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TEACHING HOSPITAL

The Evolution of Endovascular Selection Criteria

An MGH Perspective

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NEUROSURGERY

Disclosures

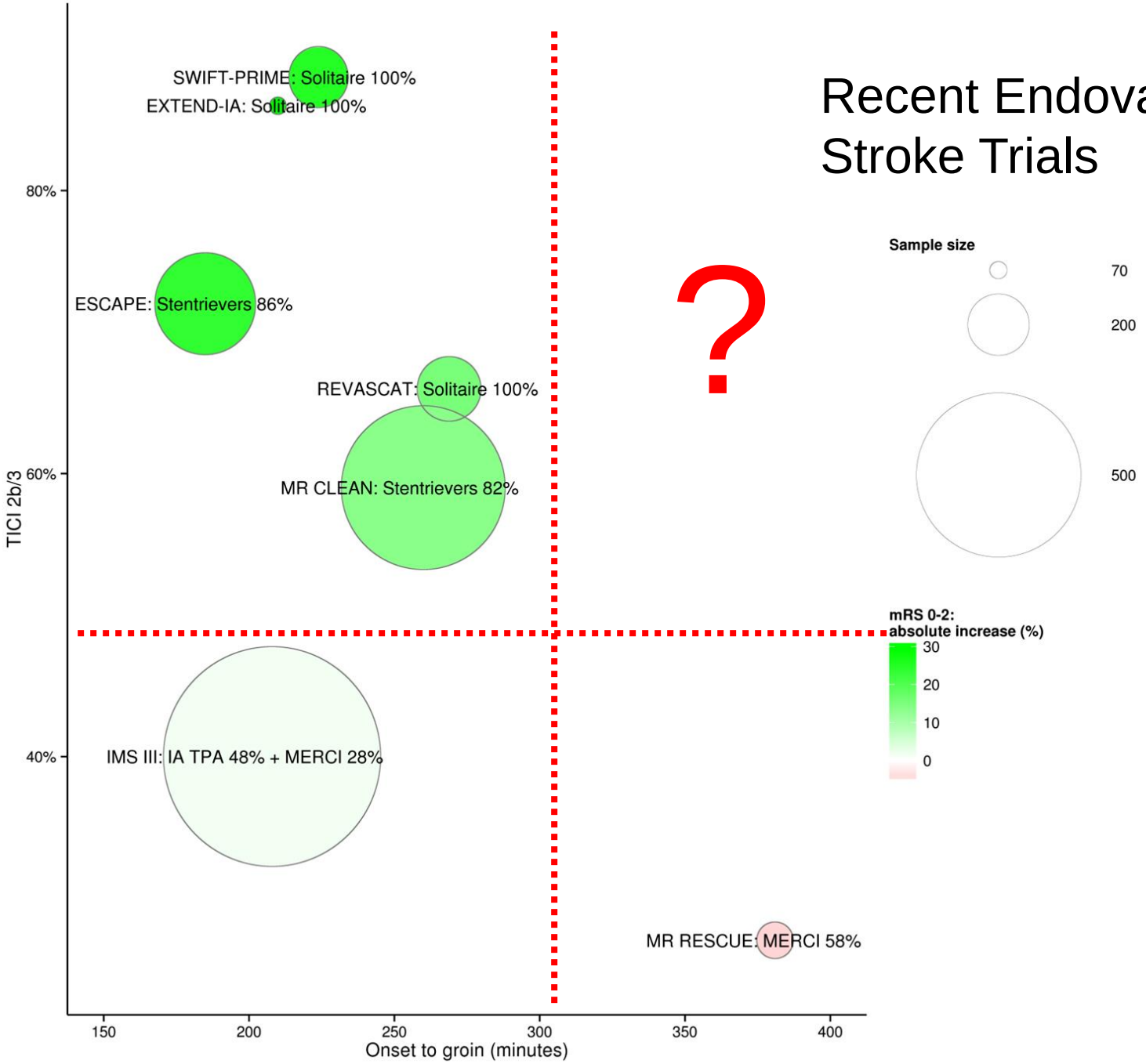
Consultant

Penumbra

Medtronic

Q'Apel

Recent Endovascular Stroke Trials



Who Do We Know Benefits?

