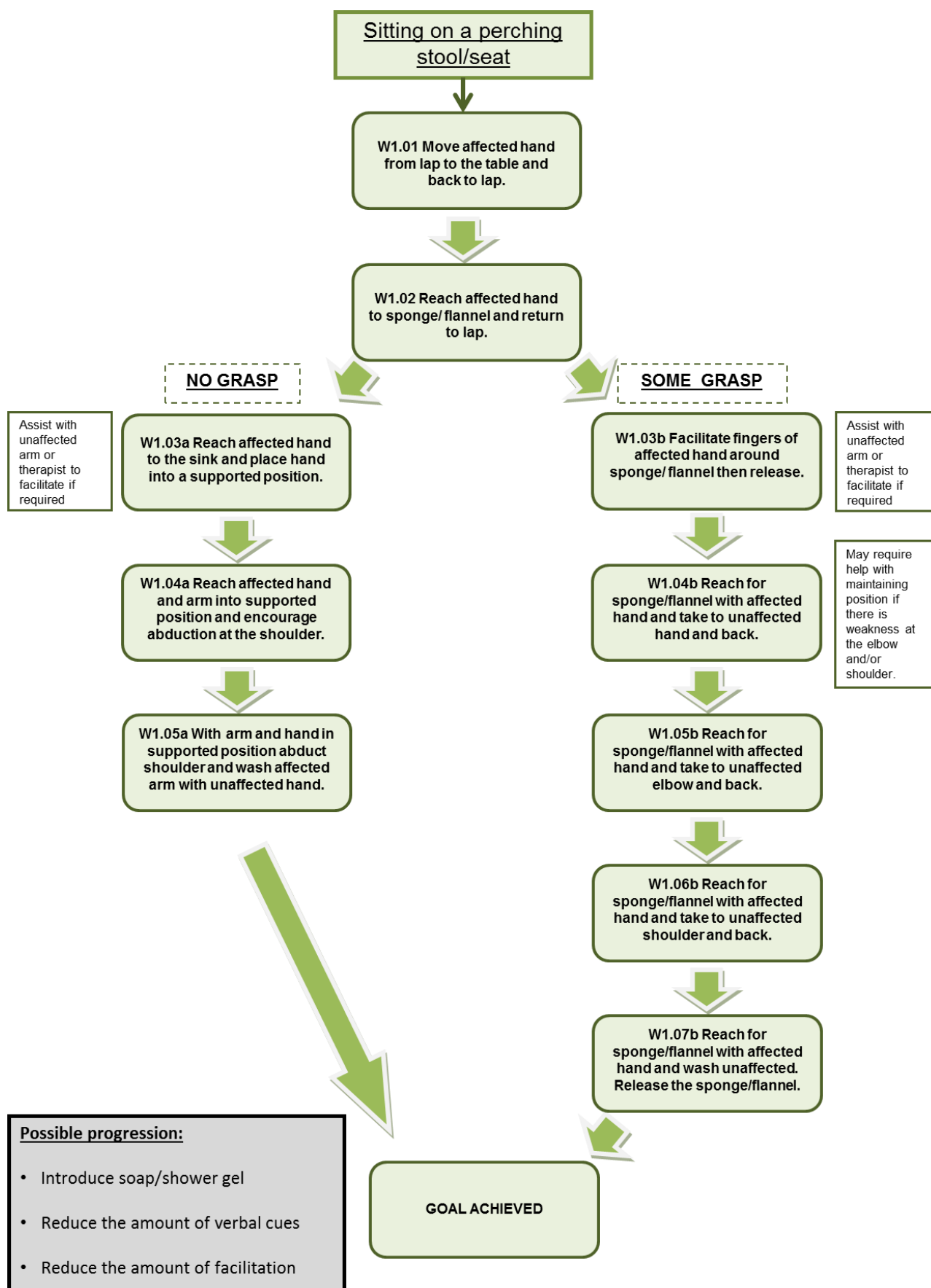
Washing (W)

W1 – Using a sponge/ flannel

1. Whole-task activity:

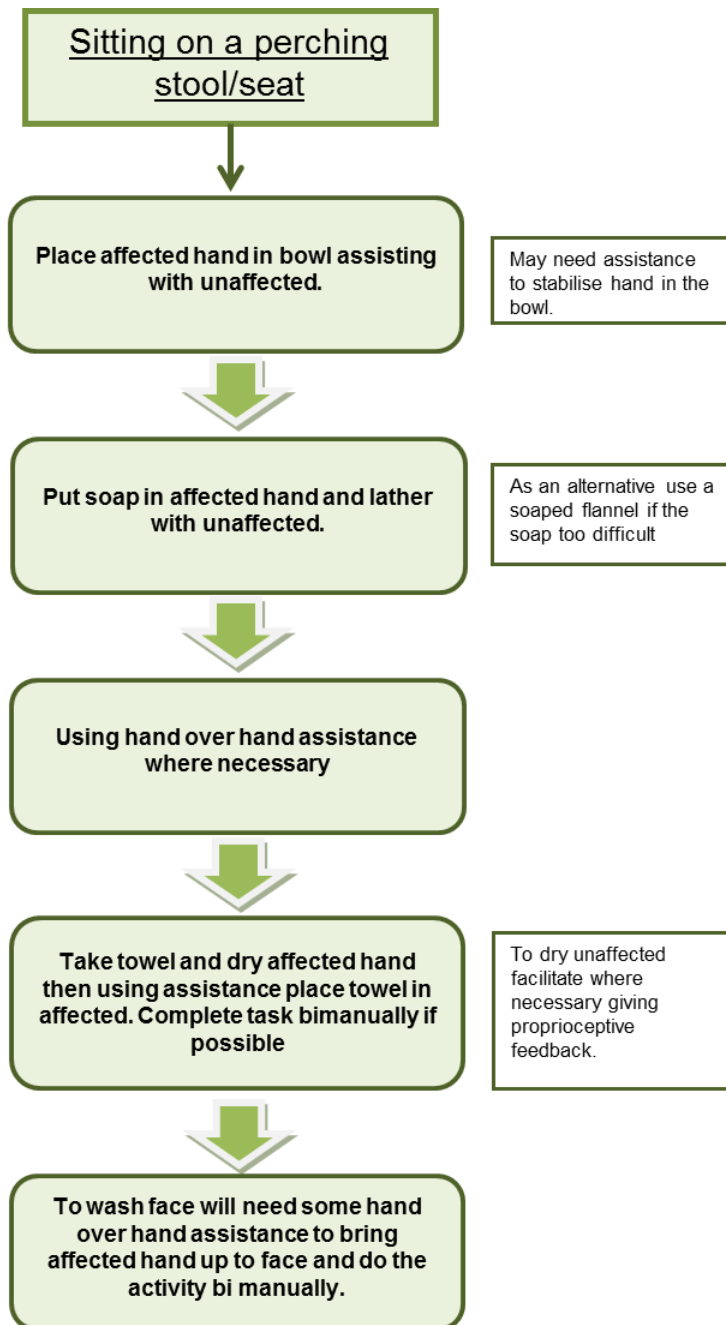


2. Part-task activities:



W2 – Washing hands/ face/ hair

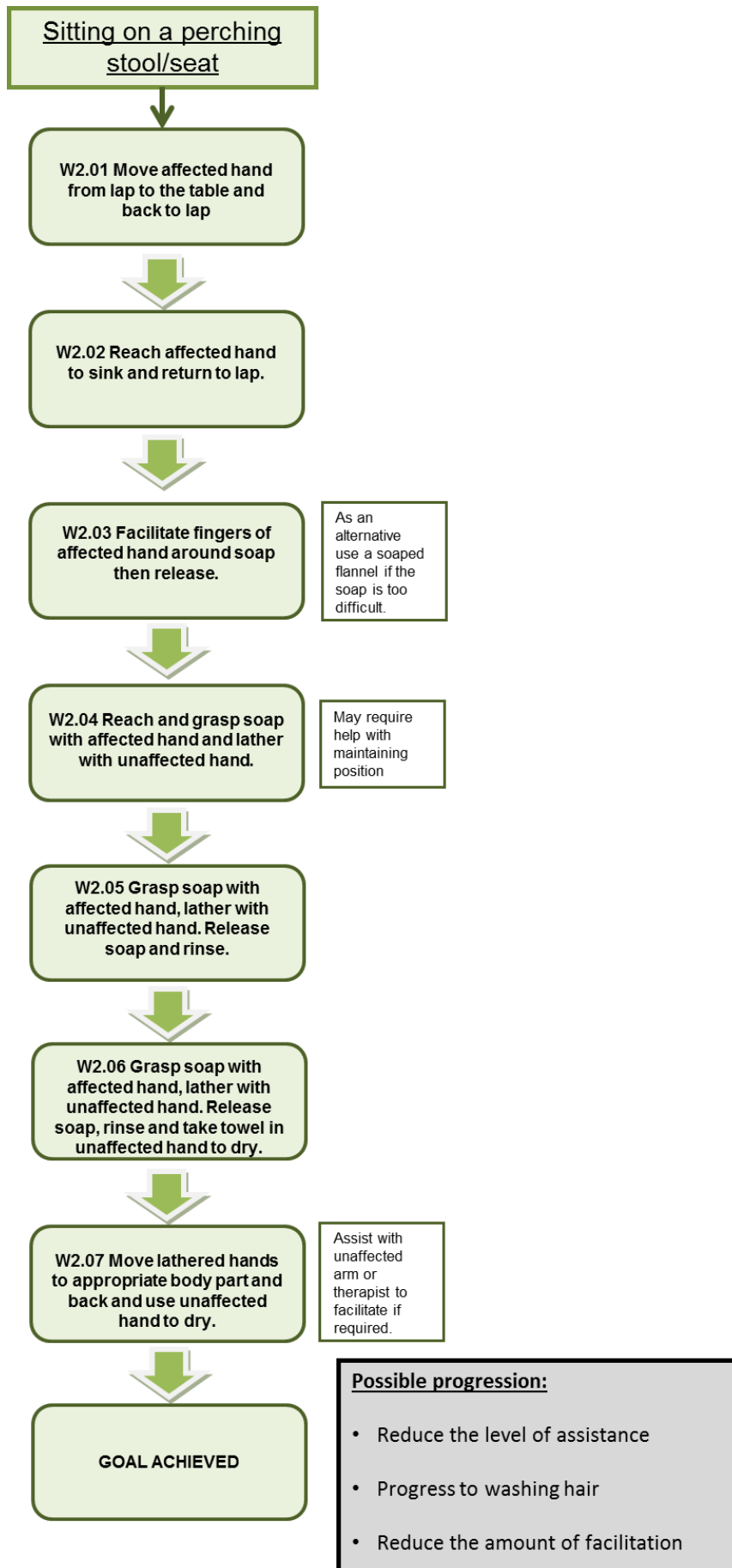
1. Whole-task activity:



Possible progression:

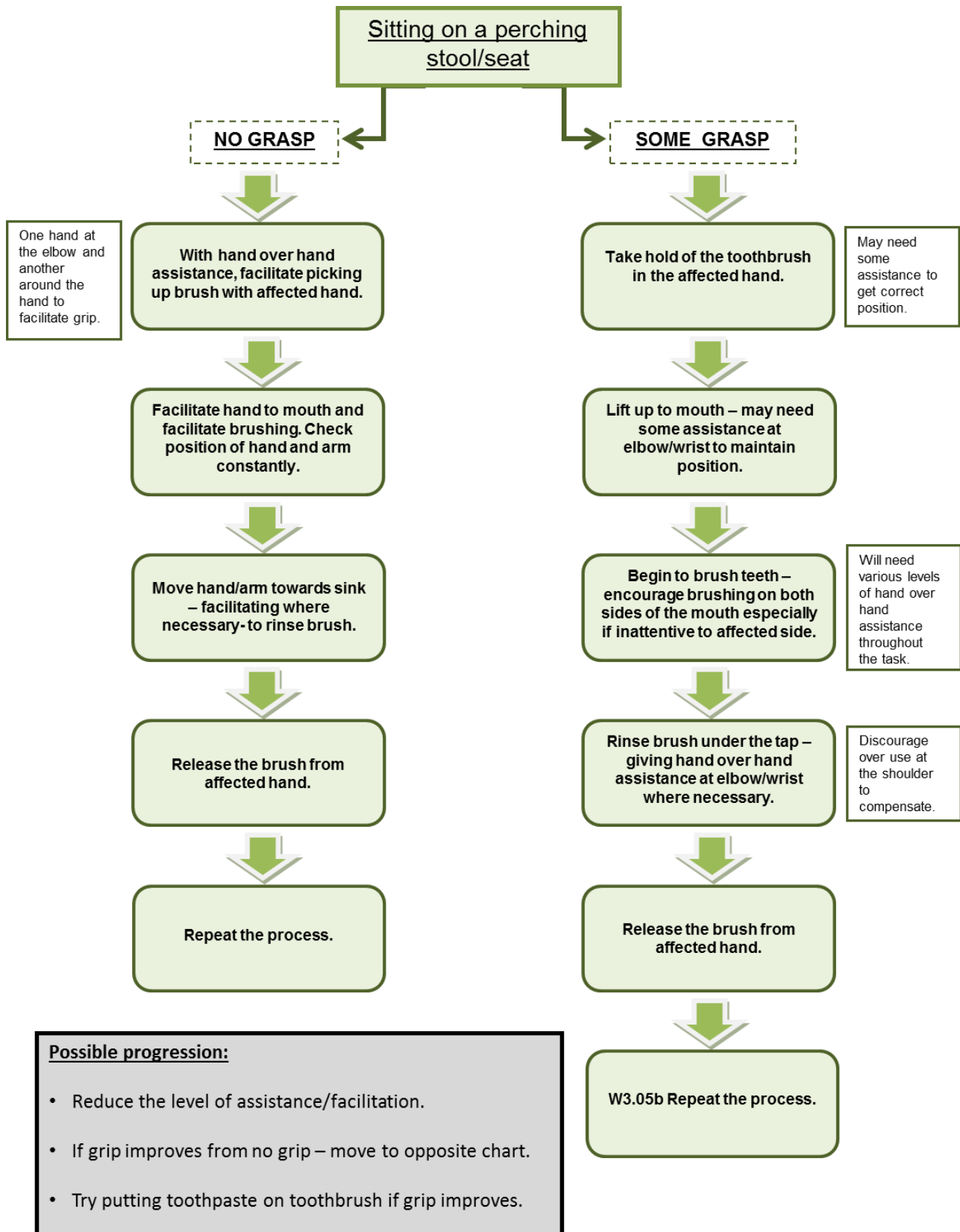
- Reduce the level of assistance
- Stop giving hand over hand when drying
- Progress to washing hair.

