Stroke School

June 11, 2020

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Stroke Network of Southeastern Ontario

Objectives

- Part 1: Review bedside neurological exam
- Part 2: Review post-admission issues:
  - Seizure
  - Prognosis after ICH
  - Antithrombotic management

Examination depends on context

- Examination in the ER
  - Examination rarely gives you the diagnosis but it can change the initial impression
  - Examination is meant to **determine if the deficit is disabling**
  - Refines the diagnosis by localizing the lesion
  - If doing the NIHSS, there is predictive value and affects decision-making

Examination depends on context

- Examination on the ward:
  - Monitor progress or deterioration in neurological function daily
  - Takes only a few minutes per patient
  - Should be relevant to the whole team, including nurses, PT, OT, SLP

Neurological Exam in the ER

- Focused neurological exam:
  - Can use the NIHSS to structure your neuro exam
    - Don’t worry if you miss an item on the NIHSS

Examination in 3 minutes

- **NIH Stroke Scale**
- *Consciousness*
- *Gaze, Visual Fields, Face*

↓

- *Arm & leg: weak, clumsy, numb*

↓

- *Language*
- *Dysarthria*
- *Inattention*

Start at head

↓

Move to arms and legs

↓

Back up to the head

The main point of the exam is to determine if the deficits are disabling or not

The actual NIHSS score is not as important.

Deficits can be disabling even if the NIHSS is low.

NIHSS

1a. Level of Consciousness (LOC)*

0 = Alert (keenly responsive)
1 = Not alert but arousable by minor stimulation
2 = Not alert: requires repeated stimulation to attend, or is obtunded and requires strong or painful stimulation to make movements
3 = Responds only with reflex motor or autonomic effects or totally unresponsive, flaccid, and flexic

1b. LOC Questions*

Ask the patient: "What month is it? How old are you?"
0 = Answers both correctly
1 = Answers one correctly
2 = Answers neither correctly

1c. LOC Commands*

Command the patient to: "Open and close your eyes. Grip and release your hand."
0 = Performs both correctly
1 = Performs one correctly
2 = Performs neither correctly

2. Best Gaze*

Establish eye contact and ask the patient to: "Follow my finger."

0 = Normal
1 = Partial gaze palsy
2 = Forced deviation or total gaze paresis

3. Visual Fields*

Use confrontation, finger counting, or visual threat.
Confront upper/lower quadrants of visual field.

0 = No visual loss
1 = Partial hemianopsia
2 = Complete hemianopsia
3 = Bilateral hemianopsia

4. Facial Palsy*

By words or pantomime, encourage the patient to: "Show me your teeth. Raise your eyebrows. Close your eyes."

0 = Normal symmetrical movement
1 = Minor paralysis (flattened nasolabial fold, asymmetry on smiling)
2 = Partial paralysis (lower face)
3 = Complete paralysis

5. Arm Motor*

Alternately position patient's arms. Extend each arm with palms down (90° if sitting, 45° if supine).

0 = No drift 1 = Drift
2 = Some effort vs gravity
3 = No effort vs gravity
4 = No movement

6. Leg Motor*

Alternately position patient's legs.
Extend each leg (30°, always while supine).

0 = No drift 1 = Drift
2 = Some effort vs gravity
3 = No effort vs gravity
4 = No movement

7. Limb Ataxia*

Ask patient (eyes open) to: "Touch your finger to your nose. Touch your heel to your shin."

0 = Absent
1 = Present in one limb
2 = Present in two or more limbs

8. Sensory*

Test as many body parts as possible (arms [not hands], legs, trunk, face) for sensation using pinprick or noxious stimulus (in the obtunded or aphasic patient).

0 = Normal
1 = Mild-to-moderate sensory loss
2 = Severe-to-total sensory loss

9. Best Language*

Using pictures and a sentence list (see reverse), ask the patient to: "Describe what you see in this picture. Name the items in this picture. Read these sentences."

0 = No aphasia
1 = Mild-to-moderate aphasia
2 = Severe aphasia
3 = Mute, global aphasia

10. Dysarthria*

Using a simple word list (see reverse), ask the patient to: "Read these words" or "Repeat these words".

0 = Normal articulation
1 = Mild-to-moderate dysarthria
2 = Severe dysarthria

11. Extinction and Inattention*

Sufficient information to determine these scores may have been obtained during the prior testing.

0 = No abnormality
1 = Visual, tactile, auditory, spatial, or personal inattention
2 = Profound hemi-inattention or extinction to more than one modality

Examination on the ward

- Purpose of the exam is to monitor changes in neurological function
  - May indicate a new lesion or suggest something overlooked in the stroke workup

- Exam is often confounded because patients are rarely well-rested, often delirious, and disoriented in the first few days

Mentation: Attention

- **Vigilance**: Detection of new stimuli
  - Does the patient acknowledge you right away, or do you have to repeat yourself, tap their shoulder repeatedly, etc to get their attention?

- **Selective focus**: Staying engaged on task
  - Do they complete the task, e.g. copying simple sequences of arm movements, or counting out loud to 20?
  - How long do they stay on task?
  - Can they stay focused in the midst of external distractions?

Mentation & Speech

- If a patient can't follow instructions, is it because of a **language deficit** or is it because of a **working memory** deficit?

- **Working memory**: Maintain information in a "short-term buffer" long enough to process that information, especially in the face of interference

Working Memory in Bedside Exam

- Standardized tests such as Spatial Span, or the Corsi block-tapping test, can be adapted at the bedside
  - https://www.youtube.com/watch?v=hyfqPuE-Gw0

- “Name the months of the year in reverse order”

Working Memory: Bedside exam for aphasic patients

- Can the patient copy a simple sequence of gestures?
  - Raise the arm three times
  - If proximal arm strength is poor, open and close your fist three times
  - If hand and arm are impaired, then blink three times or use other simple facial gestures
  - Avoid complex hand or arm movements, e.g. Luria three-step test, since **apraxia** may interfere with the performance of the movements

Working memory: Bedside exam

- To get patients to mimic your gestures, make sure they can see and/or hear you and use “positive reinforcement” through smiling or verbal encouragement (patients can recognize the positive tone in your voice)

Speech

- Six aspects of language can be tested easily at the bedside.

