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

What are the determinants of functional recovery, how are they objectively assessed and what measurement instruments are recommended? (0–6 months) Section D.1

Assess determinants objectively

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

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

Recovery of	Favorable determinants	Operationalization of favorable prognosis *Assess at least:*	
walking ability	– presence of sitting balance – reasonable to good motor function of paretic leg – reasonable to good ADL independence – lower age – absence of homonymous hemianopia – urinary continence – premorbid independent walking ability – premorbid ADL independence	– sitting unaided for at least 30 seconds – no severe paresis of the leg	TCT – sitting balance: 25 points MI – lower extremity ≥ 25 points
dexterity	– some motor function of paretic arm – some dexterity – presence of neurophysiological functions (motor evoked potentials, SEP)	– some voluntary finger extension – presence of at least visible or perceptible contraction of shoulder abductors	FMA – finger extension: ≥ 1 point MI – shoulder abduction: ≥ 9 points
basic ADLs	– reasonable ADL independence at end of first week – reasonable to good neurological status, incl. motor function of arm – lower age – presence of walking ability – premorbid ADL independence – premorbid good participation – no recurrent stroke	– limited, somewhat limited or unlimited ADL independence at end of first week – moderate/mild neurological deficits	BI at end of week 1: ≥ 7 NIHSS: ≤ 7

(NB The determinants apply particularly to strokes in the anterior circulation of the carotid artery.)

How is the patients functioning (or the risk of deterioration thereof) evaluated during the chronic phase and which assessment times are recommended? Section D.2

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 10MT comfortable: ▶ consider 6MWT. → Assess walking speed objectively (10MWT 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 1–4) and somatosensory functional impairments and/or neglect present: ▶ consider administering ARAT. → Assess dexterity objectively (ARAT) every 6 months. If functional performance changes, resume or continue physical therapy if necessary (continue at Diagnostic Process).
- If FAT 5 and no somatosensory functional impairments or neglect. → No further action in the absence of signs of impending deterioration of dexterity. If deterioration is expected: ▶ consider objectively assessing dexterity (ARAT) every 6 months. If functional performance changes, resume physical therapy if necessary (continue at Diagnostic Process).

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. → If problem detected: notify patient's family physician or elderly care physician. If treatment options within physical therapy domain available: see Diagnostic Process.
- Partner: ▶ consider administering CSI. → If problem detected: notify patient's family physician or elderly care physician. If treatment options within physical therapy domain available: see Diagnostic Process.

KNGF Guideline
Stroke

Royal Dutch Society for Physical Therapy

Diagnostic Process

Presentation (referral)

General patient details
- diagnosis at referral
- laterality of stroke
- type of stroke
- date of stroke
- recurrent stroke

Other details
Information from patient's medical file or file kept by other discipline (at hospital or institution)

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**

Analysis

prognostic determinants: **see Functional Prognosis Flowchart**

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

Clinimetrics

Domain ICF level		(H)AR	VR	LR	RC	Chapter C
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	●	●	●	●	
NHPT*	dexterity	●	●	●	●	
Basic ADLs						
Activities:						
BI**	basic ADLs	●[a]	●	●	●	
Extended ADLs						
Activities:						
NEADL	extended ADLs	●[a]	●	●	●	
Perceived quality of life:						
Participation:						
SSQOL	quality of life				●	
Other:						
Functions:						
NNM	range of motion	●	●	●	●	
MAS	resistance to passive movements	●	●	●	●	
EmNSA	somatosensory impairments	●	●	●	●	
NIHSS***	neurological impairments	●	●			
CIRS	multimorbidities	●	●	●	●	
NPRS	pain experienced	●	●	●	●	
FES	self-efficacy in maintaining balance	●	●	●	●	
FSS[a]	fatigue			●	●	
HADS[b,c]	anxiety and depression		●	●	●	
MoCA[b]	cognitive functions	●	●	●	●	
O-LCT[b]	neglect	●	●	●	●	
Activities:						
mRS	functional status	●	●	●	●	
Environmental factors:						
CSI[d]	caregiver strain		●	●	●	

Recommended assessment points	(H)AR	VR	LR	RC	Chapter C
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					
To be administered depending on context:					
timing of administration depends on patient's presenting problem and corresponding treatment goals, and/or at the physical therapist's discretion	●	●	●	●	

(H)AR = 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.

