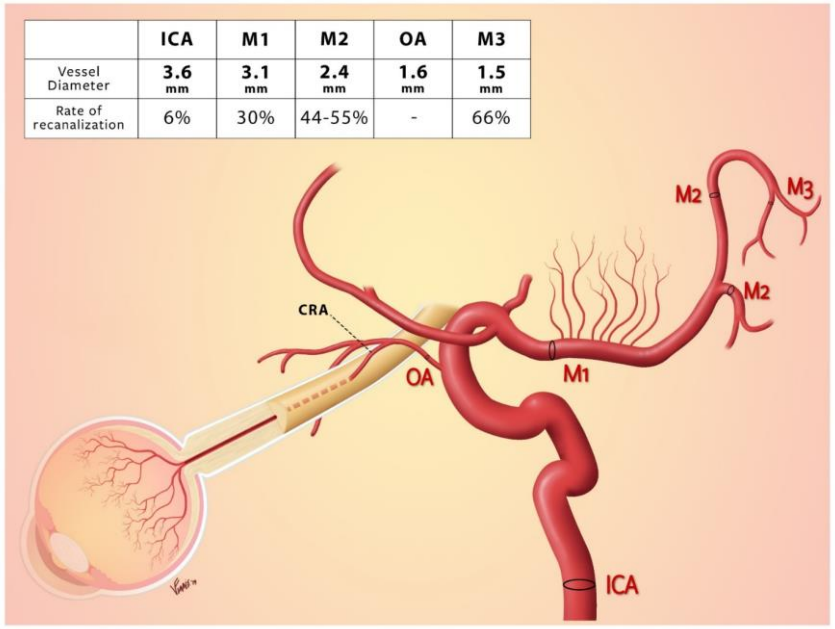
Duke Eye Stroke Center of Excellence

May 10th 2022

	ICA	M1	M2	OA	M3
Vessel Diameter	3.6 mm	3.1 mm	2.4 mm	1.6 mm	1.5 mm
Rate of recanalization	6%	30%	44-55%	-	66%



American Heart Association | American Stroke Association
life is why

Duke University School of Medicine

Sudden, Painless Vision Changes Require Emergency Care

Symptoms Indicate Possible Eye Stroke, Could Lead to Permanent Vision Loss

By Morgan deBlecourt
May 12, 2021

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Duke University School of Medicine

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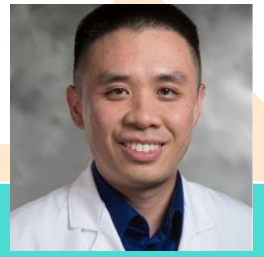
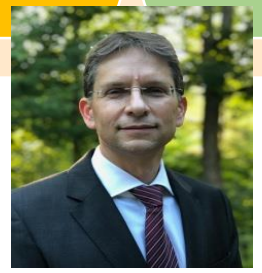
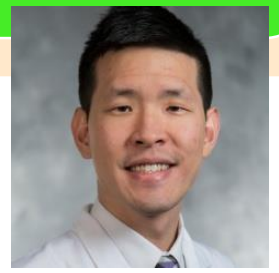


Early Recognition



IV tPA

Transfer for HBO2



Hyperbaric Oxygen Therapy

Diagnosis of Underlying Causes

Follow up in Eye Stroke Clinic

CRAO = Central Retinal Artery Occlusion = **Eye Stroke**

Definition of ischemic stroke: An episode of neurological dysfunction caused by focal cerebral, spinal, or retinal infarction.

2066 *Stroke* **July 2013**

AHA/ASA Expert Consensus Document

An Updated Definition of Stroke for the 21st Century

A Statement for Healthcare Professionals From the American Heart Association/American Stroke Association

The American Academy of Neurology affirms the value of this statement as an educational tool for neurologists.

Endorsed by the American Association of Neurological Surgeons and Congress of Neurological Surgeons

Ralph L. Sacco, MD, MS, FAHA, FAAN, Co-Chair*; Scott E. Kasner, MD, MSCE, FAHA, FAAN, Co-Chair*; Joseph P. Broderick, MD, FAHA; Louis R. Caplan, MD; J.J. (Buddy) Connors, MD; Antonio Culebras, MD, FAHA, FAAN; Mitchell S.V. Elkind, MD, MS, FAHA, FAAN; Mary G. George, MD, MSPH, FAHA†; Allen D. Hamdan, MD; Randall T. Higashida, MD; Brian L. Hoh, MD, FAHA; L. Scott Janis, PhD‡; Carlos S. Kase, MD; Dawn O. Kleindorfer, MD, FAHA; Jin-Moo Lee, MD, PhD; Michael E. Moseley, PhD; Eric D. Peterson, MD, MPH, FAHA; Tanya N. Turan, MD, MS, FAHA; Amy L. Valderrama, PhD, RN†; Harry V. Vinters, MD; on behalf of the American Heart Association Stroke Council, Council on Cardiovascular Surgery and Anesthesia, Council on Cardiovascular Radiology and Intervention, Council on Cardiovascular and Stroke Nursing, Council on Epidemiology and Prevention, Council on Peripheral Vascular Disease, and Council on Nutrition, Physical Activity and Metabolism

Table 1. Definition of Stroke

The term "stroke" should be broadly used to include all of the following:

Definition of CNS infarction: CNS infarction is brain, spinal cord, or retinal cell death attributable to ischemia, based on

1. pathological, imaging, or other objective evidence of cerebral, spinal cord, or retinal focal ischemic injury in a defined vascular distribution; or
2. clinical evidence of cerebral, spinal cord, or retinal focal ischemic injury based on symptoms persisting ≥24 hours or until death, and other etiologies excluded. (Note: CNS infarction includes hemorrhagic infarctions, types I and II; see "Hemorrhagic Infarction.")

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Why care about eye stroke?

- Devastating form of ischemic stroke
- Causes sudden, permanent blindness
- Sentinel of future stroke or heart attack

…

- Treatable!
- Using existing tools!

New Cases of Retinal Vascular Disorders Each Year

Type	Incidence (per 100,000 person years)
CRAO[1]	1.9
BRAO[2]	0.5
Amaurosis Fugax[3]	7
NAION*[4]	10.3
Total	19.7

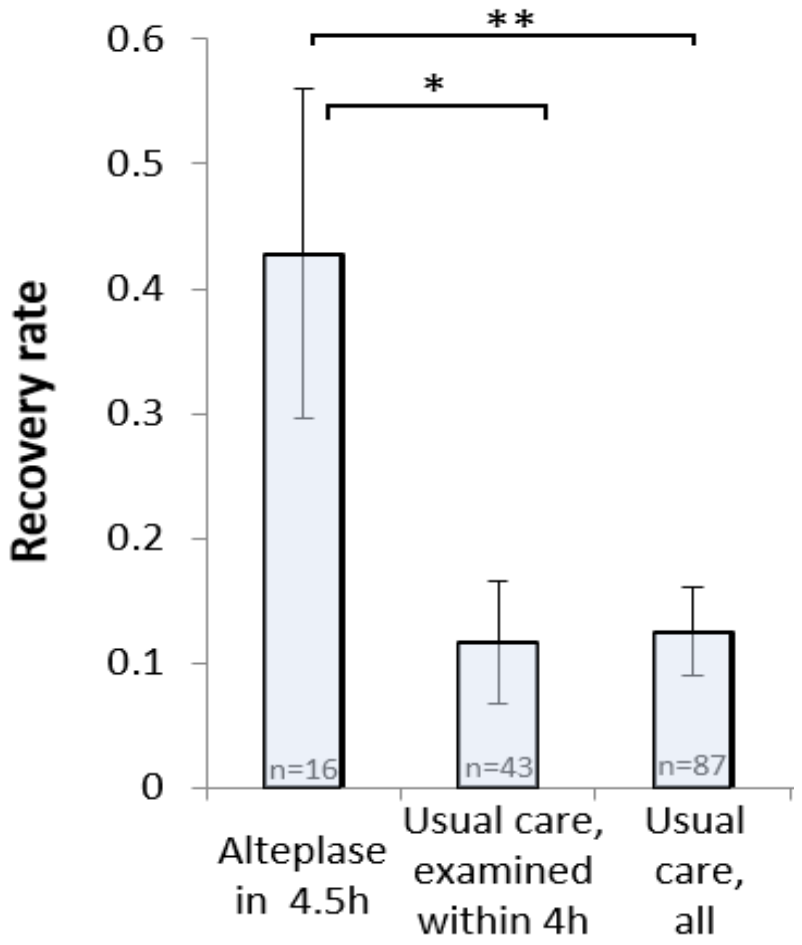
*Non-arteritic anterior ischemic optic neuropathy

