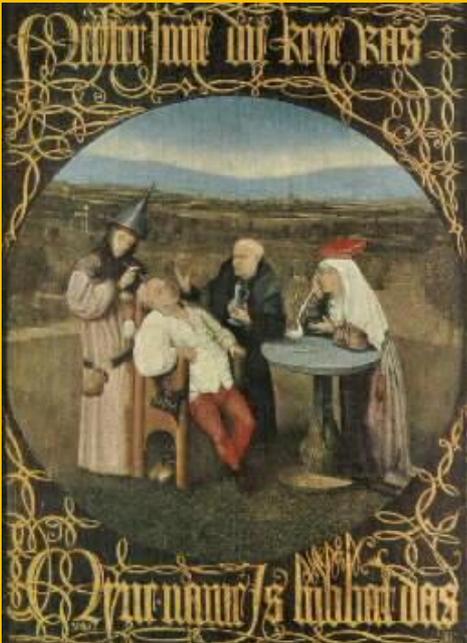
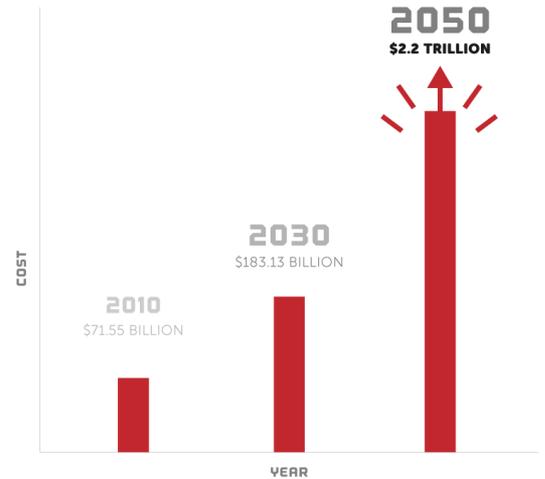
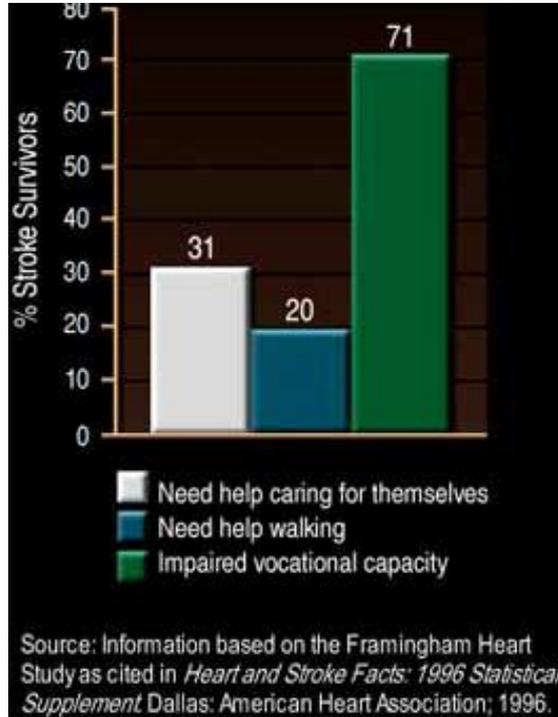
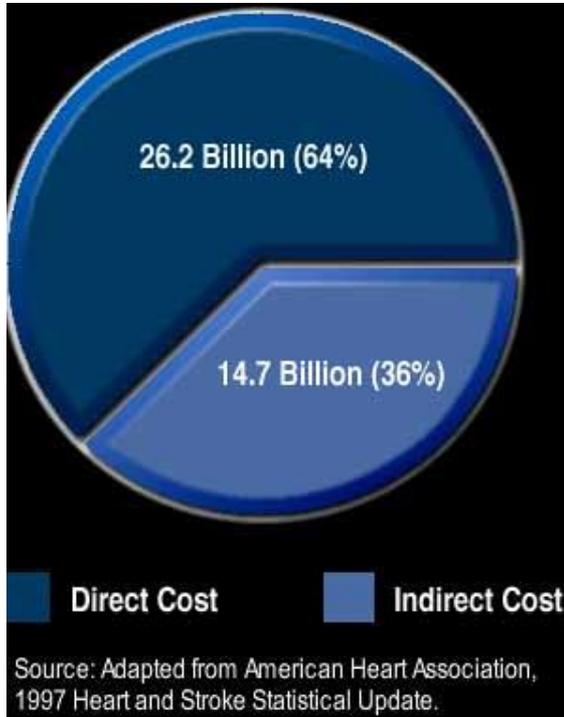


Stroke

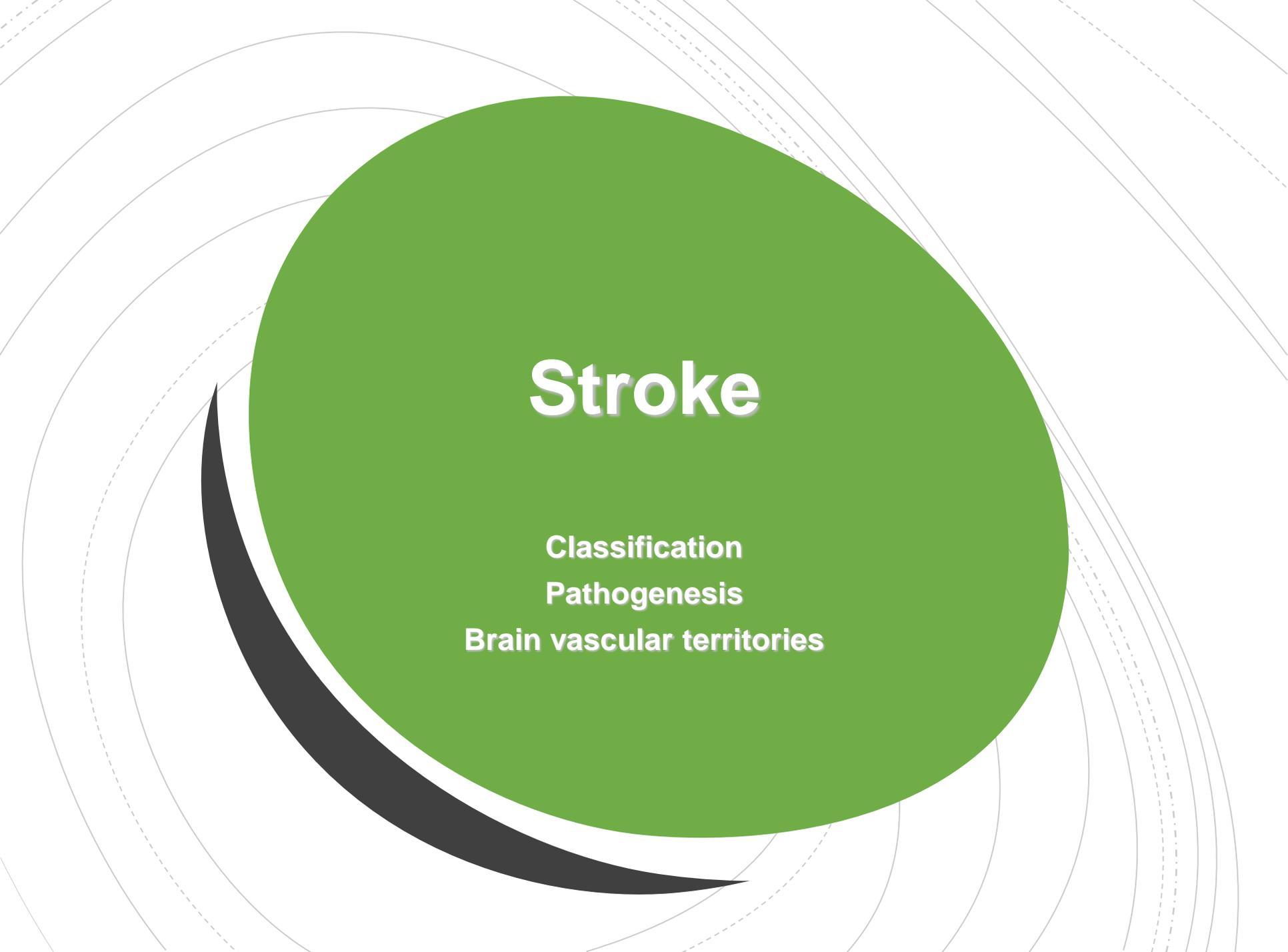




The cost of stroke



- **1 year after stroke 65% independent**
- **Stroke occupied 20% of acute and 25% of long-term beds in UK**
- **Every 34 minutes 1 patient with stroke is admitted to hospital in CR**

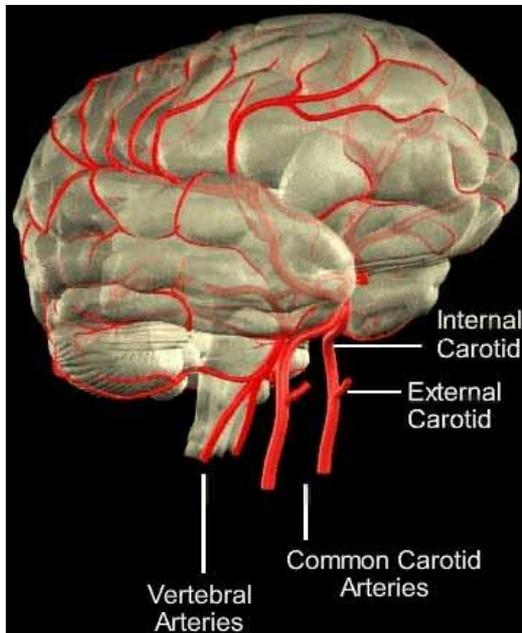
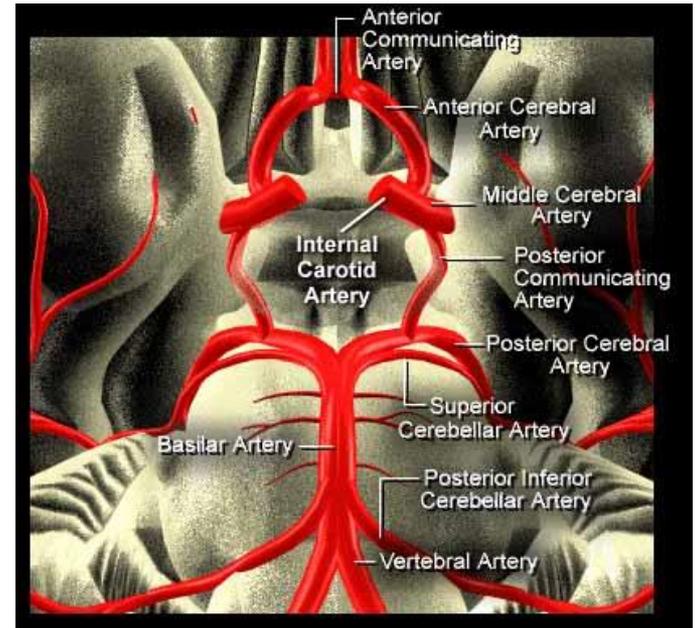
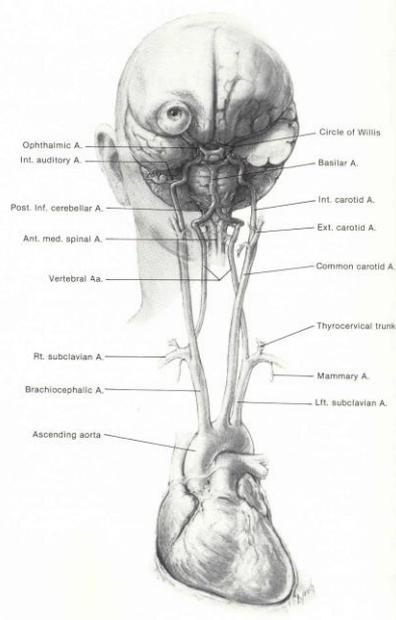


Stroke

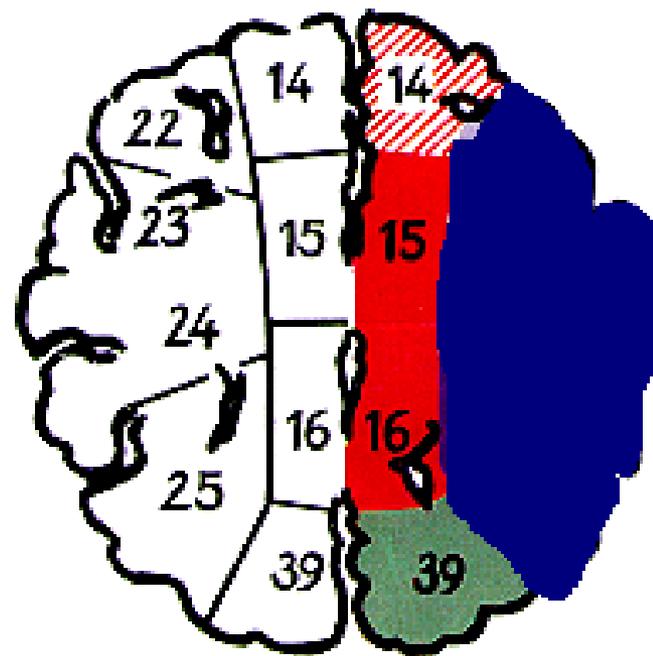
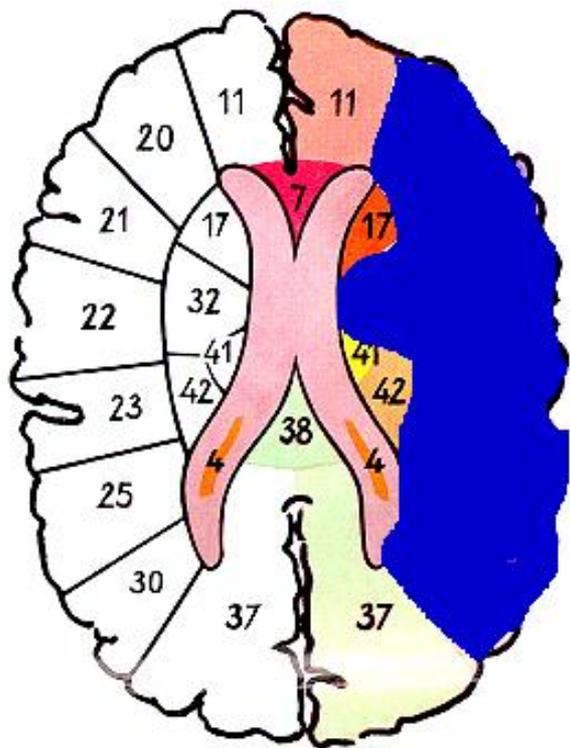
Classification