Clinical criteria

Age >18 (no clear upper age limit)

Functionally independent (mRS <2)

Significant neurologic deficit (NIHSS ≥6)

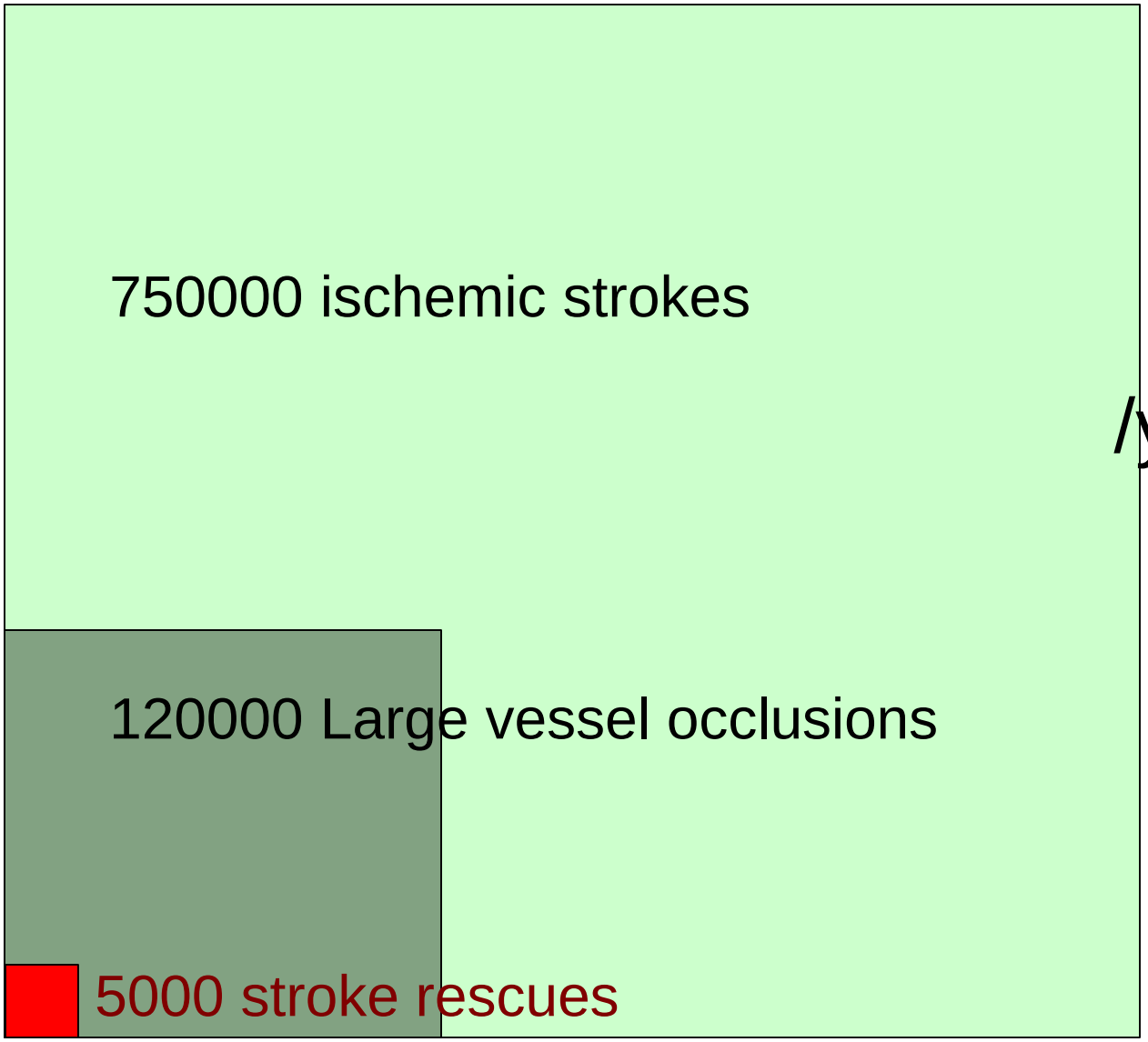
Onset to groin puncture ≤6hrs

Radiological criteria

No large established stroke (ASPECTS ≥6)