10MLT = 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; EmNSA = 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 = Motricity Index; MoCA = Montreal Cognitive Assessment; mRS = Modified Rankin Scale; NEADL = Nottingham Extended ADL index; NIHSS = National Institutes of Health Stroke Scale; NHPT = Nine Hole Peg Test; NZM = Goniometer using the Neutral-Zero method; NPRS = Numeric Pain Rating Scale; O-LCT = O-Letter Cancellation Test; SSQoL = Stroke-Specific Quality of Life scale; TCT = Trunk Control Test; TIS = Trunk Impairment Scale; TUG = Timed Up and Go test.

a To assess the premorbid situation. b Intended to detect and report; treatment not primarily within the physical therapy domain. c To be administered from 7 days after the stroke. d 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

Intervention?

Is mobilization < 24 hours after the stroke feasible?

Evaluation:
Which measurement instruments?
See **Clinimetrics flowchart**

No (applies 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

Measures	Section
▶ positioning the paretic side	E.5
▶ pressure sore prevention (regularly changing body position)	E.5
▶ breathing exercises and manual support	E.5
Measures	
▶ changing position in bed	E.5
▶ monitoring for pain, edema and fever	E.5

Yes **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	Exercising standing up and sitting down	Standing balance without visual feedback	Postural control with visual feedback	Balance during various activities	Body-weight supported treadmill training	Robot-assisted gait training*	Treadmill exercises without body weight support	Overground gait training**	Gait training with external auditory rhythms	Gait training in public spaces	Virtual reality mobility training	Circuit class training	Exercising with informal caregiver	Muscle strength training for paretic leg	Aerobic training	Combined muscle strength and aerobic training	Training in water (hydrotherapy)	Interventions for somatosensory functions	Electrostimulation of paretic leg – TENS	Electrostimulation of paretic leg – NMS	Electrostimulation of paretic leg – EMG-NMS	Biofeedback for paretic leg
Section:	F.1.1	F.1.2	F.1.3	F.1.4	F.1.5	F.1.6	F.1.7	F.1.8	F.1.9	F.1.1	F.1.1	F.1.1	F.1.1	F.1.1	F.1.1	F.1.1	F.1.1	F.1.1	F.1.1	F.1.2	F.1.2	F.1.2	F.1.2	F.1.2
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							=									=	=	=						
- 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	=																							

✓ 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.

Therapeutic Process

Yes → **Does patient have limitations of dexterity and related functions and activities?**

Consider intervention (only Level 1)

Intervention:	Therapeutic positioning of paretic arm*	Reflex-inhibiting positions and immobilization techniques for wrist/hand	Use of air-splints and wrappings around the paretic arm/handd	Supportive techniques/devices for glenohumeral subluxation/hemiplegic shoulder pain	Bilateral arm training	Original CIMT	High-intensity mCIMT	Low-intensity mCIMT	Immobilization of non-paretic arm without specific training of paretic arm	Robot-assisted shoulder/elbow training – unilateral**	Robot-assisted elbow/wrist training – bilateral**	Robot-assisted arm/hand training	Mirror therapy for paretic arm	Virtual reality training of paretic arm	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	Electrostimulation of paretic wrist/finger extensors – EMG-NMS	Electrostimulation of paretic wrist/finger extensors and flexors – EMG-NMS	EMG-biofeedback for paretic arm	Muscle strength training of paretic arm	Trunk restraint while training paretic arm	Interventions for somatosensory functions
Section:	F.4.1	F.4.2	F.4.3	F.4.4	F.4.5	F.4.6	F.4.6	F.4.6	F.4.6	F.4.7	F.4.7	F.4.7	F.4.8	F.4.9	F.4.10	F.4.10	F.4.10	F.4.10	F.4.10	F.4.10	F.4.11	F.4.12	F.4.13	F.4.14
Impairments at ICF body function level																								
- selective movements			=	=	=		=	✓		✓	✓	=	=	=		=	✓	=	✓	=	=	=		=
- muscle strength					=					✓	✓	=				=	✓		=			=		=
- resistance to passive movements		=	=							=			=	×	=				=					✓
- active range of motion																=		=	✓		=	=	=	
- passive range of motion	✓	=																						
- pain	=	=	=	=						✓			=					=				=		=
- glenohumeral subluxation																		✓						
- somatosensory function			=																					✓
Activities and participation																								
- dexterity			=		=	✓	✓	✓		=			=	=		=	=		✓	=	=	=	=	=
- perceived use of arm/hand					=	✓	✓	✓															×	
- perceived quality of arm/hand movements						✓	✓	✓																
- basic ADLs	=				=		=	✓		=				✓	=									
- quality of life								=		=														

✓ effective; = no added value; × adverse effect. * The effect on passive range of motion is not clinically relevant. ** Just as effective as other forms of exercise therapy at equal dosage.