Speech bedside tests

- Fluency
  - Speech, accuracy, proper expression
- Naming:
  - Use both high-frequency and low-frequency words
  - Number of objects correctly named
- Repetition:
  - Use words or phrases that aren't previously learned

Speech bedside tests

- Comprehension:
  - "Using your left thumb touch your chin, nose and right ear"

- Reading and writing:
  - Rarely, some patients can write even if they can't talk, i.e. speech apraxia
  - It's very rare for patients to have **pure word deafness** (can read but auditory comprehension is impaired) or **pure alexia** (can't read but auditory comprehension intact)

Apraxia

- Difficulty with motor planning and execution even when the instructions are understood
- Can be confused with aphasia
- Many different types of apraxia

Apraxia

- Oral/buccofacial apraxia
- Speech apraxia
- Ideomotor
- Ideational
- Gait
- Oculomotor
- Dressing
- Constructional

Inattention and Extinction

- Tactile, visual and auditory extinction
- It is uncommon to see neglect with right hemiparesis
  - It is more likely to be a problem with working memory or language

Cranial Nerve Exam: Visual Fields and Eye Movements

- Visual field testing at the bedside is okay for large field deficits but you can miss smaller deficits which might preclude the patient from driving

- In aphasic patients, use response to visual threat

- For eye movements, you can differentiate between gaze preference and gaze palsy by using the oculocephalic maneuver

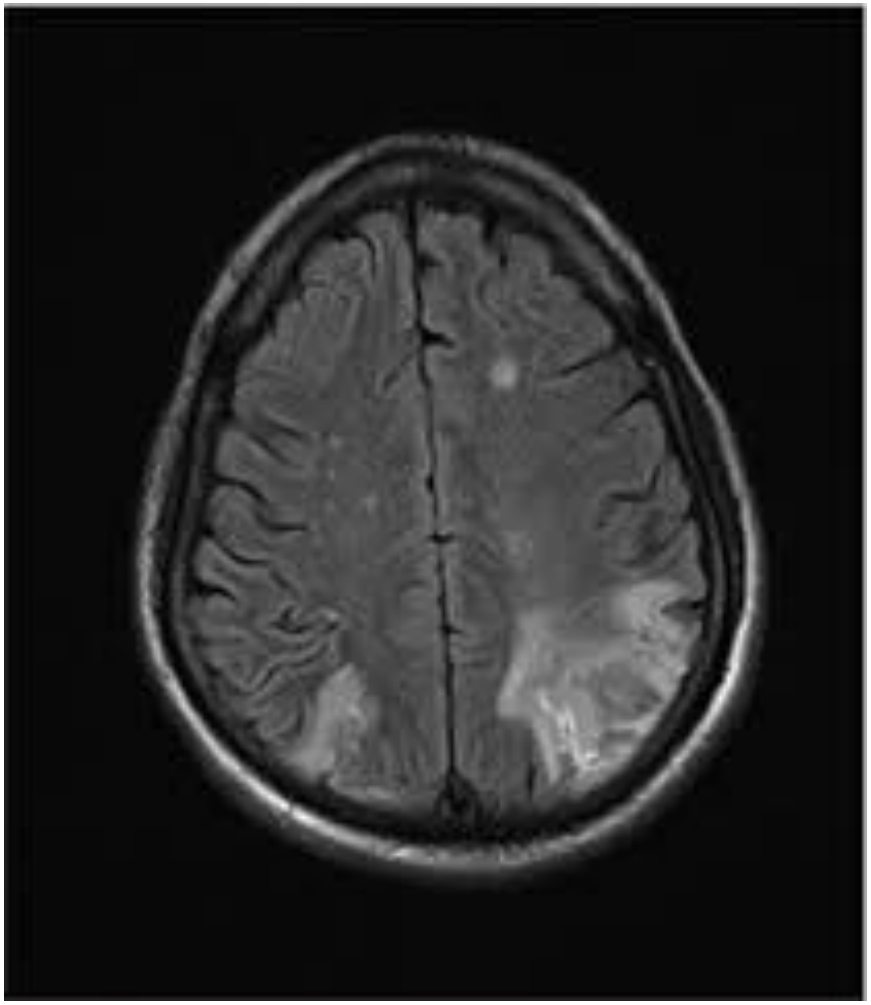
Oculocephalic maneuver

- https://www.youtube.com/watch?v=-iaqshB1UDc

- https://www.ncbi.nlm.nih.gov/books/NBK551716/

Balint's Syndrome

- Bilateral parietal or occipitoparietal lobe lesions, usually in watershed territory, e.g. after cardiac arrest
- Oculomotor apraxia
- Optic ataxia
- Simultagnosia



Amalnath SD, Kumar S, Deepanjali S, Dutta TK. Balint syndrome. Ann Indian Acad Neurol. 2014;17(1):10-11. doi:10.4103/0972-2327.128526

Oculomotor apraxia

- Difficulty initiating a saccade
- Head thrust to initiate eye movement
- Turn the whole head to look left or right

- https://www.youtube.com/watch?v=mG1lK1KdX24

Optic ataxia and Simultagnosia

- https://www.youtube.com/watch?v=4odhSq46vtU

- **Optic ataxia**: Can't use visual information to guide the hand to an object
- **Simultagnosia**: Inability to perceive simultaneous objects in the visual field
  - "Can't see the forest for the trees"

Swallowing

- **Don’t trust your own bedside assessment, unless you are trained in a standardized swallowing screen**

- This is one of the best predictors for the use of care services in the community and in many hospitals is a major barrier to rehab

Motor and Sensory Examination

- Motor & sensory deficits can change profoundly during the admission
- This can be because of:
  - Stroke recovery
  - Fluctuation of cerebral perfusion
  - Fluctuating course, e.g. from lacunar infarction
  - Recrudescence of deficit
  - Recurrent infarction

Motor exam

- **Upper extremity (How well can they reach?)**
  - Shoulder flexion and shoulder abduction
  - Elbow flexion and extension
  - Finger and wrist extension
- **Lower extremity (Can they lift their leg out of bed and stand?)**
  - Hip flexion, extension, abduction and adduction
  - Knee extension and flexion
  - Ankle dorsiflexion and plantar flexion

Motor exam

- Talk to the physiotherapist and nurses to figure out what sort of movement patterns are improving or not
- Sometimes the cause for lack of improvement is not directly related to stroke:
  - Pain
  - Joint injury missed on initial examination

Sensory Exam

- Focus on major deficits, not specific dermatomes
- Light touch is reasonable for a screening exam
- It's usually not necessary to do daily examination of vibration sense, temperature sense, proprioception or higher cortical sensory dysfunction like 2-point discrimination

Reflexes

- Skip reflex examination
- Reflexes don’t alter management of most stroke patients

Coordination

- Limb dysmetria: finger-nose and heel-shin testing can be limited by arthritis, etc.
  - You can substitute any target-reaching task to get a sense of limb dysmetria
- Fine motor coordination:
  - Simple bedside tests such as touching each finger to thumb, or handwriting
- Rapid alternating movements
  - Not necessary to assess at bedside, can use other tests to reveal cerebellar dysfunction, etc.

Gait

- At some point during the admission, you must watch the patient walk if they can
- Gait velocity is a big predictor of quality of life post-hospital

Questions or Comments?

End of Part 1

Part 2: Post-admission issues

Post-admission issues

- These topics are based on the questions which we encounter most frequently at KHSC:
  - Seizure
  - Prognosis after ICH
  - Antithrombotic management (when to start antiplatelet or anticoagulation therapy)

Neurology®

Influence of seizures on stroke outcomes: A large multicenter study

Chin-Wei Huang, Gustavo Saposnik, Jimming Fang, et al.

Neurology published online January 31, 2014
DOI 10.1212/WNL.0000000000000166

This information is current as of January 31, 2014

- Registry of CSN
- 10,261 patients!!!
- 157 patients had seizure at stroke presentation (1.53%)
- 208 patients had seizure during hospitalization (2.03%)

Multivariable analysis of variables associated with SSP and SDH. Multivariable analysis demonstrated that the following variables were associated with SSP: younger age (age 60–79 vs age <60, odds ratio [OR] = 0.551, $p = 0.015$), female sex (OR = 1.485, $p = 0.039$), absence of motor weakness (OR = 0.346, $p < 0.001$), and more severe stroke (low Canadian Neurological Scale score) (OR = 0.796, $p < 0.001$) (figure).