Anterior vessel occlusion (ICA and/or M1 MCA segments)

But There Are Many in Need



/year in the USA

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Selection History at MGH

The Challenge of Variability

Stroke Neurology

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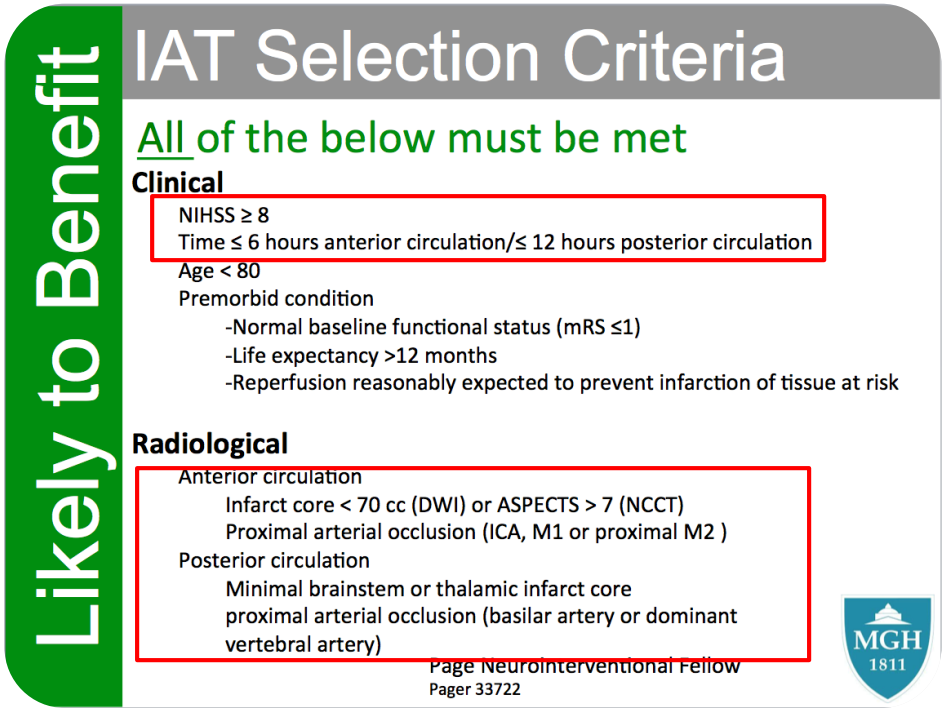
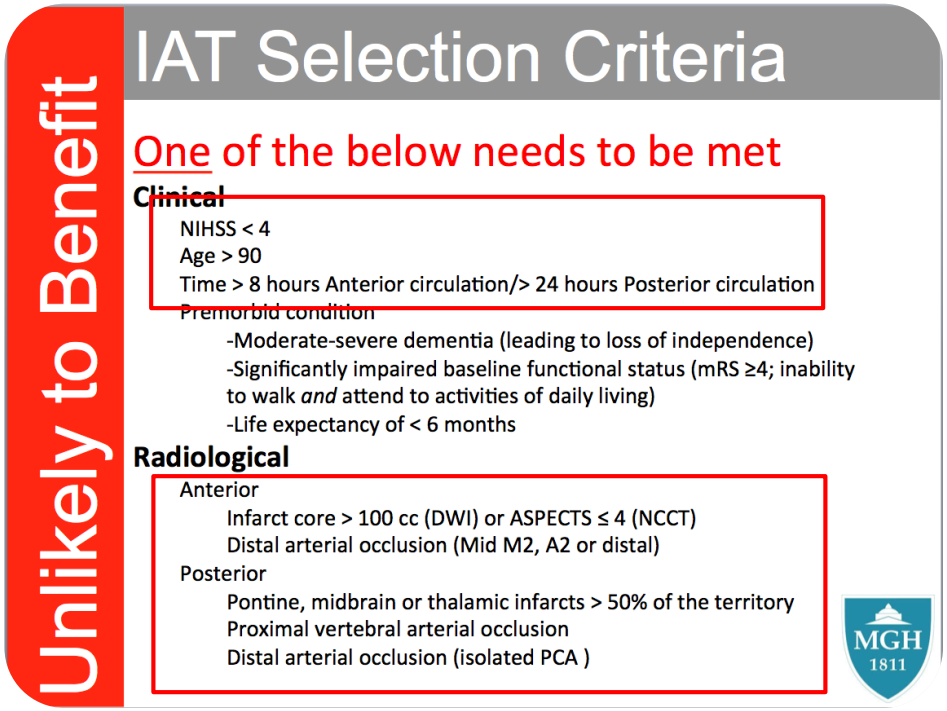
Selection circa 2012





