**Functional prognosis**

**What is the expected sequence of functional recovery? (0–6 months)**

(NB: sequence only applies to hemispheric strokes)

- Natural sequence for mobility: lying → sitting → standing/up sitting down → standing → walking
- Natural sequence for basic ADLs: care for external appearance → eating → transfers → toilet use → mobility → undressing and dressing → bathing/showering → walking stairs

**Assess determinants objectively**

- day 2: walking ability and dexterity
- day 5: basic ADLs

**Recovery of walking ability**

- Favorable determinants: presence of sitting balance
- Operationalization of favorable prognosis:
  - TCT – sitting balance: 25 points
  - MI – lower extremity ≥ 25 points

**Recovery of dexterity**

- Favorable determinants: some voluntary finger extension
- Limited, somewhat limited or unlimited ADL independence
  - BI at end of week 1: ≥ 7
  - NIHSS: ≤ 7

**Recovery of basic ADLs**

- Favorable determinants: reasonable ADL independence at end of first week
- Operationalization of favorable prognosis:
  - FMA – finger extension: ≥ 1 point
  - MI – shoulder abduction: ≥ 9 points

**What are the determinants of functional recovery, how are they objectively assessed and what measurement instruments are recommended? (0–6 months)**

- Consider administering CSI.
- Patient: Mobility
  - Able to walk
    - If FAC ≥ 3 and/or higher cortical function impairments, advanced age, depression, fatigue, physical inactivity resulting in decline of mobility:
      - Consider 6MWT.
    - If 6MWT comfortable:
      - Assess walking speed objectively (6MWT) comfortable:
        - Every 6 months, paying attention to use of aids and occurrence of falls.
        - If functional performance changes, resume or continue physical therapy if necessary (continue at Diagnostic Process).
  - Unable to walk
    - Assess mobility objectively every 6 months, including aids like wheelchair or mobility scooter, radius of action, independence, safety.
    - If functional performance changes, resume or continue physical therapy if necessary (continue at Diagnostic Process), or consult other discipline with relevant expertise.

- Dexterity
  - If recovery of dexterity incomplete (FAT < 4) and somatosensory functional impairments and/or neglect present:
    - Consider administering ARAT.
  - If FAT ≥ 5 and no somatosensory functional impairments or neglect:
    - Assess dexterity objectively (ARAT) every 6 months. If functional performance changes, resume or continue physical therapy if necessary (continue at Diagnostic Process).
    - If deterioration is expected:
      - Consider objectively assessing dexterity (ARAT) every 6 months.
      - If deterioration continues, consider administering ARAT every 6 months.

- ADLs
  - Assess basic and extended ADLs objectively (BI, NEADL) every 6 months.
  - Elevated risk of functional decline if recovery of basic and/or extended ADL incomplete and/or higher cortical function impairments and advanced age.
  - If functional performance changes, resume or continue physical therapy if necessary (continue at Diagnostic Process), or consult other discipline with relevant expertise.

- Psychosocial functioning and lifestyle
  - Patient: Consider administering MoCA, HADS, SSQoL and physical activity level assessment.
  - Partner: Consider administering CSI.

**Assess functioning objectively 6 months after stroke**

- **Mobility**
  - Able to walk
  - If FAC ≥ 3 and/or higher cortical function impairments, advanced age, depression, fatigue, physical inactivity resulting in decline of mobility:
    - Consider 6MWT.
  - If 6MWT comfortable:
    - Assess walking speed objectively (6MWT) comfortable:
      - Every 6 months, paying attention to use of aids and occurrence of falls.
      - If functional performance changes, resume or continue physical therapy if necessary (continue at Diagnostic Process).
  - Unable to walk
    - Assess mobility objectively every 6 months, including aids like wheelchair or mobility scooter, radius of action, independence, safety.
    - If functional performance changes, resume or continue physical therapy if necessary (continue at Diagnostic Process), or consult other discipline with relevant expertise.

