



Approach to Stroke

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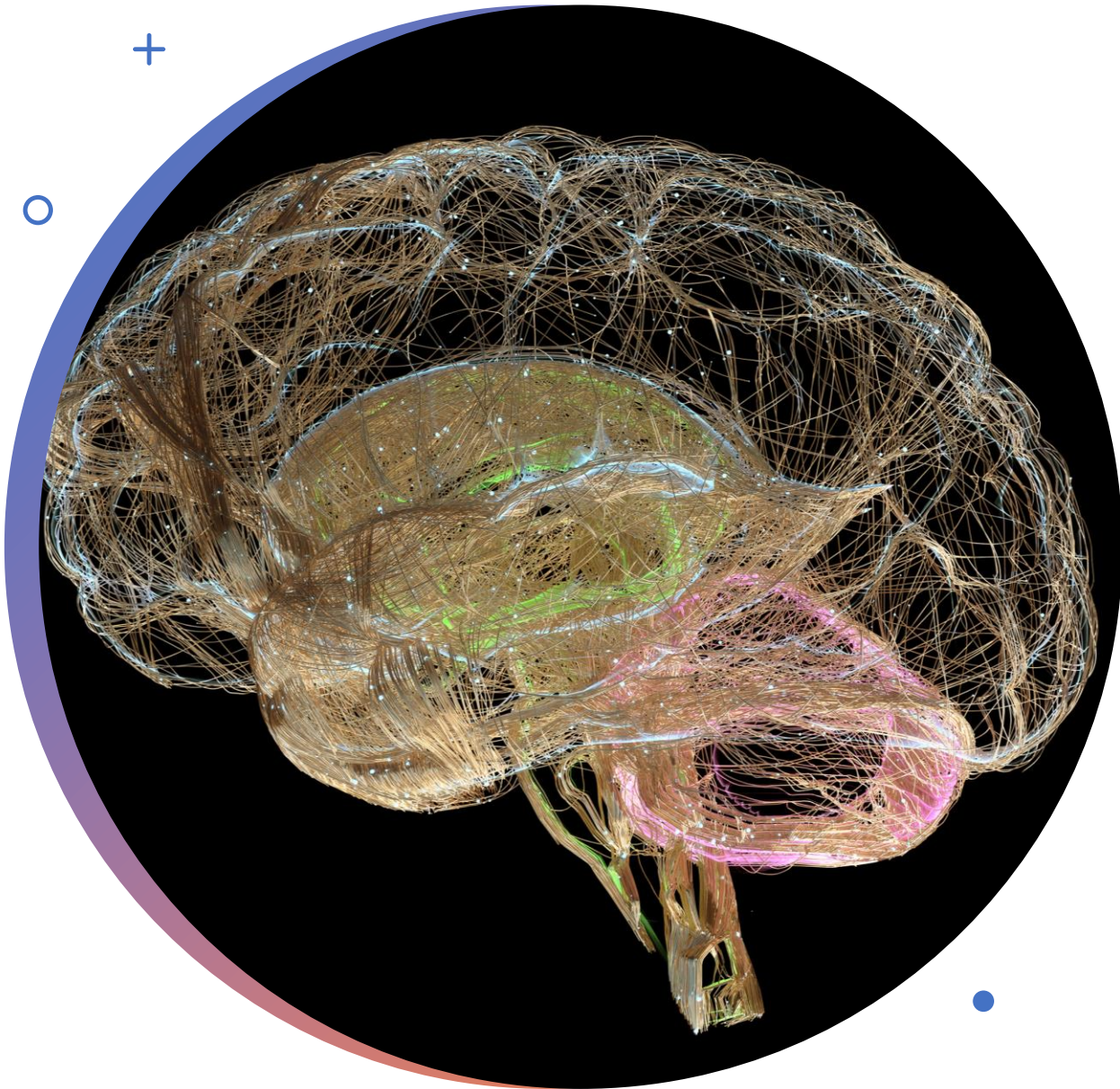


TIA

Hemorrhagic

Where there is no CT

Summary



Definition?

- What is the definition of a stroke?
- What is an ischemic stroke?
- What is a hemorrhagic stroke?
- What is a TIA?
- Which is the most common form of stroke?
- Which form of stroke has the highest mortality?



Definition

WHO Definition

- Rapidly developing clinical signs of focal or global disturbance of cerebral function, lasting more than 24 hours or leading to death, with no apparent cause other than that of vascular origin

Ischemic Stroke 60-70%

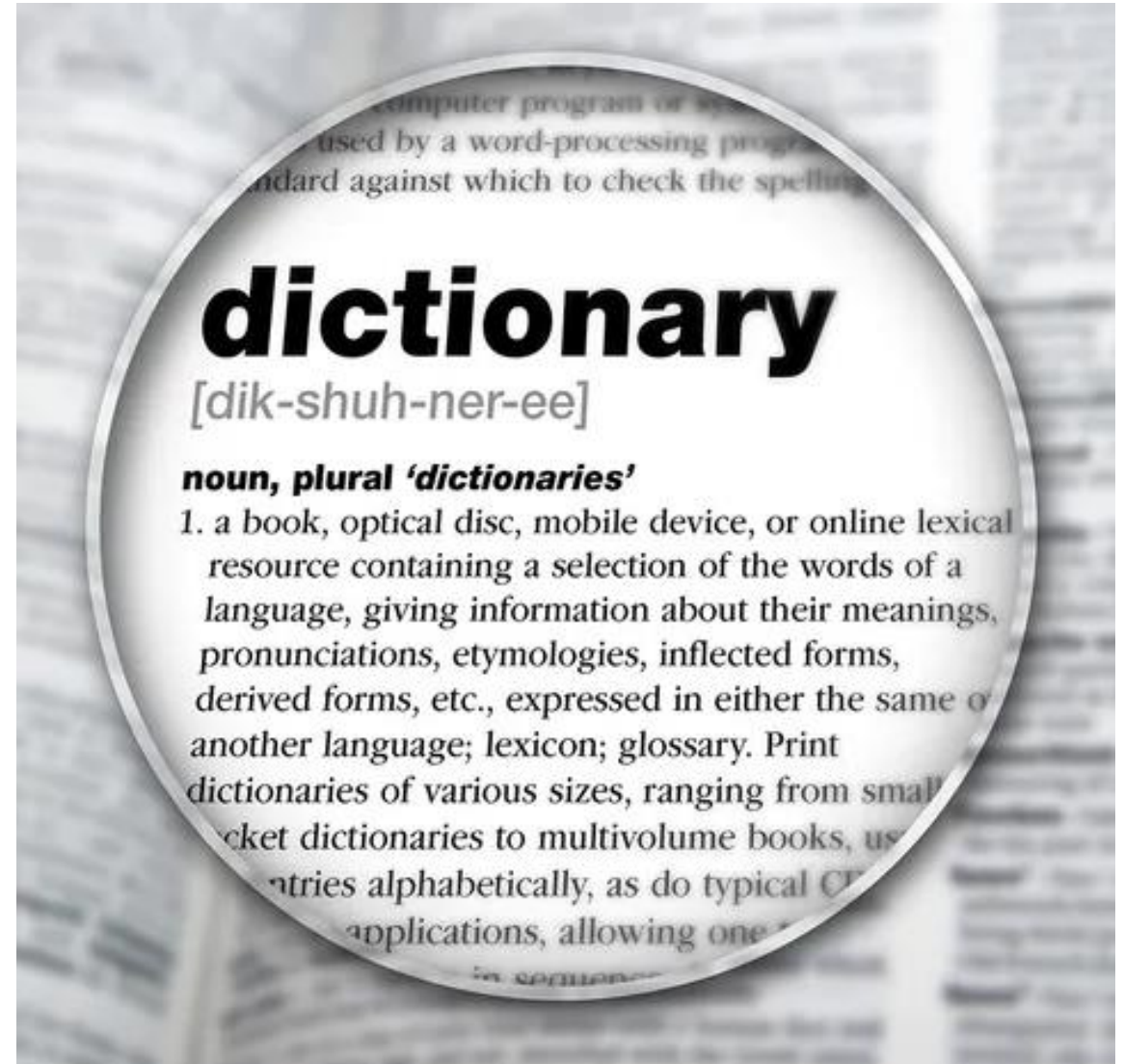
- Stroke resulting from obstruction within a blood vessel supplying blood to the brain, retina or spinal cord
- Mortality 20%