MGH Algorithm:

Both clinical and radiological criteria

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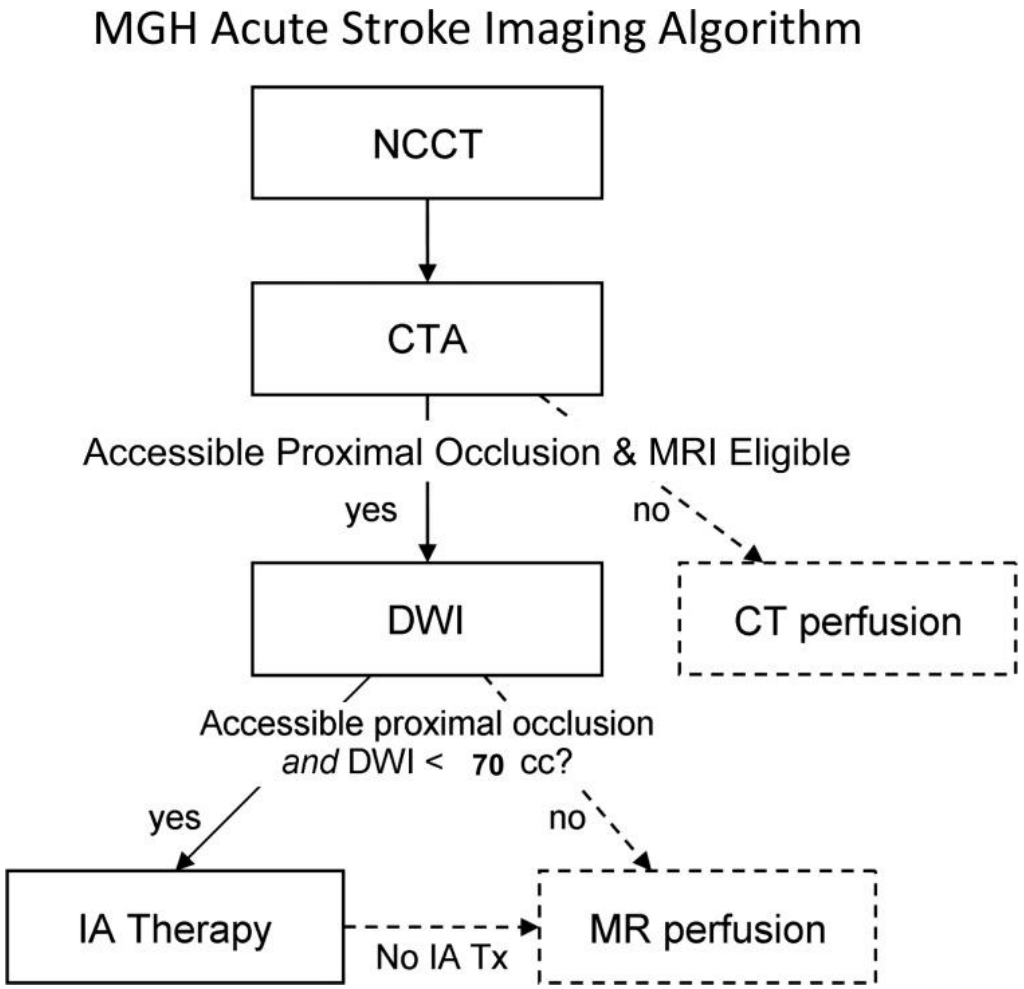
Selection circa 2012

