

Long-term outcomes after anoxic brain damage

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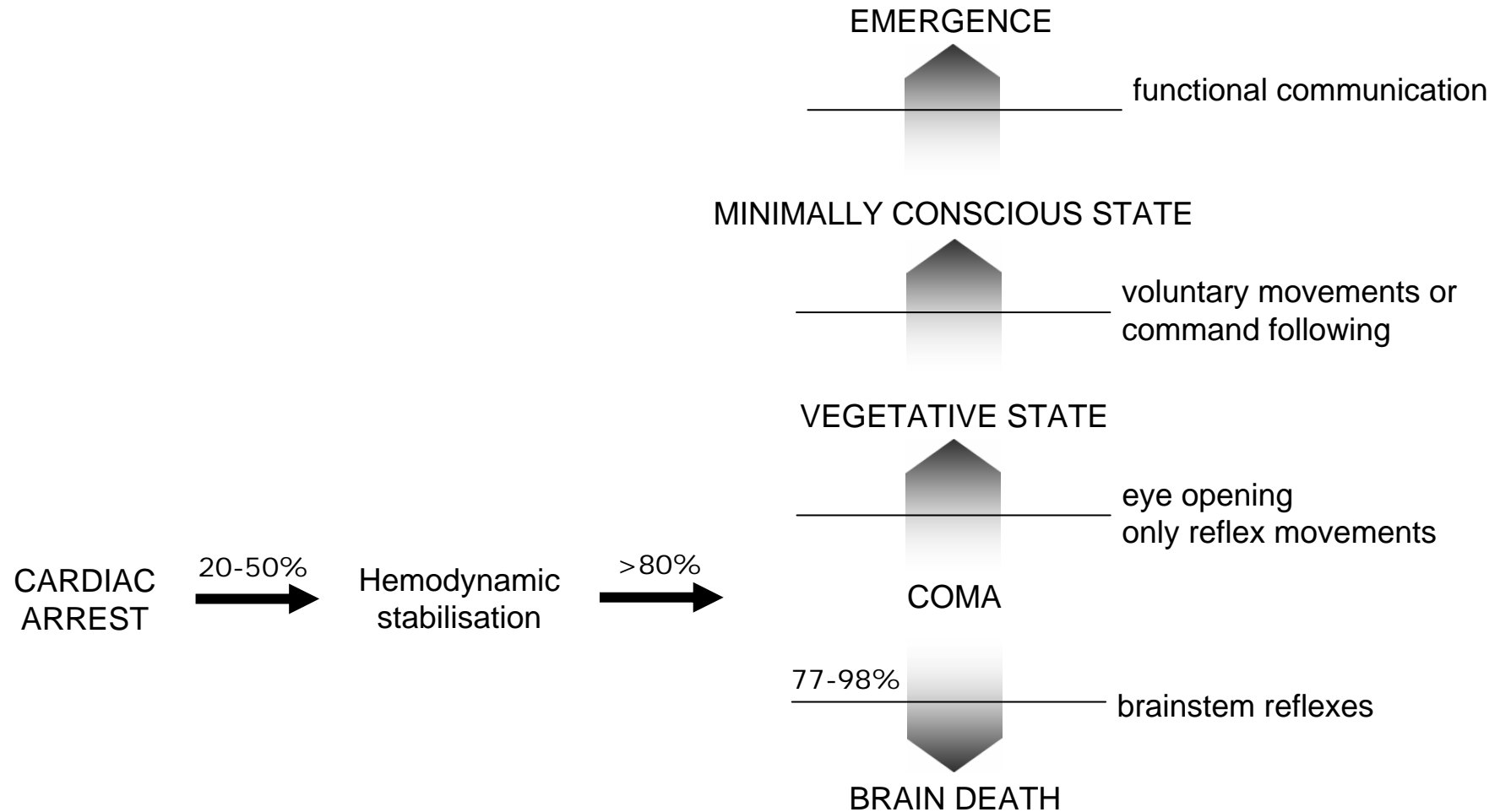