**How is the patients functioning (or the risk of deterioration thereof) evaluated during the chronic phase and which assessment times are recommended?**

- **Assess at least:**
  - Cognitive functions (MoCA)
  - Motor functions (FMA for upper and lower extremity)
  - Resistance to passive movements
  - Range of motion
  - Quality of life

**Additional investigations**

- Impairments of body functions, limitations of activities, and participation see **Chapter C**

**Recommended measurement instruments**

- Basic measurement instruments
  - Activities:
    - Basic ADLs
    - Dexterity and related functions and activities
    - Environmental factors:

- Recommended assessment points

- Treatment plan

- Prognosis

- Favorable
  - Continue at Diagnostic Process

- Unfavorable
  - Continue at Diagnostic Process
  - Weeks 0–4: assess determinants objectively each week
  - Months 1–6: assess determinants objectively each month

- Information from patient’s medical file or file kept by other discipline

- Recurrent stroke

- Relevant psychiatric history (CIRS)*

- Relevant medical history (CIRS)*

- Presence of home adaptations/aids

- Patient’s preferred hand

- Use of measurement instruments in: therapy if necessary (continue at Diagnostic Process).
**Section D.1**

**Additional history-taking / heteroanamnesis**

- patient’s preferred hand
- pre-existing functioning
- patient’s domestic situation
- presence of home adaptations/aids
- relevant medical history (CIRS)*
- relevant psychiatric history (CIRS)*
* This information may be available from the patient’s medical file.

**Additional investigations**

- diagnostics
- use of measurement instruments in accordance with Clinimetrics Flowchart
- physical therapist’s findings / results of additional investigations
- impairments of body functions, limitations of activities, and restrictions of participation see Quick reference card Additional investigations

**Therapeutic Process**

**Treatment plan**

- defined interdisciplinary goal
- interdisciplinary agreements
- expected duration of treatment, number of sessions a week and intended duration of session(s).

**Treatment**

See Therapeutic Process Flowchart

**Evaluation**

- Depending on presenting problem and related treatment goals and/or at physical therapist’s discretion
- Use of measurement instruments in accordance with Clinimetrics Flowchart

**Conclusion of treatment episode**

- date and reason for discharge/conclusion of treatment
- agreements about aftercare
**Functional prognosis**

- Assess functioning objectively 6 months after stroke
- Which assessment times are recommended?
  - No recurrent stroke
  - Premorbid ADL independence
  - Lower age - moderate/mild neurological deficits
  - NIHSS:
    - Basic ADLs - reasonable ADL independence at end of first week - limited, somewhat limited or dexterity - some motor function of paretic arm - some voluntary finger extension

**Physical therapy**

- Perceived quality of life: SSEQOL
  - Quality of life

**Clinimetrics**

### Walking and walking-related functions and activities

**Functions:**
- MI for lower extremity: muscle strength
- 10MWT comfortable (FAC ≥ 3): walking speed
- FMA for lower extremity: selective movements
- 10MWT maximum (FAC ≥ 3): walking speed
- 6MWT (whether or not combined with Borg RPE) (FAC ≥ 3): walking distance, functional endurance

**Activities:**
- TCT: trunk activity
- BBS: sitting and standing balance
- FAC: walking ability
- TIS: sitting balance
- TUG (FAC ≥ 3): walking ability

### Dexterity and related functions and activities

**Functions:**
- MI for upper extremity: muscle strength
- FMA for upper extremity: selective movements

**Activities:**
- FAT*: dexterity
- ARAT*: dexterity
- NIHSS*: dexterity

### Basic ADLs

**Activities:**
- BI** basic ADLs

### Extended ADLs

**Activities:**
- NEADL extended ADLs

### Perceived quality of life:

- Participation: SSEQOL

### Other:

**Functions:**
- NNMM: range of motion
- MAS: resistance to passive movements
- EmMSA: somatosensory impairments
- NIHSS***: neurological impairments
- CIRS: multimorbidities
- NPRS: pain experienced
- FES: self-efficacy in maintaining balance
- FES*: fatigue
- HADS**: anxiety and depression
- MoCA*: cognitive functions
- 0–10Ct*: neglect