CT and MRI



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Gonzalez RG, et al, JNIS, 2013

Selection Protocol

Patient selection

ORIGINAL RESEARCH

Implementation of a patient selection protocol for intra-arterial therapy increases treatment rates in patients with acute ischemic stroke

Natalia S Rost,[1] Eric E Smith,[2] Raul G Nogueira,[3] Kaitlin M Fitzpatrick,[1] Albert J Yoo,[4] Joshua A Hirsch,[4] Lee H Schwamm[1]

Of 1348 subjects identified, 118 (8.7%) met the criteria for LTB and 62 (52%) underwent IAT. There was a significant increase in rates of IAT among LTB patients after protocol implementation (61% vs 40%, $p<0.02$).

These data provide evidence that a uniform approach to patient selection for open-label or compassionate use of IAT may improve the rates of patient inclusion for intervention as well as the homogeneity of the patient cohort.

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Rost, et al, JNIS 2011

Reasons for not performing IAT in the LTB group

1. Late presentation in the intervention window (21.4%)
2. Rapid improvement (16.1%)
3. Family refusal (14.3%)
4. Neuroimaging features of limited tissue at risk (11%)
5. Extensive clot burden identified by endovascular team (7.2%)
6. Reason unclear/unrecorded (7.2%)
7. Advanced age (5.3%)
8. Technical challenge identified by endovascular team (5.3%)
9. Carotid dissection (4%)
10. Advanced directives (4%)
11. Hemorrhagic conversion (1.7%)
12. Trial enrollment (1.7%).

Powerful New Data

Selection circa 2016

Goals

- Modify our MGH approach based on the available new Class 1 Level A data
- Increase autonomy and consistency for cases with proven benefit
- Expand to capture cases that we think are probable to benefit

Endovascular Screening Criteria

For **ALL** patients with

NIHSS ≥4

LSW <24hrs

Assess the following:

Clinical

- Age
- Last seen well
- Premorbid baseline mRS (and dementia)
- Candidacy for IV tPA

Radiological

- Hemorrhage excluded
- Evidence of ischemic stroke
- Presence of LVO (ICA, M1, M2, BA)
- Core infarct volume (ASPECTS or DWI)
- Quality of collaterals

Using these screening criteria classify patients as

Proven

Uncertain

Unlikely

to benefit from endovascular therapy.

Page Neuroendovascular fellow 33722 immediately for all cases.

Evaluate for enrollment in active clinical trials.

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2016 Proven Benefit

Endovascular Criteria

Treatment process for all cases initiated by Stroke and Endovascular Fellows

Clinical (must meet all)

NIHSS ≥6

Time ≤6 hours from LSW to expected groin puncture

Age 18-85 years

Premorbid condition

-mRS ≤1

-Life expectancy >12 months

Radiological (must meet all)

Intracranial ICA or MCA M1 occlusion

Small established infarct core volume by either imaging modality

if by CT criteria: visual estimation of ASPECTS ≥ 6 on NCCT

: symmetric collaterals on CTA

if by MRI criteria: ≤70cc DWI by ABC/2 measurement

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2016

Uncertain to Benefit

Endovascular Criteria

Treatment only if both Stroke and Endovascular Attendings agree

Clinical (must meet all)

NIHSS ≥4

Time: ≤16 hours anterior circulation; ≤24 hours posterior circulation

Premorbid condition

-mRS ≤3

-Life expectancy >12 months

Radiological (must meet all)

Anterior circulation

Proximal arterial occlusion (ICA, M1, M2)

