Stroke Units

Michael Brainin
Professor in Clinical Neurology
Danube University Krems
Austria

WCN Dubai, Oct 2019

Time is brain – Quantified

Estimated pace of neural circuitry loss in typical large vessel, supratentorial acute ischaemic stroke

	Neurons Lost	Synapses Lost	Myelinated Fibres Lost	Accelerated Aging
Per Stroke	1.2 billion	8.3 trillion	7140 km/4470 miles	36 y
Per Hour	120 million	830 billion	714 km/447 miles	3.6 y
Per Minute	1.9 million	14 billion	12 km/7.5 miles	3.1 wk
Per Second	32 000	230 million	200 meters/218 yards	8.7 h

Saver J. *Stroke* 2006;37:263-266.

If you recognise the signs of ***STROKE*** *act*

Facial weakness

Can the person smile? Has their mouth or eye drooped?

Arm weakness

Can the person raise both arms?

Speech difficulty

Can the person speak clearly and understand what you say?

Time to act fast

If you recognise the signs of stroke, seek immediate medical attention.

*The signs of **Stroke** are:*

- *Weakness, numbness or paralysis of the face, arm or leg*
- *Difficulty speaking or understanding*
- *Dizziness and loss of balance*
- *Loss of vision*
- *Headache, usually severe and abrupt*
- *Difficulty swallowing*

Act FAST – seek immediate medical attention.

For more information call 1800 787 653 or visit www.strokefoundation.com.au.

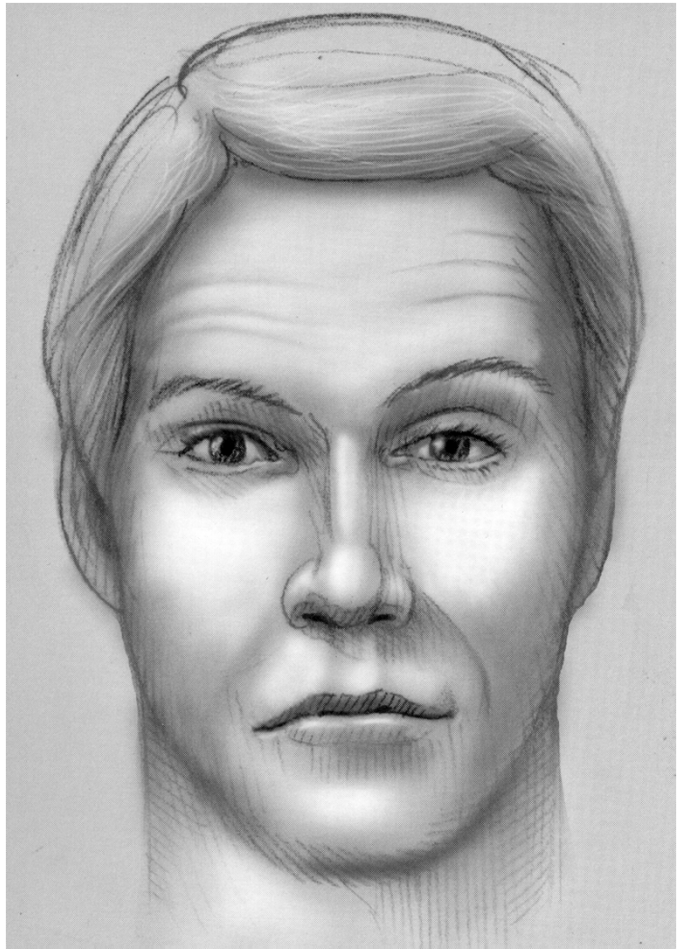
strokesafe for life

Queensland Government

The National Stroke Foundation acknowledges the support from our valued partners including Bristol-Myers Squibb, Southern Cross Broadcasting, Connex and News Limited and we thank them.

Cincinnati Prehospital Stroke Scale

Facial droop: have patient smile



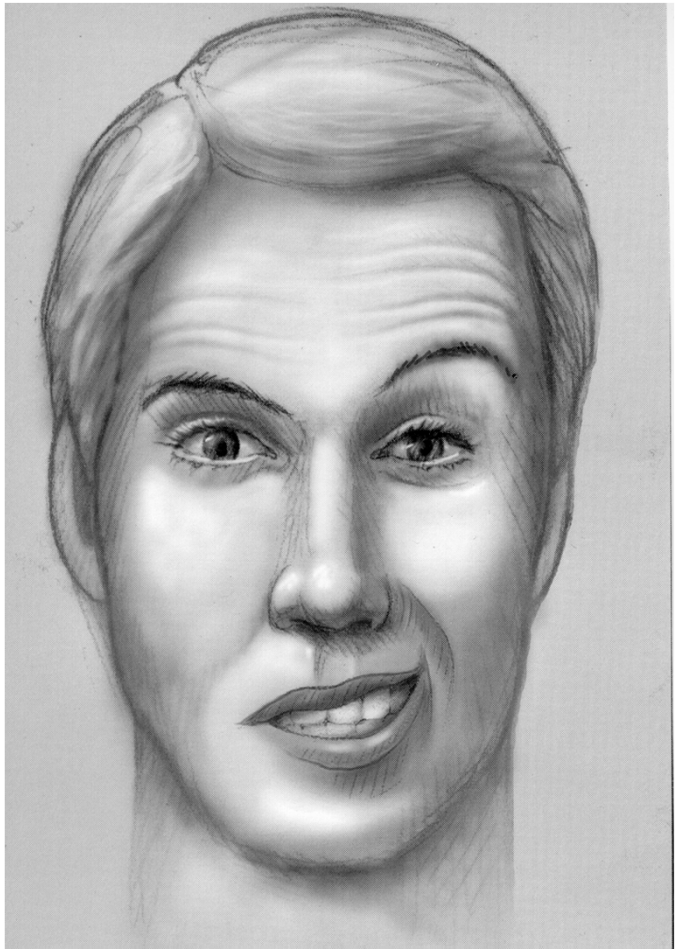


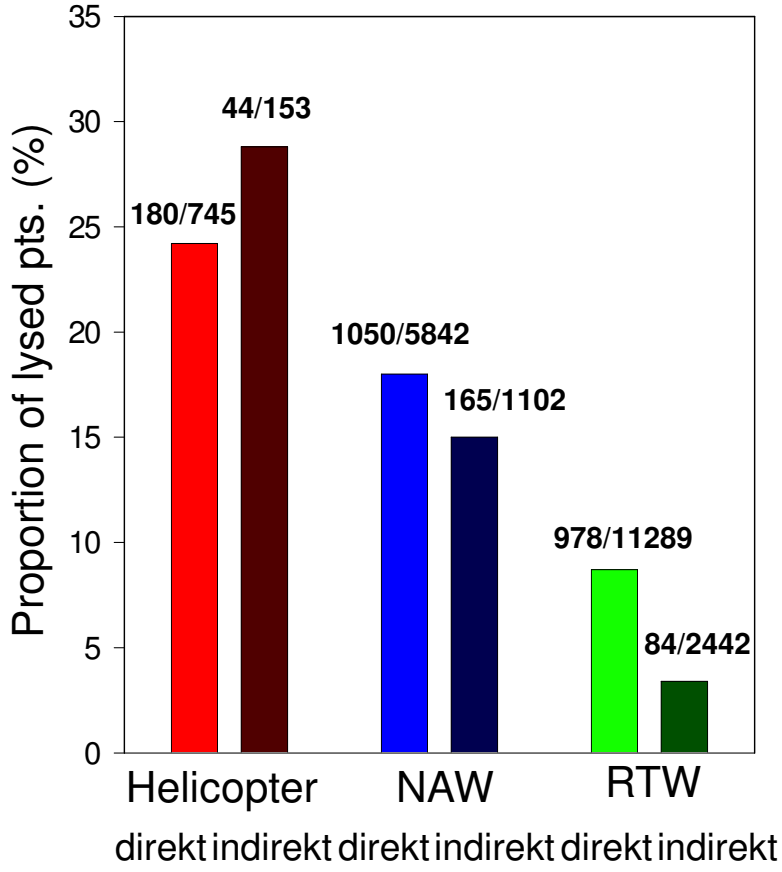
Image Source: NINDS

Arm drift: close eyes & hold out both arms

Image Source: NINDS

Helicopter transport of stroke patients and its influence on thrombolysis rates: data from the Austrian Stroke Unit Registry.

n=2.501 lysierte Pat., 2003-2009



Helicopter is fastest and predicts highest rates for thrombolysis treatment

NAW = ambulance with emergency physician
RTW = ambulance with paramedic

Reiner-Deitemyer V. et al. Stroke 2011;42:1295-300.

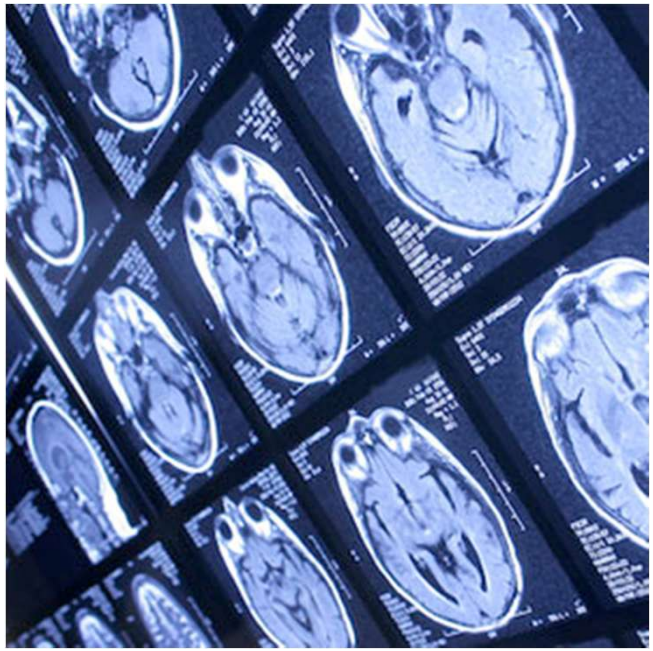
Interactive Videoconferencing and Teleradiology TEMPiS

Screenshots of a 30-frames/sec audio-video link to a hospital being 180 km away from Munich

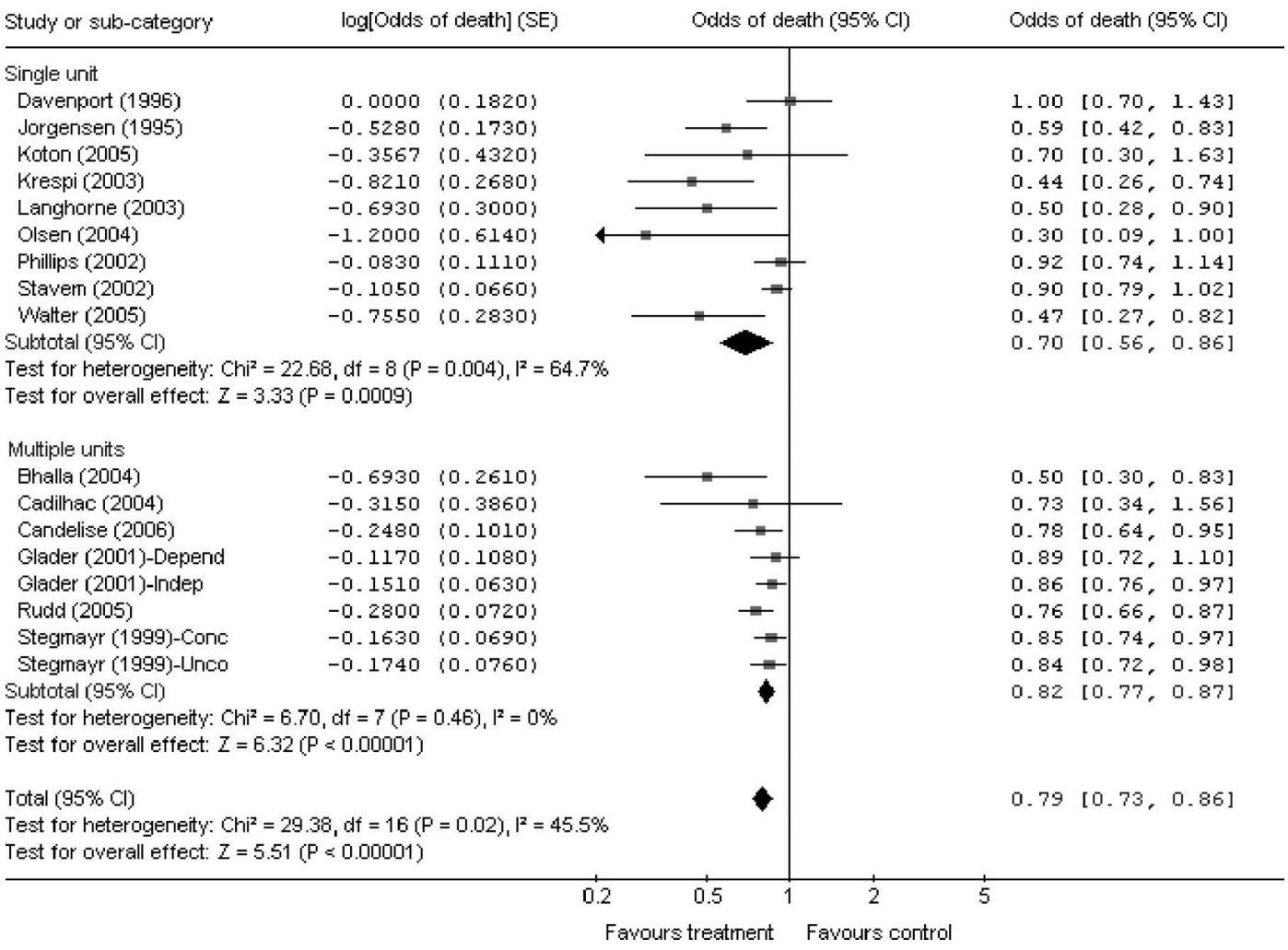
Screenshot of the strokolgists desktop– (vPoint®-Software with blue window) – eFilm®-CT-scans in the background