1. Leavitt JA, Larson TA, Hodge DO, Gullerud RE. The incidence of central retinal artery occlusion in olmsted county, minnesota. *Am J Ophthalmol*. 2011;152:820-823.e822
2. Schorr EM, Rossi KC, Stein LK, Park BL, Tuhrim S, Dhamoon MS. Characteristics and outcomes of retinal artery occlusion: Nationally representative data. 2020. *Stroke*.
3. Andersen CU, Marquardsen J, Mikkelsen B, Nehen JH, Pedersen KK, Vesterlund T. Amaurosis fugax in a danish community: A prospective study. *Stroke*. 1988;19:196-199
4. Hattenhauer MG, Leavitt JA, Hodge DO, Grill R, Gray DT. Incidence of nonarteritic anterior ischemic optic neuropathy. *Am J Ophthalmol*. 1997;123:103-107

Predicted Yearly Number of Cases in Region

Type		North Carolina (Pop. = 10,490,000)	South Carolina (Pop. = 5,149,000)	Virginia (Pop. = 8,536,000)	Total (Pop. = 24,175,000)
CRAO	1.9	199	98	162	459
BRAO	0.5	52	26	43	121
Amaurosis Fugax	7	734	360	598	1692
NAION*	10.3	1080	530	879	2490
Total	19.7	2067	1014	1682	4762

*Non-arteritic anterior ischemic optic neuropathy



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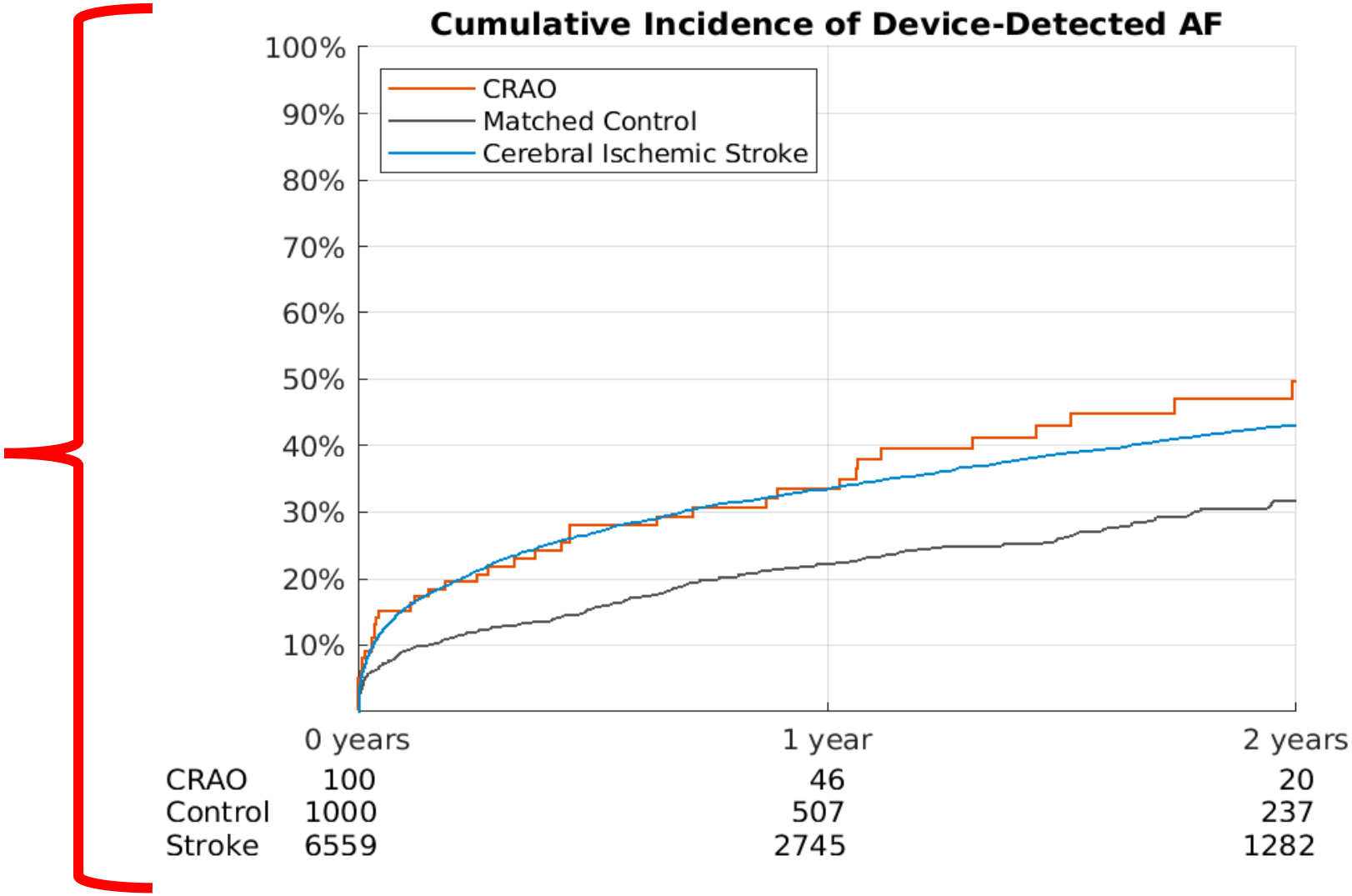

Mac Grory B, Landman SR, Ziegler PD, Flood SP, Stretz C, Madsen TE, Boyanpally A, Reznik ME, El-Jamal S, Saad A, Burton T, Cutting S, Sacchetti D, Torres J, Lavin P, Feng W, Furie K, BIousse, V, Schrag M, Yaghi S. *Stroke*. 2021.

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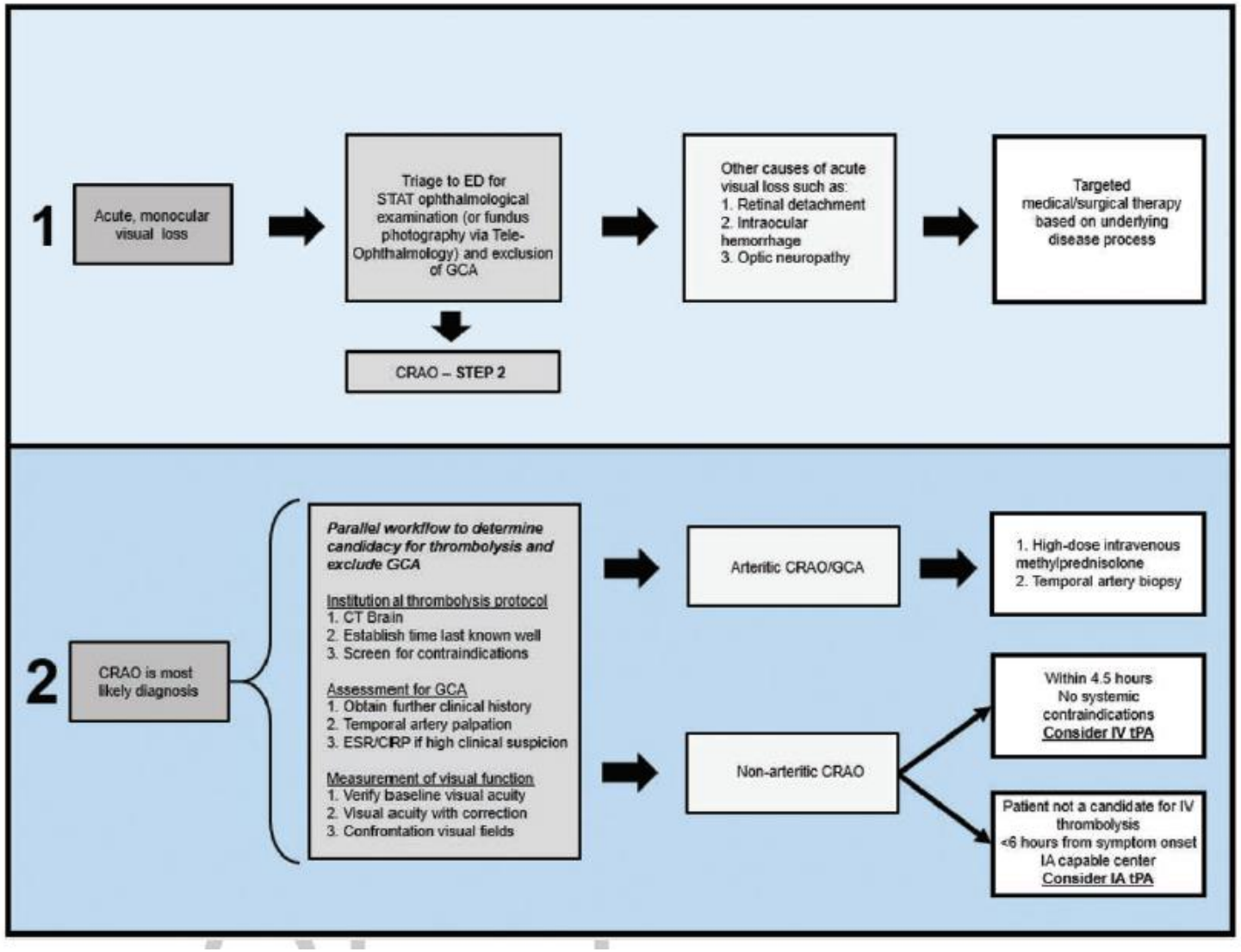
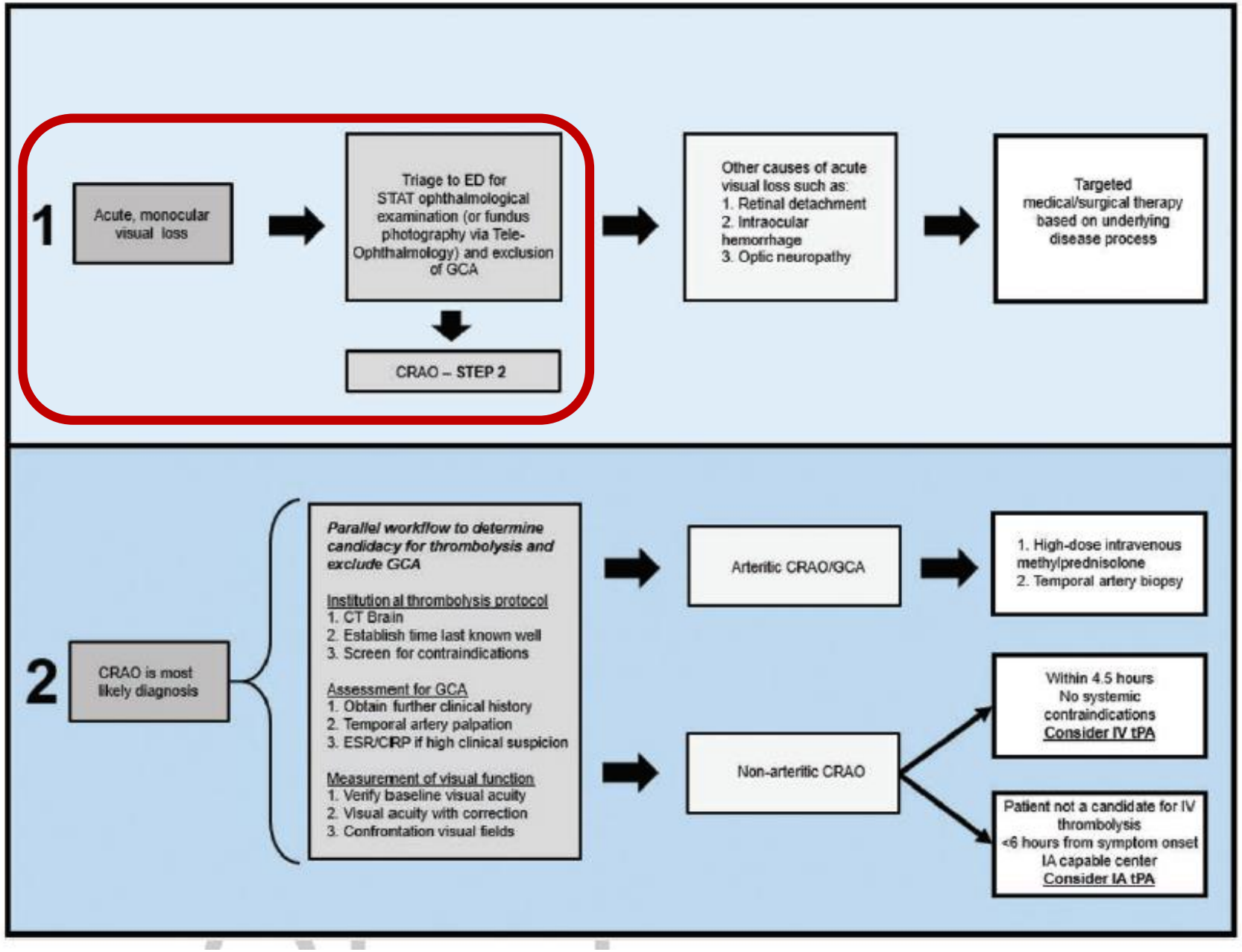
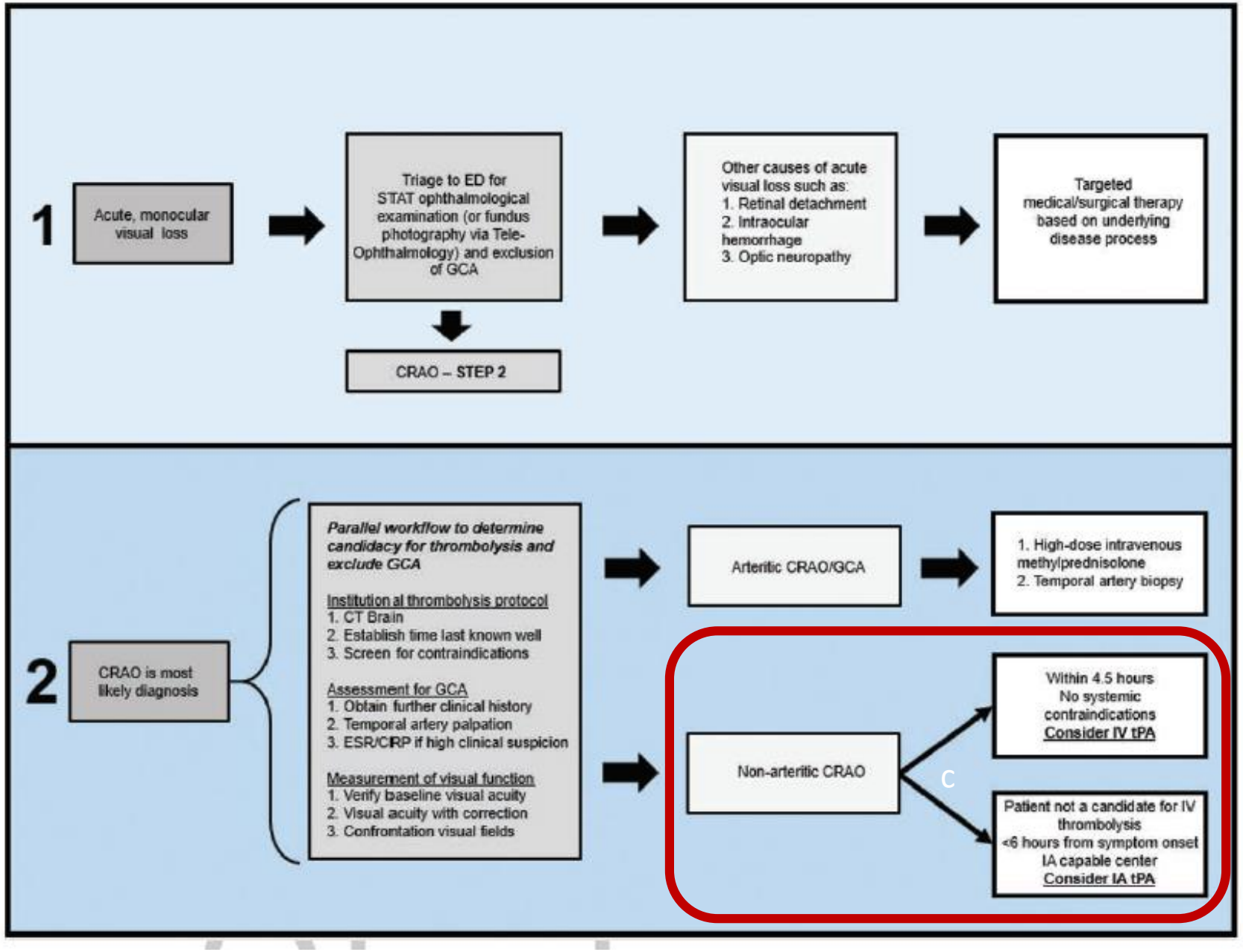
American Heart Association Scientific Statement




1
Acute, monocular visual loss
Triage to ED for STAT ophthalmological examination (or fundus photography via Tele-Ophthalmology) and exclusion of GCA
CRAO – STEP 2
Other causes of acute visual loss such as:
1. Retinal detachment
2. Intraocular hemorrhage
3. Optic neuropathy
Targeted medical/surgical therapy based on underlying disease process
2
CRAO is most likely diagnosis
Parallel workflow to determine candidacy for thrombolysis and exclude GCA
Institution al thrombolysis protocol
1. CT Brain
2. Establish time last known well
3. Screen for contraindications
Assessment for GCA
1. Obtain further clinical history
2. Temporal artery palpation
3. ESR/CRP if high clinical suspicion
Measurement of visual function
1. Verify baseline visual acuity
2. Visual acuity with correction
3. Confrontation visual fields
Arteritic CRAO/GCA
1. High-dose intravenous methylprednisolone
2. Temporal artery biopsy
Non-arteritic CRAO
Within 4.5 hours
No systemic contraindications
Consider IV tPA
Patient not a candidate for IV thrombolysis
<6 hours from symptom onset
IA capable center
Consider IA tPA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Within 4.5 hours
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Patient not a candidate for IV thrombolysis
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IA capable center
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SPOT A STROKE™