Small established infarct core volume by either imaging modality

if by MRI criteria: ≤70cc DWI by ABC/2 measurement

if needed, by CT criteria: visual estimation of ASPECTS ≥ 5 on NCCT

: excellent collaterals on CTA

Posterior circulation

Proximal arterial occlusion (basilar, dominant vertebral)

≤50% infarction of pons, midbrain or thalamus

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2016

Unlikely to Benefit

Endovascular Criteria

No endovascular treatment offered

Clinical (if meets any)

NIHSS <4

Time: >16 hr from LSW for Anterior circulation; >24 hr Posterior circulation

Premorbid condition

- mRS ≥4
- major medical co-morbidity
-Life expectancy of <12 months

Radiological (if meets any)

Anterior circulation

Large established core by either imaging modality

by CT criteria: ASPECTS ≤4 on NCCT (or)

: malignant collateral pattern

by MRI criteria: infarct core >100cc DWI by ABC/2 measurement

Distal arterial occlusion (M3, M4, A2)

Posterior circulation

>50% infarction of pons, midbrain or thalamus

Distal arterial occlusion (e.g. isolated PCA)

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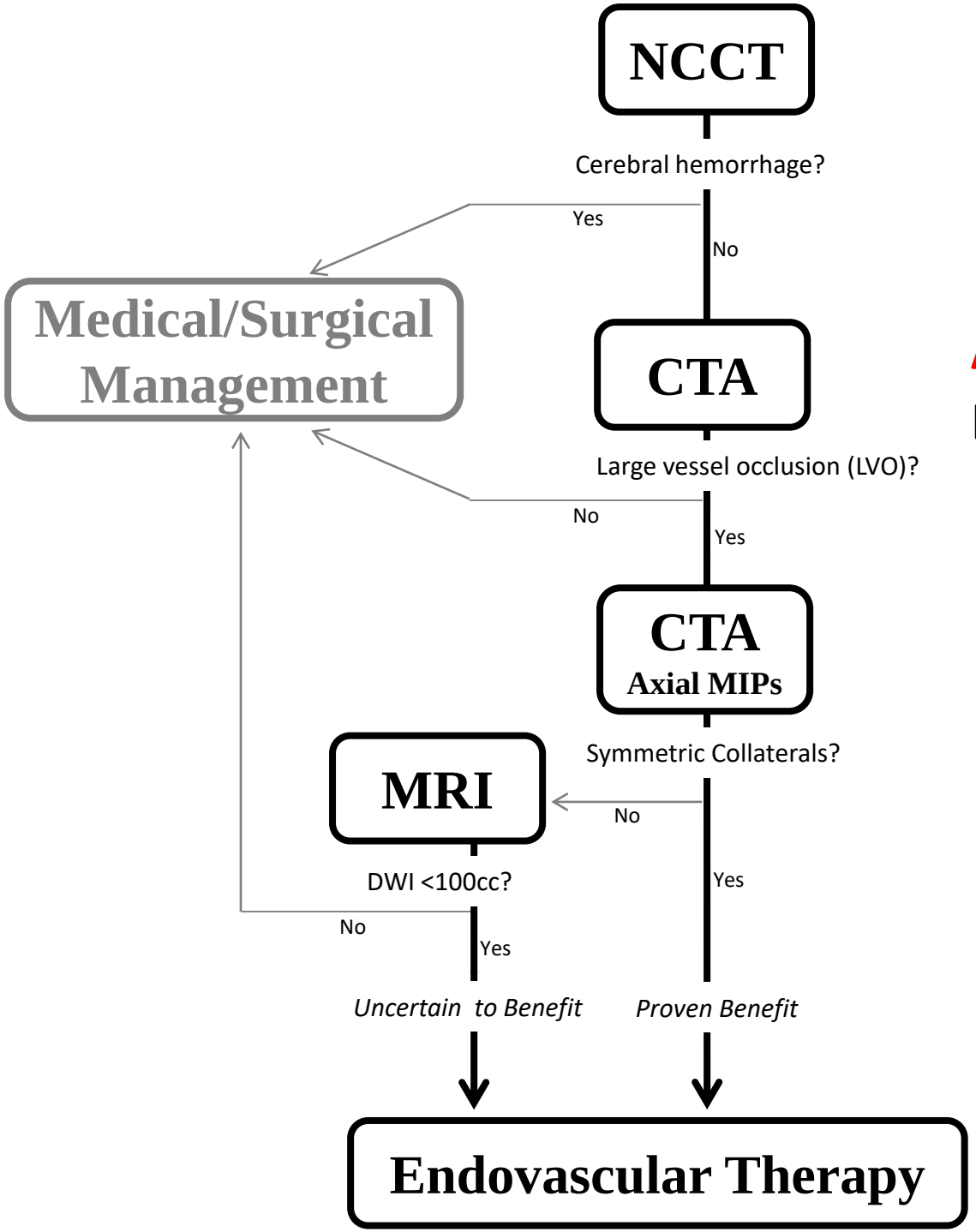
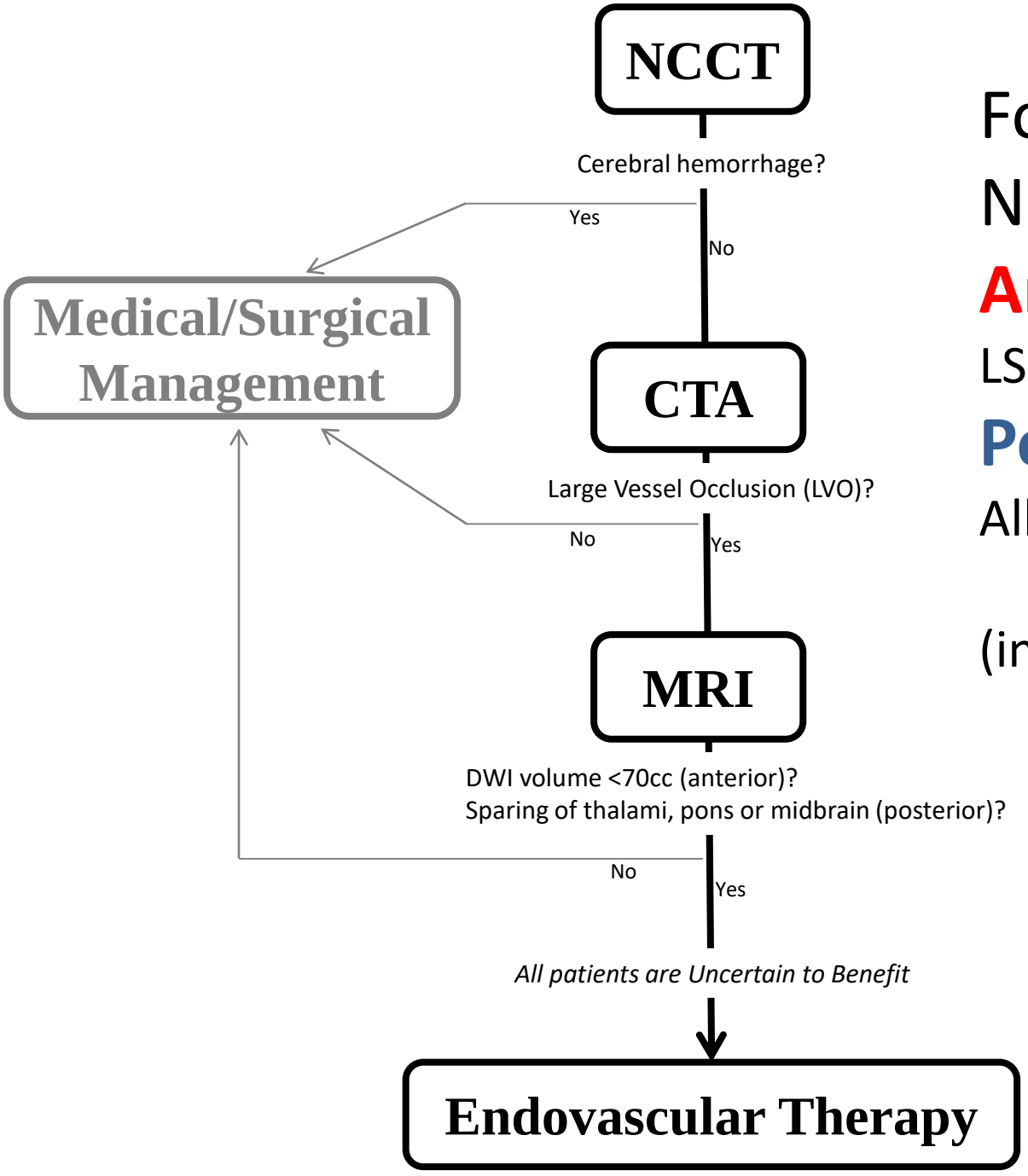