STEMO
STROKE-EINSATZMOBIL


UTHealth
Mobile Stroke Unit

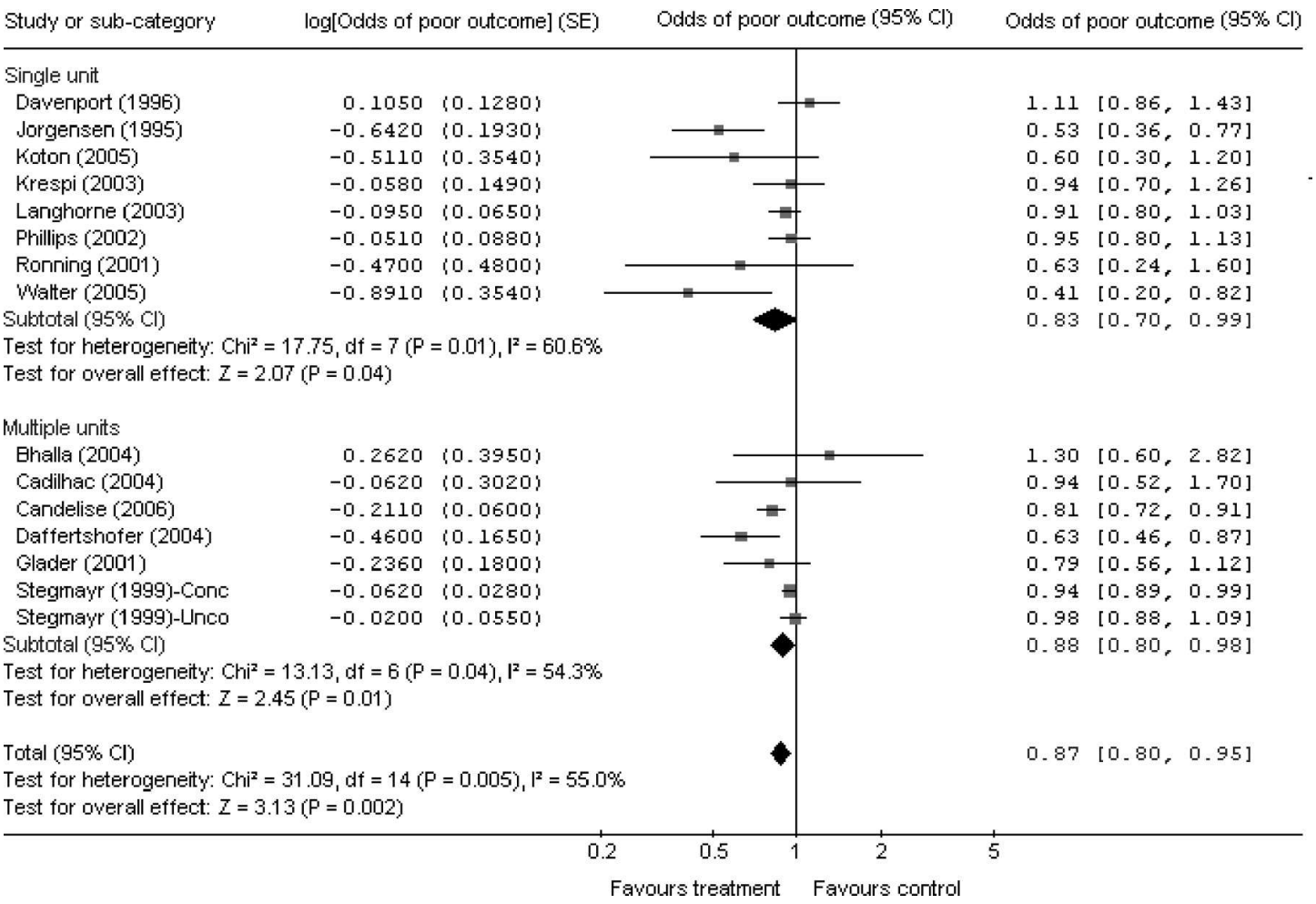


Death within 1 year of stroke: stroke unit vs non-stroke unit care



Seenan, P. et al. Stroke 2007;38:1886-1892

Poor outcome within 1 year of stroke: stroke unit vs non-stroke unit care



Seenan, P. et al. Stroke 2007;38:1886-1892

Benefit of Stroke Units

Stroke Unit: 4936 Patients versus conventional ward: 6636 Pat..

274 ^Hospitals, 2 year follow-up

Rankin > 2: <u>53% vs. 62%</u>; OR 0,81 (0,72-0,91)

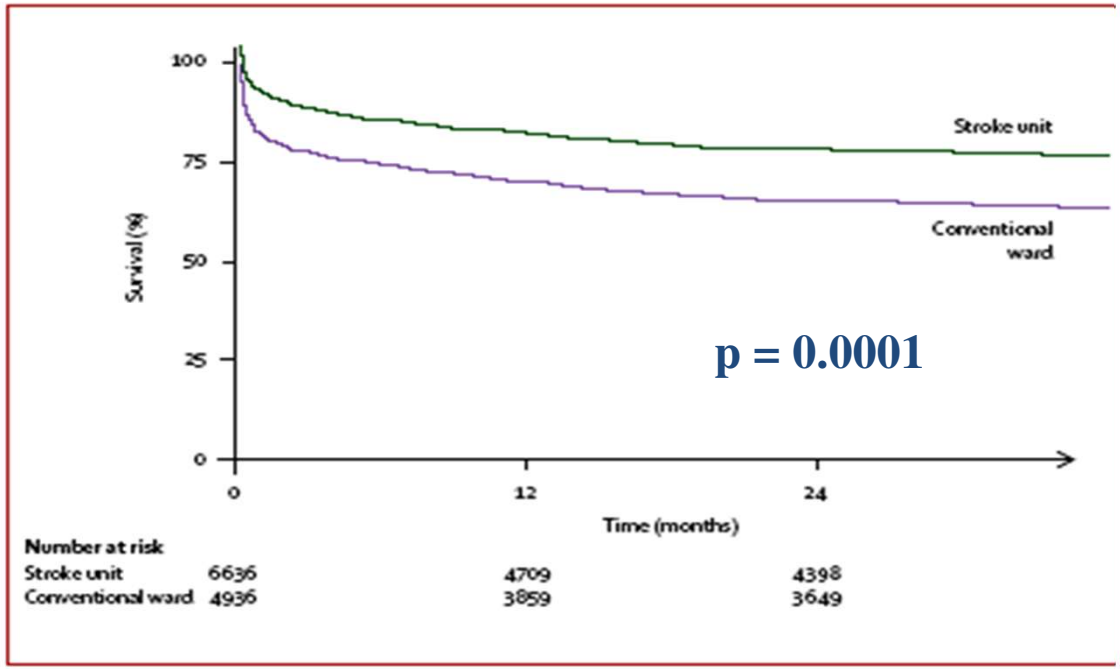


Figure 2: Survival curves for patients admitted to stroke unit or conventional ward

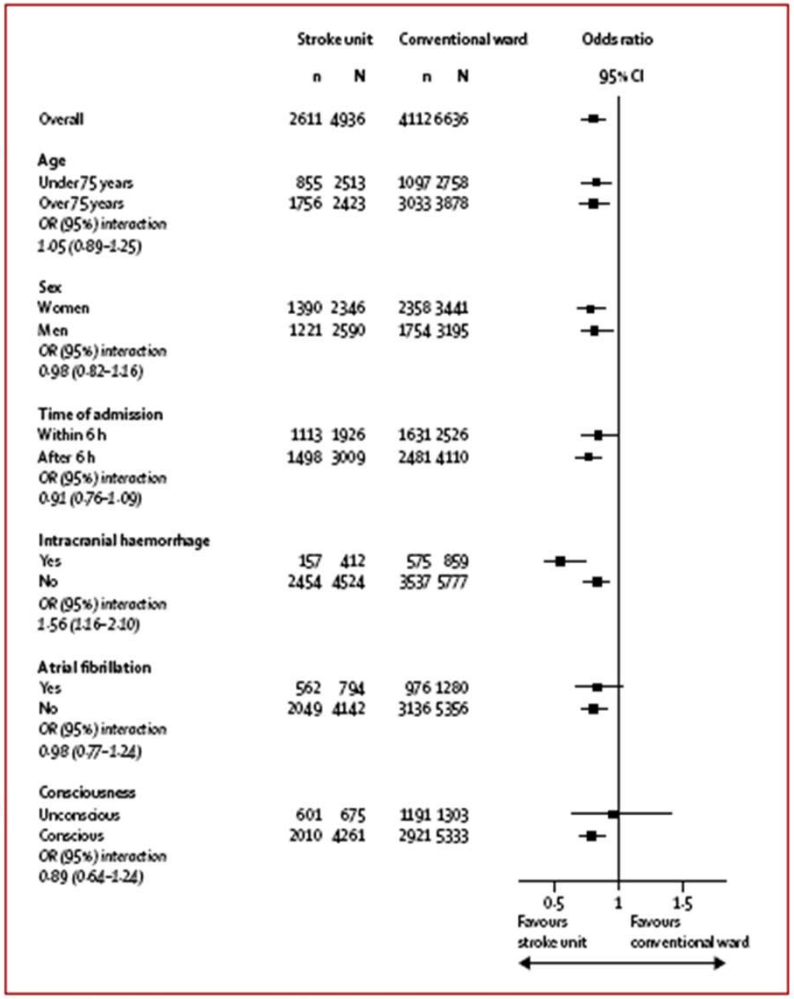


Figure 3: Effect of stroke unit care on death or disability by patient subgroups
Data adjusted for patient characteristics and clustered at the hospital level.

Lancet 2007;369:299-305

The main components of stroke unit care: results of a European expert survey. *[comprehensive service]*

FACILITIES THAT SHOULD BE AVAILABLE

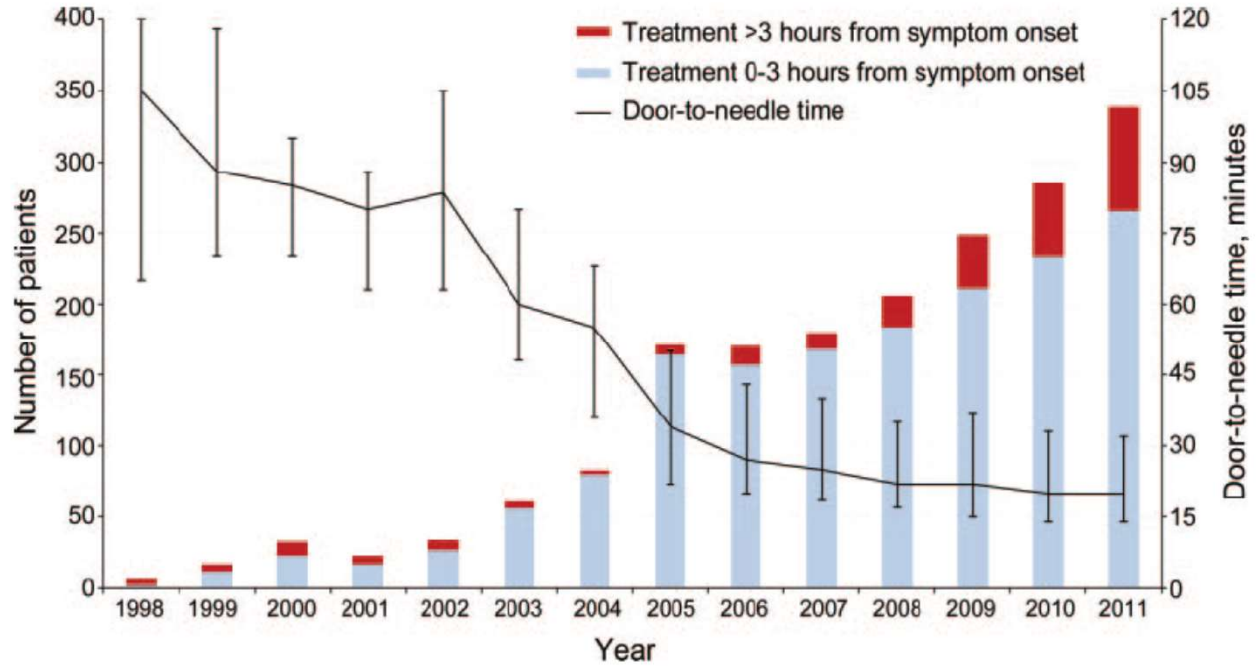
- Stroke trained physician (24/7)
- Diagnostic radiologist on call
- Multidisciplinary team
- Stroke trained nurses
- Physician expert in neurovascular ultrasonology
- Speech therapy start within 2 days
- Physiotherapy start within 2 days
- Brain CT scan 24/7 *[MRI and MRA or CT and CTA]*
- Extracranial Duplex sonography *[Transcranial Dopplersonography]*
- Transthoracic echocardiography *[Transosephageal echocardiography]*
- Automated ECG monitoring at bed-side
- Intravenous rt-PA protocols 24/7 *[Endovascular emergency thrombectomy]*
- Rehabilitation available (in-house or outside)
- Secondary prevention program
- *[Neurosurgery service]*

Modif. from : The main components of stroke unit care: results of a European expert survey.
Leys et al, EUSI Exec Comm. *Cerebrovasc Dis* 2007;23(5-6):344-52. Epub 2007 Jan 30.

Reducing in-hospital delay to 20 minutes in stroke thrombolysis

- Thrombolysis registry Helsinki
- 1998-2011
- N=1860

Figure 1 Number of annually treated patients and median door-to-needle times



Annual patients, with those treated beyond 3 hours in red (bars, left axis) and median door-to-needle time in minutes with interquartile range (line, right axis). Total n = 1,686. The projected number of patients for 2011 is based on the observed numbers of the first 6 months.