**Activities:**
- mRS: functional status

**Environmental factors:**
- CSI**: caregiver strain

---

**Recommended assessment points**

### Basic measurement instruments

- Always to be administered:
  - During the diagnostic process
  - At conclusion of treatment period and when transferring a patient to another physical therapist
  - At the end of the first week, and 3 and 6 months after the stroke

- To be administered depending on context:
  - Just before any interdisciplinary consultation (functional [rehabilitation] outcomes)
  - Timing of administration depends on patient's presenting problem and corresponding treatment goals, and/or at the physical therapist's discretion

### Recommended measurement instruments

- Timing of administration depends on patient's presenting problem and corresponding treatment goals, and/or at the physical therapist’s discretion

---

*HAR = hyperacute or acute (rehabilitation) phase; VR = early rehabilitation phase; LR = late rehabilitation phase; RC = rehabilitation during chronic phase.

- Phase in which the basic / recommended measurement instrument is administered.

10MWT = Ten–meter walk test; 6MWT = Six–minute walk test; ARAT = Action Research Arm Test; BI = Barthel Index; BBS = Berg Balance Scale; Borg RPE = Borg Rating of Perceived Exertion; CIRS = Cumulative Illness Rating Scale; CSI = Caregiver Strain Index; EmMSA = Erasmus MC modification of the (revised) Nottingham Sensory Assessment; FAC = Functional Ambulation Categories; FAT = Frenchay Arm Test; FES = Falls–Efficacy Scale; FMA = Fugl–Meyer Assessment; FSS = Fatigue Severity Scale; HADS = Hospital Anxiety and Depression Scale; MAS = Modified Ashworth Scale; MI = Miotoeity Index; MoCA = Montreal Cognitive Assessment; mRS = Modified Rankin Scale; NEADL = Nottingham Extended ADL index; NIHSS = National Institutes of Health Stroke Scale; NIHPT = Nine Hole Peg Test; N2M = Goniometer using the Neutral–Zero method; NPRS = Numeric Pain Rating Scale; O–10Ct = 0–10 Letter Cancellation Test; SSEQOL = Stroke-Specific Quality of Life scale; TCT = Trunk Control Test; TIS = Trunk Impairment Scale; TUG = Timed Up and Go test.

- To assess the premorbid situation.
- Intended to detect and report; treatment not primarily within the physical therapy domain.
- To be administered from 7 days after the stroke.
- After patient is discharged home or after trial stay at home, provided an informal caregiver is present.

* Possibly to be derived from occupational therapy file.
** Possibly to be derived from nursing file.
*** Possibly to be derived from medical file.
Therapeutic Process

Is mobilization < 24 hours after the stroke feasible?

No

(aplies only if mobilization is contra-indicated)

Are there problems while lying in bed regarding:
- body position in the bed?
- changing body position?
- airways ventilation?*

Are any complications to be expected while lying in bed?
- bronchopneumonia
- deep vein thrombosis

* Hemorrhagic stroke is a relative contra-indication for drainage positions

Are there any limitations of activities regarding walking or related functions and activities?

Consider intervention (only Level 1)

Intervention:
- Early mobilization from bed
- Exercising sitting balance
- Standing balance with visual and/or auditory feedback
- Partial sitting mobilization with body weight support
- Knee-walking gait training
- Heel and toe exercises without body weight support
- Gait training with exoskeleton
- Circuit class training
- Circuit class training with informal caregiver
- Muscle strength training for paretic leg

Interventions for somatosensory functions
- Electrostimulation of paretic leg – TENS
- Electrostimulation of paretic leg – NMS
- Electrostimulation of paretic wrist/finger extensors – NMS
- Electrostimulation of paretic wrist/finger extensors and flexors – NMS
- Electrostimulation of paretic shoulder – NMS

Interventions for somatosensory functions
- Virtual reality training of paretic arm
- Robot-assisted elbow/wrist training – bilateral**
- Robot-assisted arm/hand training
- Low-intensity mCIMT
- Combined muscle strength and aerobic training
- Training in water (hydrotherapy)