For patients with NIHSS ≥6:

Anterior Circulation

LSW <6hrs



For patients with NIHSS ≥6:

Anterior Circulation

LSW 6-16hrs

Posterior Circulation

All patients <24hrs

(includes wake-up strokes)

Note, this imaging approach may vary for patients enrolled in a research trial

The Near Horizon: Time Window Expansion

defuse 3

16 hours, larger volume inclusion

24 hours\smaller volume inclusion

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Selection 2017/2018: Proposed

2017 Proven Benefit

Endovascular Criteria

Treatment process for all cases initiated by Stroke and Endovascular Fellows

- **Clinical (must meet all)**
  - –NIHSS ≥6
  - –Time ≤24 hours from LSW to expected groin puncture
  - –Age 18-95 years
  - –Premorbid condition
    - •mRS ≤2
    - •Life expectancy >12 months
- **Radiological (must meet all)**
  - *–≤ 6 hours from LSW to expected groin puncture*
    - •Intracranial ICA or MCA M1 occlusion
  - *–6-24hrs from LSW to expected groin puncture*
    - •Intracranial ICA or MCA M1 occlusion
    - •Small established infarct core volume by either imaging modality
      - – if by CT criteria: ASPECTS ≥ 7 on NCCT
        - » Adequate collateral pattern on CTA
      - – if by MRI criteria: ≤70cc DWI by ABC/2 measurement

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2017

Potential to Benefit

Endovascular Criteria

Treatment only if both Stroke and Endovascular Attendings agree

Clinical (must meet all)

- NIHSS ≥4
- Time: ≤24 hours from LSW to expected groin puncture
- Premorbid condition
  - mRS ≤4
  - Adequate life expectancy

Radiological (must meet all)

Anterior circulation

Proximal arterial occlusion (ICA, M1, M2)

Small established infarct core volume by either imaging modality

if by MRI criteria: ≤120cc DWI by ABC/2 measurement

if needed, by CT criteria: visual estimation of ASPECTS ≥ 5 on NCCT

: non malignant collaterals on CTA

Posterior circulation

Proximal arterial occlusion (basilar, dominant vertebral)

≤70% infarction of pons, midbrain or thalamus

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2017

Unlikely to Benefit

Endovascular Criteria

No endovascular treatment offered

Clinical (if meets any)

NIHSS <4

Time: >24 hr from LSW for Anterior circulation; >24 hr Posterior circulation

Premorbid condition

- mRS ≥4
- major medical co-morbidity
-Life expectancy

Radiological (if meets any)

Anterior circulation

Large established core by either imaging modality

by CT criteria: ASPECTS ≤4 on NCCT (or)

: malignant collateral pattern

by MRI criteria: infarct core >120cc DWI by ABC/2 measurement

Distal arterial occlusion (M3, M4, A2)

Posterior circulation

>70% infarction of pons, midbrain or thalamus

Distal arterial occlusion (e.g. isolated PCA)

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Conclusions

- Key to have institutional protocols – increases patient treatment
- Work-flow protocols unrelated to patient characteristics are important
- Decisions cannot be made based on whims, personal opinions, timing, holidays, vacation schedules
- Review data and results
- Re-evaluate established protocols altering data
- Imaging criteria are important

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Thank you.

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