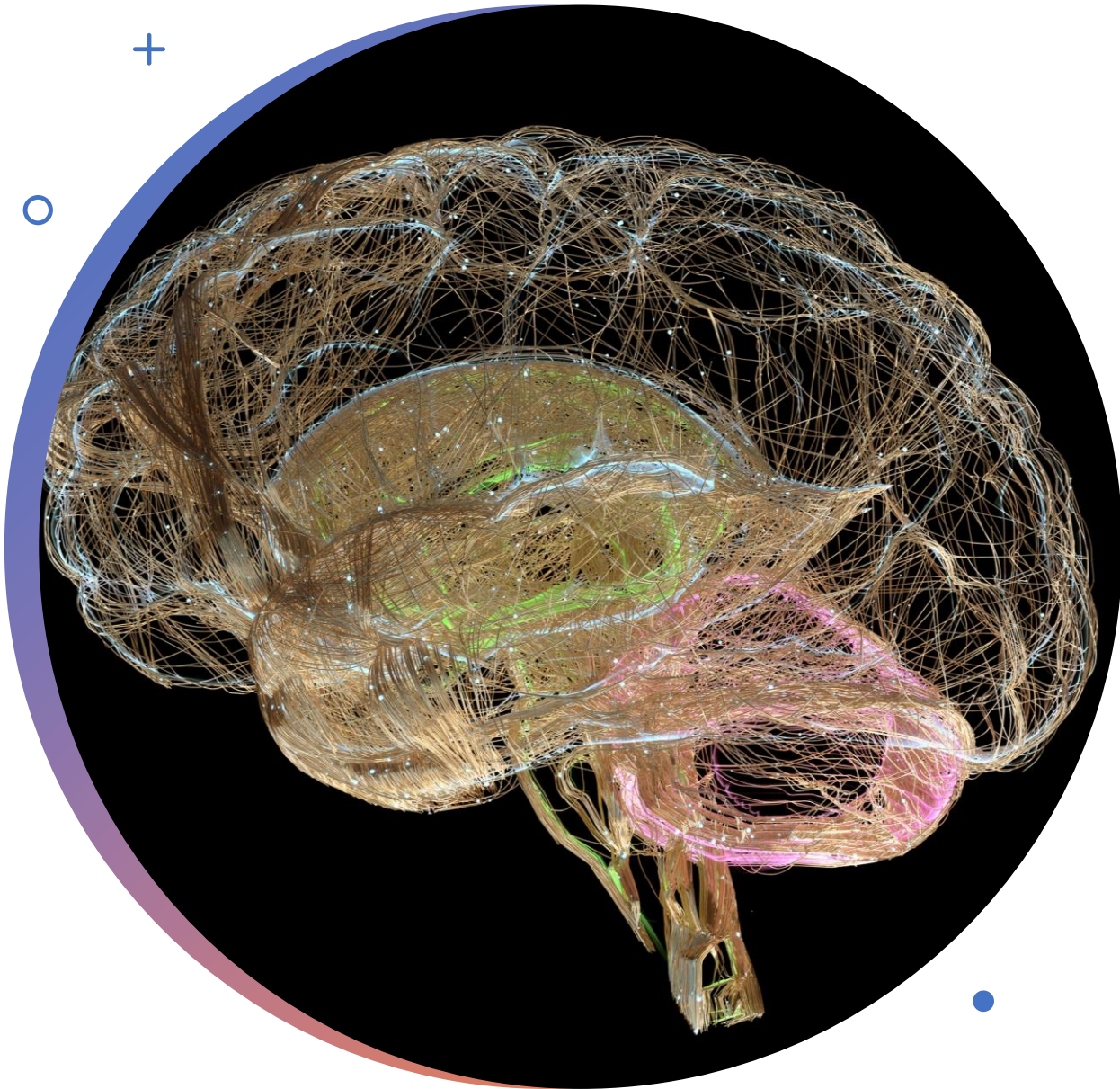
Hemorrhagic Stroke (intracerebral hemorrhage) 30-40%

- Stroke that occurs when a weakened blood vessel ruptures, usually due to hypertension
- Mortality 50%

Transient Ischemic Attack (TIA)

- A transient episode of neurologic dysfunction resulting from focal cerebral, retinal or spinal cord ischemia without evidence of acute infarction





The numbers?

- How common is stroke in Africa?
- What are the risk factors for stroke in Africa?





The Numbers

Africa: 316 per 100,000 population

US: 246 per 100,000 population

Drivers of increased rates of stroke in Africa

HYPERTENSION

- Africa has world's highest rates of hypertension (50% of the population > 35 years old, up to 70% unaware)