2. Part-task activities:

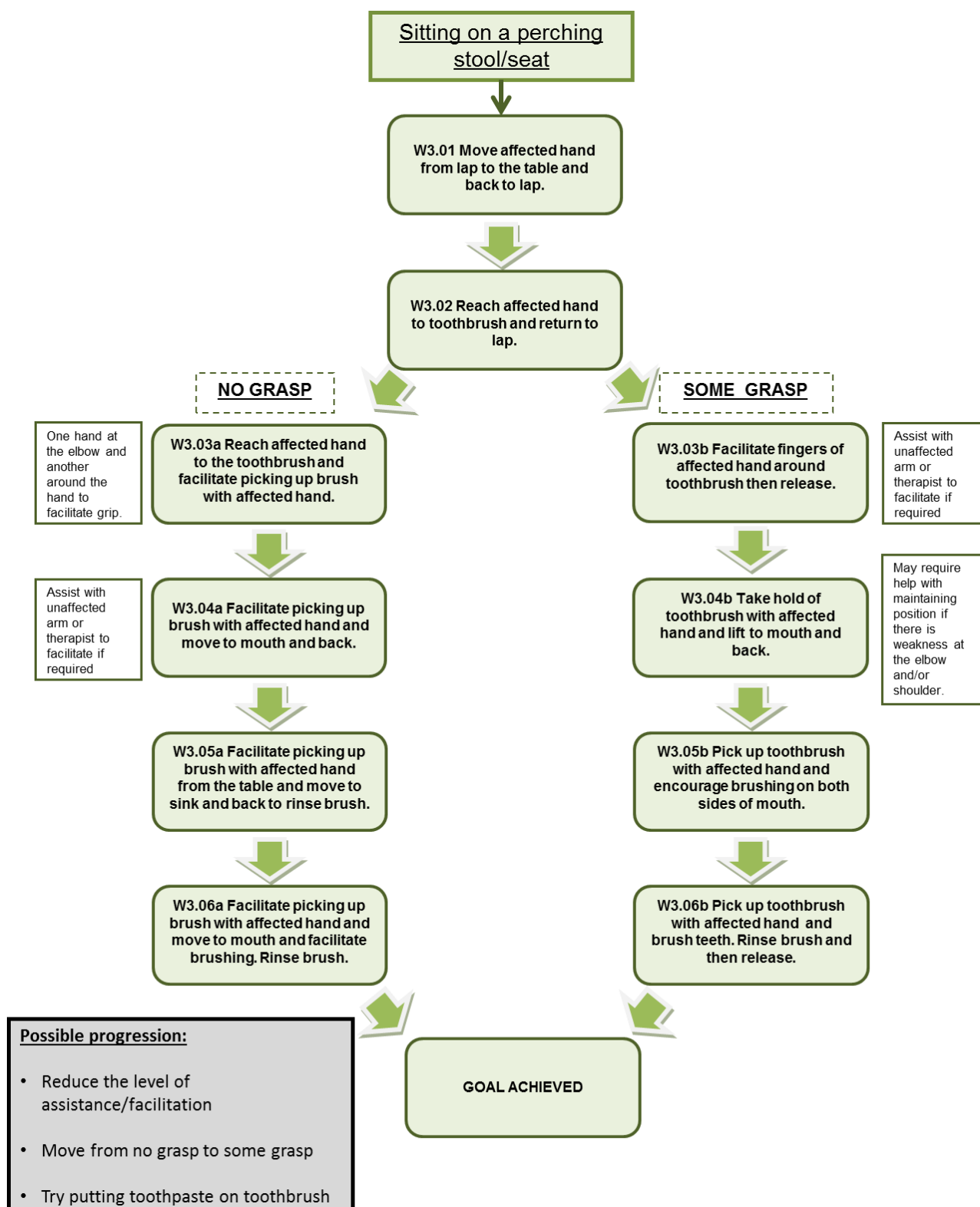


W3 – Cleaning Teeth

1. Whole-task activity:

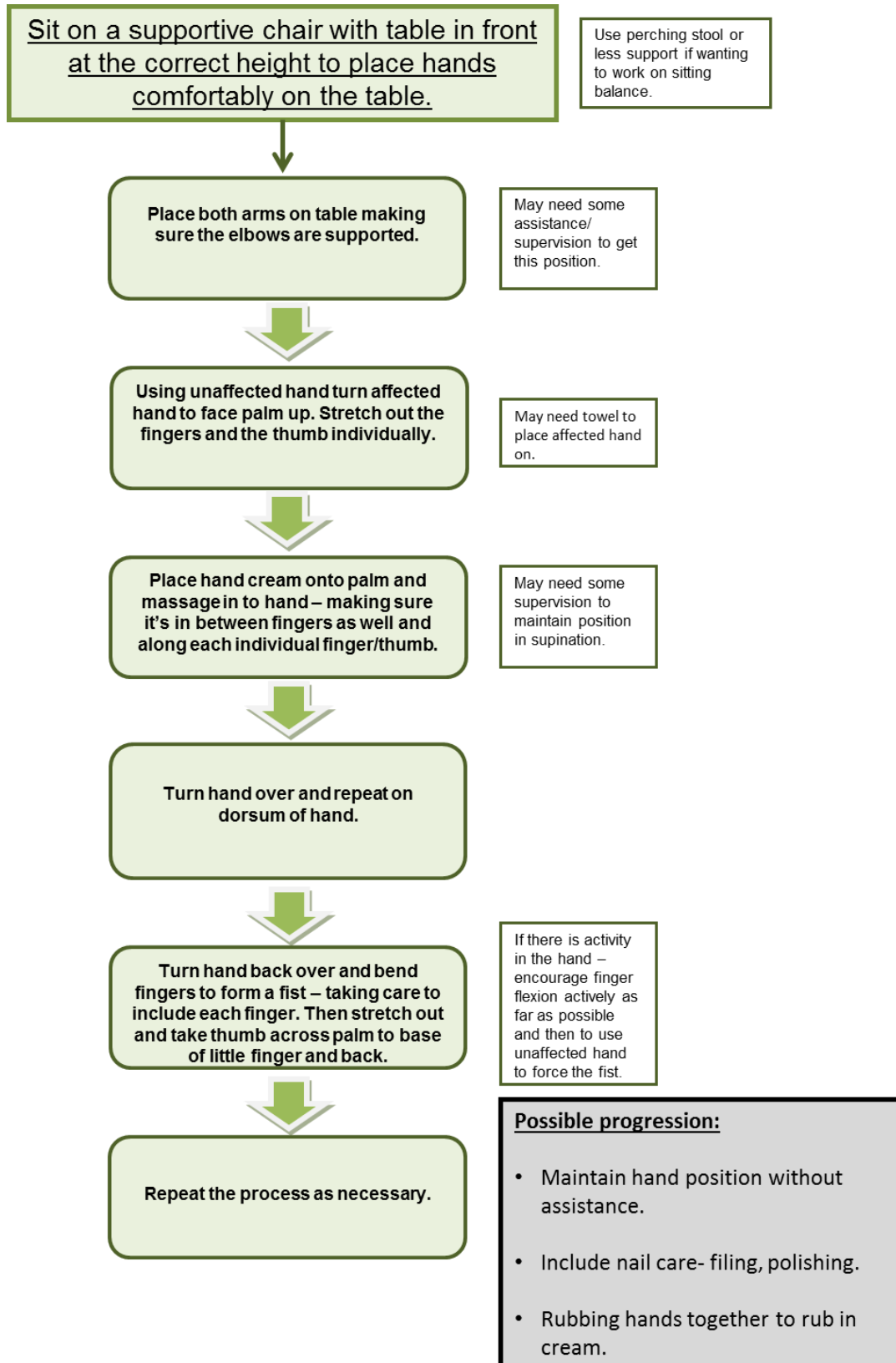


2. Part-task activities:

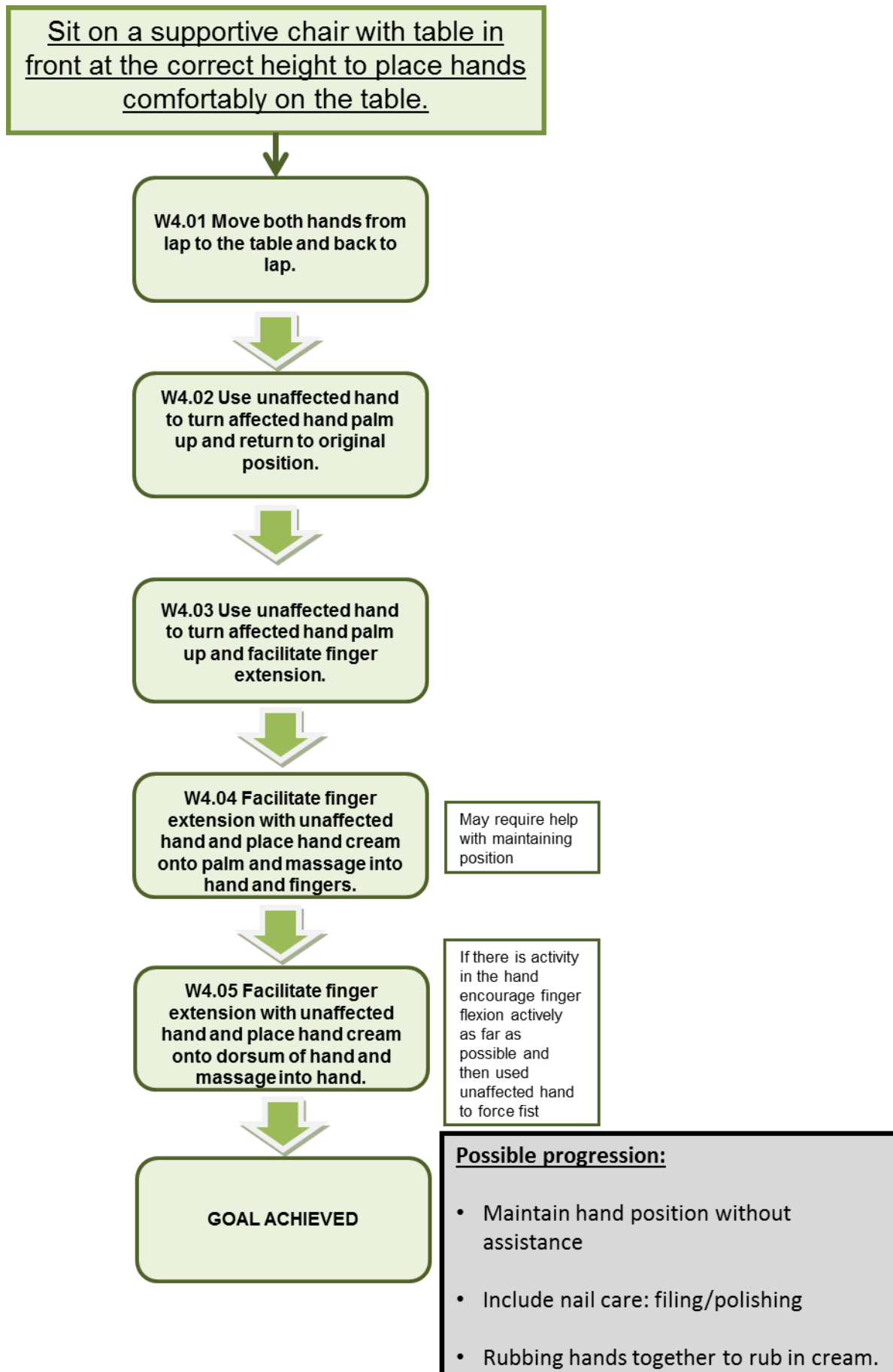


W4 – Hand care

1. Whole-task activity:



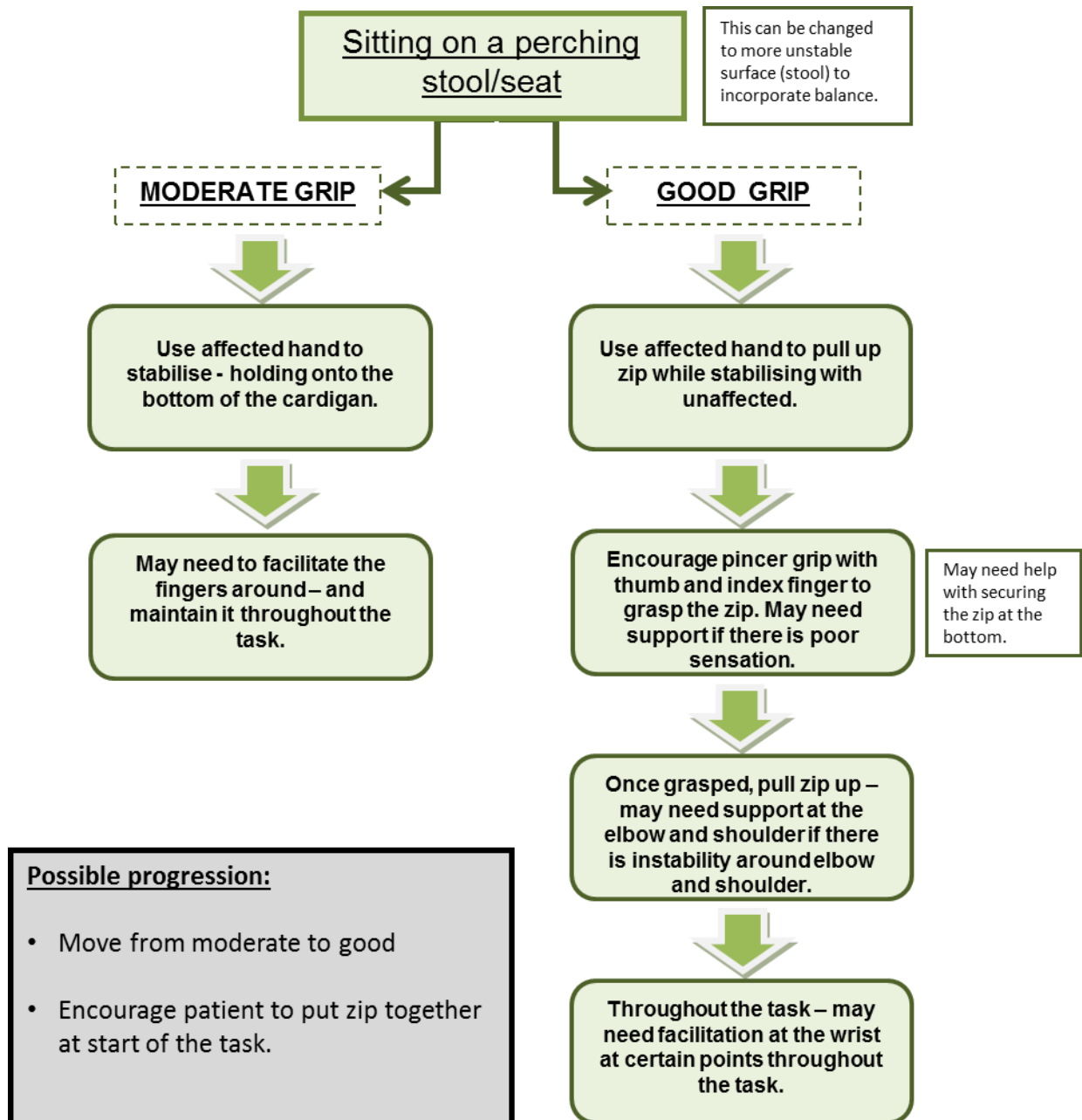
2. Part-task activities:



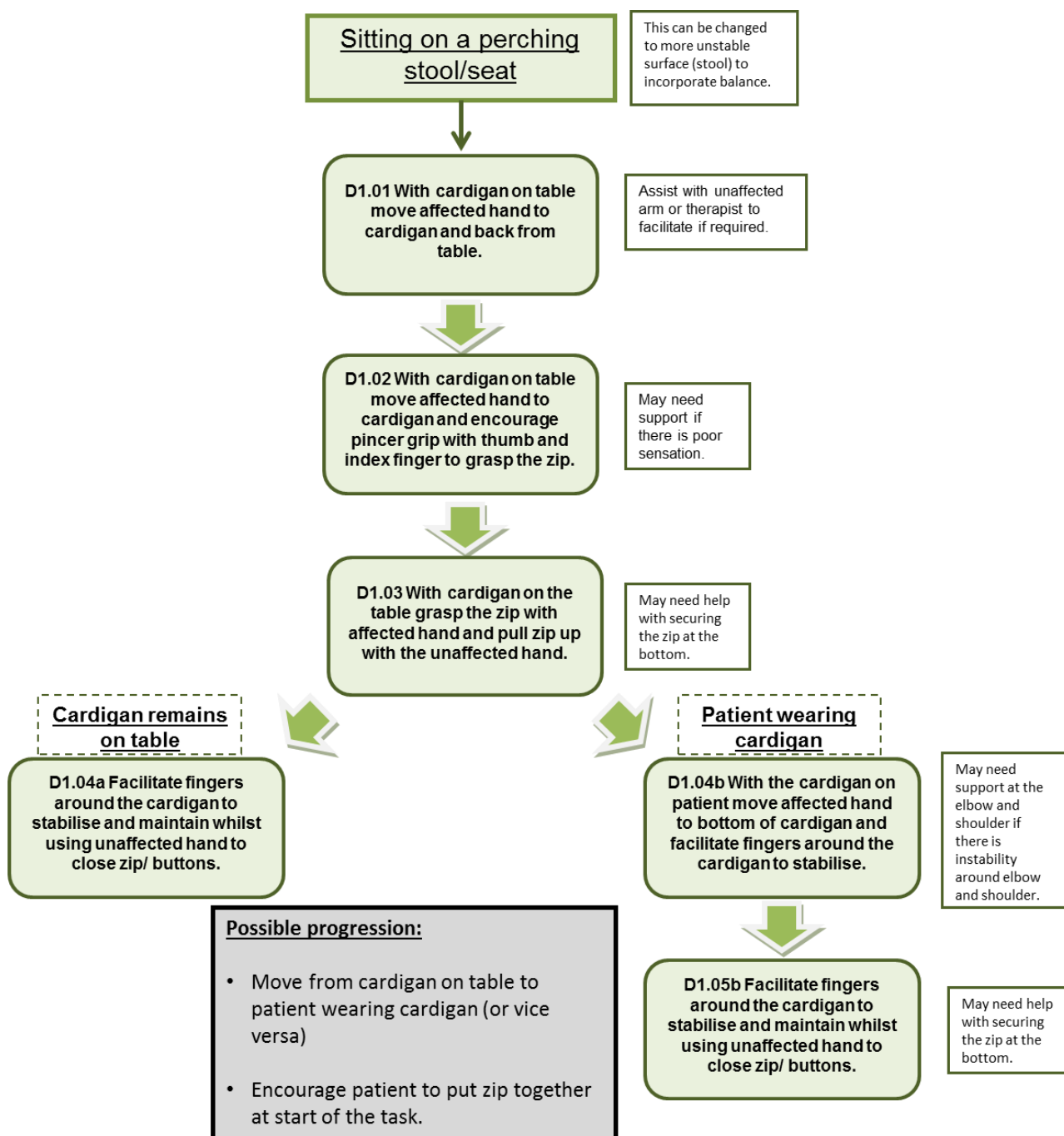
Dressing (D)