28th International Symposium
on Intensive Care
and Emergency Medicine



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Outcome after cardiac arrest



Clinical outcome markers



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Circumstances surrounding CPR

- Time between collapse and CPR > 5 min
(FPR 20%; 95% CI 14-25)
- Duration CPR > 20 min
(FPR 23%; 95% CI 17-29)
- Asystole or electro-mechanic dissociation versus ventricular fibrillation or tachycardia
(FPR 27 %; 95% CI 21-33)
- Cause of the cardiac arrest (cardiac vs noncardiac)

Rogove et al Crit Care Med 1995;23:18–25 (N=774; class I study)

Hyperthermia

- each °C > 37° (tympanic thermometry < 48h)
-> 2 x more likely to die or remain VS after 6m

Zeiner et al Arch Intern Med 2001;161:2007–2012 (class II study)

Clinical examination

- at 72 hours:
GCS motor score ≤ 2 or
absence of pupillary & corneal reflexes
(FPR 0%; 95% CI 0 to 3)
- Myoclonus status epilepticus (repetitive, generalized myoclonus;
not single seizures or sporadic focal myoclonus)
(FPR 0%; 95% CI 0 to 8.8)

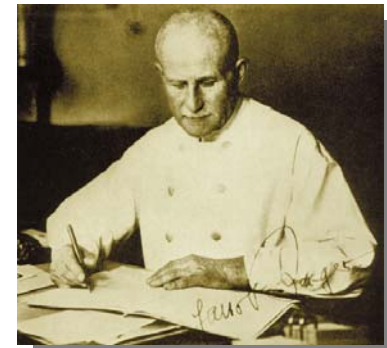
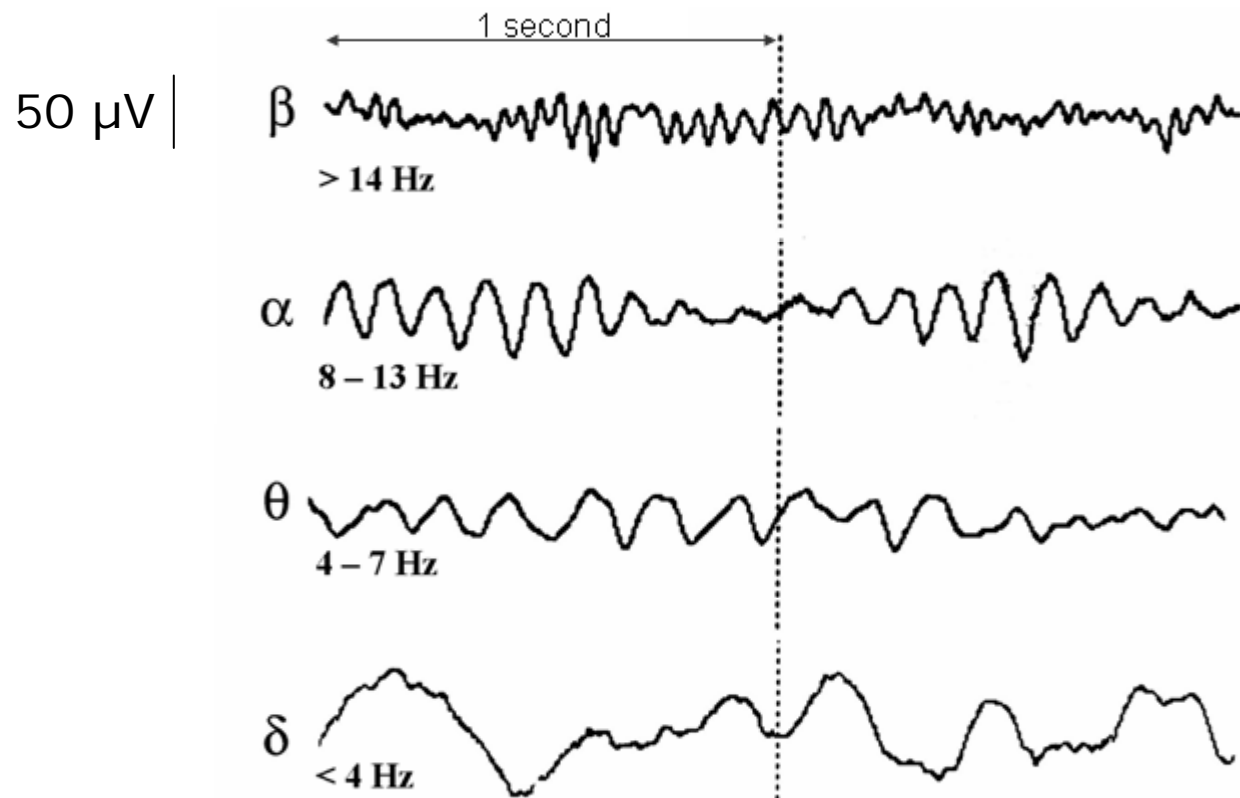
Wijdicks et al Neurology 2006
(analysis of 3 class I, 2 class II, 5 class III studies)