FACE Drooping

ARM Weakness

SPEECH Difficulty

TIME to Call 911

StrokeAssociation.org

American Heart Association | American Stroke Association | *Together* to End Stroke™

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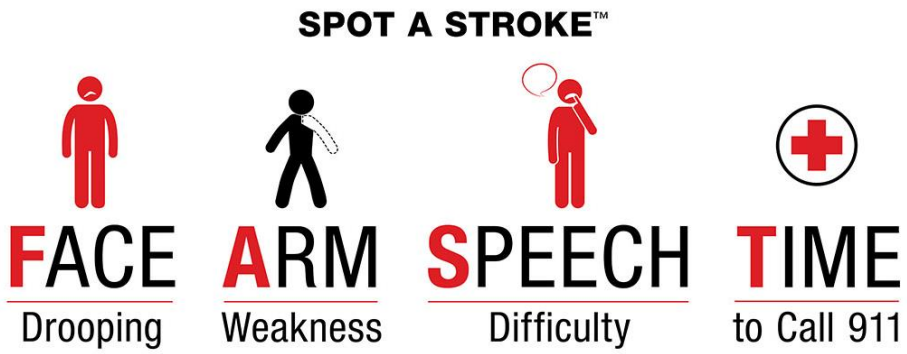

StrokeAssociation.org

American Heart Association | American Stroke Association. Together to End Stroke™

ED Stroke Code Activation → Neurology Resident Assesses + Performs NIHSS → Vital Signs, Weight, Labs → CT/CTA Brain/Neck → Benefit-Risk Discussion → tPA Decision → Admission to Stroke Unit

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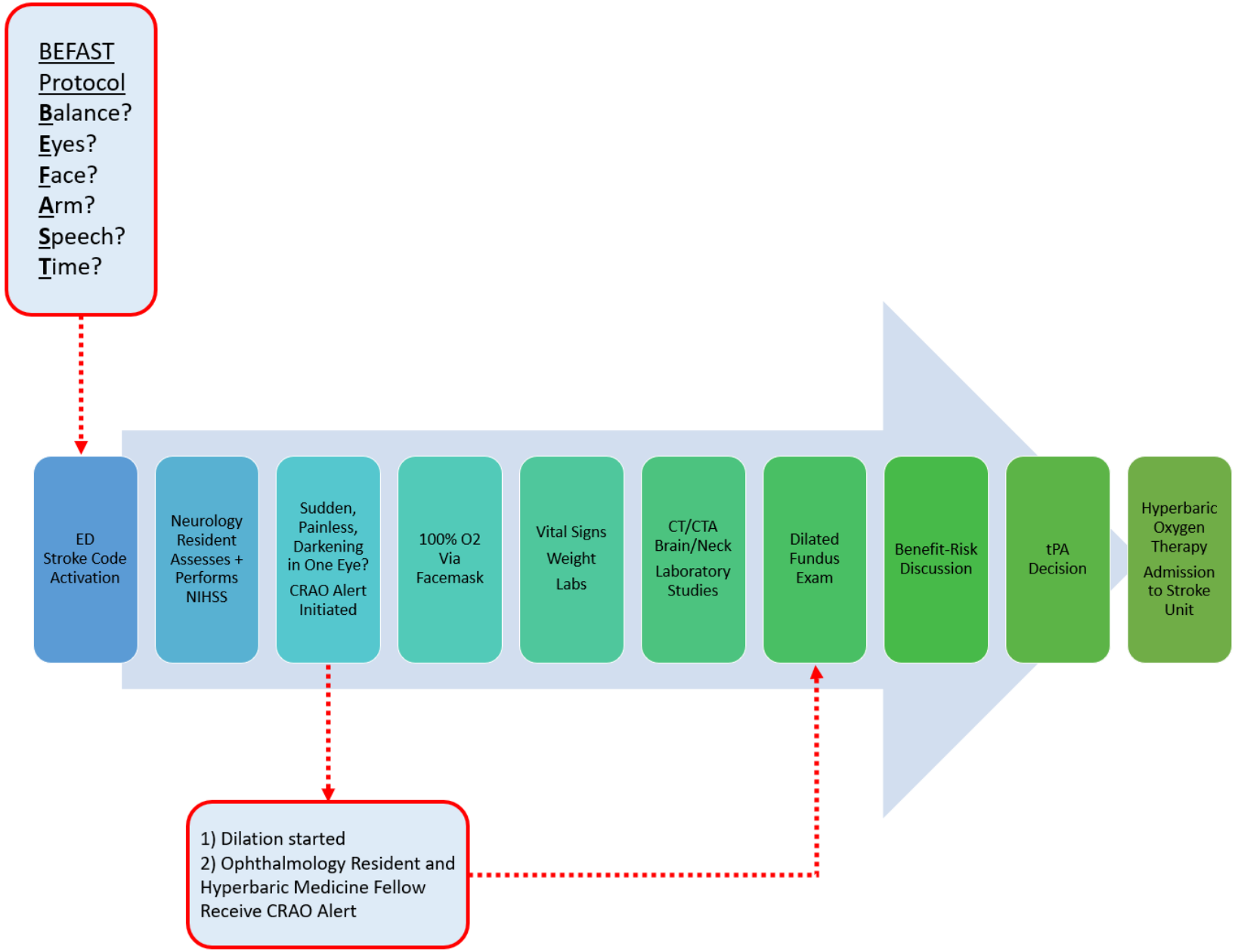
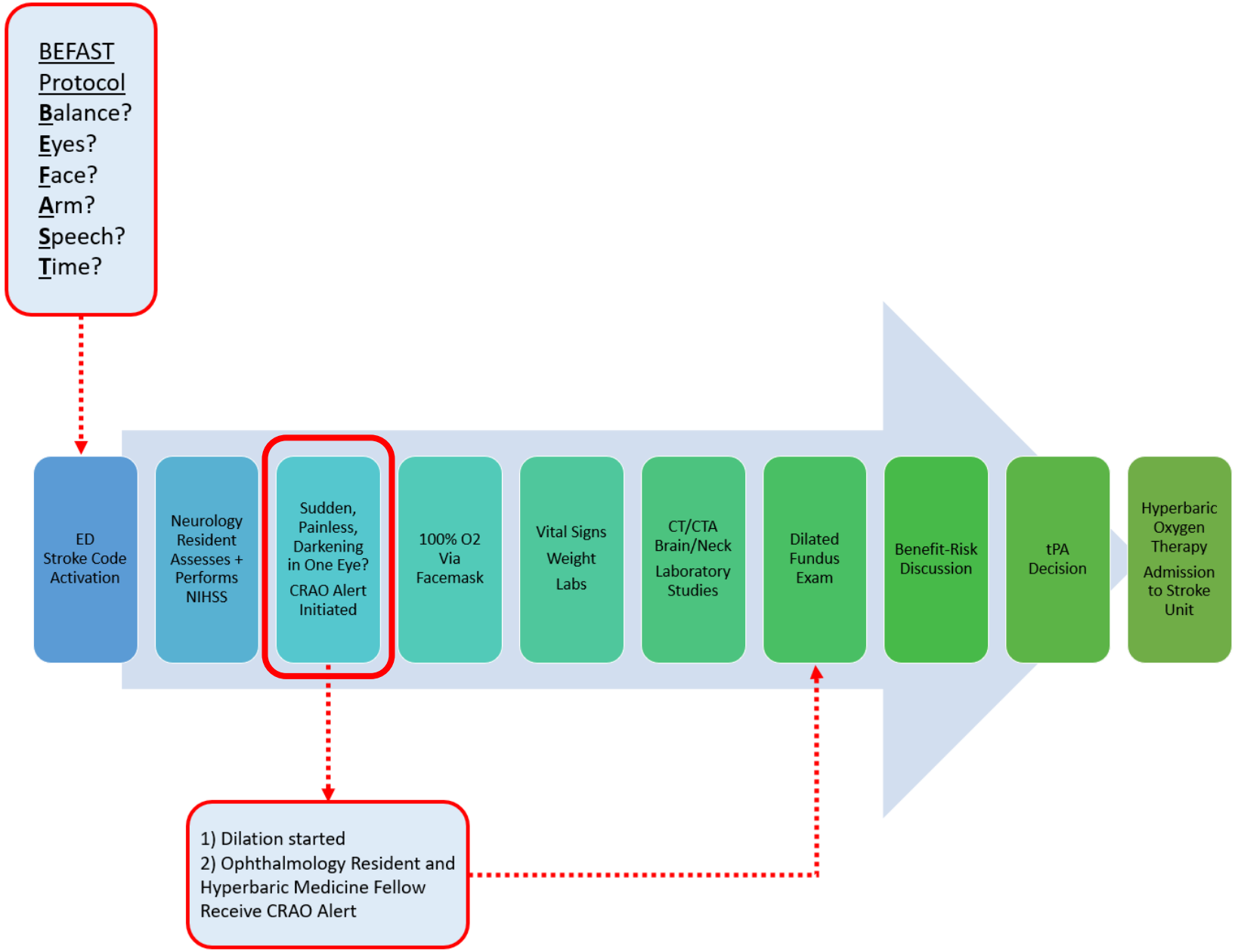