D1 – Closing a zip/ buttons

1. Whole-task activity:

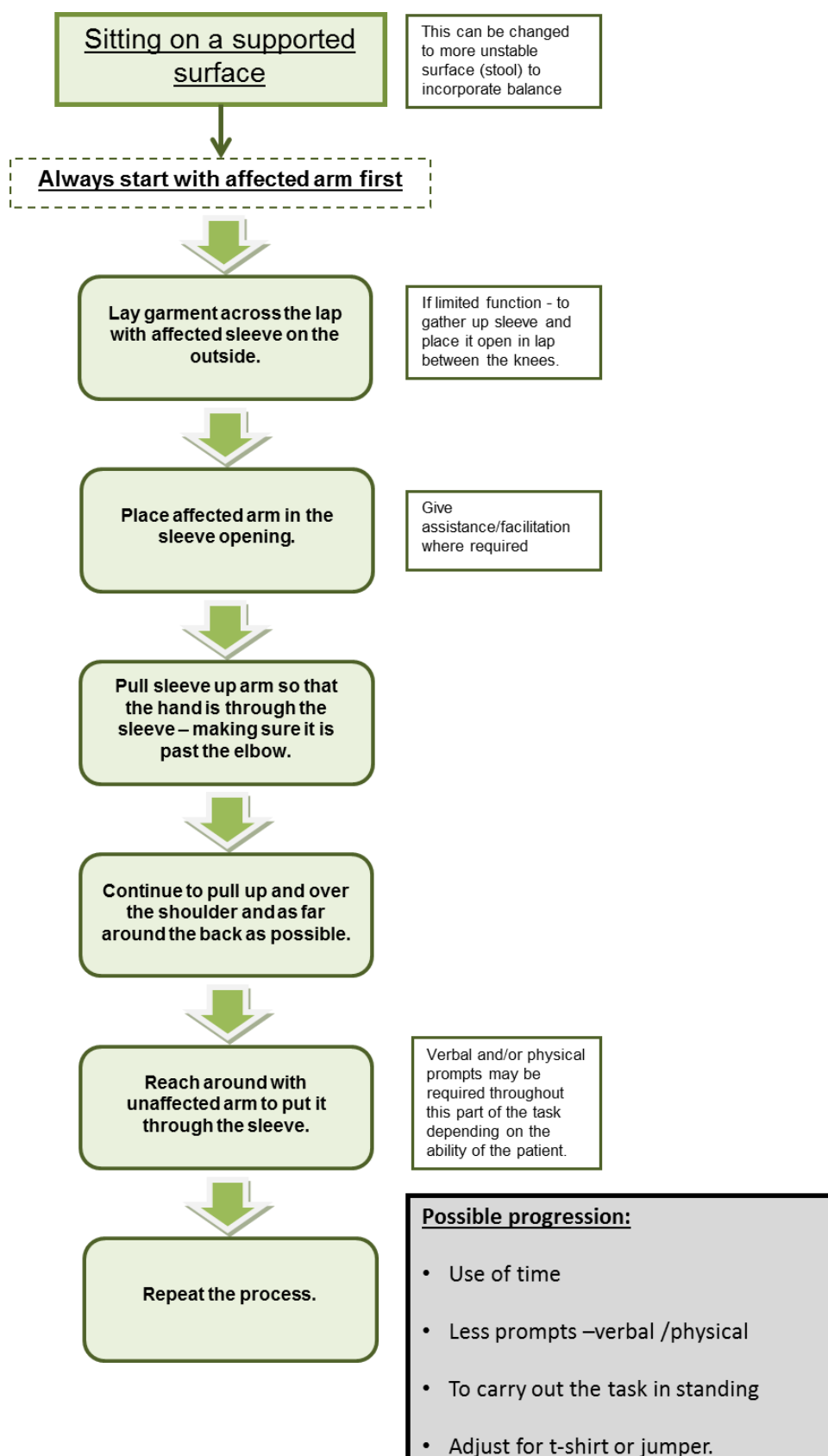


2. Part-task activities:

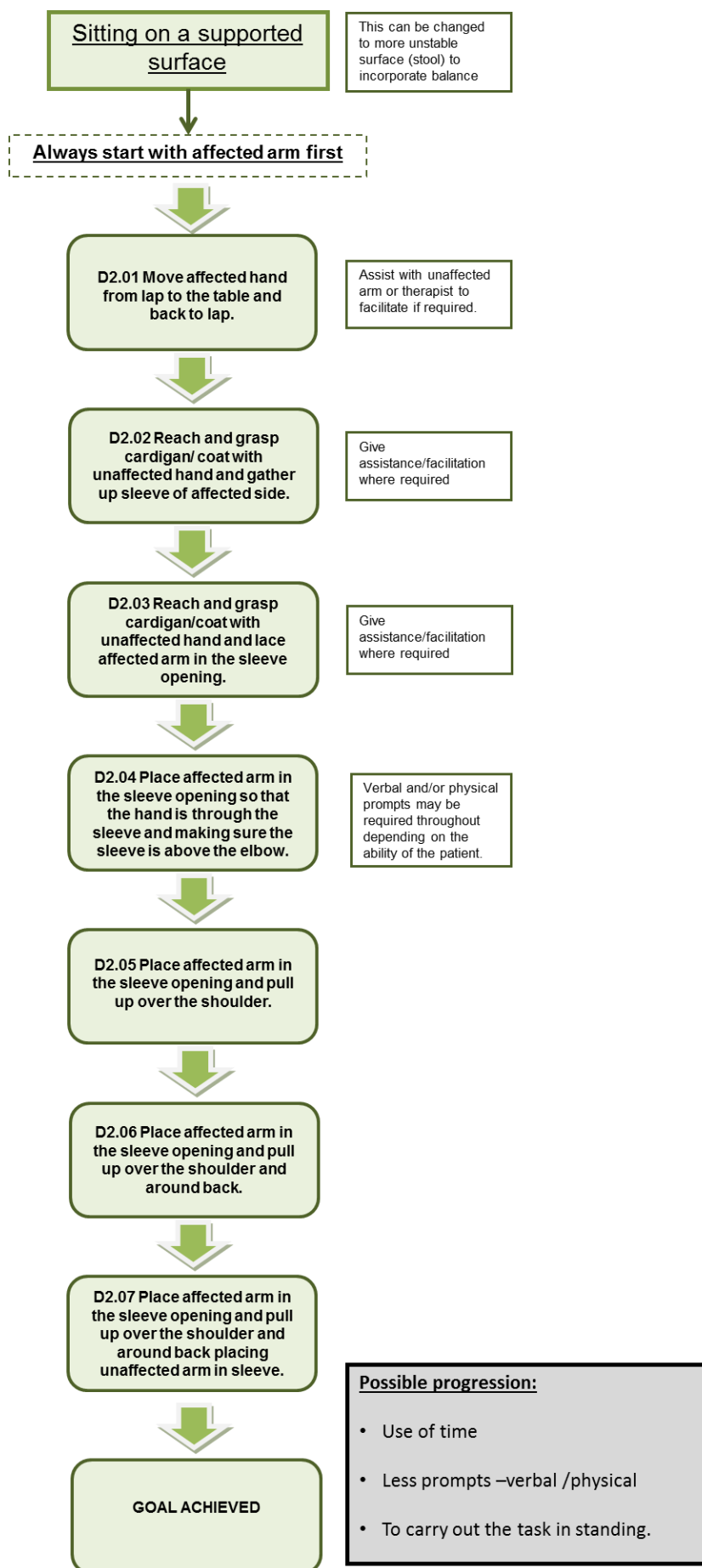


D2 – Putting on a cardigan/ coat/ shirt

1. Whole-task activity:

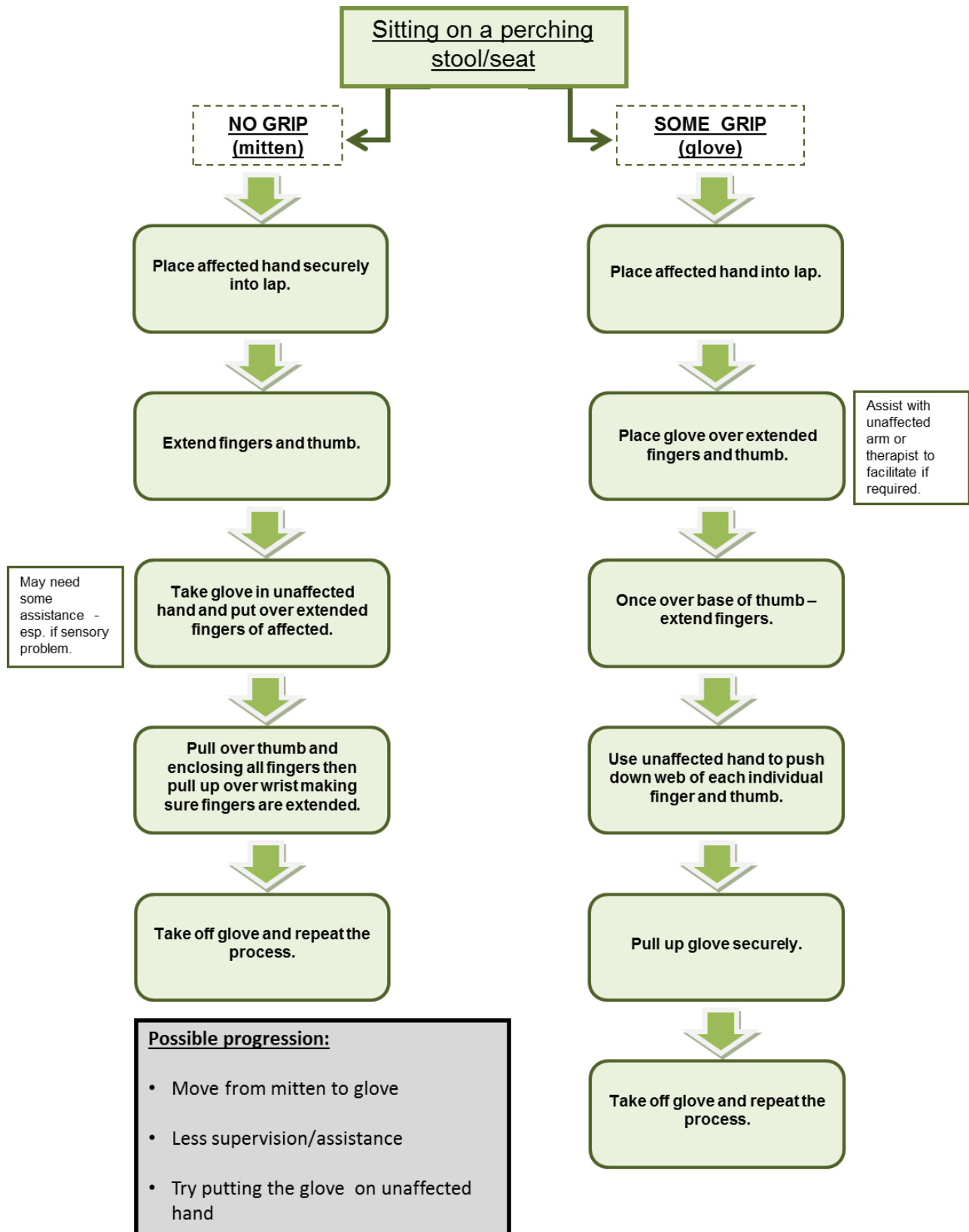


2. Part-task activities:

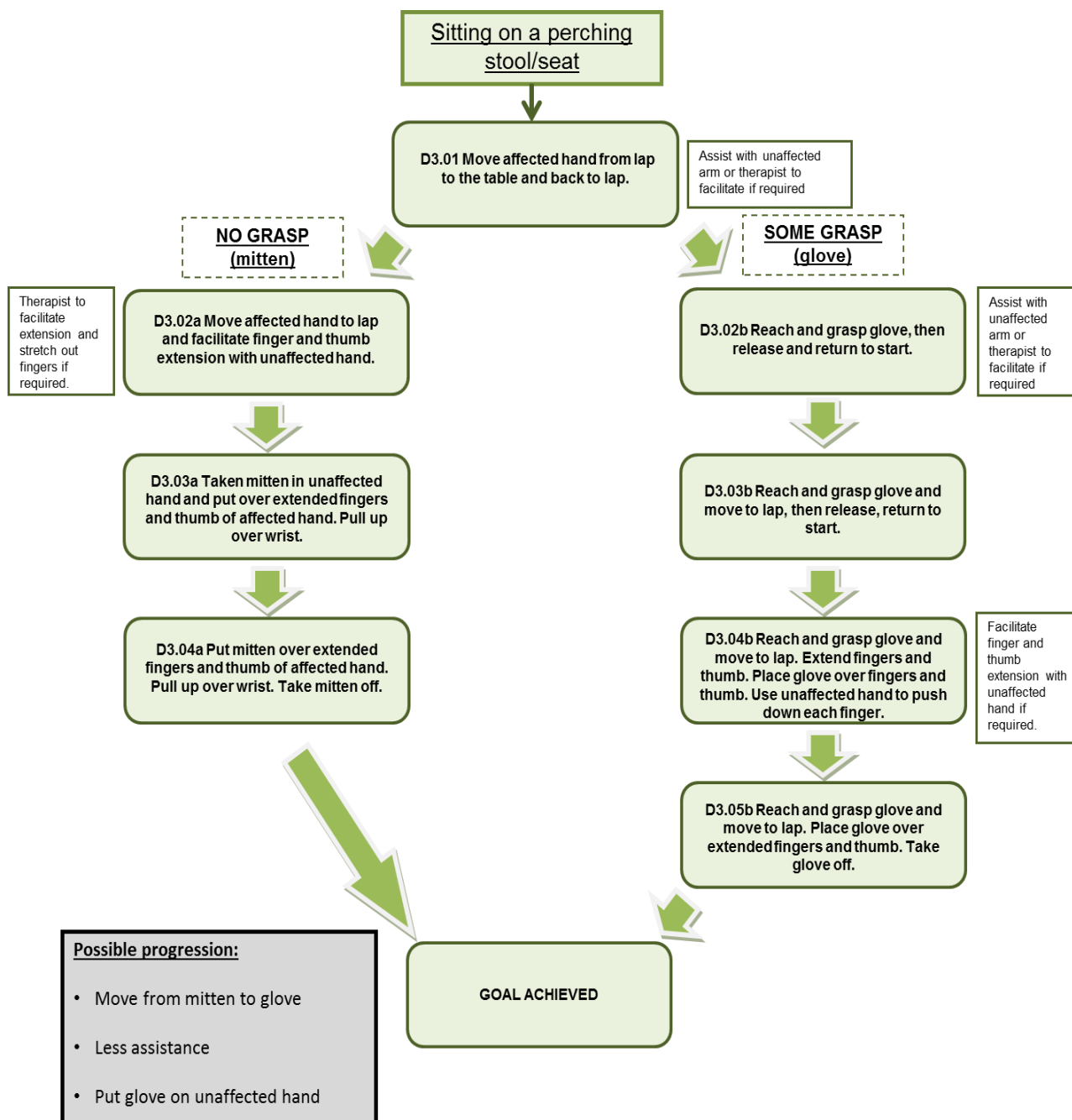


D3 – Putting on a mitten/ glove

1. Whole-task activity:



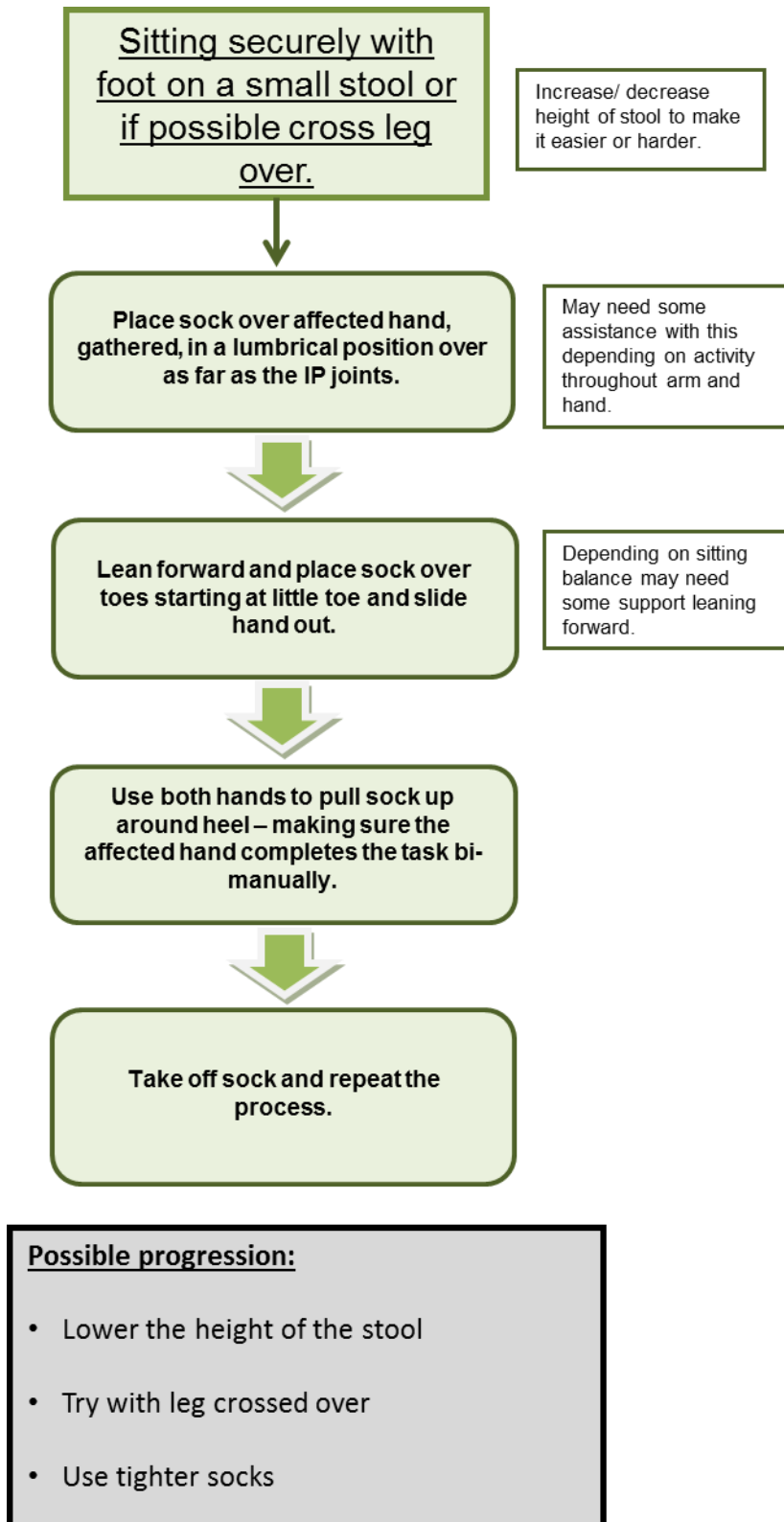
2. Part-task activities:



D4 – Putting on socks/ shoes

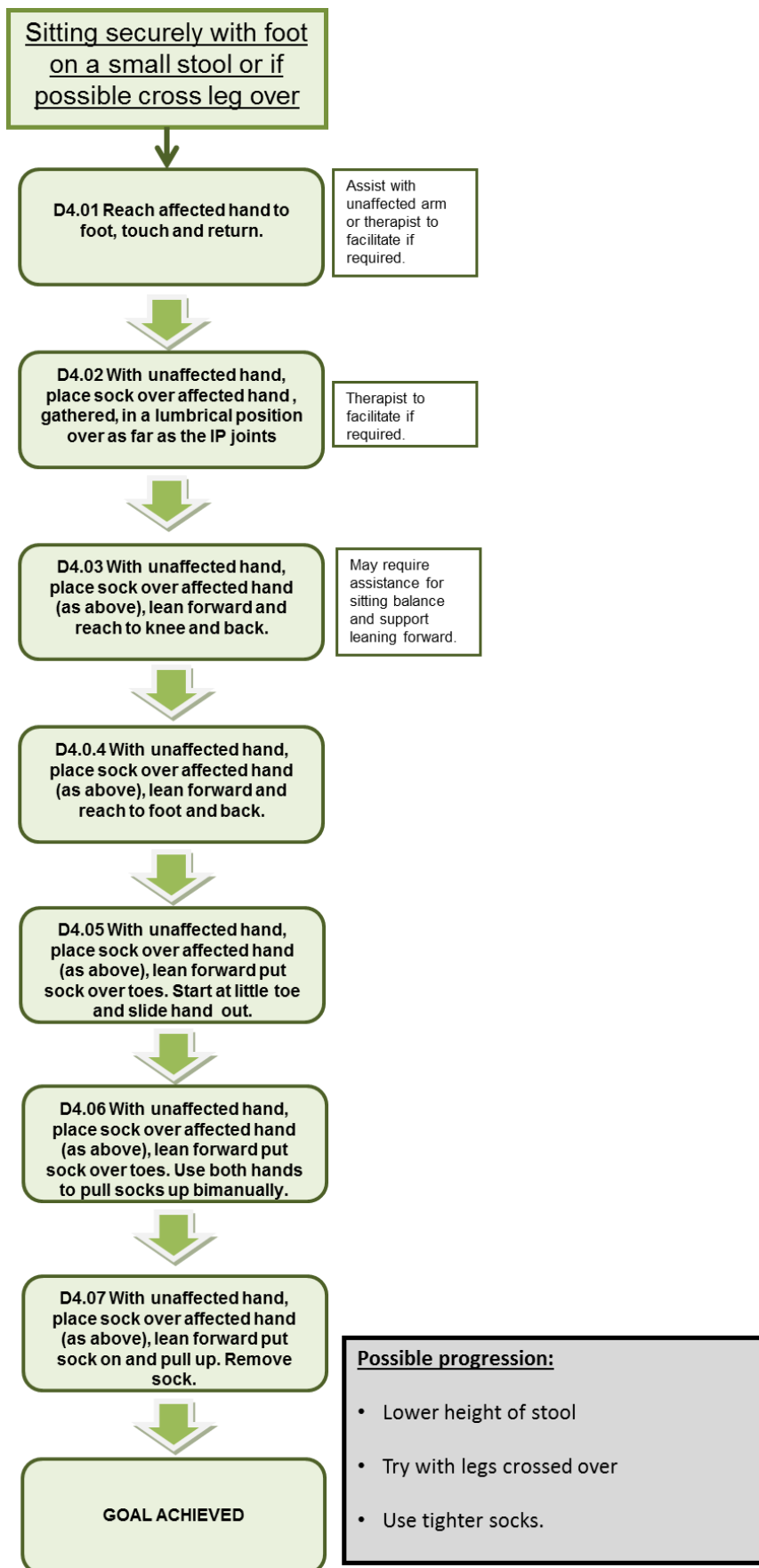
1. Whole-task activity:

NB: Only for participants with moderate to good grip and fairly good lower limb function.



2. Part-task activities:

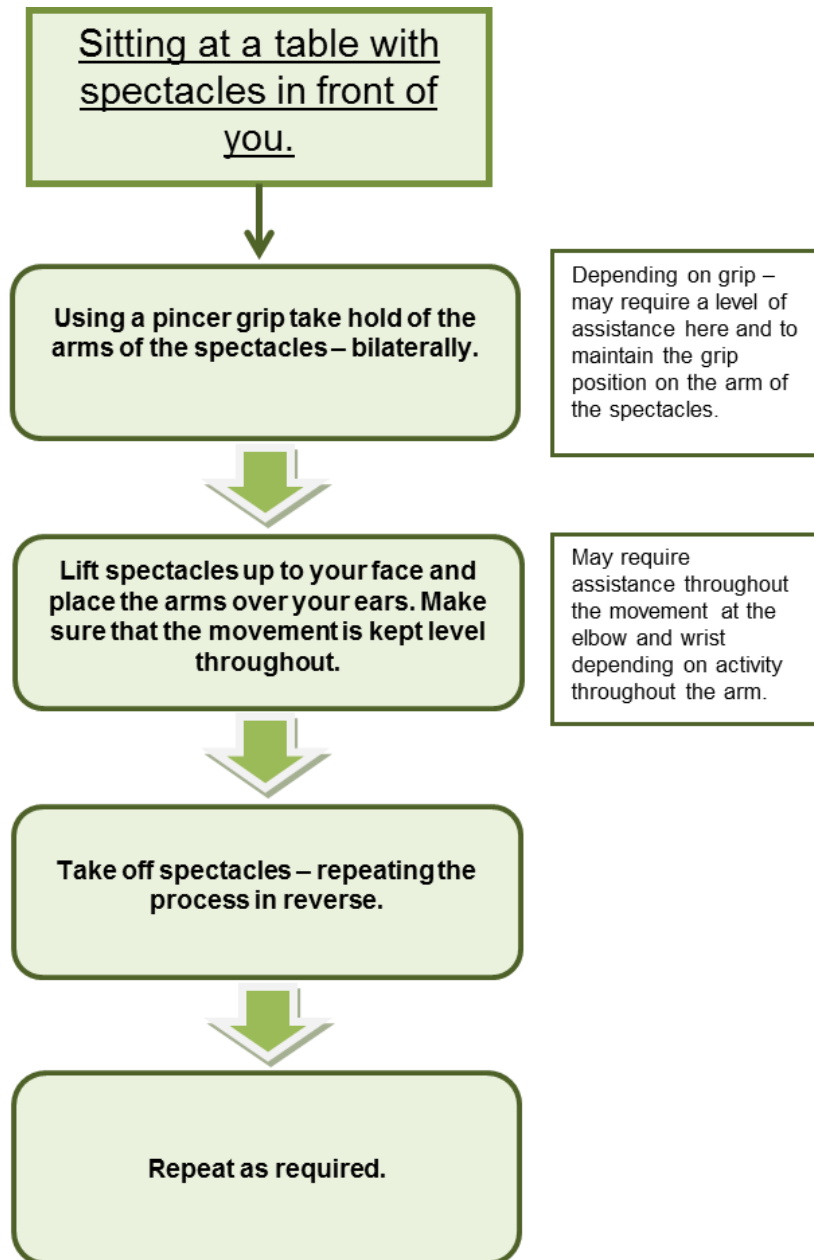
NB: Only for participants with moderate to good grip and fairly good lower limb function.