Pathogenesis

Brain vascular territories

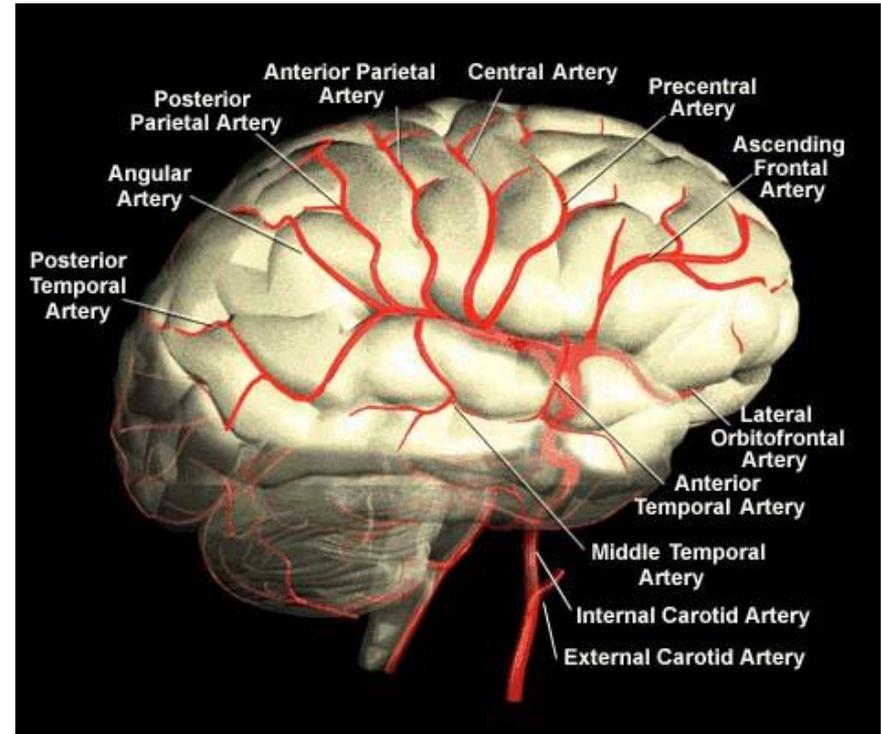
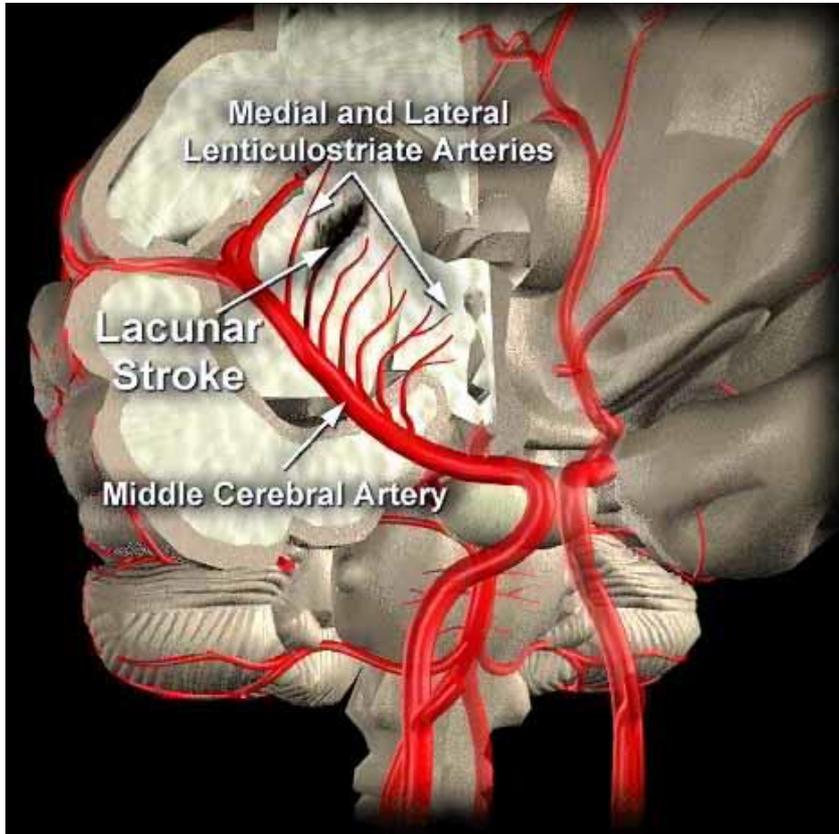


Brain arteries

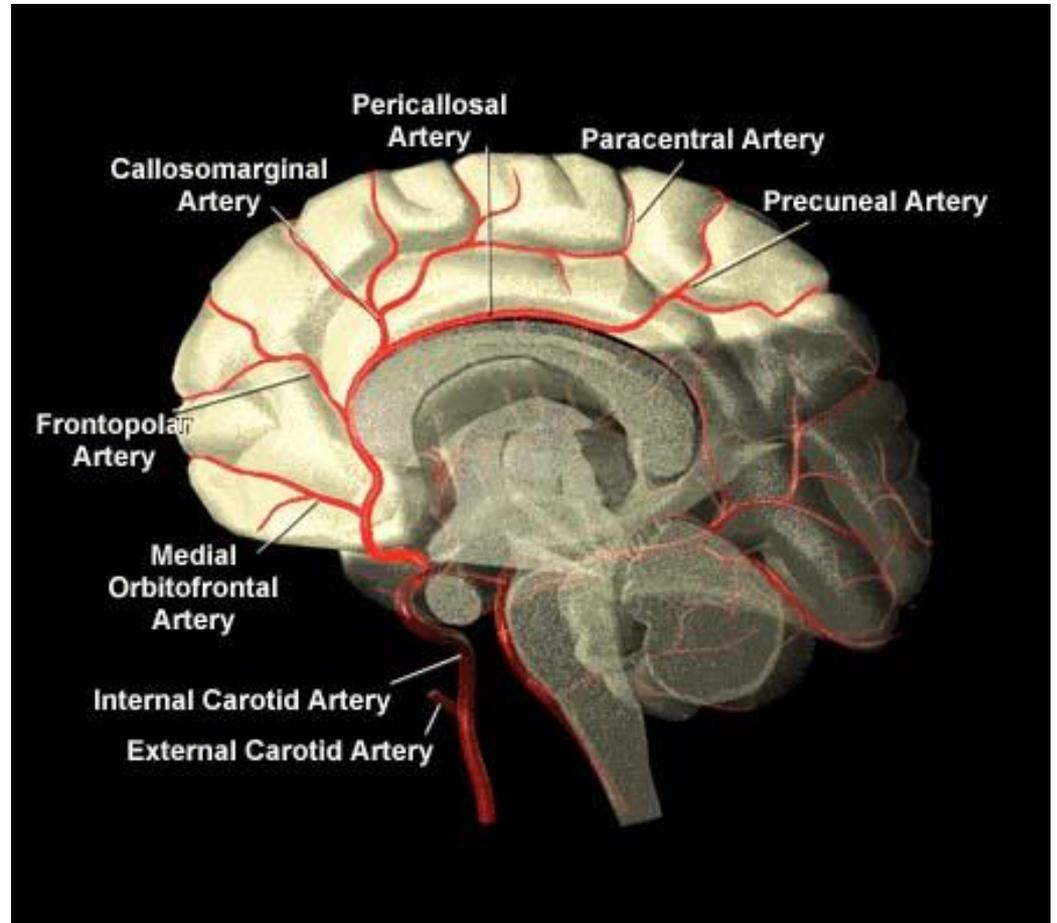


Vascular territories

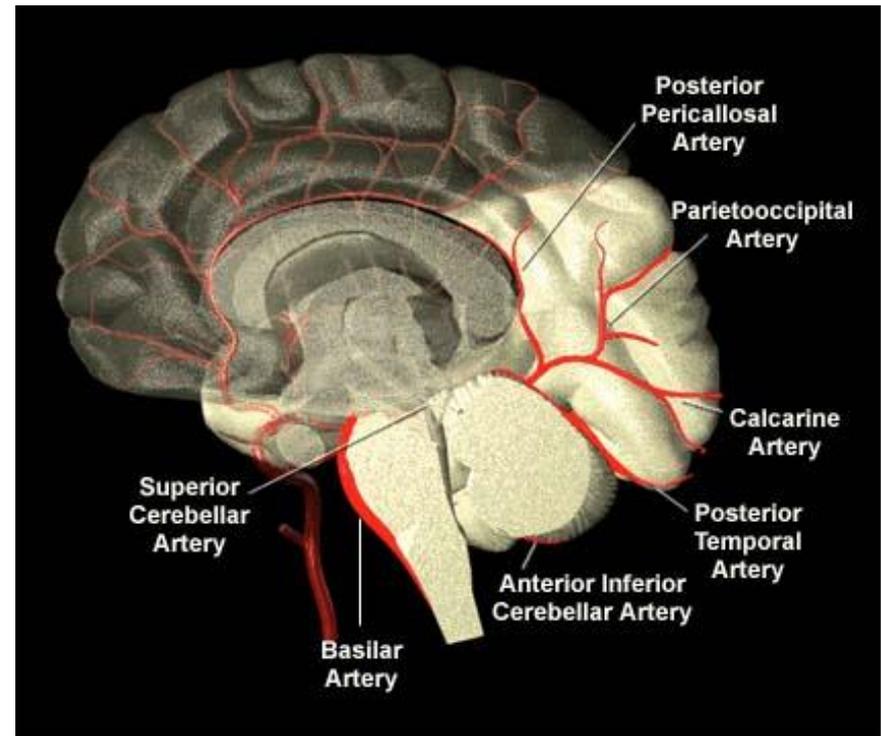
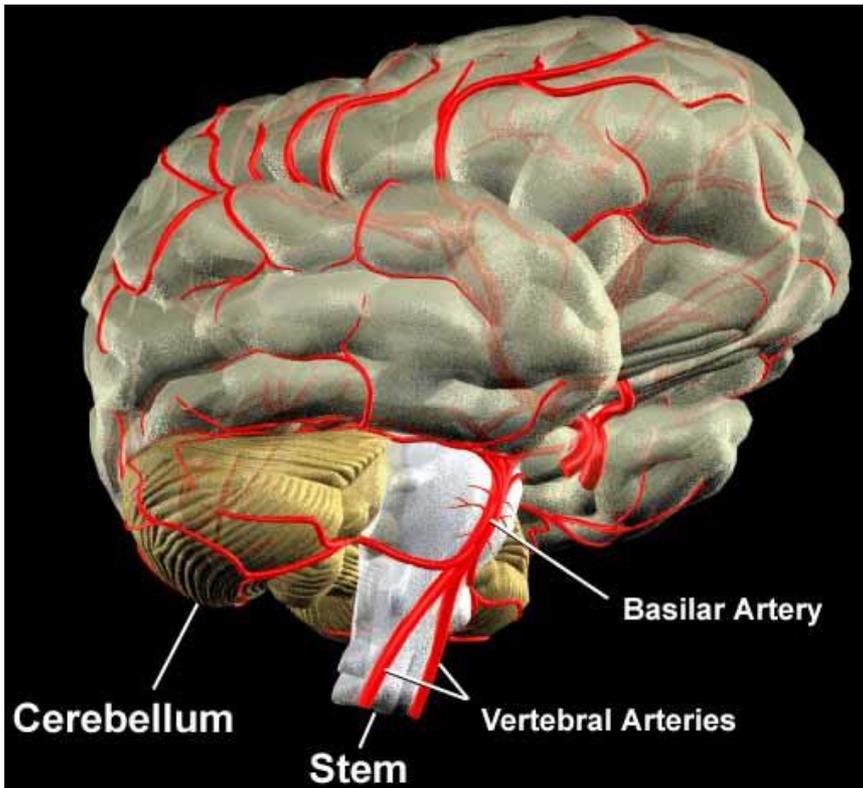
Medial cerebral artery



Anterior cerebral artery



Posterior circulation

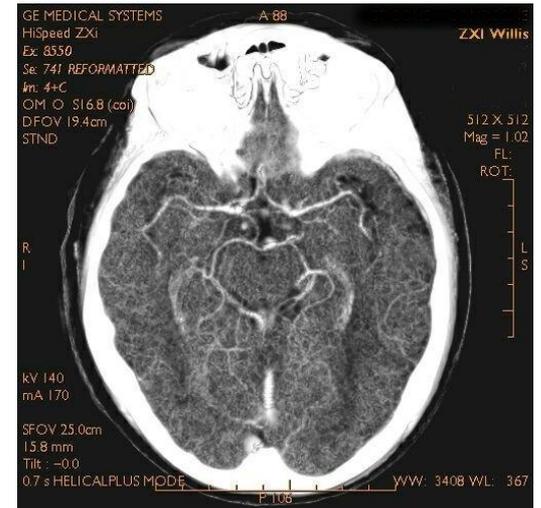
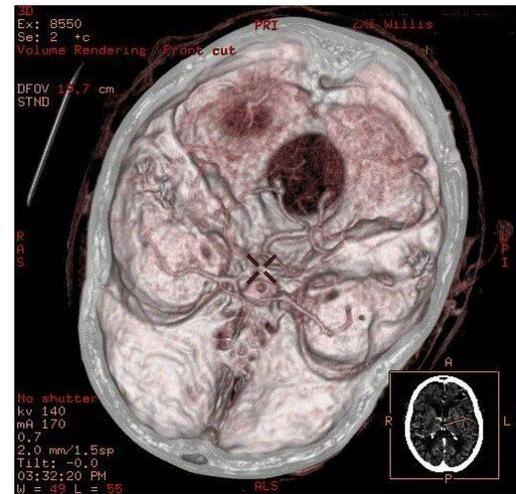
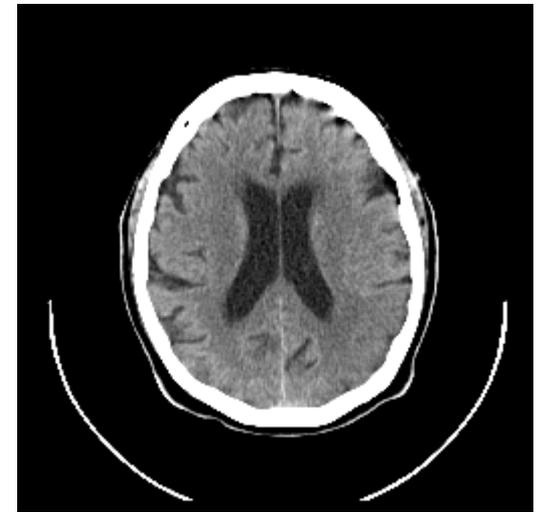
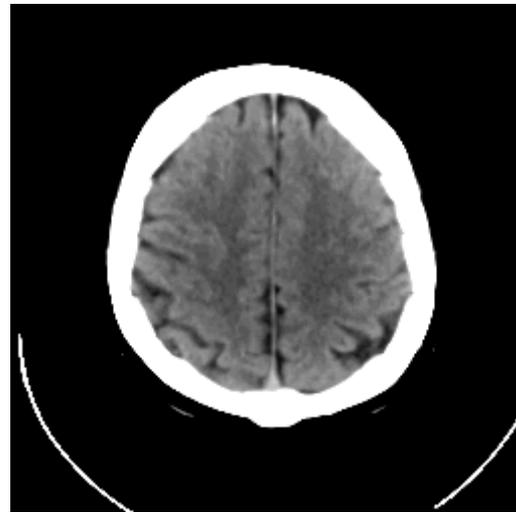


Imaging



CT examination

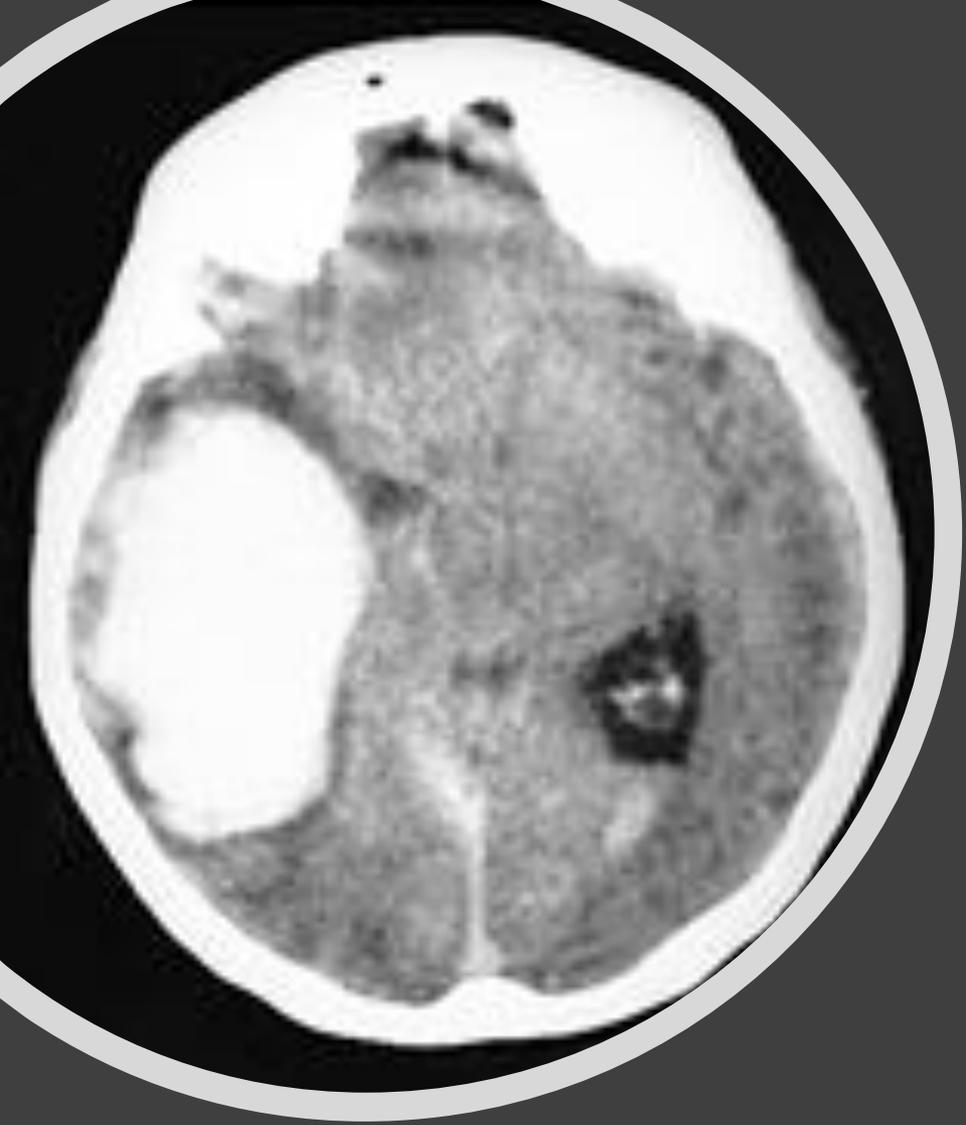
- X rays
- High doses
- Computer assisted
- Short examination time
- Without or with contrast media