Aging population

Increased rates of smoking, diabetes, hyperlipidemia, obesity

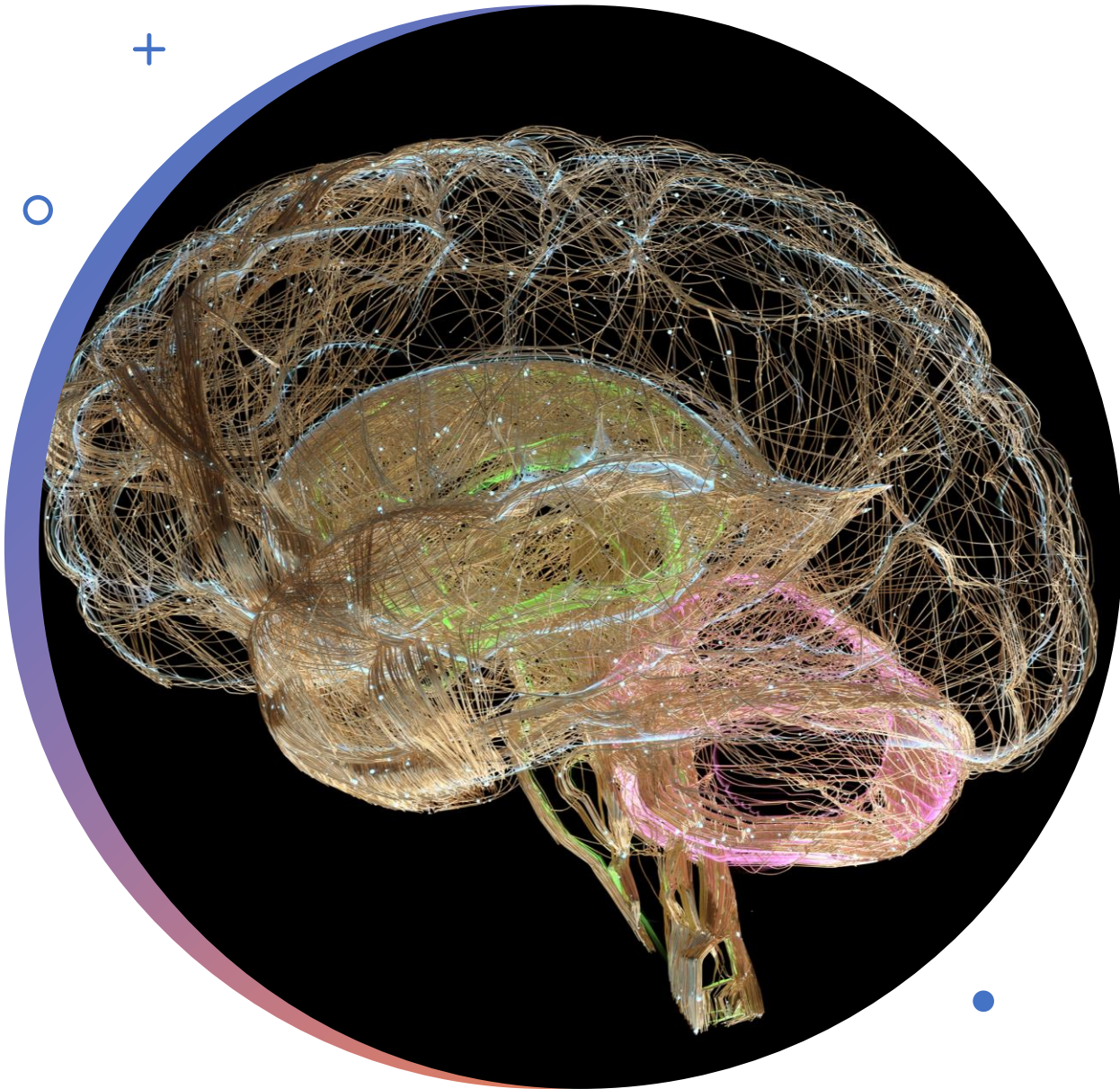
Westernized diets and physical inactivity

High rates of HIV

Other risk factors: hyperlipidemia/atherosclerosis, carotid artery stenosis, vascular dissection,

Cardioembolic factors: Atrial fibrillation, LV thrombus, Low EF (< 35%), Hypercoagulable state with PFO





Which one?

- What are clinical signs that can be used to help differentiate a hemorrhagic versus ischemic stroke?

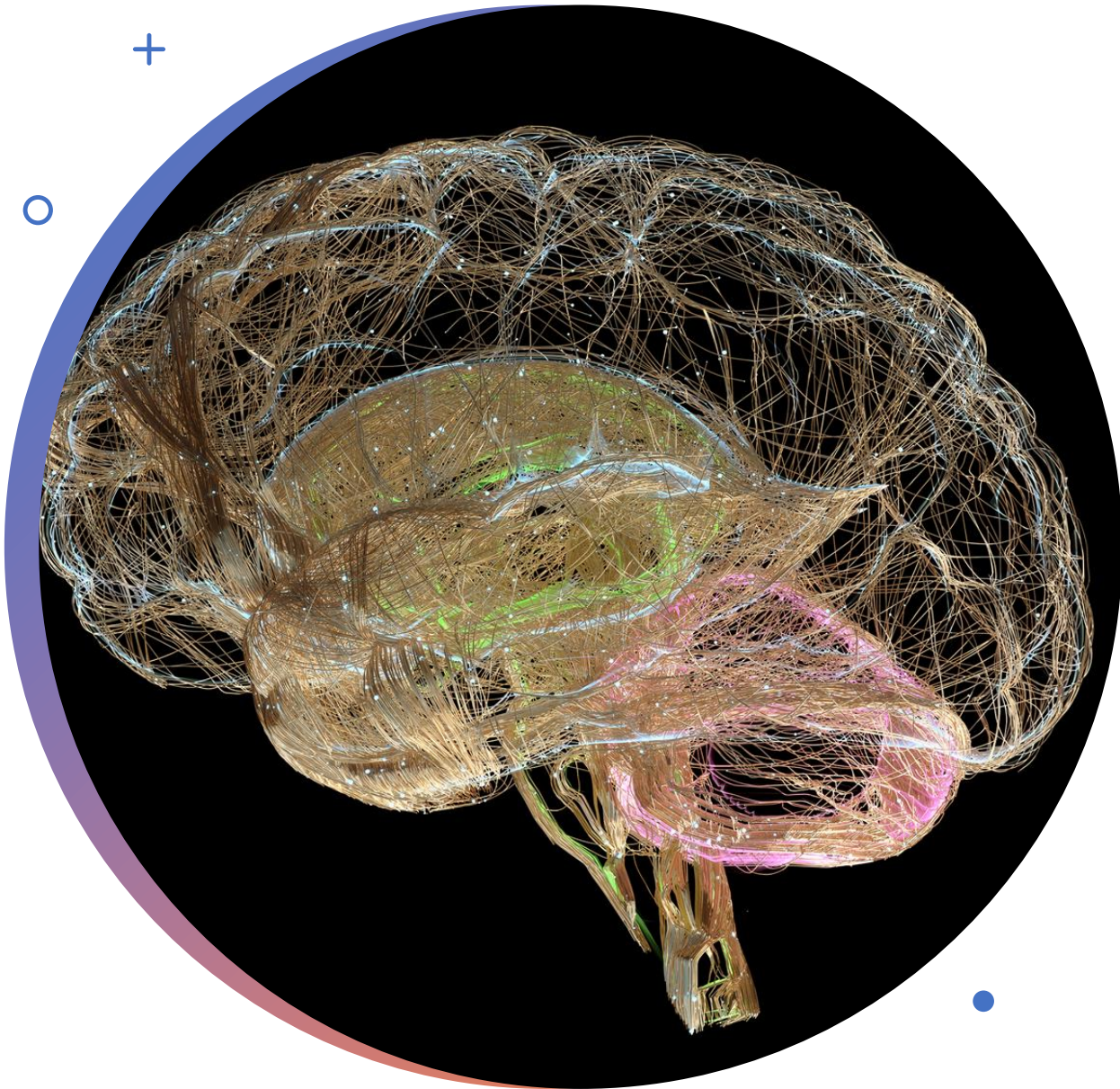




Which one

- Difficult to differentiate ischemic from hemorrhagic strokes clinically
- Increased risk of hemorrhagic stroke
 - Headache at onset
 - Nausea/vomiting at onset
 - Coma at onset
 - Seizure within first 24 hours