Younger age (age 60–79 vs age <60, OR = 0.663, $p = 0.025$), SSP (OR = 15.10, $p < 0.001$), the presence of hemineglect (OR = 2.176, $p < 0.001$), low Canadian Neurological Scale score (OR = 0.902, $p < 0.001$), ICU admission (OR = 1.764, $p = 0.014$), and pneumonia as complication (OR = 1.928, $p = 0.003$) were associated with SDH (figure).

Table 3 Outcome comparison by ischemic stroke severity

Variable	Overall	Seizures during hospitalization		*p*
		Yes	No	
All patients				
Death within 30 days	1,396 (13.6)	63 (30.3)	1,333 (13.3)	<0.001
Death within 1 year	2,519 (24.5)	99 (47.6)	2,420 (24.1)	<0.001
mRS > 3	4,171 (40.8)	143 (68.8)	4,028 (40.2)	<0.001

Worse outcomes in seizure and ischemic stroke

- Death within 30 days: OR 2.8
- Death within a year: OR 2.6
- mRS greater than 3: OR 2.4

- But thrombolysis did not make any difference in seizures at presentation or during hospitalization

Diseases which can present with stroke and seizure

- The most common conditions are AVMs and cavernous malformations (ICH + seizure)
- **Cerebral Venous Sinus Thrombosis**
- Mitochondrial disorders (MELAS)
- Takayasu's arteritis
- Homocystinuria

Prediction of late seizures after ischaemic stroke with a novel prognostic model (the SeLECT score): a multivariable prediction model development and validation study

Marian Galovic, Nico Döhler, Barbara Erdélyi-Canavese, Ansgar Felbecker, Philip Siebel, Julian Conrad, Stefan Evers, Michael Winklehner, Tim J von Oertzen, Hans-Peter Haring, Anna Serafini, Giorgia Gregoraci, Mariarosaria Valente, Francesco Janes, Gian Luigi Gigli, Mark R Keezer, John S Duncan, Josemir W Sander, Matthias J Koepp, Barbara Tettenborn

Summary

Background Stroke is one of the leading causes of acquired epilepsy in adults. An instrument to predict whether people are at high risk of developing post-stroke seizures is not available. We aimed to develop and validate a prognostic model of late (>7 days) seizures after ischaemic stroke.

Lancet Neurol 2018; 17: 143–52

See **Comment** page 106

Department of Neurology, Kantonsspital St Gallen,

	SeLECT score (points)
(Se) Severity of stroke	
NIHSS ≤3	0
NIHSS 4–10	1
NIHSS ≥11	2
(L) Large-artery atherosclerosis	
No	0
Yes	1
(E) Early seizure (≤7 days)	
No	0
Yes	3
(C) Cortical involvement	
No	0
Yes	2
(T) Territory of MCA	
No	0
Yes	1

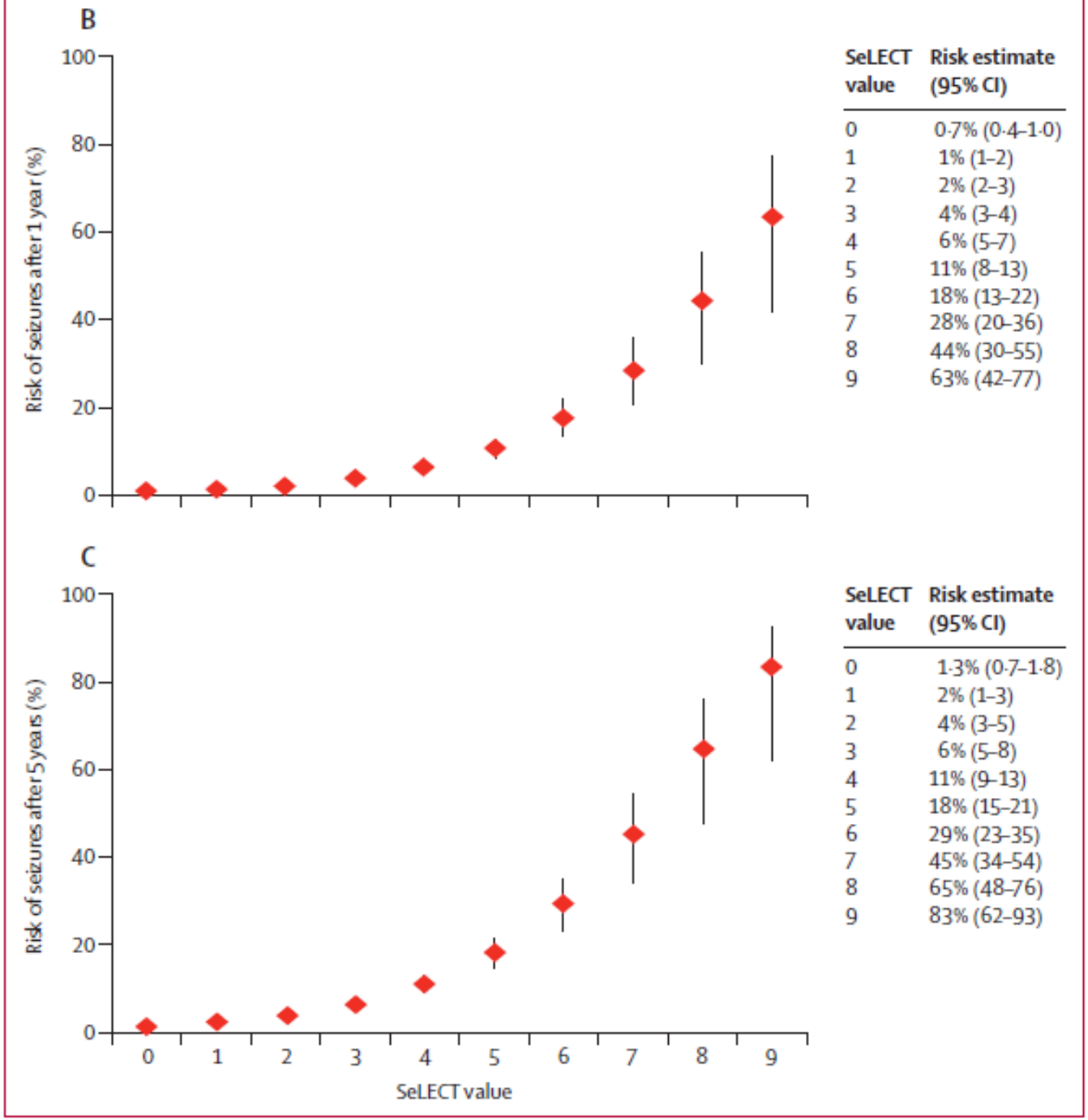


Figure 3: **Predicted risk of late seizures according to SeLECT score**

No early seizures

	No cortical involvement				Cortical involvement			
Territory of MCA	No		Yes		No		Yes	
Large-artery atherosclerosis	No	Yes	No	Yes	No	Yes	No	Yes
NIHSS 0–3	0·7% (1%)	1% (2%)	1% (2%)	2% (4%)	2% (4%)	4% (6%)	4% (6%)	6% (11%)
NIHSS 4–10	1% (2%)	2% (4%)	2% (4%)	4% (6%)	4% (6%)	6% (11%)	6% (11%)	11% (18%)
NIHSS ≥11	2% (4%)	4% (6%)	4% (6%)	6% (11%)	6% (11%)	11% (18%)	11% (18%)	**18% (29%)**