CT- ischaemic stroke

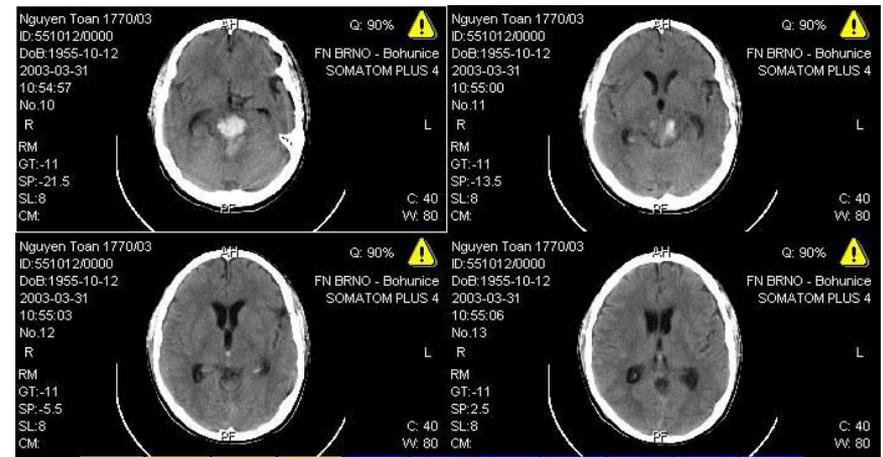
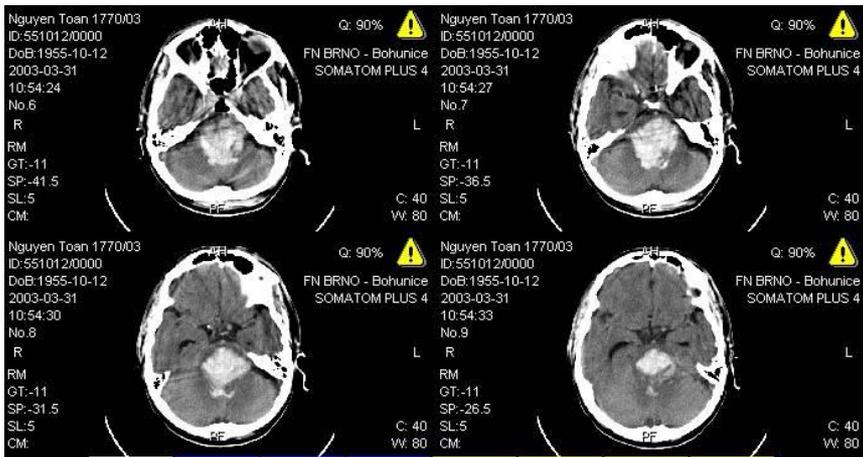
- Cardioembolic stroke (AF)
- Fluent aphasia



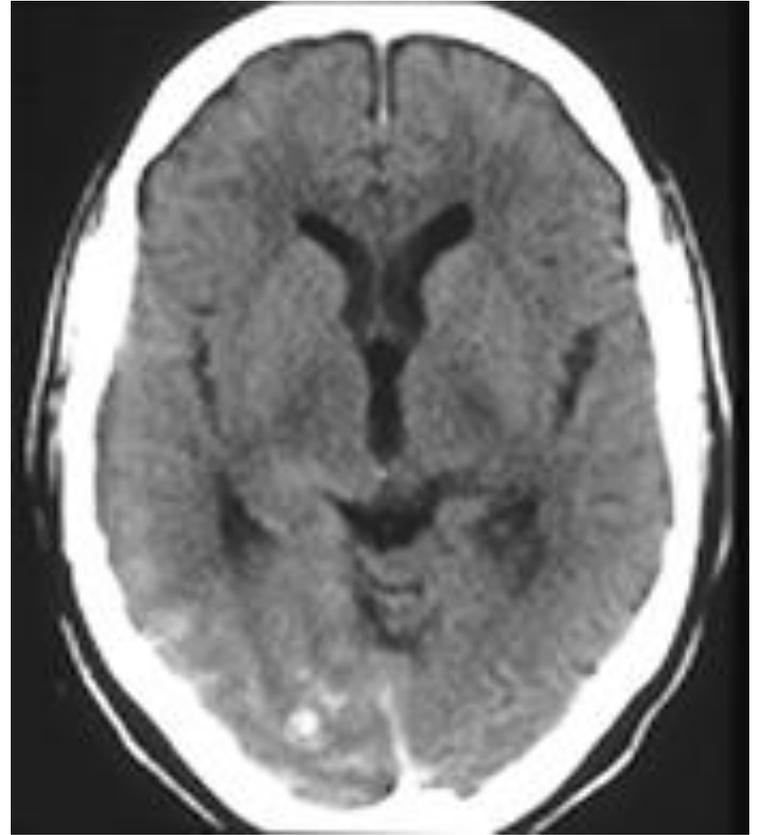


ICH: CT

Brain-stem haemorrhage



SAH: CT



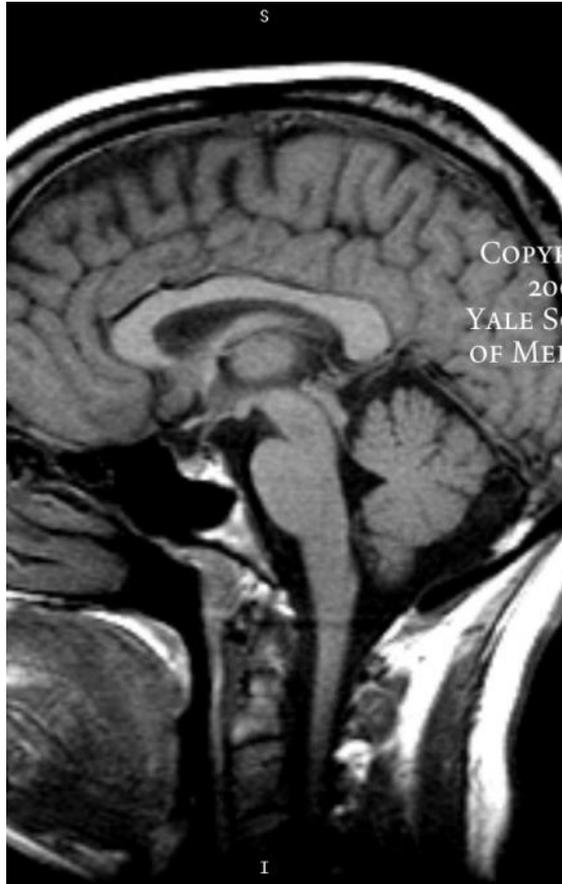
During magnetic resonance imaging (MRI), a narrow tube moves the patient through a tunnel-like structure. Inside the structure, radio waves pass through a magnetic field around the patient, creating a 3-D image of the internal structures.



ADAM

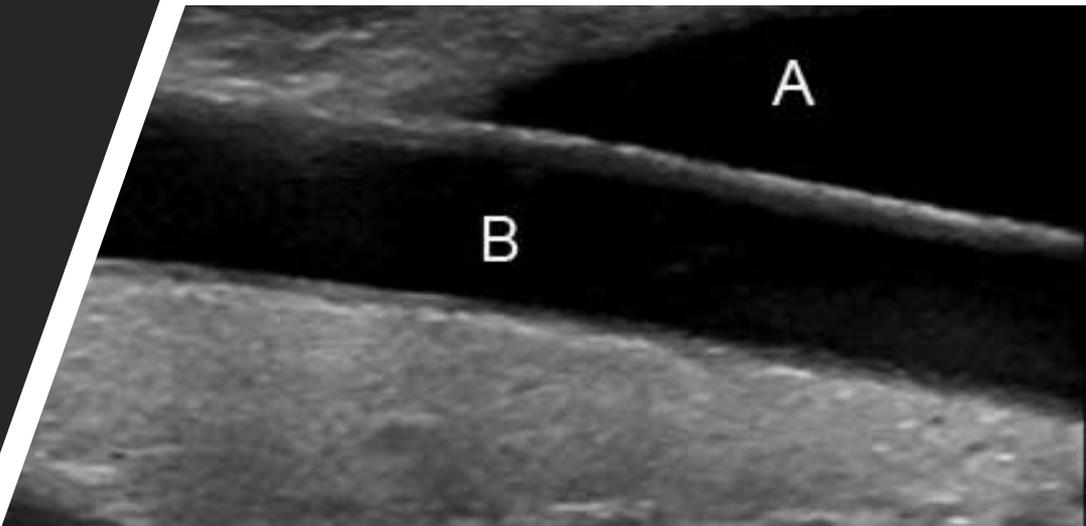
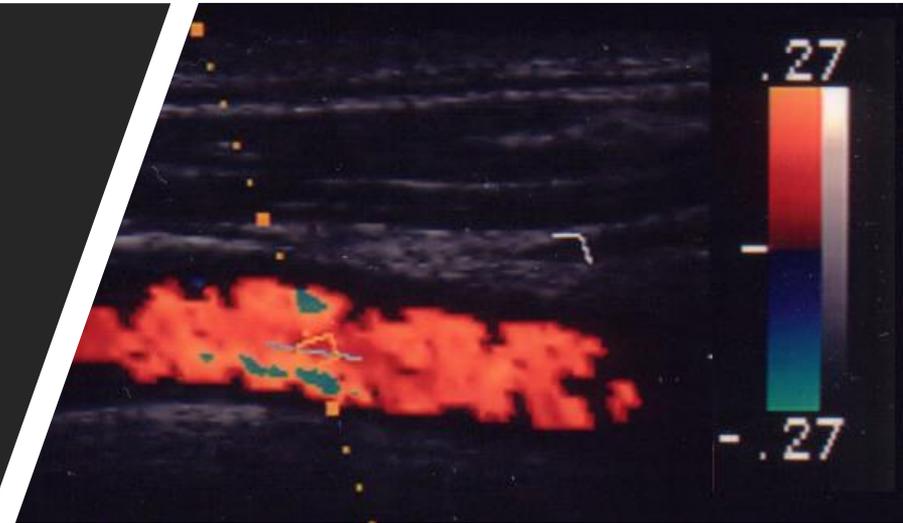
MRI

- No X rays
- Radio frequency (RF) fields are used to systematically alter the alignment of this magnetization, causing the hydrogen nuclei to produce a rotating magnetic field detectable by the scanner.
- More information than CT
 - much greater contrast between the different soft tissues of the body than computed tomography
- Longer examination time
- fMR



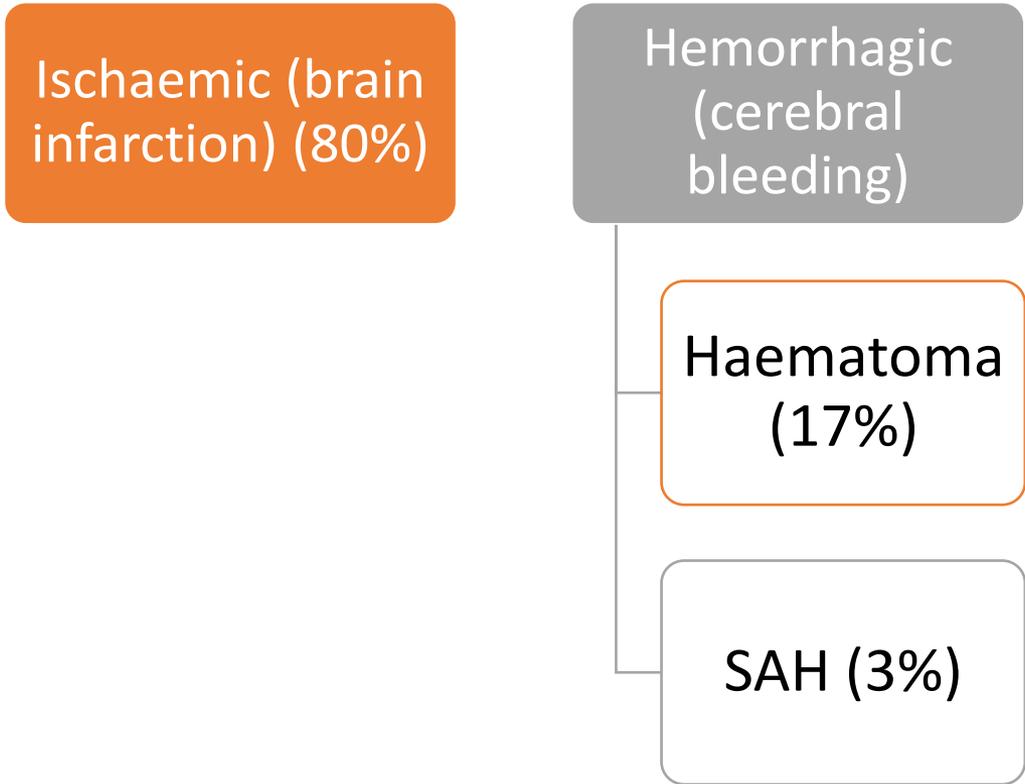
Ultrasound

- Duplex sonography
- Transcranial doppler sonography





Angiography



Stroke



Ischaemic stroke

- Stroke is currently the second leading cause of death in the Western world
- Most frequent cause of the severe disability among older adults

Incidence (100 tis./year)

Italy (Valle d'Aosta)

- 289

England

- Newcastle, Darlington
276
- Oxfordshire
240
(první iktus)

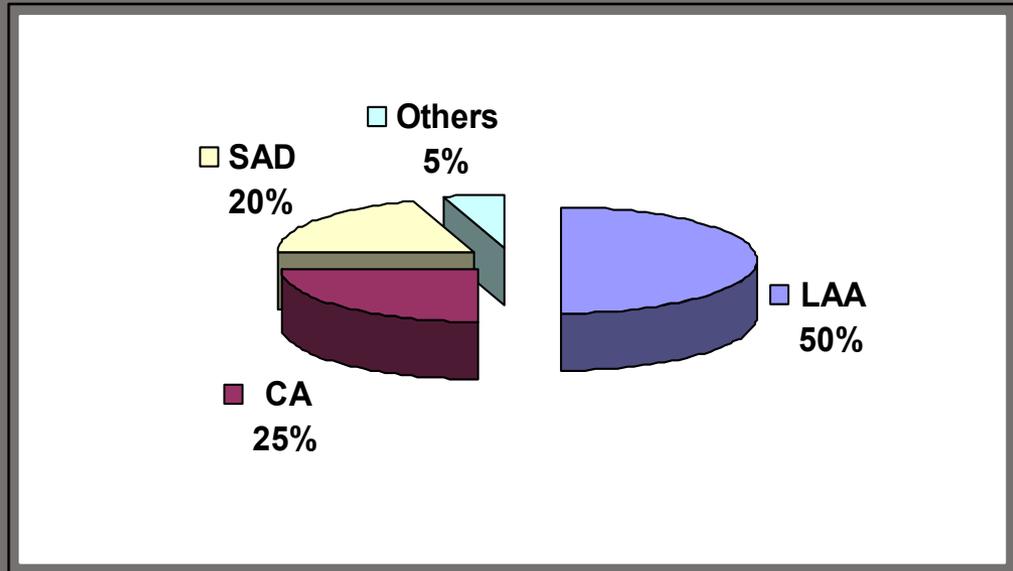
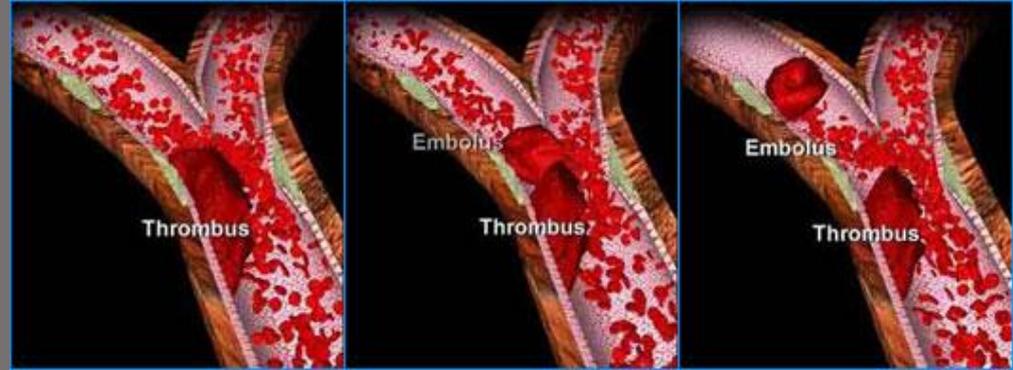
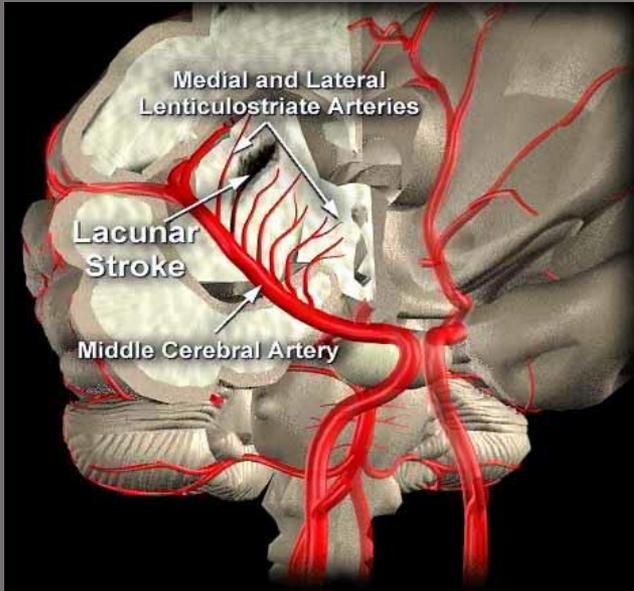
Czech Republic