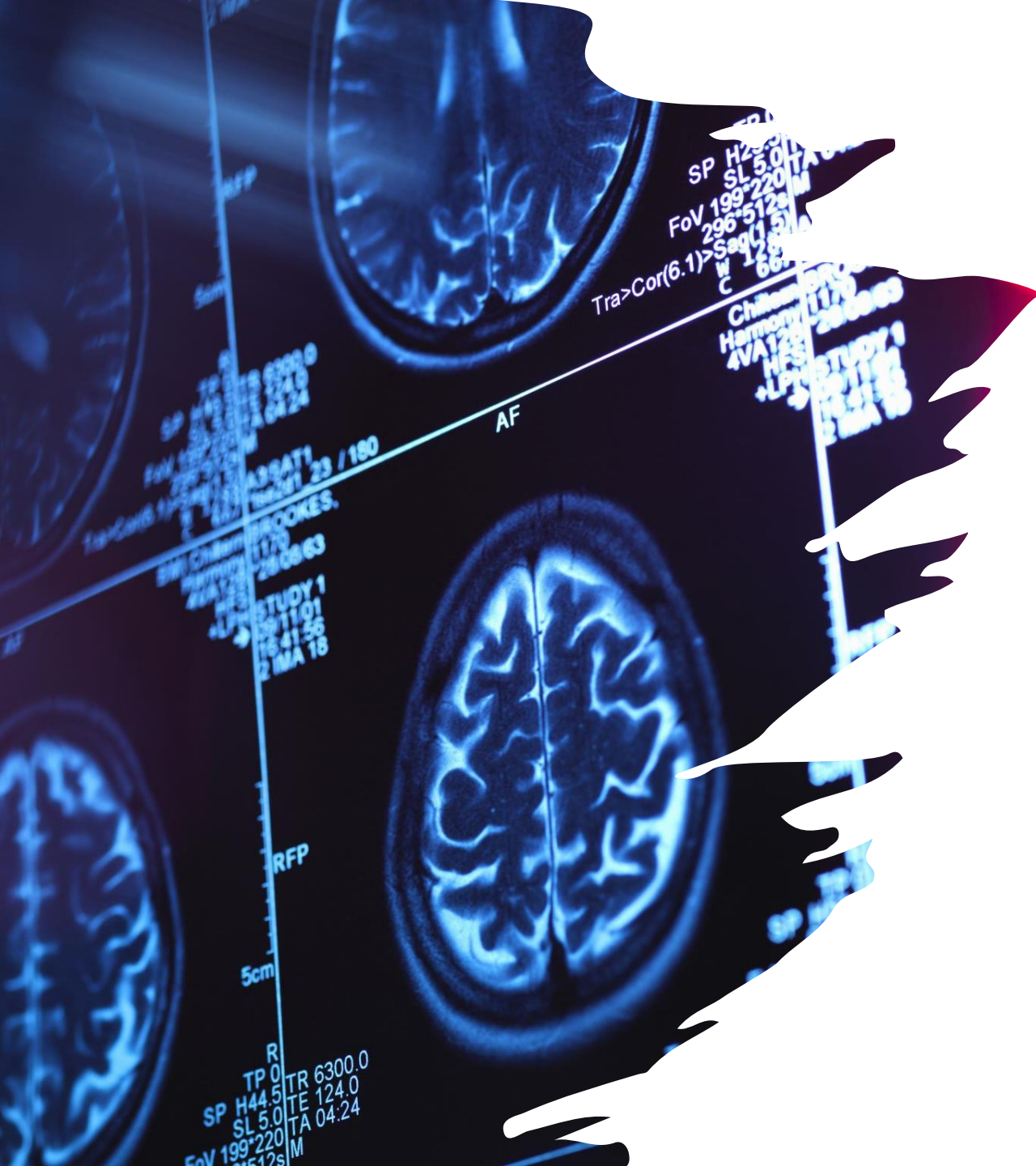




Investigations?

- What imaging should be ordered?
- What other investigations can be ordered based the type of stroke?





Investigations

Brain imaging is initial workup for all stroke types

CT is modality of choice

- Evaluates for hemorrhage
- Can sometimes show subacute ischemic infarcts
- Will not show acute ischemic infarcts or infratentorial strokes

MRI can confirm ischemic stroke remainder of workup is guided by type of stroke

Clinical signs/symptoms can be used to *localize the lesion* prior to imaging results