BEFAST Protocol
Balance?
Eyes?
Face?
Arm?
Speech?
Time?
ED Stroke Code Activation
Neurology Resident Assesses + Performs NIHSS
Sudden, Painless, Darkening in One Eye?
CRAO Alert Initiated
100% O2 Via Facemask
Vital Signs
Weight
Labs
CT/CTA Brain/Neck
Laboratory Studies
Dilated Fundus Exam
Benefit-Risk Discussion
tPA Decision
Hyperbaric Oxygen Therapy
Admission to Stroke Unit
1) Dilation started
2) Ophthalmology Resident and Hyperbaric Medicine Fellow Receive CRAO Alert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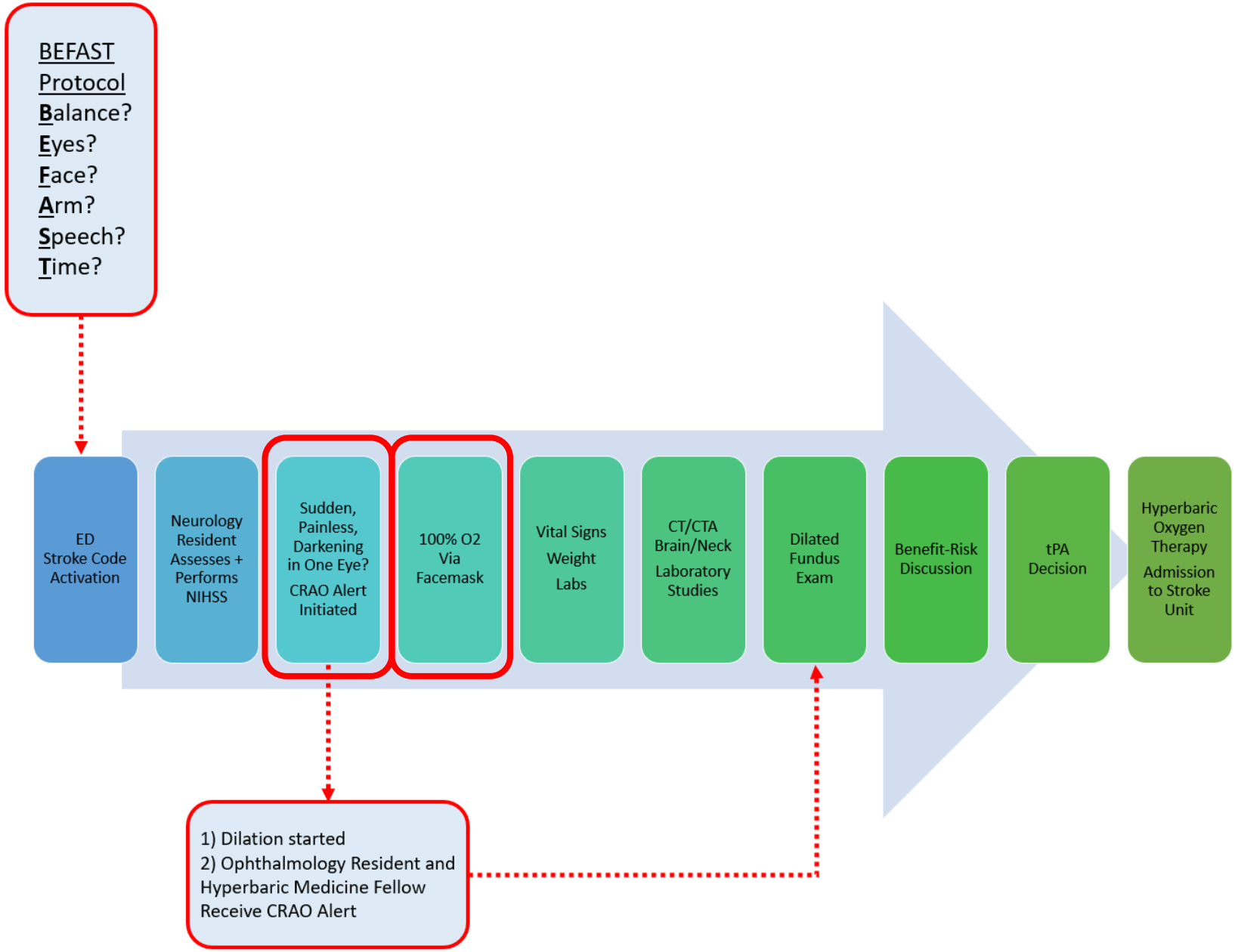
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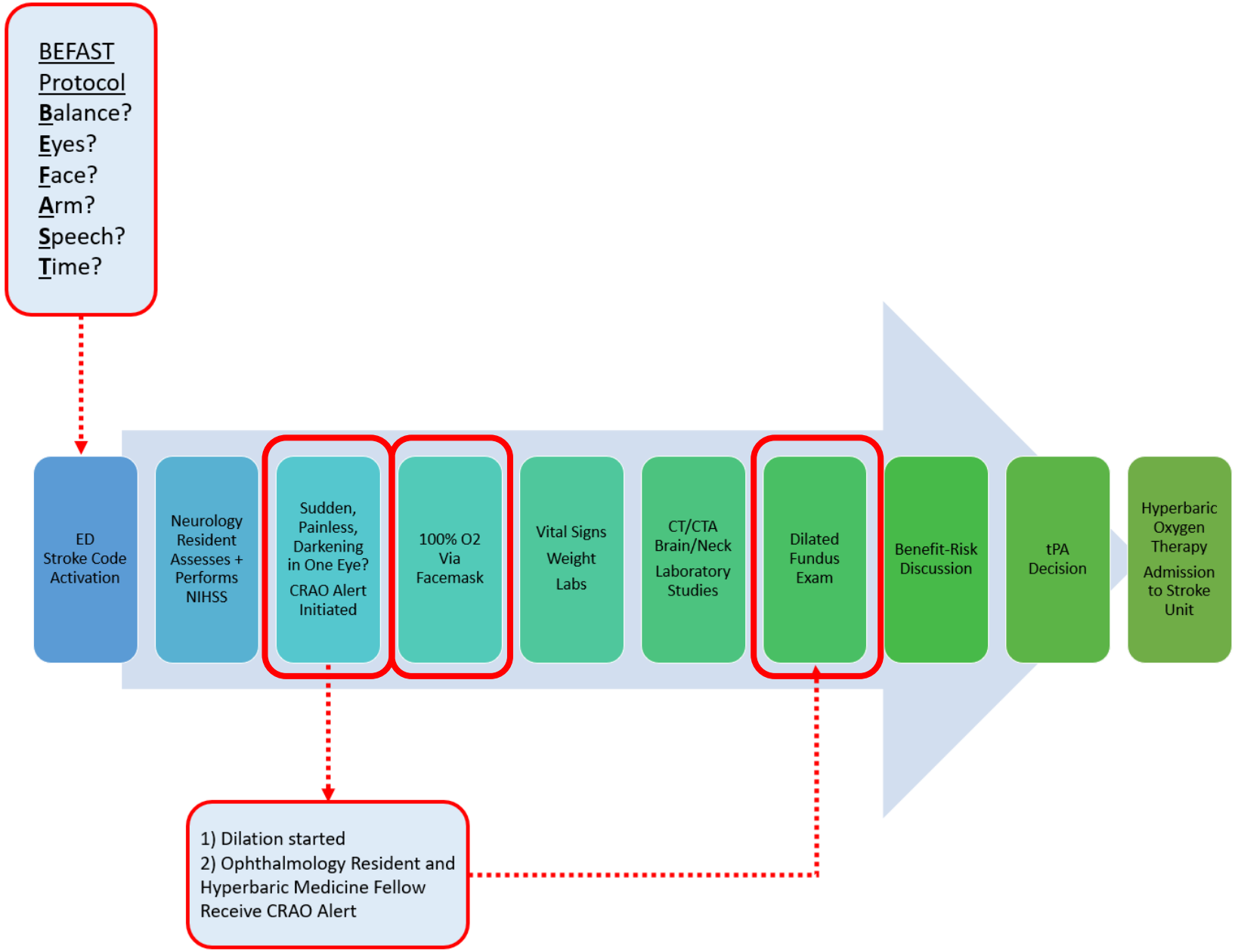
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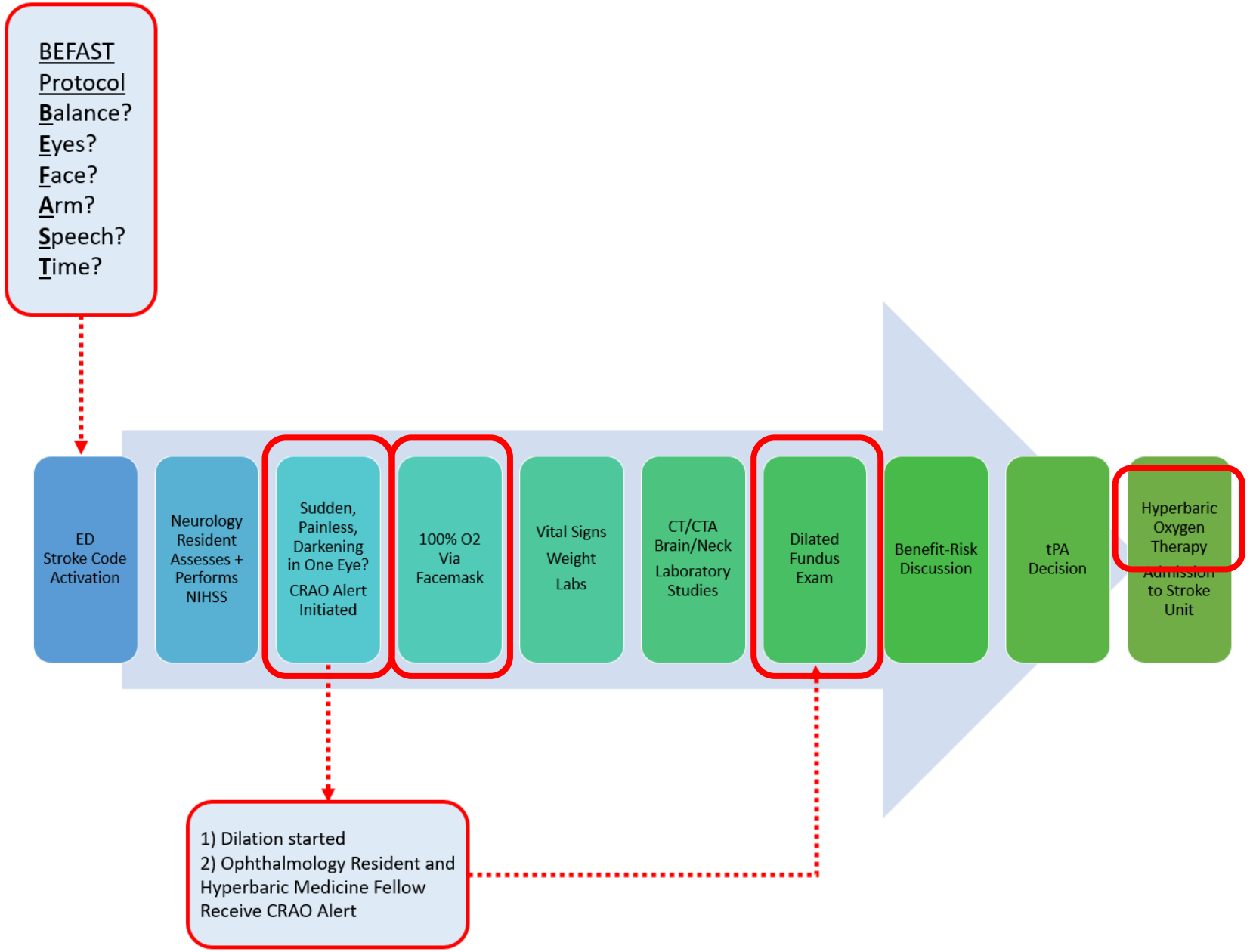
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Hyperbaric Oxygen Therapy