D5 – Putting on spectacles

1. Whole-task activity:

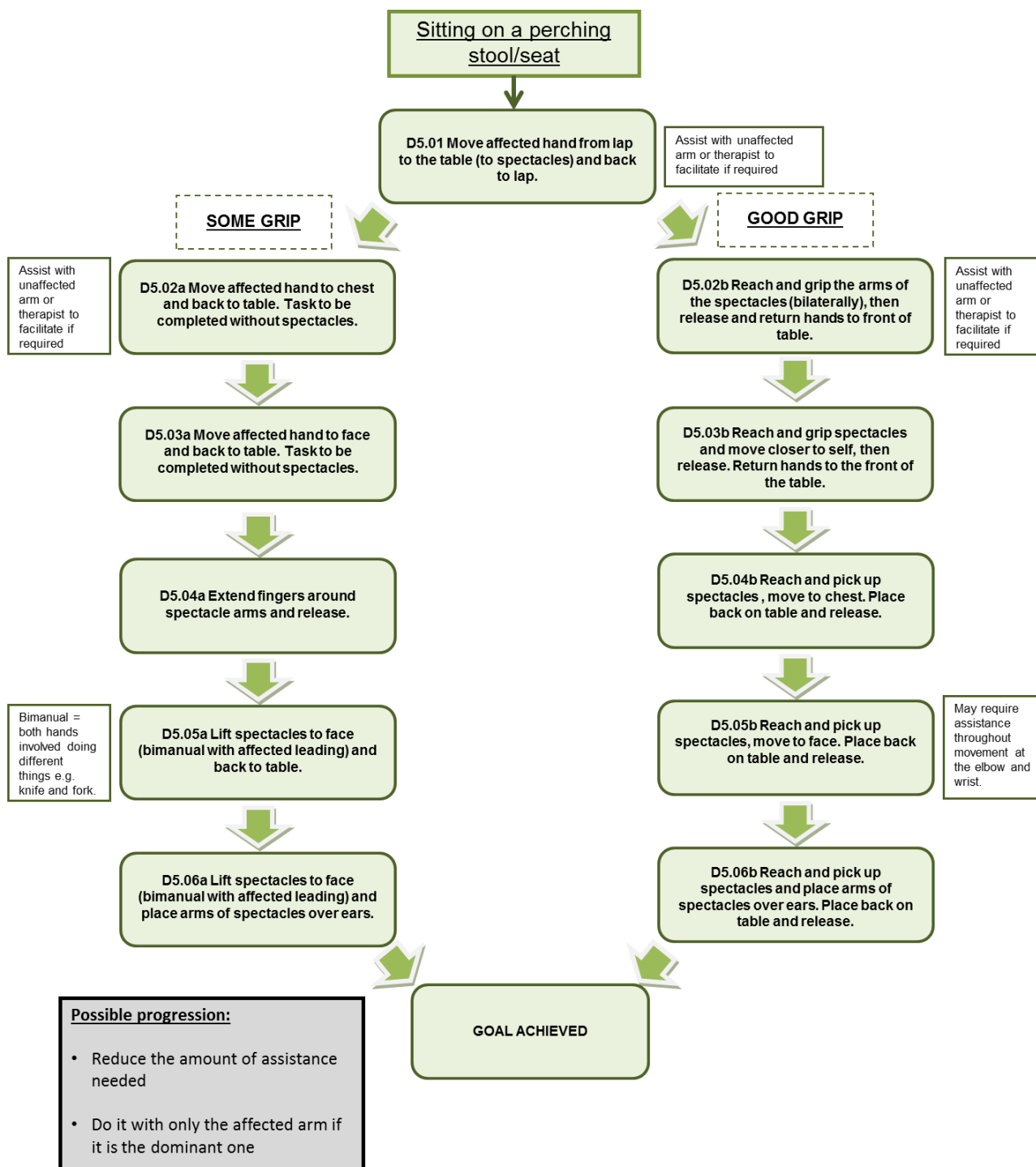
NB: The participant must have some grip.



Possible progression:

- Reduce the amount of assistance needed at the grip and elbow.
- Do it with only the affected arm if it is the dominant one.

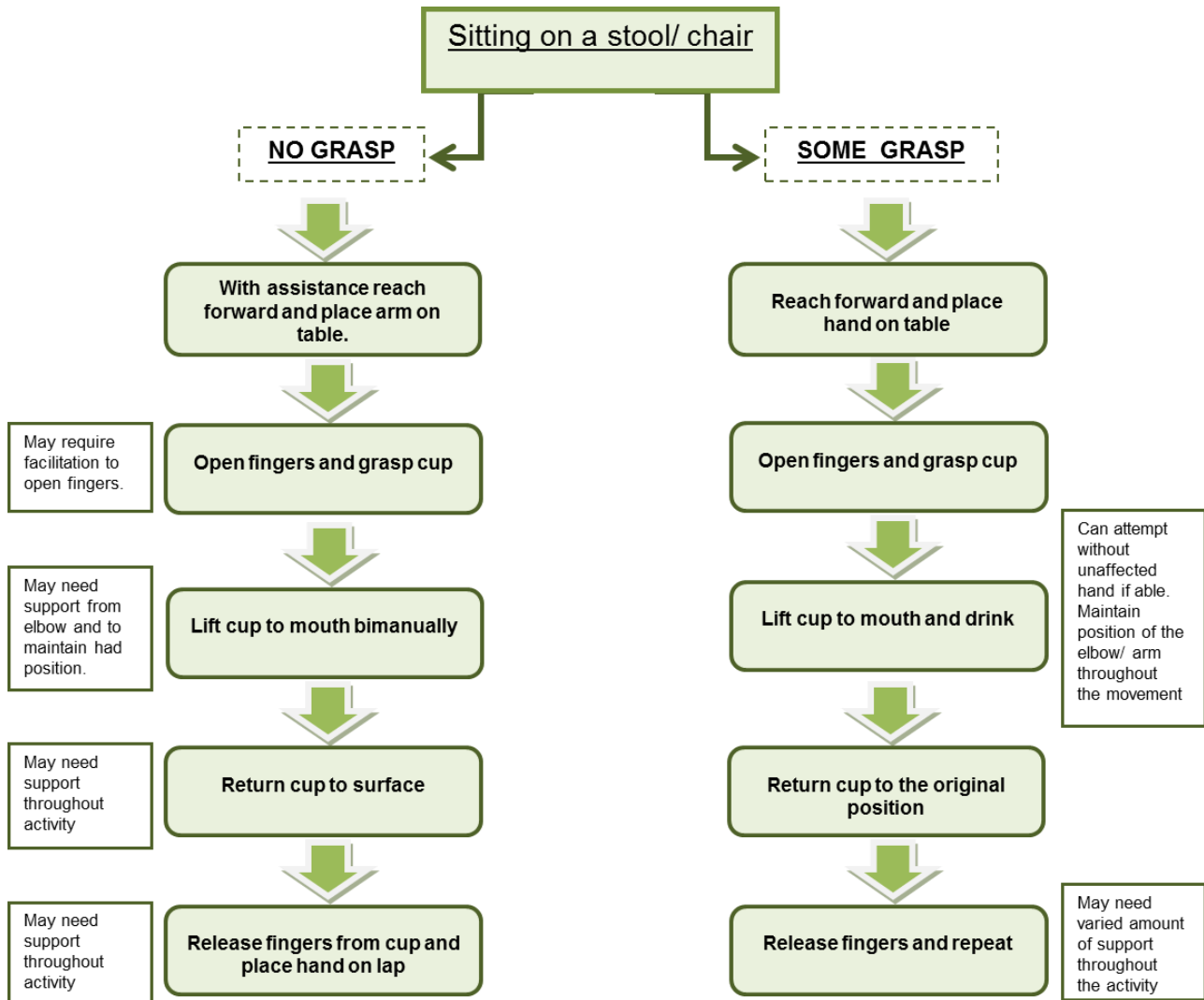
2. Part-task activities:



Eating and Drinking (F)

F1 – Drinking from mug/ glass

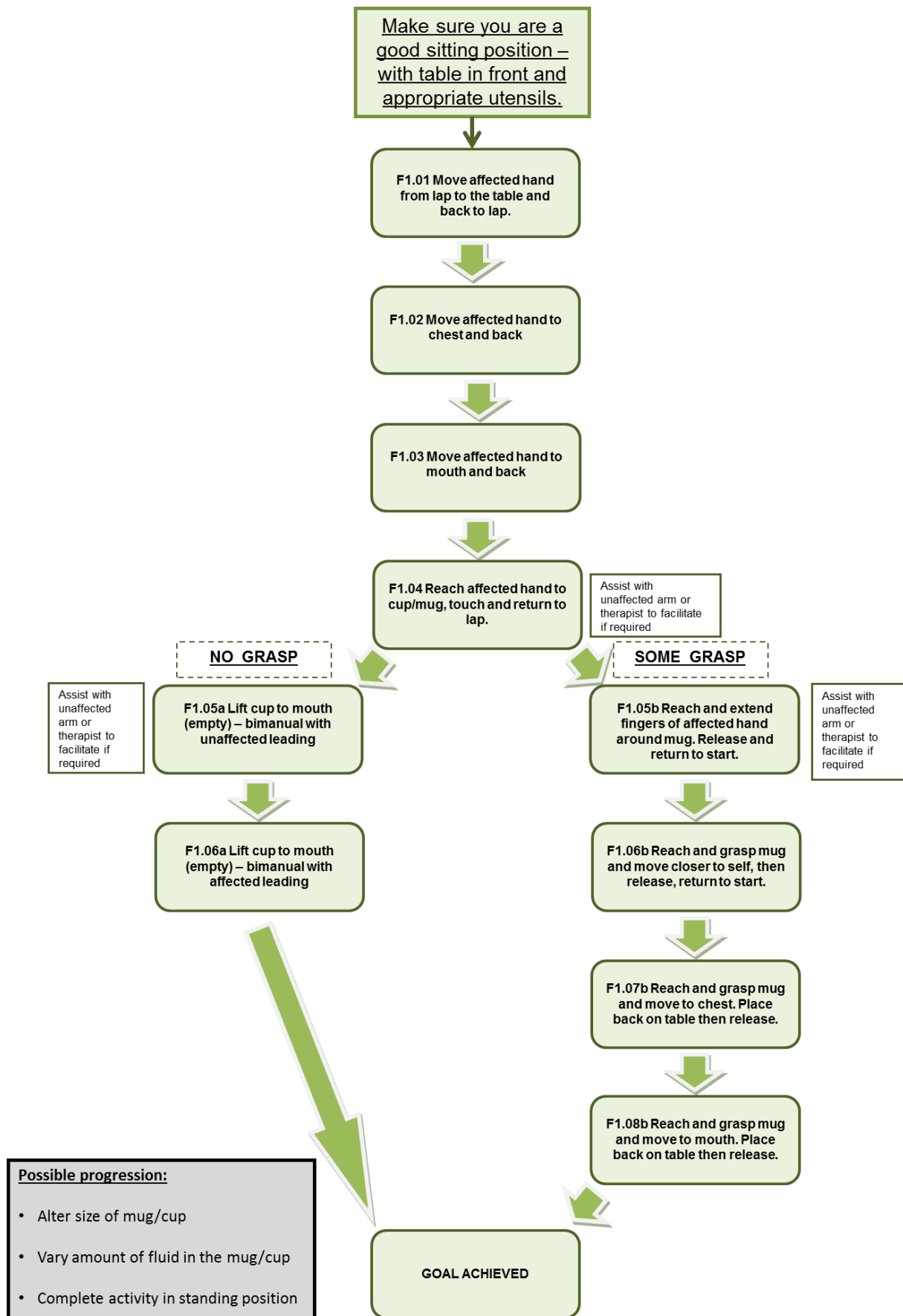
1. Whole-task activity:



Possible progression:

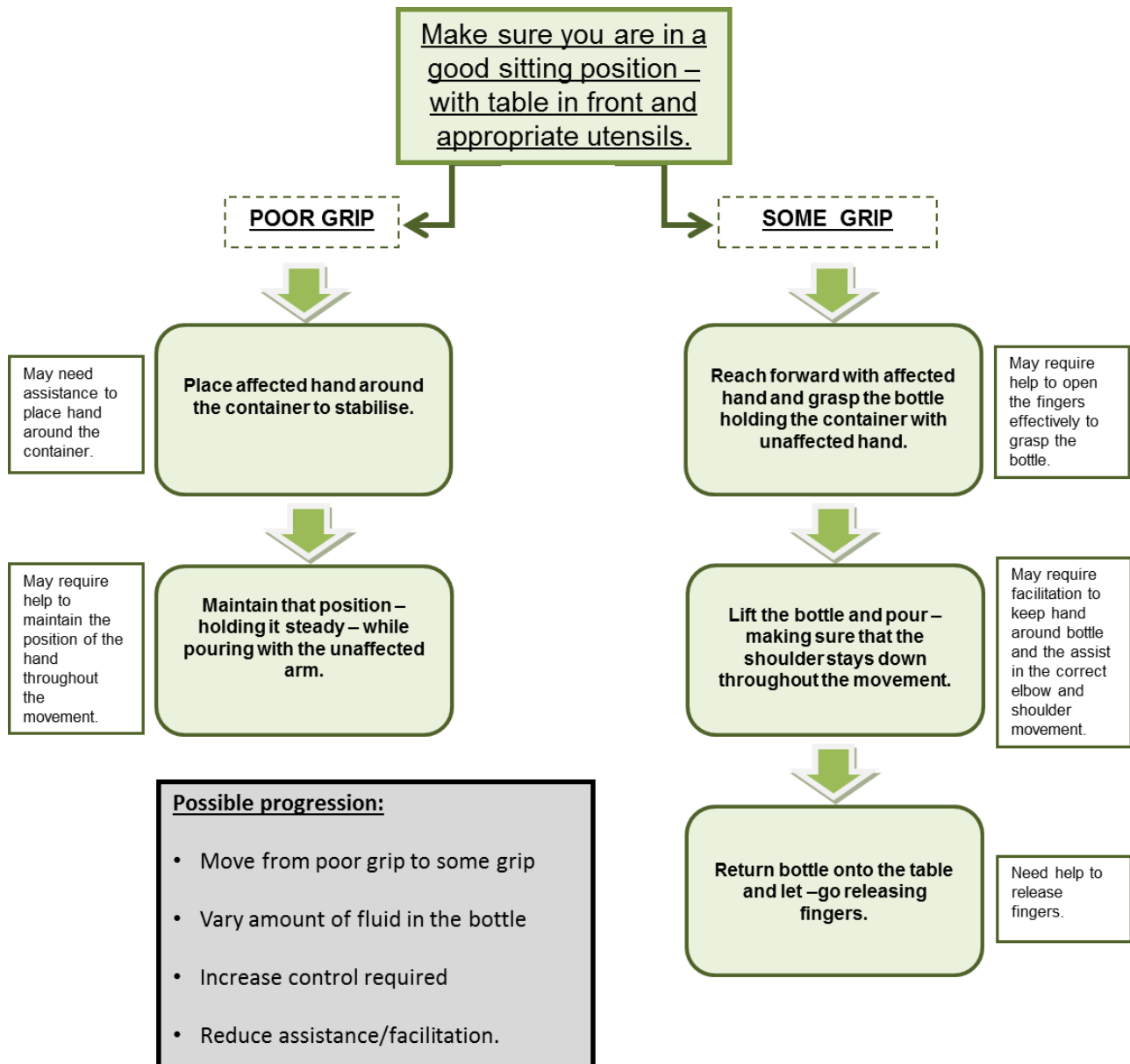
- Alter size of cup/ mug
- Alter quantity of liquid
- Complete activity in standing
- Alter the amount of assistance

2. Part-task activities:

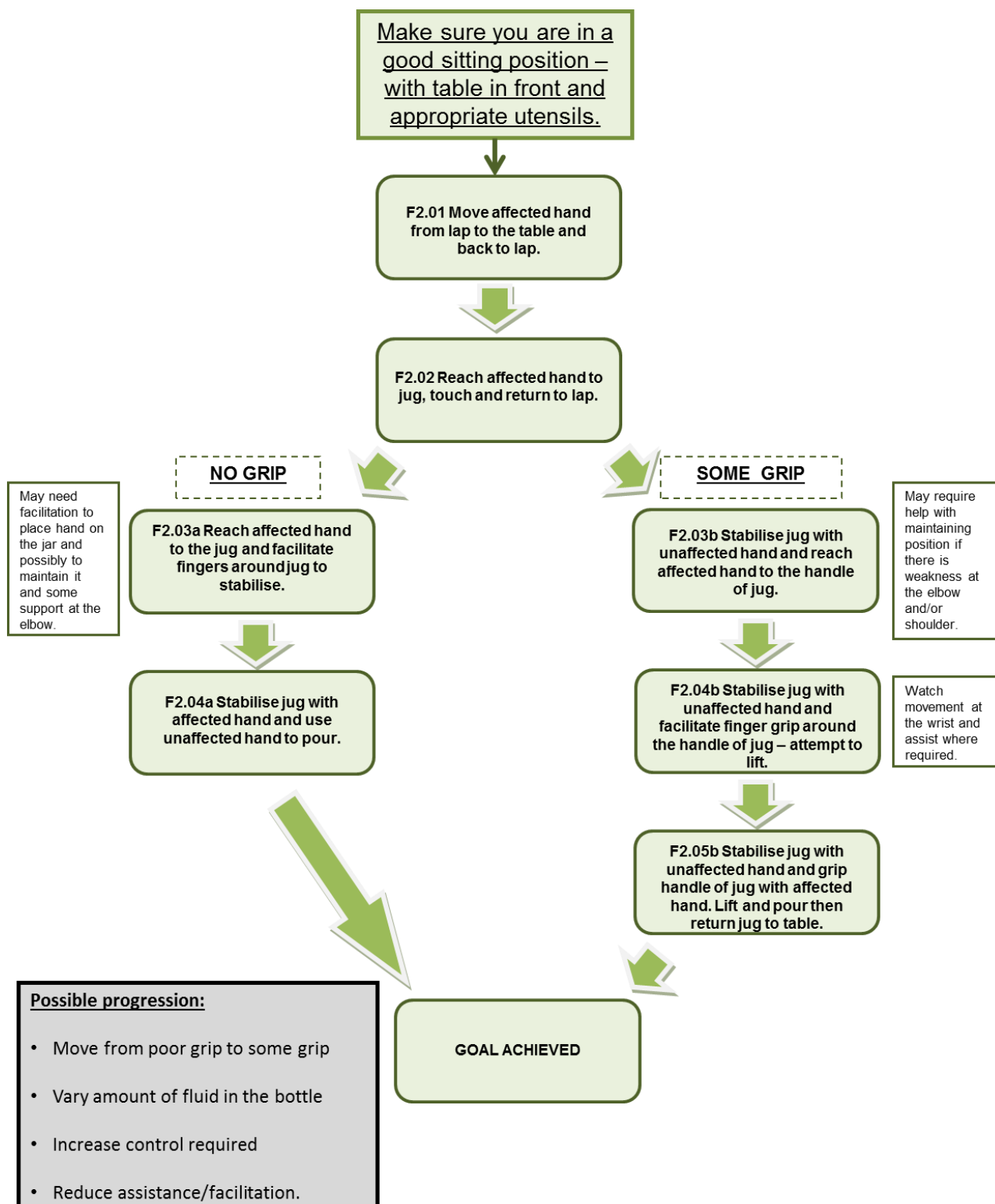


F2 – Pouring from bottle/ jug/ kettle

1. Whole-task activity:

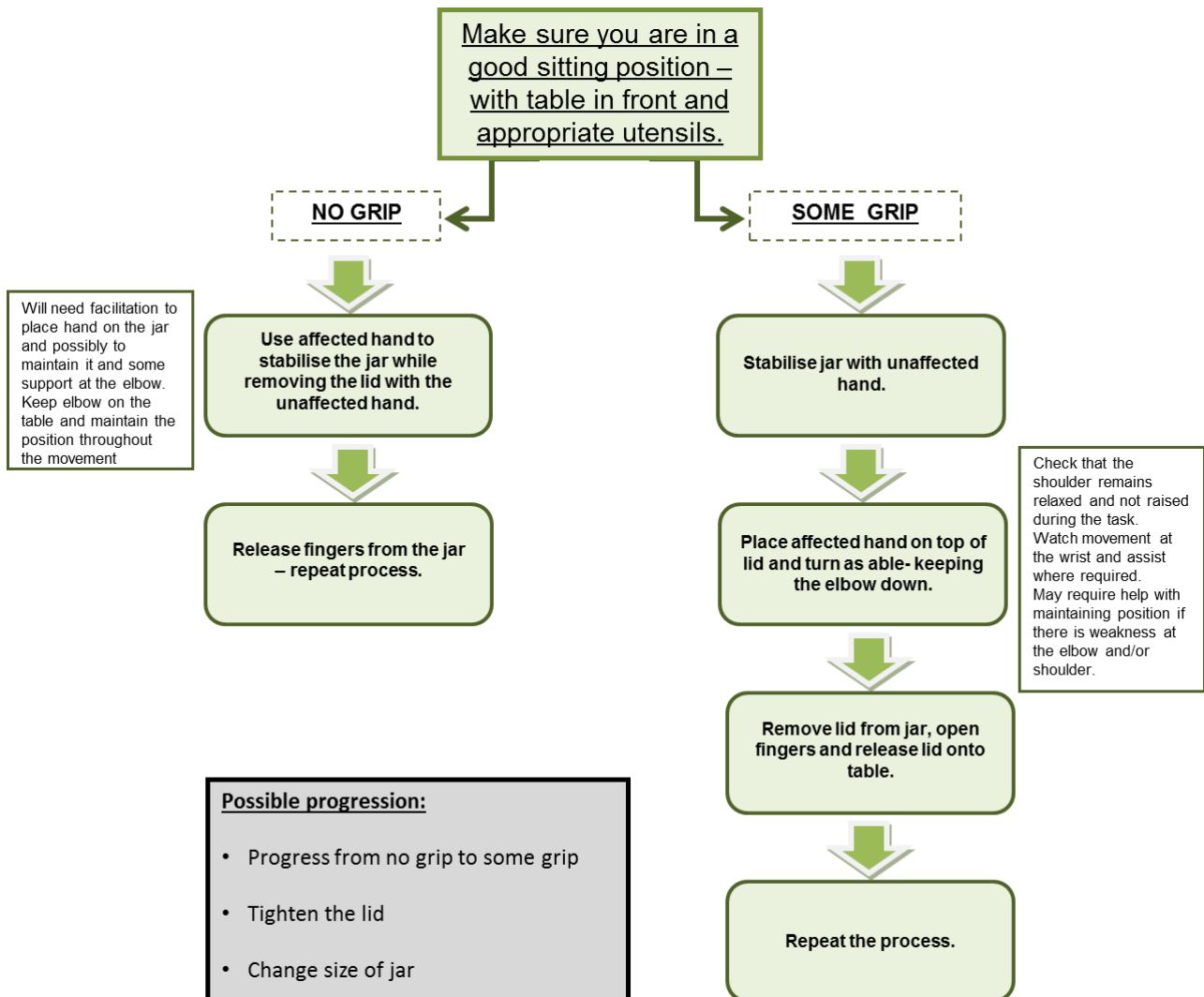


2. Part-task activities:

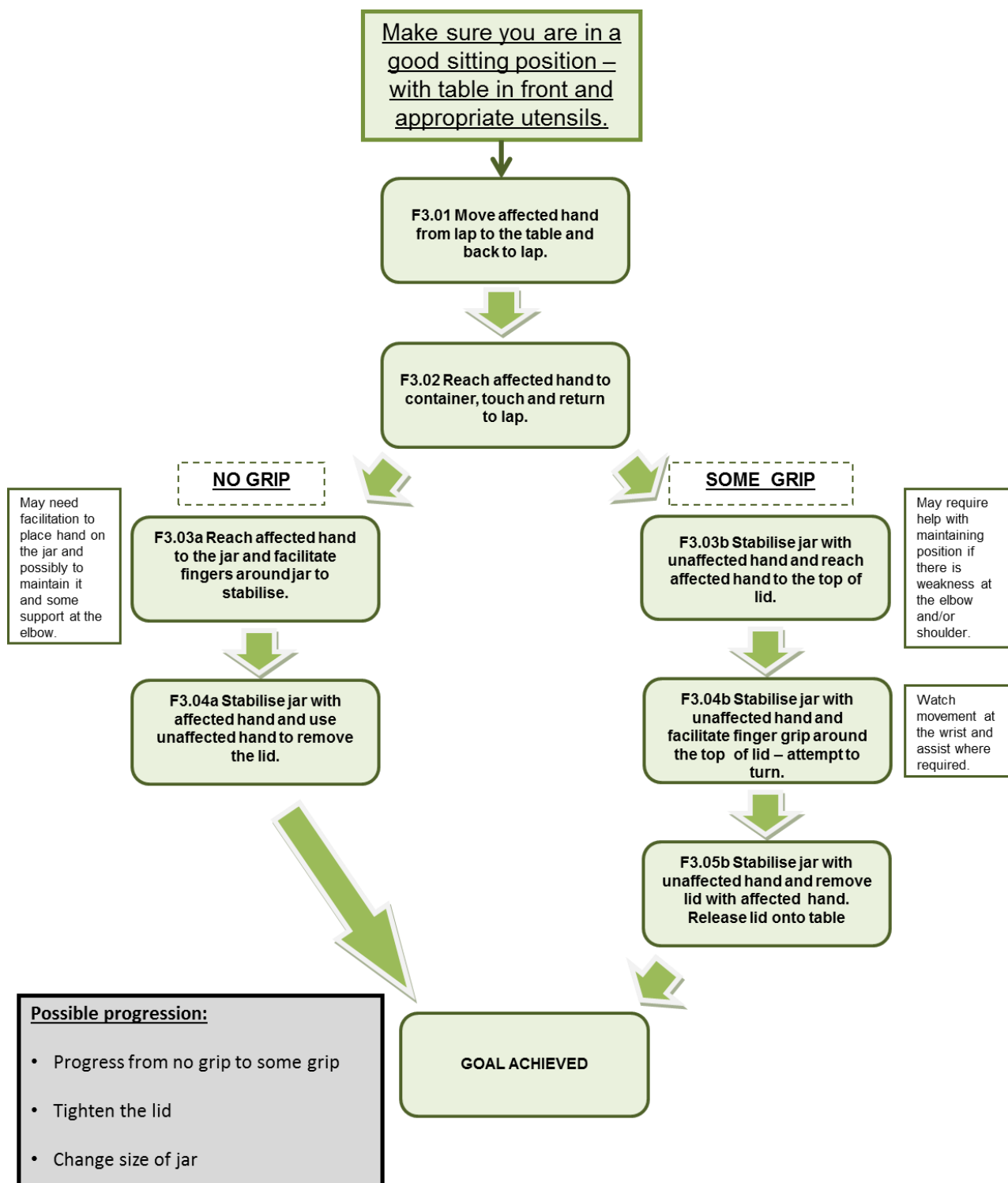


F3 – Removing lids/ open containers

1. Whole-task activity:



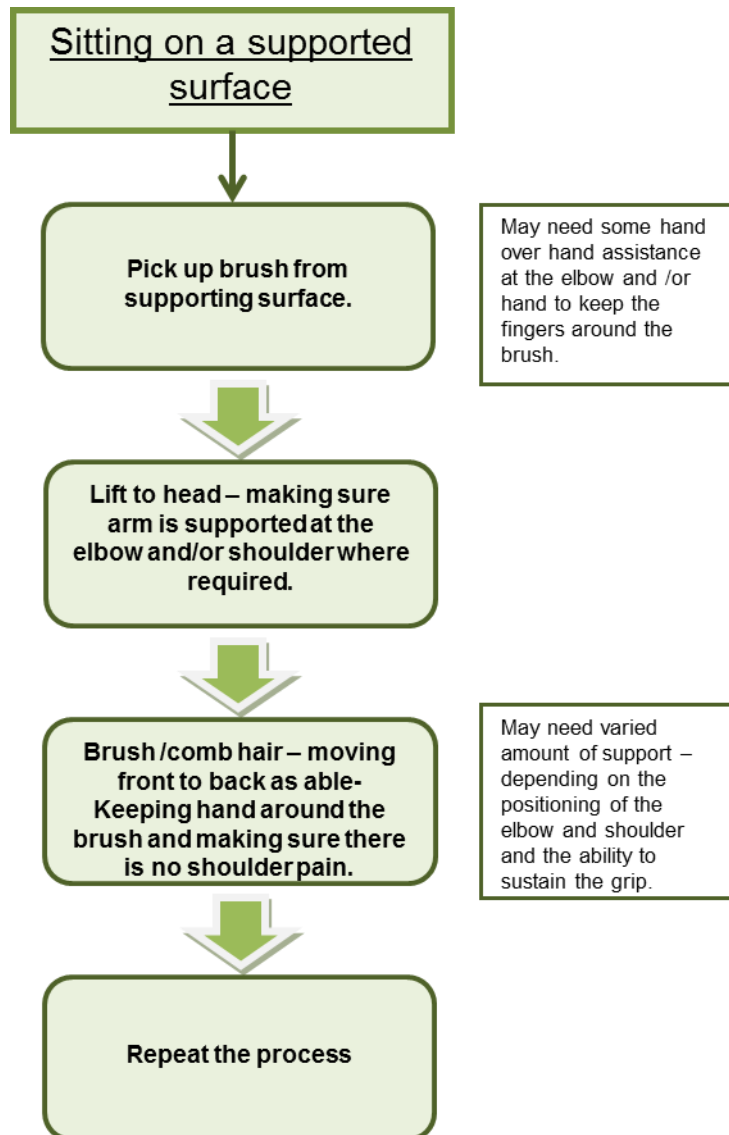
2. Part-task activities:



Other

PC1 – Brushing hair

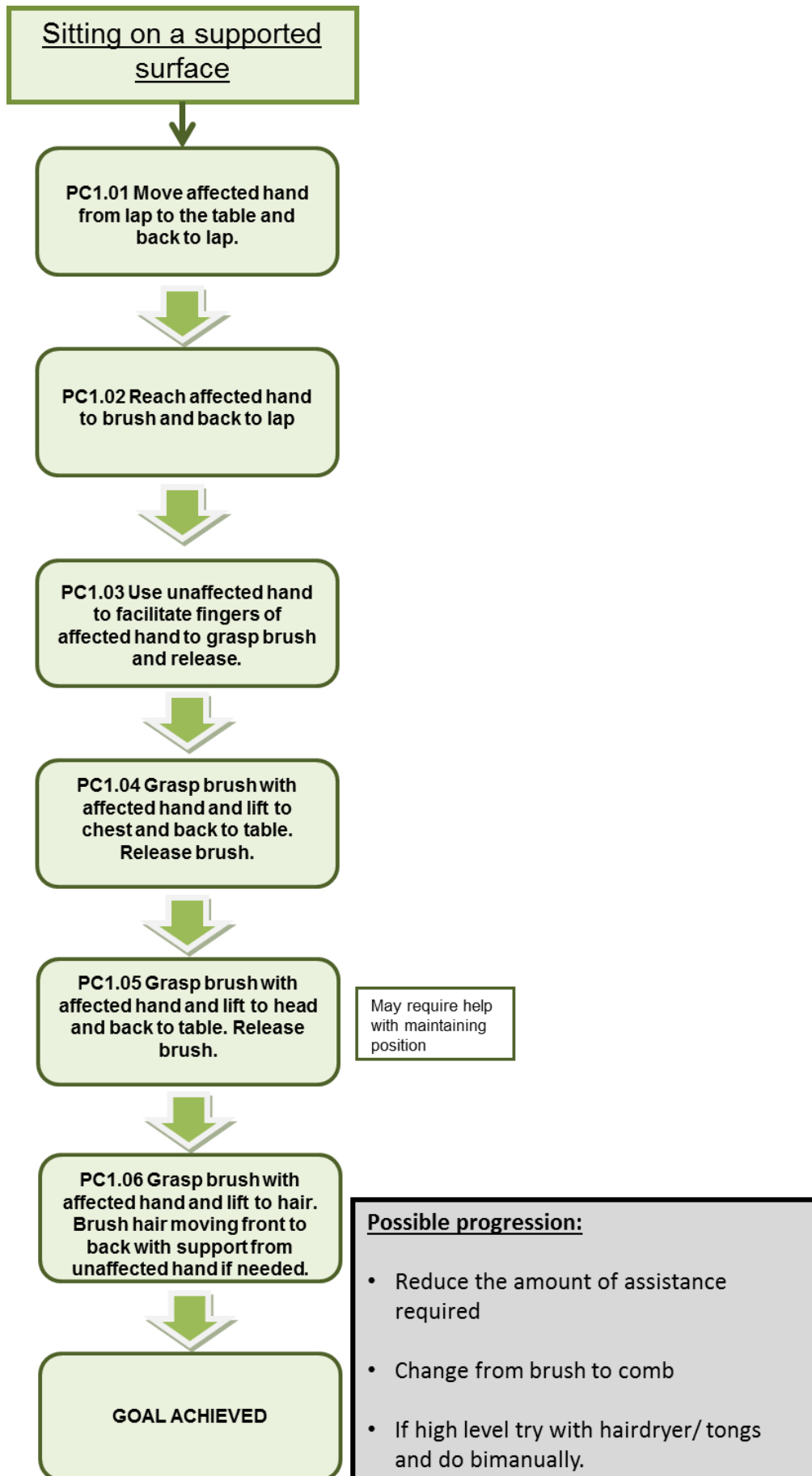
1. Whole-task activity:



Possible progression:

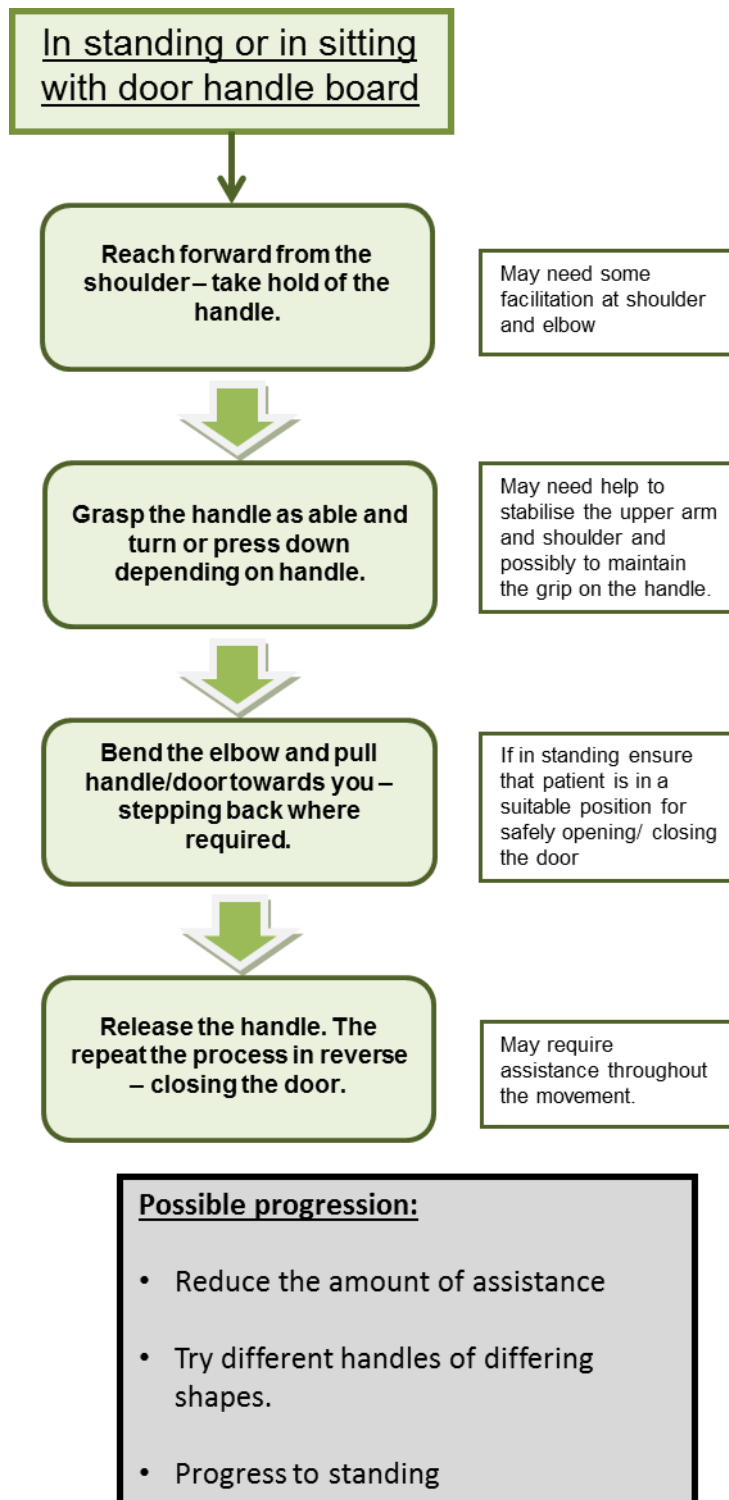
- Reduce the amount of assistance required
- Change from brush-comb
- If high level try with hairdryer/tongs and do bimanually.

2. Part-task activities:

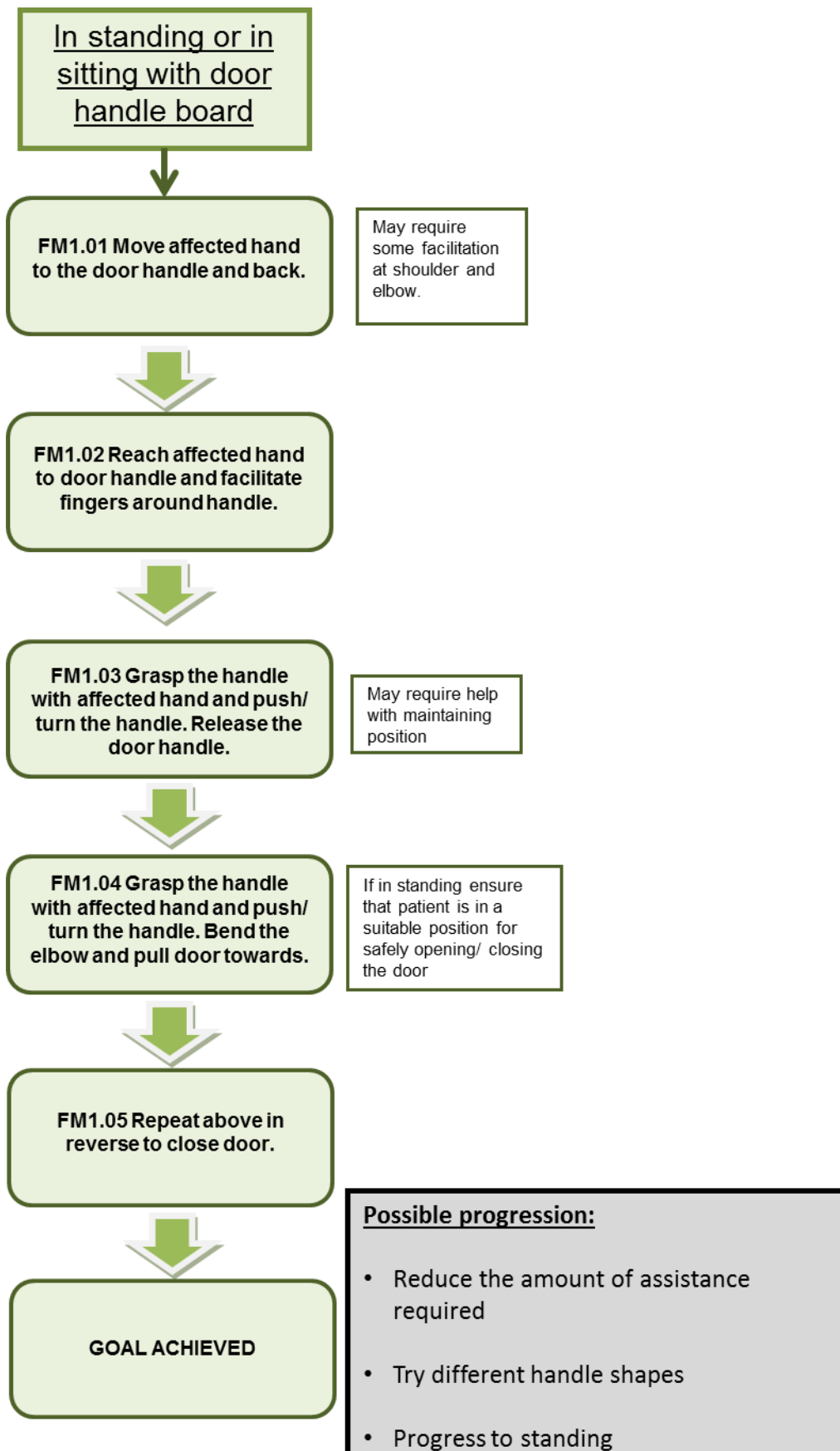


FM1 – Opening doors with affected hand

1. Whole-task activity:



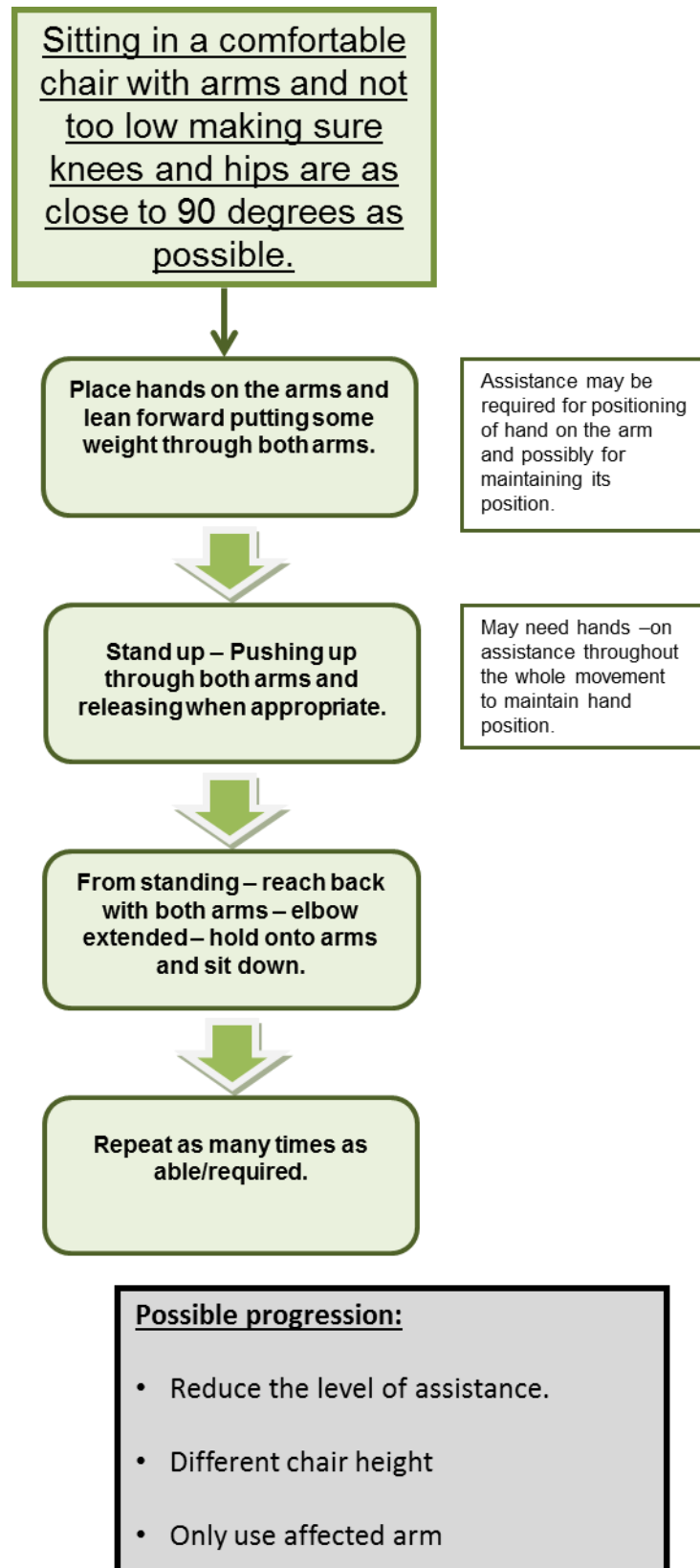
2. Part-task activities:



FM2 – Sit-to-stand using both hands

1. Whole-task activity:

NB participant must be able to stand with assistance from 1



Additional instructions for moving from sit to stand:

Please instruct the participant as follows:

1. place both hands (or, if not possible, the less-affected hand only) on the arm rests, or on the seat of the chair
2. shuffle bottom forward to the edge of the chair
3. move both feet back a little, keeping feet flat on the floor - and hip-width apart
4. in one movement, stand up as follows: keep looking straight ahead, lean forward from the hips and push down with your hands.
5. remain standing for a moment.

In people with an ankle foot orthosis (AFO) the affected foot is only to be moved back as far as is comfortable.

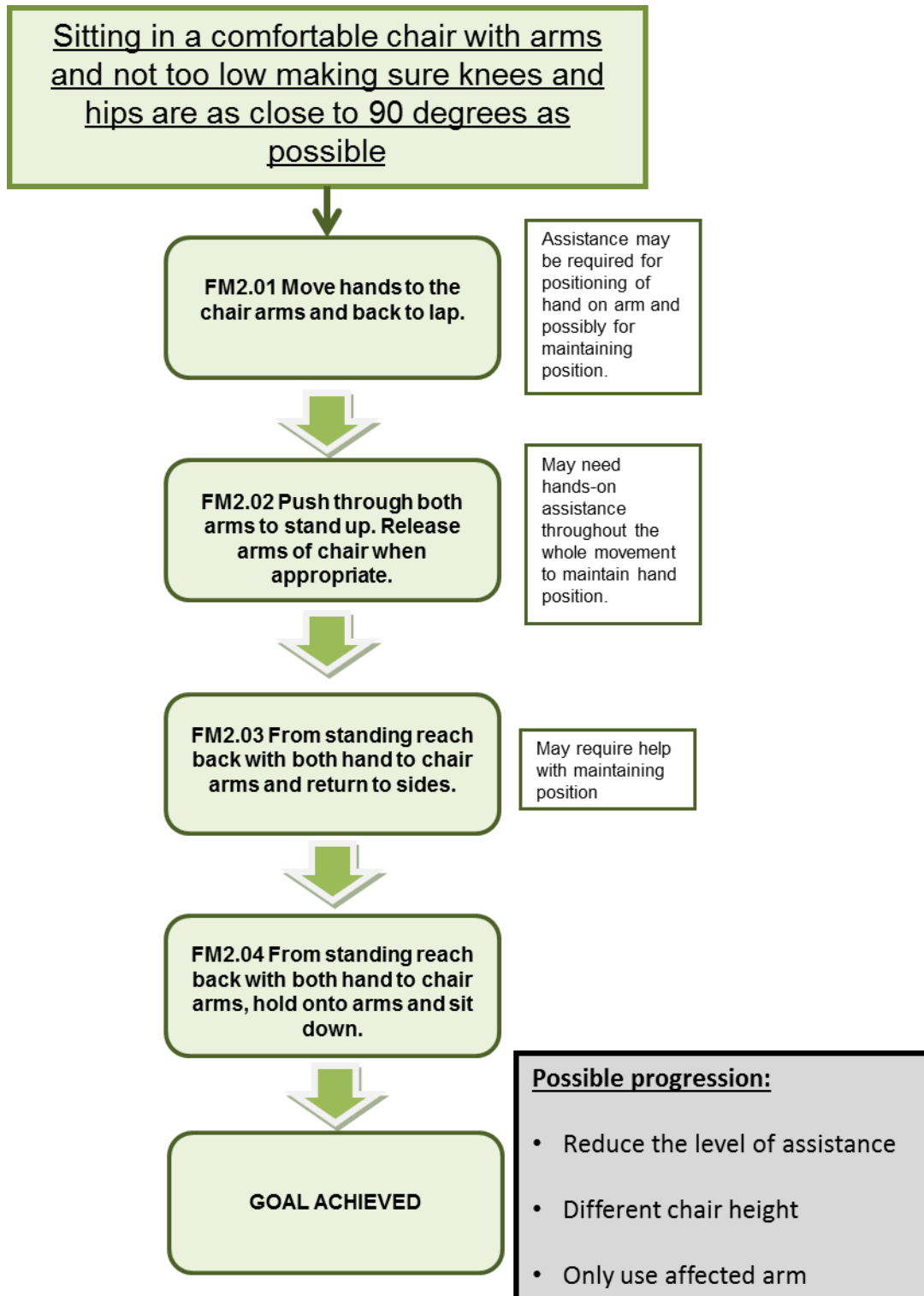
Additional instructions for moving from stand to sit:

Please instruct the participant as follows:

1. with the chair behind you, shuffle back until you can feel the seat of the chair against the back of your legs
2. check to see if there are arm rests
3. bending from the hips, reach for the arm rests, or for the seat of the chair.
4. gently lower yourself down.

2. Part-task activities:

NB participant must be able to stand with assistance from 1



5. Enhanced upper limb therapy documents

This Enhanced upper limb therapy 3: Warm-up stretches, goal choices and activity flowcharts manual is part of a series of documents developed to describe the RATULS enhanced upper limb therapy programme. The other documents in this series are:

- Enhanced upper limb therapy 1: Programme overview
- Enhanced upper limb therapy 2: How to deliver the programme

6. RATULS co-ordinating centre

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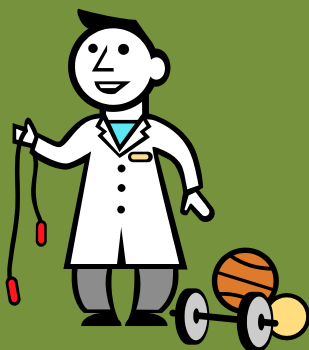
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Frederike van Wijck, Glasgow Caledonian University
Scott Wilkes, University of Sunderland

Robot Assisted Training for the Upper Limb after Stroke

RATULS

Enhanced upper limb therapy: **Participant goal and therapy record**



Participant ID

Study centre number



Further information

Enhanced upper limb therapy documents

This Enhanced upper limb therapy: Participant goal and therapy record is designed to document the therapy received as part of the RATULS enhanced upper limb therapy programme. In order to deliver this programme please refer to the series of documents developed to describe the RATULS enhanced upper limb therapy programme. The documents in this series are:

- Enhanced upper limb therapy 1: Programme overview
- Enhanced upper limb therapy 2: How to deliver the programme
- Enhanced upper limb therapy 3: Warm-up stretches, goal choices and activity flowcharts.

RATULS co-ordinating centre

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Programme overview



Goal setting and review documentation

Participant ID:

Session 1 Week 1 Initial session	Goal 1				Goal 2				Goal 3				Goal 4			
	Whole (tick)	Part (tick)	Current Position	Part of task (? / ?)	Whole (tick)	Part (tick)	Current Position	Part of task (? / ?)	Whole (tick)	Part (tick)	Current Position	Part of task (? / ?)	Whole (tick)	Part (tick)	Current Position	Part of task (? / ?)
Session number: Progress since week 1	Goal 1				Goal 2				Goal 3				Goal 4			
	Current Position		Part of task (? / ?)	Achieved (Y/N)	Current Position		Part of task (? / ?)	Achieved (Y/N)	Current Position		Part of task (? / ?)	Achieved (Y/N)	Current Position		Part of task (? / ?)	Achieved (Y/N)
Session number: Week 4 Review session	Goal 1				Goal 2				Goal 3				Goal 4			
	Week 1 Goal 1 Achieved (Y/N)				Week 1 Goal 2 Achieved (Y/N)				Week 1 Goal 3 Achieved (Y/N)				Week 1 Goal 4 Achieved (Y/N)			
	Whole (tick)	Part (tick)	Current Position	Part of task (? / ?)	Whole (tick)	Part (tick)	Current Position	Part of task (? / ?)	Whole (tick)	Part (tick)	Current Position	Part of task (? / ?)	Whole (tick)	Part (tick)	Current Position	Part of task (? / ?)
Session number: Progress since week 4	Goal 1				Goal 2				Goal 3				Goal 4			
	Current Position		Part of task (? / ?)	Achieved (Y/N)	Current Position		Part of task (? / ?)	Achieved (Y/N)	Current Position		Part of task (? / ?)	Achieved (Y/N)	Current Position		Part of task (? / ?)	Achieved (Y/N)
Session number: Week 8 Review session	Goal 1				Goal 2				Goal 3				Goal 4			
	Week 4 Goal 1 Achieved (Y/N)				Week 4 Goal 2 Achieved (Y/N)				Week 4 Goal 3 Achieved (Y/N)				Week 4 Goal 4 Achieved (Y/N)			
	Whole (tick)	Part (tick)	Current Position	Part of task (? / ?)	Whole (tick)	Part (tick)	Current Position	Part of task (? / ?)	Whole (tick)	Part (tick)	Current Position	Part of task (? / ?)	Whole (tick)	Part (tick)	Current Position	Part of task (? / ?)
Session number: Progress since week 8	Goal 1				Goal 2				Goal 3				Goal 4			
	Current Position		Part of task (? / ?)	Achieved (Y/N)	Current Position		Part of task (? / ?)	Achieved (Y/N)	Current Position		Part of task (? / ?)	Achieved (Y/N)	Current Position		Part of task (? / ?)	Achieved (Y/N)
Final session	Week 8 Goal 1 Achieved (Y/N)				Week 8 Goal 2 Achieved (Y/N)				Week 8 Goal 3 Achieved (Y/N)				Week 8 Goal 4 Achieved (Y/N)			

Therapy record

Participant ID:

	Goal 1	Goal 2	Goal 3	Goal 4	Session notes
Session number:					
Date: __/__/20__	Repetitions	Repetitions	Repetitions	Repetitions	
Session duration: ____mins					
Therapist name:		Signature:	Duration of activity practice:		
	Goal 1	Goal 2	Goal 3	Goal 4	Session notes
Session number:					
Date: __/__/20__	Repetitions	Repetitions	Repetitions	Repetitions	
Session duration: ____mins					
Therapist name:		Signature:	Duration of activity practice:		
	Goal 1	Goal 2	Goal 3	Goal 4	Session notes
Session number:					
Date: __/__/20__	Repetitions	Repetitions	Repetitions	Repetitions	
Session duration: ____mins					
Therapist name:		Signature:	Duration of activity practice:		
	Goal 1	Goal 2	Goal 3	Goal 4	Session notes
Session number:					
Date: __/__/20__	Repetitions	Repetitions	Repetitions	Repetitions	
Session duration: ____mins					
Therapist name:		Signature:	Duration of activity practice:		

Therapy record

Participant ID:

	Goal 1	Goal 2	Goal 3	Goal 4	Session notes
Session number:					
Date: __/__/20__	Repetitions	Repetitions	Repetitions	Repetitions	
Session duration: ____mins					
Therapist name:	_____	Signature: _____	Duration of activity practice: _____mins		
	Goal 1	Goal 2	Goal 3	Goal 4	Session notes
Session number:					
Date: __/__/20__	Repetitions	Repetitions	Repetitions	Repetitions	
Session duration: ____mins					
Therapist name:	_____	Signature: _____	Duration of activity practice: _____mins		
	Goal 1	Goal 2	Goal 3	Goal 4	Session notes
Session number:					
Date: __/__/20__	Repetitions	Repetitions	Repetitions	Repetitions	
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Therapy record

Participant ID:

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Final session feedback and advice

Participant ID:

Feedback given to participant about progress over the programme

Further advice given regarding maintaining upper limb function (e.g home exercises)

Session notes continued

Participant ID:

[illegible][illegible]

Session notes continued

Participant ID:

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[illegible][illegible]

Upper limb assessment

Upper limb assessment to be completed by senior therapist

Session number: _____

Side of body affected by current stroke: _____

Prompts:

- Selective movement
- Passive range of movement
- Muscle tone
- Compensations
- Proprioception
- Associated reactions
- Pain

Shoulder		Wrist	
Elbow		Hand	

Inattention / other comments:

Upper limb assessment

Upper limb assessment to be completed by senior therapist

Session number: _____

Side of body affected by current stroke: _____

Prompts:

- Selective movement
- Passive range of movement
- Muscle tone
- Compensations
- Proprioception
- Associated reactions
- Pain

Shoulder		Wrist	
Elbow		Hand	

Inattention / other comments:

Upper limb assessment

Upper limb assessment to be completed by senior therapist

Session number: _____

Side of body affected by current stroke: _____

Prompts:

- Selective movement
- Passive range of movement
- Muscle tone
- Compensations
- Proprioception
- Associated reactions
- Pain

Shoulder		Wrist	
Elbow		Hand	

Inattention / other comments:
