SMALL stroke BIG problem (Moving beyond NIHSS)

UNIVERSITY of GLASGOW

Stroke association

Terry Quinn

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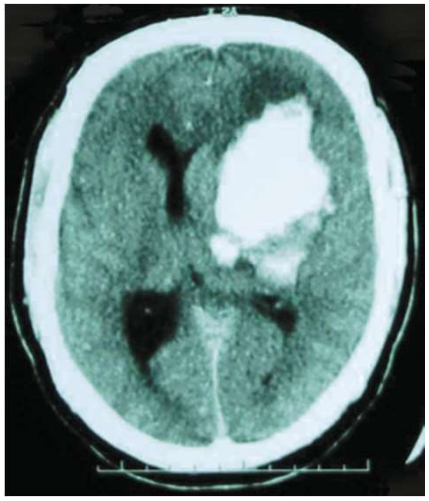

Question

Question

- What is he going to talk about ?
- Is this going to be relevant ?
- Will he keep to time ?

Jim’s story

- 69 year old man
- COPD, osteoarthritis, diabetes

- Right hemisphere stroke
- Visual inattention, mild left hemiparesis
- NIH 3

Question

- Is this minor stroke ?
- Would you give tPA ?
- What do you expect the outcome to be at 3/12 ?

NIHSS

• LoC	• 0-7	(3,2,2)
• Gaze	• 0-2	
• Fields	• 0-3	
• Facial paresis	• 0-3	
• Arm & leg paresis	• 0-4 (arm, leg, R, L)	
• Limb ataxia	• 0-2	
• Sensory	• 0-2	
• Speech	• 0-5	(3,2)
• Extinction/inattention	• 0-2	

NIHSS

- Very severe
- Severe
- Moderate Severe
- Mild

- Return home
- Need for rehab’
- Need for care-home

- NIHSS ?

NIHSS

- Very severe
- Severe
- Moderate Severe
- Mild

- NIHSS >25

- Return home
- Need for rehab’
- Need for care-home

NIHSS

- Very severe
- Severe
- Moderate Severe
- Mild

- NIHSS >25
- NIHSS 15-24

- Return home
- Need for rehab’
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NIHSS

- Very severe
- Severe
- Moderate Severe
- Mild

- NIHSS >25
- NIHSS 15-24
- NIHSS 5-14

- Return home
- Need for rehab’
- Need for care-home

NIHSS

- Very severe
- Severe
- Moderate Severe
- Mild

- NIHSS >25
- NIHSS 15-24
- NIHSS 5-14
- NIHSS <5

- Return home
- Need for rehab’
- Need for care-home

NIHSS

• Very severe	• NIHSS >25
• Severe	• NIHSS 15-24
• Moderate Severe	• NIHSS 5-14
• Mild	• NIHSS <5
• Return home	• NIHSS <5
• Need for rehab’	
• Need for care-home	

NIHSS

• Very severe	• NIHSS >25
• Severe	• NIHSS 15-24
• Moderate Severe	• NIHSS 5-14
• Mild	• NIHSS <5
• Return home	• NIHSS <5
• Need for rehab’	• NIHSS 6-13
• Need for care-home	

NIHSS

• Very severe	• NIHSS >25
• Severe	• NIHSS 15-24
• Moderate Severe	• NIHSS 5-14
• Mild	• NIHSS <5
• Return home	• NIHSS <5
• Need for rehab’	• NIHSS 6-13
• Need for care-home	• NIHSS >13

NIHSS

• Very severe	• NIHSS >25
• Severe	• NIHSS 15-24
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• Need for rehab’	• NIHSS 6-13
• Need for care-home	• NIHSS >13

JAMA | Original Investigation

Effect of Alteplase vs Aspirin on Functional Outcome for Patients With Acute Ischemic Stroke and Minor Nondisabling Neurologic Deficits

The PRISMS Randomized Clinical Trial

Pooja Khatri, MD, MSc; Dawn O. Kleindorfer, MD; Thomas Devlin, MD; Robert N. Sawyer Jr, MD; Matthew Starr, MD; Jennifer Mejilla, DO; Joseph Broderick, MD; Anjan Chatterjee, MD; Edward C. Jauch, MD, MS; Steven R. Levine, MD; Jose G. Romano, MD; Jeffrey L. Saver, MD; Achala Vagal, MD, MS; Barbara Purdon, PhD; Jenny Devenport, PhD; Andrey Pavlov, PhD; Sharon D. Yeatts, PhD; for the PRISMS Investigators

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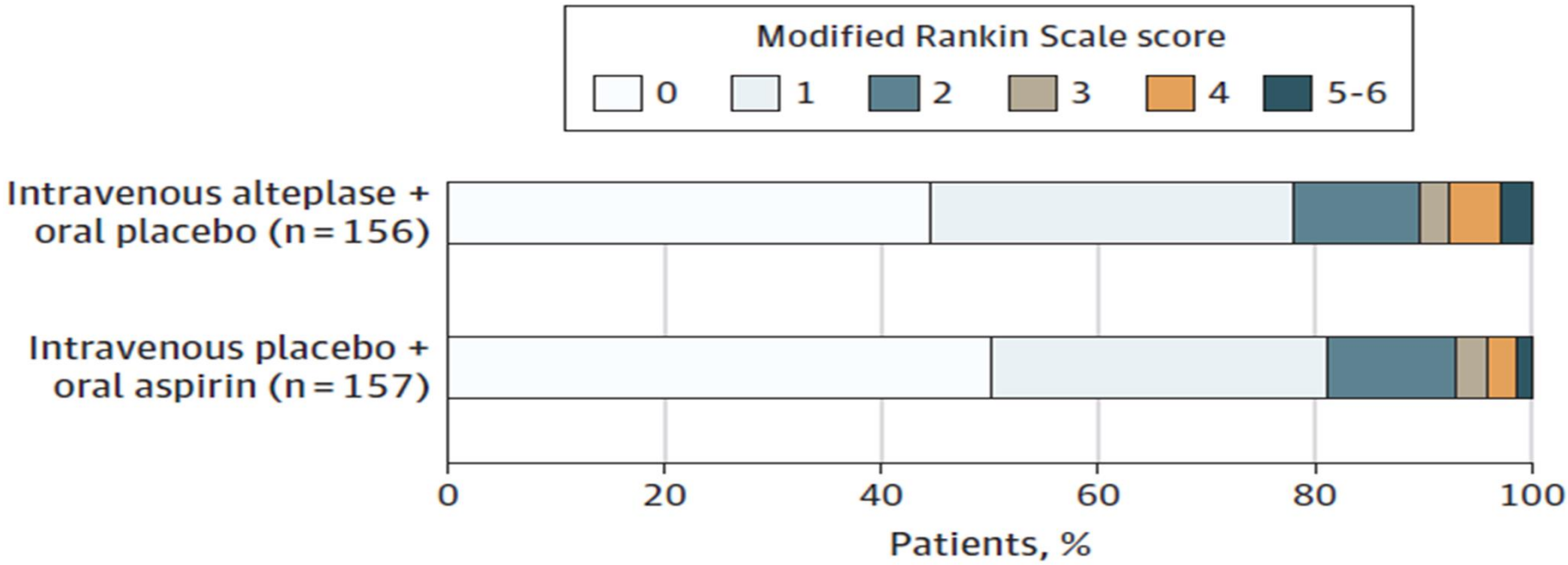
Figure 2. Modified Rankin Scale Score Distributions at 90 Days by Treatment Group



Jim’s story

- 69 year old man
- COPD, osteoarthritis, diabetes
- Still plays piano professionally

- Right hemisphere stroke
- Visual inattention, mild left hemiparesis
- NIH 3

- Evidence based therapy

- 3/12 follow up:

Jim’s story

- 69 year old man
- COPD, osteoarthritis, diabetes
- Still plays piano professionally

- Right hemisphere stroke
- Visual inattention, mild left hemiparesis
- NIH 3

- Evidence based therapy

- 3/12 follow up: modified Rankin 3 (poor outcome)

Published in final edited form as:
Ann Emerg Med. 2011 January ; 57(1): 42–45. doi:10.1016/j.annemergmed.2010.06.564.

Zero on the NIHSS Does NOT Equal the Absence of Stroke

Shery
Panda
[1]The S
[2]Depa
[3]Depa
[4]Depa
TX

Hindawi Publishing Corporation
Stroke Research and Treatment
Volume 2014, Article ID 462681, 6 pages
http://dx.doi.org/10.1155/2014/462681

Hindawi

Clinical Study

Stroke Survivors Scoring Zero on the NIH Stroke Scale Score Still Exhibit Significant Motor Impairment and Functional Limitation

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453 West Tenth Avenue, Su
[2] *School of Health and Rehab*
Suite 406, Columbus, OH 4

Stroke

NO ACCESS
ARTICLE

Request Access

National Institutes of Health Stroke Scale Zero Strokes

Immeasurable but Not Innocent

Elissavet Eskioglou, Mitra Huchmandzadeh Millotte, Michael Amig
Patrik Michel

Question

- Is this a problem with NIHSS ?
- Is this a problem with our outcomes ?
- Is this not related to the stroke ?

Question

- Is this a problem with NIHSS ?
- Is this a problem with our outcomes ?
- Is this not related to the stroke ?

Lots of assessment scales

Quinn TJ. et al

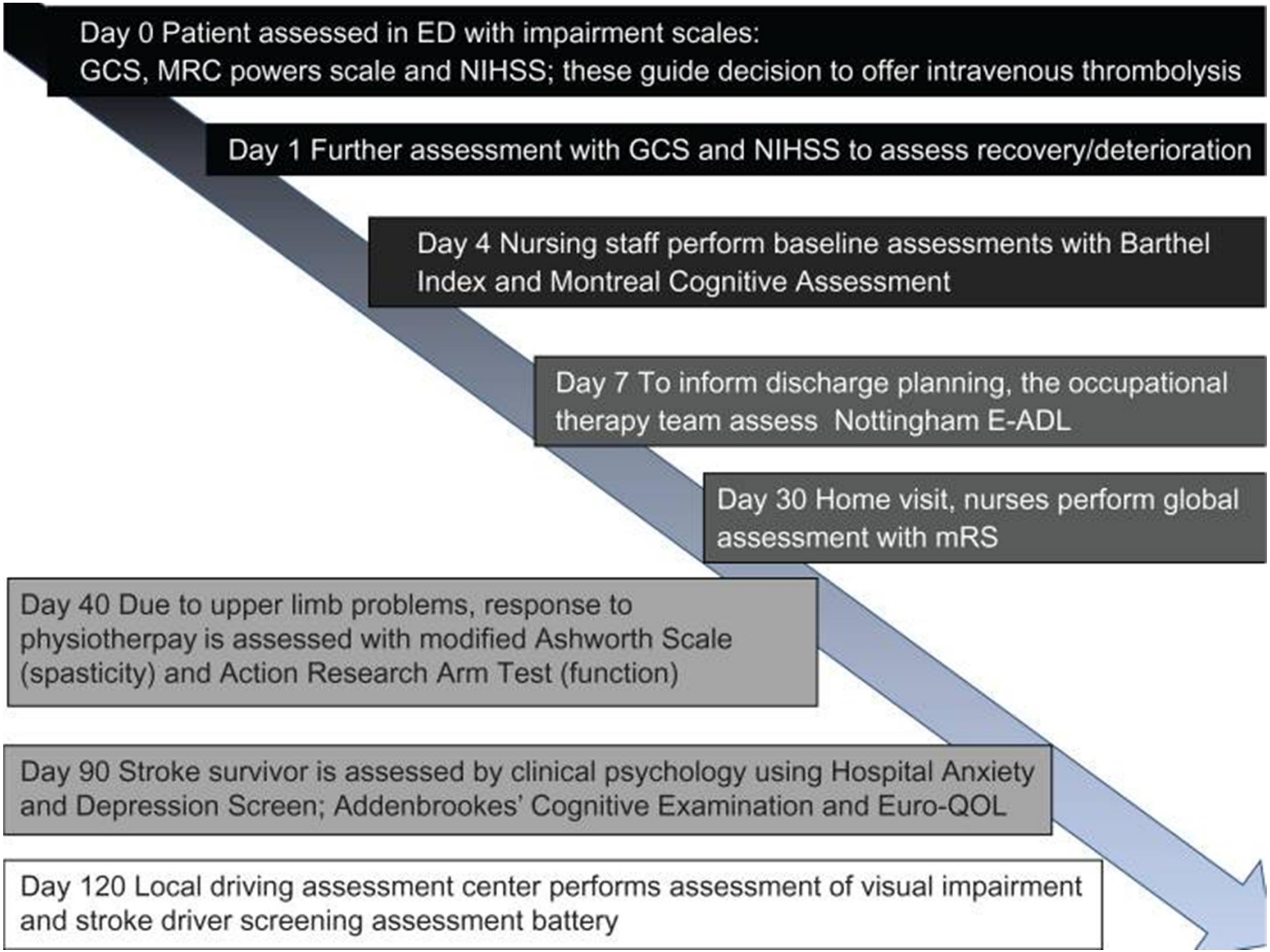
Int J Stroke 2009;3:200-5

Outcome Measure	Number of Trials
Modified Rankin Scale	81 (64.3%)
Barthel Index	51 (40.5%)
Nat. Institutes of Health Stroke Scale	35 (27.8%)
Scandinavian Stroke Scale	11 (8.7%)
Glasgow Outcomes Scale	8 (6.3%)
Frenchay Activities Index	6 (4.7%)
Timed Walk/ 6 Minute Walk	6 (4.7%)
EuroQOL	4 (3.1%)
Fugl-Meyer Motor	4 (3.1%)
Wolf Motor Functional Test	4 (3.1%)
Rivermead Mobility Index	3 (2.4%)
Short Form 36	3 (2.4%)
Stroke Impact Scale	3 (2.4%)
Berg Balance Scale	2 (1.6%)
Canadian Stroke Scale	2 (1.6%)
Tinetti Balance Assessment Tool	2 (1.6%)

126 stroke trials in high impact journals

48 different outcome measures

In some papers up to 9 scales used


Day 0 Patient assessed in ED with impairment scales:
GCS, MRC powers scale and NIHSS; these guide decision to offer intravenous thrombolysis
Day 1 Further assessment with GCS and NIHSS to assess recovery/deterioration
Day 4 Nursing staff perform baseline assessments with Barthel Index and Montreal Cognitive Assessment
Day 7 To inform discharge planning, the occupational therapy team assess Nottingham E-ADL
Day 30 Home visit, nurses perform global assessment with mRS
Day 40 Due to upper limb problems, response to physiotherpay is assessed with modified Ashworth Scale (spasticity) and Action Research Arm Test (function)
Day 90 Stroke survivor is assessed by clinical psychology using Hospital Anxiety and Depression Screen; Addenbrookes' Cognitive Examination and Euro-QOL
Day 120 Local driving assessment center performs assessment of visual impairment and stroke driver screening assessment battery

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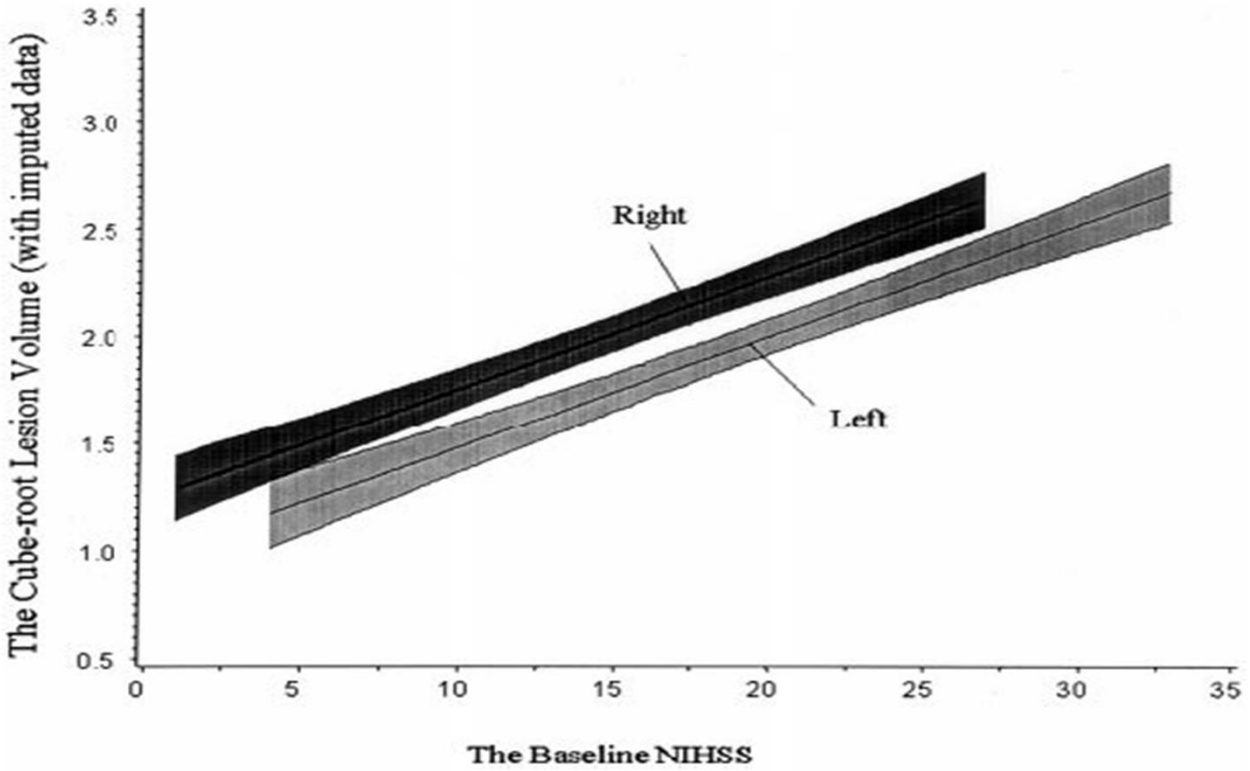
NIHSS

Woo D et al

Stroke 1999;30:2355-9



Cube-root lesion volume for right and left hemisphere strokes compared with baseline NIHSS score. Shaded areas represent 95% confidence intervals.

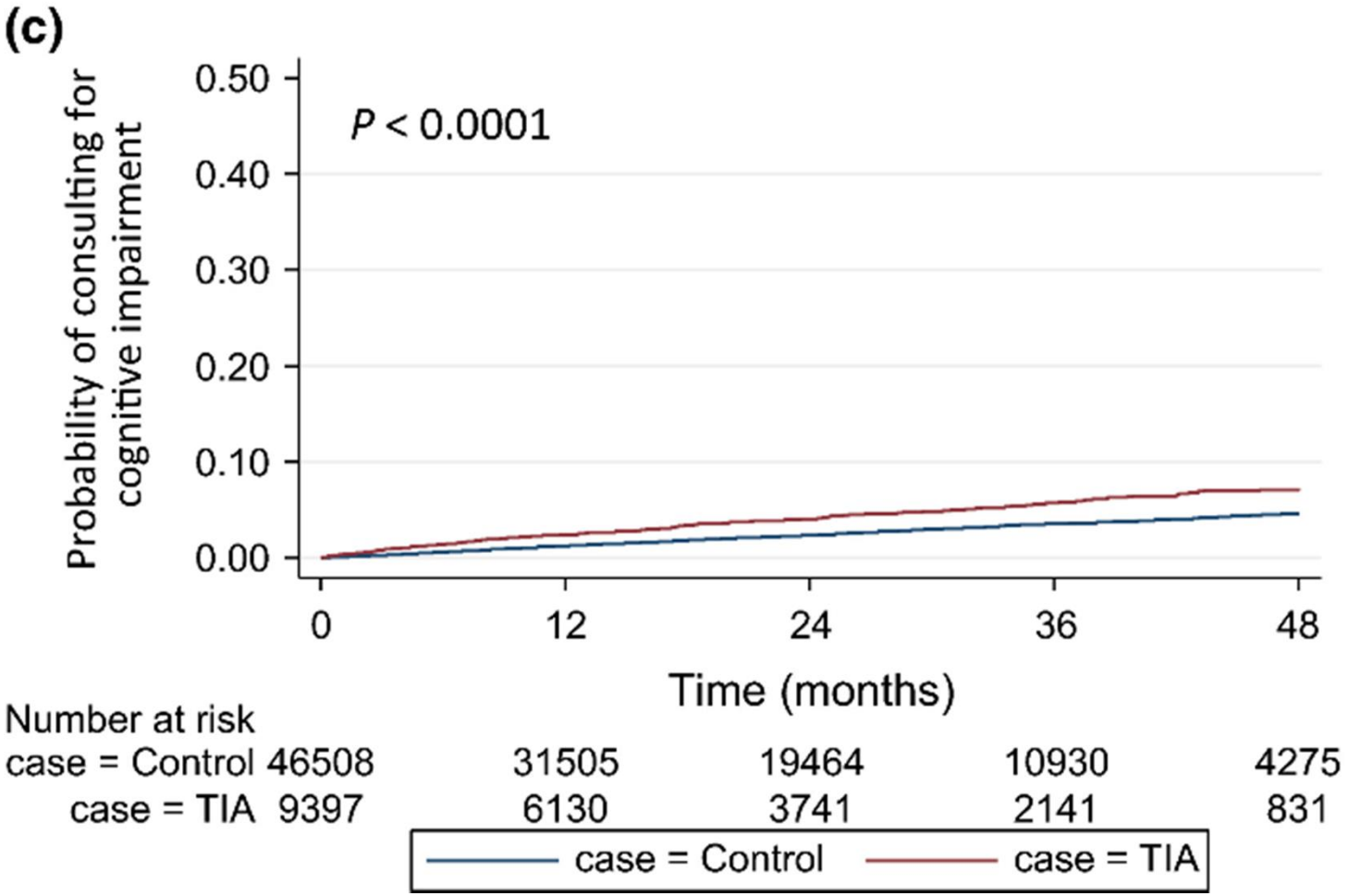
NIHSS

- LoC
- Gaze
- Fields
- Facial paresis
- Arm & leg paresis
- Limb ataxia
- Sensory
- Speech
- Extinction/inattention
- Anything else?

What is NIHSS not measuring ?

Turner GM et al

Eur J Neur 2016;23:1642



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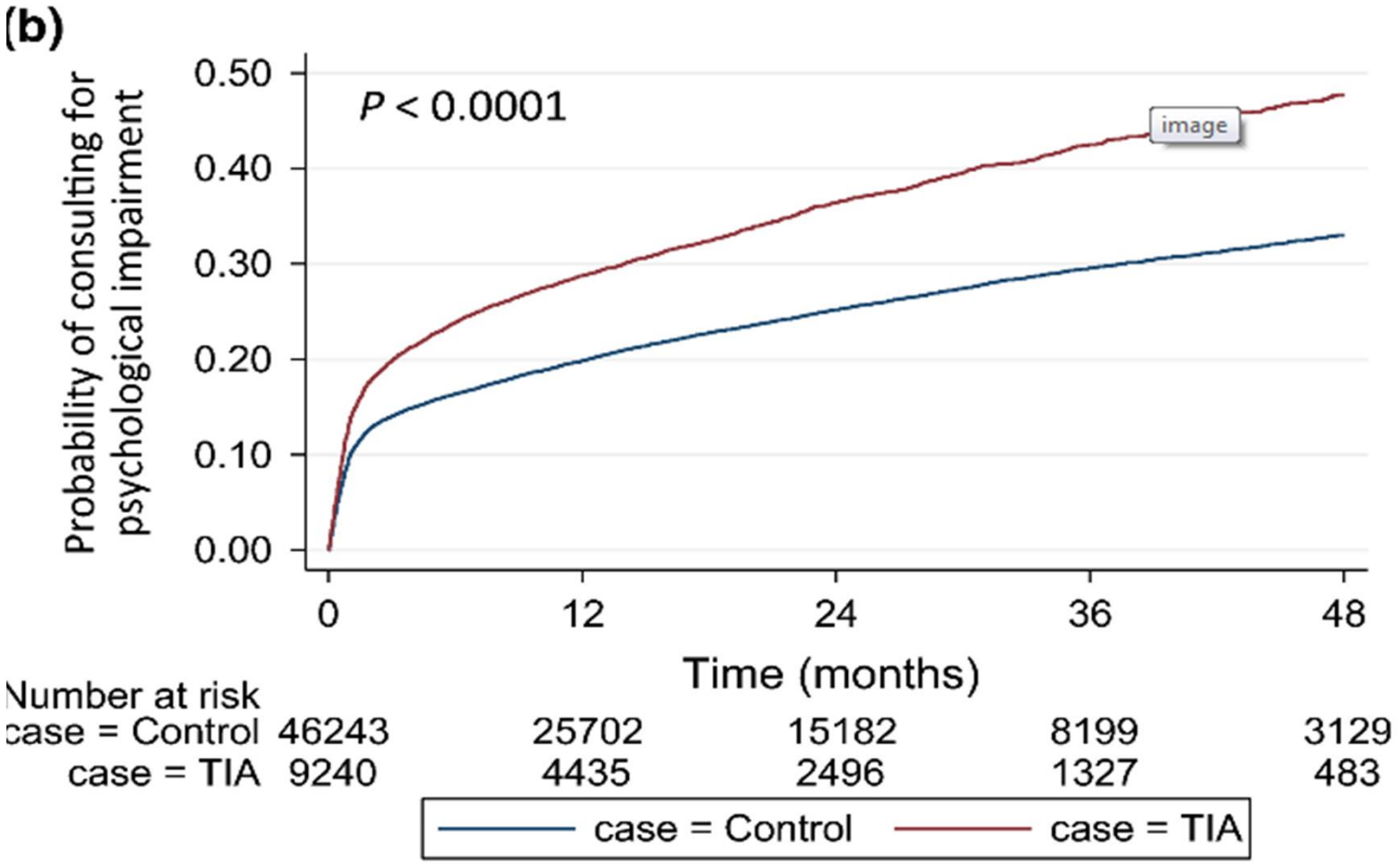

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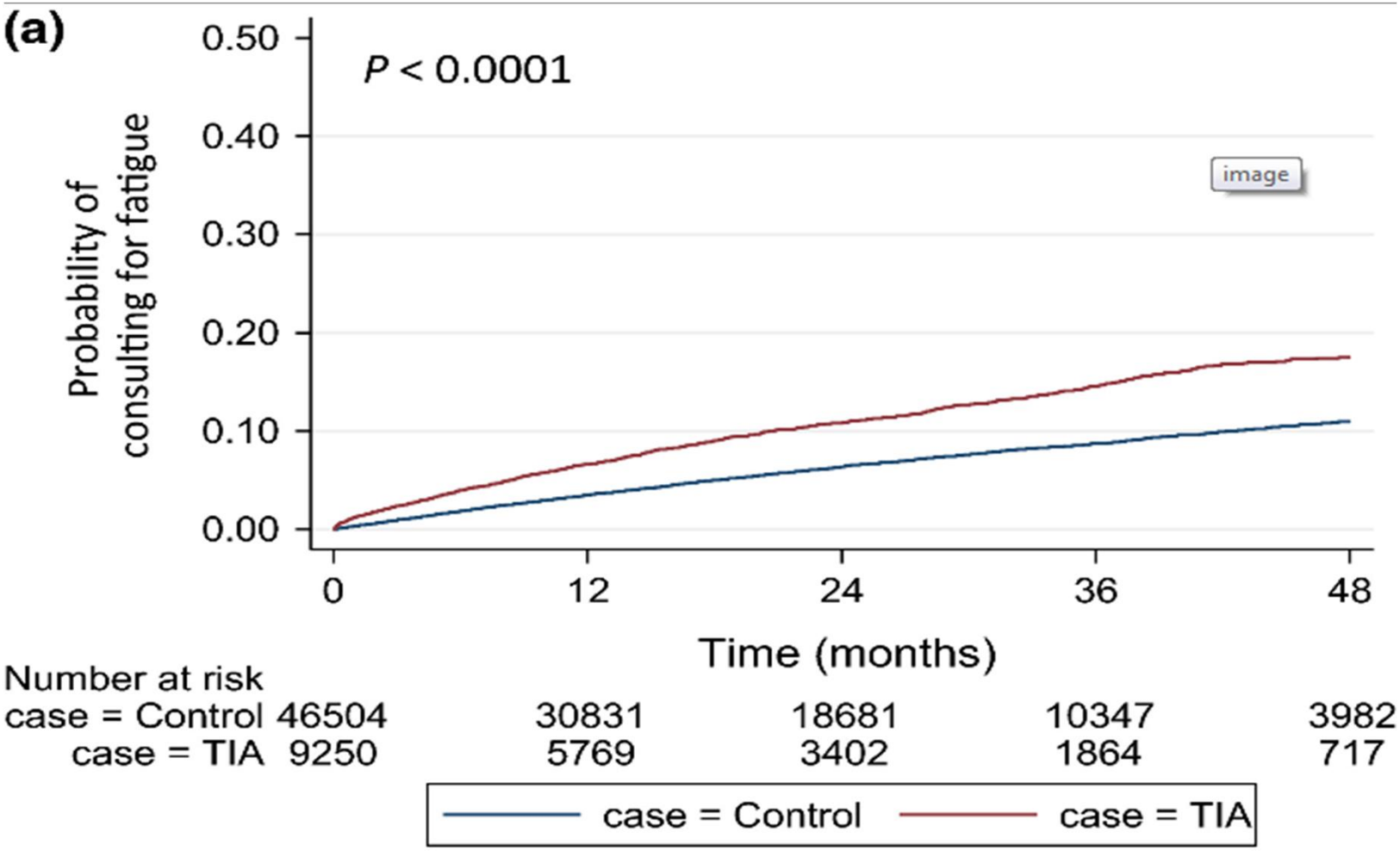

University of Glasgow

1. What are the best ways to improve cognition after a stroke
2. What are the best ways to help people come to terms with long term consequences of stroke
3. What are the best ways to help people recover from aphasia
4. What are the best treatments for arm recovery
5. What are the best ways to treat visual problems after a stroke
6. What are the best ways to manage of prevent fatigue
7. What are the best treatments for balance, gait and mobility
8. How can stroke survivors & families cope with aphasia
9. What are the best ways of improving confidence after stroke
10. Are exercise and fitness programmes beneficial

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Question

- Should we add NIHSS to SSCA ?
- Are you screening for cognitive / psychological issues acutely ?
- If so are you worried about being charged ?

CGS·SCG
CANADIAN GERIATRICS SOCIETY
LA SOCIÉTÉ CANADIENNE DE GÉRIATRIE

EDITORIAL

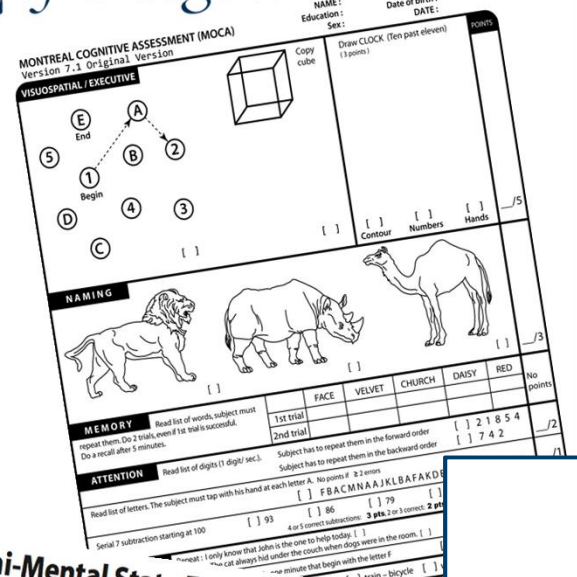
EXPLORING OPTIONS WHEN PREVIOUSLY FREE OPEN ACCESS COGNITIVE SCREENING TOOLS SUCH AS THE MMSE AND MOCA BECOME PROPRIETARY AND CHARGE FOR USE AND/OR TRAINING

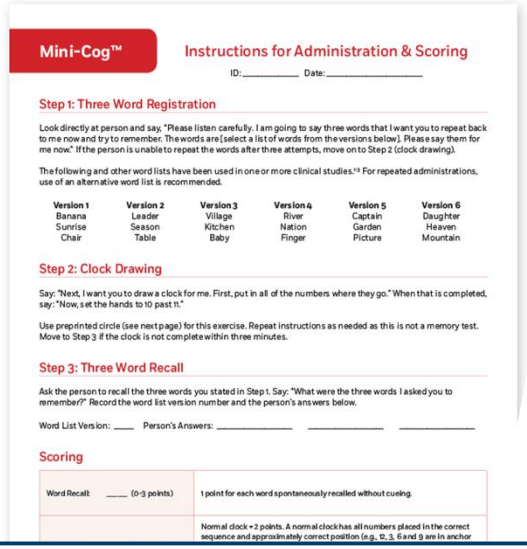
Dr. Frank Molnar
MSc, MDCM, FRCPC
Editor-in-chief,
Canadian Geriatrics Society
CME Journal

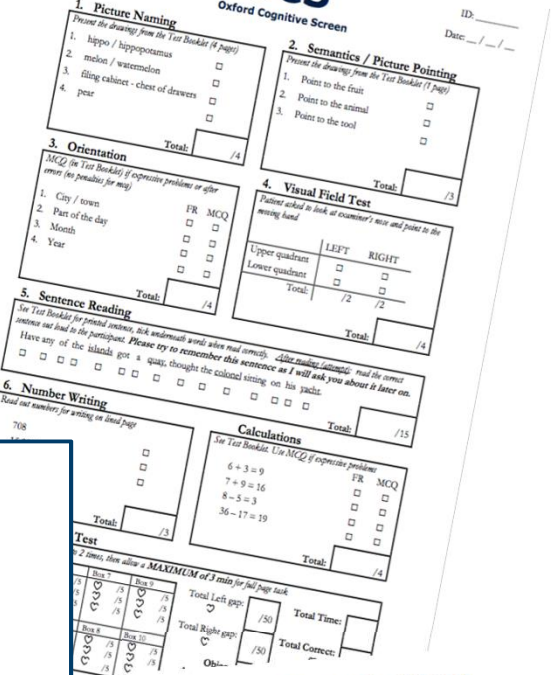
The opinions expressed below represent those of the author alone who accepts full responsibility. The opinions do not reflect the opinions of the Canadian Geriatrics Society nor of the Canadian Geriatrics Society Journal of CME both of whom are indemnified. The purpose of this editorial is to stimulate informed in-depth scholarly discussion.

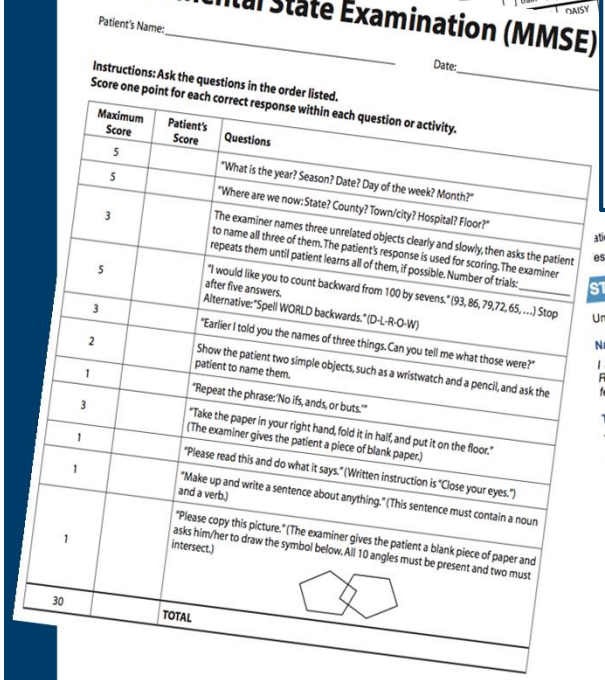
University of Glasgow

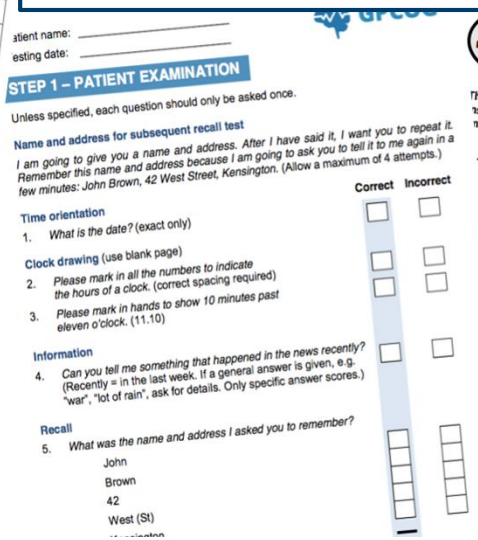
There is no perfect screening test

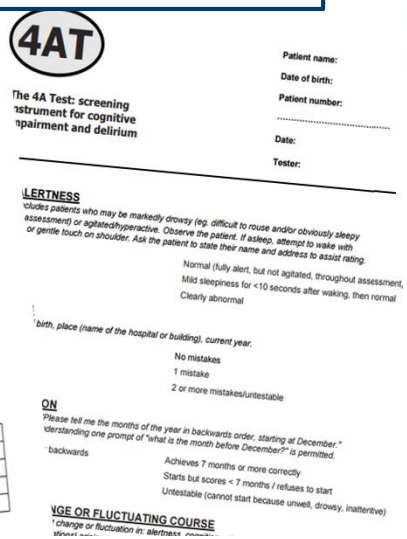


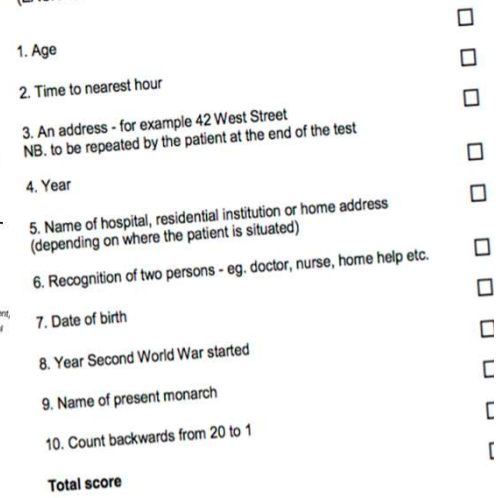












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Lees R. et al
Stroke *2014*

Test (threshold)	Sensitivity (95%CI)	Specificity (95%CI)	Positive Likelihood Ratio (95%CI)	Negative Likelihood Ratio (95%CI)
ACE-R (<88/100)	0.77 (0.45-0.93)	0.93 (0.02-0.99)	11.42 (0.02-51.7)	0.24 (0.11-0.53)
MMSE (<25/30)	0.72 (0.60-0.81)	0.82 (0.77-0.86)	4.17 (3.17-5.34)	0.33 (0.24-0.49)
MoCA (<26/30)	0.95 (0.89-0.98)	0.45 (0.34-0.57)	1.73 (1.43-2.10)	0.10 (0.04-0.23)
R-CAMCOG (<33/49)	0.81 (0.57-0.93)	0.92 (0.87-0.95)	10.18 (6.41-16.18)	0.20 (0.07-0.52)

University of Glasgow

NHS Greater Glasgow and Clyde

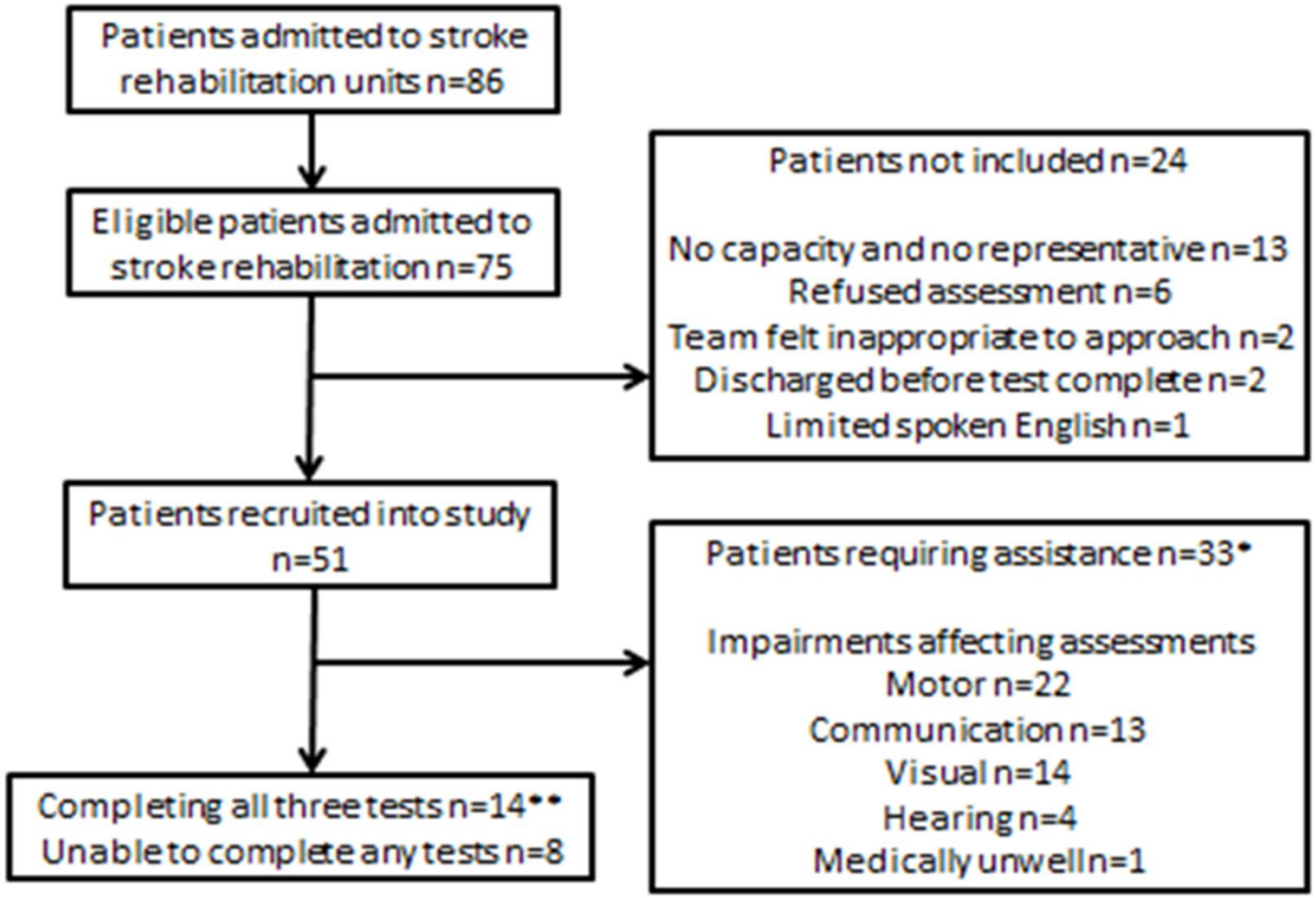
3,000 stroke admissions p.a
most (all) strokes come to hospital

Assume 1 year occurrence (incident and prevalent) multidomain cognitive impairment 40%

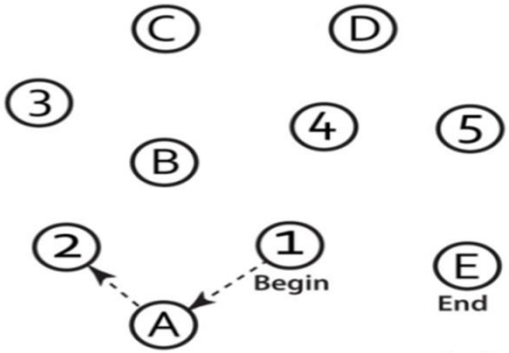
If we use MoCA <26 as only screening test
60 patients with impairment will be told they are OK
990 cognitively OK will be told they have impairment

For MoCA <22
180 patients with impairment will be told they are OK
432 cognitively OK will be told they have impairment

University of Glasgow



VISUOSPATIAL / EXECUTIVE



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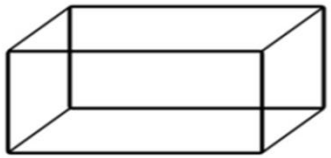


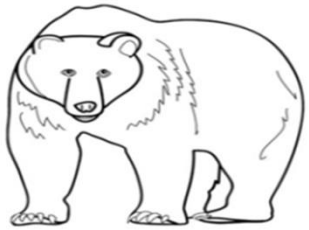
Draw CLOCK (Five past four)
(3 points)

[ ] Contour [ ] Numbers [ ] Hands

POINTS ___/5

NAMING

[ ]



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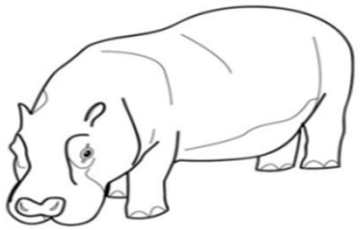

[ ] ___/3

MEMORY

Read list of words, subject must repeat them. Do 2 trials, even if 1st trial is successful. Do a recall after 5 minutes.

	TRUCK	BANANA	VIOLIN	DESK	GREEN
1st trial					
2nd trial					

No points

ATTENTION

Read list of digits (1 digit/ sec.).

Subject has to repeat them in the forward order [ ] 3 2 9 6 5

Subject has to repeat them in the backward order [ ] 8 5 2 ___/2

Read list of letters. The subject must tap with his hand at each letter A. No points if ≥ 2 errors

[ ] F B A C M N A A J K L B A F A K D E A A A J A M O F A A B ___/1

Serial 7 subtraction starting at 90 [ ] 83 [ ] 76 [ ] 69 [ ] 62 [ ] 55

4 or 5 correct subtractions: **3 pts**, 2 or 3 correct: **2 pts**, 1 correct: **1 pt**, 0 correct: **0 pt** ___/3

LANGUAGE

Repeat : A bird can fly into closed windows when it's dark and windy. [ ]
The caring grandmother sent groceries over a week ago. [ ] ___/2

Fluency / Name maximum number of words in one minute that begin with the letter S [ ] _____ (N ≥ 11 words) ___/1

ABSTRACTION

Similarity between e.g. banana - orange = fruit [ ] diamond - ruby [ ] cannon - rifle ___/2

DELAYED RECALL

Optional

Has to recall words **WITH NO CUE**	TRUCK [ ]	BANANA [ ]	VIOLIN [ ]	DESK [ ]	GREEN [ ]	Points for UNCUED recall only
Category cue						
Multiple choice cue						

___/5

ORIENTATION

[ ] Date [ ] Month [ ] Year [ ] Day [ ] Place [ ] City ___/6

VISUOSPATIAL / EXECUTIVE

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[ ] [ ]

Draw CLOCK (Five past four)
(3 points)

[ ] Contour [ ] Numbers [ ] Hands

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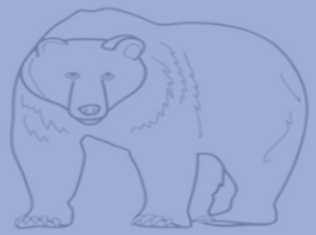
NAMING

[ ]



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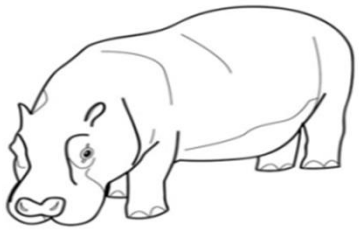

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	TRUCK	BANANA	VIOLIN	DESK	GREEN
1st trial					
2nd trial					

No points

ATTENTION

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Multiple choice cue						

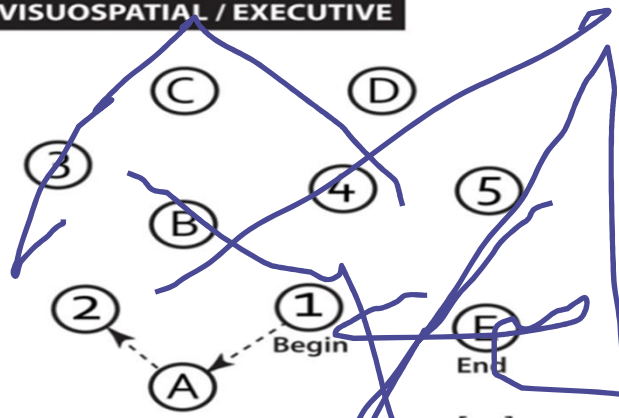
___/5

ORIENTATION

[ ] Date [ ] Month [ ] Year [ ] Day [ ] Place [ ] City

___/6

VISUOSPATIAL / EXECUTIVE



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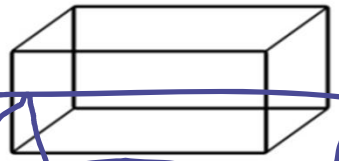

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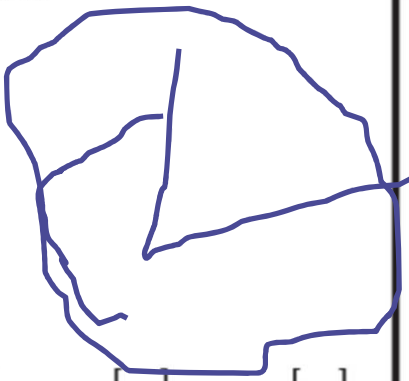

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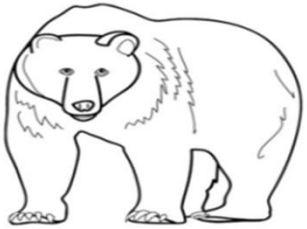
POINTS ___/5

NAMING

[ ]



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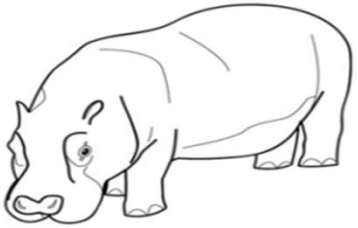


[ ]

___/3

MEMORY

Read list of words, subject must repeat them. Do 2 trials, even if 1st trial is successful. Do a recall after 5 minutes.

	TRUCK	BANANA	VIOLIN	DESK	GREEN
1st trial					
2nd trial					

No points

ATTENTION

Read list of digits (1 digit/ sec.).

Subject has to repeat them in the forward order [ ] 3 2 9 6 5

Subject has to repeat them in the backward order [ ] 8 5 2

___/2

Read list of letters. The subject must tap with his hand at each letter A. No points if ≥ 2 errors

[ ] F B A C M N A A J K L B A F A K D E A A A J A M O F A A B

___/1

Serial 7 subtraction starting at 90 [ ] 83 [ ] 76 [ ] 69 [ ] 62 [ ] 55

4 or 5 correct subtractions: **3 pts**, 2 or 3 correct: **2 pts**, 1 correct: **1 pt**, 0 correct: **0 pt**

___/3

LANGUAGE

Repeat : A bird can fly into closed windows when it's dark and windy. [ ]
The caring grandmother sent groceries over a week ago. [ ]

___/2

Fluency / Name maximum number of words in one minute that begin with the letter S [ ] _____ (N ≥ 11 words)

___/1

ABSTRACTION

Similarity between e.g. banana - orange = fruit [ ] diamond - ruby [ ] cannon - rifle

___/2

DELAYED RECALL

Optional

Has to recall words **WITH NO CUE**	TRUCK [ ]	BANANA [ ]	VIOLIN [ ]	DESK [ ]	GREEN [ ]	Points for UNCUED recall only
Category cue						
Multiple choice cue						

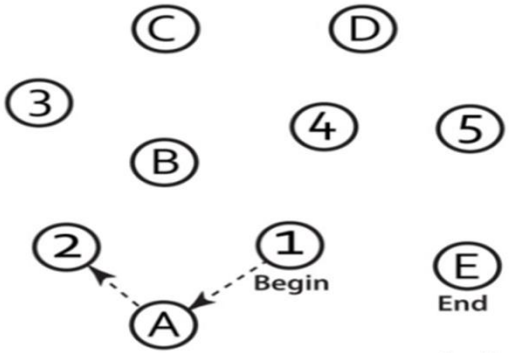
___/5

ORIENTATION

[ ] Date [ ] Month [ ] Year [ ] Day [ ] Place [ ] City

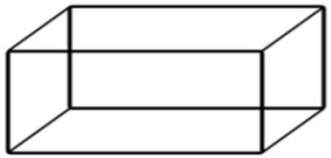
___/6

VISUOSPATIAL / EXECUTIVE



[ ] [ ]

Copy rectangle



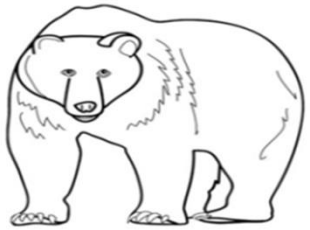
Draw CLOCK (Five past four)
(3 points)

[ ] Contour [ ] Numbers [ ] Hands

POINTS ___/5

NAMING

[ ]



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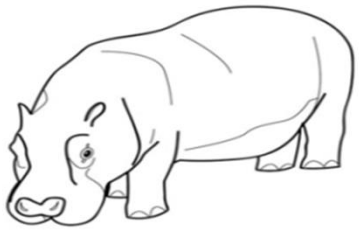


[ ]

___/3

MEMORY

Read list of words, subject must repeat them. Do 2 trials, even if 1st trial is successful. Do a recall after 5 minutes.

	TRUCK	BANANA	VIOLIN	DESK	GREEN
1st trial					
2nd trial					

No points

ATTENTION

Read list of digits (1 digit/ sec.).

Subject has to repeat them in the forward order [ ] 3 2 9 6 5

Subject has to repeat them in the backward order [ ] 8 5 2

___/2

Read list of letters. The subject must tap with his hand at each letter A. No points if ≥ 2 errors

[ ] F B A C M N A A J K L B A F A K D E A A A J A M O F A A B

___/1

Serial 7 subtraction starting at 90 [ ] 83 [ ] 76 [ ] 69 [ ] 62 [ ] 55

4 or 5 correct subtractions: **3 pts**, 2 or 3 correct: **2 pts**, 1 correct: **1 pt**, 0 correct: **0 pt**

___/3

LANGUAGE

Repeat : A [illegible] when it's dark and windy. [ ]
Th[illegible]eries over a week ago. [ ]

___/2

Fluency / Name maximum nu[illegible] begin with the letter S [ ] _____ (N ≥ 11 words)

___/1

ABSTRACTION

Similarity b[illegible]it [ ] diamond - ruby [ ] cannon - rifle

___/2

DELAYED RECALL

	Has to r[illegible] words WITH NO CUE	TRUCK [ ]	BANANA [ ]	VIOLIN [ ]	DESK [ ]	GREEN [ ]	Points for UNCUED recall only
Optional	Category cue						
	Multiple choice cue						

___/5

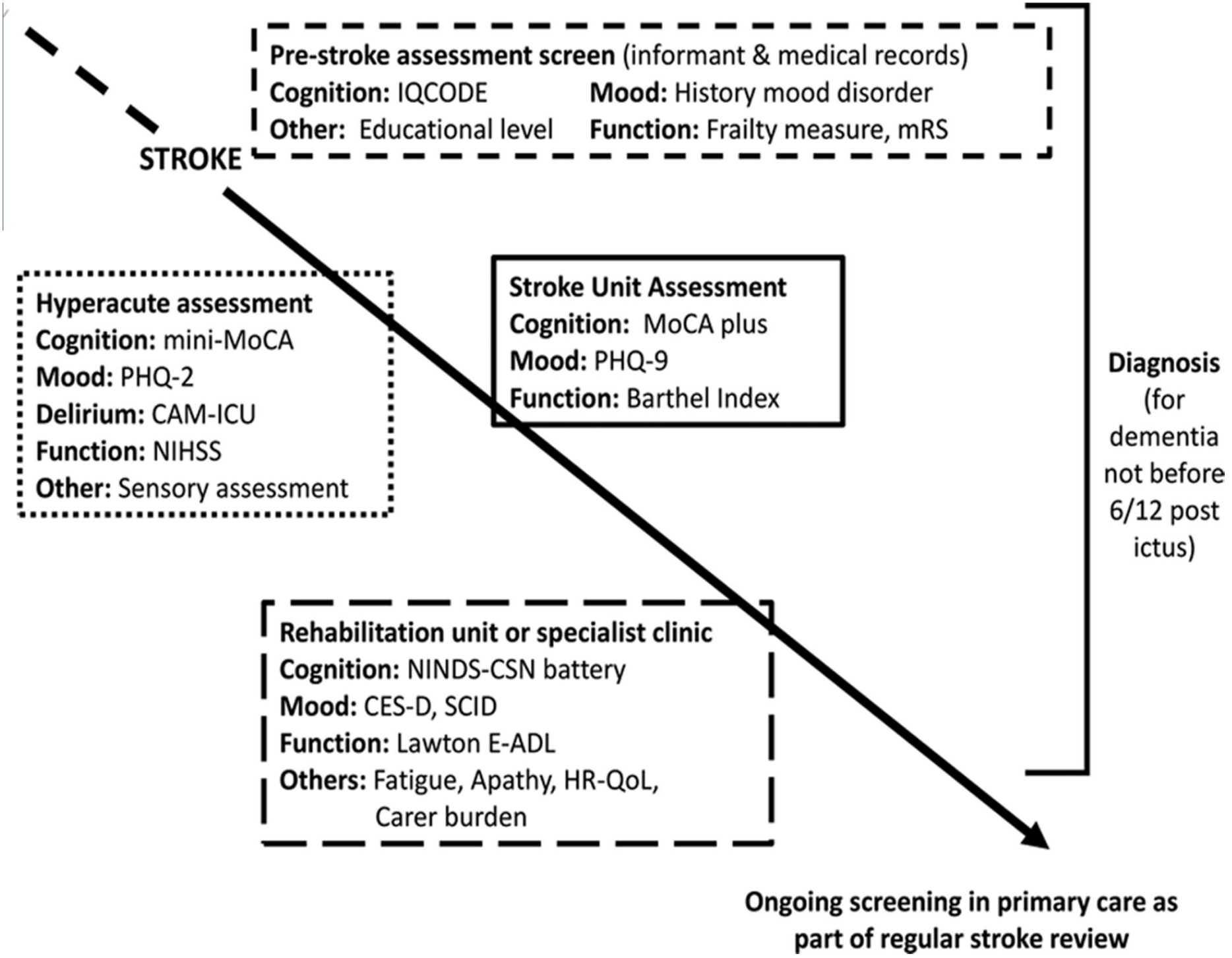
ORIENTATION

[ ] Date [ ] Month [ ] Year [ ] Day [ ] Place [ ] City

___/6

S S S S S

S


Pre-stroke assessment screen (informant & medical records)
Cognition: IQCODE
Mood: History mood disorder
Other: Educational level
Function: Frailty measure, mRS
STROKE
Hyperacute assessment
Cognition: mini-MoCA
Mood: PHQ-2
Delirium: CAM-ICU
Function: NIHSS
Other: Sensory assessment
Stroke Unit Assessment
Cognition: MoCA plus
Mood: PHQ-9
Function: Barthel Index
Diagnosis (for dementia not before 6/12 post ictus)
Rehabilitation unit or specialist clinic
Cognition: NINDS-CSN battery
Mood: CES-D, SCID
Function: Lawton E-ADL
Others: Fatigue, Apathy, HR-QoL, Carer burden
Ongoing screening in primary care as part of regular stroke review

Question

- Is this a problem with NIHSS ?
- Is this a problem with our outcomes ?
- Is this not related to the stroke ?

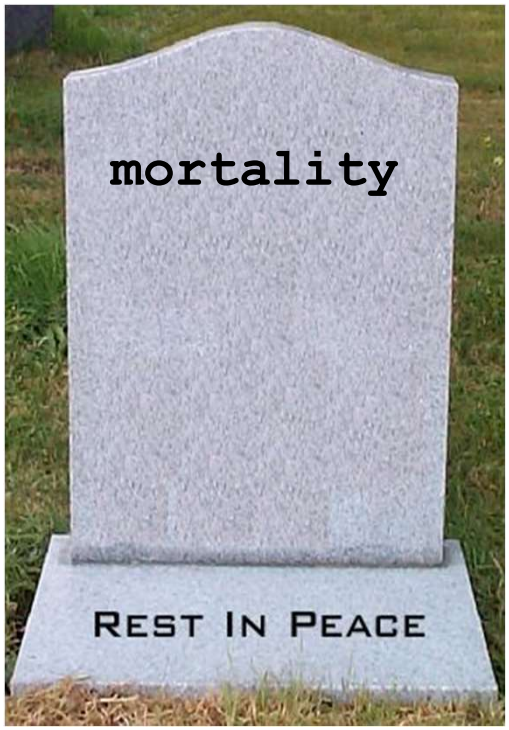
Question

- How should we measure stroke recovery ?

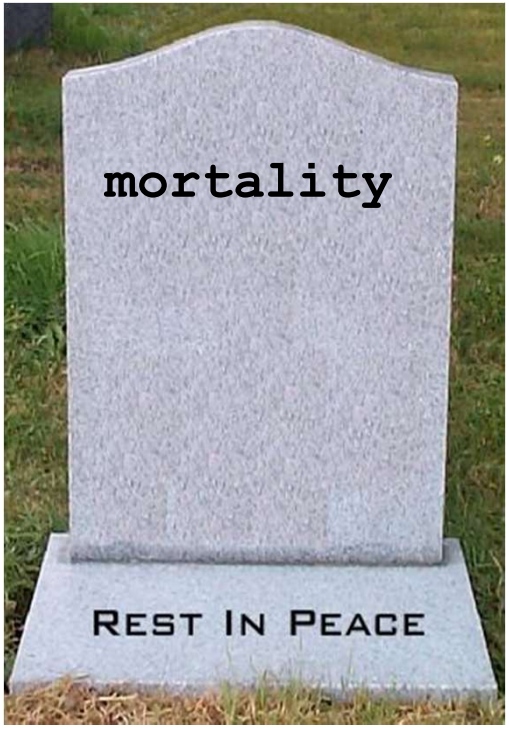
- Who should measure stroke recovery
- Doctor?
- Nurse?
- Patient?

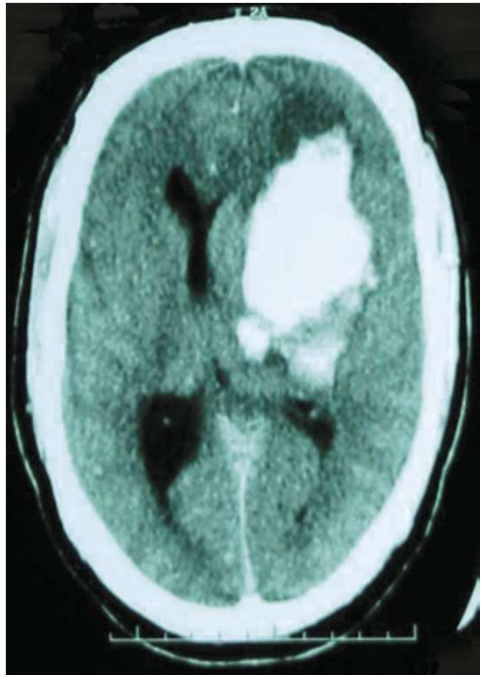
Measuring Stroke Recovery

Measuring Stroke Recovery

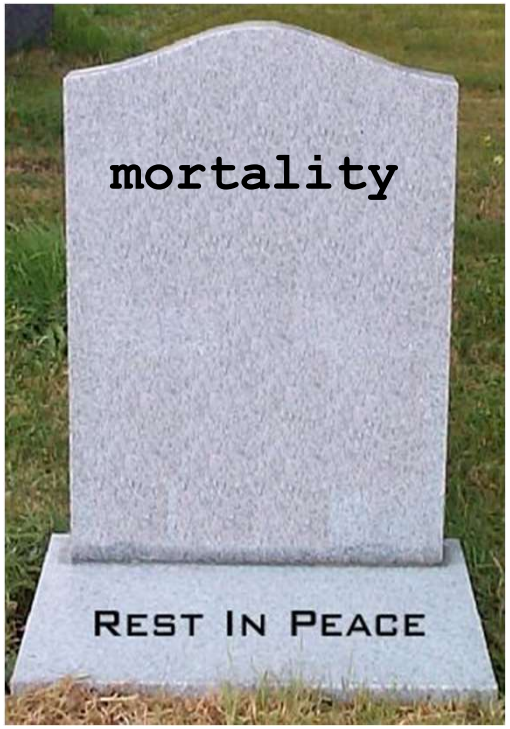


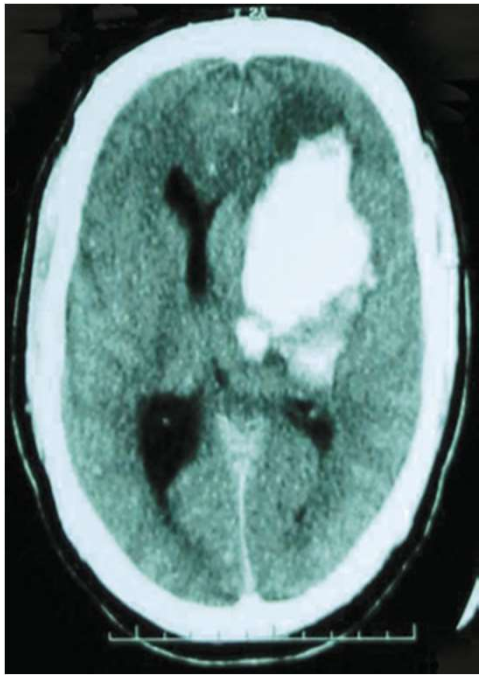
Measuring Stroke Recovery



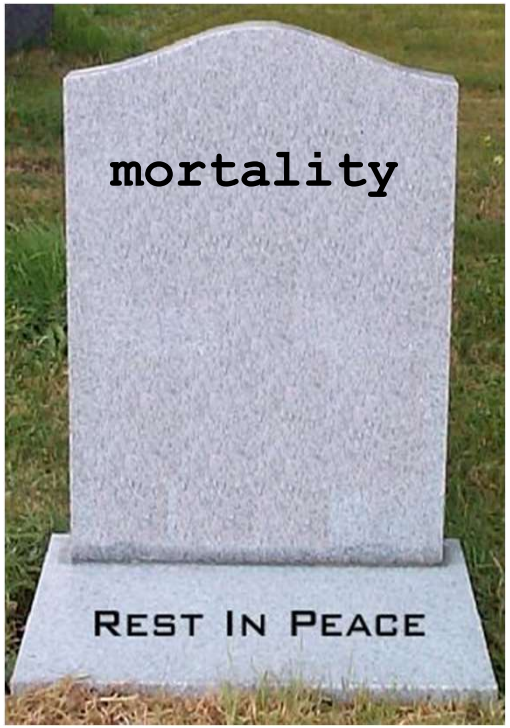


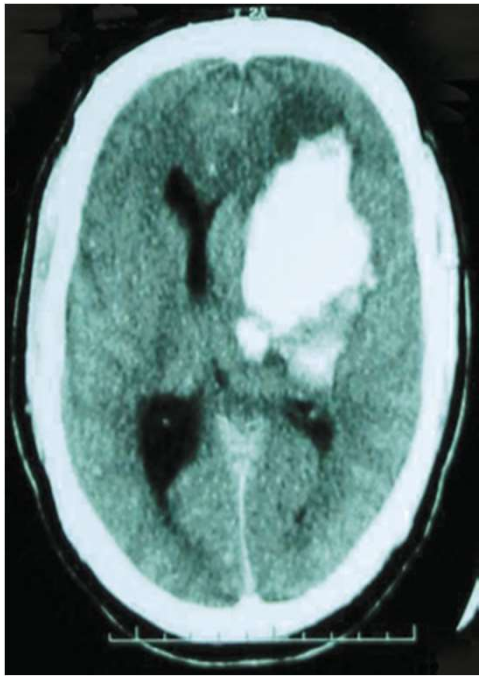
Measuring Stroke Recovery



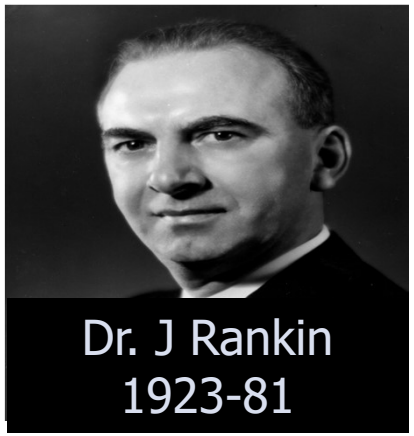


Measuring Stroke Recovery



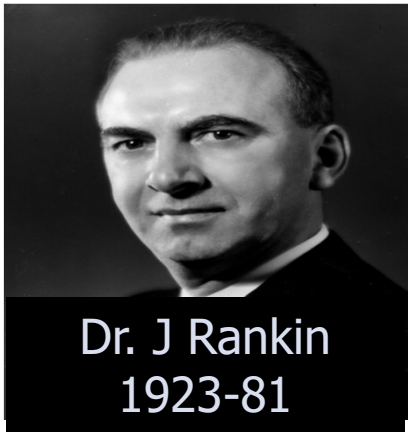


Modified Rankin Scale


Dr. J Rankin
1923-81

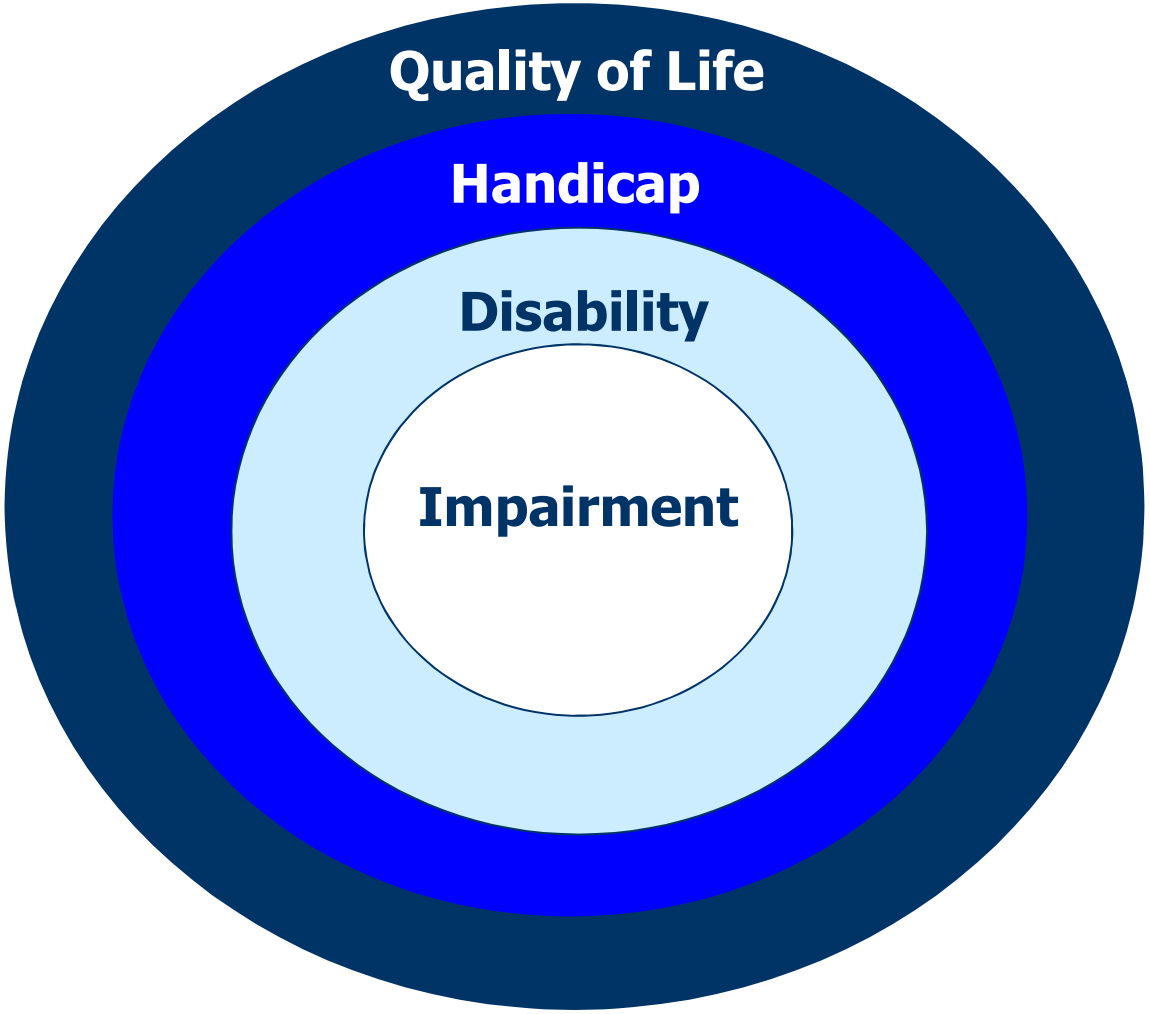
- First described in 1950s (Stobhill Hospital)
- "Global" scale with emphasis on walking
- Modified for use in first multi-centre neurology trial: UK-TIA trial
- Now the most prevalent functional assessment scale

Modified Rankin Scale

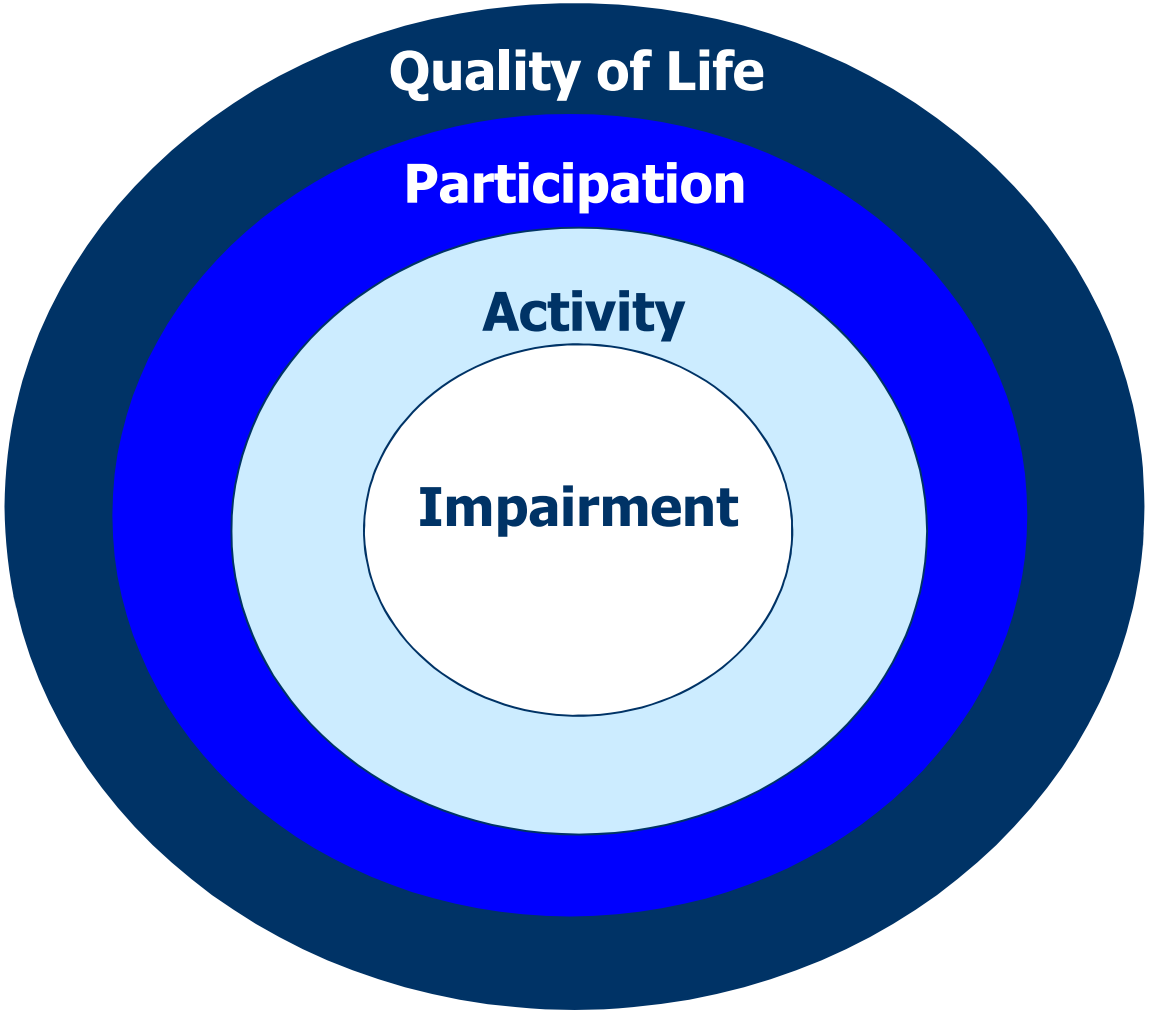

Dr. J Rankin
1923-81

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

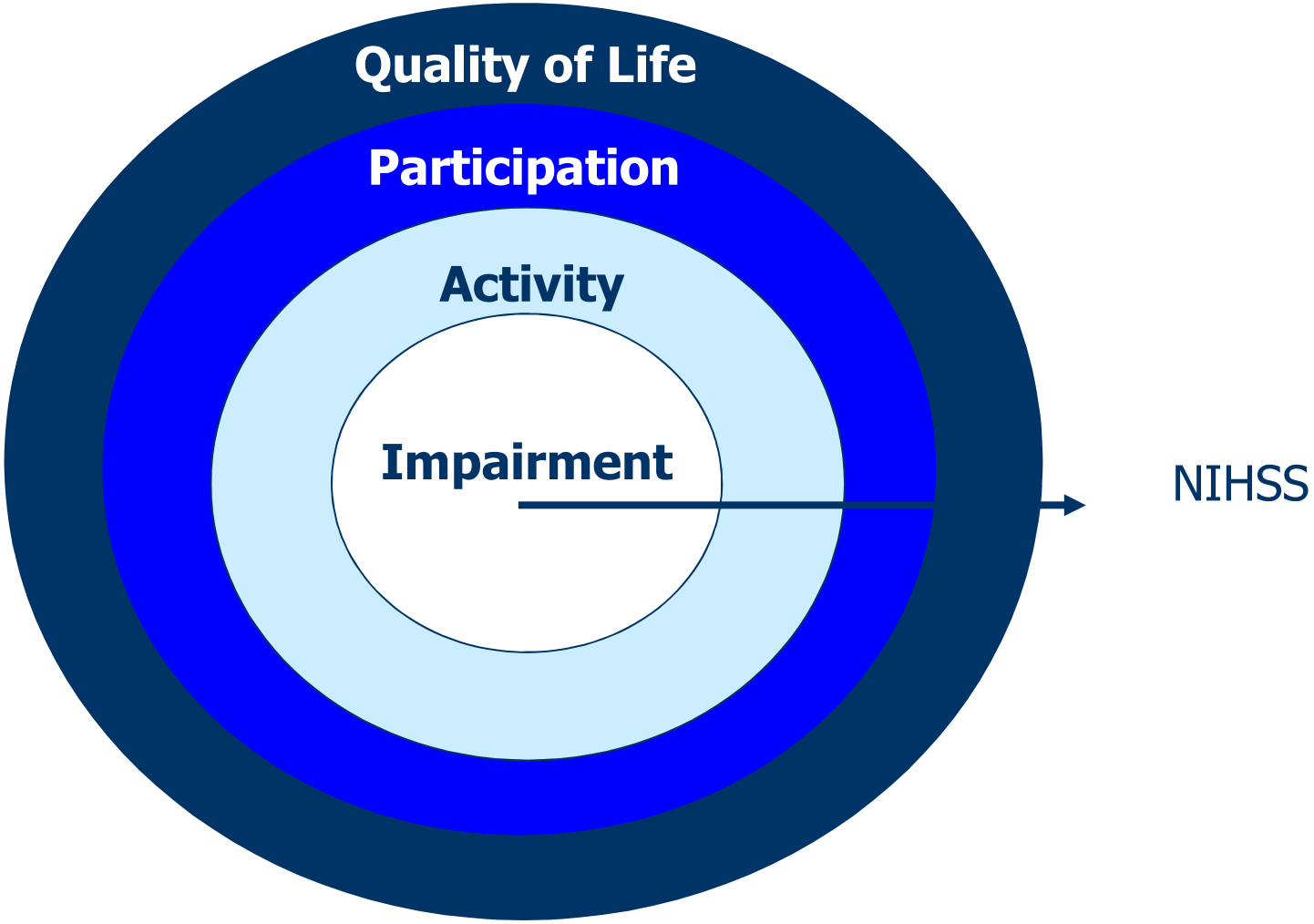
Levels of functioning



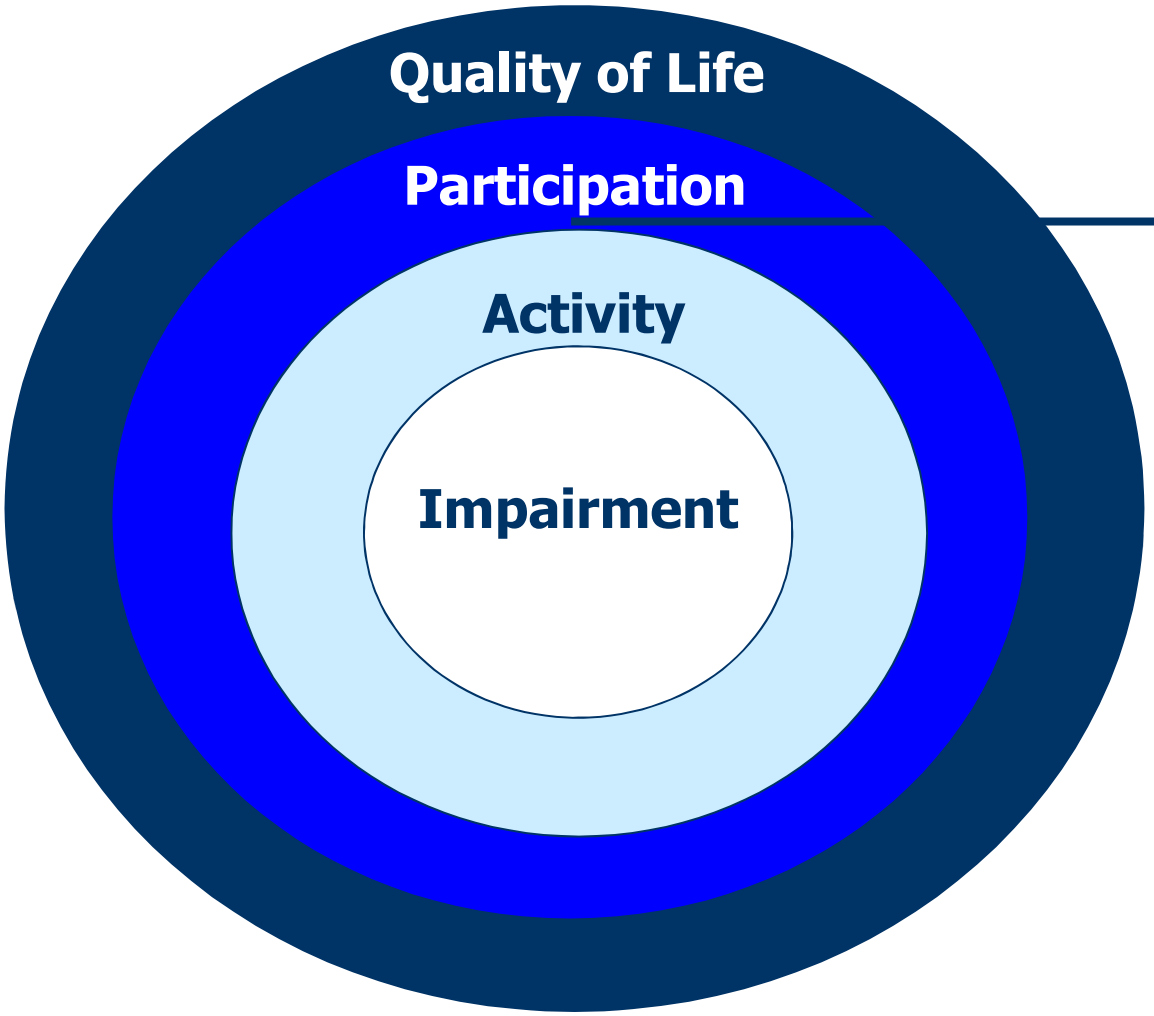
Levels of functioning



Levels of functioning



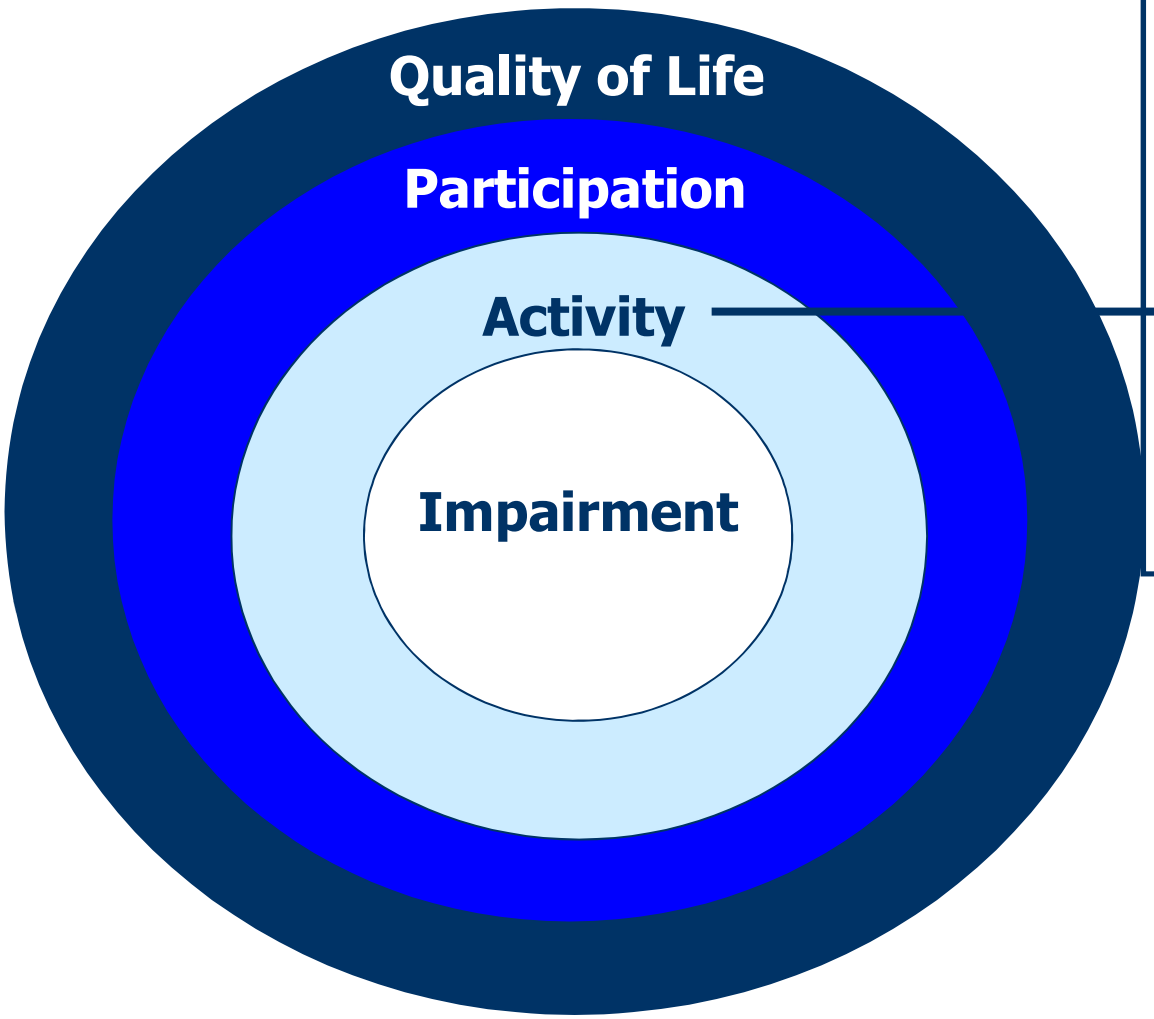
Levels of functioning



Modified Rankin Scale (mRS)

London Handicap Scale

Levels of functioning



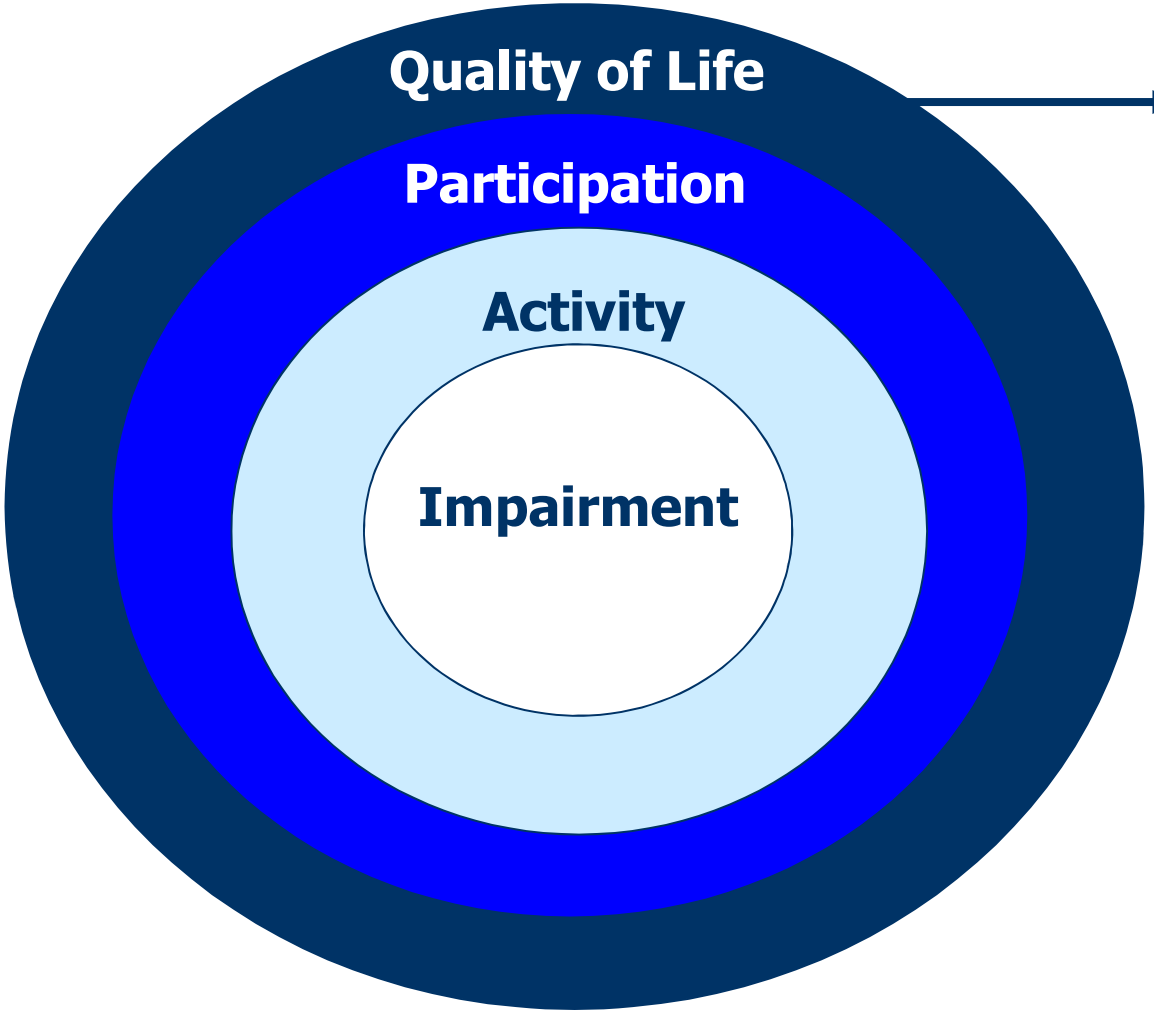
Barthel Index

Functional Independence Measure

Katz ADL Scale

Lawton Scale

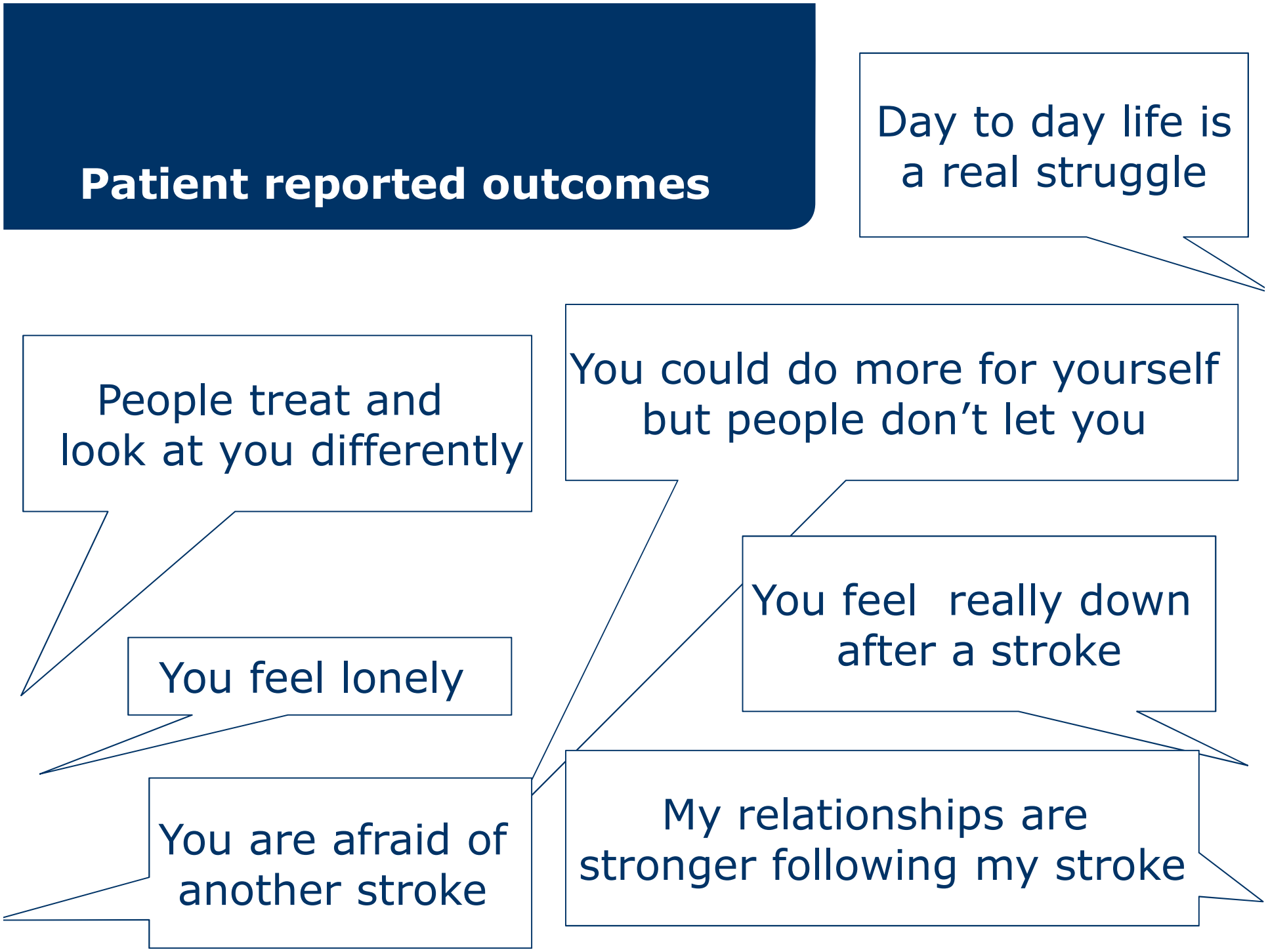
Levels of functioning



Short Form 36

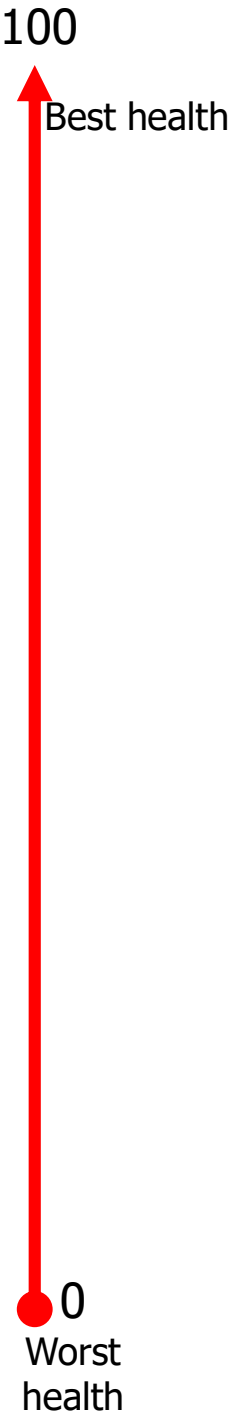
EURO-QOL

Patient reported outcomes



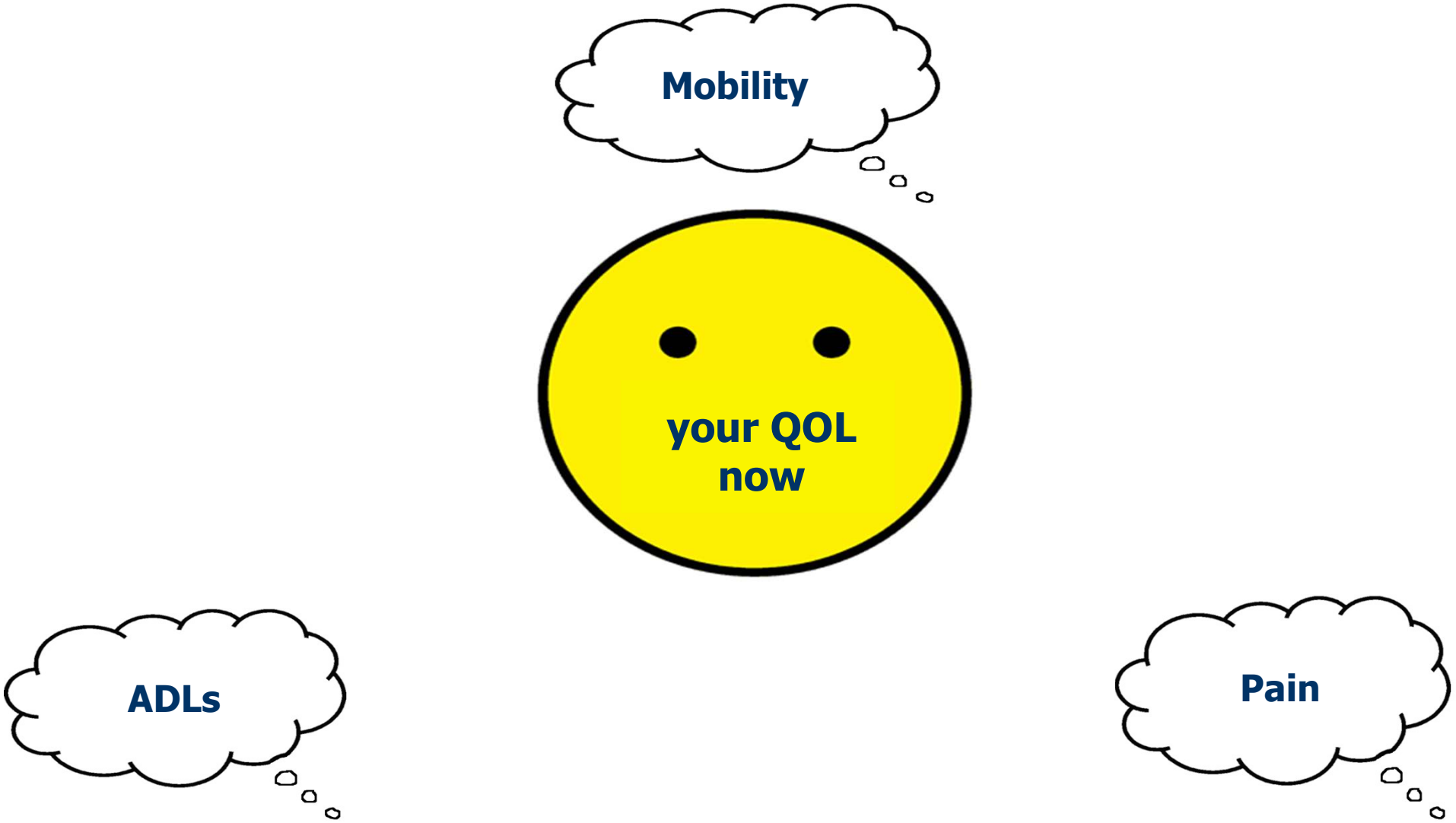
Euro-QOL

- **Mobility**
  - I have no problems walking about
  - I have some problems walking about
  - I am confined to bed
- **Self care**
  - I have no problems with self-care
  - I have some problems washing / dressing
  - I am unable to wash / dress
- **Activities**
  - I have no problems with usual activities
  - I have some problems with usual activities
  - I am unable to perform usual activities
- **Pain/Discomfort**
  - I have no pain or discomfort
  - I have moderate pain or discomfort
  - I have extreme pain or discomfort
- **Anxiety/Depression**
  - I am not anxious or depressed
  - I am moderately anxious or depressed
  - I am extremely anxious or depressed

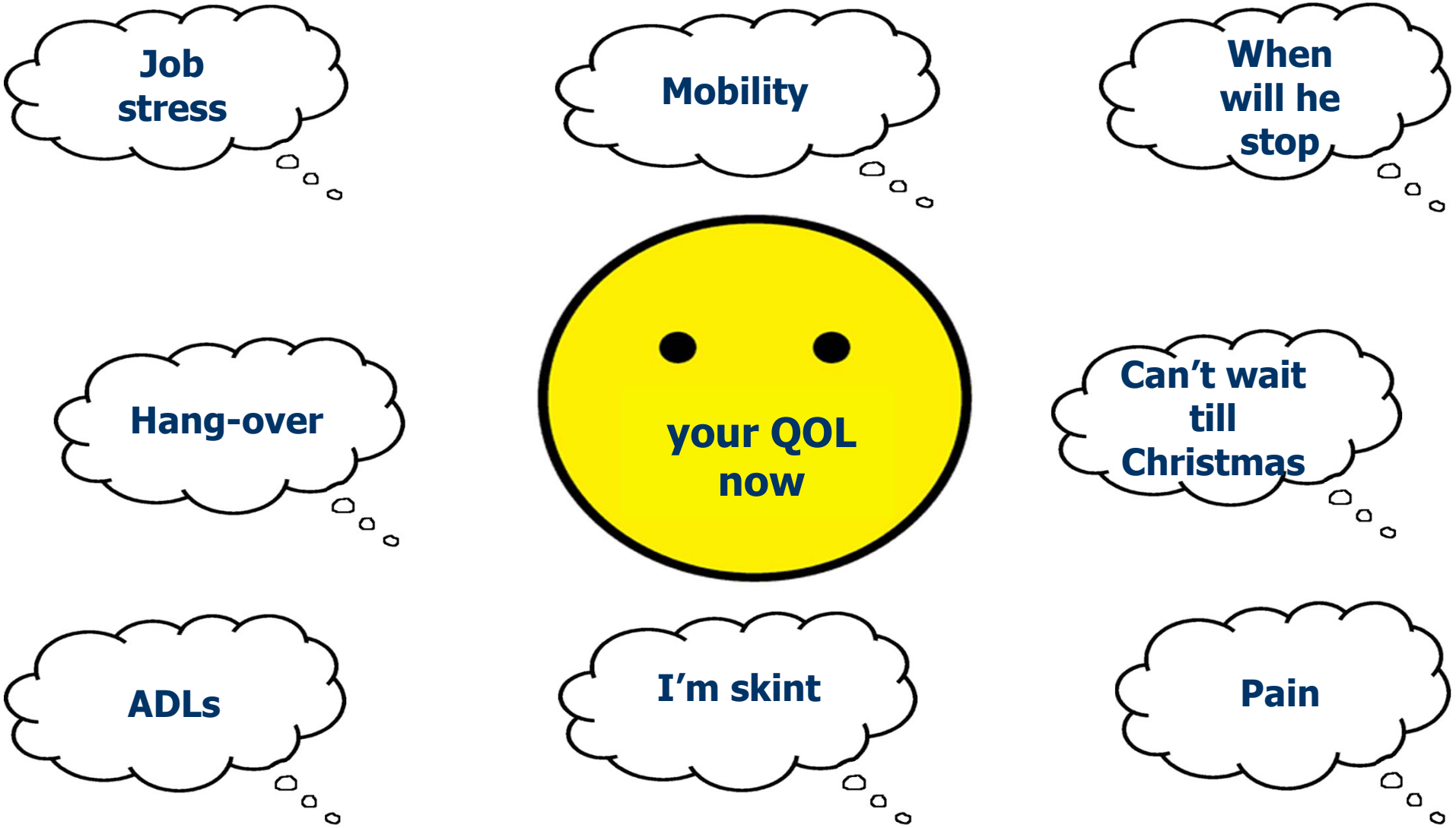


Problems with QOL scales

Problems with QOL scales



Problems with QOL scales



Measuring Function

- Difficult to translate individual experience into numbers / grades

"Simple" impairment scale

Easy to grade

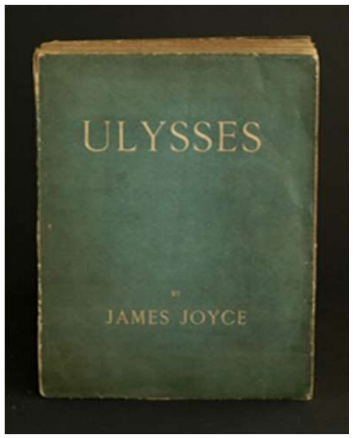
Limited information

Participation / QOL scale

Difficult to grade

Too much information?

Measuring Function



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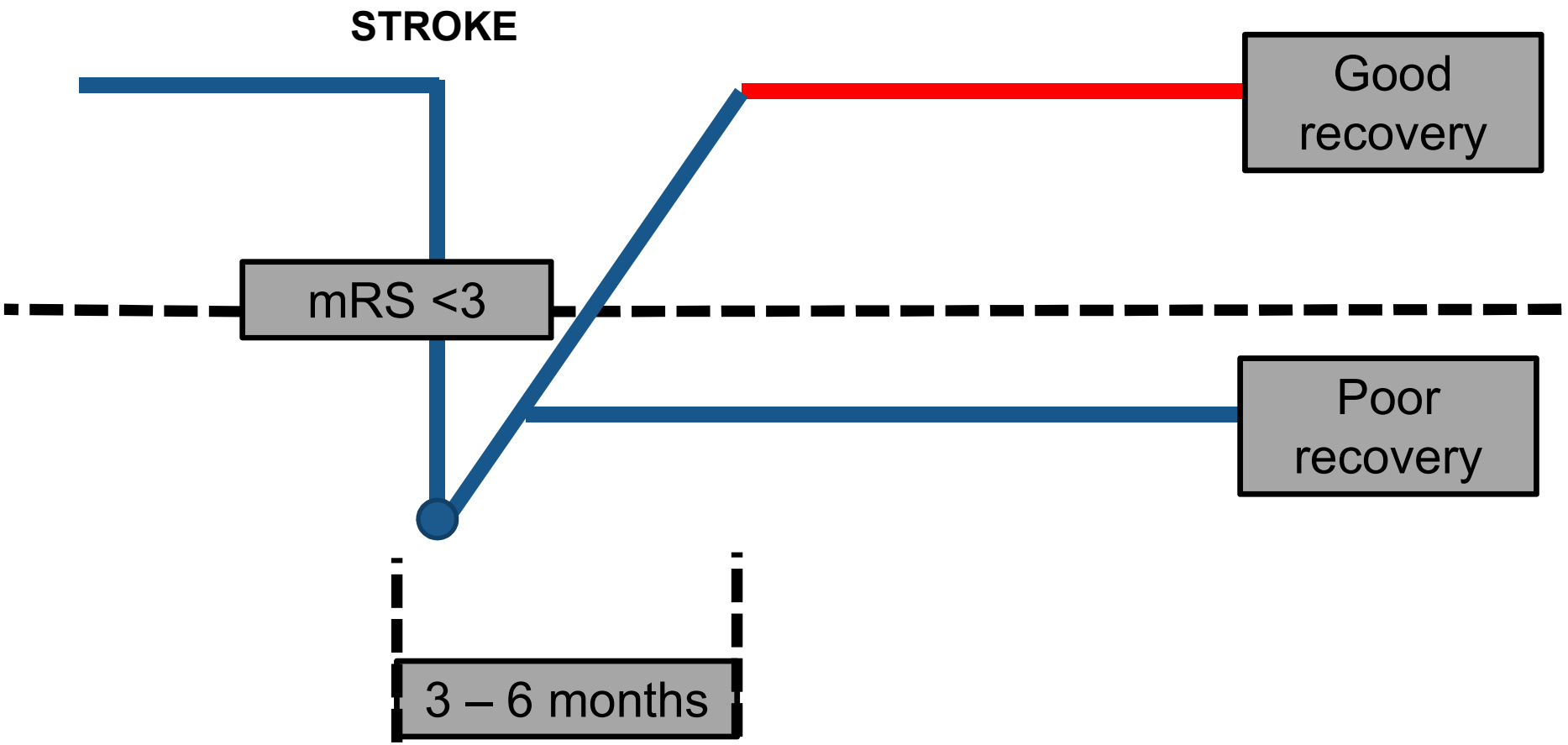
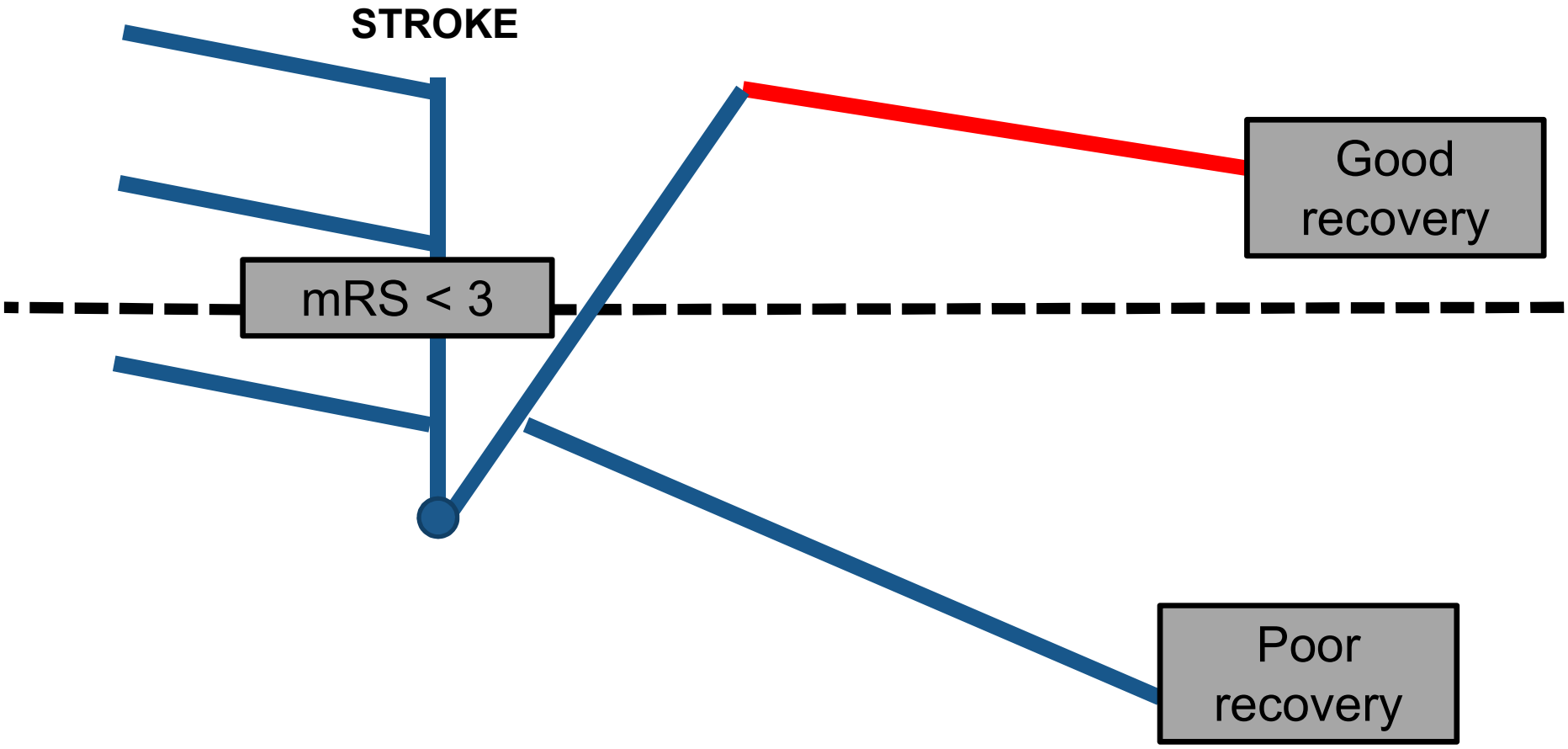
Question

- Is this a problem with NIHSS ?
- Is this a problem with our outcomes ?
- Is this not related to the stroke ?

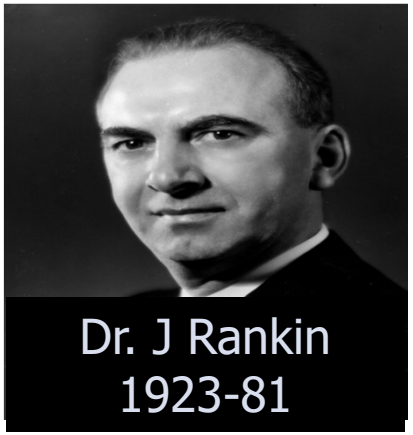

STROKE
Good recovery
mRS <3
Poor recovery
3 – 6 months


STROKE
mRS < 3
Good recovery
Poor recovery

Question

- Do you measure pre-stroke function ?
- Who should measure this ?
- Do you assess frailty?

Modified Rankin Scale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Grade 6	Dead

Pre-Stroke Modified Rankin Scale: Evaluation of Validity, Prognostic Accuracy, and Association with Treatment

Terence J. Quinn[1], Martin Taylor-F*
Stanley D. Musgrave[2], Anthony K.
Elizabeth A. Warburton[4], John F. F

Neurology®

The most widely read and highly cited peer-reviewed neurology journal

The mRS is not suitable pre-stroke

Prestroke Modified Rankin Stroke Scale Has Moderate Interobserver Reliability and Validity in an Acute Stroke Setting

Patrica Fearon, MRCP; Kate S. McArthur, MRCP; Kevin Garrity; Laura J. Graham; Geraldine McGroarty; Sarah Vincent; T. J. Quinn, MD

Frailty is a ‘hot topic’

- Last year, 1458 scientific studies on frailty were published
- Frailty assessment being introduced for hospital admissions
- Frailty assessment being introduced in GP surgeries
- UK Government has policy on frailty in older age
- New treatments for frailty being tested

Frailty is a ‘hot topic’

- Last year, 1458 scientific studies on frailty were published
- Last year, 4 studies on frailty and stroke were published

- Frailty assessment being introduced in NHS
- But not for stroke

- UK Government has policy on frailty in older age
- Stroke not mentioned

- New treatments for frailty being tested
- People living with stroke are excluded

University of Glasgow

“the old have little heat left and as a small flame is easily extinguished, even small ailments can result in death”

Aristotle, 4th Century BC

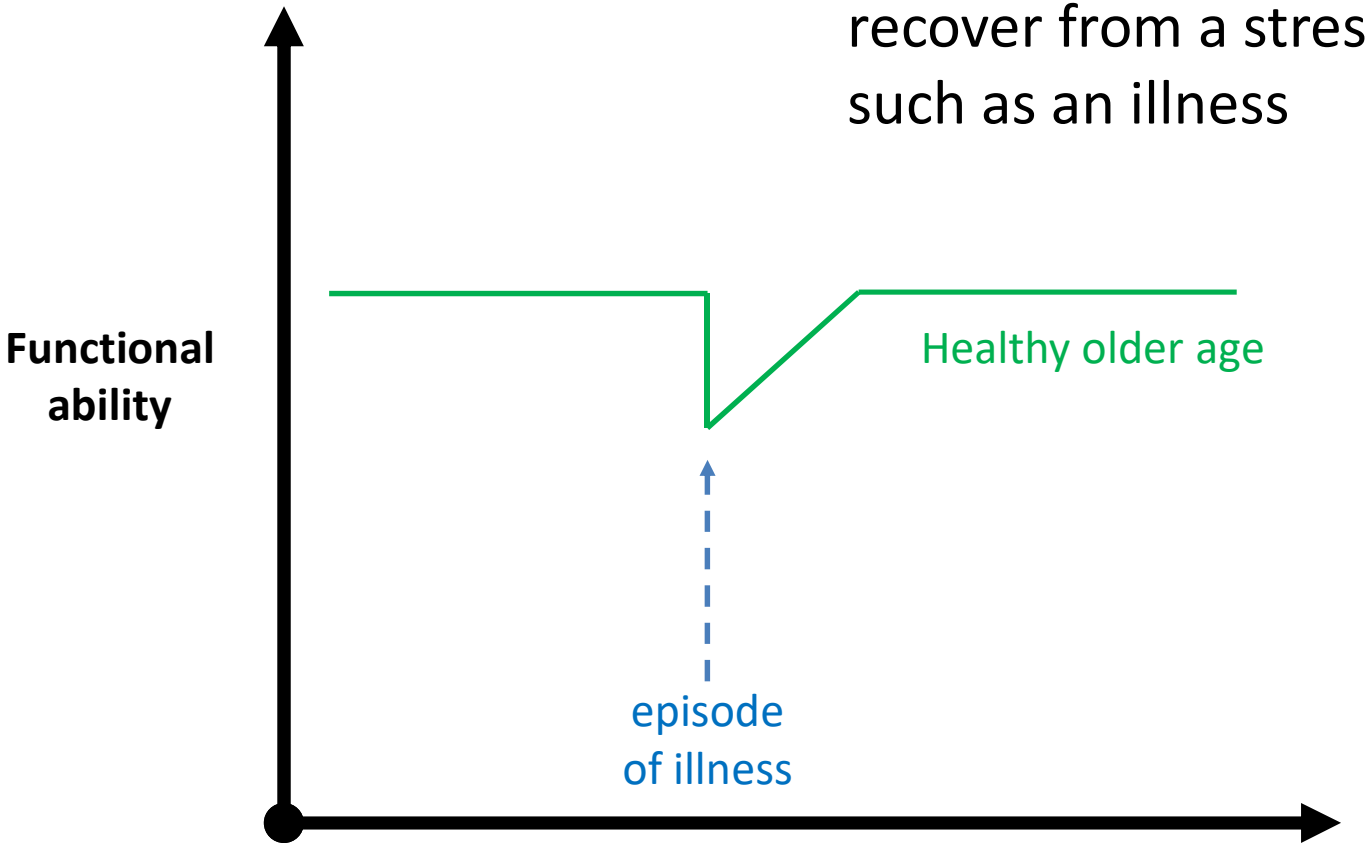
University of Glasgow

Frailty

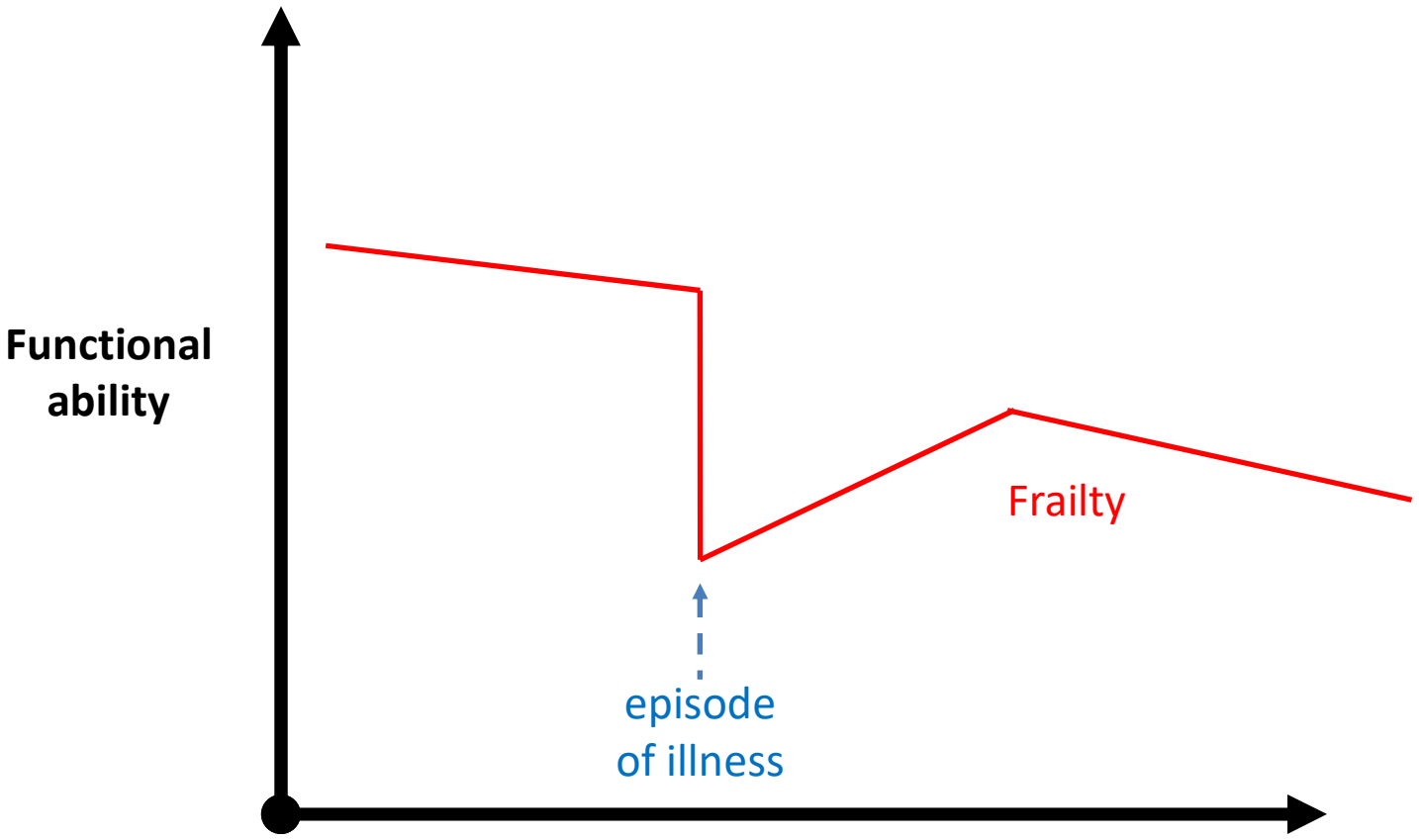
" A physiologic syndrome characterized by decreased reserve and resistance to stressors, resulting from cumulative decline across multiple physiologic systems, and causing vulnerability to adverse outcomes"

So, what is frailty

Frailty is a reduced ability to recover from a stressor event such as an illness

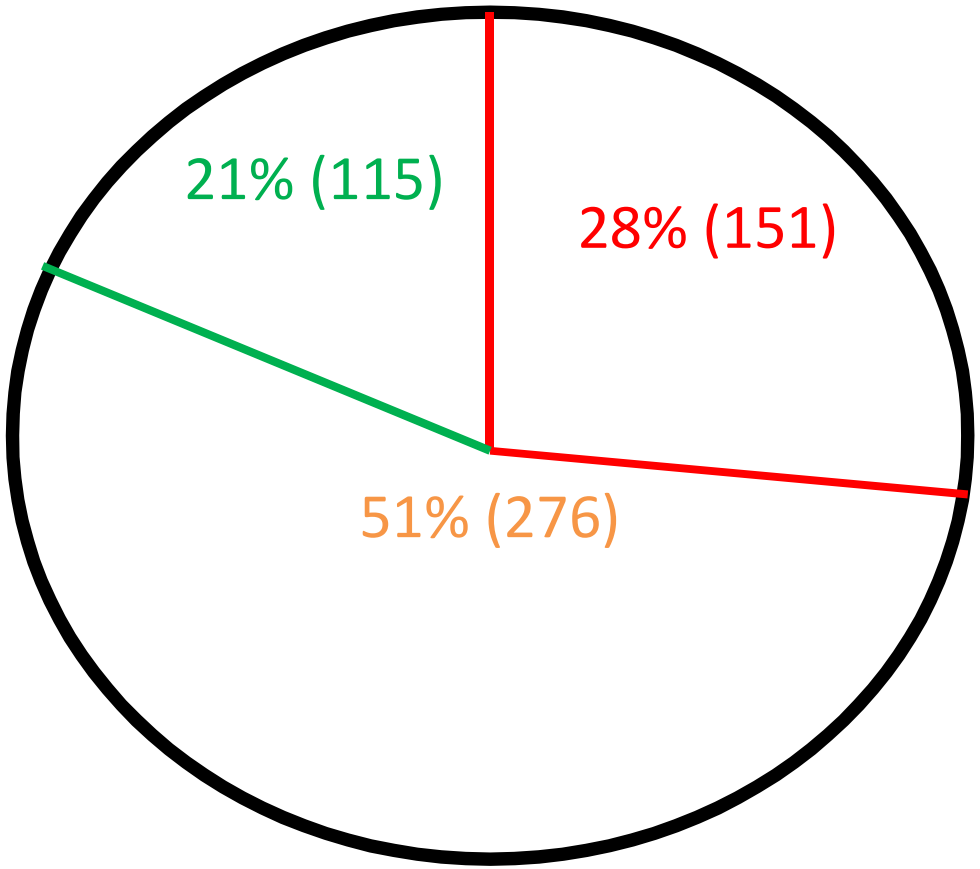


So, what is frailty



Is frailty seen in stroke

All stroke admissions assessed for frailty in a UK hospital:



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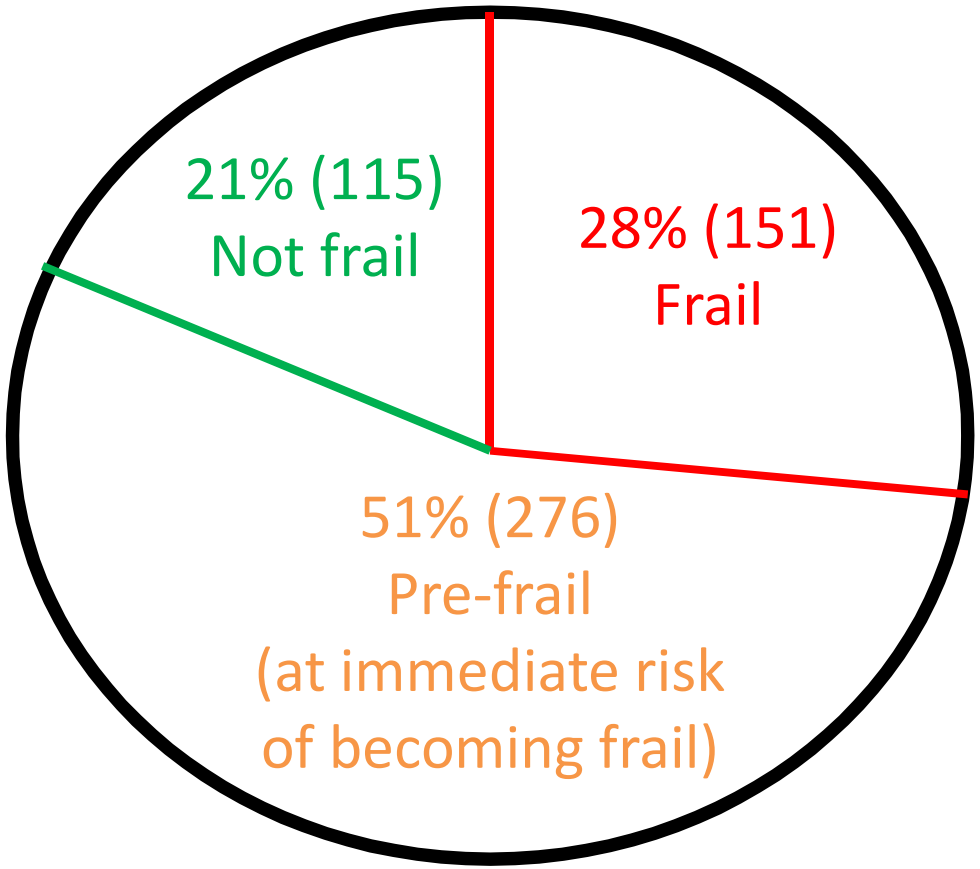


University of Glasgow

FRIED FRAILTY CRITERIA

Frailty phenotype

Unintentional weight loss

Self reported exhaustion

Weakness (grip strength)

Slowness (on timed walk)

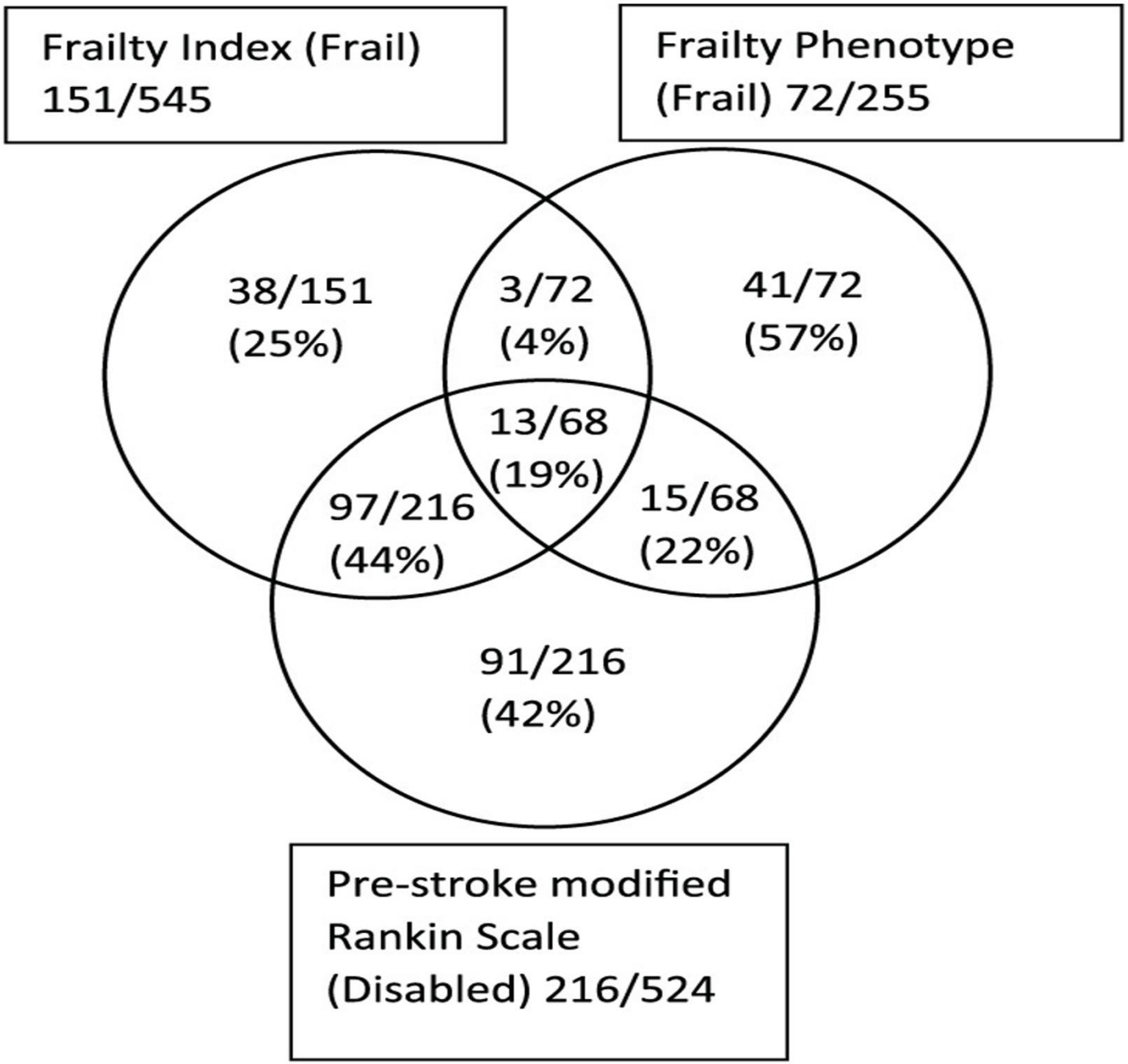
Low levels of activity

0 = robust, 1-2 = prefrail, ≥3 = frail

University of Glasgow

Rockwood's Frailty Index

"The more things an individual has wrong with them, the more likely they are to be frail"


Frailty Index (Frail) 151/545
Frailty Phenotype (Frail) 72/255
38/151 (25%)
3/72 (4%)
41/72 (57%)
13/68 (19%)
97/216 (44%)
15/68 (22%)
91/216 (42%)
Pre-stroke modified Rankin Scale (Disabled) 216/524

Question

- Is this a problem with NIHSS ?
- Is this a problem with our outcomes ?
- Is this not related to the stroke ?

SMALL stroke BIG problem (Moving beyond NIHSS)

UNIVERSITY of GLASGOW

Stroke association

Terry Quinn

Institute Cardiovascular & Medical Sciences

University of Glasgow

@DrTerryQuinn

Terry.quinn@glasgow.ac.uk