Potential investigations: A1c, lipid, RPR, ECG, echocardiogram, carotid doppler

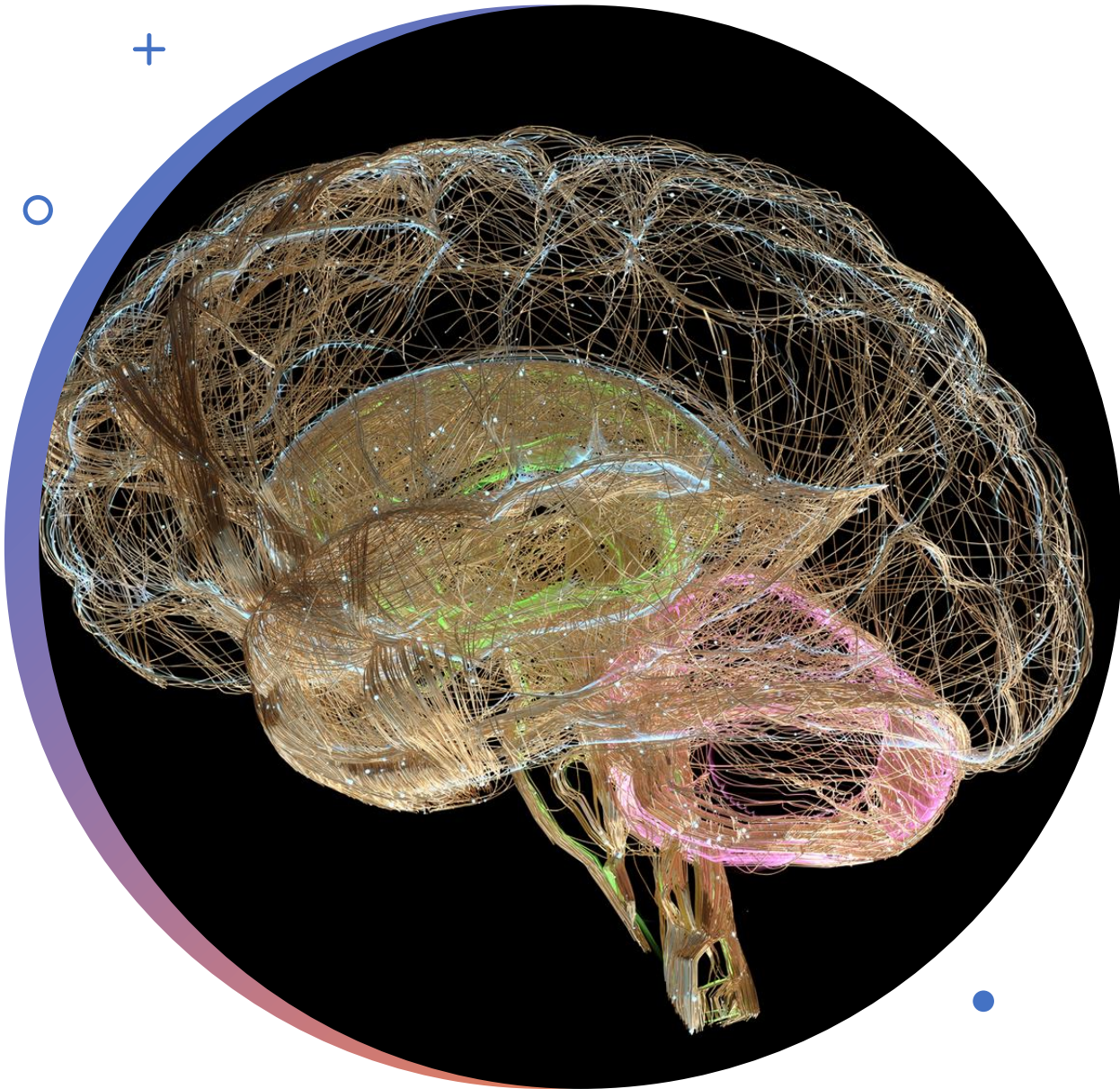


Localizing

Syndrome	Signs/symptoms	Localization	Vascular supply
Pure motor	Contralesional hemiparesis	Posterior limb of internal capsule, corona radiata or basis pontis	Lenticulostriate branches of the MCA or perforating arteries from the basilar artery
Pure sensory	Contralesional hemisensory loss	Ventroposterolateral nucleus of the thalamus	Lenticulostriate branches of the MCA or small thalamoperforators from the PCA
Sensorimotor	Contralesional weakness and numbness	Thalamus and adjacent posterior limb of internal capsule	Lenticulostriate branches from the MCA
Dysarthria-clumsy hand	Slurred speech and (typically fine motor) weakness of contralesional hand	Basis pontis, between rostral third and caudal two thirds	Perforating arteries from the basilar artery
Ataxia-hemiparesis	Contralesional (mild to moderate) hemiparesis and limb ataxia out of proportion to the degree of weakness	Posterior limb of internal capsule or basis pontis	Lenticulostriate branches of the MCA or perforating arteries from the basilar
Hemiballismus/hemichorea	Contralesional limb flailing or dyskinesias	Subthalamic nucleus	Perforating arteries from anterior choroidal (ICA), PCOM arteries

ICA, internal carotid artery; MCA, middle cerebral artery; PCA, posterior cerebral artery; PCOM, posterior communicating.





Ischemic stroke treatment?

- What is the acute treatment for an ischemic stroke?
- What orders should be in place for the hospitalization?
- What are the complications of ischemic stroke?





Ischemic stroke treatment

Acute Treatment

- IV tissue plasminogen activator (tPA) within 4.5 to 6 hours of symptom onset
- Endovascular therapies with directed thrombolysis or clot retrieval

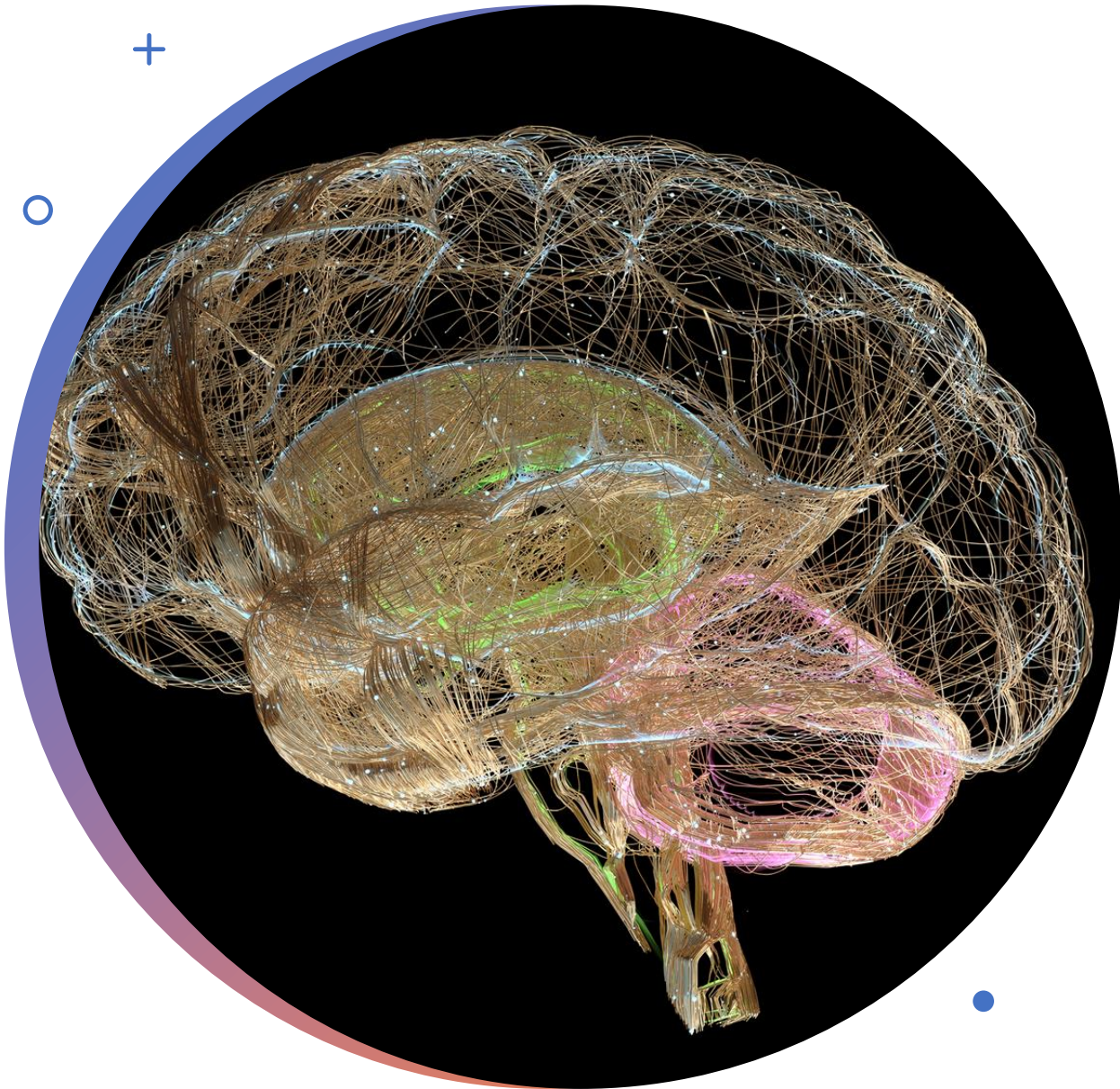
Orders

- Allow Permissive hypertension x 48 hours with an SBP < 220
- High-dose aspirin within first 48 hours
- Prevent aspiration: [Bedside swallow evaluation](#), consider NGT and enteral feeds, elevate head of bed
- DVT prophylaxis
- Maintain euthermia
- Maintain euglycemia
- Adequate hydration and nutrition
- Early mobilization

Complications

- Peak edema 3-5 days after stroke (increased significance in younger patients with less cerebral atrophy)
- Hemorrhagic transformation





Ischemic stroke secondary prevention?

- What are measures that can be taken for secondary prevention?