Early seizures

	No cortical involvement				Cortical involvement			
Territory of MCA	No		Yes		No		Yes	
Large-artery atherosclerosis	No	Yes	No	Yes	No	Yes	No	Yes
NIHSS 0–3	4% (6%)	6% (11%)	6% (11%)	11% (18%)	11% (18%)	**18% (29%)**	**18% (29%)**	**28% (45%)**
NIHSS 4–10	6% (11%)	11% (18%)	11% (18%)	**18% (29%)**	**18% (29%)**	**28% (45%)**	**28% (45%)**	**44% (65%)**
NIHSS ≥11	11% (18%)	**18% (29%)**	**18% (29%)**	**28% (45%)**	**28% (45%)**	**44% (65%)**	**44% (65%)**	**63% (83%)**

Very low risk
Low risk
Moderate risk
High risk
Very high risk

Figure 4: **Prediction chart of late seizures after stroke**
Numbers in the prediction chart correspond to the risk of late seizures 1 year after stroke (numbers in parentheses are risks 5 years after stroke). MCA=middle cerebral artery. NIHSS=National Institutes of Health Stroke Scale.

The CAVE Score for Predicting Late Seizures After Intracerebral Hemorrhage

Elena Haapaniemi, MD; Daniel Strbian, MD; Costanza Rossi, MD; Jukka Putaala, MD; Tuulia Sipi, MB; Satu Mustanoja, MD; Tiina Sairanen, MD; Sami Curtze, MD; Jarno Satopää, MD; Reina Roivainen, MD; Markku Kaste, MD; Charlotte Cordonnier, MD; Turgut Tatlisumak, MD; Atte Meretoja, MD

(*Stroke*. 2014;45:1971-1976.)

CAVE score and risk of seizure >7 days after ICH

CAVE Score	Risk of late seizure
0	0.6%
1	3.6%
2	9.8%
3	34.8%
4	46.2%

1 point for: cortical involvement, age < 65 yrs, volume > 10 mL, early seizure within 7 days of ICH

What to expect with hemorrhagic stroke

- Deficits are based on the location of the hematoma
- But the clinical course can change very quickly if the hematoma expands

Intracerebral hemorrhage has high mortality

- About a third will die in the first month
- Age is a major factor with over 50% mortality in patients > 80 yo

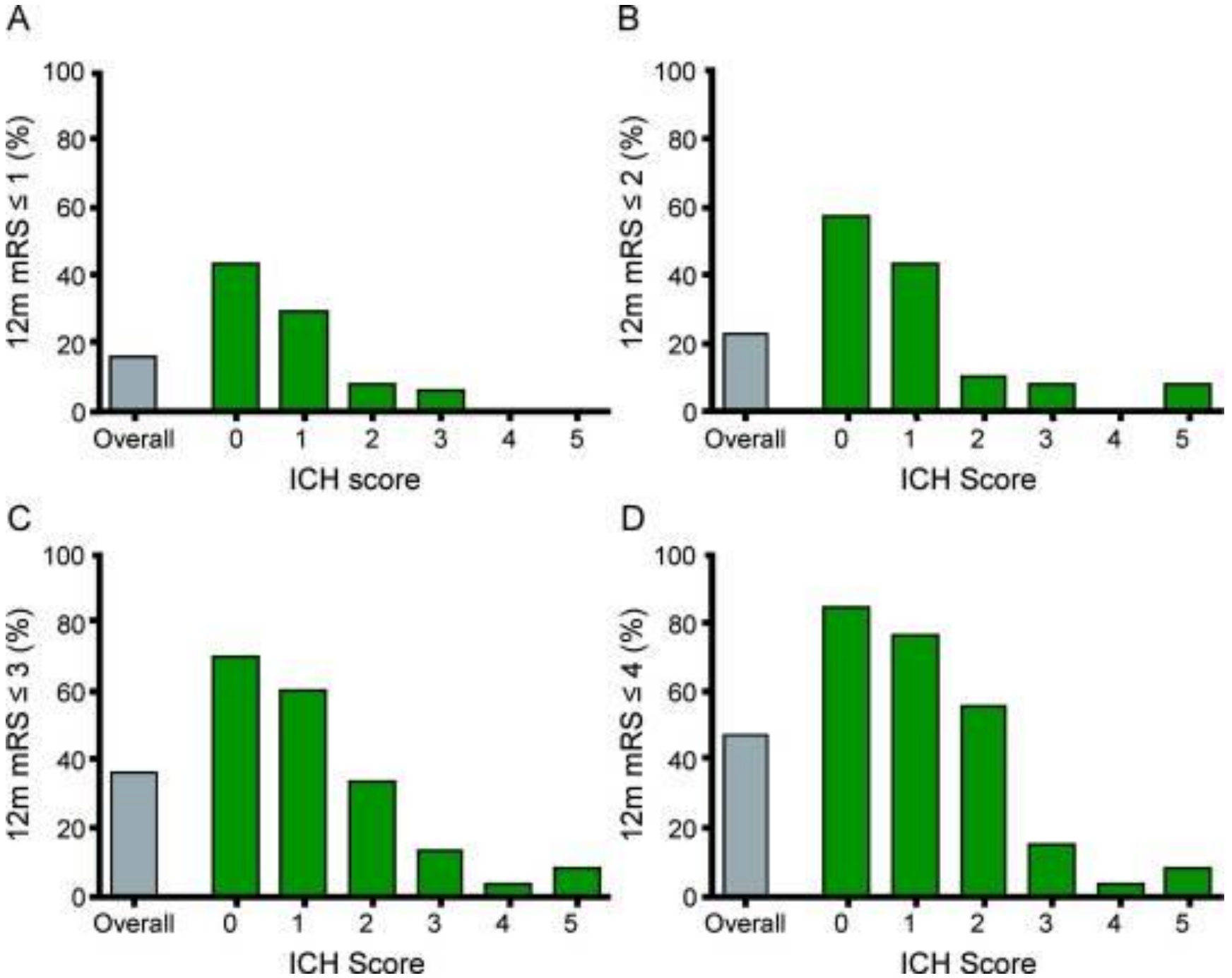
Mortality after hemorrhagic stroke
Antonio González-Pérez, David Gaist, Mari-Ann Wallander, GillianMcFeat, Luis A. García-Rodríguez
Neurology Aug 2013, 81 (6) 559-565

Table 2 **Modified Rankin Scale (mRS) score at various timepoints (n = 243)**

mRS score	Hospital discharge	30 d	3 mo	6 mo	12 mo
0	3 (1)	3 (1)	5 (2)	4 (2)	5 (2)
1	21 (9)	25 (10)	29 (12)	32 (13)	35 (14)
2	13 (5)	15 (6)	17 (7)	21 (9)	16 (7)
3	31 (13)	27 (11)	31 (13)	29 (12)	31 (13)
4	55 (23)	55 (23)	42 (17)	36 (15)	26 (11)
5	25 (10)	18 (7)	8 (3)	7 (3)	13 (5)
6	95 (39)	100 (41)	111 (46)	114 (47)	117 (48)

Values are expressed as n (%).