Intervention:
- Monitoring for pain, edema and fever
- Changing position in bed
- Positioning the paretic side
- Consult (neuro)psychologist: strategy training using internal and/or external strategies
- Consult (neuro)psychologist: compensation strategies training
- Consult occupational therapist and/or (neuro)psychologist: strategy training; gestural training

<table>
<thead>
<tr>
<th>Section</th>
<th>Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>E.5</td>
<td>Positioning the paretic side</td>
</tr>
<tr>
<td>E.5</td>
<td>Pressure sore prevention (regularly changing body position)</td>
</tr>
<tr>
<td>E.5</td>
<td>Breathing exercises and manual support</td>
</tr>
<tr>
<td>E.5</td>
<td>Changing position in bed</td>
</tr>
<tr>
<td>E.5</td>
<td>Monitoring for pain, edema and fever</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Measures</th>
<th>Section</th>
</tr>
</thead>
<tbody>
<tr>
<td>E.6</td>
<td>Pain</td>
</tr>
<tr>
<td>E.6</td>
<td>Dexterity</td>
</tr>
<tr>
<td>E.6</td>
<td>Muscle strength</td>
</tr>
<tr>
<td>E.6</td>
<td>Selective movements</td>
</tr>
<tr>
<td>E.6</td>
<td>Resistance to passive movements</td>
</tr>
<tr>
<td>E.6</td>
<td>Active range of motion</td>
</tr>
<tr>
<td>E.6</td>
<td>EMG activity</td>
</tr>
<tr>
<td>E.6</td>
<td>Maximum walking speed</td>
</tr>
<tr>
<td>E.6</td>
<td>Maximum walking speed</td>
</tr>
<tr>
<td>E.6</td>
<td>Walking distance</td>
</tr>
<tr>
<td>E.6</td>
<td>Spatiotemporal parameters</td>
</tr>
<tr>
<td>E.6</td>
<td>Postural sway</td>
</tr>
<tr>
<td>E.6</td>
<td>Symmetry of ground reaction forces</td>
</tr>
<tr>
<td>E.6</td>
<td>Heart rate</td>
</tr>
<tr>
<td>E.6</td>
<td>Blood pressure</td>
</tr>
<tr>
<td>E.6</td>
<td>Aerobic endurance</td>
</tr>
<tr>
<td>E.6</td>
<td>Energy consumption</td>
</tr>
<tr>
<td>E.6</td>
<td>Body weight</td>
</tr>
<tr>
<td>E.6</td>
<td>Workload</td>
</tr>
<tr>
<td>E.6</td>
<td>Respiratory functions</td>
</tr>
<tr>
<td>E.6</td>
<td>Anxiety</td>
</tr>
<tr>
<td>E.6</td>
<td>Depression</td>
</tr>
<tr>
<td>E.6</td>
<td>Fatigue</td>
</tr>
<tr>
<td>E.6</td>
<td>Fear of falling</td>
</tr>
<tr>
<td>E.6</td>
<td>Complications</td>
</tr>
<tr>
<td>E.6</td>
<td>Neurological functions</td>
</tr>
<tr>
<td>E.6</td>
<td>Falls</td>
</tr>
<tr>
<td>E.6</td>
<td>Physical activity level in daily life</td>
</tr>
<tr>
<td>E.6</td>
<td>Quality of life</td>
</tr>
</tbody>
</table>

- Effective: = no added value; × adverse effect. * Effect on comfortable walking speed, sitting balance, standing balance, and walking ability applies only to patients unable to walk unaided. ** Adverse effect on aerobic endurance applies only to patients in early rehabilitation phase; effect on walking distance and anxiety applies to patients walking unaided.