Ischemic stroke secondary prevention

Low-dose aspirin (75 mg) daily indefinitely

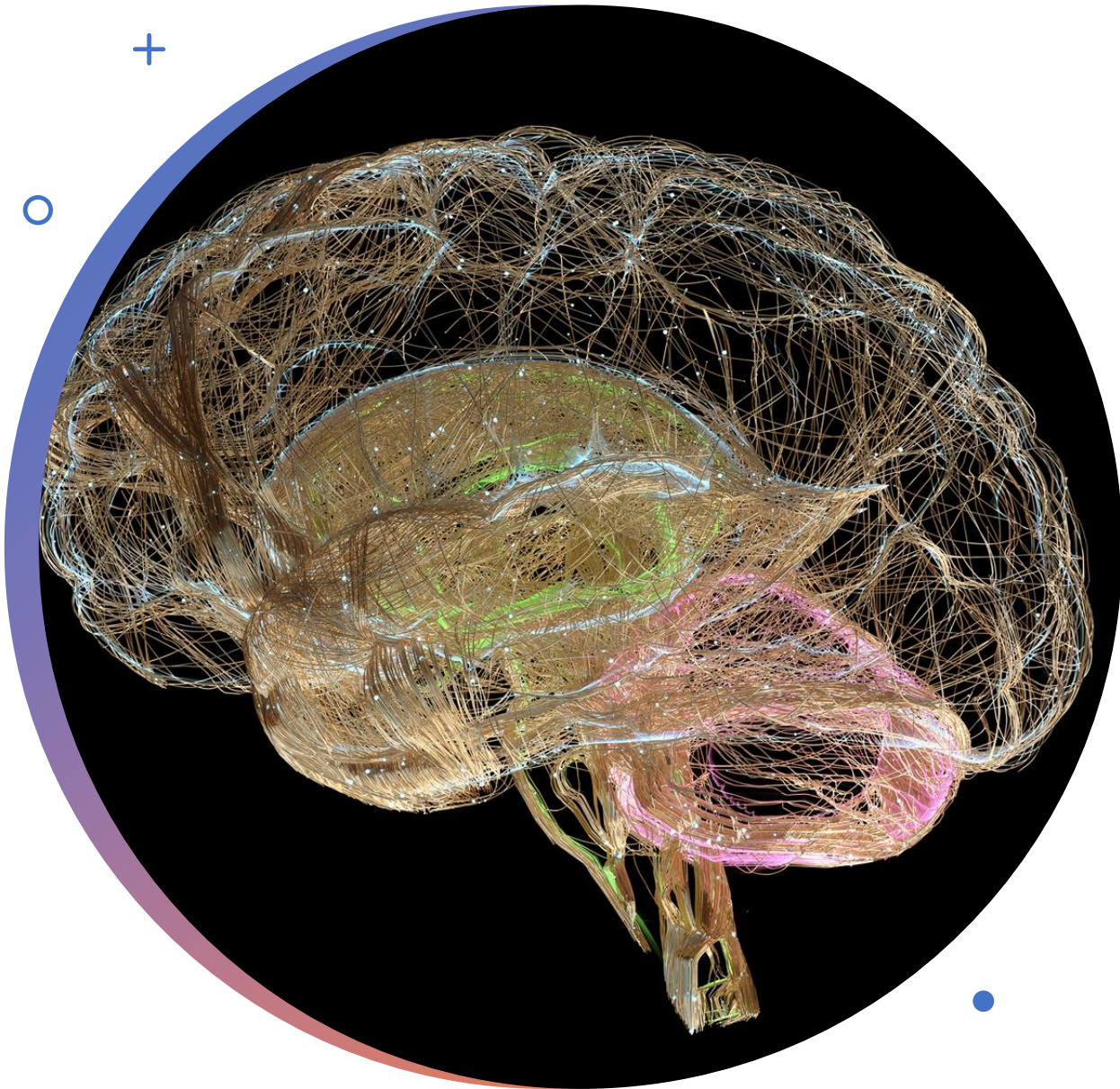
Statin regardless of age or ASCVD score

Anticoagulation for cardioembolic strokes, do not continue aspirin

Carotid endarterectomy for symptomatic carotid artery stenosis

Dual anti-platelets for 3 months for intracranial atherosclerosis





TIA?

- What is the significance of a TIA?
- What does the ABCD2 score predict?
- What investigations should be ordered?
- What is the treatment?



TIA

Warning sign of impending stroke

10-15% of patients will have stroke within 3 months

- Half of these occur within 48 hours of TIA
- [ABCD² Score](#) can help [risk stratify](#) patients presenting with TIA

Investigations

- Carotid doppler, echocardiogram, prolonged EKG monitoring, A1c, lipid profile, RPR

Treatment

- Consider anticoagulation or carotid endarterectomy as indicated, aspirin, statin, control cardiovascular risk factors