Electroencephalography



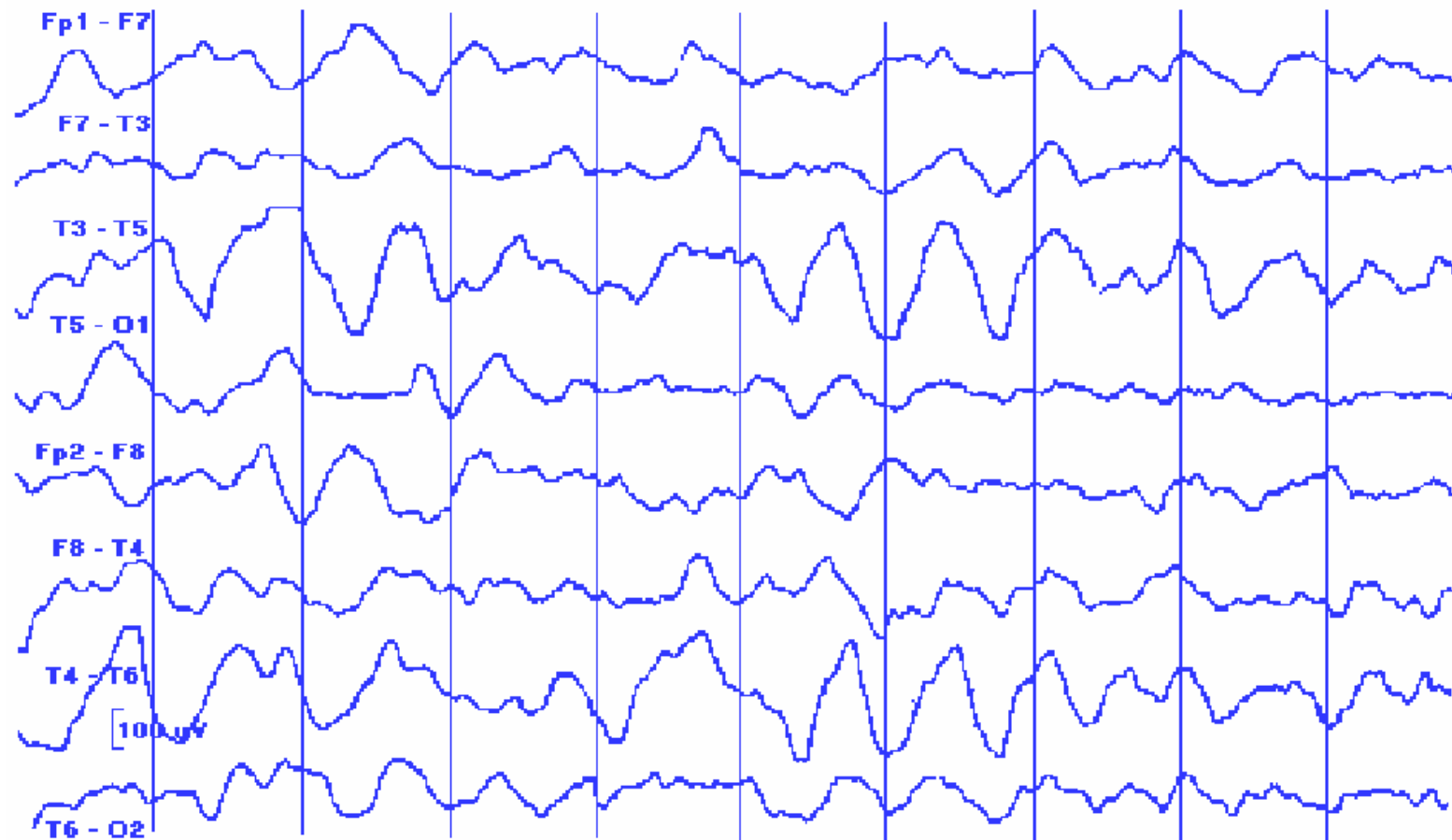
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Electroencephalography