Duke Center of Excellence

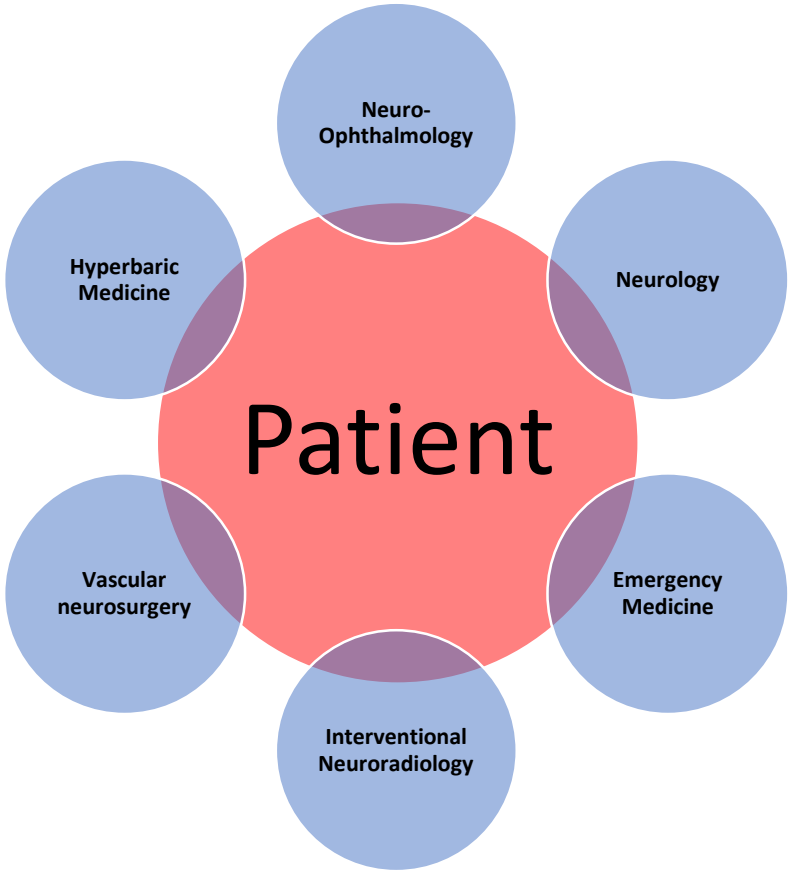
Acute Program

1. Hyperbaric Oxygen Therapy
2. Intravenous thrombolysis
3. Intra-arterial thrombolysis
4. Stroke Unit Care

Outpatient Program

Multidisciplinary clinic

Acute Program



Sudden, Painless Vision Changes Require Emergency Care

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By Morgan deBlecourt
May 12, 2021

Share:

Blanchie Marston Stevenson, 72, smiles outside her home in Raleigh, NC. Stevenson experienced an eye stroke in April 2021.

Early Recognition → IV tPA → Transfer for HBO2 → Hyperbaric Oxygen Therapy → Diagnosis of Underlying Causes → Follow up in Eye Stroke Clinic