Meretoja et al. 2012
Neurology

Table 1 Twelve measures to reduce treatment delays

Measure	Description	Year
EMS involvement	Education of dispatchers and EMS personnel, stroke high-priority dispatch	1998
Hospital prenotification	EMS contacts stroke physician directly via mobile phone	2001
Alarm and preorder of tests	Laboratory and CT computer-ordered and alarmed at prenotification	2001
No-delay CT interpretation	Stroke physician interprets the CT scan, not waiting for formal radiology report	2001
Premixing of tPA	With highly suspect thrombolysis candidates, tPA premixed prior to patient arrival	2002
Delivery of tPA on CT table	Bolus administered on CT table	2002
CT relocated to ER	Patient transfers of several hundred meters, including elevators, were no longer needed	2003
CT priority and CT transfer	CT emptied prior to patient arrival, and patient transferred straight onto CT table, not ER bed	2004
Rapid neurologic evaluation	Patient is examined upon arrival, on CT table	2004
Preacquisition of history	Statewide electronic patient records and eyewitness interview before/during transportation	2005
Point-of-care INR	Laboratory personnel draw blood while patient on CT table, and perform instant POC INR	2005
Reduced imaging	While all patients have a CT, advanced imaging reserved for unclear cases only	2005

Abbreviations: EMS = emergency medical service; ER = emergency room; INR = international normalized ratio; POC = point-of-care; tPA = tissue plasminogen activator.

Meretoja 2012 Neurology

Some measures to reduce treatment delays within the hospital

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Meretoja 2012 Neurology

Some measures to reduce treatment delays within the hospital

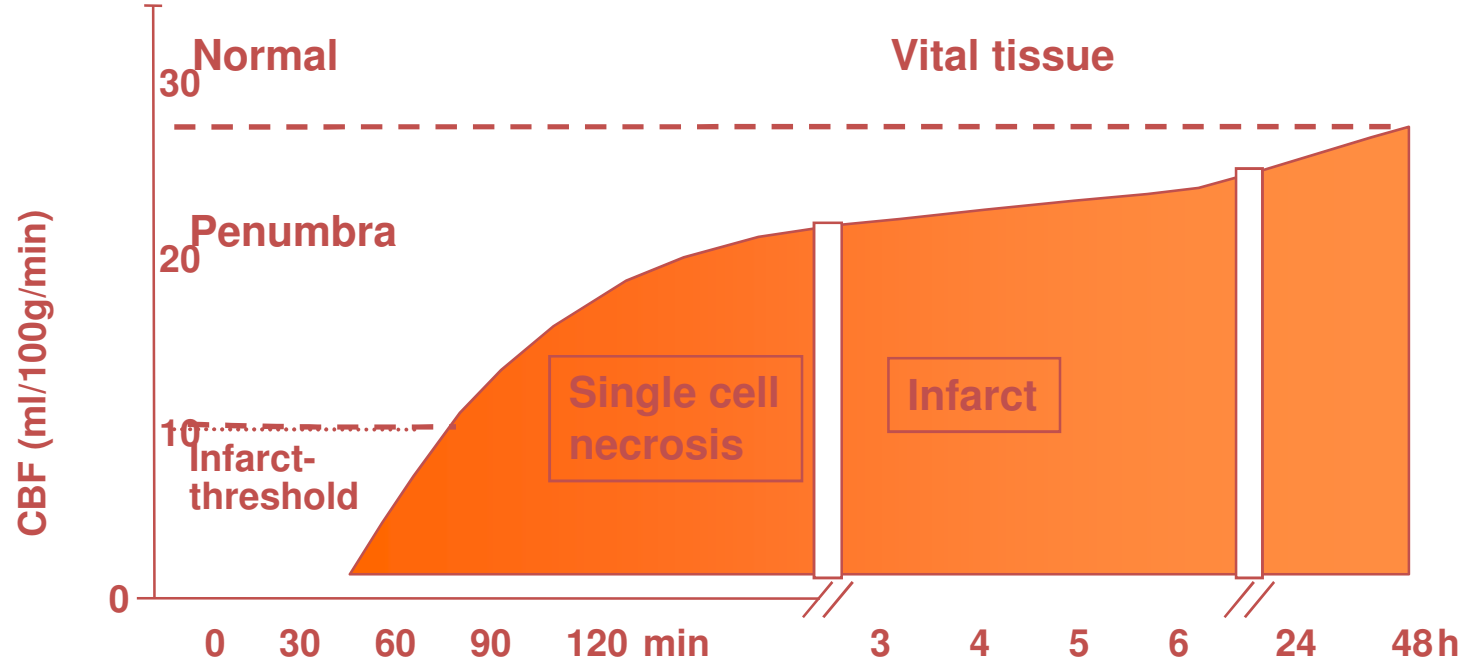
Diagnosis

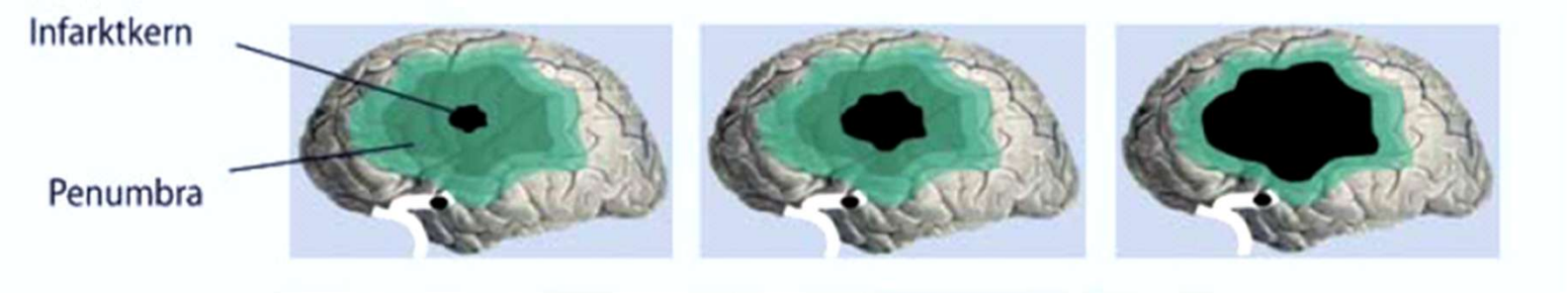
Therapy

Complications

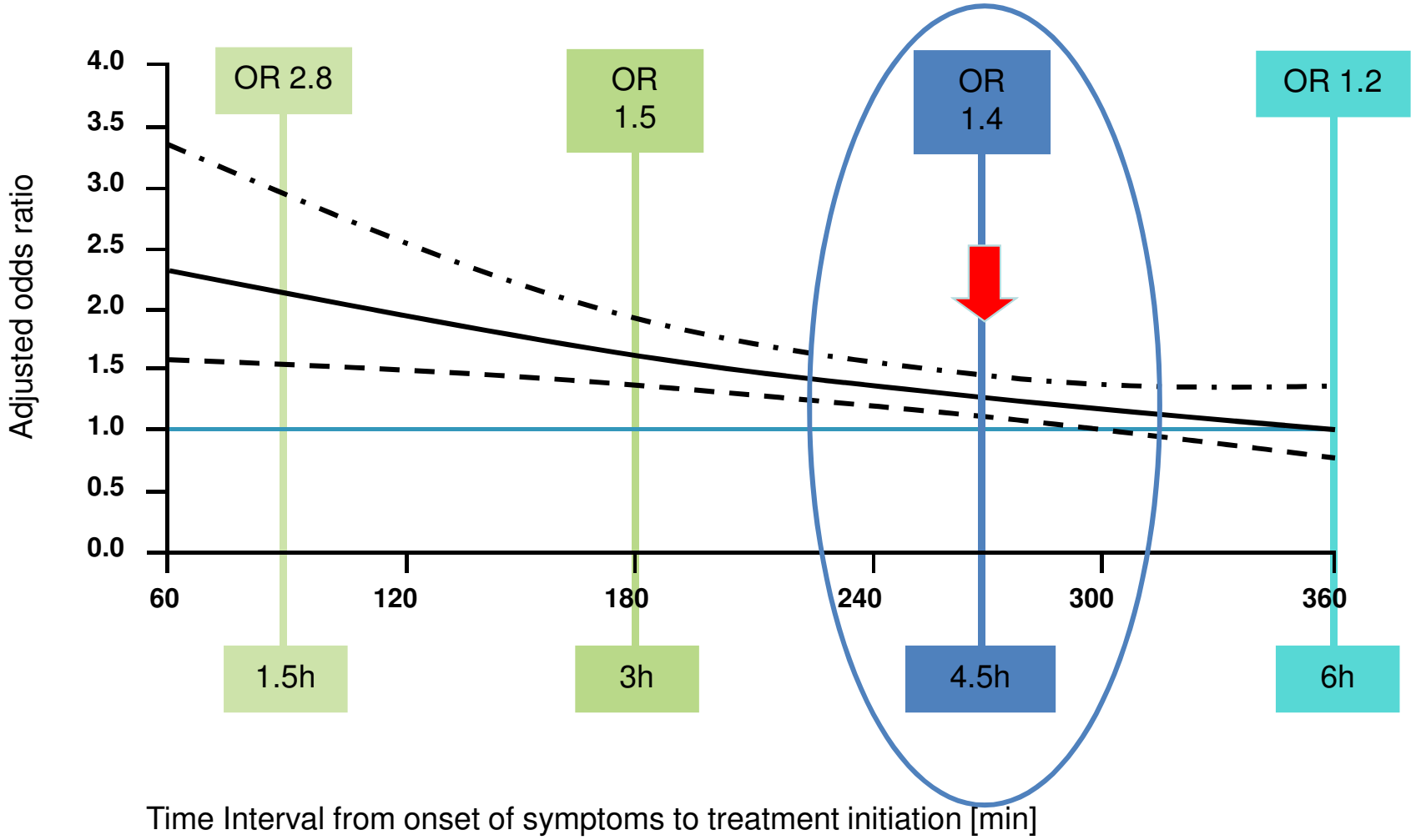
Mobilisation

Penumbra and Treatment Options





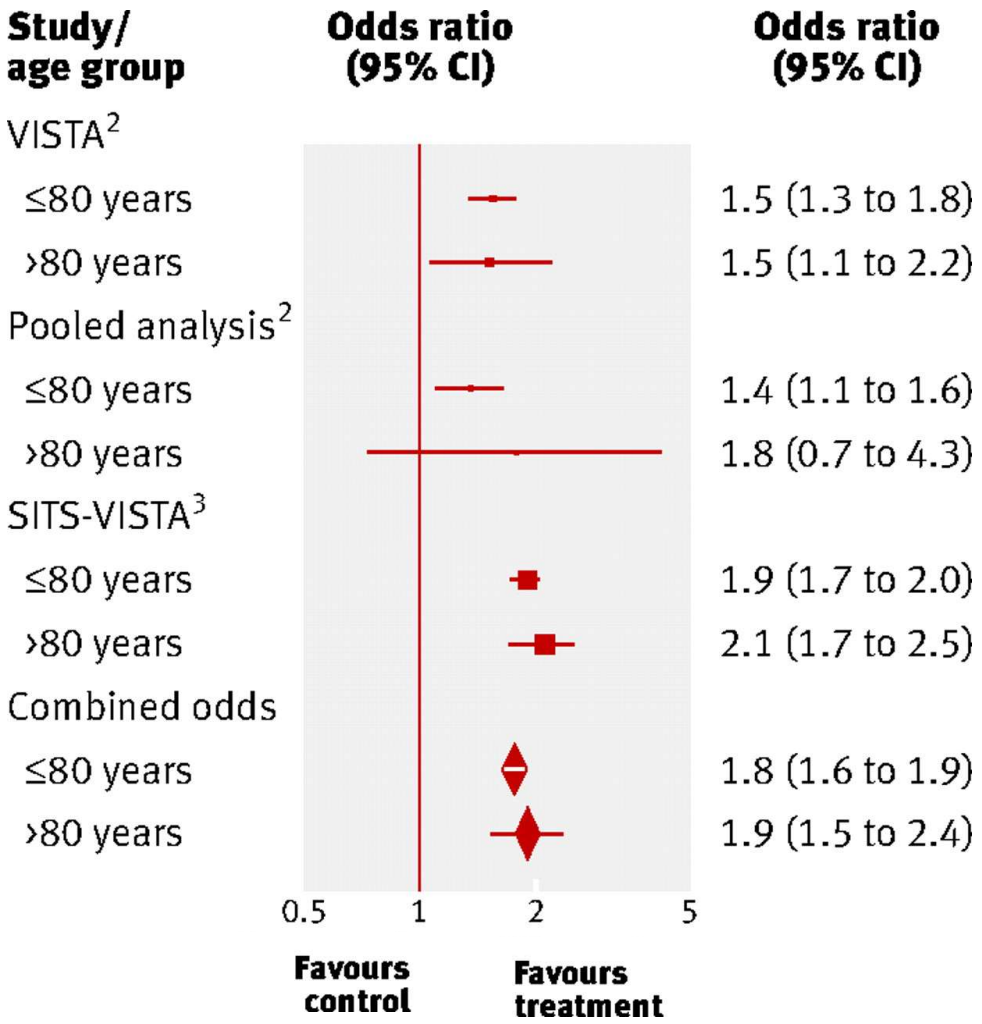
ECASS 3 Trial



OR, odds ratio

Hacke et al. Lancet 2004; 363: 768–74

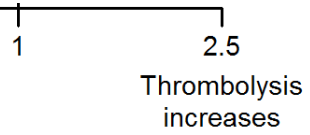
Age >80 y does not appear to influence response to alteplase



BMJ 2011; 342:d312 doi: 10.1136/bmj.d312

Effect of age: <80 vs. > 80 years and time: <3 vs. 3-6 hrs

Subgroup	No. trials	Events (No. patients) Thrombolysis	Events (No. patients) Control	Odds Ratio (95% CI)
Treated up to 6 hours				
≤ 80 years	10	1372 / 2612	1237 / 2562	1·17 (1·05 - 1·31)
> 80 years	3	237 / 870	197 / 841	1·22 (0·98 - 1·52)
All trials	**10**	**1609 / 3482**	**1434 / 3403**	**1·18 (1·07 - 1·31) p=0·0008**



IST-3 Thrombolysis

The new endovascular thrombectomy stroke trials

- October 2014: ***MR CLEAN*** is presented at the WSC in Istanbul and published early 2015

Berkhemer OA et al. NEJM 2015; 372:11-20

MR CLEAN

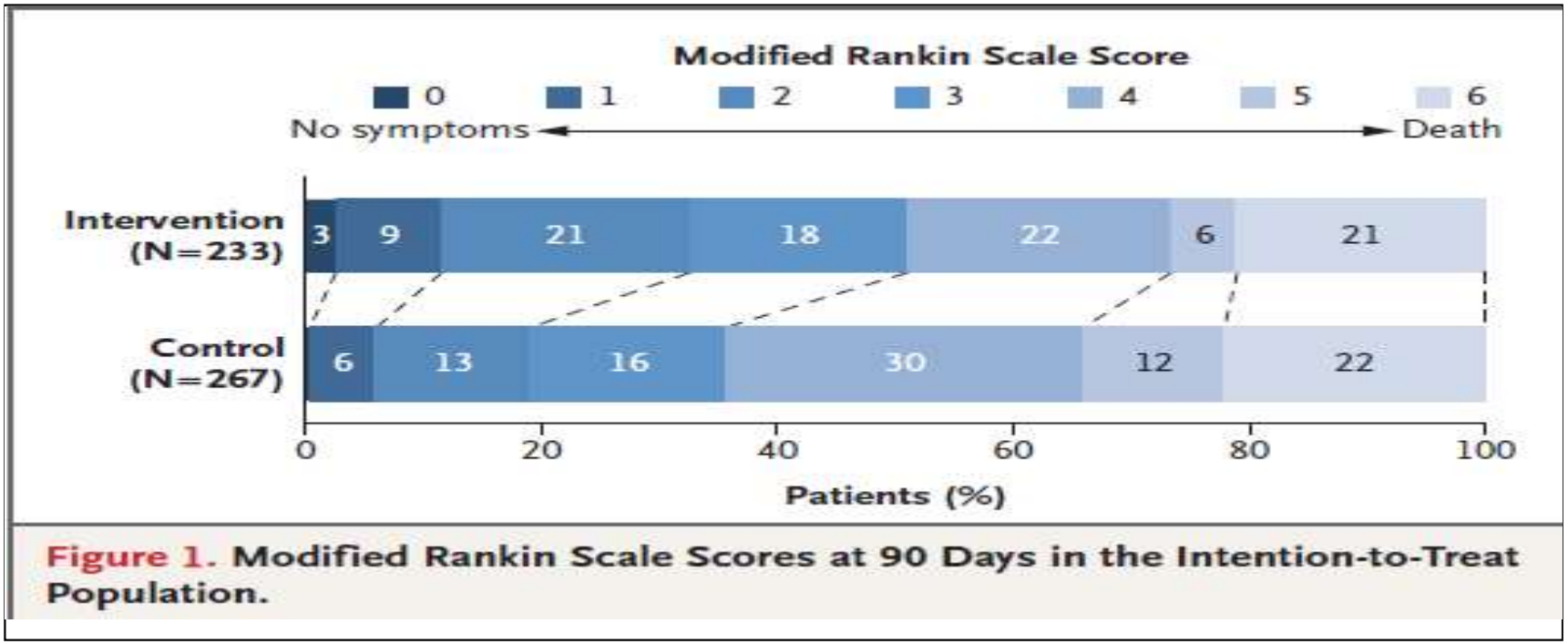


Figure 1. Modified Rankin Scale Scores at 90 Days in the Intention-to-Treat Population.

Berkhemer OA N Engl J Med. 2015;372:11-20.

HERMES Metaanalysis

Articles

Endovascular thrombectomy after large-vessel ischaemic stroke: a meta-analysis of individual patient data from five randomised trials

Mayank Goyal, Bijoy K Menon, Wim H van Zwam, Diederik W J Dippel, Peter J Mitchell, Andrew M Demchuk, Antoni Dávalos, Charles B L M Majoie, Aad van der Lugt, Maria A de Miquel, Geoffrey A Donnan, Yvo B W E M Roos, Alain Bonafe, Reza Jahan, Hans-Christoph Diener, Lucie A van den Berg, Elad I Levy, Olvert A Berkhemer, Vitor M Pereira, Jeremy Rempel, Mònica Millán, Stephen M Davis, Daniel Roy, John Thornton, Luis San Román, Marc Ribó, Debbie Beumer, Bruce Stouch, Scott Brown, Bruce C V Campbell, Robert J van Oostenbrugge, Jeffrey L Saver, Michael D Hill, Tudor G Jovin, for the HERMES collaborators

Lancet 2016; 387: 1723–31

	Intervention population (n=634)	Control population (n=653)
Demographic characteristics		
Median age (years)	68 (57–77)	68 (59–76)*
Men	330 (52%)	352 (54%)
Women	304 (48%)	301 (46%)
Past medical history		
Hypertension	352 (56%)	388 (59%)
Diabetes mellitus	82 (13%)	88 (13%)
Atrial fibrillation	209 (33%)	215 (33%)
Smoking (recent or current)	194 (31%)	210 (32%)
Clinical characteristics		
Baseline NIHSS score	17 (14–20))†	17 (13–21)‡
Baseline blood glucose (mmol/L)	6·6 (5·9–7·8)§	6·7 (5·9–7·8)¶
Imaging characteristics		
ASPECTS on baseline CT	9 (7–10)§	9 (8–10)¶
Intracranial occlusion location		
Internal carotid artery	133 (21%)	144 (22%)
M1 segment middle cerebral artery	439 (69%)	452 (69%)
M2 segment middle cerebral artery	51 (8%)	44 (7%)
Other	11 (2%)	13 (2%)
Treatment details and process times		
Treatment with intravenous alteplase	526 (83%)	569 (87%)
Treatment with intravenous alteplase documented within 180 min	442 (70%)	462 (71%)
Process times (min)		
Onset to randomisation	195·5 (142–260)‖	196 (142–270)*
Onset to intravenous alteplase	100 (75–133)**	100 (74–140)††
Onset to reperfusion	285 (210–362)	NA

Data are median (IQR), n (%), or mean (SD). NIHSS=National Institutes of Health Stroke Scale. ASPECTS=Alberta Stroke Program Early CT Score. *n=650. †n=631. ‡n=648. §n=620. ¶n=644. ‖n=632. **n=598. ††n=618.

Table 1: **Baseline characteristics in the pooled data**

HERMES Results

	Intervention population	Control population	Risk difference (%)	Rate ratio (95% CI)	Odds ratio (95% CI)
mRS score reduction (shift analysis; primary outcome)*	..	..	..	..	2·26* (1·67–3·06); p<0·0001
mRS score 0–1 at 90 days	26·9% (170/633)	12·9% (83/645)	14·0	2·00 (1·54–2·60); p<0·0001	2·49 (1·84–3·35); p<0·0001
mRS score 0–2 at 90 days	46·0% (291/633)	26·5% (171/645)	19·5	1·7 (1·41–2·05); p<0·0001	2·35 (1·85–2·98); p<0·0001

With or without rtPA

HERMES Safety

	Intervention population	Control population	Risk difference (%)	Rate ratio (95% CI)	Odds ratio (95% CI)
Symptomatic intracranial haemorrhage	4·4% (28/634)	4·3% (28/653)	0·1	1·06 (0·63–1·80); p=0·82	1·07 (0·62–1·83); p=0·81
Parenchymal haematoma type 2	5·1% (32/629)	5·3% (34/641)	−0·2	0·99 (0·61–1·61); p=0·97	0·99 (0·60–1·63); p=0·97
Mortality	15·3% (97/633)	18·9% (122/646)	−3·6	0·82 (0·63–1·07); p=0·15	0·77 (0·54–1·10); p=0·16

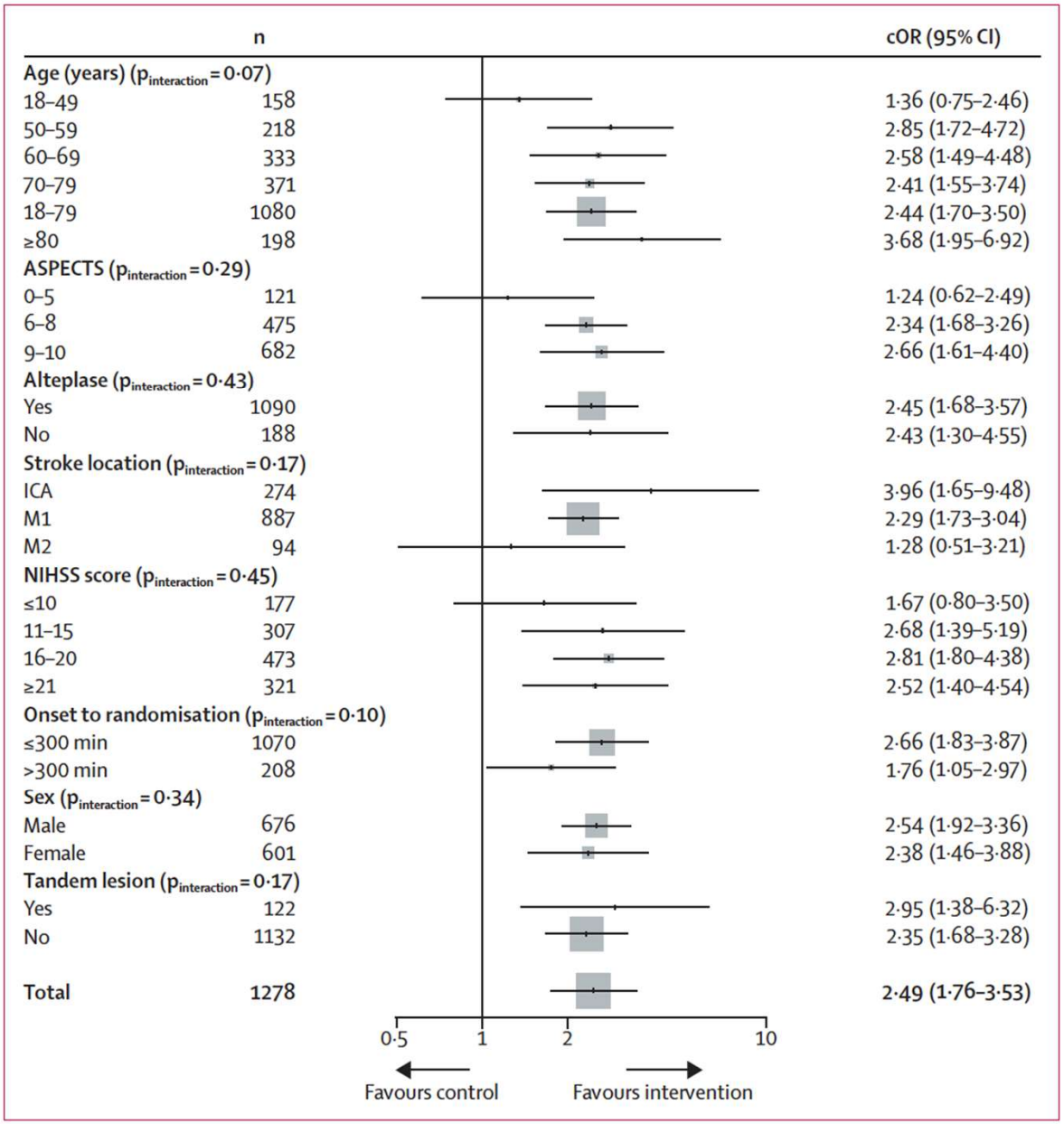
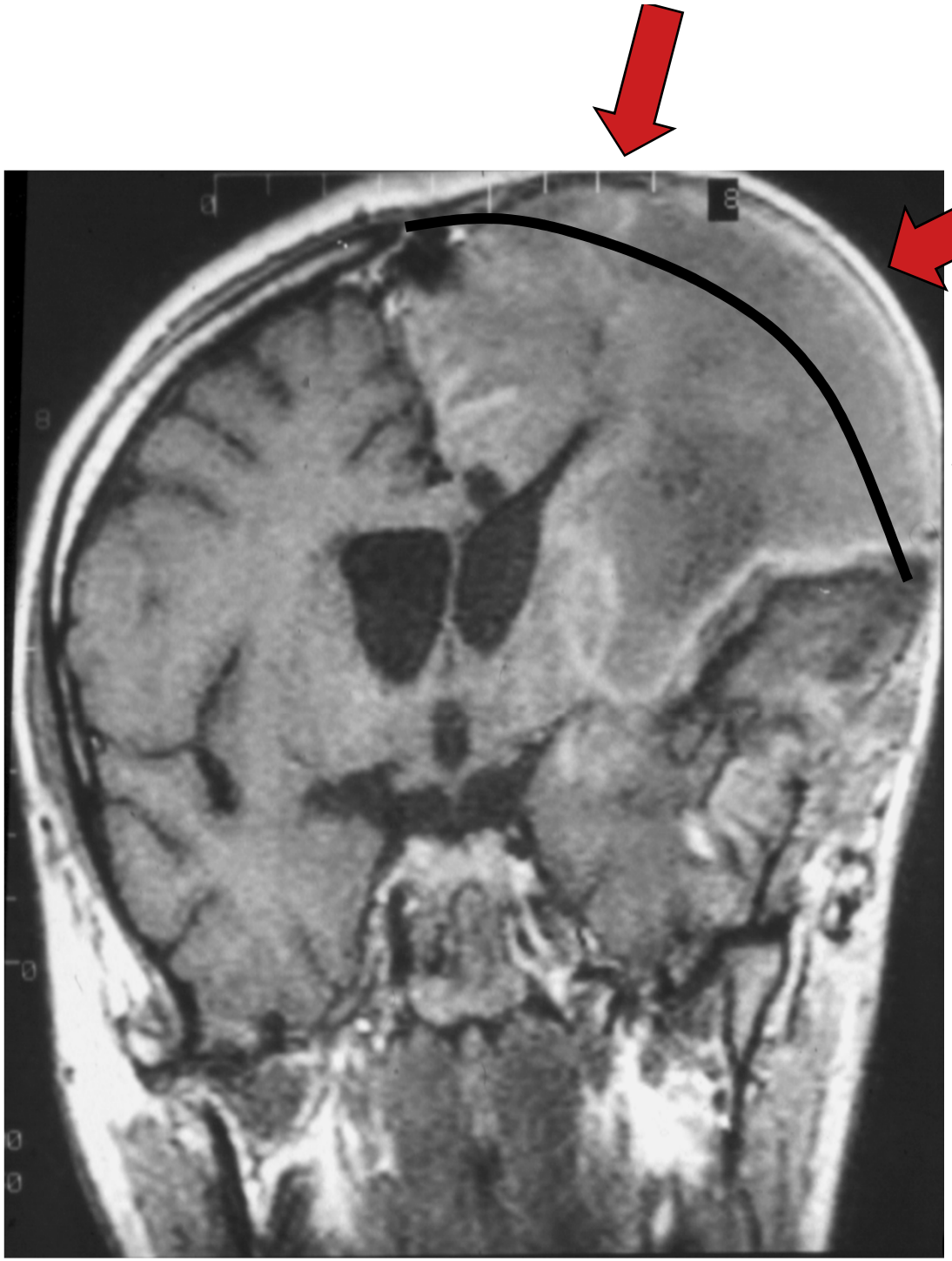