1929 Hans Berger

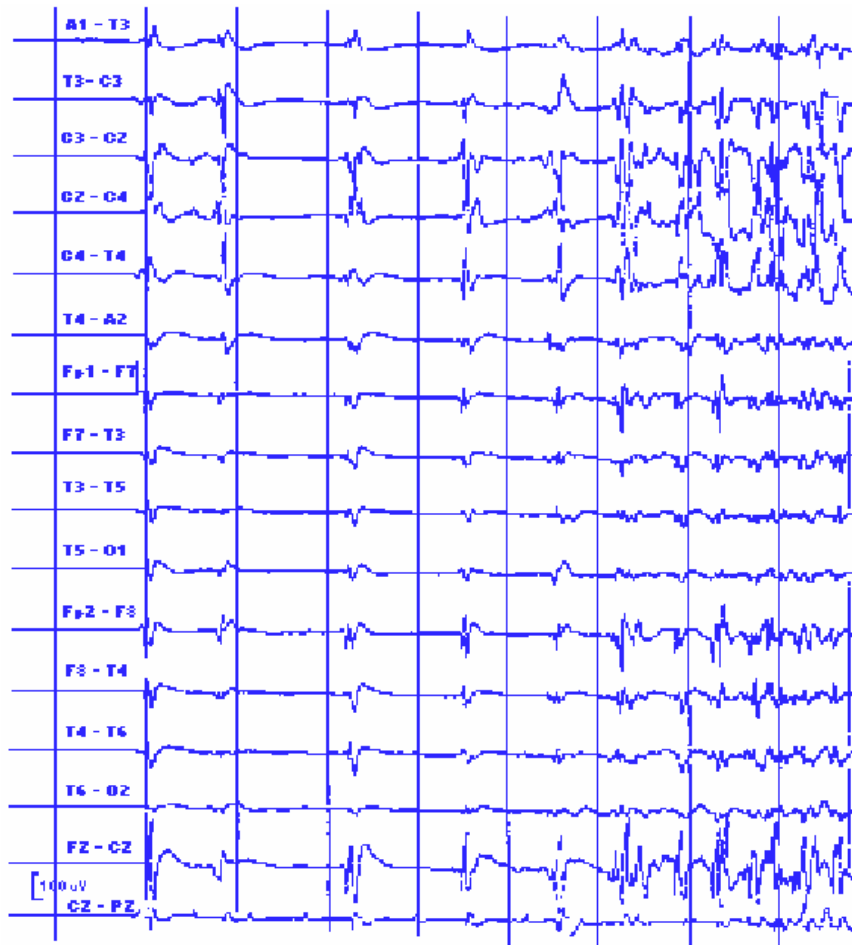
Generalized slowing baseline activity



Cerebral blood flow < 25 ml/100g/min