Hemphill JC 3rd, Farrant M, Neill TA Jr. Prospective validation of the ICH Score for 12-month functional outcome. Neurology. 2009 Oct 6;73(14):1088-94. doi: 10.1212/WNL.0b013e3181b8b332. Epub 2009 Sep 2. PMID: 19726752; PMCID: PMC2764394.


A
12m mRS ≤ 1 (%)
100
80
60
40
20
0
Overall
0
1
2
3
4
5
ICH score
B
12m mRS ≤ 2 (%)
100
80
60
40
20
0
Overall
0
1
2
3
4
5
ICH Score
C
12m mRS ≤ 3 (%)
100
80
60
40
20
0
Overall
0
1
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4
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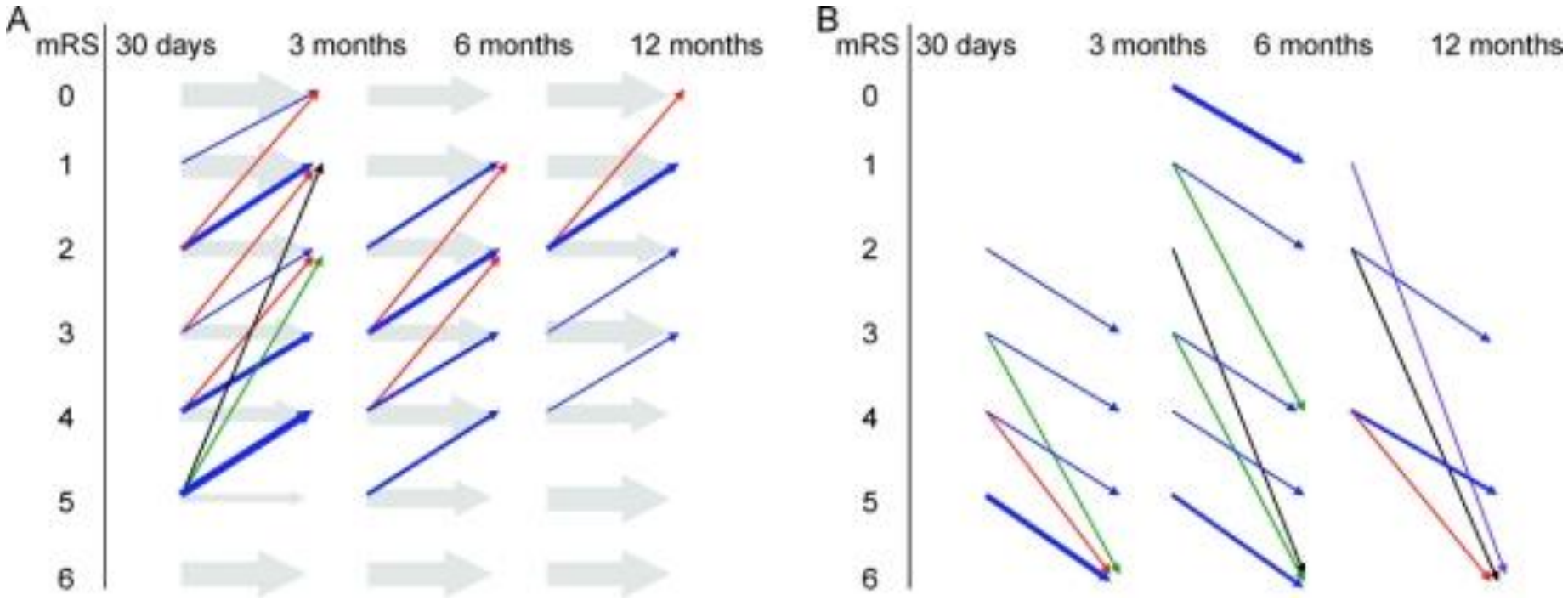
ICH Score
D
12m mRS ≤ 4 (%)
100
80
60
40
20
0
Overall
0
1
2
3
4
5
ICH Score

But many ICH patients change after hospital discharge

- 34% will improve by one point or more on mRS after hospital discharge
  - 13% will improve by 2 or more points

- 22% will deteriorate by one or more points
  - 10% will deteriorate by 2 or more points, often due to other conditions not related to ICH



- Grey: no improvement
- Blue: mRS changed by 1
- Line thickness indicates # patients

Be cautious when offering palliation based on ICH score

- One of the greatest predictors of in-hospital mortality is discussion of DNR within the first 24 hours

Severity assessment in maximally treated ICH patients

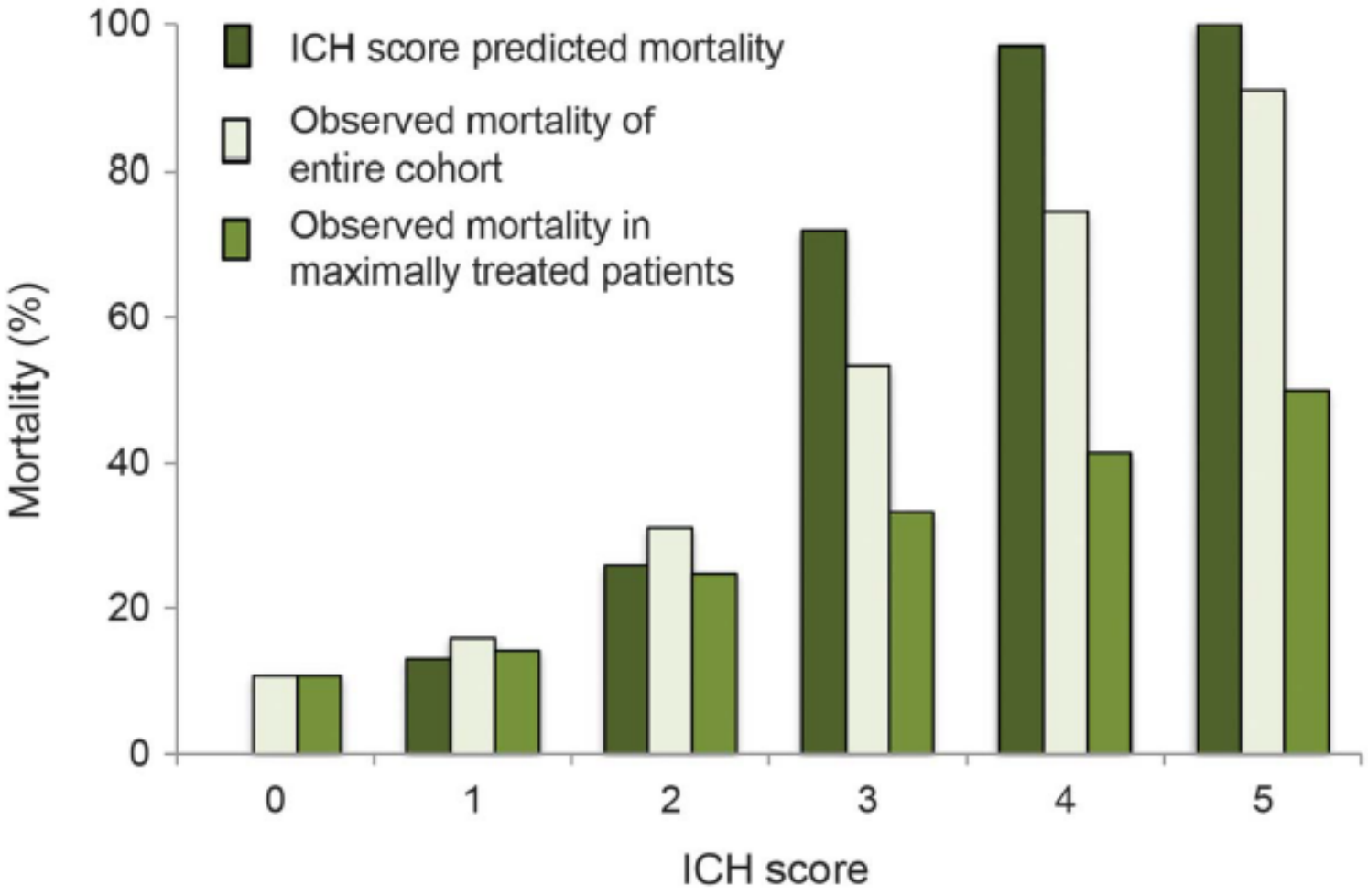
The max-ICH score

Conclusions: Care limitations significantly influenced the validity of common prognostication models resulting in overestimation of poor outcome. The max-ICH score demonstrated increased predictive validity with minimized confounding by care limitations, making it a useful tool for severity assessment in ICH patients. *Neurology*® 2017;89:423–431

- **Early care limitations are a self-fulfilling prophecy**

Jochen A. Sembill, MD
Stefan T. Gerner, MD
Bastian Volbers, MD
Tobias Bobinger, MD
Hannes Lücking, MD
Stephan P. Kloska, MD
Stefan Schwab, MD
Hagen B. Huttner, MD
Joji B. Kuramatsu, MD

Figure 1 **Comparison of mortality rates**



Observed short-term mortality rate in the entire intracerebral hemorrhage (ICH) cohort (n = 583) and in maximally treated patients (n = 471) in contrast to predicted short-term mortality rate by the ICH score.

- Prevalence of ECL 19.2% (n=112/583) and all of these patients died

- But, propensity score matching showed that **50.7% theoretically could have survived** and **18.8% possibly reaching favorable outcome** (modified Rankin Scale score of 0 to 3).

Antithrombotic Management

- Dual or single antiplatelet therapy after stroke?
- If there is hemorrhagic transformation after ischemic stroke, when can I start antiplatelet therapy?
- If my patient has atrial fibrillation and intracerebral hemorrhage, when is it safe to (re)start anticoagulation?

Dual vs Single Antiplatelet Therapy

- For TIA or minor stroke, i.e. non-disabling, dual antiplatelet therapy is preferred
  - POINT trial: NEJM 2018; 379: 215-225
  - CHANCE trial: NEJM 2013; 369: 11-19

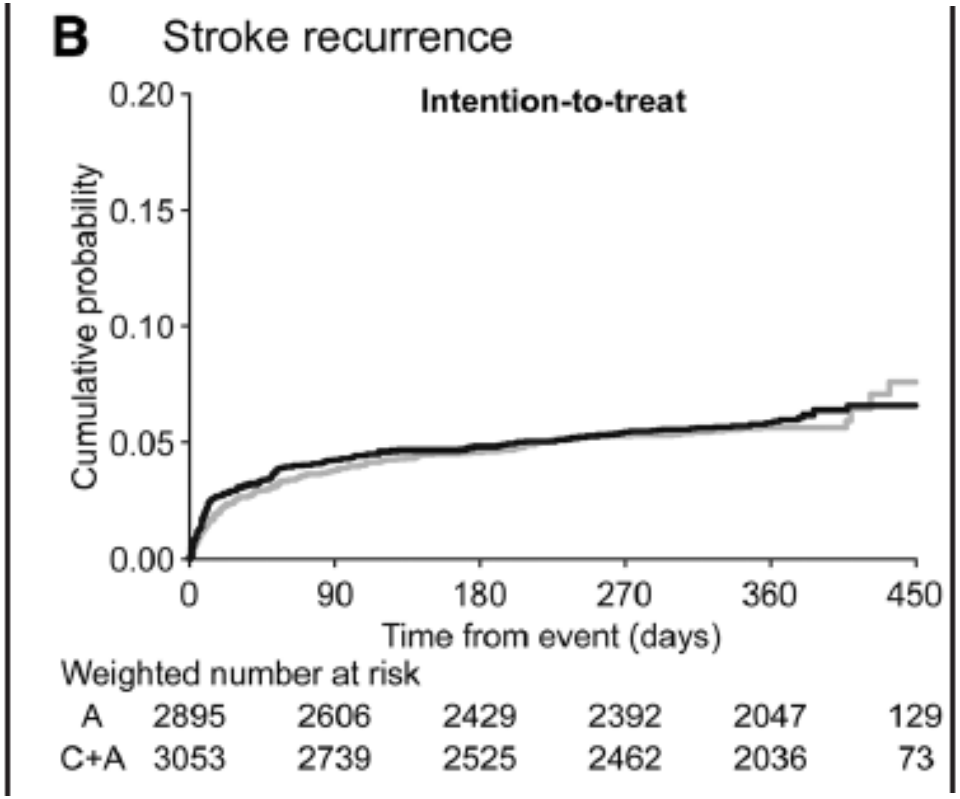
- For disabling stroke, it isn't so clear…

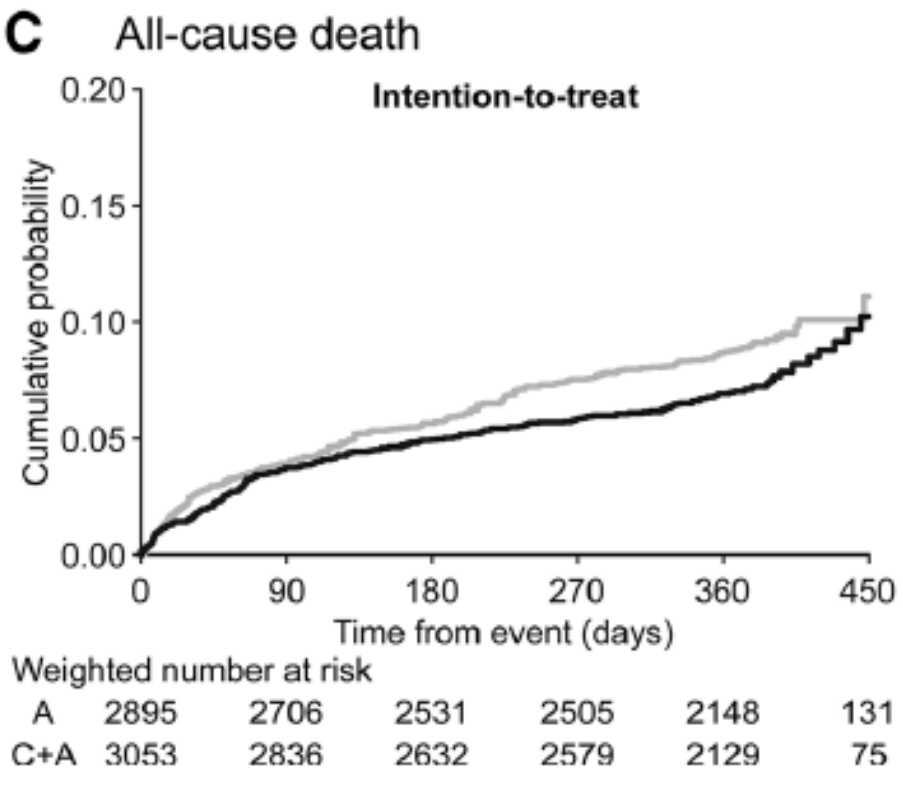
Dual Versus Mono Antiplatelet Therapy in Large Atherosclerotic Stroke