Figure 2: Forest plot showing adjusted treatment effect for mRS at 90 days in prespecified subgroups with p values for heterogeneity across subgroups

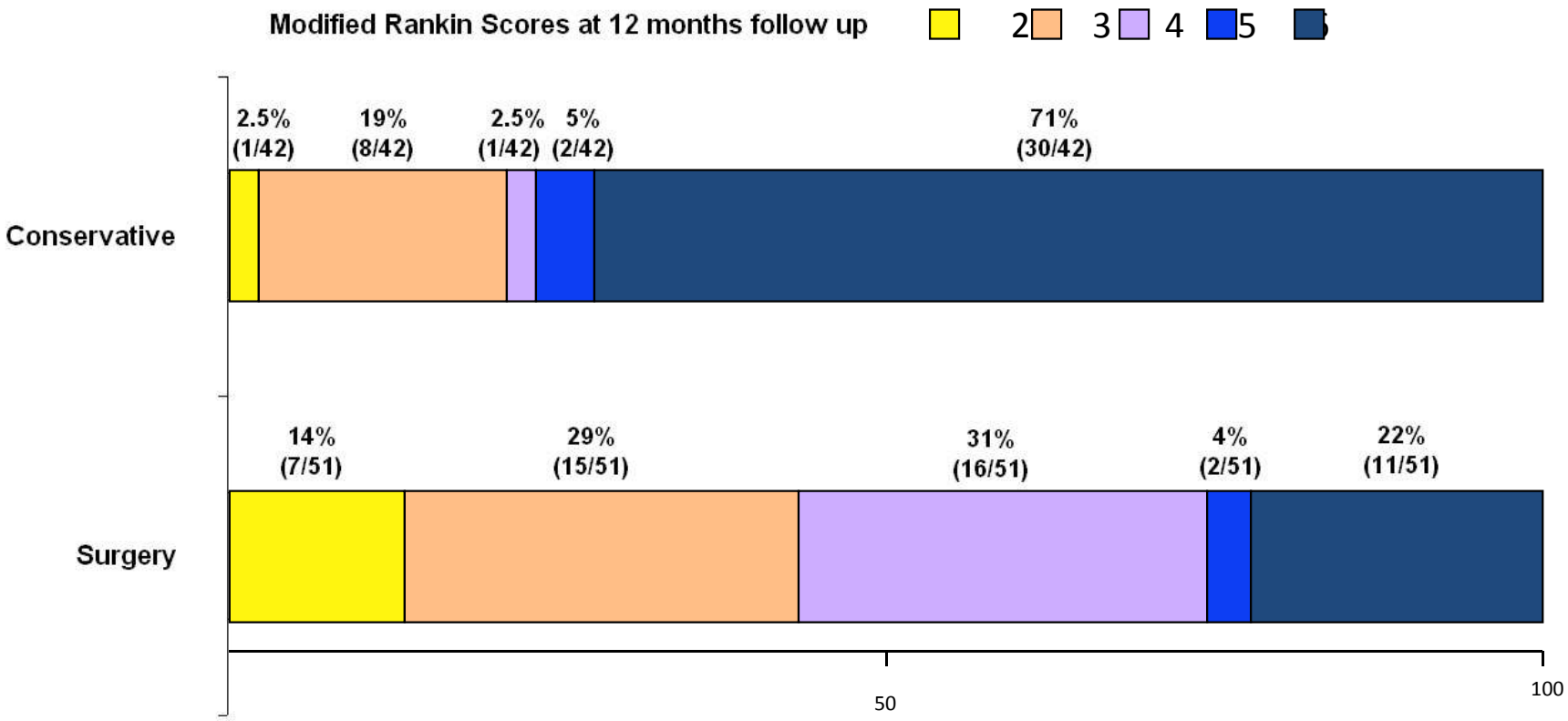


Additional volume

after MCA infarction and hemi-craniectomy

Courtesy, Prof. Hacke

Results: Distribution of Outcome



p for mRS distribution (shift analysis) <.001

World Stroke Organization

Diagnosis

Therapy

Complications

Mobilisation

Medical complications after stroke

Chest infection	Pulmonary embolism
Urinary tract infection	Myocardial infarction/angina
Fever	Cardiac heart failure
Pain	Cardiac arrest
Pressure sores	GI bleed
Falls	Urinary incontinence
Depression	Cognitive decline
Deep vein thrombosis	

modif, from Kumar S, Selim MH, Caplan LR: Medical complications after stroke. Lancet Neurol 2010; 9: 105-118

Complications following acute stroke within the first week

Neurological complications:

- increased intracranial pressure (7.6%)
- recurrent cerebral ischemia (5.1%)

Medical complications

- fever >38 degrees C (13.2%),
- severe arterial hypertension (7.5%)
- pneumonia (7.4%)

Weimar C et al. Eur Neurol. 2002;48(3):133-40

Stroke unit care

"Stroke patients who receive organised inpatient care in a stroke unit are more likely to be alive, independent, and living at home one year after the stroke. The benefits were most apparent in units based in a discrete ward. No systematic increase was observed in the length of inpatient stay."

Cochrane Database Syst Rev. 2007 Oct 17;(4):CD000197.

Acute stroke unit

Emergency Diagnostic Tests: assess risk of early, recurrent stroke

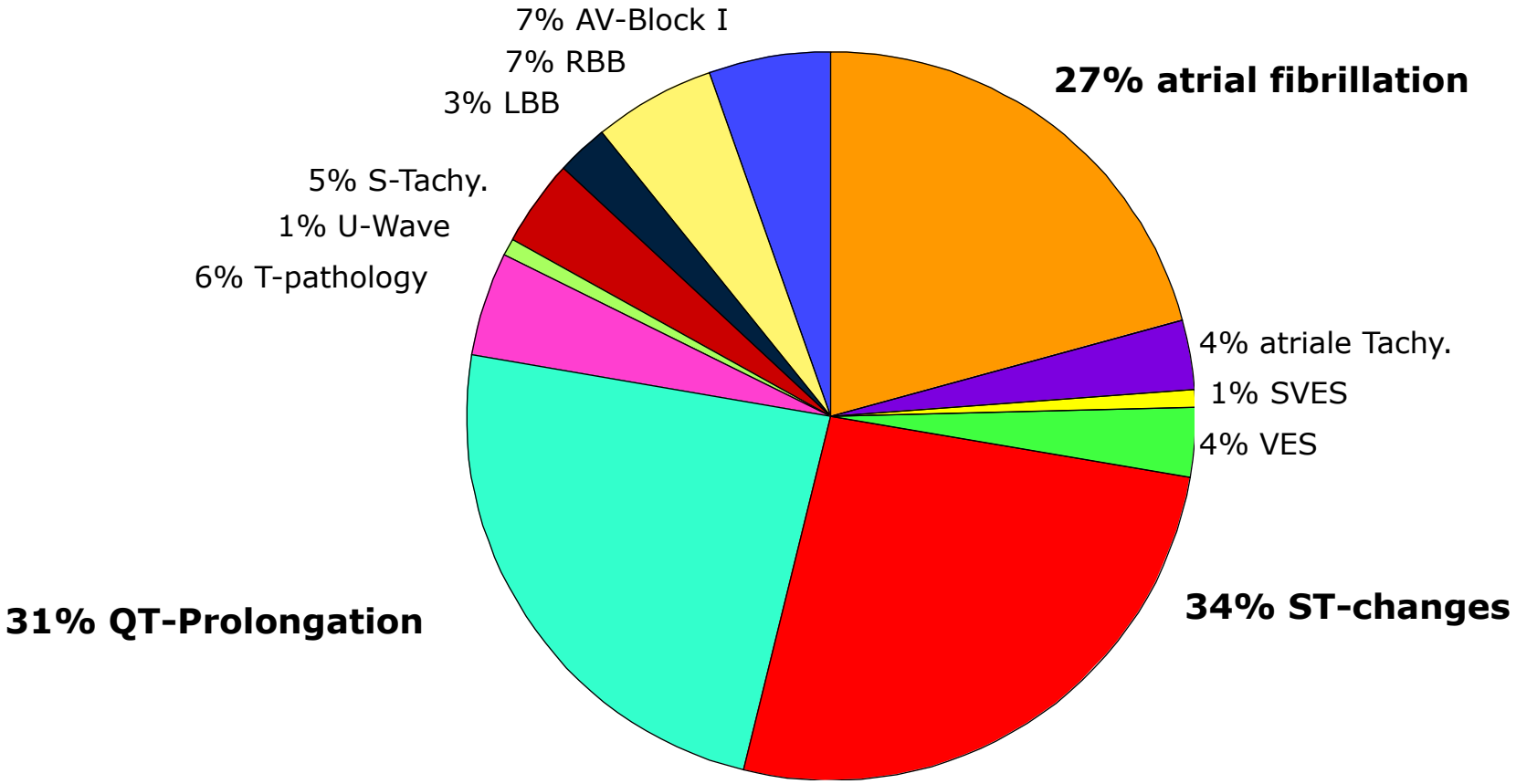
- Differentiate between different types of stroke
  - Assess the underlying cause of brain ischaemia
  - Assess prognosis
- Provide a basis for physiological monitoring of the stroke patient
- Identify concurrent diseases or complications associated with stroke
- Rule out other brain diseases

Emergency Diagnostic Tests

- Electrocardiogram (ECG)
  - Cardiac abnormalities are common in acute stroke patients[1]
  - Arrhythmias may induce stroke, stroke may cause arrhythmias
  - Holter monitoring is superior to routine ECG for the detection of atrial fibrillation (AF)[2]

1: Christensen H et al. Neurol Sci (2005) 234:99 –103
2: Gunalp M et al. Adv Ther (2006) 23:854-60

ECG changes in acute stroke:
69% prevalence



Tatschl C et al. Cerebrovasc Dis 2005; 21: 47-53

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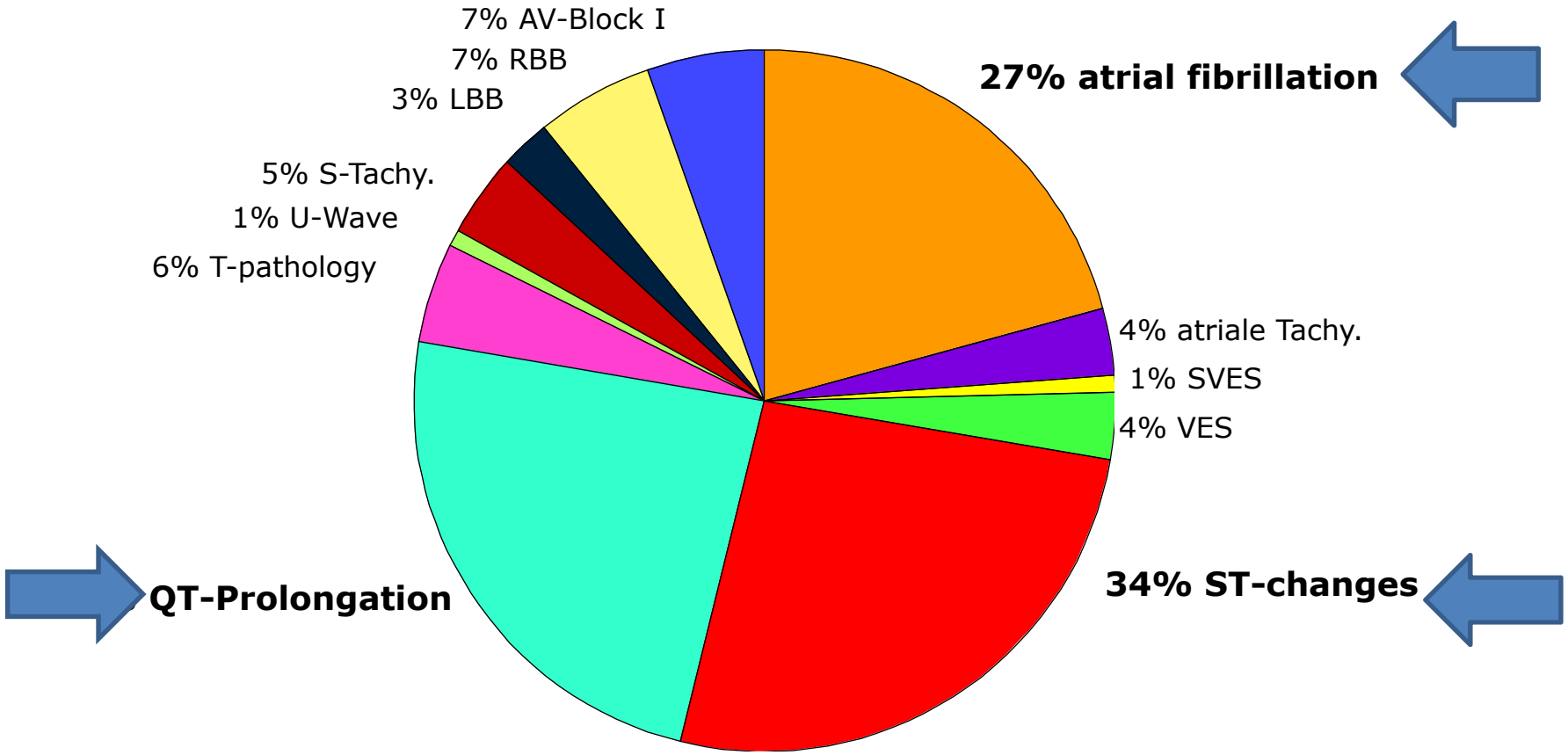