Interventions for somatosensory functions
- Electrostimulation of paretic arm – TENS
- Electrostimulation of paretic wrist/finger extensors – NMS
- Electrostimulation of paretic wrist/finger extensors and flexors – NMS
- Electrostimulation of paretic shoulder – NMS

Interventions for somatosensory functions
- Virtual reality training of paretic arm
- Robot-assisted elbow/wrist training – bilateral**
- Robot-assisted arm/hand training
- Low-intensity mCIMT
- Combined muscle strength and aerobic training
- Training in water (hydrotherapy)

Intervention:
- Monitoring for pain, edema and fever
- Changing position in bed
- Positioning the paretic side
- Consult (neuro)psychologist: strategy training using internal and/or external strategies
- Consult (neuro)psychologist: compensation strategies training
- Consult occupational therapist and/or (neuro)psychologist: strategy training; gestural training

Section: F.1.1

Impairments at ICF body function level
- selective movements
- muscle strength
- resistance to passive movements
- active range of motion
- EMG activity
- comfortable walking speed
- maximum walking speed
- walking distance
- spatiotemporal parameters
- postural sway
- symmetry of ground reaction forces
- heart rate
- blood pressure
- aerobic endurance
- energy consumption
- body weight
- workload
- respiratory functions
- anxiety
- depression
- fatigue
- fear of falling
- complications
- neurological functions
- falls

Activities and participation
- sitting balance
- speed of reaching while sitting
- standing balance
- standing up and sitting down
- walking ability
- basic ADLs
- extended ADLs
- physical activity level in daily life
- quality of life

Environmental factors
- perceived burden of care of informal caregiver
- discharge home
### Therapeutic Process

**Intervention?**

Patients walking unaided.

Unable to walk unaided. ** Adverse effect on aerobic endurance applies only to patients in early rehabilitation phase; effect on walking distance and anxiety applies to

#### Environmental factors

- Quality of life
  - Walking ability
  - Standing balance
  - Speed of reaching while sitting
  - Neurological functions
  - Fear of falling
  - Workload
  - Aerobic endurance
  - Blood pressure
  - Symmetry of ground reaction forces
  - Spatiotemporal parameters
  - Maximum walking speed
  - Active range of motion
  - Muscle strength

**Consider intervention (only Level 1)**

*Hemorrhagic stroke is a relative contra-indication for drainage positions.*

Is mobilization < 24 hours after the stroke feasible?

Are any complications to be expected while lying in bed?

#### Section: F.1.1

- Electrostimulation of paretic leg – NMS
- Electrostimulation of paretic leg – EMG-NMS
- Biofeedback for paretic leg
- Spatiotemporal parameters
- Maximum walking speed
- Muscle strength
- Pain
- Active range of motion
- Dexterity
- Perceived quality of arm/hand
- Selective movements
- Somatosensory function
- Resistance to passive movements
- Active range of motion
- Passive range of motion
- Pain
- Glenohumeral subluxation
- Somatosensory function

#### Section: F.1.2

- Consult (neuro)physiologist: visual scanning training
- Consult occupational therapist and/or (neuro)psychologist: strategy training; gestural training

#### Section: F.1.3

- Rotation of affected arm
- Rotation of non-affected arm
- Passive range of motion
- Active range of motion
- Control of arm
- Control of hand
- Use of assistive devices
- Use of assistive devices and combinations of splinting

**Consider intervention (only Level 1)**

**KNGF Guideline**

**Stroke**

---

**KNGF Guideline**

**Stroke**

---

© KNGF
Therapeutic Process

Does patient have limitations of activities for walking or related functions and activities?
Consider intervention (only Level 2)

Intervention:
- Body-weight supported treadmill training
- Treadmill exercises without body weight support
- Overground gait training
- Gait training with external auditory rhythms
- Gait training in public spaces

Impairments at ICF body function level
- selective movements
- muscle strength
- resistance to passive movements
- postural sway
- spatiotemporal parameters
- walking speed
- basic ADLs
- walking ability
- standing balance
- standing up from chair
- speed of standing up/sitting down
- walking ability
- basic ADLs

Activities and participation
- sitting and standing balance
- standing up from chair
- speed of standing up/sitting down
- walking ability
- basic ADLs

Environmental factors
- length of stay
- quality of life

Are any aids required for mobility?
- walking aids
- leg orthoses
- wheelchair

Does patient have any limitations of other ADLs regarding:
- dyspraxia?
- leisure time activities?

Does patient have limitations of cognitive abilities regarding:
- attention span?
- memory?
- attention for neglected side?