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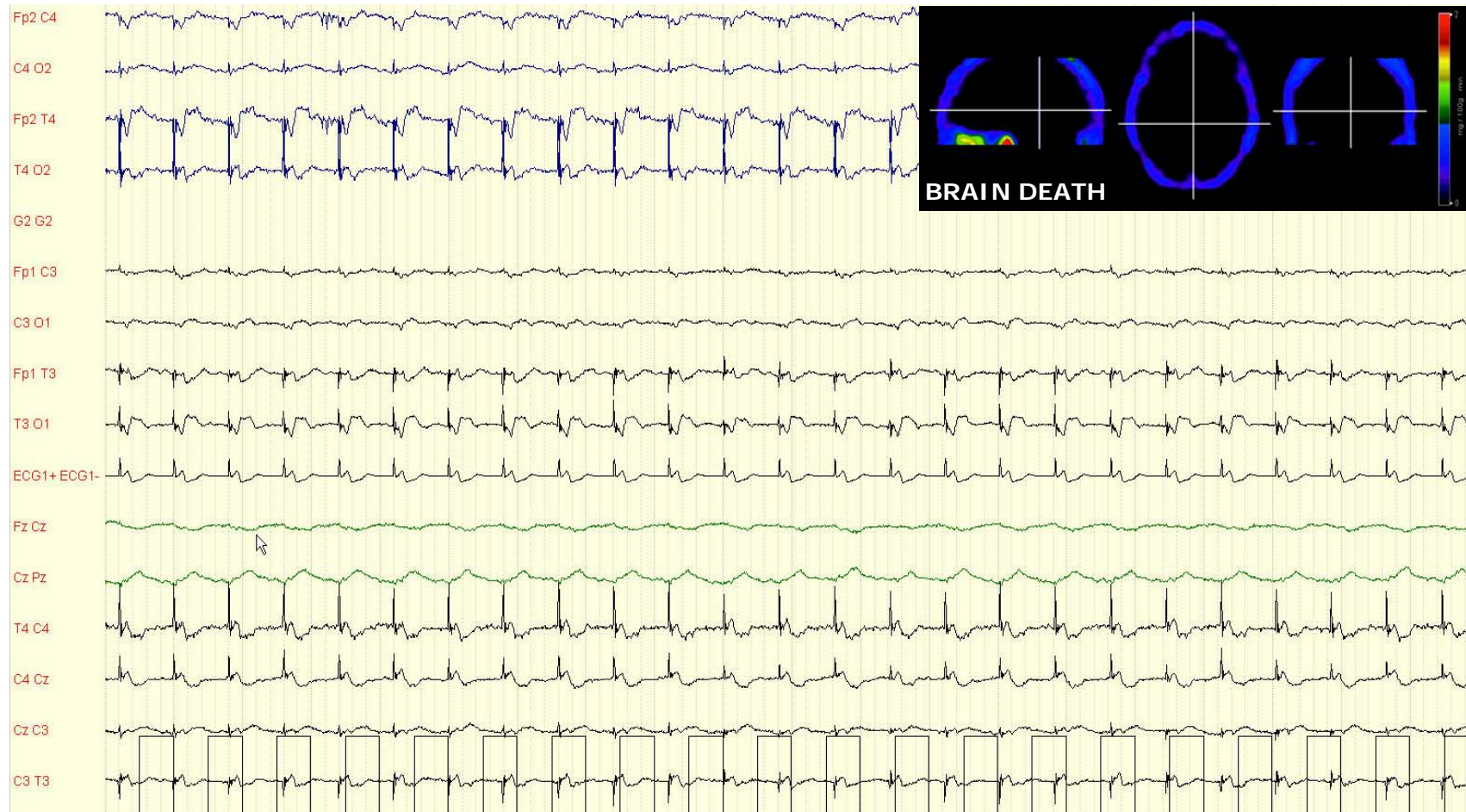
EEG: burst suppression