- ???
- *Brno (280-350)*

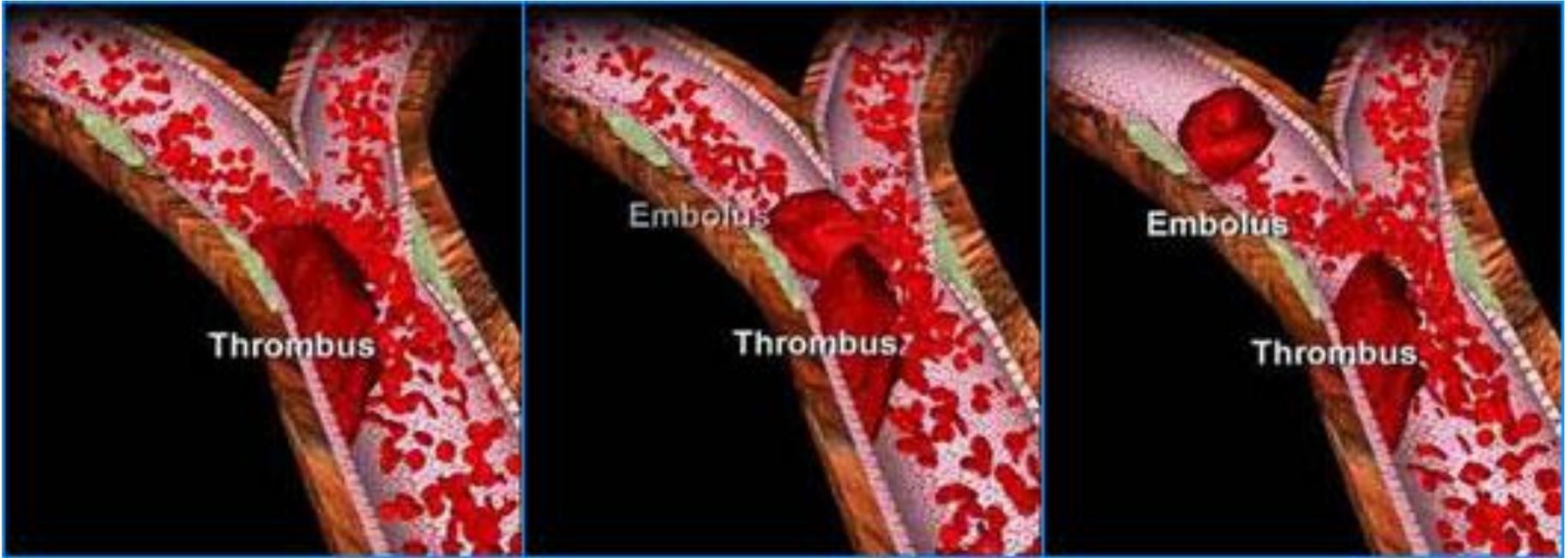
Prevalence

- Northern England
 - 468 / 100 tis.
 - Cognitive changes 33%
 - Problems with gait 30%
 - Speech difficulties 27%

Subtypes of stroke



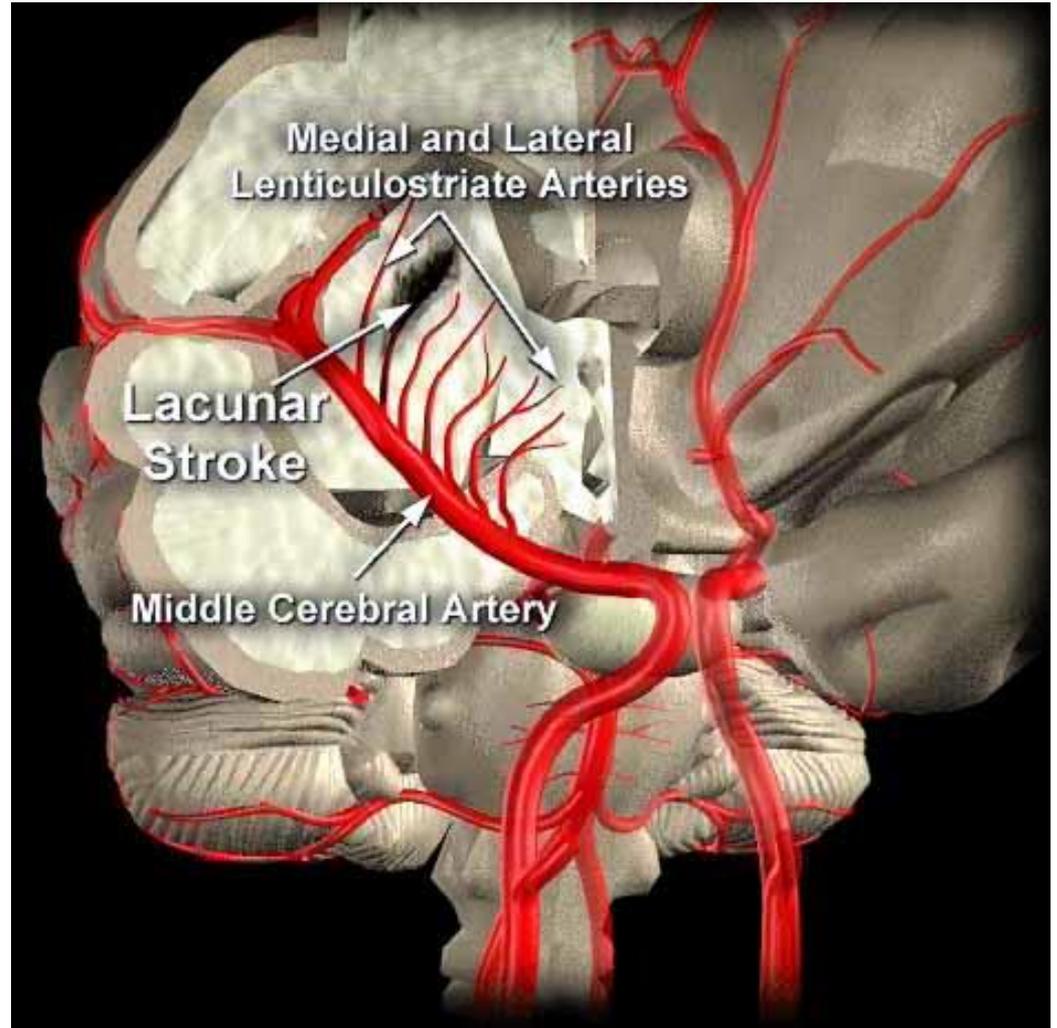
- Atherotrombotic
 - Large artery atherotrombosis
- Cardioembolic infarction
- Lacunar infarction- SAD



Tromboembolic stroke

Lacunar infarction

Small vessel disease

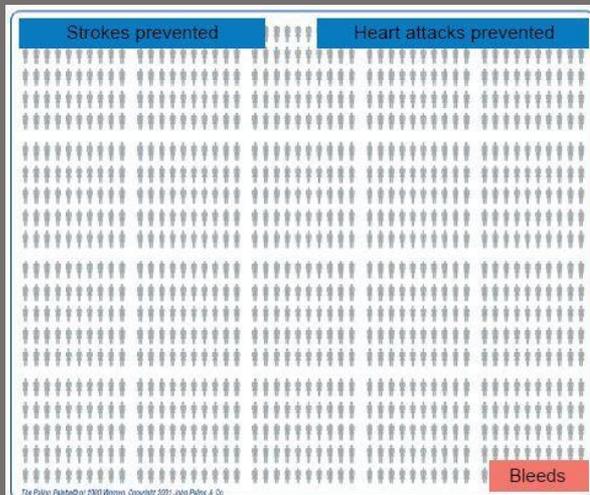


Cardiac source of embolism- AF

- 9% persons >70 years
 - 16,1/12,2 % M/F >75 y
- 5,6x greater risk of Stroke
 - (+valvular mitral stenosis = 17x)

ECG
Holter monitoring
Implantable long-term
device - reveal

Anticoagulation therapy risk reduction 68- 81%



Signs and symptoms



Brain infarction

Sudden deficit

- Over seconds to minutes

Anterior or posterior circulation

- (The symptoms depend on the area of the brain affected.)



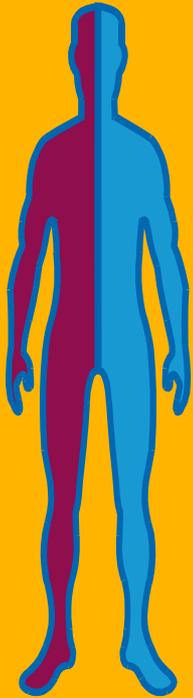
TIA

Up to 1 hour, mostly minutes-20 min

- Amaurosis fugax
- **Crescendo TIA 2 and more= urgent situation**

Clinical Presentations of Stroke

Signs and symptoms



Weakness, sensory disorder
Contralaterally



Blurred vision



Speech disorders



Acute headache



Vertigo, dizziness

Anterior circulation

- Hemiparesis
- Sensory loss
- Aphasia, Apraxia
- Hemianopsia

Posterior circulation

- Vertigo, dizziness
- Drop attack
- Diplopia
- Altered vision
- Cranial nerves lesions

Signs and symptoms

Primary
prevention



Highlights

- **Up to 90% of all strokes are preventable, and attributable to 10 modifiable risk factors**
- **Hypertension** is ubiquitously the major modifiable risk factor for stroke,
 - accounting for one-third of stroke in developed countries and two-thirds in
 - developing countries
- *Optimal stroke prevention requires a harmonious, integrated approach to educating about stroke risk and healthy lifestyle behaviors, simple screening and management of individuals for a history and presence of modifiable and treatable causal risk factors, and improving social and environmental factors*

Risk factors



Nonmodifiable

Age
Gender

Modifiable

Hypertension
Diabetes
Smoking
Heart
diseases
HLP

High blood pressure

- **The most important risk factor**
 - **Systolic and diastolic BP**
- **Hypertonics**
 - **SBP 10/DBP 5**
 - **41% reduction of stroke risk**
 - **(fatal –30%, nonfatal –34%)**
- **Normotonics**
 - **UKTIA SBP 12 /DBP 5 = -34%**

Smoking

- **The risk of stroke is approximately 50% higher in smokers than in non-smokers**
 - Spousal cigarette smoking also harmful
- The risk increases with the number of cigarettes smoked per day and is reversible
- **Stopping smoking reduces the risk of stroke:**
 - By approximately 50% within one year
 - To normal levels (people who never smoked) within five years



Other risk factors

DM

Independent risk factor (1.5-3.0)

- Depends on type and severity

HLP

Statins are more effective for the primary prevention of acute coronary syndrome and MI compared with ischemic stroke

For every 1-mmol/l reduction in LDL cholesterol concentration with statin therapy, the risk of first stroke is reduced by about 21%

Other risk factors II

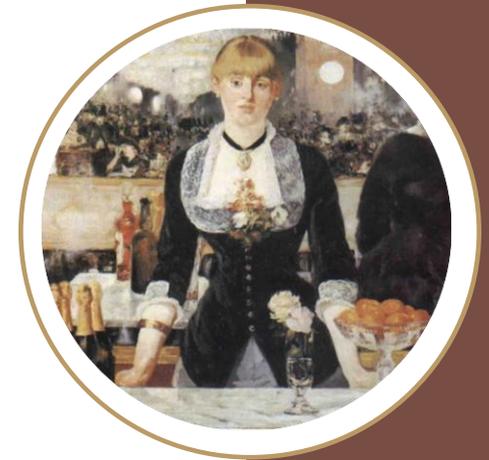
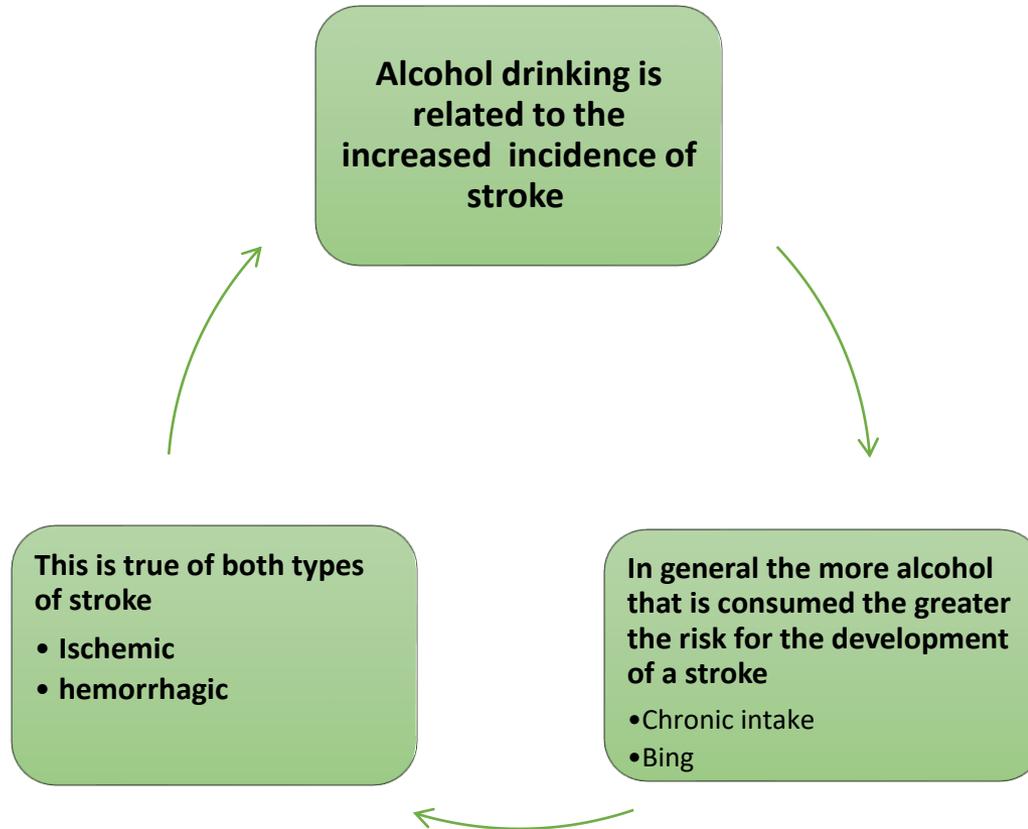
- **Oral contraceptives**
 - Depends on estrogen level
 - Low level 1.93
 - Higher level 2.75
 - Normal BP, non-smoker: 1 stroke per 24 000 cases
 - Risk disappears after withdrawal of OC
 - 10% of strokes in young women is caused by OC HRT: not clear...
- *Hormone replacement after menopause is not effective in the secondary stroke prevention in women and may increase mortality after stroke.*