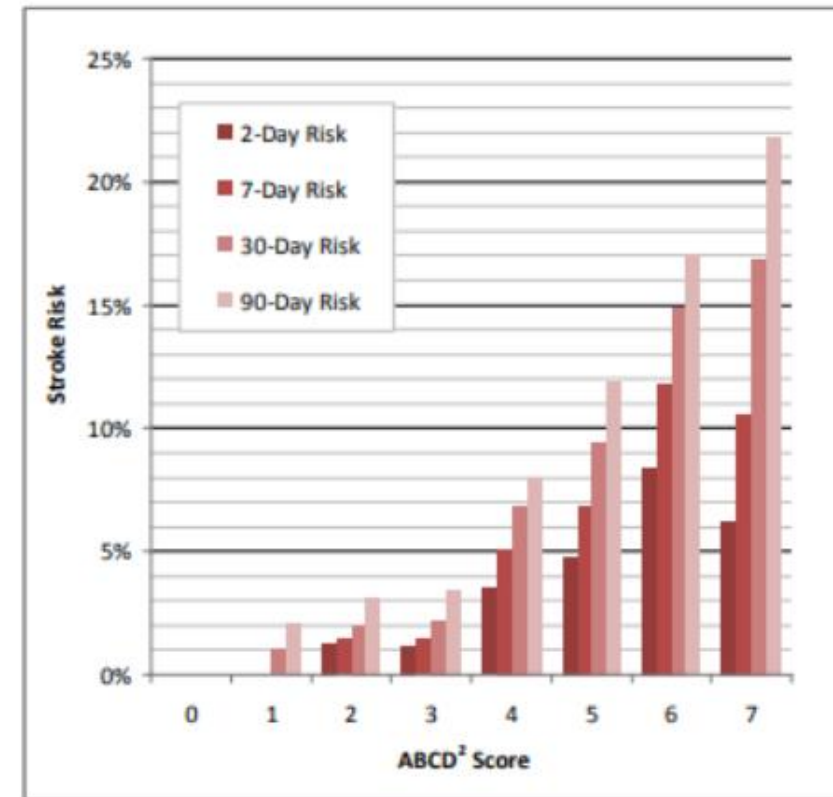


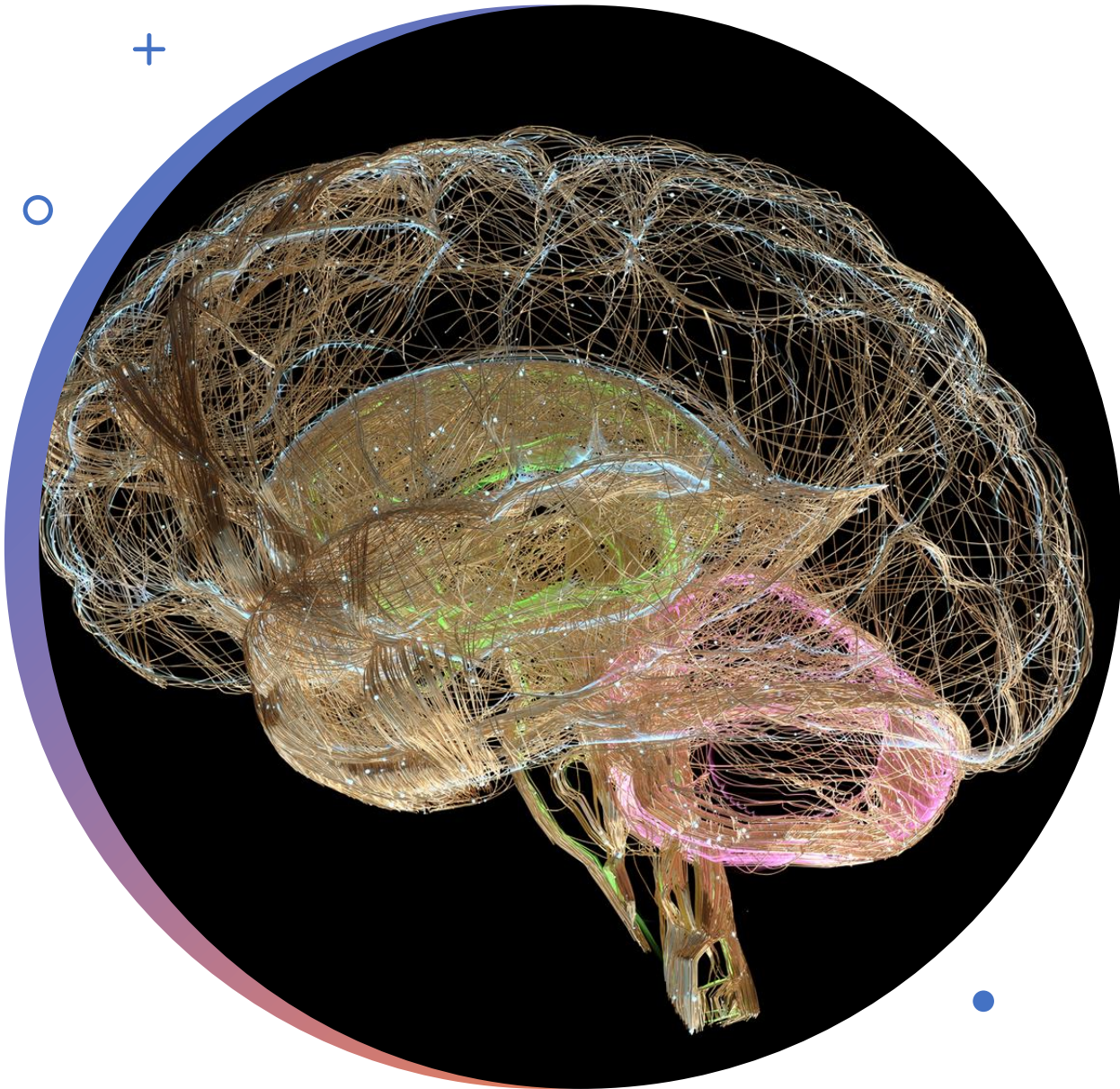
ABCD² Score

Higher ABCD² scores are associated with greater risk of stroke during the 2, 7, 30, and 90 days after a TIA (Figure). The authors of the ABCD² score made the following recommendations for hospital observation:¹

ABCD ² Score	2-day Stroke Risk	Comment
0-3	1.0%	Hospital observation may be unnecessary without another indication (e.g., new atrial fibrillation)
4-5	4.1%	Hospital observation justified in most situations
6-7	8.1%	Hospital observation worthwhile

[1] Johnston SC, Rothwell PM, Huynh-Huynh MN, Giles MF, Elkins JS, Sidney S, "Validation and refinement of scores to predict very early stroke risk after transient ischemic attack," *Lancet*, 369:283-292, 2007.





Hemorrhagic?

- What are risk factors for a hemorrhagic stroke?
- What is the acute treatment?
- What orders should be in place for hospitalization?
- What are the complications of hemorrhagic strokes?



Hemorrhagic

Risk factors

- **Hypertension, cerebral amyloid angiopathy**, advanced age, anticoagulation intensity, white matter disease, previous stroke, hematologic abnormalities, CKD, trauma and falls, aneurysm/vascular malformations, alcohol consumption, drug abuse, low cholesterol

Acute treatment

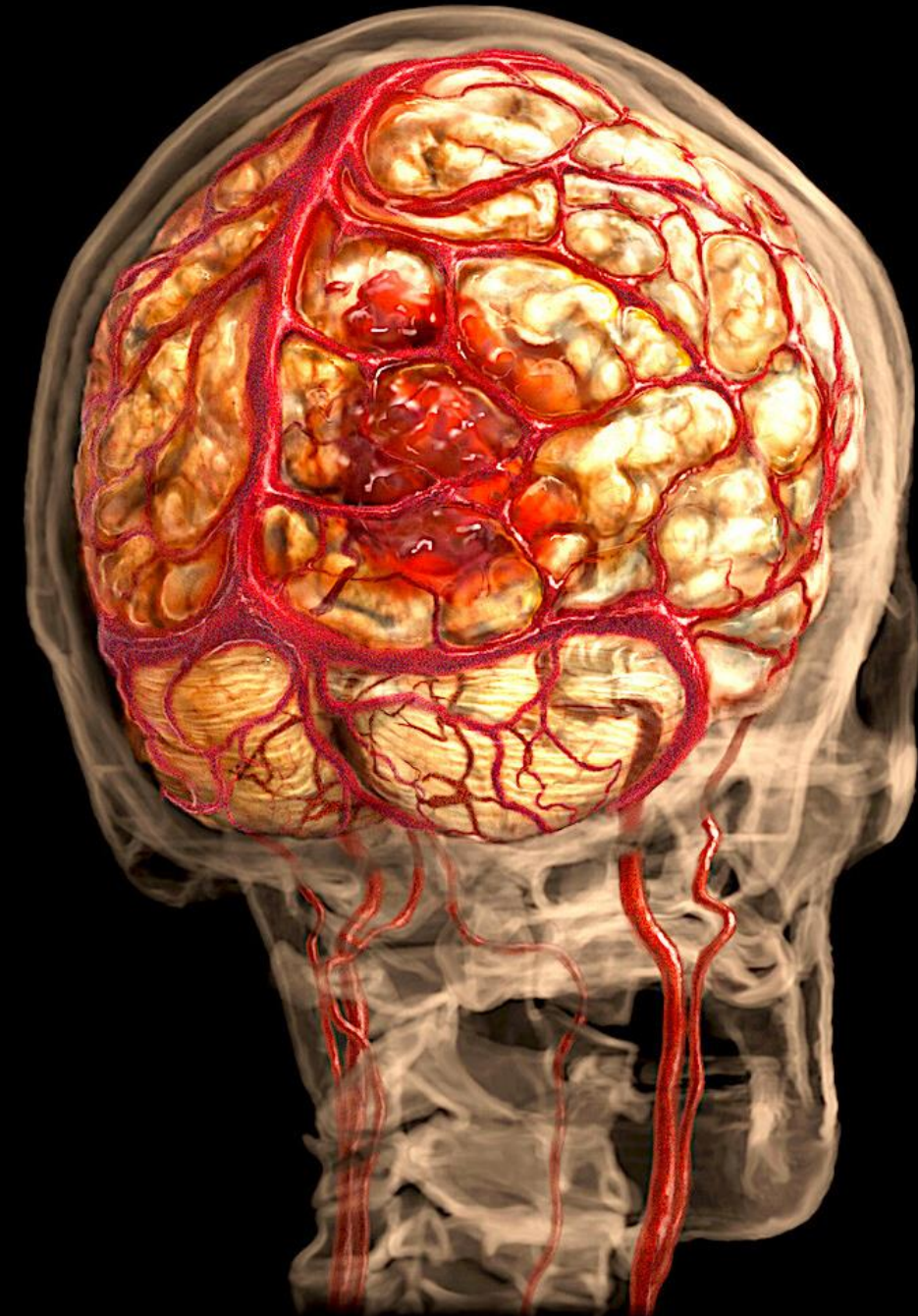
- Blood pressure control with an SBP < 160 mmHg
- Reverse coagulopathies