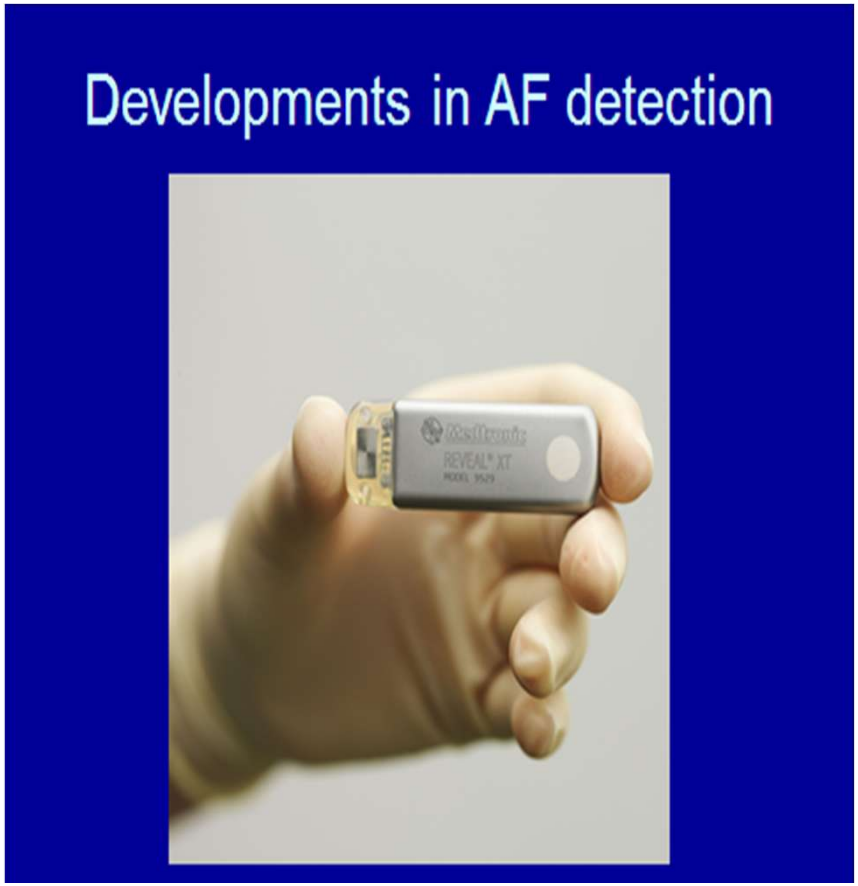
Tatschl C et al. Cerebrovasc Dis 2005; 21: 47-53

Atrial fibrillation (AF) - Etiology

- Hypertension
- Coronary heart disease
- Rheumatic
- Post myocarditis
- Valvular
- Lone AF
- AF with extracardiac causes
  - Hyperthyroidism
  - Respiratory tract infection
  - Reflux esophagitis

Paroxysmal AF (PAF)

- Detected in stroke patients by
  - Holter monitoring during 24-72 hours in 4.6%
  - 4-7 days loop-recording in additional 6-8%
  - 7 days event-recording in 14%
  - Holter and serial ECGs within 3 days in 14%
- 25% detection rate by combining different monitoring methods.*[Sposato 2015]*



QT prolongation

- Potentially leading to torsades des pointes and ventricular fibrillation
- A variety of drugs may induce QT prolongation.
  - Psychotropics
  - Antibiotics
  - Antiallergics
  - Herbal drugs (ephedra, St. John‘s worth)……
- Actual information in www.torsades.org

(Stöllberger C, Int Clin Psychopharmacol 2005;20:243-51.)

Risk factors for QT-prolongation

- Increased age
- Female gender
- Elektrolyte-disturbances
  - Hypokalaemia,
  - Hypomagnesaemia
  - Hypocalzaemia
- Bradycardia
- Cardiovascular diseases
  - Cerebrovascular diseases,
  - Diabetes mellitus,
  - Coronary heart disease,
  - Heart failure,
  - Arterial hypertension
- Hypoglycaemia, hypothermia, hypothyroidism, obesity

(Tatschl C, Cerebrovasc Dis 2006;21:47-53.)

QT-prolongation: Therapy

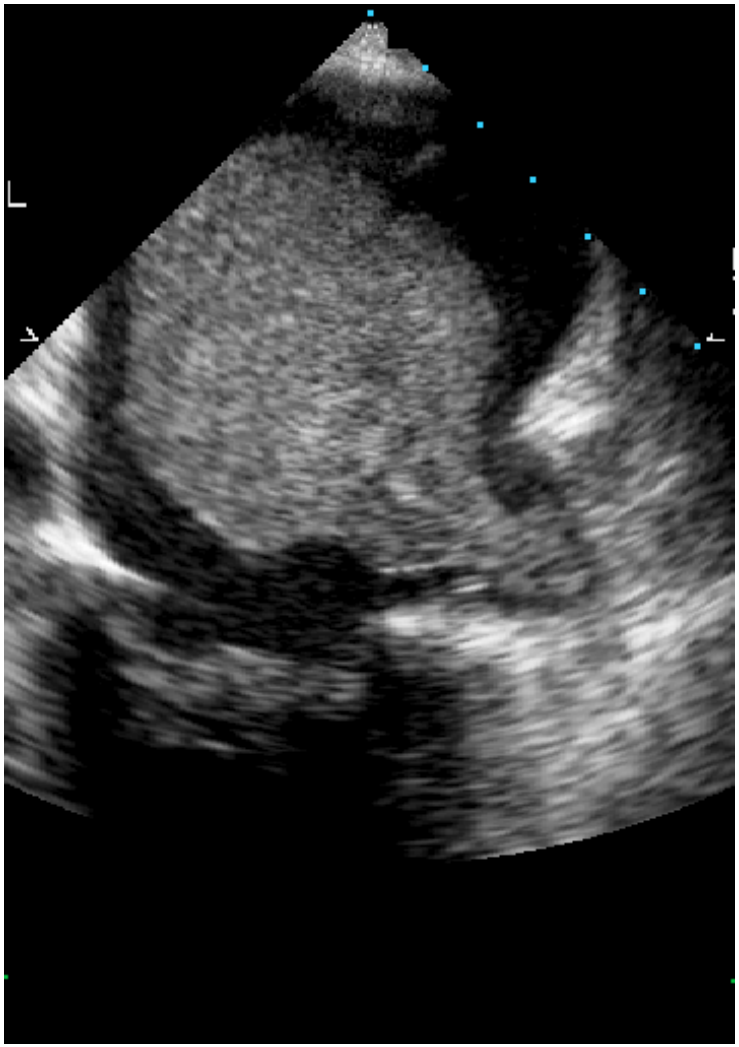
- Patient should be monitored!
- Heart rate should be >60/min
  - Consider pacing when <60/min
- Assess serum potassium level
  - Target value: >4.0 mmol/l
- Assess comedication
- Therapeutic option: Magnesium iv.

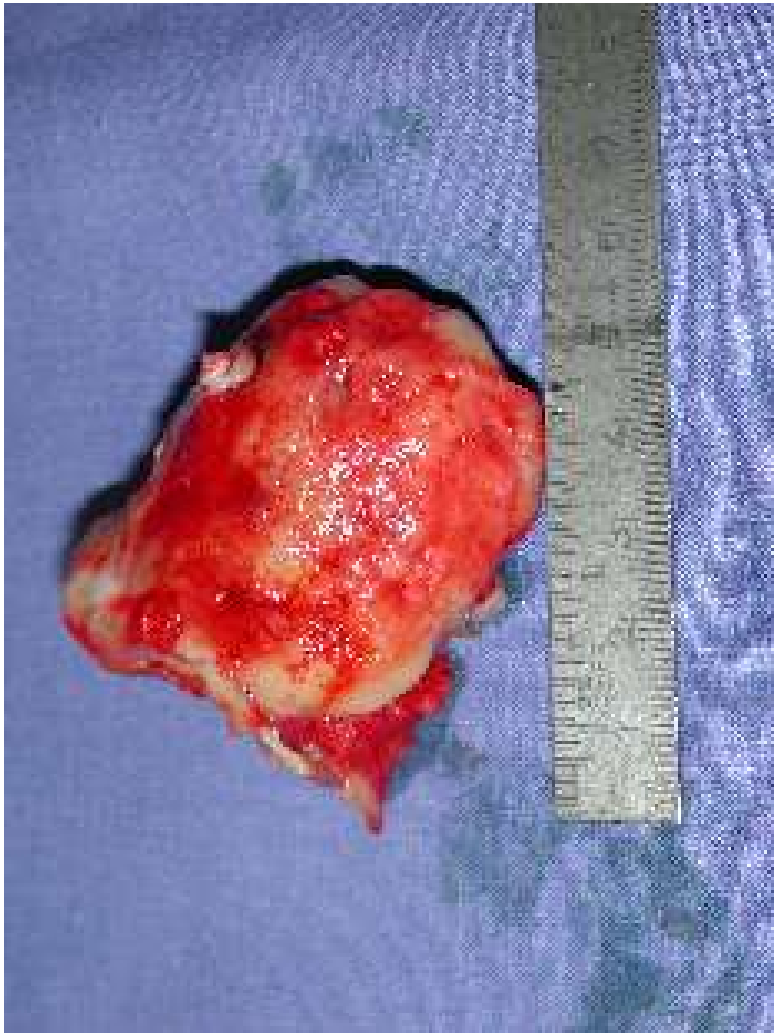
Emergency Diagnostic Tests

- Echocardiography (TTE / TOE)
  - Echocardiography can detect many potential causes of stroke[1]
  - It is particularly required in patients with history of cardiac disease, ECG pathologies, suspected source of embolism, suspected aortic disease, suspected paradoxical embolism
  - Transoesophageal echocardiography (TOE) might be superior to transthoracic echocardiography (TTE) for the detection of potential cardiac sources of embolism[2]

1: Lerakis S et al. Am J Med Sci (2005) 329:310-6
2: de Bruijn SF et al. Stroke (2006) 37:2531-4