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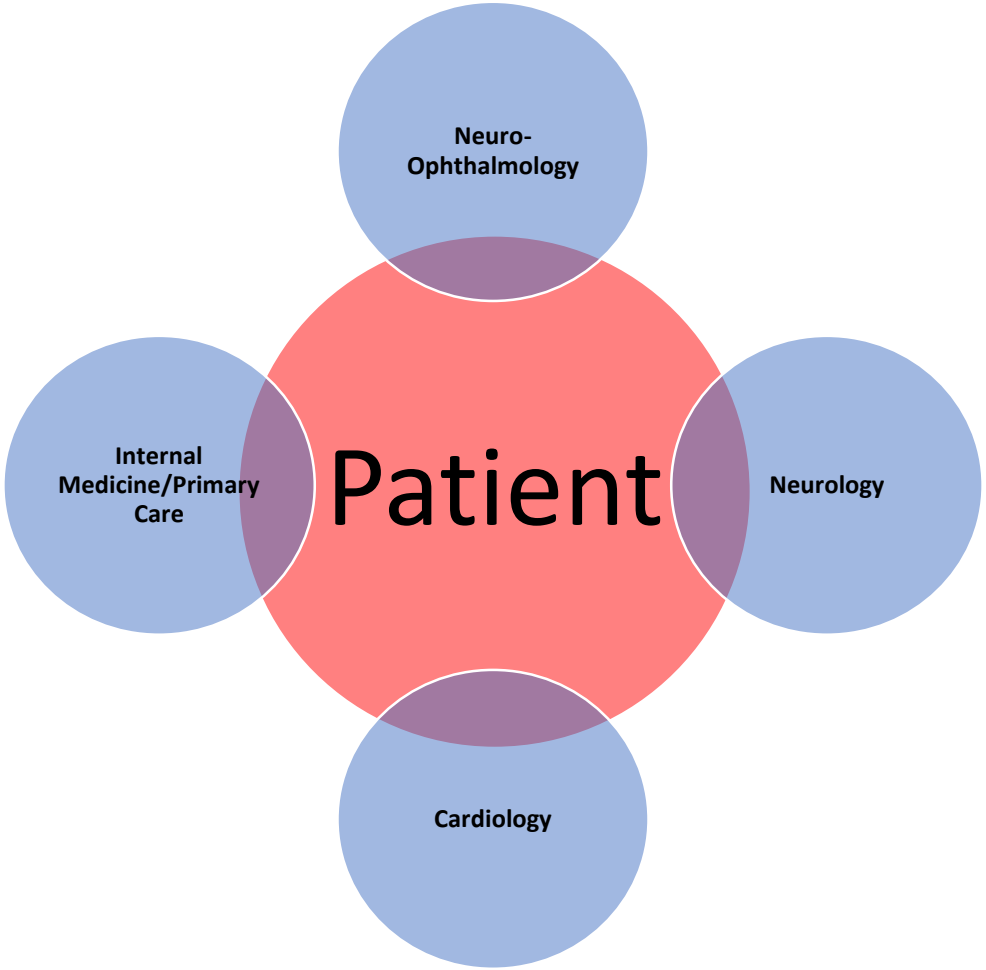
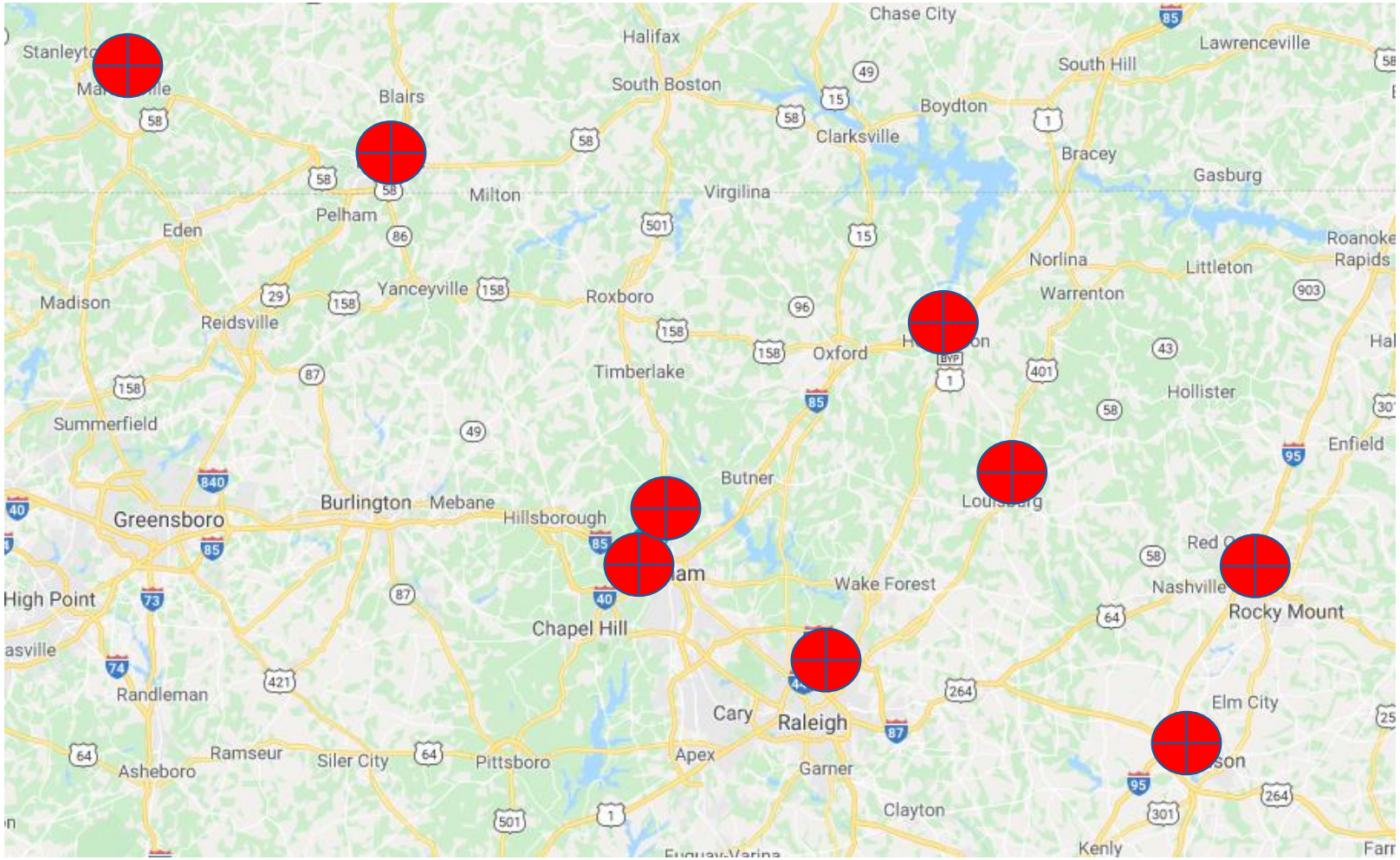


Duke Telestroke Network




Duke Life Flight

American Heart Association | American Stroke Association

life is why

Duke University School of Medicine

Region	Organization	Recommendation
United States		
Neurology	American Heart Association	CRAO not mentioned in 2018 guidelines
Ophthalmology	American Academy of Ophthalmology	"More aggressive treatments, such as thrombolysis… have accompanying risks and are controversial in the absence of a strong evidence-based recommendation."
Emergency Medicine	American Academy of Emergency Medicine	CRAO not mentioned in 2010 thrombolysis guidelines or 2016 Focused Update
Europe		
Neurology	European Stroke Organization	CRAO not mentioned in 2008 stroke guidelines or 2009 focused update
	National Institute for Health and Care Excellence (U.K.)	CRAO not mentioned in 2017 stroke guidelines
Ophthalmology	Royal College of Ophthalmologists	No guidelines for CRAO
Emergency Medicine	EUSEM	No guidelines for stroke
Australia		
Neurology	Australian Stroke Foundation	CRAO not mentioned in 2017 stroke guidelines
Ophthalmology	RANZCO	No guidelines for CRAO
Emergency Medicine	Australian College for Emergency Medicine	CRAO not mentioned in 2010 stroke guidelines

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Both intra-arterial and intravenous thrombolytics have been investigated.[51,52] However, there remains strong controversy regarding the best management strategy. There are meaningful limitations to establishing a reliable study design for such trials, especially given the complexity in disease variables and timing for intervention. Also, the low incidence of symptomatic arterial occlusions limits enrollment in treatment studies. The need for systemic testing and prompt intervention creates urgency and severely limits possible study design.[48]

Olsen TW, Pulido JS, Folk JC, Hyman L, Flaxel CJ, Adelman RA. Retinal and Ophthalmic Artery Occlusions Preferred Practice Pattern®. Ophthalmology. 2017;124(2):P120-P43.

Departments

1. Hyperbaric Medicine and Environmental physiology
2. Ophthalmology
3. Emergency Medicine
4. Comprehensive Stroke Center Program Manager/Coordinator
5. Stroke Neurology
6. Duke Telestroke
7. Emergency Department Nursing
8. Neurointerventional Radiology
9. Anesthesia
10. Duke Transfer Center
11. Duke LifeFlight
12. Laboratory Medicine

- Carey Unger, MHA
- Associate Vice President,

  Neurosciences and Behavioral Health,

  Duke University Health System

Duke University School of Medicine

- Carey Unger, MHA
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  Neurosciences and Behavioral Health,
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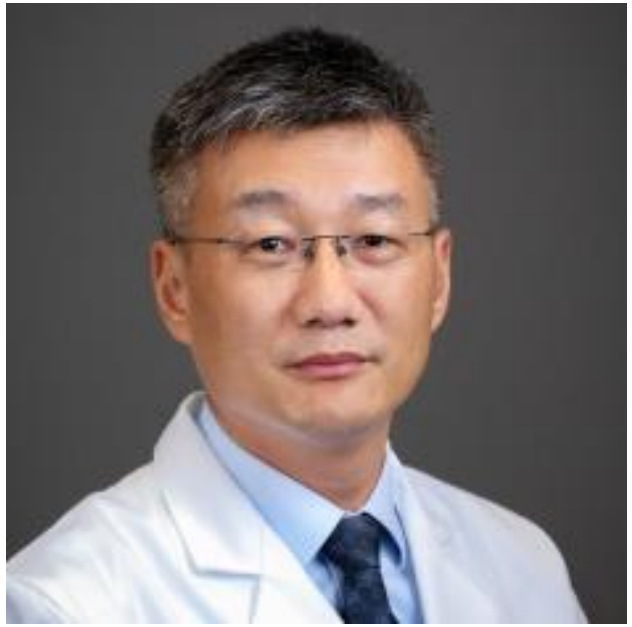

- Wayne Feng, MD, MS
- Professor, CSC Director
  Department of Neurology
  Duke University School of Medicine