FPR = 3%,
95% CI: 0.9 à 11

Wijdicks et al 2006
1 class II 4 class III studies

EEG: isoelectrical



Cerebral blood flow < 15 ml/100g/min

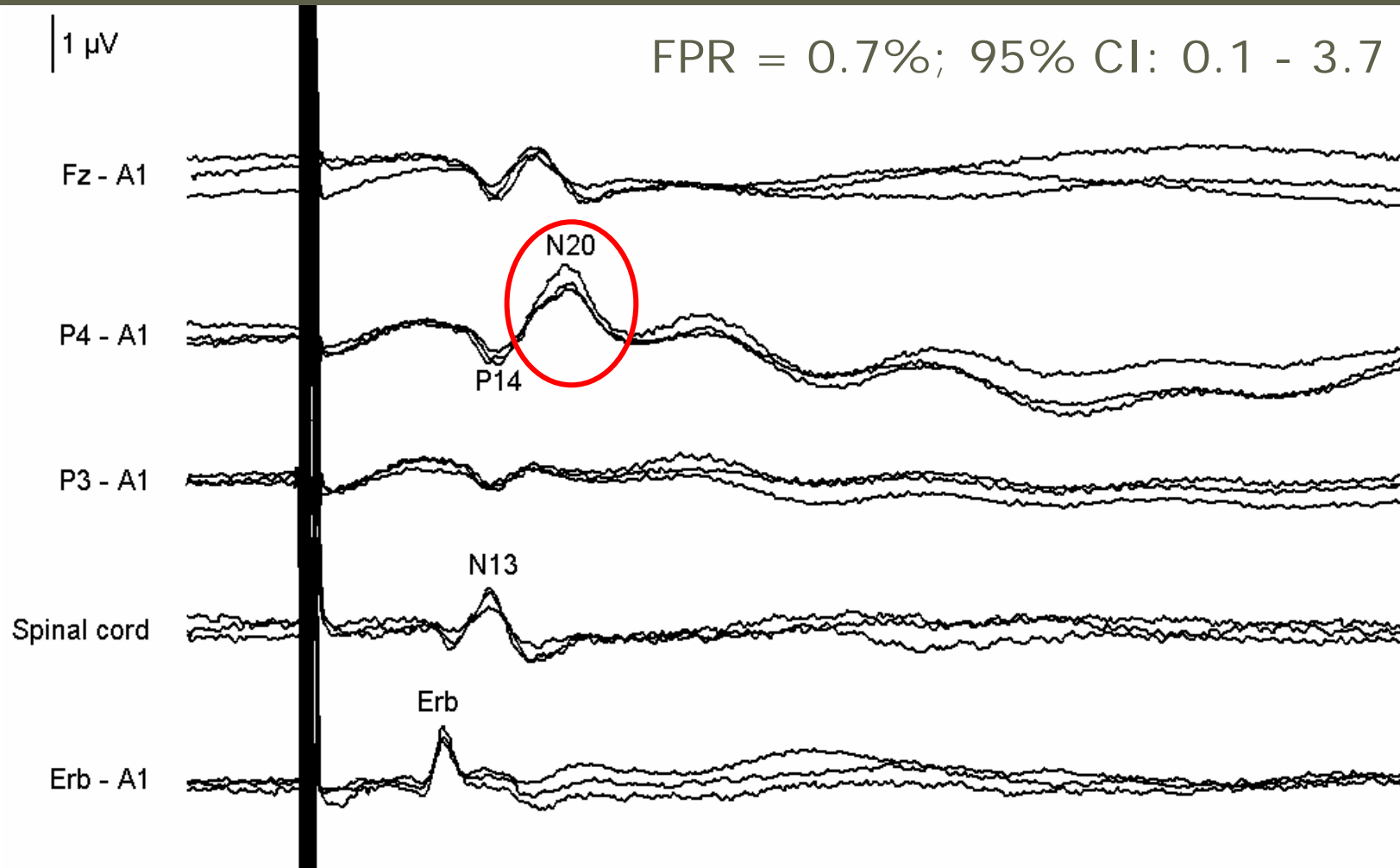
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Evoked potentials