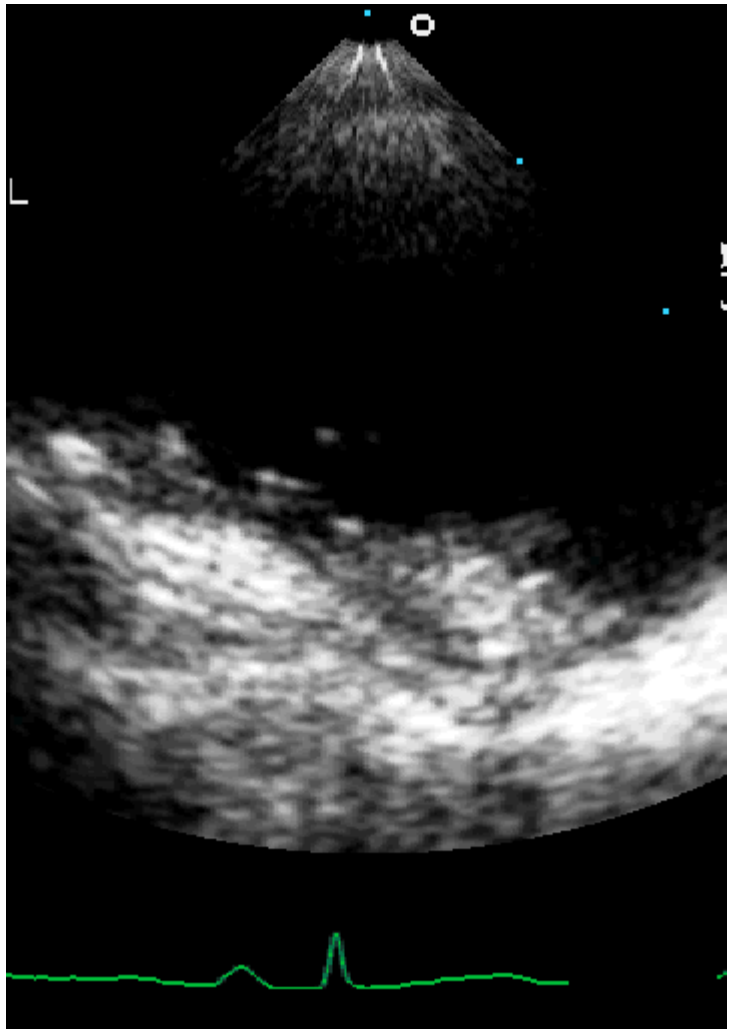
Atrial fibrillation - LAAT



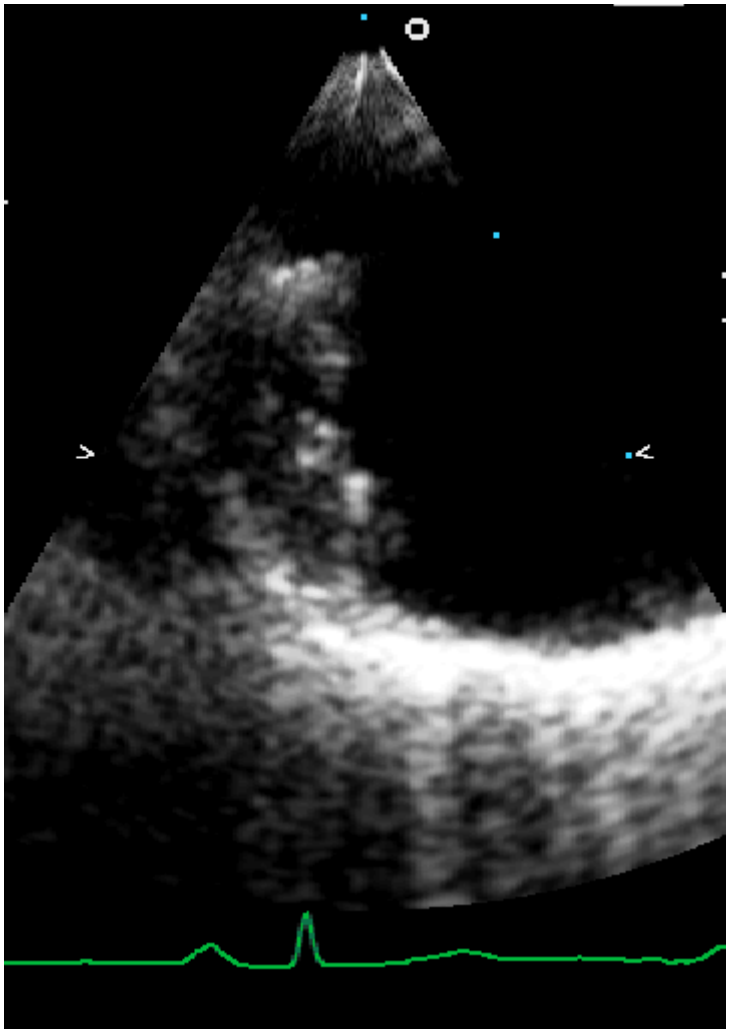


Courtesy Claudia Stoellberger MD

Aortic arch atheroma



exulcerated plaque



complex plaque >4mm

Courtesy Claudia Stoellberger MD

Takotsubo Syndrome: stress following acute stroke

A characteristic cardiomyopathy with left ventricular apical ballooning can occur as a complication of haemorrhagic or ischaemic strokes.

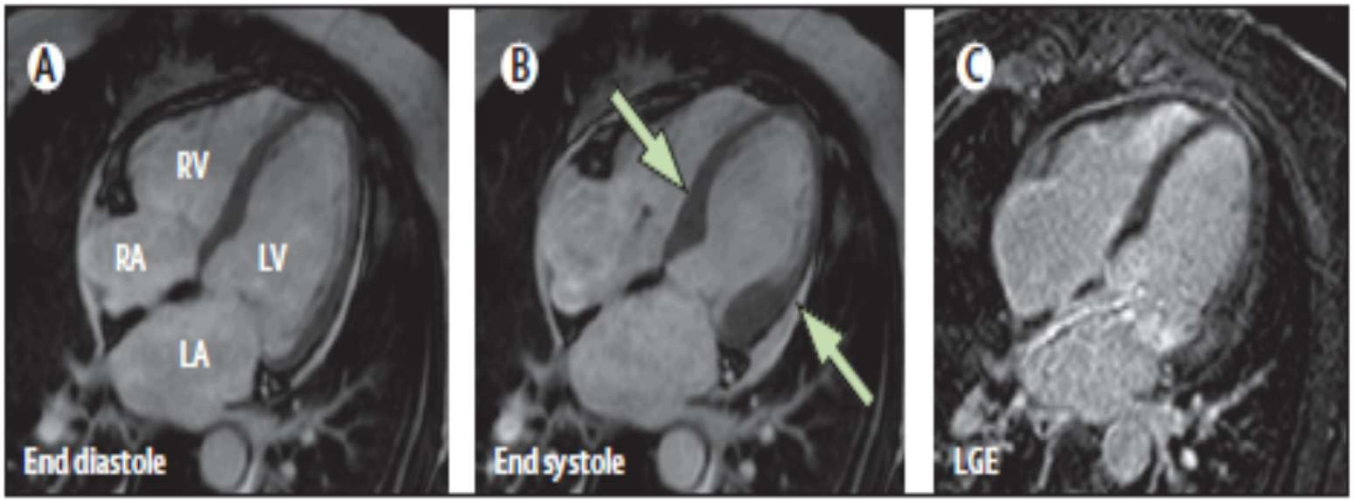


Figure 1: **Cardiac MRI of a patient with takotsubo syndrome (stress cardiomyopathy)**
(A) Steady-state free precession MRI shows the four chambers of the heart at the end of diastole. (B) Cardiac chambers at the end of systole are shown; the arrows point to the hinge point where the basal segment contracts, but the apical to mid-segments do not contract—a characteristic finding in takotsubo syndrome. (C) LGE phase of fat-saturated inversion recovery gradient echo sequence does not show any enhancement to indicate cardiac scarring. LA=left atrium. LGE=late gadolinium enhancement. LV=left ventricle. RA=right atrium. RV=right ventricle.

Incidence of takotsubo syndrome was 1.2% in consecutive patients within the first 2 weeks after an ischaemic stroke. Risk population: women, with strokes involving the insular region or with extensive brainstem.

S. Kumar et al. Lancet Neurol .

Recommendations for treatment of hypertension within the first 24-48 hours ctd.

- In patients **without** previous antihypertensive drugs, and
- SBP <180 mm Hg, and
- DBP <100 mm Hg
- no antihypertensive therapy,
- unless thrombolysis is indicated.

Recommendations for treatment of hypertension within the first 24-48 hours ctd.

- In patients **with** previous oral antihypertensive therapy
- antihypertensive therapy should be given
- to avoid rebound hypertension.
- Aim is to maintain a
- SBP <180
- DBP <100 mm Hg.

(Klijn CJ, Lancet Neurol 2003;2:698-701)

Emergency Diagnostic Tests

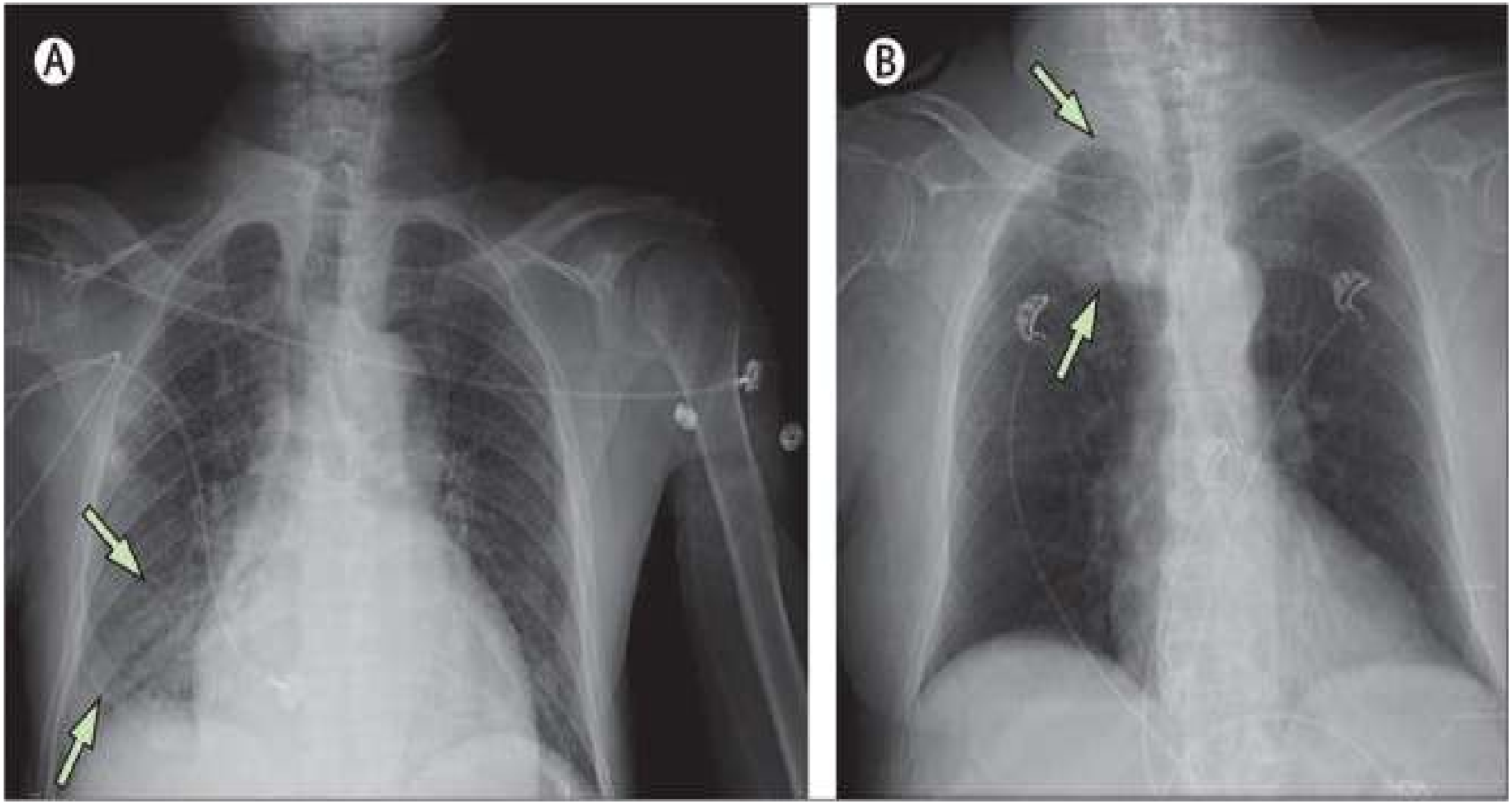
- Laboratory tests
  - Haematology (RBC, WBC, platelet count)
  - Basic clotting parameters
  - Electrolytes
  - Renal and hepatic chemistry
  - Blood Glucose
  - CRP, sedimentation rate

Hyperthermia and stroke

- Hyperthermia is associated with a poor clinical outcome.
- The later the hyperthermia occurs within the first week, the worse the prognosis.
- Severity of stroke and inflammation are important determinants of hyperthermia after ischemic stroke.

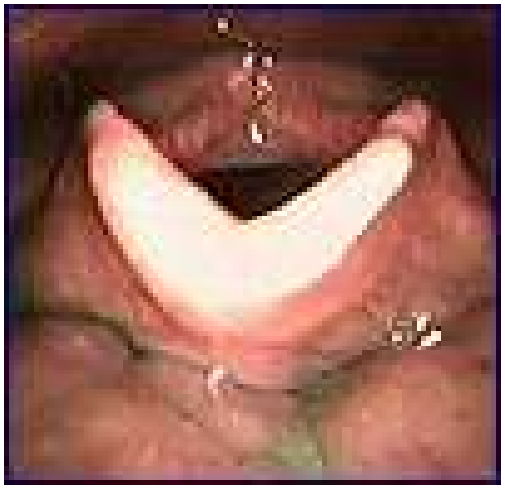
Saini M, Saqqur M, Kamruzzaman A, Lees KR, Shuaib A;
on behalf of the VISTA Investigators. Effect of hyperthermia on prognosis after scute ischemic stroke.
Stroke. 2009 Jul 30. [Epub ahead of print] PMID: 19644066

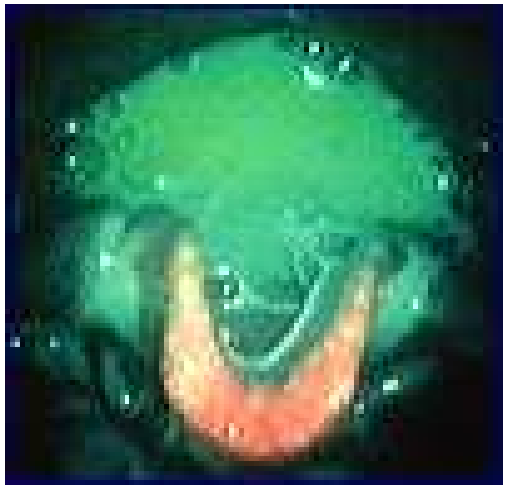
Pneumonia following stroke



Source: The Lancet Neurology 2010; 9:105-118 (DOI:10.1016/S1474-4422(09)70266-2)