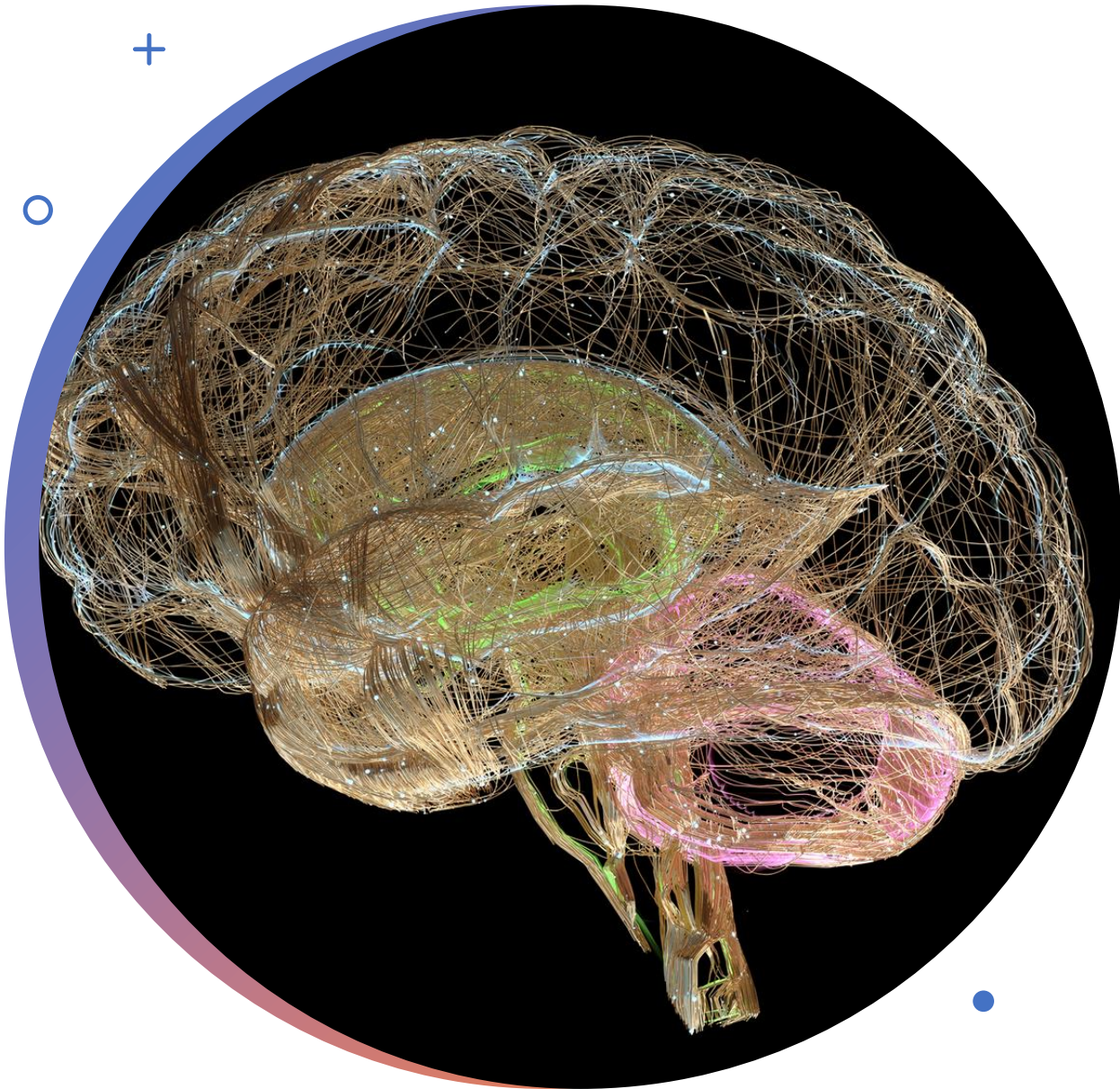
Orders

- Prevent aspiration: [*Bedside swallow evaluation*](#), consider NGT and enteral feeds, elevate head of bed
- DVT prophylaxis
- Maintain euthermia
- Maintain euglycemia
- Adequate hydration and nutrition
- Early mobilization

Complications

- Increased intracranial pressure from obstructive hydrocephalus, mass effect from hemorrhage, peri hemorrhage edema which peaks 72 hours after ICH, lasts for ~5 days, ICH expansion usually occurring in the first 6 hours





Where there is no CT?

- How do you know what kind of stroke it is?
- What medications can be started at presentation?
- What orders can be implemented during hospitalizations?



Where there is no CT

Clinical presentation cannot reliably differentiate between ischemic and hemorrhagic or stroke mimics

Allow permissive hypertension

- Systolic blood pressure of 160-180 x48-72 hours after stroke onset

Start high dose aspirin within 48 hours of stroke followed by daily low dose aspirin to lower mortality and dependence

Prevention of aspiration pneumonia, DVTs and decubitus ulcers

Early mobilization and aggressive physiotherapy

Adequate glucose control, avoid fevers, Avoid in-hospital infections (especially catheter-associated UTIs)

Identification and control of stroke risk factors



Stroke Summary



Without imaging you cannot reliably distinguish between ischemic, hemorrhage or stroke mimic

When CT not available

- Start aspirin 300mg followed by 75mg and statin

Order A1c, lipid, RPR

Consider ECG, echo

If HIV(+) add CAT, TAT TB, LP and consider vasculitis

Permissive hypertension for up to 72 hours after last normal

- Allow up to 180/105
- Use any first line anti-hypertensive medication

Reduce risk of aspiration, decubitus ulcers, hospital acquired infections, DVT

Aggressive physiotherapy early