A Retrospective Analysis of the Nationwide Multicenter Stroke Registry

Dohoung Kim, MD, PhD; Jong-Moo Park, MD, PhD; Kyusik Kang, MD, PhD; Yong-Jin Cho, MD, PhD; Keun-Sik Hong, MD, PhD; Kyung Bok Lee, MD, PhD; Tai Hwan Park, MD, PhD; Soo Joo Lee, MD, PhD; Jae Guk Kim, MD, PhD; Moon-Ku Han, MD, PhD; Beom Joon Kim, MD, PhD; Jun Lee, MD, PhD; Jae-Kwan Cha, MD, PhD; Dae-Hyun Kim, MD, PhD; Hyun-Wook Nah, MD, PhD; Dong-Eog Kim, MD, PhD; Wi-Sun Ryu, MD, PhD; Joon-Tae Kim, MD, PhD; Kang-Ho Choi, MD, PhD; Jay Chol Choi, MD, PhD; Byung-Chul Lee, MD, PhD; Kyung-Ho Yu, MD, PhD; Mi Sun Oh, MD, PhD; Wook-Joo Kim, MD, PhD; Jee-Hyun Kwon, MD, PhD; Dong-Ick Shin, MD, PhD; Sung-Il Sohn, MD, PhD; Jeong-Ho Hong, MD, PhD; Ji Sung Lee, PhD; Juneyoung Lee, PhD; Philip B. Gorelick, MD, MPH; Hee-Joon Bae, MD, PhD; on behalf of Clinical Research Collaboration for Stroke in Korea (CRCS-K) Investigators

Conclusions—Compared with patients receiving aspirin monotherapy, the primary outcome seemed to occur less frequently in patients receiving dual antiplatelet therapy, which is explained mainly by the decrease of all-cause death. Since this is a nonrandomized, retrospective, observational study, our study should be cautiously interpreted. **(*Stroke*. 2019;50:1184-1192. DOI: 10.1161/STROKEAHA.119.024786.)**





Clopidogrel-Aspirin Aspirin

- Clinical considerations for single vs dual antiplatelet therapy after stroke include risk of systemic bleeding, and potential revascularization surgery

Can I restart antiplatelet agents after hemorrhagic transformation?

- Hemorrhagic transformation on post-admission CT usually warrants stopping antithrombotic therapy at least temporarily
- If restarting antiplatelet therapy is being considered, then it's reasonable to wait a few days and re-scan.
- If there is no change in hematoma size or the hematoma is resolving, then it's usually safe to start antiplatelet therapy

If my patient had a primary ICH, can I restart antiplatelet therapy at some point?

Effects of antiplatelet therapy after stroke due to intracerebral haemorrhage (RESTART): a randomised, open-label trial

*RESTART Collaboration**

Summary

Background Antiplatelet therapy reduces the risk of major vascular events for people with occlusive vascular disease, although it might increase the risk of intracranial haemorrhage. Patients surviving the commonest subtype of intracranial haemorrhage, intracerebral haemorrhage, are at risk of both haemorrhagic and occlusive vascular events, but whether antiplatelet therapy can be used safely is unclear. We aimed to estimate the relative and absolute effects of antiplatelet therapy on recurrent intracerebral haemorrhage and whether this risk might exceed any reduction of occlusive vascular events.

Methods The REstart or STop Antithrombotics Randomised Trial (RESTART) was a prospective, randomised, open-label, blinded endpoint, parallel-group trial at 122 hospitals in the UK. We recruited adults (≥18 years) who were taking antithrombotic (antiplatelet or anticoagulant) therapy for the prevention of occlusive vascular disease when they developed intracerebral haemorrhage, discontinued antithrombotic therapy, and survived for 24 h. Computerised randomisation incorporating minimisation allocated participants (1:1) to start or avoid antiplatelet therapy. We followed participants for the primary outcome (recurrent symptomatic intracerebral haemorrhage) for up to 5 years. We analysed data from all randomised participants using Cox proportional hazards regression, adjusted for minimisation covariates. This trial is registered with ISRCTN (number ISRCTN71907627).

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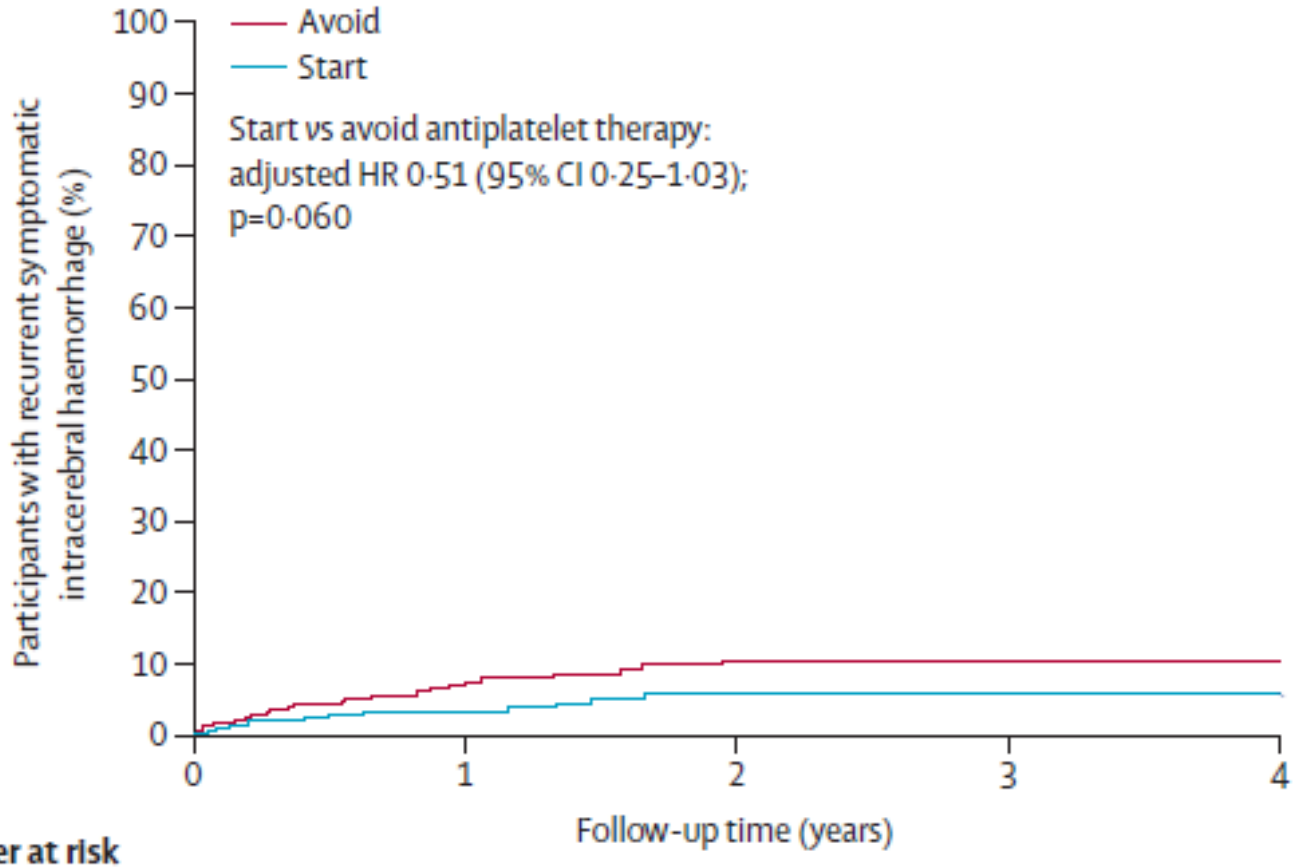