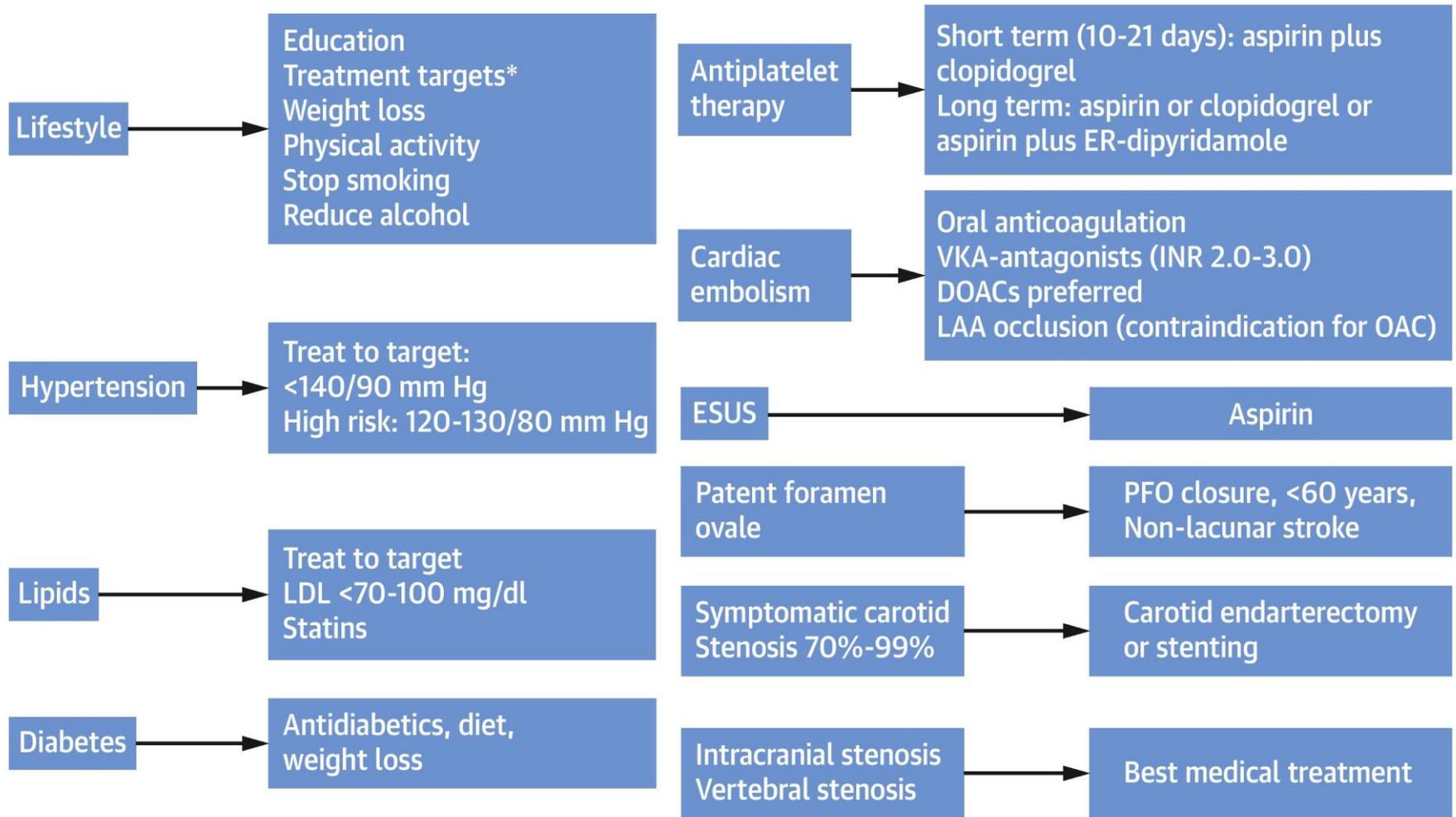
Other risk factors III

- **Gravidity and puerperium**
 - 13x increased risk
 - 1 stroke/ 3000 childbirth

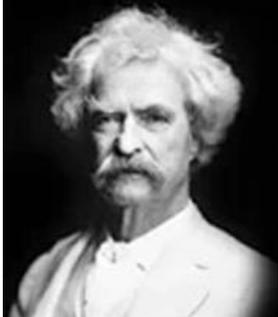
Other risk factors- drinking



Patients with TIA or ischaemic stroke



The only way to keep
your health is to eat
what you don't want,
drink what you don't
like, and do what you'd
rather not.

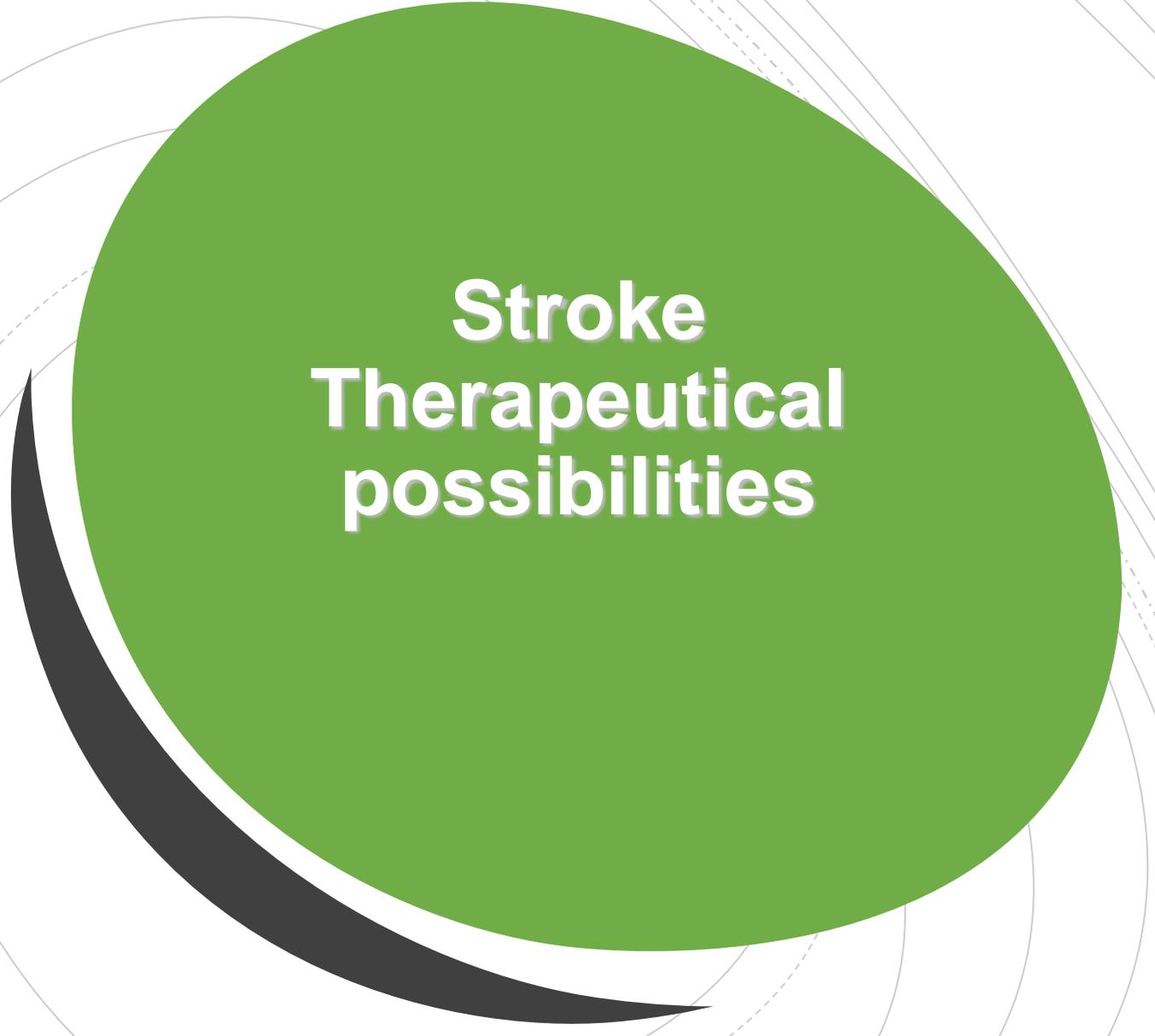


Mark Twain

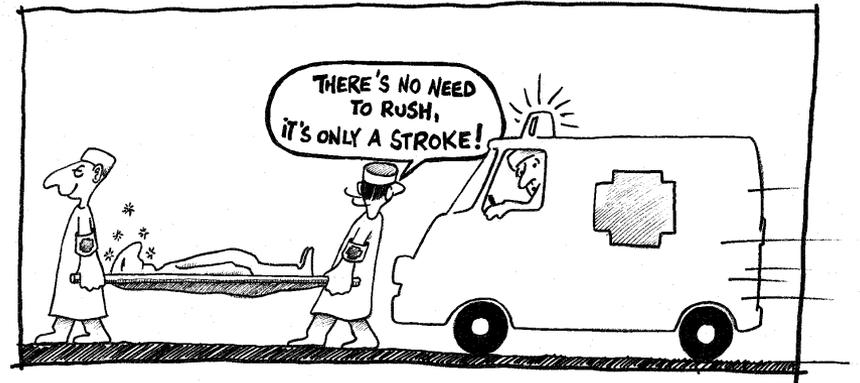
American Author and Humorist

(1835-1910)

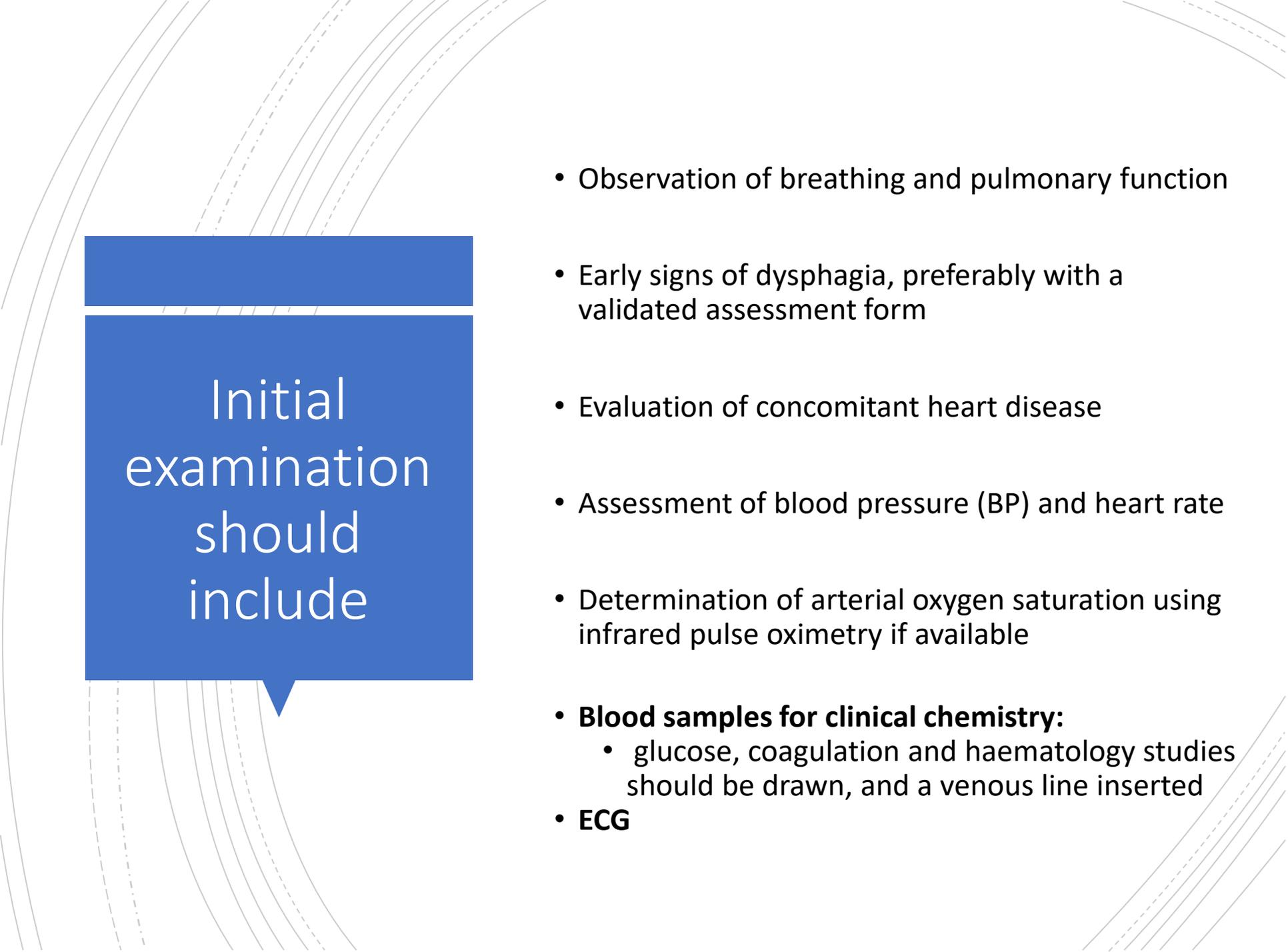
QuoteHD.com



**Stroke
Therapeutical
possibilities**

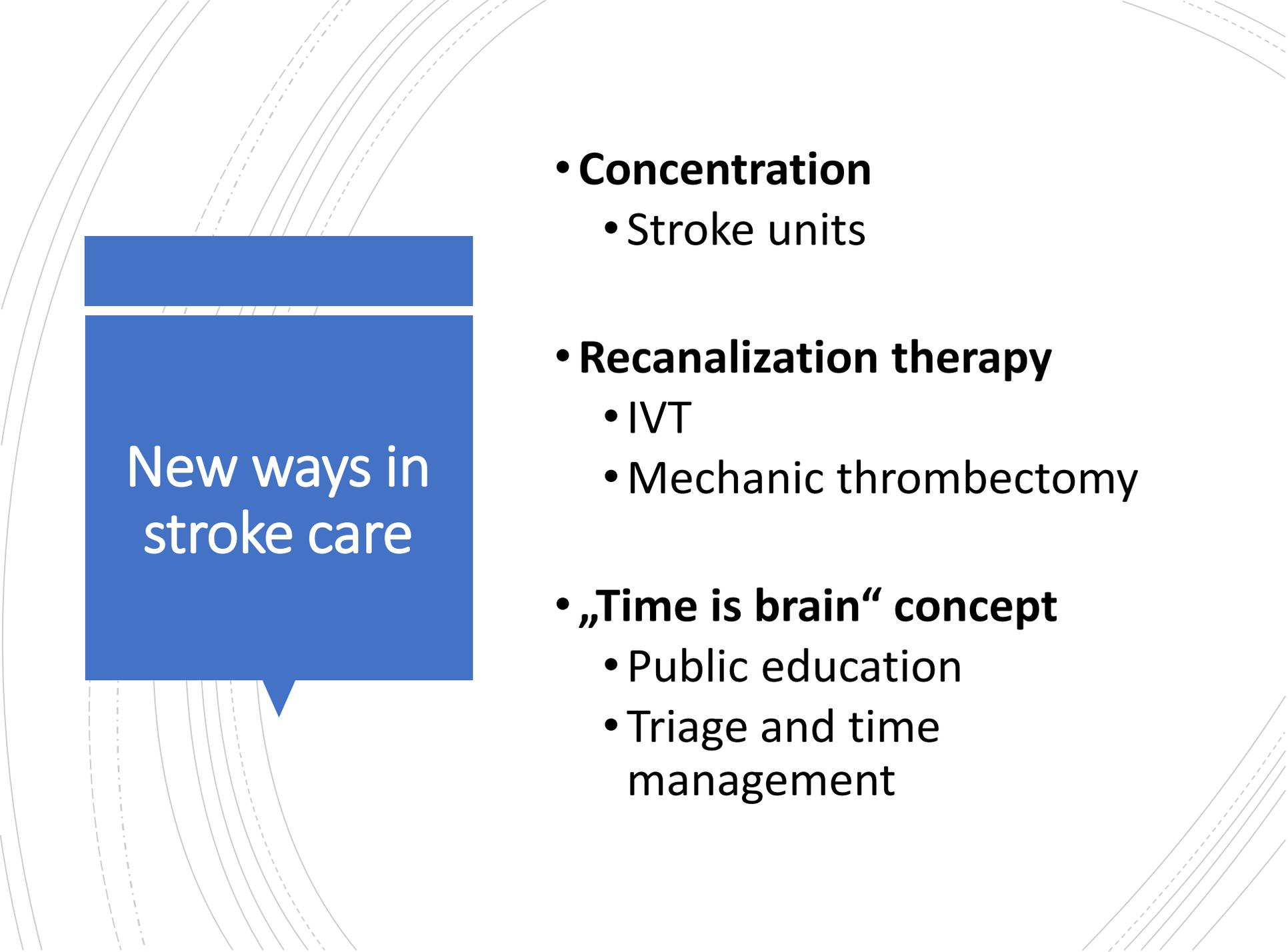


Acute care



Initial
examination
should
include

- Observation of breathing and pulmonary function
- Early signs of dysphagia, preferably with a validated assessment form
- Evaluation of concomitant heart disease
- Assessment of blood pressure (BP) and heart rate
- Determination of arterial oxygen saturation using infrared pulse oximetry if available
- **Blood samples for clinical chemistry:**
 - glucose, coagulation and haematology studies should be drawn, and a venous line inserted
- **ECG**