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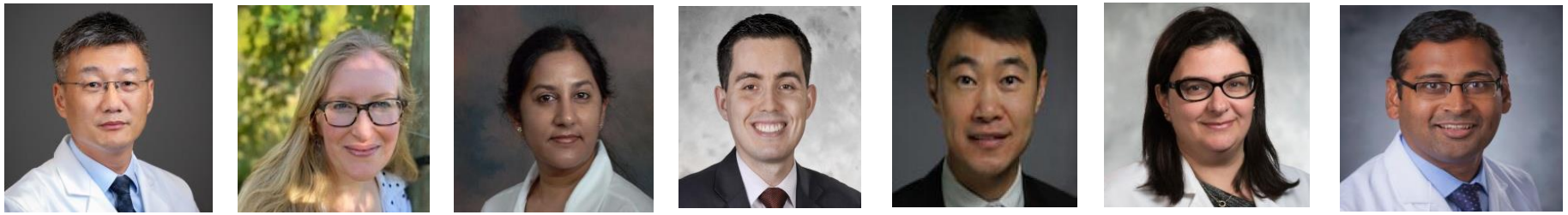
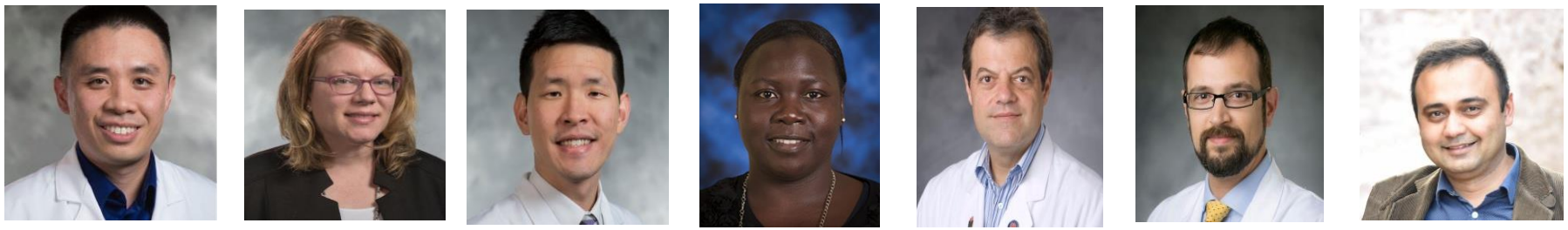
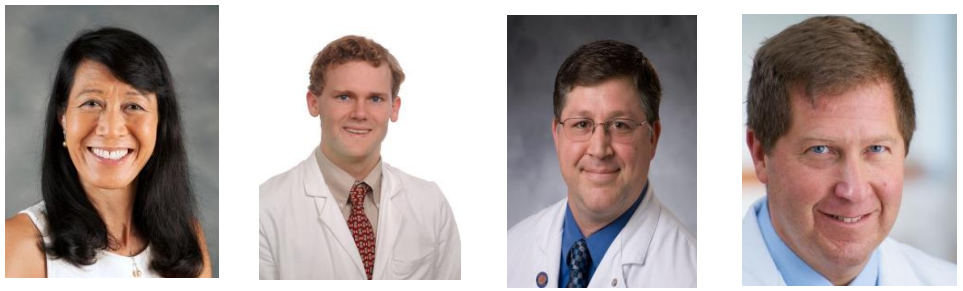
Stroke & Vascular Neurology



Stroke & Vascular Neurology Division



Vascular Neurosurgery Team

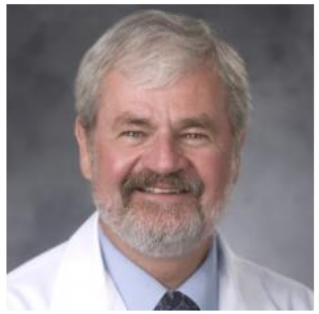


Neurocritical Care Division

Duke University School of Medicine

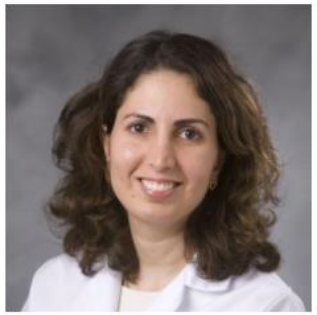
Duke Neuro-Ophthalmology

Chantal Josee Boisvert, MD
Neuro-Ophthalmology



Edward George Buckley, MD
Neuro-Ophthalmology
Pediatric Ophthalmology and Strabismus

Romain Cartoni, PhD
Neuro-Ophthalmology



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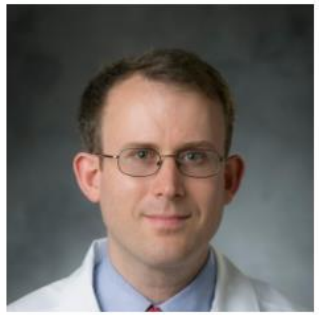
Neuro-Ophthalmology
Pediatric Ophthalmology and Strabismus



Sidney Maloch Gospe, MD
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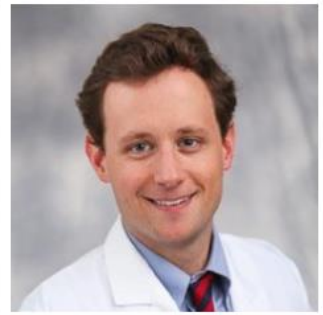

Landon Charles Meekins, MD
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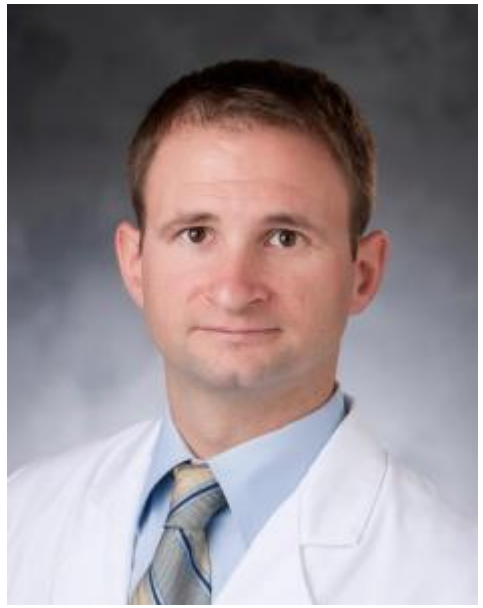

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Table 1 Acute management of CRAO by primary provider type

	All respondents ($n = 45$)[a]	Primary management included stroke neurology ($n = 23$)	Primary management by ophthalmology ($n = 20$)	p value
Does your institution have a CRAO protocol?	20% yes	26% yes	14% yes	0.19
Which team(s) treat CRAO?		NA	NA	
Neurology and ophthalmology jointly	24%			
Ophthalmology primary	44%			
Neurology primary	27%			
Neuro-ophthalmology	4%			
Where are patients referred for treatment?				0.0002
General emergency department	65%	87%	35%	
Ophthalmologic emergency department	7%	4%	10%	
Clinic	28%	9%	55%	
Preferred first-line treatment[b]				
Systemic fibrinolysis (for appropriate patients)	36%	52%	20%	0.034
Ocular massage	19%	9%	25%	0.17
Anterior chamber paracentesis	14%	0%	30%	0.006
No treatment	9%	13%	5%	0.38
No consensus approach	33%	26%	40%	0.34
Treatments offered at least "occasionally"				
Systemic fibrinolysis	53%	61%	50%	0.48
Intra-arterial fibrinolysis	14%	22%	5%	0.12
Ocular massage	66%	57%	80%	0.12
Anterior chamber paracentesis	42%	21%	70%	0.002
Hemodilution	2%	4%	0%	0.32
Hyperbaric oxygen	7%	0%	15%	0.063
Acute anticoagulation	5%	4%	5%	1.0
Acetazolamide	7%	4%	10%	0.54
Breathing into bag or carbogen inhalation	9%	0%	20%	0.03
Topical intra-ocular pressure lowering drops	12%	4%	20%	0.14
Nd:YAG laser thrombectomy	2%	0%	5%	0.29

Youn TS, Lavin P, Patrylo M, Schindler J, Kirshner H, Greer DM, et al. Current treatment of central retinal artery occlusion: a national survey. J Neurol. 2018;265(2):330-5.

AHA Scientific Statement

American Heart Association | American Stroke Association
life is why

Stroke
Journal of the American Heart Association

American Stroke Association
A Division of American Heart Association

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AHA SCIENTIFIC STATEMENT

Management of Central Retinal Artery Occlusion

A Scientific Statement From the American Heart Association

The American Academy of Neurology affirms the value of this statement as an educational tool for neurologists.

The American Association of Neurological Surgeons/Congress of Neurological Surgeons Cerebrovascular Section affirms the educational benefit of this document.

Endorsed by the North American Neuro-Ophthalmology Society, the American Academy of Ophthalmology Quality of Care Secretariat, and the American Academy of Optometry.

Brian Mac Grory, MB BCh BAO, MRCP, Chair; Matthew Schrag, MD, PhD, Vice-Chair; Valérie Biousse, MD; Karen L. Furie, MD, MPH, FAHA; Marie Gerhard-Herman, MD; Patrick J. Lavin, MB BCh BAO, MRCPI; Lucia Sobrin, MD, MPH; Stavropoula I. Tjoumakaris, MD; Cornelia M. Weyand, MD, PhD; Shadi Yaghi, MD, FAHA; on behalf of the American Heart Association Stroke Council; Council on Arteriosclerosis, Thrombosis and Vascular Biology; Council on Hypertension; and Council on Peripheral Vascular Disease

Stroke
JOURNAL OF THE AMERICAN HEART ASSOCIATION

American Stroke Association
A Division of American Heart Association