Number at risk (number of cumulative events)

Avoid	268 (0)	184 (18)	121 (23)	73 (23)	22 (23)
Start	268 (0)	190 (8)	122 (12)	72 (12)	25 (12)

Figure 2: **Kaplan-Meier plot of the first occurrence of recurrent symptomatic intracerebral haemorrhage**
Numbers at risk refer to survivors under follow-up at the start of each year according to treatment allocation. Cumulative events indicate the participants in follow-up with a first event. HR=hazard ratio.

In summary, RESTART excluded all but a very modest increase in the risk of recurrent intracerebral haemorrhage with antiplatelet therapy, which seemed too small to exceed the established benefits of antiplatelet therapy for secondary prevention of major vascular events (video). Antiplatelet therapy might have reduced the recurrence of intracerebral haemorrhage. These findings provide reassurance about the use of antiplatelet therapy for similar patients in clinical practice. Ongoing randomised trials, their meta-analysis with RESTART, and an adequately powered definitive randomised trial should be done to strengthen the evidence.

Anticoagulation after HT?

ORIGINAL RESEARCH

American Heart Association | American Stroke Association

Hemorrhagic Transformation in Patients With Acute Ischemic Stroke and Atrial Fibrillation: Time to Initiation of Oral Anticoagulant Therapy and Outcomes

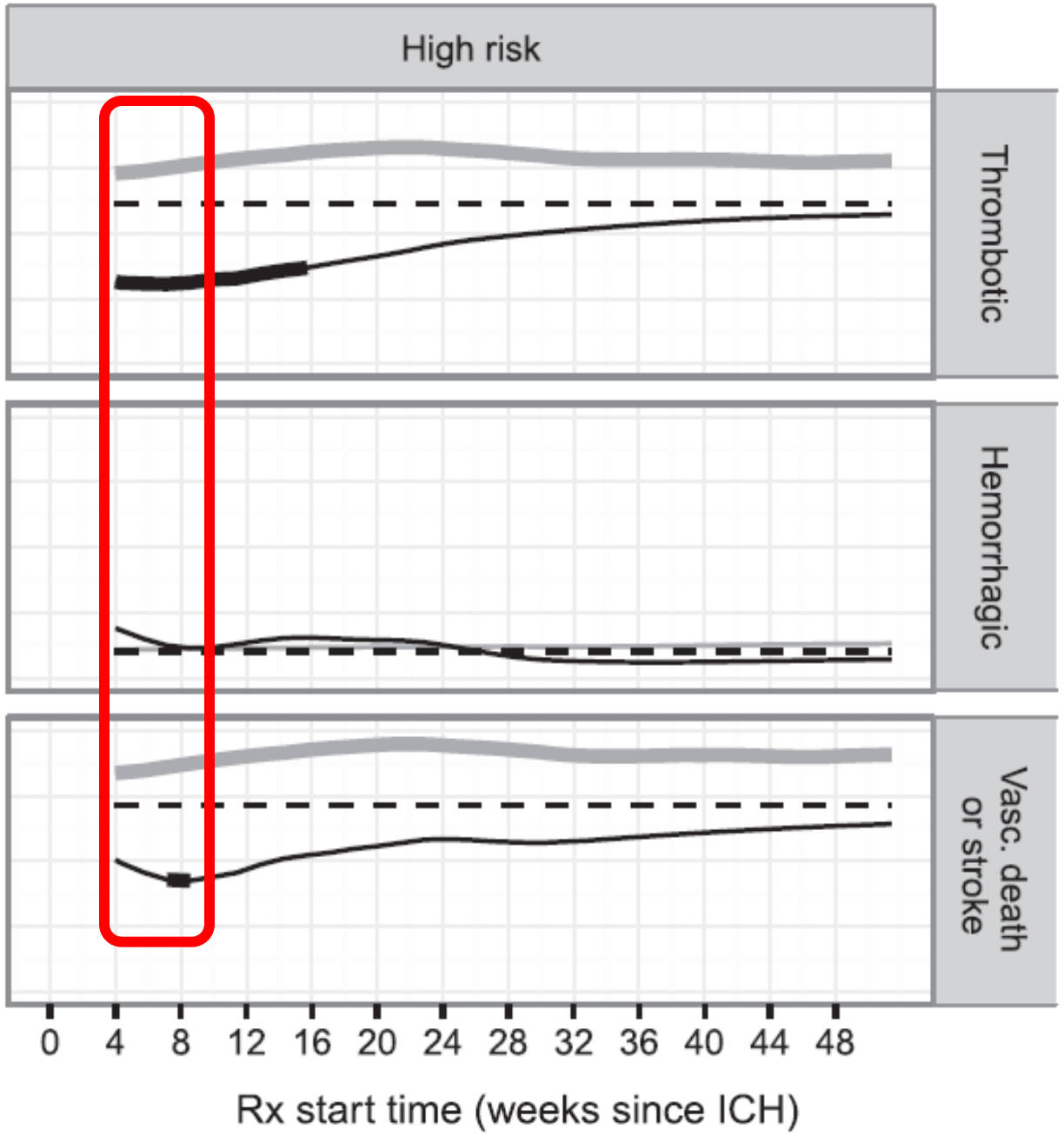
- J Am Heart Assoc. 2018;7:e010133
- In HT patients anticoagulation was started 12 days later than patients without HT
- No increase in ischemic recurrence

Optimal Timing of Anticoagulant Treatment After Intracerebral Hemorrhage in Patients With Atrial Fibrillation

Johanna Pennlert, MD; Rosanna Overholser, PhD; Kjell Asplund, MD, PhD; Bo Carlberg, MD, PhD; Bart Van Rompaye, PhD; Per-Gunnar Wiklund, MD, PhD; Marie Eriksson, PhD

- Stroke 2017;48:314-320
- Observational study in Sweden with 2619 ICH survivors, 5759 person-years of follow-up

- Greatest benefit when anticoagulation was started 7 to 8 weeks after ICH
- Benefits similar for both men and women with high risk of cardioembolic stroke (i.e. CHA_2DS_2-VASc score of 6 for men and 7 for women)


High risk
Thrombotic
Hemorrhagic
Vasc. death or stroke
0
4
8
12
16
20
24
28
32
36
40
44
48
Rx start time (weeks since ICH)

Questions or Comments?

Thanks for your attention!
If you have any questions email me at Albert.Jin@kingstonhsc.ca