

Am I going to recover from my stroke?

Using assessment results to inform your discussions.

Wes Oczkowski, MD, & Pat Miller, PT, PhD

May 17, 2022



MacNeurology
Excellence in Care, Education, and Research

Review stroke assessment tools

Understand trajectories of different categories of stroke with factors that affect it (i.e., pre-morbid status, age, BMI, family support)

Recognize prognostic variables which can inform discussions with patients about their recovery

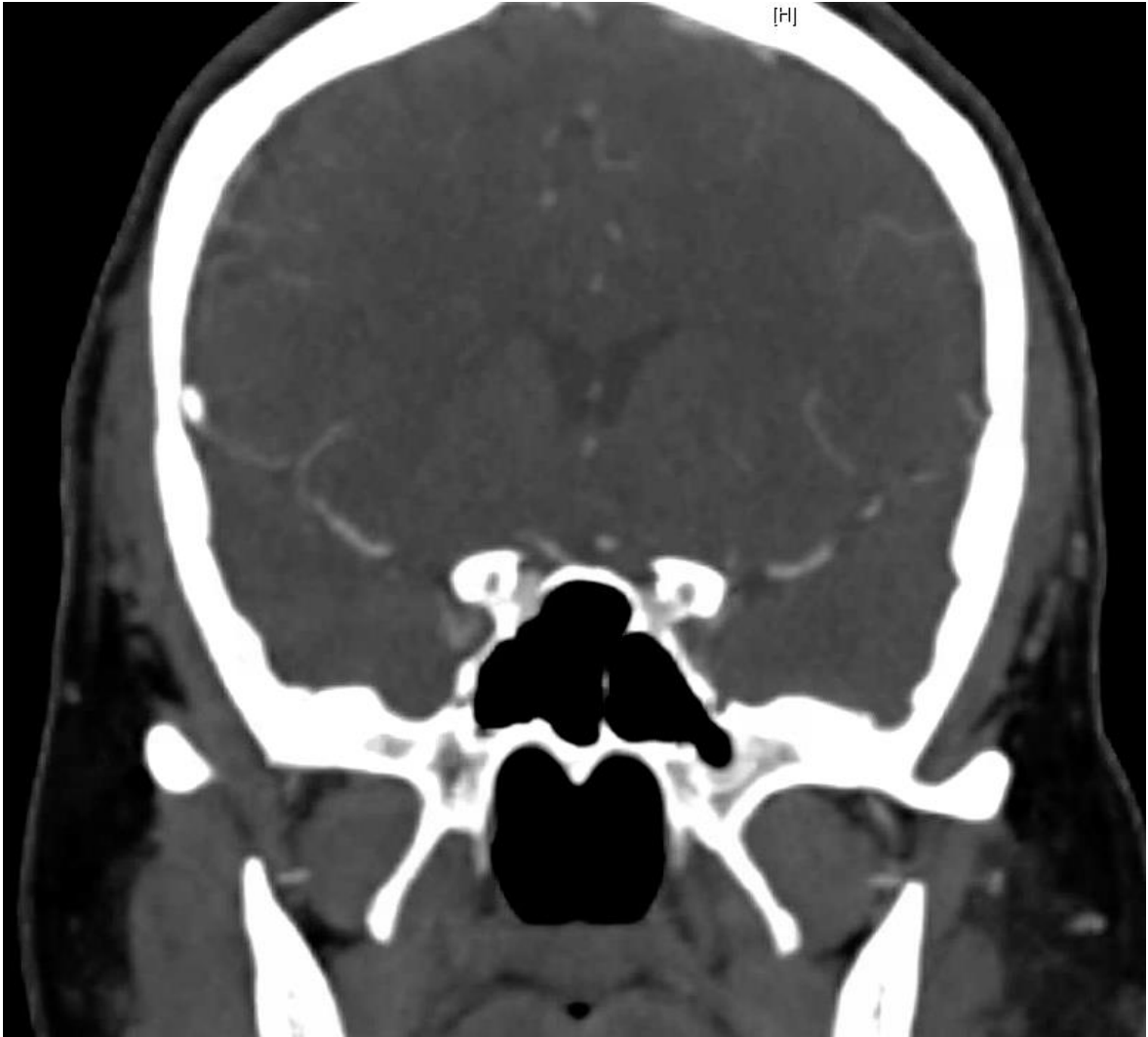
Utilize case-based approach

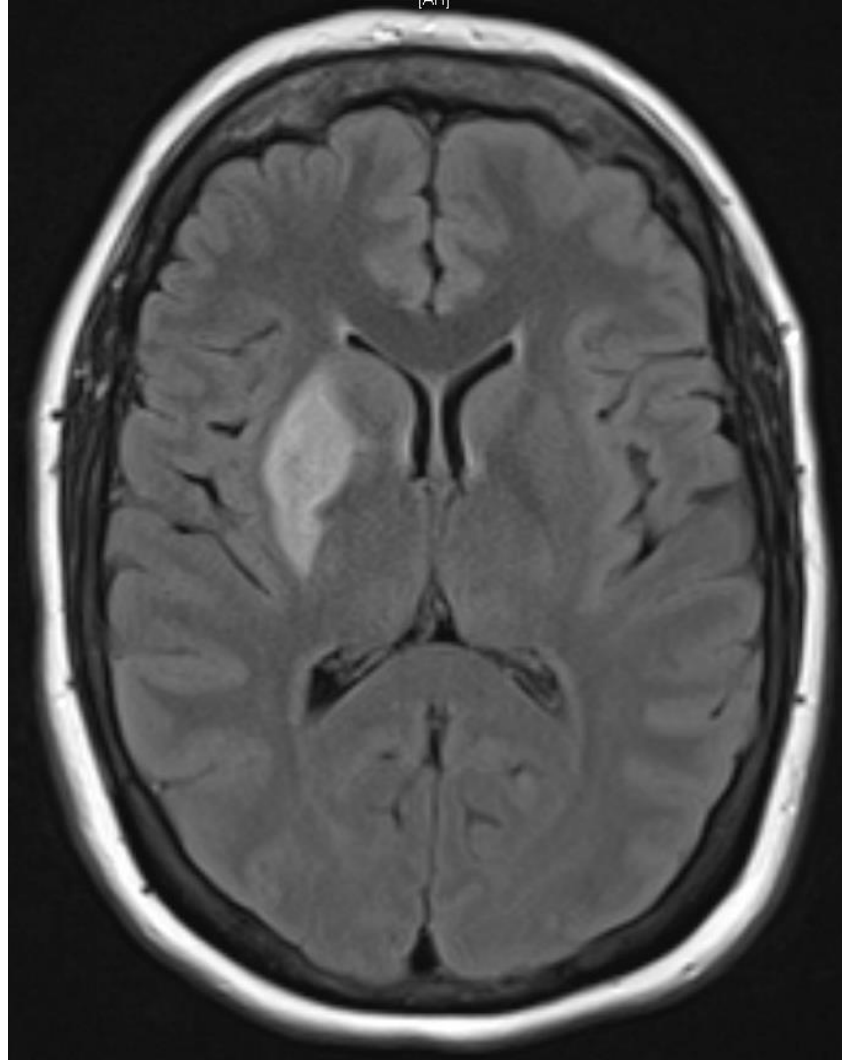
We welcome your questions!

40 year old female

- Rmca stroke, secondary to ICAD
 - Hypertension
 - Dyslipidemia
 - Smoker
 - Obesity
-
- Awoke with stroke, no tPA or EVT
 - NIHSS = 5, face 2, arm 1, leg 1, dysarthria 1
 - Acute care 11 days, 30 days rehab







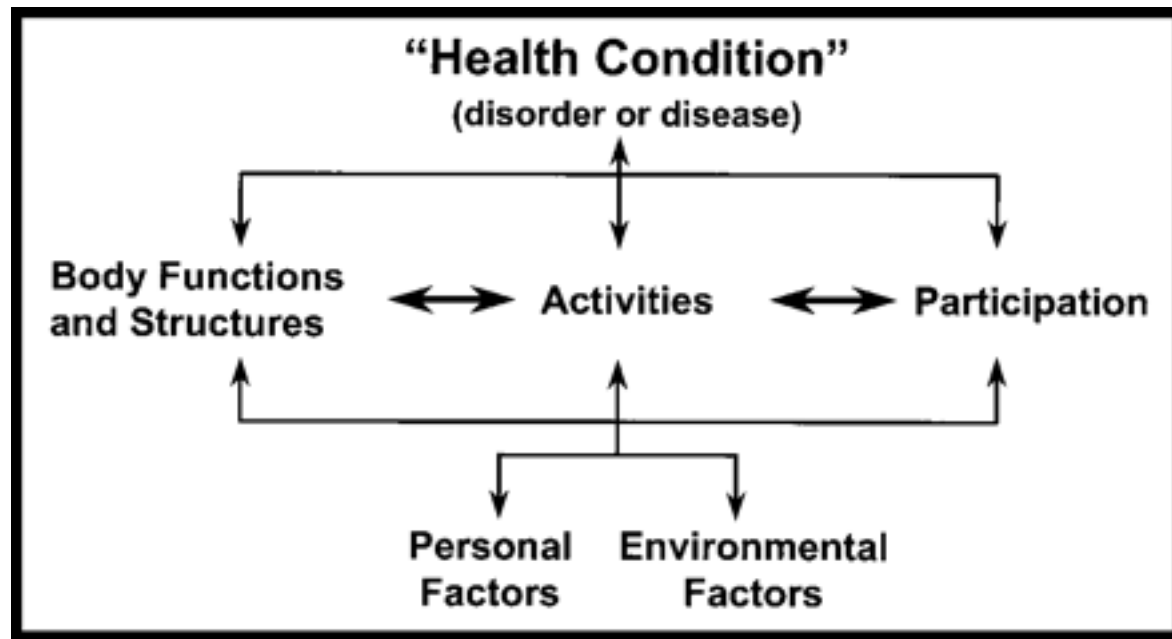
Will she recover?

- 1. We need to wait and see.
- 2. Yes, because she is very young.
- 3. Depends on multiple factors.
- 4. Yes, but only if she receives aggressive rehabilitation.
- 5. I need more information.

WHO ICF Model

- WHO' s international classification of function, disability, and health,
- Provides a framework for the effect of stroke on the individual in terms of
- Pathology (disease or diagnosis),
- Impairment (symptoms and signs),
- Activity limitations (disability),
- Participation restrictions (handicap)

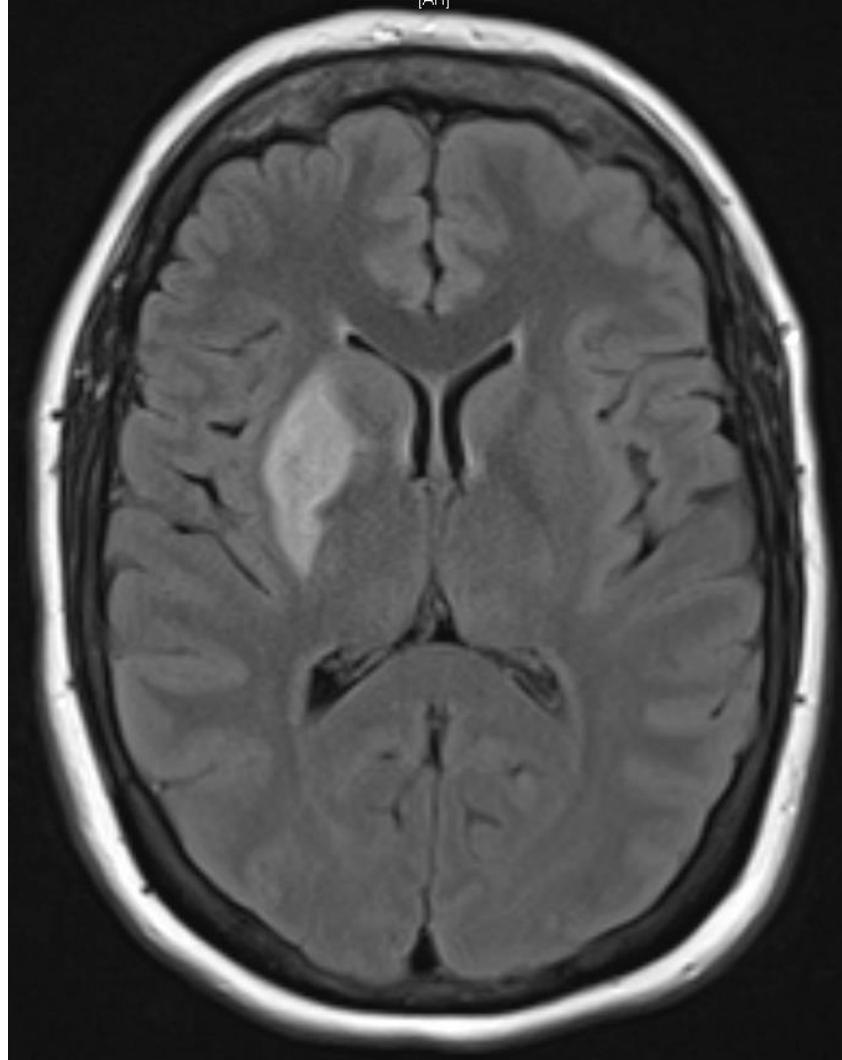
The International Classification of Functioning, Disability, and Health (ICF) Model of Functioning and Disability

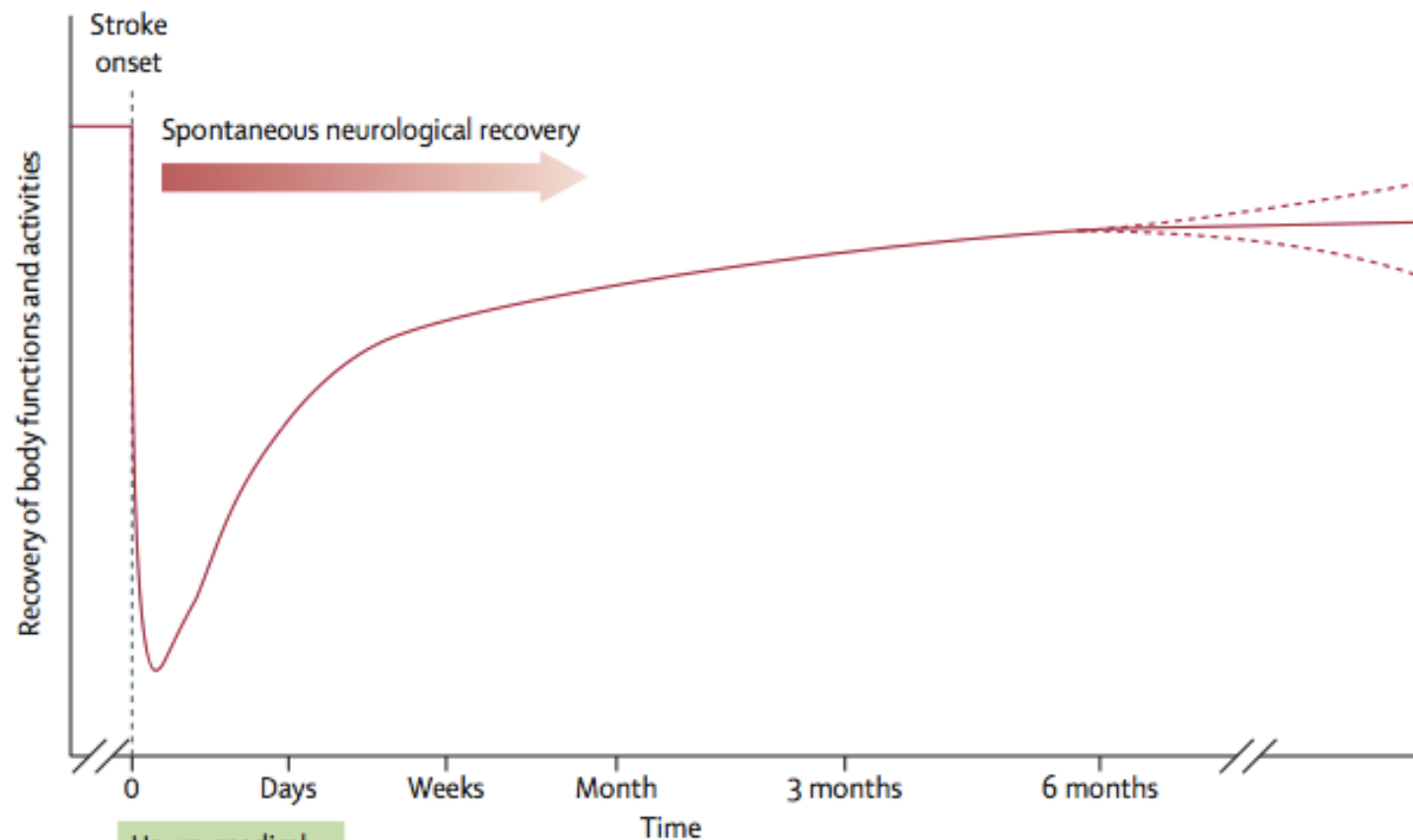


https://cdn.who.int/media/docs/default-source/classification/icf/icfbeginnersguide.pdf?sfvrsn=eead63d3_4&download=true

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Hours: medical

Hours-days: early mobilisation

Days-weeks: restoring impairments in order to regain activities

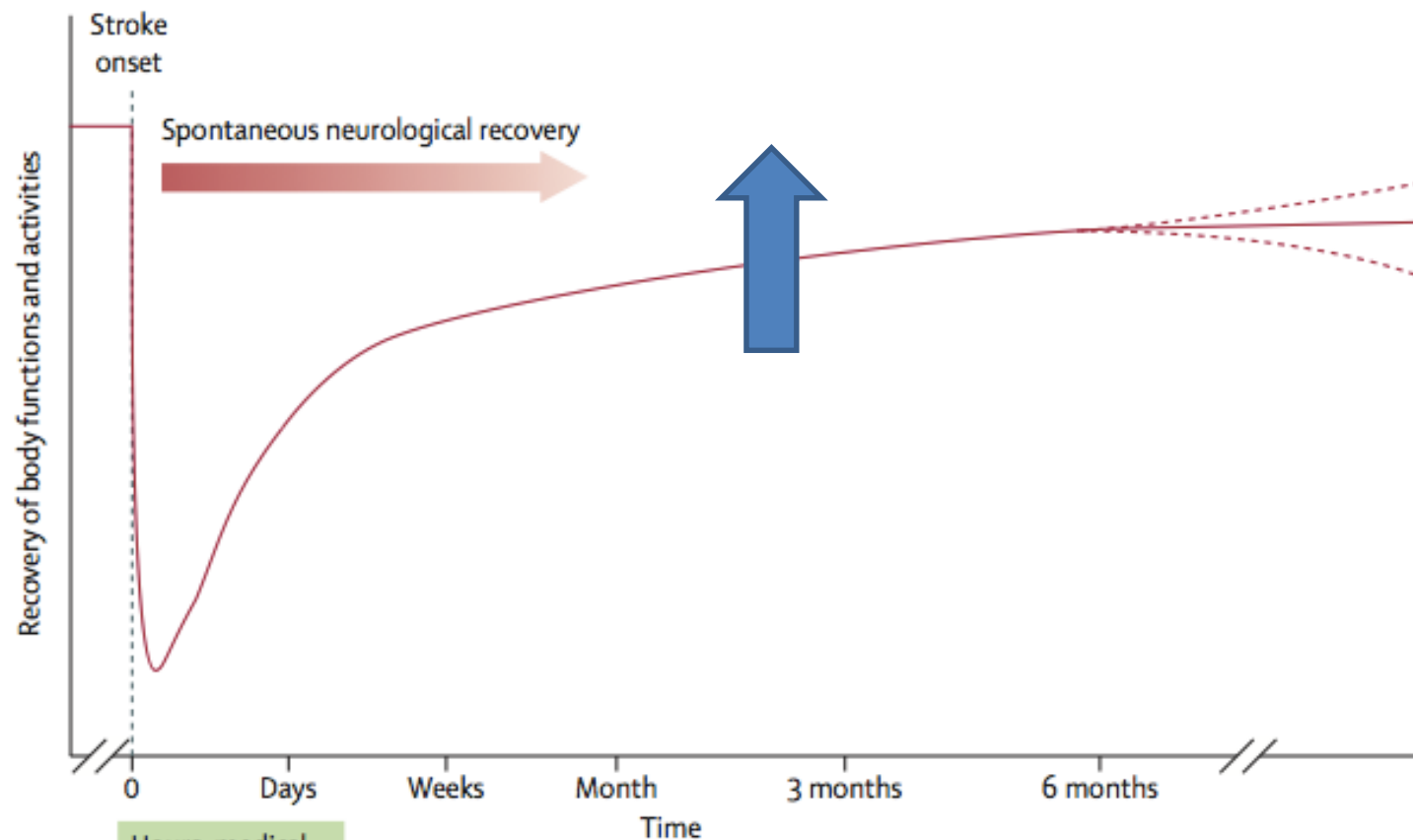
Days-months: task-oriented practice with adaptive learning and compensation strategies

Days-months: specific rehabilitation interventions (including physical fitness) to improve extended activities of daily living and social interaction

Weeks-months: environmental adaptations and services at home

Months-years: maintenance of physical condition and monitoring quality of life

Stroke rehabilitation



Hours: medical

Hours-days: early mobilisation

Days-weeks: restoring impairments in order to regain activities

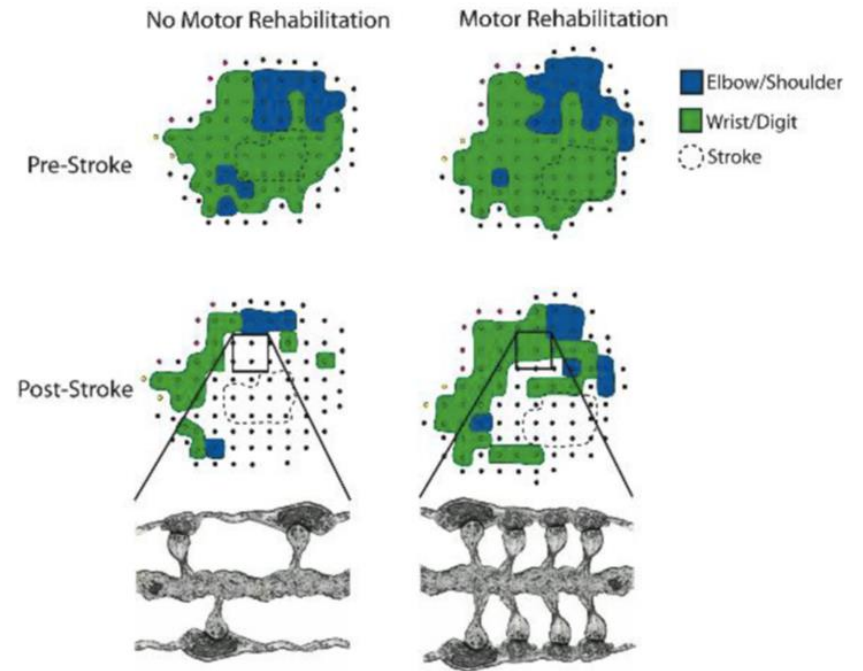
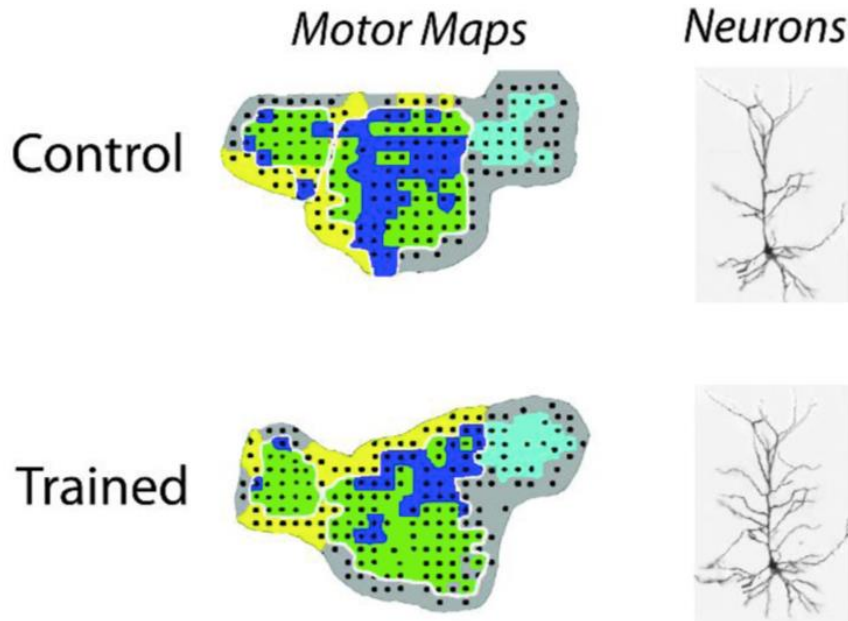
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Weeks-months: environmental adaptations and services at home

Months-years: maintenance of physical condition and monitoring quality of life

Stroke rehabilitation



Neural Plasticity: The Biological Substrate For Neurorehabilitation

Zuha Warraich, BS, Jeffrey A. Kleim, PhD

PM R 2010;2:S208-S219

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- Impairment,
- Activity limitations (disability),

Motor recovery after stroke

- Motor impairment after stroke typically affects the control of movement of the face, arm, and leg of one side of the body and affects about 80% of patients.
- There seems to be a direct relation between motor impairment and function; for example, independence in walking (function) has been correlated with lower-limb strength (impairment).

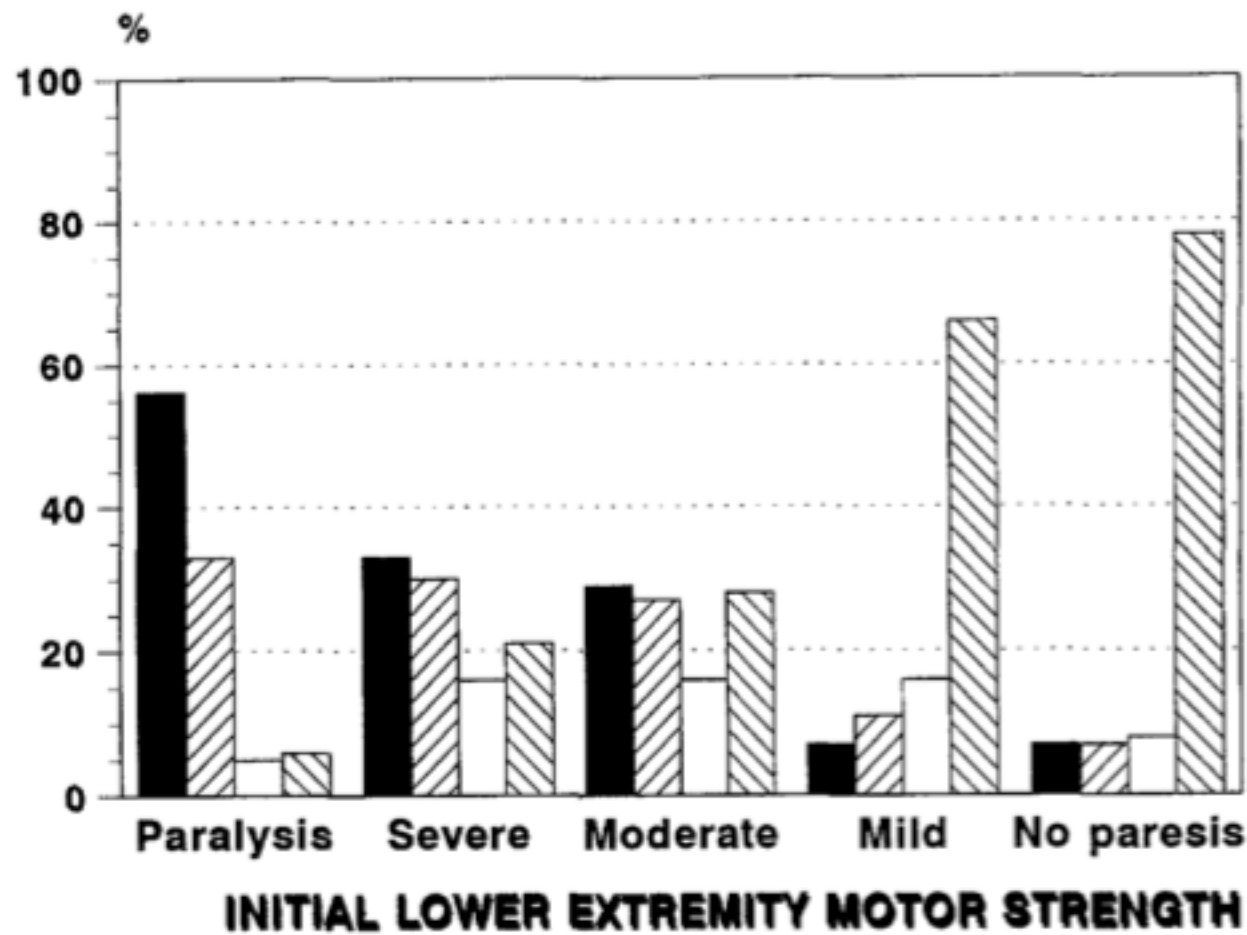


Fig 3—Final walking function in relation to initial lower extremity motor strength. Final walking function: ■, died; ▨, no walking function; □, walks with assistance; ▩, independent walking function.

Recovery of Walking Function in Stroke Patients: The Copenhagen Stroke Study

Henrik S. Jørgensen, MD, Hirofumi Nakayama, MD, Hans O. Raaschou, MD, Tom S. Olsen, MD, PhD

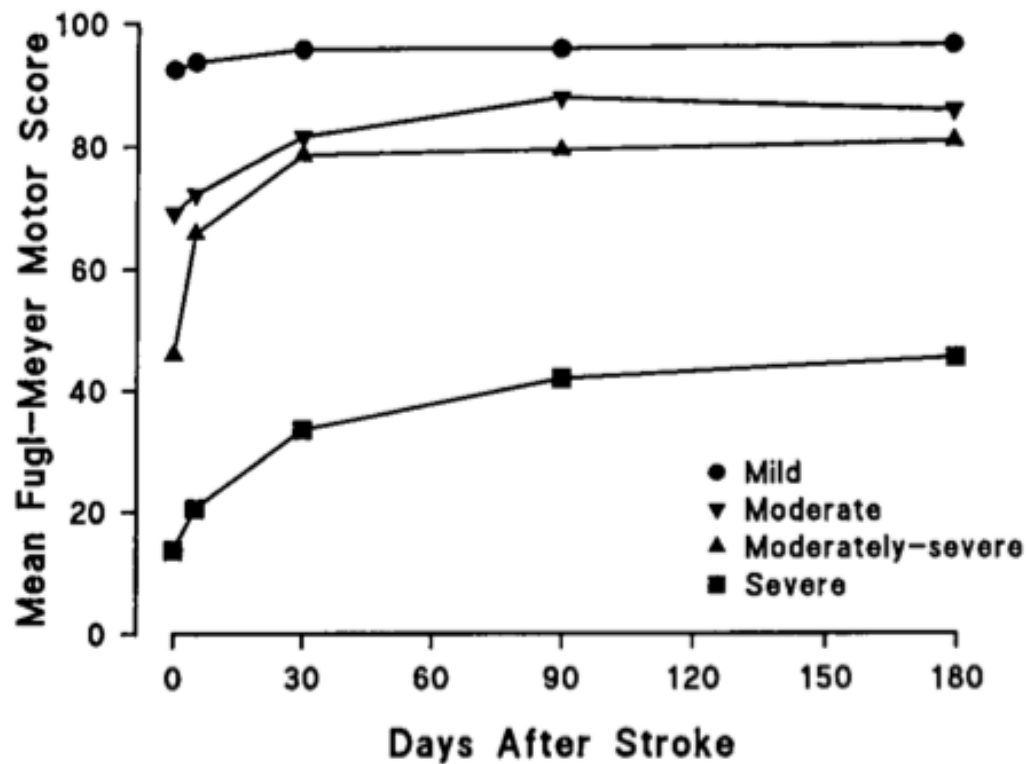


FIGURE 1. *Graph showing recovery of motor function after stroke based on Fugl-Meyer motor scores. Patients are stratified into groups based on the initial severity of motor deficit measured with Fugl-Meyer Assessment (see text). Regardless of initial severity of stroke, the most dramatic recovery occurs within the first 30 days. Moderate and most severe stroke patients continue to experience some recovery for 90 days. Graph represents mean Fugl-Meyer scores.*

Measurement of Motor Recovery After Stroke

Outcome Assessment and Sample Size Requirements

Pamela W. Duncan, PhD, PT; Larry B. Goldstein, MD; David Matchar, MD;
George W. Divine, PhD; and John Feussner, MD

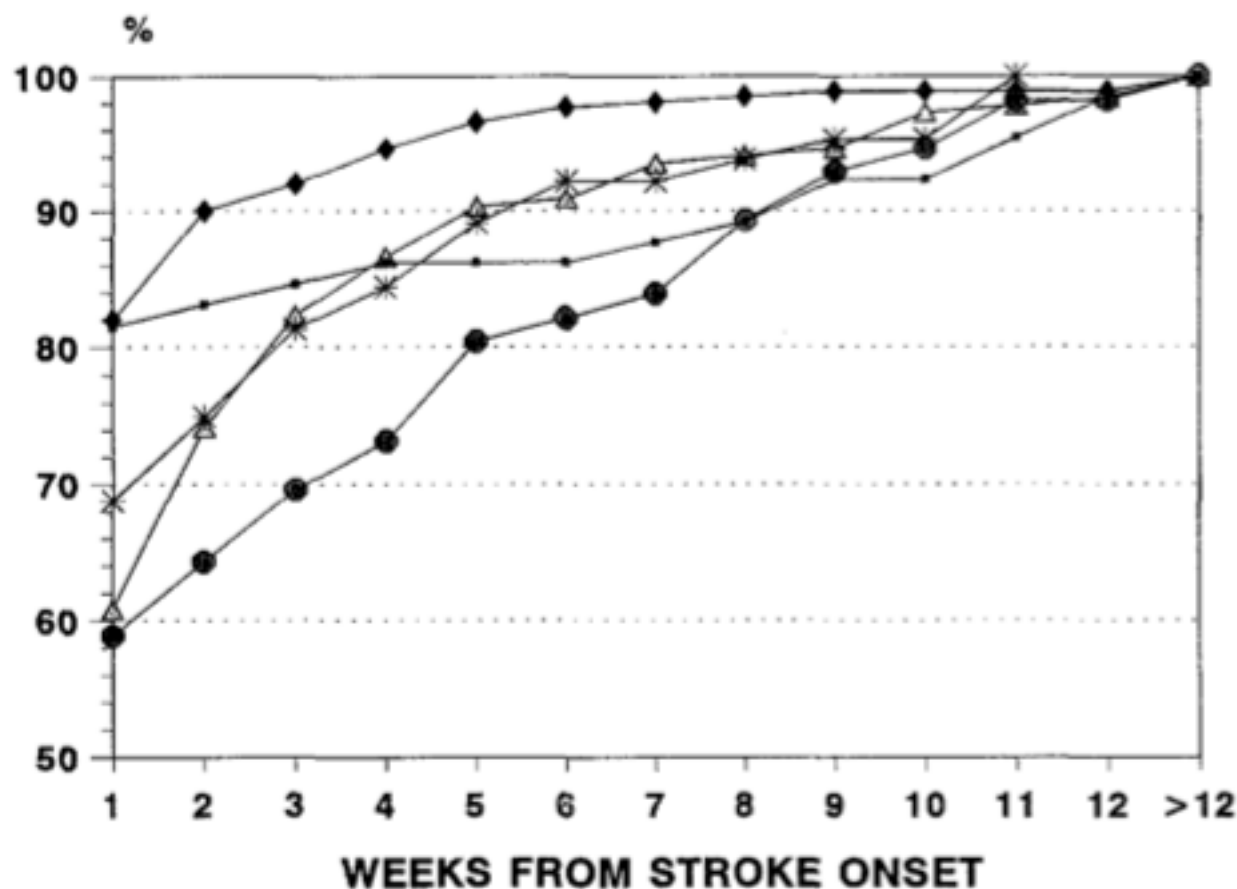


Fig 4—Cumulative rate (in percentage) of survivors with stationary walking function in relation to initial degree of leg paresis. Initial LE motor strength: ■, paralysis; ●, severe paresis; *, moderate paresis; ▲, mild paresis; ◆, no paresis.

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- The Copenhagen study showed that 80% of survivors of acute stroke who were initially unable to walk reached their best function within 6 weeks and 95% within 11 weeks.
- Independent walking for 150 feet was achieved by 34% of survivors who were dependent on admission and 60% of those who initially required assistance.

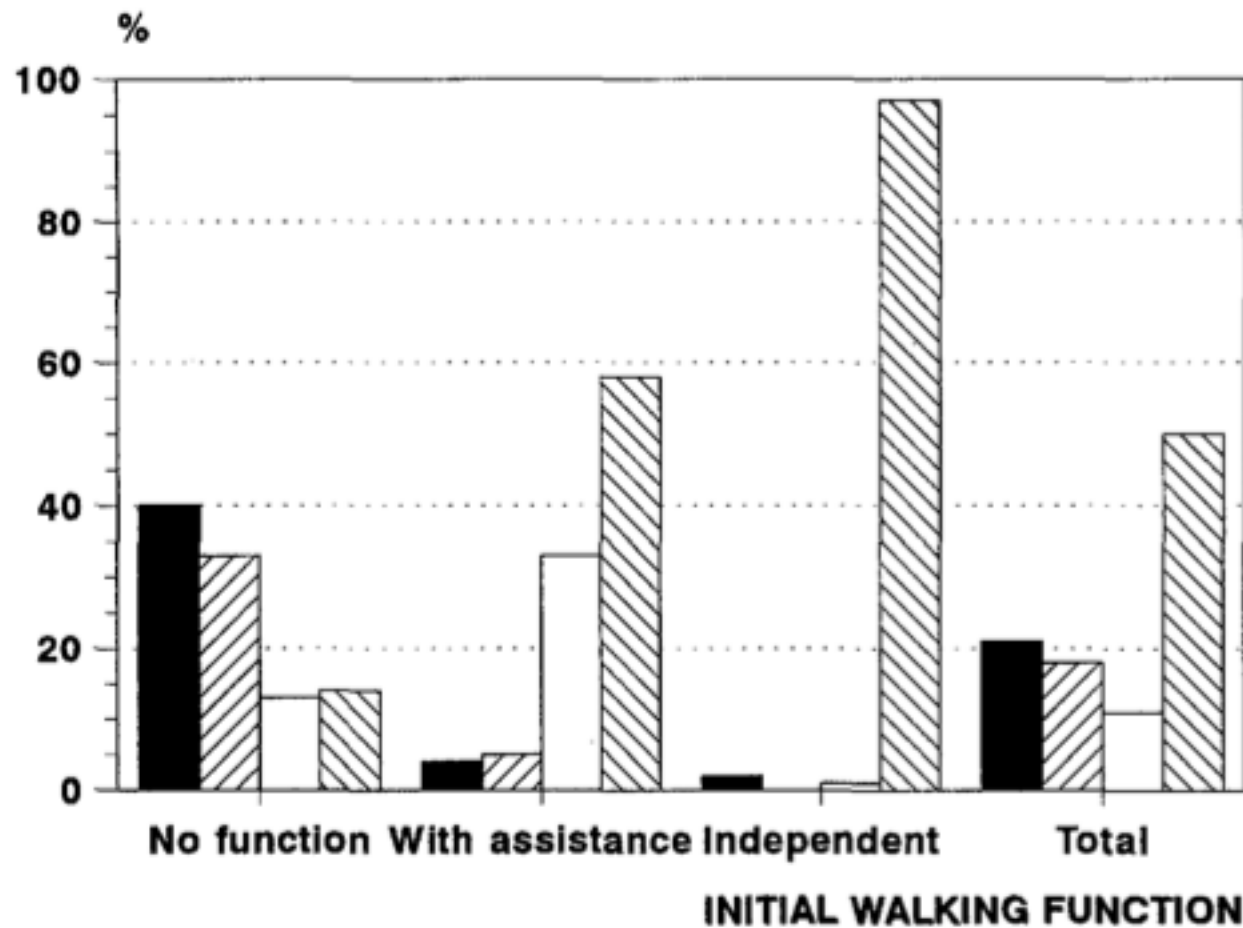


Fig 1—Final walking function in relation to initial walking function. Final walking function: ■, died; ▨, no walking function; □, walks with assistance; ▩, independent walking function.

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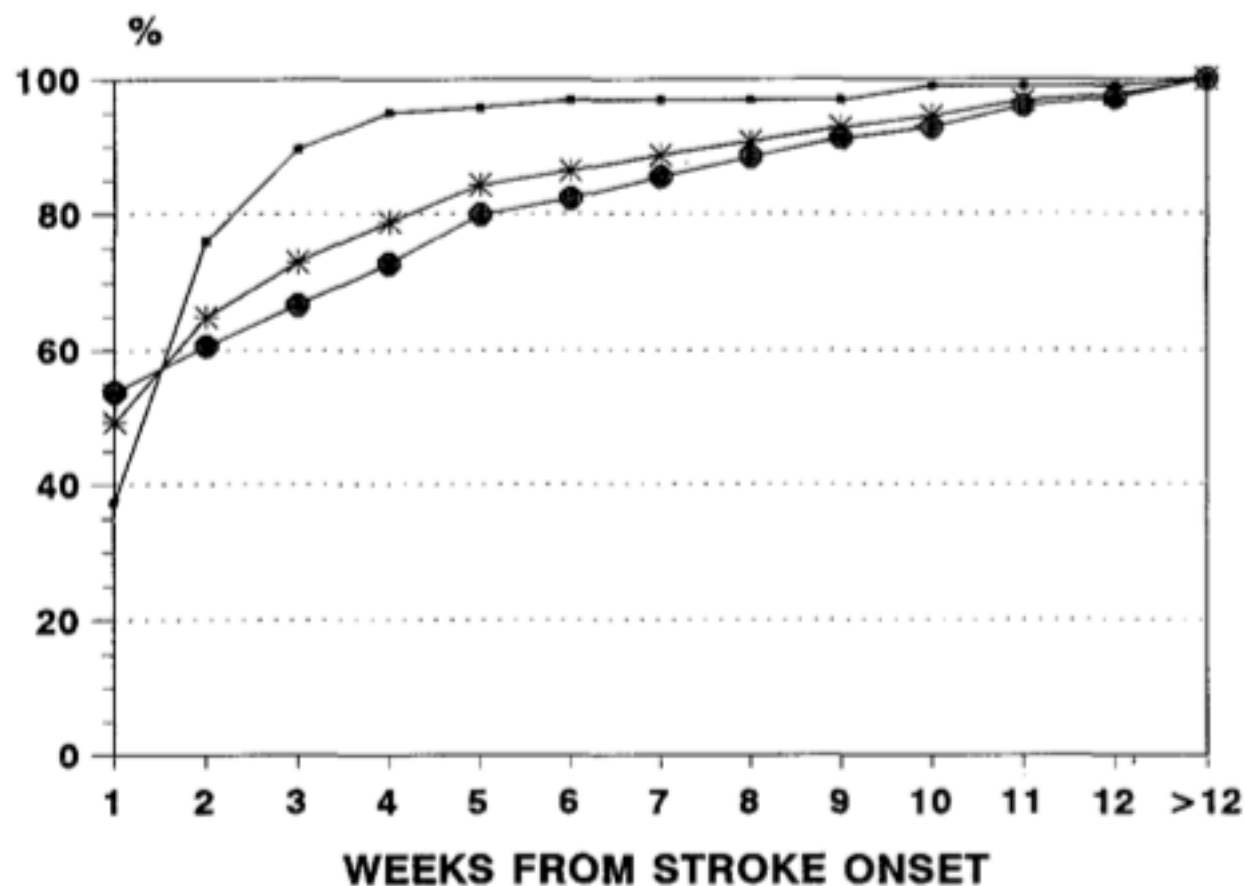


Fig 2—Cumulative rate (in percentage) of survivors with stationary walking function in relation to initial walking function. Initial walking function: ●, no walking function; ■, walks with assistance; *, total.

Recovery of Walking Function in Stroke Patients: The Copenhagen Stroke Study

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Recovery (%) of independent walking for 150 feet by impairment group²

Initial impairment	Able to walk at onset	1 month	3 months	6 months
Motor	18	50	75	85
Sensorimotor	10	48	72	72
Motor, hemianopia	7	28	68	75
Sensorimotor, hemianopia	3	16	33	38

Strategies for stroke rehabilitation

I know how to interpret or can perform an NIH Stroke Scale.

- 1. I can interpret the results of an NIHSS
- 2. I can perform and NIHSS
- 3. Tell me more.

NIH Stroke Scale

Panel 1: Current form of the NIHSS

1a Level of consciousness*

- 0–Alert
- 1–Not alert, arousable
- 2–Not alert, obtunded
- 3–Unresponsive

1b Questions

- 0–Answers both correctly
- 1–Answers one correctly
- 2–Answers neither correctly

1c Commands

- 0–Performs both tasks correctly
- 1–Performs one task correctly
- 2–Performs neither task

2 Gaze

- 0–Normal
- 1–Partial gaze palsy
- 2–Total gaze palsy

3 Visual fields

- 0–No visual loss
- 1–Partial hemianopsia
- 2–Complete hemianopsia
- 3–Bilateral hemianopsia

4 Facial palsy*

- 0–Normal
- 1–Minor paralysis
- 2–Partial paralysis
- 3–Complete paralysis

5a Left motor arm

- 0–No drift
- 1–Drift before 10 s
- 2–Falls before 10 s
- 3–No effort against gravity
- 4–No movement

5b Right motor arm

- 0–No drift
- 1–Drift before 10 s
- 2–Falls before 10 s
- 3–No effort against gravity
- 4–No movement

6a Left motor leg

- 0–No drift
- 1–Drift before 5 s
- 2–Falls before 5 s
- 3–No effort against gravity
- 4–No movement

6b Right motor leg

- 0–No drift
- 1–Drift before 5 s
- 2–Falls before 5 s
- 3–No effort against gravity
- 4–No movement

7 Ataxia*

- 0–Absent
- 1–One limb
- 2–Two limbs

8 Sensory

- 0–Normal
- 1–Mild loss
- 2–Severe loss

9 Language

- 0–Normal
- 1–Mild aphasia
- 2–Severe aphasia
- 3–Mute or global aphasia

10 Dysarthria*

- 0–Normal
- 1–Mild
- 2–Severe

11 Extinction/inattention

- 0–Normal
- 1–Mild
- 2–Severe

* These items are dropped in the modified NIH stroke scale (mNIHSS). The sensory item is scored as 0=normal and 1=abnormal in the mNIHSS.¹² Reproduced from *Stroke*, by permission of Lippincott Williams and Wilkins.¹³

Inter-observer reliability (ICC) = 0.95!

Excellent clinical predictive validity

NIHSS ≤ 5 – 80% discharge home

NIHSS 6-13 – rehabilitation

NIHSS \geq Nursing home

High correlation validity, i.e CNS

Excellent for monitoring change

Not limited to MDs

Reliable by video-telemedicine

Strategic strokes can have low scores
but very disabling, i.e. lateral medullary
syndrome

Baseline NIH Stroke Scale score strongly predicts outcome after stroke

A report of the Trial of Org 10172 in Acute Stroke Treatment (TOAST)

H.P. Adams Jr., MD, P.H. Davis, MD, E.C. Leira, MD, K.-C. Chang, MD, B.H. Bendixen, PhD, MD, W.R. Clarke, PhD, R.F. Woolson, PhD and M.D. Hansen, MS

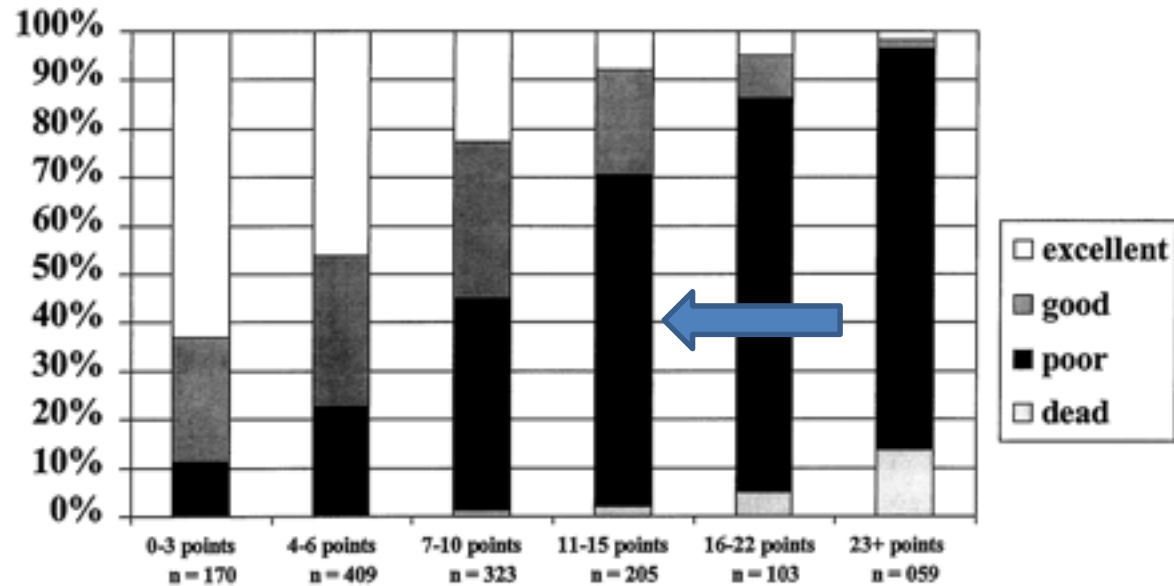


Figure 1. Effect of baseline NIH Stroke Scale score on outcome at 7 days. Patients' outcomes are rated as excellent, good, poor, or dead. The number of points that define each group and the number of patients included in the group are listed at the bottom of each column. The accumulated percentages are listed on the left side of the figure.

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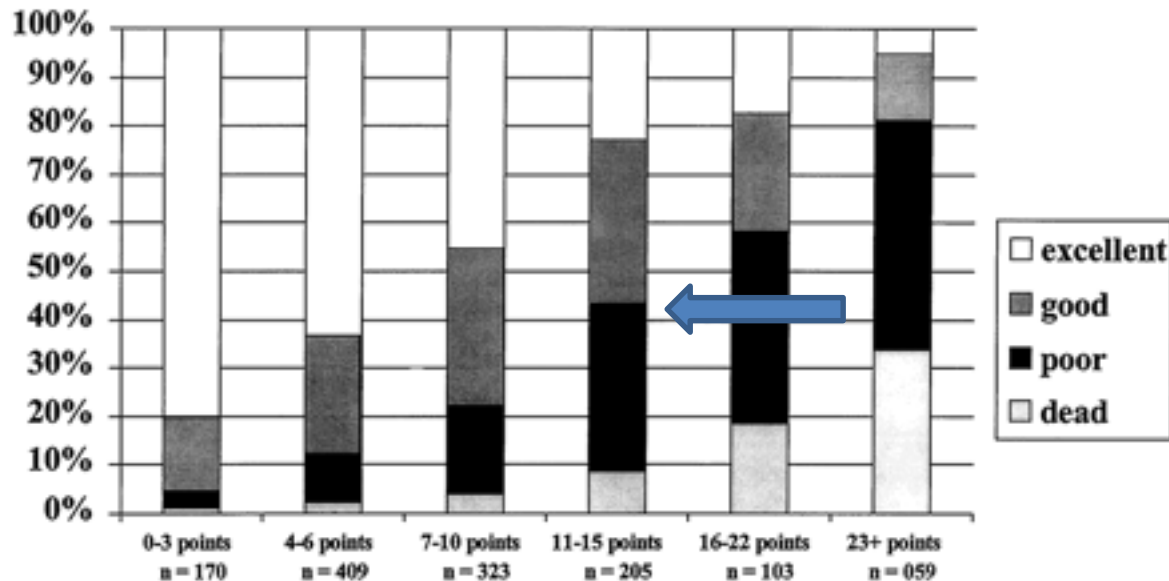


Figure 2. Effect of baseline NIH Stroke Scale score on outcome at 3 months. Patients' outcomes are rated as excellent, good, poor, or dead. The number of points that define each group and the number of patients included in the group are listed at the bottom of each column. The accumulated percentages are listed on the left side of the figure.

The ICH Score

A Simple, Reliable Grading Scale for Intracerebral Hemorrhage

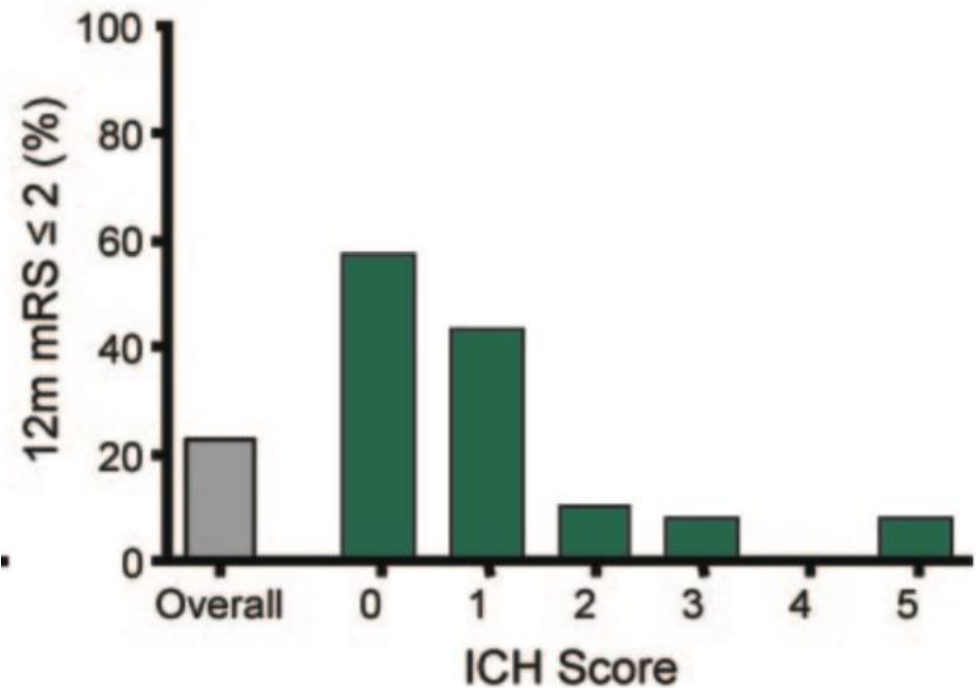
J. Claude Hemphill III, MD; David C. Bonovich, MD; Lavrentios Besmertis, MD;
Geoffrey T. Manley, MD, PhD; S. Claiborne Johnston, MD, MPH

TABLE 3. Determination of the ICH Score

Component	ICH Score Points
GCS score	
3–4	2
5–12	1
13–15	0
ICH volume, cm ³	
≥30	1
<30	0
IVH	
Yes	1
No	0
Infratentorial origin of ICH	
Yes	1
No	0
Age, y	
≥80	1
<80	0
Total ICH Score	0–6

GCS score indicates GCS score on initial presentation (or after resuscitation); ICH volume, volume on initial CT calculated using *ABC/2* method; and IVH, presence of any IVH on initial CT.

B



We can predict if someone will be able to walk after stroke.

- 1. Yes within hours after the stroke.
- 2. Yes within days after the stroke.
- 3. Yes within weeks after the stroke.
- 4. We have to wait and see.

Is Accurate Prediction of Gait in Nonambulatory Stroke Patients Possible Within 72 Hours Poststroke? The EPOS Study

**J. M. Veerbeek, MSc¹, E. E. H. Van Wegen, PhD¹,
B. C. Harmeling-Van der Wel, PT², and G. Kwakkel, PhD¹, for the EPOS Investigators; 2011**

- * The first aim of the present study was to investigate if independent gait at 6 months post stroke can be accurately predicted within the first 72 hours after stroke, in order to optimize early goal setting and referral policy in hospital stroke units.**
- * The second objective was to investigate the effects of early reassessment on days 5 and 9 on the accuracy of predicting outcomes in terms of regaining independent gait at 6 months post stroke.**

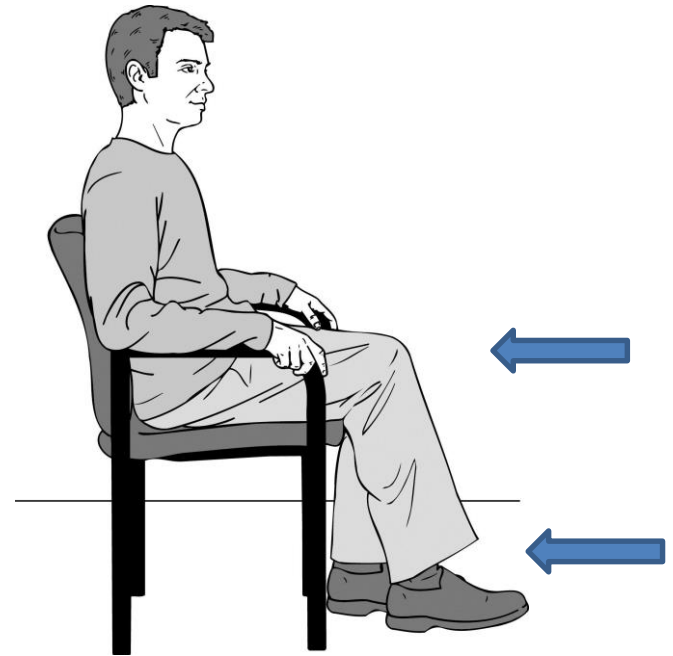
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- * The EPOS study (acronym for Early Prediction of Functional Outcome after Stroke) is a prospective cohort study with an intensive repeated-measurements design during the first 2 weeks post stroke.**
- * Patients were recruited from 9 hospital stroke units in the Netherlands. Assessments were performed within 72 hours and on days 5 and 9 post stroke.**
- * Final outcome was measured at 6 months post stroke.**
- * All assessments were performed by trained physical therapists from each participating stroke unit, and patients received physical therapy treatment according to the Dutch guidelines for physical therapists.**

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- * Non-ambulatory but pass both tests at 72 hours = 98% probability ambulatory at 6 months
- * Non-ambulatory but fail both tests at 72 hours = 27% probability ambulatory at 6 months
- * Non-ambulatory but fail both tests at 9 days

We can predict if someone will have functional hand and arm function after stroke.

- 1. Yes within hours after the stroke.
- 2. Yes within days after the stroke.
- 3. Yes with weeks after the stroke.
- 4. We have to wait and see.

Presence of Finger Extension and Shoulder Abduction Within 72 Hours After Stroke Predicts Functional Recovery

Early Prediction of Functional Outcome After Stroke: The EPOS Cohort Study

Rinske H.M. Nijland, MSc; Erwin E.H. van Wegen, PhD; Barbara C. Harmeling-van der Wel;
Gert Kwakkel, PhD; on behalf of the EPOS Investigators

- Candidate determinants were measured in 188 stroke patients within 72 hours and at 5 and 9 days after stroke.
- Logistic regression analysis was used for model development to predict upper limb function at 6 months

**Presence of Finger Extension and Shoulder Abduction
Within 72 Hours After Stroke Predicts Functional Recovery**
**Early Prediction of Functional Outcome After Stroke: The EPOS
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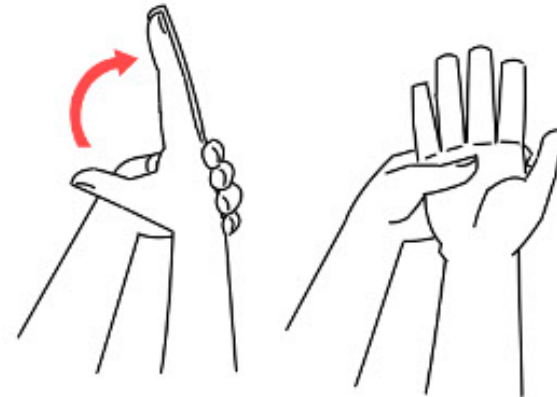
Rinske H.M. Nijland, MSc; Erwin E.H. van Wegen, PhD; Barbara C. Harmeling-van der Wel;
Gert Kwakkel, PhD; on behalf of the EPOS Investigators

- Overall, the pre-test probability of return of some hand function at 6 months is:
 - 70% (34% excellent)

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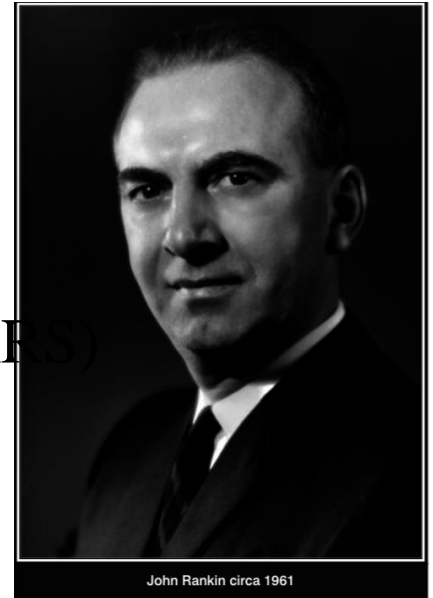
- * Non-functional but pass both tests at 72 hours = 98% probability of dexterity at 6 months
- * Non-functional but fail both tests at 72 hours = 25% probability of dexterity at 6 months
- * Non-functional but fail both tests at 9 days = 14% probability of dexterity at 6 months

I can interpret or administer a modified Rankin Score.

- 1. I can interpret a modified Rankin Score.
- 2. I can administer a modified Rankin Score.
- 3. Tell me more.

No symptoms at all	0
No significant disability despite symptoms; able to carry out all usual duties and activities	+1
Slight disability; unable to carry out all previous activities, but able to look after own affairs without assistance	+2
Moderate disability; requiring some help, but able to walk without assistance	+3
Moderately severe disability; unable to walk and attend to bodily needs without assistance	+4
Severe disability; bedridden, incontinent and requiring constant nursing care and attention	+5
Dead	+6

modified Rankin Scale (mRS)



Dr. John Rankin (1923—1981) is one of the many distinguished alumni of the former University Department of Materia Medica and Therapeutics, Stobhill Hospital Glasgow. While his varied international career encompassed pulmonary physiology, occupational medicine and public health, he remains best remembered in the United Kingdom for his early stroke publications. In a series of articles published 50 years ago in the *Scottish Medical Journal* he described early rehabilitative stroke medicine using a novel grading system. Half a century on Rankin's eponymous stroke scale has become the endpoint of choice in acute stroke trials. This paper describes Rankin's remarkable career and the legacy of his work, with a particular focus on his stroke research and grading system.

MODIFIED RANKIN SCALE

Panel 3: Modified Rankin scale

0=no symptoms

1=no significant disability, despite symptoms

Able to perform all usual duties and activities

2=slight disability

Unable to perform all previous activities but able to look after own affairs without assistance

3=moderate disability

Requires some help, but able to walk without assistance

4=moderately severe disability

Unable to walk without assistance and unable to attend to own bodily needs without assistance

5=severe disability

Bedridden, incontinent, and requires constant nursing care and attention

6=dead

Reproduced from *International Disability Studies*, by permission of Taylor and Francis.⁴⁰

1-point shift is deemed clinically important

Supervision or any help is dependence

Inter-rater reliability = 0.74 (k)

Concurrent validity with infarct size = 0.6

Construct validity with GOS high

Responsiveness from admission to discharge can be poor.

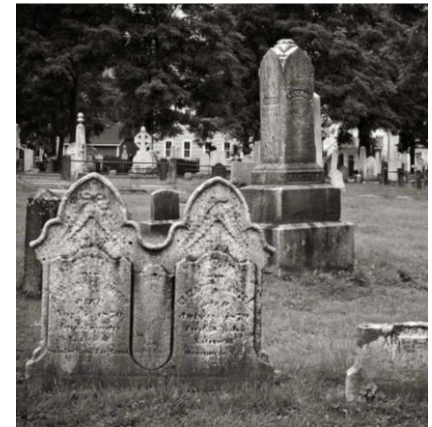
Some domains are not directly

The modified Rankin Score (mRS)

Favourable outcome
(mRS 0-2)



Unfavourable outcome
(mRS 3-6)



Slide Courtesy of Dr. B. V

Discharge to Rehab on Day 11

On admission to rehab

Patient unfortunately had progression of her stroke (worsening) within the first few days...

- NIHSS (NIH Stroke Scale) = 7
 - face 1(mild facial asymmetry),
 - arm 4 (no movement),
 - leg 2 (falls to bed before 5 seconds)
- Risk reduction medications:
- Amlodipine, perindopril, ASA, clopidogrel, atorvastatin, nicotine patch
-
- On Rehab: treated with Sinemet and Ritalin

Rehabilitation: Predicting and Evaluating Change

Outline

- Principles of evidence-based practice
- Features of the CMSA
- Evidence & resources
- Questions

Outcome Measurement

Sackett's definition of Evidence-based Medicine (EBM)

“EBM is the conscientious, explicit, and judicious use of current best evidence in making decisions about the care of individual patients”.



**Sackett et al
BMJ 1996, p. 312**

Outcome Measures in EBM...

Why bother anyway?

ANSWER IN CHAT BOX

Standardized outcome measures...

- Determine prognosis
- Evaluate change / improvement
- Track progress
- Provide feedback to patients, family, team
- Help guide decision-making when designing your management plan
- Provide evidence of accountability through addressing expected standards

Purpose of Outcome Measures

- Evaluate change
- Discriminate among subgroups (i.e., categorize)
- Predict outcomes

Kirshner and Guyatt, 1985

Types of Measures

- Self-reported (or proxy-reported)
 - Patient-reported outcomes (PROs, PROMs)
- Performance-based /observer

Types of Measures

- Condition or region or symptom-specific
- Generic (quality of life, participation)
- Patient-specific (COPM & Patient-Specific Functional Scale)
- Physical examination measures (strength, ROM, etc.)

Things that influence the outcome I use

1. I use one I'm familiar with
2. I use one I just learned about
3. I use one I'm told to use
4. Other reasons
5. I'd rather not be expected to use one!

When selecting a measure...

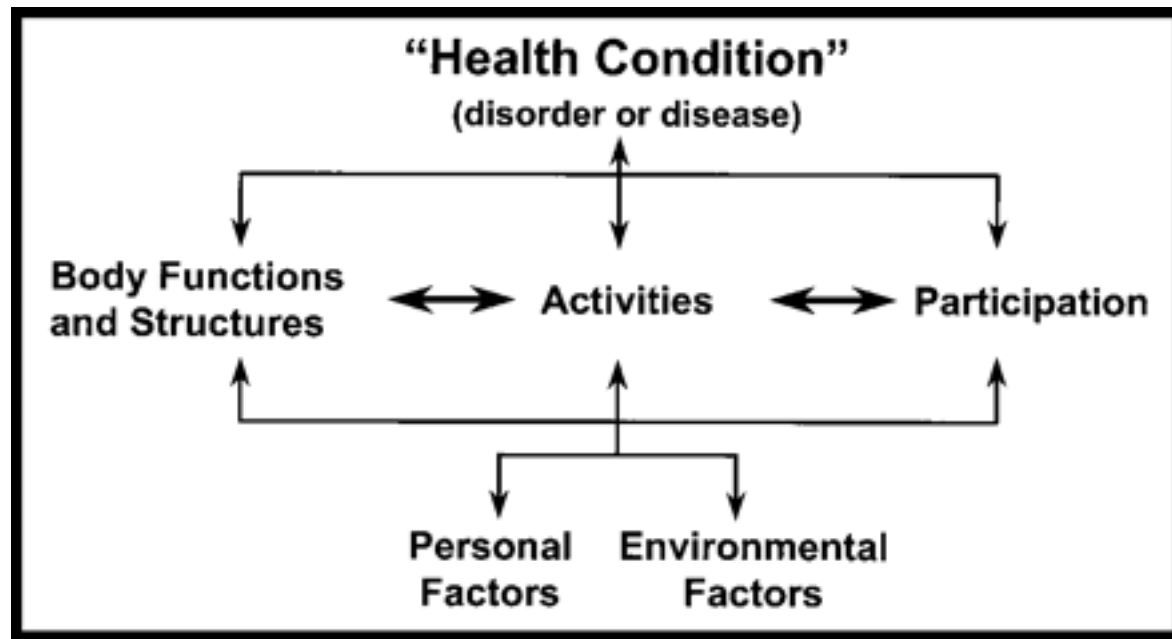
1. Define the purpose of the measurement
2. Consider the restraints related to the patient and your setting
3. Identify a relevant tool/measure. Scrutinize the literature – *ensure that the information relates to your patient population.*
4. Is there information about the interpretation of score values for this measure?

Stratford P. A few thoughts on outcome measures and their successful application. *Physiotherapy Practice*, Fall/Winter 2021, 11(4); 5-7.

Validity and Reliability

- Validity is the degree to which it measures what it is supposed to measure.
*criterion, construct (convergent, discriminative), predictive
- Reliability is the extent to which a measurement gives results that are consistent and can discriminate among individuals.
*inter-rater & intra-rater
- Responsiveness is the ability of a measure to detect change when it has occurred.

The International Classification of Functioning, Disability, and Health (ICF) Model of Functioning and Disability



https://cdn.who.int/media/docs/default-source/classification/icf/icfbeginnersguide.pdf?sfvrsn=eead63d3_4&download=true

Examples

- Body structure and function (impairment)
 - blood glucose level, pain (VAS, NPRS), range of motion, spasticity, strength (CMSA)
- Activity
 - Mobility & activities of daily living (2 or 6 MWT, CMSA, mRS, FIM, AlphaFIM)
- Participation
 - parenting, leisure activities (RNLI)
- Combined (LIFE-H: ADLs & social roles)
- Quality of Life (EQ-5D, SF-36)

How I get information about the outcome I decide to use

1. I always use the same one, so I don't need any new information
2. I take advice/direction from my colleagues
3. I go back to my notes from School
4. I search the internet
5. I don't have time...

Follow Guidelines & Recommendations

Guidelines



Canadian Stroke Best Practice Recommendations: Rehabilitation, Recovery, and Community Participation following Stroke. *Part One: Rehabilitation and Recovery Following Stroke; 6th Edition Update 2019*

**Robert Teasell^{1,2}, Nancy M Salbach³, Norine Foley⁴,
Anita Mountain^{5,6}, Jill I Cameron⁷, Andrea de Jong⁸**

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DOI: 10.1177/1747493019897843
journals.sagepub.com/home/wso



Teasell R, Salbach NM, Foley N, Mountain A, Cameron JI, Jong AD, Acerra NE, Bastasi D, Carter SL, Fung J, Halabi ML. Canadian stroke best practice recommendations: rehabilitation, recovery, and community participation following stroke. Part one: rehabilitation and recovery following stroke; update 2019. International Journal of Stroke. 2020 Oct;15(7):763-88.

Follow Guidelines & Recommendations

Guideline



Canadian Stroke Best Practice Recommendations: Rehabilitation, Recovery, and Community Participation following Stroke. Part Two: Transitions and Community Participation Following Stroke

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Teasell R, Salbach NM, Foley N, Mountain A, Cameron JI, Jong AD, Acerra NE, Bastasi D, Carter SL, Fung J, Halabi ML. Canadian stroke best practice recommendations: rehabilitation, recovery, and community participation following stroke. Part one: rehabilitation and recovery following stroke; update 2019. International Journal of Stroke. 2020 Oct;15(7):763-88.

Guidelines & Recommendations: Tools/Outcomes



CANADIAN STROKE BEST PRACTICE RECOMMENDATIONS

Rehabilitation and Recovery following Stroke

Table 1: Suggested Stroke Rehabilitation Screening and Assessment Tools

Teasell R, Salbach NM (Writing Group Chairs)

2019

on Behalf of the Canadian Stroke Best Practice Recommendations

Rehabilitation and Recovery following Stroke Writing Group

<https://www.heartandstroke.ca/-/media/1-stroke-best-practices/rehabilitation-nov2019/-csbpr-rehabilitation-table1-suggested-stroke-rehabilitation-screening-and-assessment-toolsnov19.ashx?rev=96be9dace11948ccaa56529fcc674f60>

Evidence-based Resources

- Stroke Engine (assessment tools)

<https://strokengine.ca/en/>

- Shirley Ryan Abilities Lab, Rehabilitation Measures database

<https://www.sralab.org/rehabilitation-measures>

Chedoke-McMaster Stroke Assessment (CMSA)

I can interpret or administer the CMSA

1. I can interpret CMSA scores.
2. I can administer the CMSA.
3. Tell me more.

Chedoke-McMaster Stroke Assessment

The CMSA has 2 components:

- **Impairment Inventory**

- Quality of movement/motor control

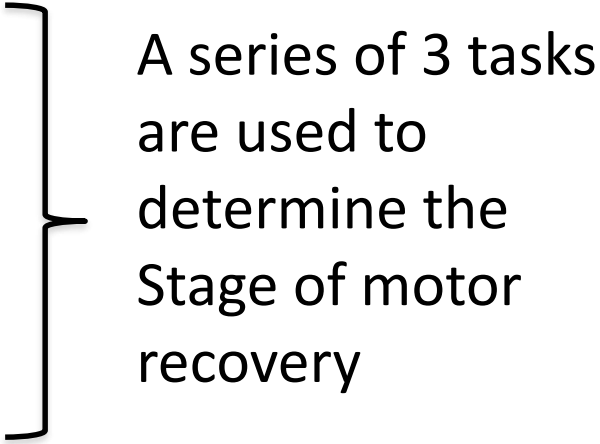
- **Activity Inventory** (Disability Inventory)

- Functional ability

CMISA

- Impairment Inventory (II)
 - 6 dimensions *shoulder pain, arm, hand, leg, foot and postural control*
 - Scored as Stage 1 -7
- Activity Inventory (AI)
 - 15 tasks
 - 14 tasks are scored 1-7, Task #15 scored 0 or 2

Impairment Inventory

- Six **dimensions** – scored as **Stage 1 to 7**
 - Postural control
 - Arm
 - Hand
 - Leg
 - Foot
 - Shoulder pain*
- 
- A series of 3 tasks
are used to
determine the
Stage of motor
recovery

*The evaluation of shoulder pain is descriptive.

Impairment Inventory

ARM

1 ☐ not yet Stage 2

2 ☐ resistance to passive abduction or elbow extension

☐ facilitated elbow extension

☐ facilitated elbow flexion

3 ☐ touch opposite knee

☐ touch chin

☐ shoulder shrugging > ½ range

Start with Stage 3 tasks

Activity Inventory

- Two indices (15 items)- Scored as 1-7
 1. Gross Motor Function Index
 - 10 items
 2. Walking Index
 - 4 items
 - 2 minute walk test (scored as 0 or 2)
- Total score: /100

Scoring*

- Independent
 - 7 Complete
 - 6 Modified (*uses assistive devices, more than X3 time*)
- Modified Dependence
 - 5 Supervision (*for safety or cueing*)
 - 4 Minimal Assistance (75% or more by the patient)
 - 3 Moderate Assistance (50%-75% by the patient)
- Complete Dependence
 - 2 Maximal Assistance (25%-50% by the patient)
 - 1 Total Assistance (*or task not tested*)

*Similar to FIM but with some differences

SCORE

1. Supine to side lying on strong side
2. Supine to side lying on weak side
3. Side lying to long sitting through strong side
4. Side lying to sitting on side of the bed through strong side
5. Side lying to sitting on side of bed through the weak side
6. Remain standing
7. Transfer to and from bed towards strong side
8. Transfer to and from bed towards weak side
9. Transfer up and down from floor to chair
10. Transfer up and down from floor to standing

#1-10: Gross Motor Function Index

11. Walk indoors – 25 meters
12. Walk outdoors, over rough ground, ramps, and curbs – 150 meters
13. Walk outdoors several blocks – 900 meters
14. Walk up and down stairs
15. Age appropriate walking distance for 2 minutes (2 Point Bonus)

#11-15: Walking Index

☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐

Training Strategies

- Online resources in English and French:
<https://cnfs.ca/stroke/>
- Manual free online (Shirley Ryan Abilities Lab)
- CMSA Training Workshop

Theoretical Framework of the CMSA Model of Physical Performance

Measurement
theory

Discriminate
Predict
Evaluate

1. Body
functions and
Structures
2. Activities -
Participation

WHO:
International
Classification of
Functioning,
Disability and
Health (ICF)

*Physical
Performance*

Clinically
important

Client-centred
practice

Purpose of Outcome Measures

- Evaluate change
- Discriminate among subgroups (i.e., categorize)
- Predict outcomes

Kirshner and Guyatt, 1985

DISCRIMINATE

- Categorize clients into homogeneous subgroups based on level of impairment
- Purpose
 - guides decisions about intervention
 - Informs the consideration of prognosis
 - facilitates communication
 - utilized in research

SELECTING INTERVENTION

- Selection of appropriate interventions based on:
 - Client's goals
 - Best practice guidelines
 - Treatment preferences / own experience

Evaluate Change: Impairment Inventory

The **threshold value for change**:

- a change of **1 impairment point** for the arm, hand, leg, foot, and postural control dimensions, and
- a change of **2 impairment points** for the shoulder pain dimension.

Beyer R, Wharin C, Gillespie E, Odumeru K, Stratford P, Miller P. Estimating the Threshold Value for Change for the Six Dimensions of the Impairment Inventory Dimensions of the Chedoke-McMaster Stroke Assessment. *Physiotherapy Canada* 2019; 71(2): 103-110.

Evaluate Change: Activity Inventory

- **Clinically Important Change**
 - The Minimal Clinically Important Difference (MCID) is **8 points** during rehabilitation.
- **Effectiveness of Interventions**
 - Demonstrated sensitivity to change

Barclay-Goddard R. Physical Function Outcome Measurement in Acute Neurology. Physiotherapy Canada 2000, 52(2): 138-145.

Evaluating Change

For the 2 minute walk test, the Minimal Detectable Change at a 90% confidence level (MDC_{90}) is:

11.4 meters for maximal speed test

19.8 meters for the comfortable speed test

Miller PA, Moreland J, Stevenson T. Measurement properties of a standardized version of the two-minute walk test for individuals with neurological dysfunction. *Physiotherapy Canada*, Fall 2002: 241-248, 257.

TCMSA-AI

Telephone version of the AI

- This telephone version of the AI can reduce the burden on the patient (13-15 versus 30-45 minutes).
- Evidence of inter-rater reliability and validity when reported over the telephone by the client or his/her proxy.

Barclay R, Miller PA, Pooyania S, Stratford P. Development of a Telephone Interview Version of the Chedoke-McMaster Stroke Assessment Activity Inventory. *Physiotherapy Canada*. 2016;68(3):216-22.

Predicting ambulation

- If Leg score + Postural Control score ≥ 9 , client expected (at least) to walk independently with supervision.

Stevenson, TJ. Using Impairment Inventory Scores to Determine Ambulation Status in Individuals with Stroke. *Physiotherapy Canada*, Summer 1999, p168-174.

PREDICTING OUTCOMES

Predictive equations were developed - using scores obtained at one time helped predict scores in the future.

However, it was determined that the large error associated with the predictive equations limits their clinical usefulness.



Dang M, Ramsaran KD, Street ME, Syed SN, Barclay-Goddard R, Stratford P, Miller PA. Examining the Accuracy of the Chedoke-McMaster Stroke Assessment Predictive Equations for Stroke Rehabilitation. *Physiotherapy Canada* 2011; 63(3): 334-341.

Other Evidence...

CLINICAL AND POPULATION SCIENCES

Prediction of Independent Walking in People Who Are Nonambulatory Early After Stroke

A Systematic Review

Elisabeth Preston , PhD; Louise Ada , PhD; Rosalyn Stanton, PhD; Niruthikha Mahendran, PhD; Catherine M. Dean, PhD

Purpose: to identify the factors that influence ambulation (with or without aids, independently) at 3, 6, and 12 months in people who are non-ambulatory* within 30 days after experiencing a stroke

*FIM mobility subscale >5-6

Results: 15 articles

Preston E, Ada L, Stanton R, Mahendran N, Dean CM. Prediction of independent walking in people who are nonambulatory early after stroke: a systematic review. Stroke 2021 Oct; 52(10):3217-24.

Factors that predict ambulation at 3 months

- Younger patients OR 3.4
- **“Good” leg strength at 13 days OR 5.0**
- **“Good” sitting at 17 days OR 7.9**
- **Independence in ADL measured at 25 days
by FIM & BI OR 10.5**
- Intact corticospinal tract at 17 days OR 8.3
- No presence of cognitive impairment, neglect,
aphasia, and incontinence

Factors that predict ambulation at 6 months

- Younger patients OR 2.1
- **“Good” sitting at 5 days OR 19.1**
- No incontinence at 6 days OR 13.8

Insufficient data for analysis at 12 months

Predictors of walking after stroke

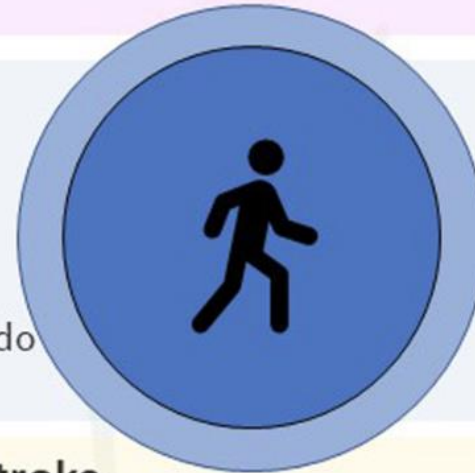


Within one month of stroke

Prognostic factors measured in non-ambulatory patients within one month of stroke.

3 months after stroke

- ✓ Younger age, intact corticospinal tract, good leg strength, no cognitive impairment, no neglect, continence, good sitting, and independence in ADL predict independent walking.
- ✗ Sex, stroke type, side of hemiplegia or aphasia do not predict independent walking.



6 months after stroke

- ✓ Younger age, continence, and good sitting predict independent walking at 6 months after stroke
- ✗ Sex does not predict independent walking.

Implications:

Predictors of walking could be used to:

- triage patients to rehabilitation or residential care
- guide intervention during rehabilitation
- educate the patient, the family and carers about expected outcomes.



Measure of Functional Independence Dominates Discharge Outcome Prediction After Inpatient Rehabilitation for Stroke

Allen W. Brown, MD, Terry M. Therneau, PhD, Billie A. Schultz, MD, Paulette M. Niewczyk, PhD, MPH, and Carl V. Granger, MD

- 148,000+ patients, admitted to rehab 8 days after CVA, mean total FIM 57, LOS 17 days, with a mean increase of 24 in FIM
- **Most clinically relevant predictors of discharge home: Age, FIM motor subscale, and walking ability**

Brown AW, Therneau TM, Schultz BA, Niewczyk PM, Granger CV. Measure of functional independence dominates discharge outcome prediction after inpatient rehabilitation for stroke. *Stroke*. 2015 Apr;46(4):1038-44.

Berg Balance Scale Score as a Predictor of Independent Walking at Discharge among Adult Stroke Survivors

A BBS score of 14 or more predicts who is most likely to achieve independent walking (10 m) at discharge from a rehab unit.

68 patients, assessed within 2 days of admission to rehab
Time since CVA: Median 14 days: median LOS: 8 weeks

Jenkin J, Parkinson S, Jacques A, Kho L. Berg Balance Scale Score as a predictor of Independent Walking at Discharge Among Stroke Survivors. Physiotherapy Canada 2021; 73(3): 252-256.

Additional information about BBS

Blum L, Korner-Bitensky N. Usefulness of the Berg Balance Scale in stroke rehabilitation: a systematic review. *Physical Therapy* 2008 May 1; 88(5):559-66.

We can predict if someone will be able to walk after stroke.

1. Yes within hours after the stroke.
2. Yes within days after the stroke.
3. Yes within weeks after the stroke.
4. We have to wait and see.

We can predict if someone will be able to walk after stroke.

1. I answered this question the same way that I did when the session began
2. I have changed my answer

Our Patient – 30 days in Rehab

	ADMISSION TO REHAB	DISCHARGE FROM REHAB
CMSA Arm	2	3
CMSA Leg	3	5
CMSA Postural Control	3	5
Transfers	Mod. Assist. of 1	Independent
Ambulation	n/a	Quad cane X 200m Stairs with rail

Does this “match” the evidence we have discussed?

Answer in Chat Box

Sackett's definition of Evidence-based Medicine (EBM)

“EBM is the conscientious, explicit, and judicious use of current best evidence in making decisions about the care of individual patients”.



**Sackett et al
BMJ 1996, p. 312**

Effectiveness of Interventions

- Cochrane Library

<https://www.cochranelibrary.com/>

- Physiotherapy Evidence Database PEDro

<https://pedro.org.au/>



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*Evidence-Based Review of **Stroke Rehabilitation***

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Reviews of RCTs

Understanding Research Evidence

From the National Collaborating Centre for
Methods and Tools:

<https://www.nccmt.ca/capacity-development/videos?v=125#ure1>

-helpful short videos discussing odds ratios, confidence interval, forest plots, etc.

Synthesized Evidence/Appraisals

You can sign up to receives summaries in your fields of interest via emails

- Accesssss <https://www.accessss.org/>
- KTPlus: <https://plus.mcmaster.ca/kt/>

Questions?

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