New ways in
stroke care

- **Concentration**
 - Stroke units
- **Recanalization therapy**
 - IVT
 - Mechanic thrombectomy
- **„Time is brain“ concept**
 - Public education
 - Triage and time management

Stroke unit

BP

- Hypertension
.. Hypotension
- Routine lowering of the BP is not recommended

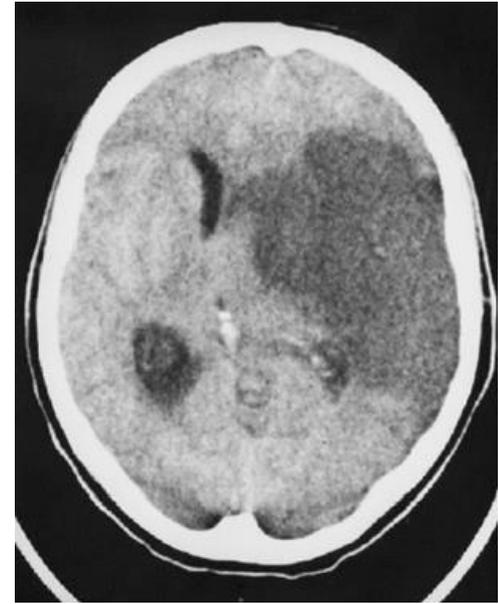
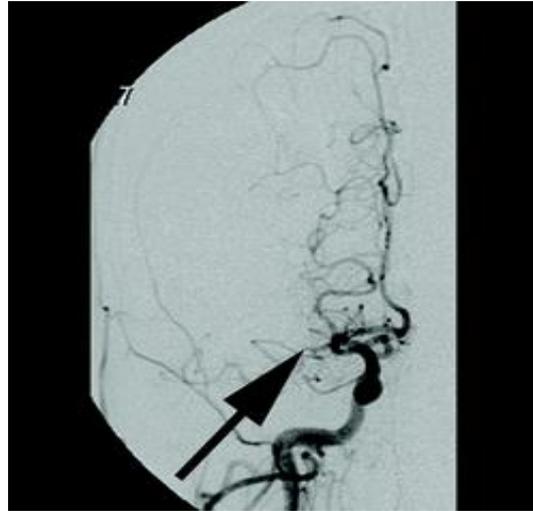
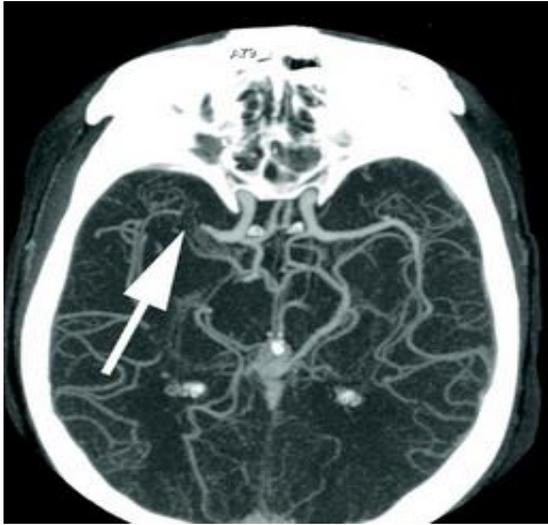
Glycemia

- Hyperglycemia increases the extent of the brain infarction and decreases the chance of good result (mRS 0-1)

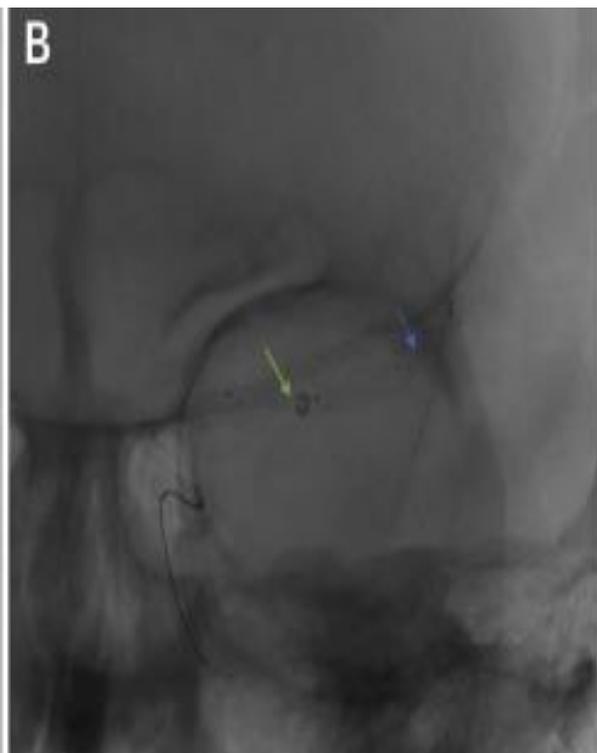
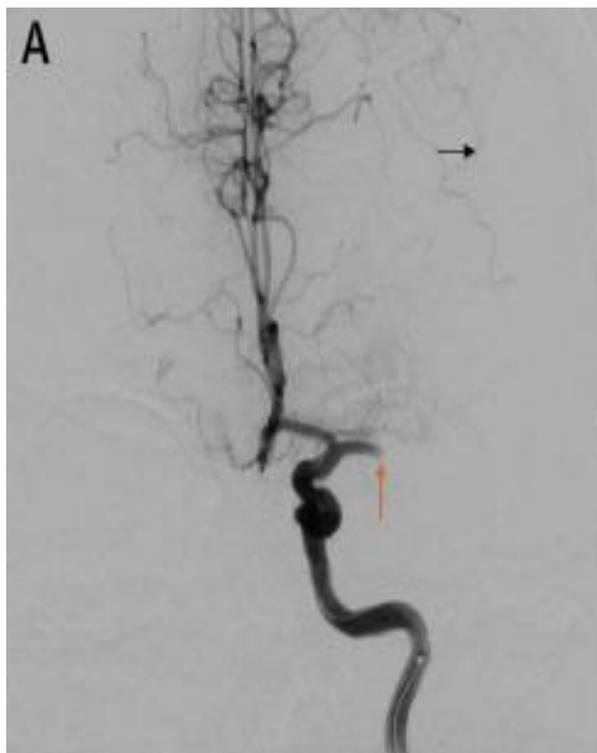
BT

- High body temperature increases the extent of the infarction

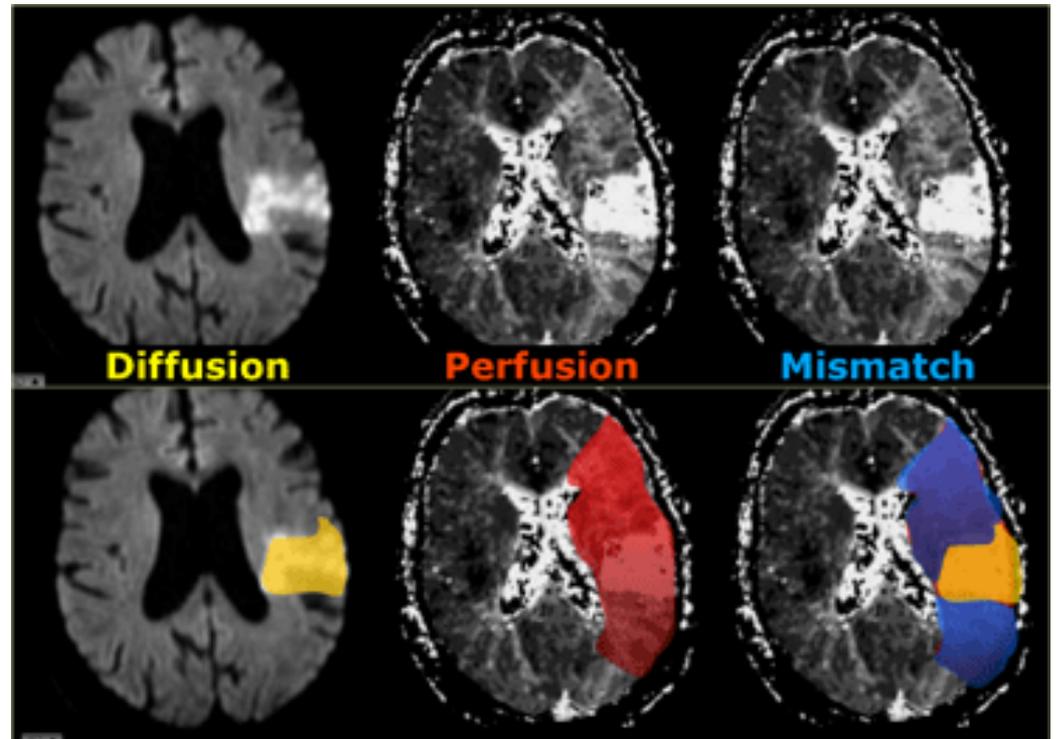
Recanalization



- The primary aim of thrombolysis in acute ischemic stroke is recanalization of an occluded intracranial artery
- Recanalization is an important predictor of stroke outcome as timely restoration of regional cerebral perfusion helps salvage threatened ischemic tissue
- The time of the recanalization is probably the most important factor
- Recanalization is strongly associated with improved functional outcomes and reduced mortality.



Battlefield...



Intravenous thrombolysis (IVT)



Intravenously administered recombinant tissue plasminogen activator (IV-TPA)

0.9 mg/kg (10% bolus, 90% v 60 min.
infusion)
≤ 4,5 hrs

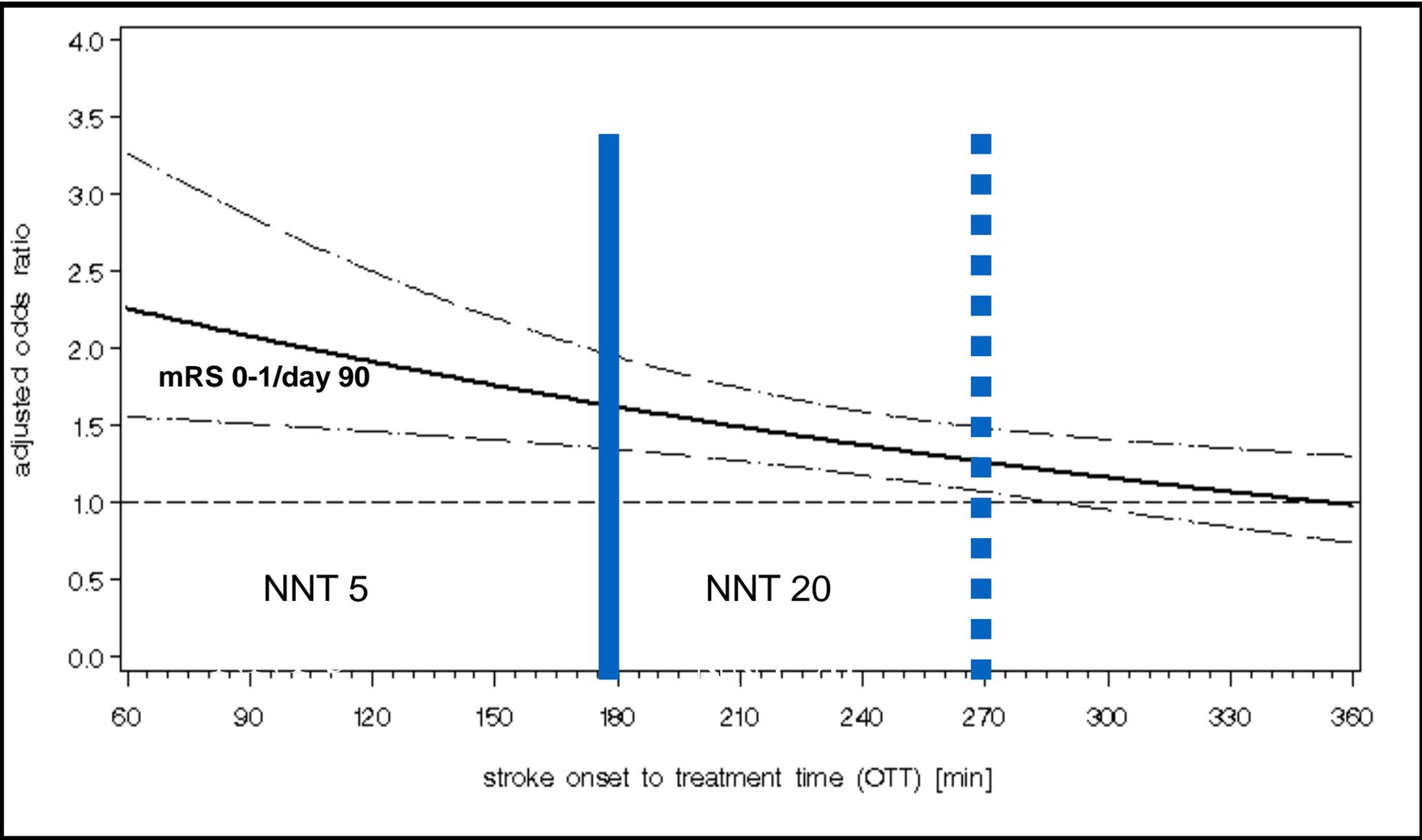


NINDS (1995)...

1996 approved FDA
2002 EMEA
•2003 SUKL



2008 ECASS II- prolongation 4.5 hrs

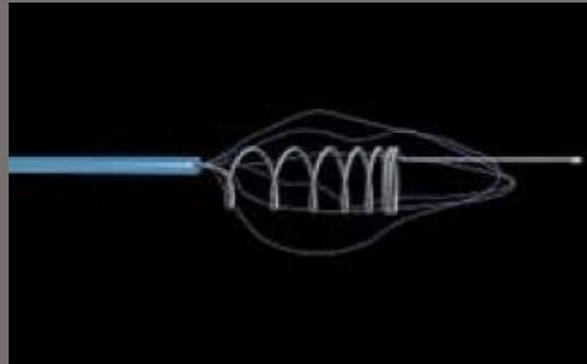
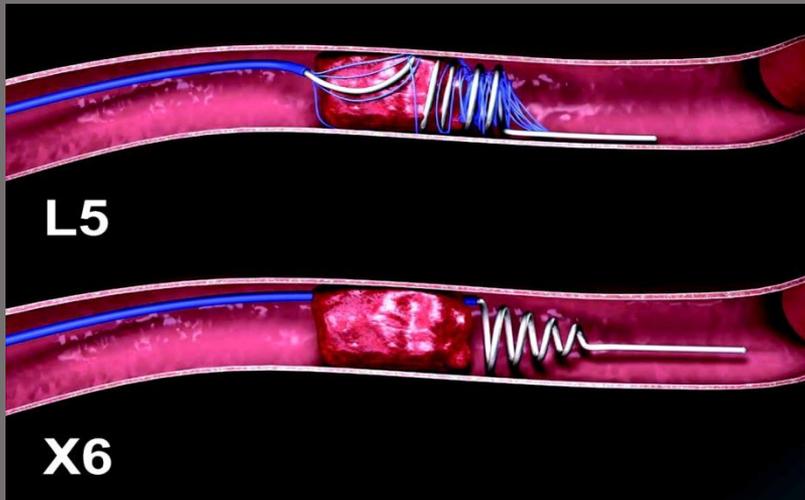


Proportion of Patients Achieving mRS Score of 0 or 1 at 3 to 6 Months

Treatment Delay	tPA (n = 3391) (%)	Control (n = 3365) (%)
≤3 h	33	23
>3 and ≤4.5 h	35	30
>4.5 h	33	31

Mechanic thrombectomy

IVT: only in 18% of patients we can find after two hrs. the full recanalization



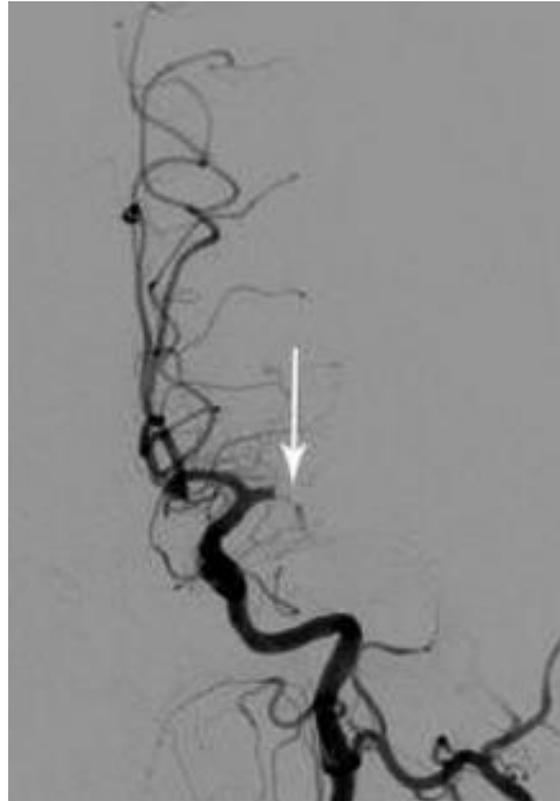
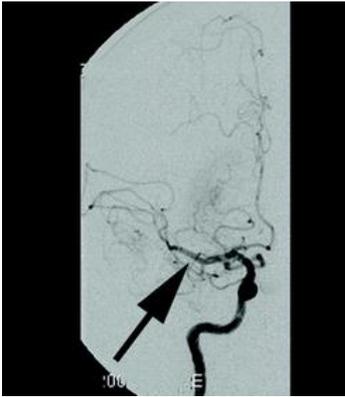
Thrombectomy

Increasingly established as an alternative to lytic therapy

Mechanical clot removing from the cerebral vessel with the help of a catheter device

More efficient, particularly in the case of large or proximal occlusions

Whether (or not) better recanalisation also means a better result for the patient is currently being investigated in a number of international studies



Occurrence and Predictors of Futile Recanalization following Endovascular Treatment among Patients with Acute Ischemic Stroke: A Multicenter Study

ORIGINAL RESEARCH

H.M. Hussein
A.L. Georgiadis
G. Vazquez
J.T. Milley
M.Z. Memon
Y.M. Mohammad
G.A. Christoforidis
N. Tariq
A.I. Qureshi

BACKGROUND AND PURPOSE: Although recanalization is the goal of thrombolysis, it is well recognized that it fails to improve outcome of acute stroke in a subset of patients. Our aim was to assess the rate of and factors associated with "futile recanalization," defined by absence of clinical benefit from recanalization, following endovascular treatment of acute ischemic stroke.

MATERIALS AND METHODS: Data from 8 studies of acute ischemic stroke treated with mechanical and/or pharmacologic endovascular treatment were analyzed. "Futile recanalization" was defined by the occurrence of unfavorable outcome (mRS score of ≥ 3 at 1–3 months) despite complete angiographic recanalization (Caruethi grade 0 or TIMI grade 3).

RESULTS: Complete recanalization was observed in 96 of 270 patients treated with IA thrombolysis. Futile recanalization was observed in 47 (62%). In univariate analysis, patients with futile recanalization were older (73 \pm 11 versus 68 \pm 16 years, $P < .0001$) and had higher median initial NIHSS scores (19 versus 14, $P < .0001$), more frequent BA occlusion (17% versus 4%, $P = .042$), less frequent MCA occlusion (53% versus 78%, $P = .032$), and a nonsignificantly higher rate of symptomatic hemorrhagic complications (2% versus 3%, $P = .2$). In logistic regression analysis, futile recanalization was positively associated with age > 70 years (OR, 4.4; 95% CI, 1.9–10.1; $P = .0008$) and initial NIHSS score 10–19 (OR, 3.8; 95% CI, 1.7–8.4; $P = .001$), and initial NIHSS score ≥ 20 (OR, 6.4; 95% CI, 2.8–14.4; $P < .0001$).

CONCLUSION: Futile recanalization is a relatively common occurrence following endovascular treatment, particularly among elderly patients and those with severe neurologic deficits.

The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

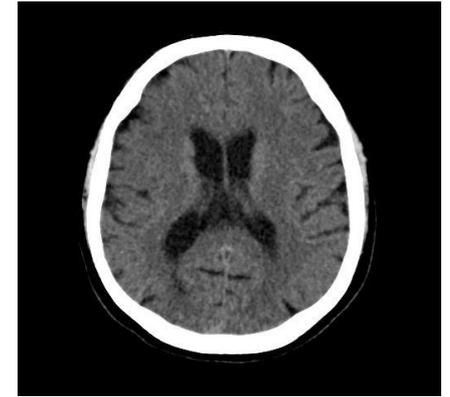
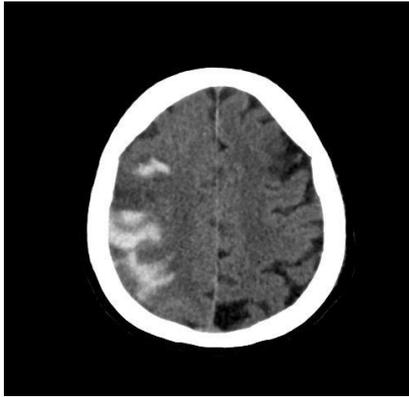
Endovascular Treatment for Acute Ischemic Stroke

Alfonso Ciccone, M.D., Luca Valvassori, M.D., Michele Nichelatti, Ph.D., Annalisa Sgoifo, Psy.D., Michela Ponzio, Ph.D., Roberto Sterzi, M.D., and Edoardo Boccardi, M.D., for the SYNTHESIS Expansion Investigators*

ABSTRACT



Mechanic thrombectomy



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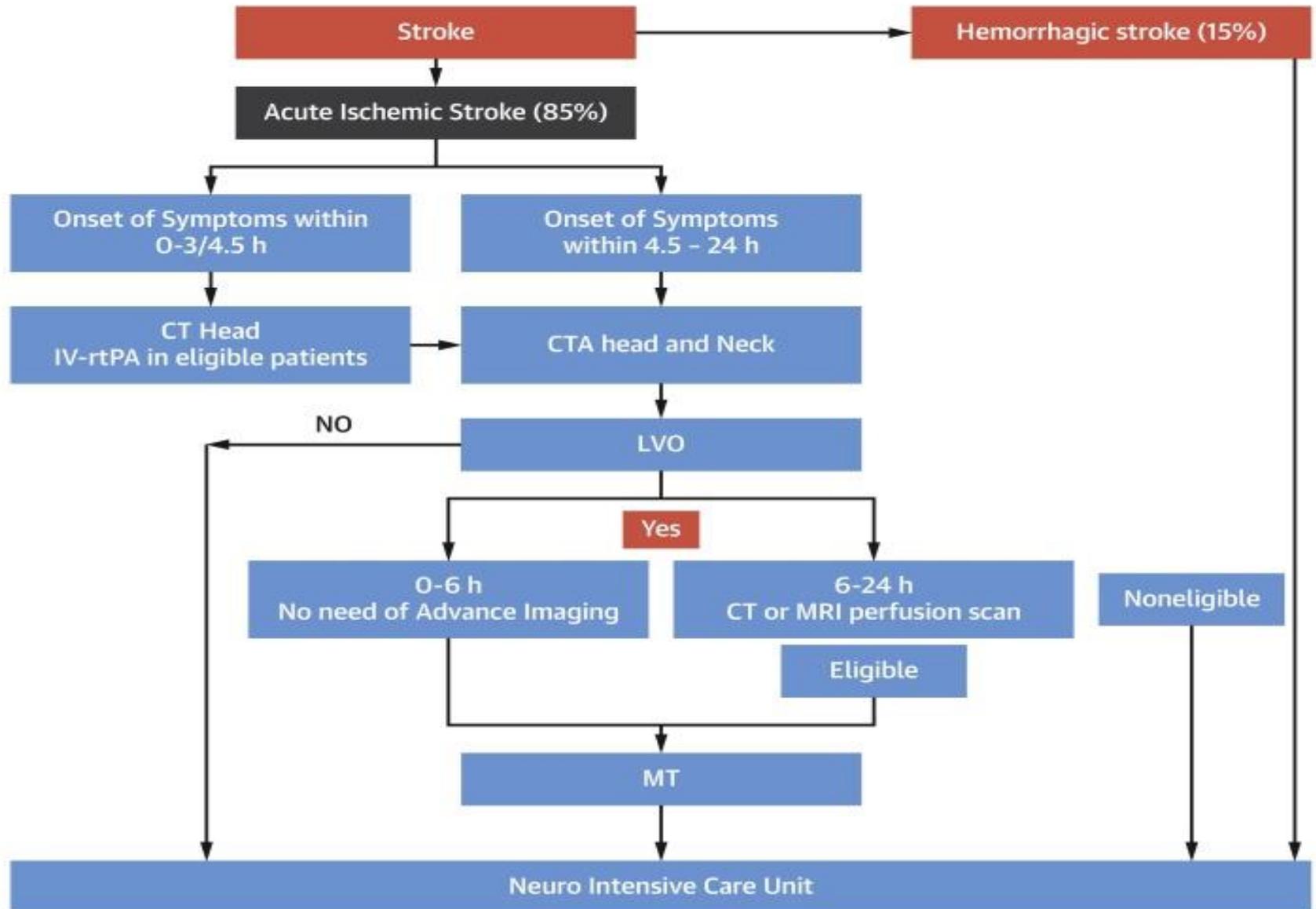
RESULTS: Complete recanalization was observed in 96 of 270 patients treated with IA thrombolysis. Futile recanalization was observed in 47 (62%). In univariate analysis, patients with futile recanalization were older (53 \pm 11 versus 58 \pm 16 years, $P < .0001$) and had higher median initial NIHSS scores (19 versus 14, $P < .0001$), more frequent BA occlusion (17% versus 4%, $P = .042$), less frequent MCA occlusion (53% versus 78%, $P = .032$), and a nonsignificantly higher rate of symptomatic hemorrhagic complications (2% versus 3%, $P = .2$). In logistic regression analysis, futile recanalization was positively associated with age > 70 years (OR, 4.4; 95% CI, 1.9–10.1; $P = .0008$) and initial NIHSS score 10–19 (OR, 3.8; 95% CI, 1.7–8.4; $P = .001$), and initial NIHSS score ≥ 20 (OR, 6.4; 95% CI, 2.8–14.4; $P < .0001$).

CONCLUSIONS: Futile recanalization is a relatively common occurrence following endovascular treatment, particularly among elderly patients and those with severe neurologic deficits.



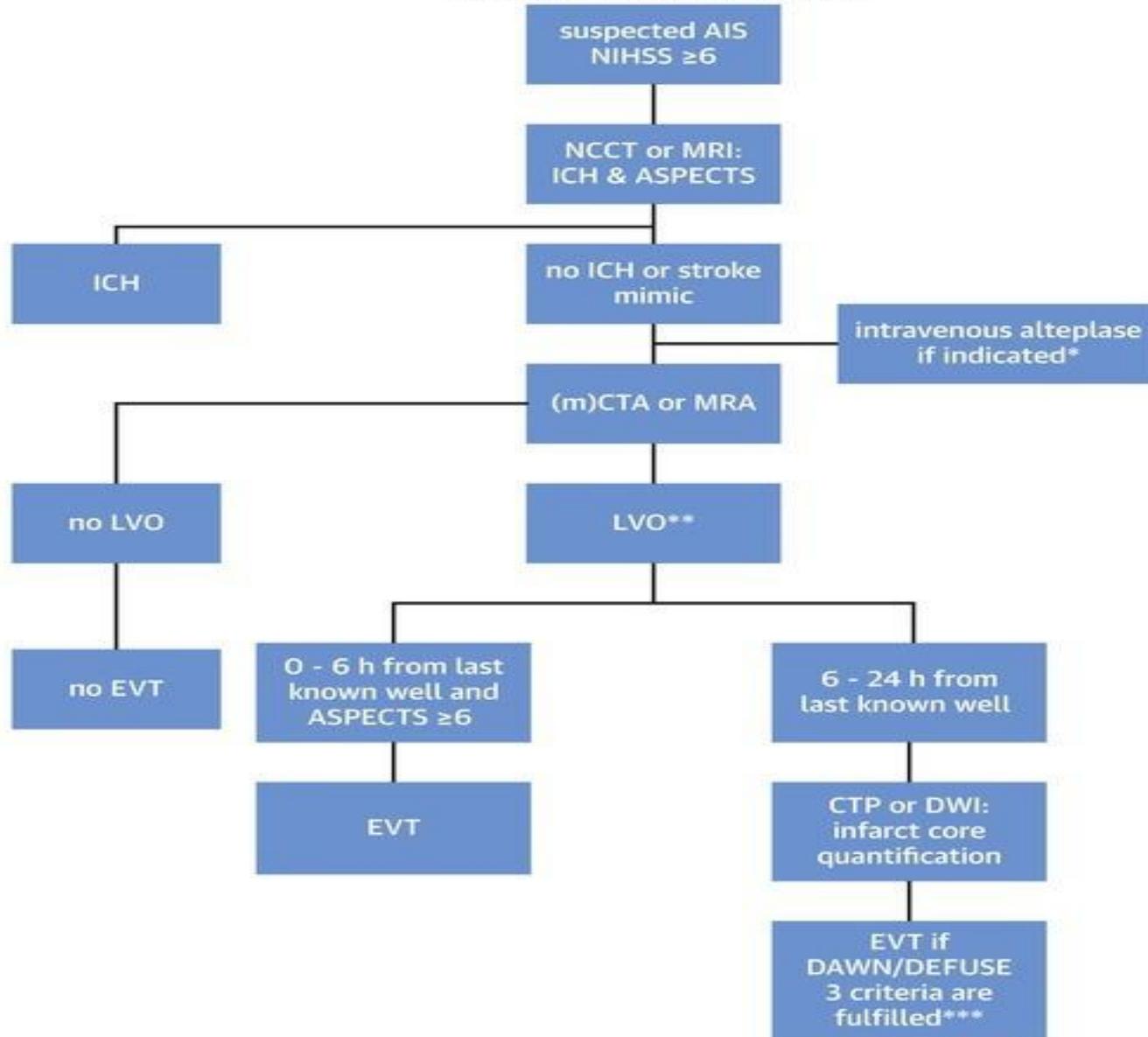
Futile recanalization

Triaging patients with acute ischemic stroke



Management of Acute Ischemic Stroke

Current AHA/ASA Guidelines





The “time is brain” concept

- It means that treatment of stroke should be considered as an emergency.
- Avoiding delay should be the major aim in the prehospital phase of acute stroke care.
- This has far-reaching implications in terms of recognition of signs and symptoms of stroke by the patient or by relatives or bystanders, the nature of first medical contact, and the means of transportation to hospital.
- **Recommendations**
 - Educational programmes to increase awareness of stroke at the population level are recommended
 - Educational programmes to increase stroke awareness among professionals (paramedics/emergency physicians) are recommended

Time

- „Time is brain“ concept
 - NNT: 2 (90') → 7 (3 hrs.) → 14 (3-4,5 hrs.)*
- **Obstacles**
 - Social circumstances
 - Time of onset
 - Public education
 - Increase **public awareness**

Calling 911 in Response to Stroke

A Nationwide Study Assessing Definitive Individual Behavior

Robert Mikulík, MD, PhD; Laura Bunt, PhD; Daniel Hrdlička; Ladislav Dušek, PhD;
Daniel Václavík, MD; Jiří Krýza



*Hacke W, Kaste M, Bluhmki E, Brozman M, Davalos A, Guidetti D, Larrue V, Lees KR, Medeghri Z, Machnig T, Schneider D, von Kummer R, Wahlgren N, Toni D, for the ECASS Investigators. Thrombolysis with Alteplase 3 to 4.5 Hours after Acute Ischemic Stroke. *New Engl J Med* 2008; 359: 1317–1329.

First contact after onset of symptoms

- Recognition of stroke in communities
 - Most studies show that only approximately 33-50% of patients recognize their own symptoms as stroke
- Education

HOW TO SPOT A STROKE

			
F	A	S	T
Face Drooping	Arm Weakness	Speech Difficulty	Time to Call 911

**WHEN
STROKE STRIKES
ACT F.A.S.T.**



GO



**IRISH HEART
FOUNDATION**
Fighting Heart Disease & Stroke

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Stroke Action's F.A.S.T. Campaign



**WHEN STROKE STRIKES,
ACT F.A.S.T.**

CALL 999

Stroke Action's F.A.S.T. campaign, wants to help the public achieve a better understanding of the warning signs of stroke. Stroke is Ireland's third biggest killer but hundreds of lives could be saved each year if more people knew that stroke is a medical emergency.