Normal swallowing vs. aspiration





Pneumonia frequency in stroke patients with aspiration and no aspiration

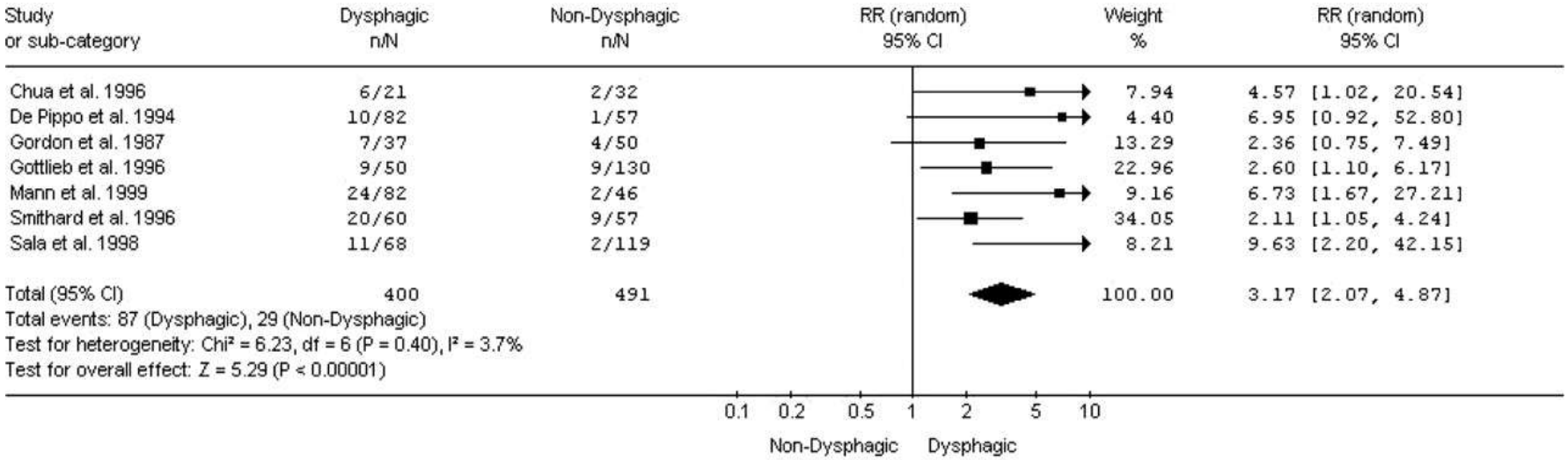
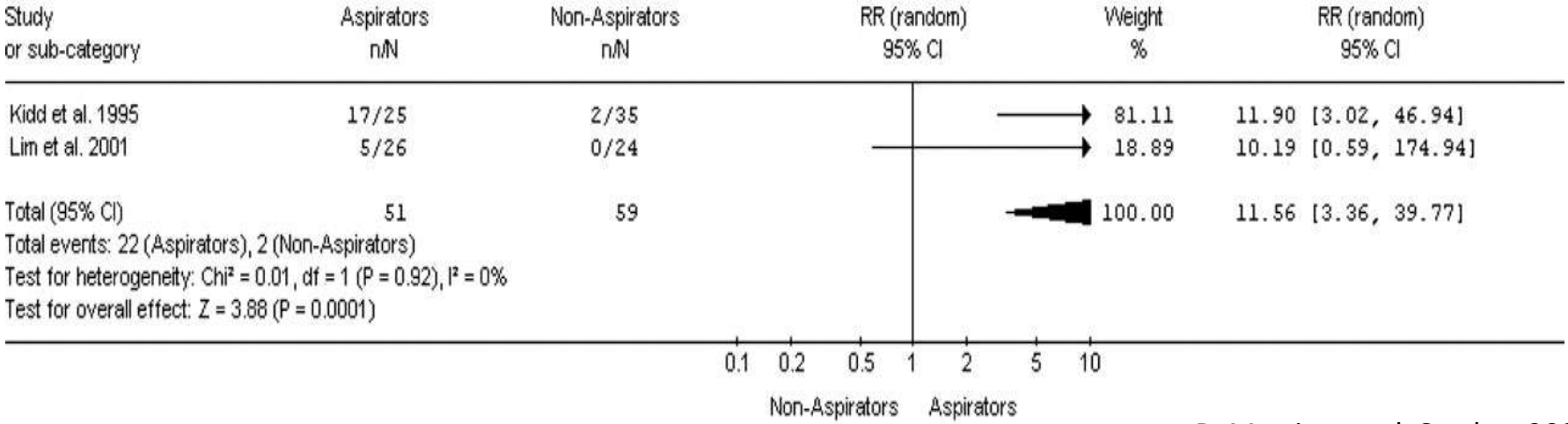


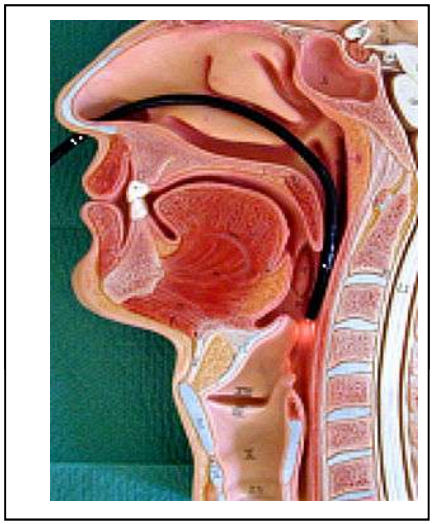
Figure 2. Pneumonia frequency in stroke patients with dysphagia and no dysphagia.

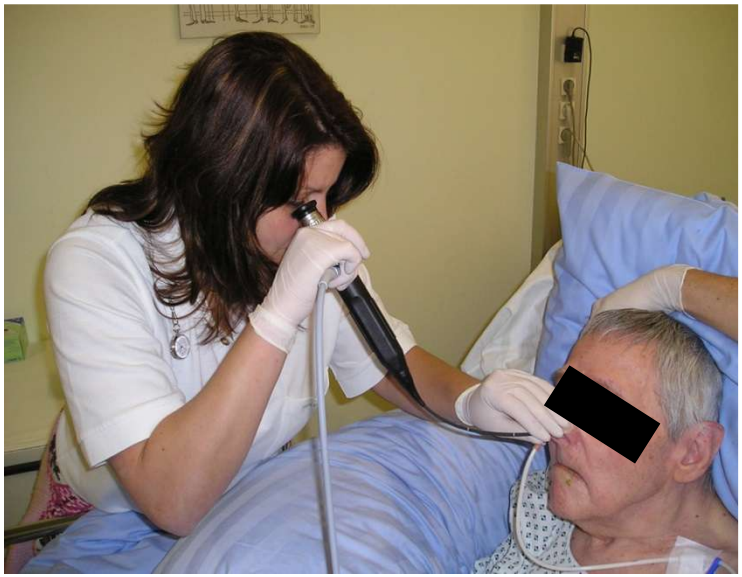


R. Martino et al. Stroke.. 2005;36: 63

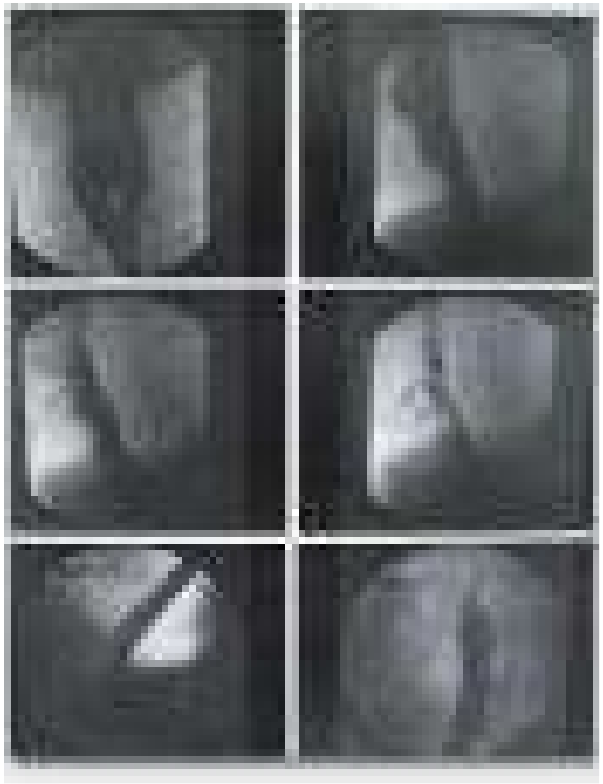
Management of Complications

- Systematic swallowing assessment is recommended
- Early commencement of nasogastric (NG) feeding (within 48 hours) is recommended in stroke patients with impaired swallowing
- Percutaneous enteral gastrostomy (PEG) feeding should not be considered in stroke patients in the first 2 weeks





- **DIAGNOSIS**
- Bedside Screening
- VFS (Videofluoroskopy)
- FEES (Fiberoptic endoscopic evaluation of swallowing)



GUSS

(Gugging Swallowing Screen)[1]

2. Direct Swallowing Test

(Material: Aqua bi, flat teaspoon, food thickener, bread)

In the following order:	1 →	2 →	3 →
	SEMISOLID*	**LIQUID****	**SOLID *** **
DEGLUTITION:			
▪ Swallowing not possible	0 ☐	0 ☐	0 ☐
▪ Swallowing delayed *(> 2 sec.) (Solid textures > 10 sec.)*	1 ☐	1 ☐	1 ☐
▪ Swallowing successful	2 ☐	2 ☐	2 ☐
COUGH (involuntary): *(before, during or after swallowing – until 3 minutes later)*			
▪ Yes	0 ☐	0 ☐	0 ☐
▪ No	1 ☐	1 ☐	1 ☐
DROOLING:			
▪ Yes	0 ☐	0 ☐	0 ☐
▪ No	1 ☐	1 ☐	1 ☐
VOICE CHANGE: *(listen tot he voice before and after swalloing- patient should speak „Oh")*			
▪ Yes	0 ☐	0 ☐	0 ☐
▪ No	1 ☐	1 ☐	1 ☐
SUM:	(5)	(5)	(5)
	1 – 4 = Investigate further[2] 5 = Continue „LIQUID"	**1 – 4** = Investigate further[2] 5 = Continue „SOLID"	**1 – 4** = Investigate further[2] 5 = NORMAL

[1]**The Gugging Swallowing Screen.** *Stroke.* 2007;38:2948 Michaela Trapl, SLT, MSc; Paul Enderle, MD, MSc; Monika Nowotny, MD; Yvonne Teuschl, PhD; Karl Matz, MD; Alexandra Dachenhausen, PhD Michael Brainin, MD

Pulmonary embolism

Data from a pooled analysis of 16 trials involving 23 043 patients showed that high-dose UFH (≥15 000 IU per day) reduced the incidence of pulmonary embolism but led to an increased risk of intracranial haemorrhages , whereas low-dose UFH (<15 000 IU) decreased the risk of DVTs but had no effect on pulmonary embolism or the risk of haemorrhage .

Table 2 Relative risk of deep-vein thrombosis, pulmonary embolism, intracranial hemorrhage and extracranial hemorrhage associated with prophylaxis of low-dose or high-dose unfractionated heparin or low-molecular-weight heparin compared to no prophylaxis after acute ischemic stroke

	DVT		PE		ICH		ECH	
	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
Low-dose UFH	0.17	0.11–0.26	0.83	0.53–1.31	1.67	0.97–2.87	1.58	0.89–2.81
High-dose UFH	No studies		0.49	0.29–0.83	3.86	2.41–6.19	4.74	2.88–7.78
Low-dose LMWH	0.34	0.19–0.59	0.36	0.15–0.87	1.39	0.53–3.67	1.44	0.13–16
High-dose LMWH	0.07	0.02–0.29	0.44	0.18–1.11	2.01	1.02–3.96	1.78	0.99–3.17

DVT = deep-vein thrombosis; PE = pulmonary embolism; ICH = intracranial hemorrhage; ECH = extracranial hemorrhage; OR = odds ratio; CI = confidence interval.

Kamphuisen PW et al. Thromb Res. 2007;119:269-72

ESO Guidelines for prophylaxis for venous thromboembolism im immobile patients with acute ischemic stroke

- Intermittent compression stockings in immobile patients

  (QoE: Moderate, Strength of Recom: strong, no effect on major outcomes including symptomatic DVT and PE, but reduction of overall mortality)

- Prophylactic anticoagulation with low molecular weight heparin or heparinoid preferred over unfractionated heparin (5000 Units 2-3 times daily)

  (QoE: moderate SoR: weak, but LMWH have higher risk of extrcranial bleeding, higher drug costs and risk in elderly pts with poor renal function)

- Early mobilization, avoidance of dehydration, aspirin

Dennis M et al: European Stroke Journal 2016, 1:6-19

Medical complications after stroke

Chest infection	Prevent aspiration
Urinary tract infection	Mobilize early
Fever	Prevent aspiration
Pain	Mobilize early
Pressure sores	Mobilize early
Falls	Physiotherapy
Depression	Early recognition and Tx
Deep vein thrombosis	Compression stockings

Medical complications after stroke

Pulmonary embolism	Heparin and Mobilization
Myocardial infarction/angina	Assess cardiac risks
Cardiac heart failure	Reduce autonomic stress reaction
Cardiac arrest	Assess cardiac function
GI bleed	Assess bleeding risk
Urinary incontinence	Prevent stress, look for risks
	Train natural functions, specialist assessment

World Stroke Organization

Diagnosis

Therapy

Complications

Mobilisation

Advances in Neurorehabilitation

Promising areas:

- Drug therapy for motor recovery
- Body-weight support treadmill training
- Robotics
- Virtual reality
- Transcranial magnetic stimulation
- Early mobilization

Brainin M and Zorowitz R: Stroke 2013; 44:311-313

Simplified as a process, stroke rehabilitation involves

- assessment,
- goal-setting,
- intervention,
- reassessment

Langhorne P, Bernhardt J, Kwakkel G *Stroke rehabilitation. Lancet. 2011;377:1693–1702.*

Rehabilitation on a stroke unit

Stroke rehabilitation practice guidelines, update 2015
(Int J Stroke 2016)

Assessment components should include dysphagia, mood and cognition, mobility, functional assessment, temperature, nutrition, bowel and bladder function, skin breakdown, discharge planning, prevention therapies, venous thromboembolism
prophylaxis (Evidence Level B).

Rehabilitation on a stroke unit

Stroke rehabilitation practice guidelines, update 2015 (Int J Stroke 2016)

Mobilization is defined as ‘‘the process of getting a patient to move in the bed, sit up, stand, and eventually walk.’’

i. **All patients admitted to hospital with acute stroke should be assessed by rehabilitation professionals (Evidence Level A), ideally within the first 48 h of admission (Evidence Level C).**

ii. **Frequent, out-of-bed activity in the very early time frame (within 24 h of stroke onset) is not recommended (Evidence Level B). Mobilization may be reasonable for some patients with acute stroke in the very early time frame and clinical judgment should be used (Evidence Level C).**

Rehabilitation on a stroke unit

Stroke rehabilitation practice guidelines, update 2015 (Int J Stroke 2016)

iii. All patients admitted to hospital with acute stroke should start to be mobilized early (between 24 h and 48 h of stroke onset) if there are no contraindications (Evidence Level B). Contraindications to early mobilization include, but are not restricted to, patients who have had an arterial puncture for an interventional procedure, unstable medical conditions, low oxygen saturation and lower limb fracture or injury.