Therapeutic Process

Yes

Does patient have limitations of activities for walking or related functions and activities?

Consider intervention (only Level 2)

Intervention:	Bilateral leg training with rhythmic auditory cueing	Mirror therapy for paretic leg	Limb overloading with external weight on paretic side	Systematic feedback on walking speed	Maintaining ankle dorsiflexion by means of standing frame or night splint	Manual passive mobilization of ankle*	Range of motion exercises for ankle with devices	Ultrasound for paretic leg	Segmental muscle vibration for drop foot	Whole body vibration
Section:	F.2.1	F.2.2	F.2.3	F.2.4	F.2.5	F.2.6	F.2.7	F.2.8	F.2.9	F.2.10
Impairments at ICF body function level										
- selective movements	=	✓								
- muscle strength							=			=
- resistance to passive movements		=					=	=		
- Hmax/Mmax ratio								✓		
- range of motion					=	✓	=	=		
- somatosensory function										=
- walking speed	=		=	✓			=		=	
- symmetry of ground reaction forces						=				
- walking distance				=			=			
- spatiotemporal parameters									=	
- kinematic outcome measures									✓	
- electromyographic functions									✓	
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				=						

✓ effective; = no added value; × adverse effect. * The effect on passive range of motion is not clinically relevant. ** Just as effective as other forms of exercise therapy at equal dosage.

Does patient have limitations of dexterity and related functions and activities?

Consider intervention (only Level 2)

Intervention:	'Continuous passive motion' for shoulder	Subsensory threshold electrical and vibration stimulation of paretic arm	Circuit class training	Passive bilateral arm training	Mechanical arm trainer
Section:	F.5.1	F.5.2	F.5.3	F.5.4	F.5.5
Impairments at ICF body function level					
- selective movements		=	✓	=	=
- muscle strength	=			=	=
- resistance to passive movements	=				
- shoulder joint stability	=				
- pain	=				
- somatosensory function		×			
- neurological functions				=	
- neurophysiological outcome measures				✓	
Activities and participation					
- dexterity		=	✓		✓
- basic ADLs	=				=
- quality of life		=			

✓ effective; = no added value; × adverse effect.

General treatment options		Section
Teleconsultation/ telerehabilitation	to facilitate self-management, independent exercising, and empowerment in patient's own domestic and community environment (Level 2)	B.6
Self-management	to facilitate patient's control of own treatment and initiative	B.7
Lifestyle programs	with aerobic training (clinimetrics and program structure according to *KGNF Guideline on Cardiac Rehabilitation)* to reduce risk factors for stroke if history of TIA or 'minor stroke' (Level 2)	B.8
Falls prevention	to improve walking ability, including screening for elevated falls risk and implementing multifactorial treatment strategy (Level 4)	B.9

Are any aids required for mobility?		Section
walking aids	to improve walking ability (safety, independence, efficiency, confidence) (Level 2)	F.3.1
leg orthoses	to improve walking ability (walking speed, energy consumption, walking distance (Level 2)	F.3.2
wheelchair	To improve mobility of non-ambulatory patients (safety, independence, radius of action) (Level 4)	F.3.3

Does patient have any limitations of other ADLs regarding:		Section
dyspraxia?	consult occupational therapist and/or (neuro)psychologist: strategy training; gestural training	F.6.2
leisure time activities?	consult occupational therapist: learning/re-learning and resuming leisure or social activities in home setting	F.6.3

Does patient have limitations of cognitive abilities regarding:		Section
attention span?	consult (neuro)psychologist: compensation strategies training	G.1
memory?	consult (neuro)psychologist: strategy training using internal and/or external strategies	G.2
attention for neglected side?	consult (neuro)psychologist: visuele scanning training	G.3