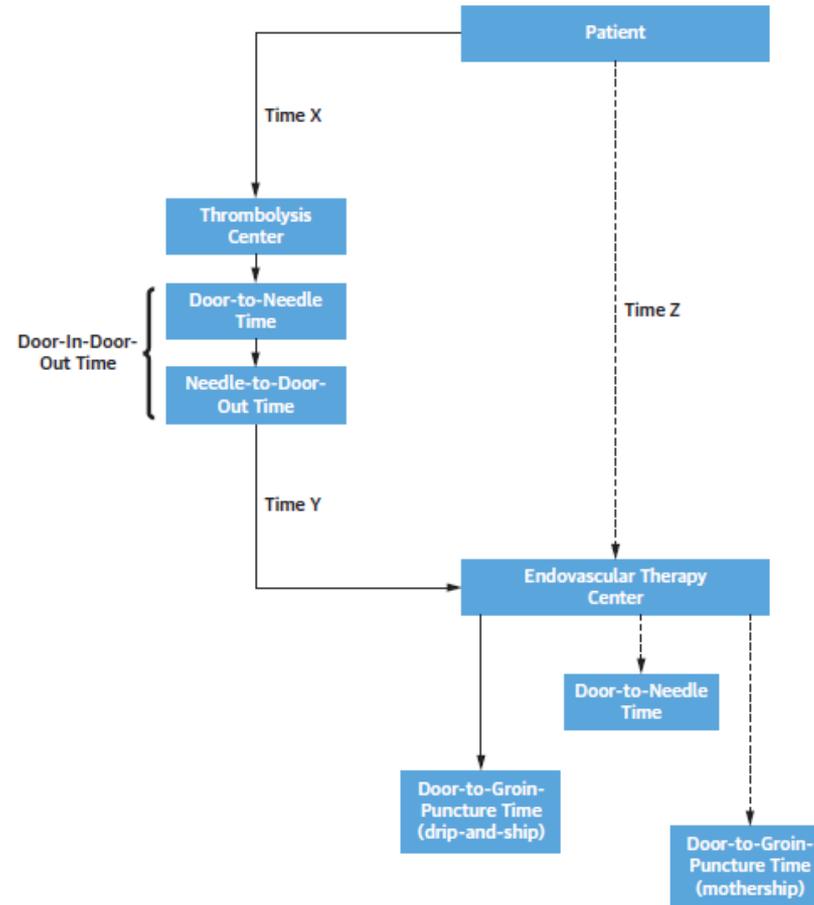
Stroke destroys two million brain cells every minute so **TIME IS BRAIN**. If you suspect that

Triage and time management

- Phone contact with the ambulance
- Sustained pressure on the shortening of the onset-to-needle time
 - Measurement, evaluation, benchmarking
 - Door-to-needle (DNT)
 - Door-to-imaging (DIT)
- Bridging, drip-and-ship...



Drip-and-ship vs. mothership model





Secondary prevention

Prevention

- • Up to 90% of all strokes are preventable, and attributable to 10 modifiable risk factors.
- • Hypertension is ubiquitously the major modifiable risk factor for stroke, accounting for one-third of stroke in developed countries and two-thirds in developing countries.
- • Optimal stroke prevention requires a harmonious, integrated approach to educating about stroke risk and healthy lifestyle behaviors, simple screening and management of individuals for a history and presence of modifiable and treatable causal risk factors, and improving social and environmental factors.

Risk of recurrence

01

The highest risk during first weeks-months

02

10% during first year

03

Then 5% per year

04

Patient, who survives ischemic stroke (80%/first month) has 2x greater risk of death during following years

Antiplatelet drugs

- **Acetylsalicylic Acid (ASA)**
 - COX inhibitor
- **Clopidogrel**
 - Inhibition ADP induced activation of FBG receptors IIb/IIIa
 - More effective than ASA +18% (27 vs 33%)

ASA

30- 1300 mg - 18% reduction of new stroke episodes during 3 years

Prevention of 40 severe strokes per 1000 treated (2 hemorrhages per 1000 treated)



Ischemic stroke, HI, vascular death
-27%



ASA

- Incidence of bleeding is dose independent
- GI complications and discomfort are dose dependent
- Sufficient recommended dose= 100 mg
- **No reason for primary prevention**

Lipids lowering agents

9014 pts
(HI,AP)

CCH 4-7
mmol/l

6 years

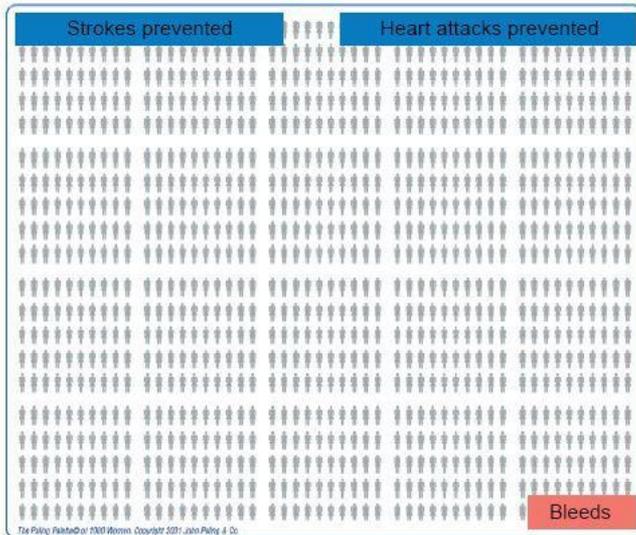
Reduction
23%

All types of stroke (CE 30%,
LAA 17%, SAD 20%)

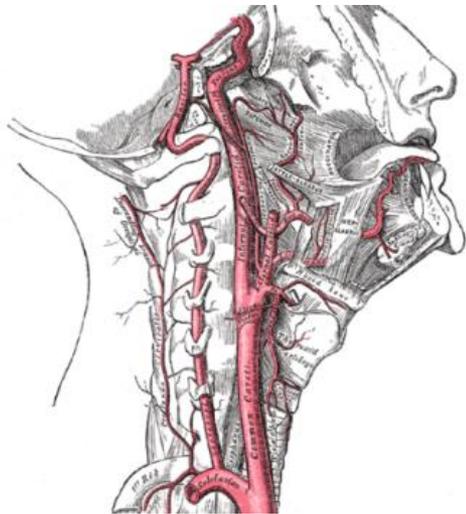
Atrial Fibrillation

- **More than 9% persons >70 years**
 - 16,1/12,2 % M/F >75 years
- **5,6x higher risk of stroke**
 - (+rheumatic Mi stenosis = 17x)
- **Warfarin / DOAC**
 - Risk reduction of first and repeated ischemic stroke between 68- 81%
 - If Warfarin is contraindicated- ASA
 - Oral anticoagulation is not recommended in patients with co-morbid conditions such as falls, poor compliance, uncontrolled epilepsy, or gastrointestinal bleeding
 - Increasing age alone is not a contraindication to oral anticoagulation

Risk factors



- ASA
 - Epistaxis
- Anticoagulation
 - Warfarin
 - 2% of treated patients
 - Risk of bleeding 8-11x Hypolipidemika
- Thrombolysis
 - 6,4%



Carotid endarterectomy

- Atherosclerosis causes plaque to form in the carotid arteries, usually at the fork where the common carotid artery divides into the internal and external carotid artery
- The plaque can build up in the inner surface of the artery (lumen), and narrow or constrict the artery
- Pieces of the plaque emboli can break off and travel up the internal carotid artery to the brain, where it blocks circulation, and can cause death of the brain tissue

Carotid endarterectomy

- NASCET, ECST, VA (sympt.)
- ACAS (asympt.)
- The North American Symptomatic Carotid Endarterectomy Trial (NASCET) and the European Carotid Surgery Trial (ECST)
- Large randomized class 1 studies which have helped define current indications for carotid endarterectomy
- The NASCET found that for every six patients treated, one major stroke would be prevented at two years (i.e. a number needed to treat (NNT) of six) for symptomatic patients with a 70 – 99% stenosis

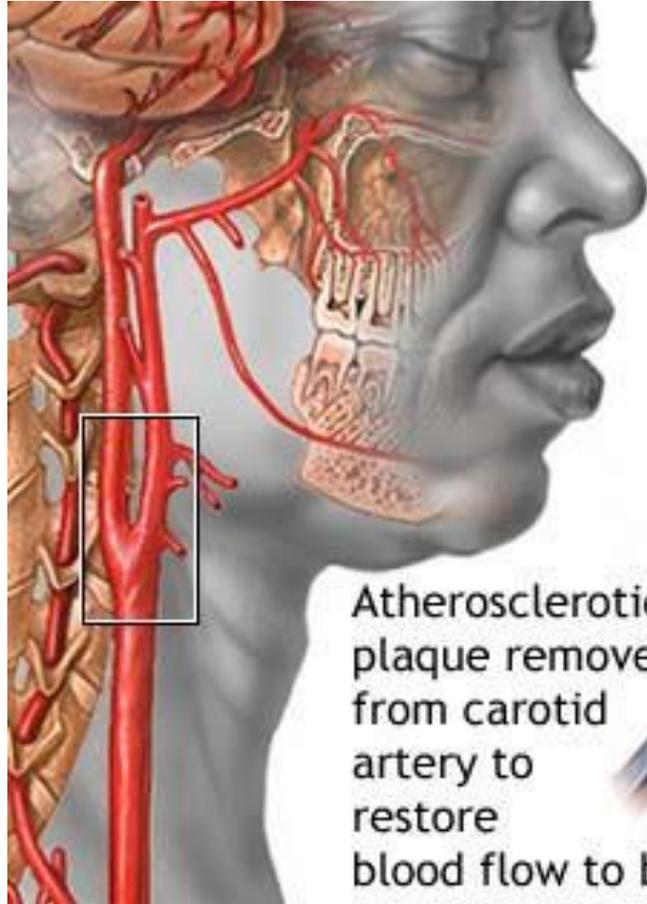
Endarterectomy

Contra-indications

- Complete internal carotid artery obstruction (because there is no benefit to treating chronic occlusion)
- Previous stroke on the ipsilateral side with severe deficit
 - No point in preventing what has already happened

Complications

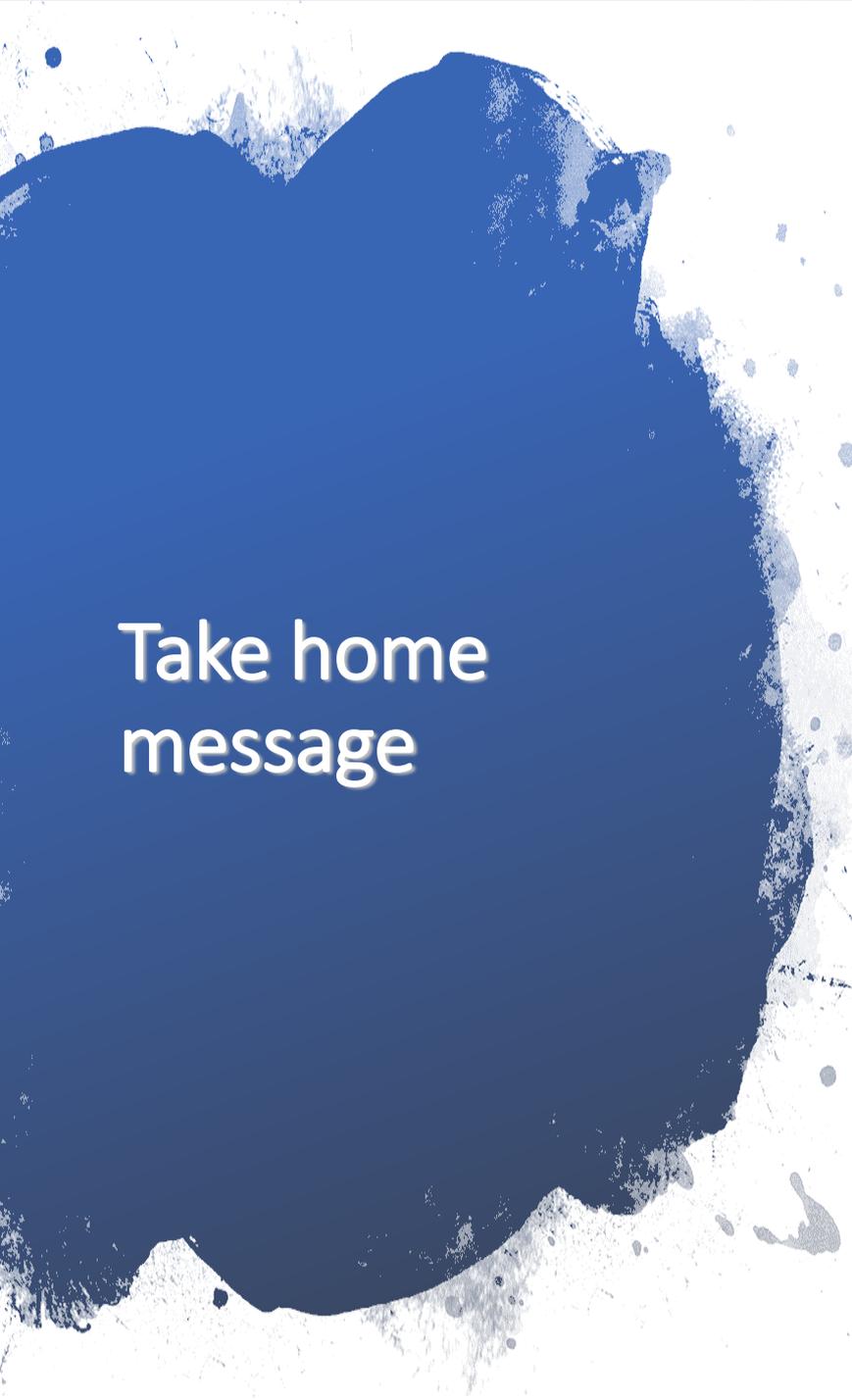
- About 3% of asymptomatic and 6% of symptomatic patients are expected to suffer stroke or death as a result of either the surgery or carotid stenting



Atherosclerotic
plaque removed
from carotid
artery to
restore
blood flow to brain



 ADAM.



Take home message

- **Acute therapy**
 - **Thrombolysis**
 - **Stroke unit**
- **HBP**
 - **Most important treatable risk factor**
- **Secondary prevention**
 - **ASA**
- **AF**
 - **Warfarin / DOAC**
- **Carotid endarterectomy**
 - **symptomatic stenosis 70-99%**

Rehabilitation



Rehabilitation

The most frequent cause
of disability of adults

10-20% die in acute stage

10% resolve

30% severe deficit

30% rehabilitation

Rehabilitation

- **Patients with disabling strokes undergo treatment to help them return to normal life as much as possible by regaining and relearning the skills of everyday living**
- **Multidisciplinary**
 - **A team with different skills working together to help the patient.**
- **Nursing staff**
- **Physiotherapy**
- **Occupational therapy**
- **Speech and language therapy**
- **Social workers**

Rehabilitation

- **Rehabilitation process includes**
 - **Nursing**
 - **occupational therapy (OT),**
 - **physical therapy (PT),**
 - **therapeutic recreation (TR),**
 - **speech therapy (or speech language pathology, SLP),**
 - **Psychology and vocational rehabilitation.**

Rehabilitation



- **OT involves exercise and training to help the stroke patient relearn everyday activities, sometimes called the Activities of daily living (ADLs)**
 - **eating and drinking, dressing, bathing, cooking, reading and writing, and toileting**
- **Therapeutic recreation works on several areas including problem solving, improving movement and re-entry into the community through familiar, new, and adaptive leisure skills**
- **Speech and language therapy is appropriate for patients who have problems understanding speech or written words, cognitive loss, or problems forming speech**
 - **Speech therapists also assess a person's ability to safely swallow after a stroke**
- **Psychologists can assess cognitive function and teach people with stroke coping strategies**
- **Vocational rehabilitation can work directly with a person who has stroke and their employer to facilitate successful return to work**



Depression after stroke

- **More than 50%**
- **SSRI antidepressants**

Post-stroke pain

- 19-74% of patients
 - Brain lesion itself
 - Central post-stroke pain' (CPSP)
 - 1-8%
 - Adrenergic antidepressants, Antiepileptics, (lamotrigine), GABAergic drugs (gabapentin or pregabalin)
 - Other sources
 - Frozen shoulder, spasticity

Incontinence and stroke

- **1/3- 2/3 pts in acute stage**
- **Correlate with severity of the stroke**
- **Important factor which influences the overall prognosis**
 - **Infections**
 - **Bedsore (decubitus)**

Incontinence and stroke

- **Depressed level of consciousness**
- **Immobility**
- **Communication problems**
- **Weakness or clumsiness of UE**
- **Detrusor instability**
- **Urinary infection**
- **Supine position**
- **Diuretics**

Stroke and epilepsy

- **2% of patients with stroke have first epileptic seizure**
- **Cortical infarction – higher risk**
- **Risk of epilepsy after first stroke**
 - **5% during first year**
 - **1-2% annually during following years**