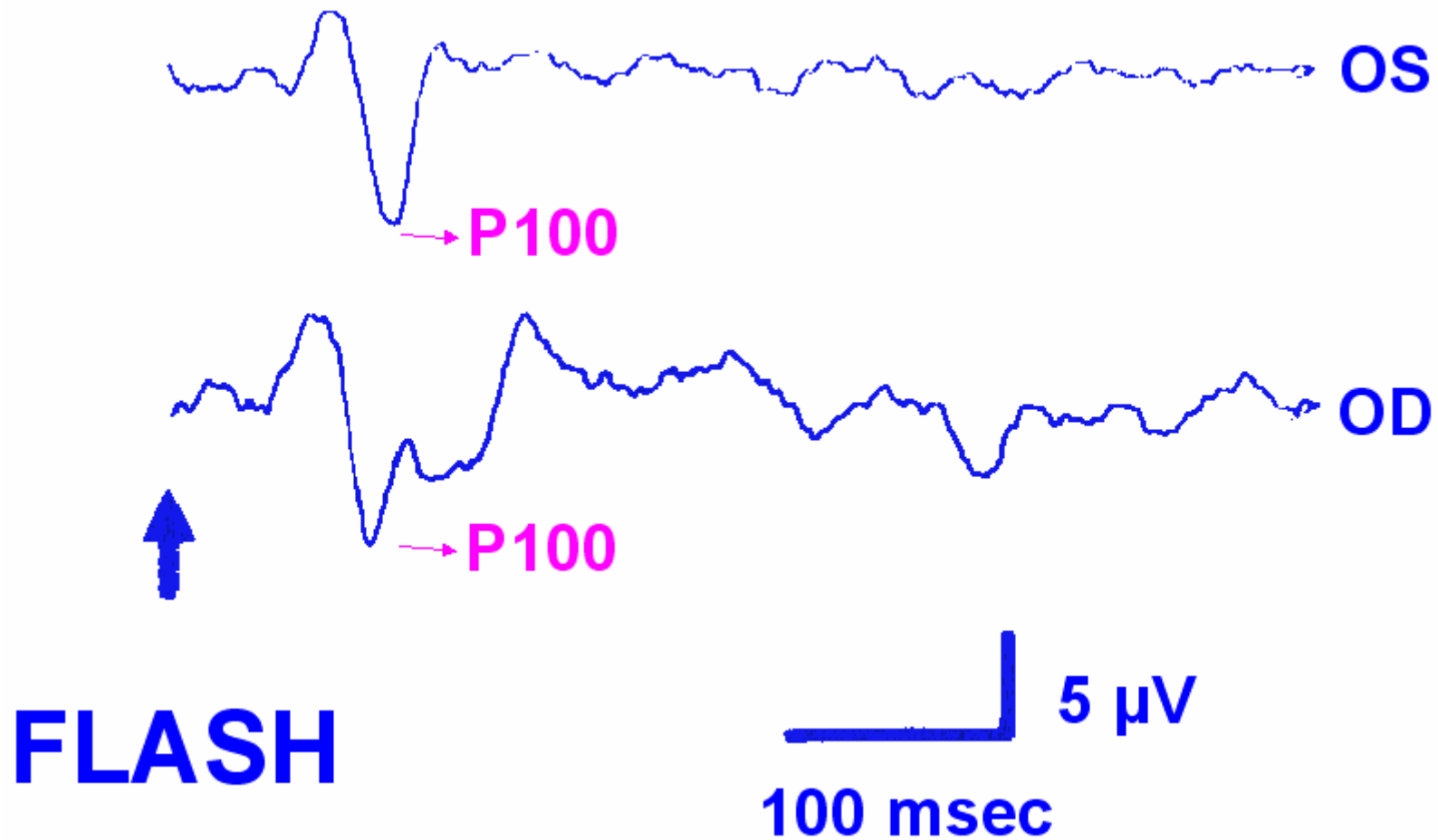


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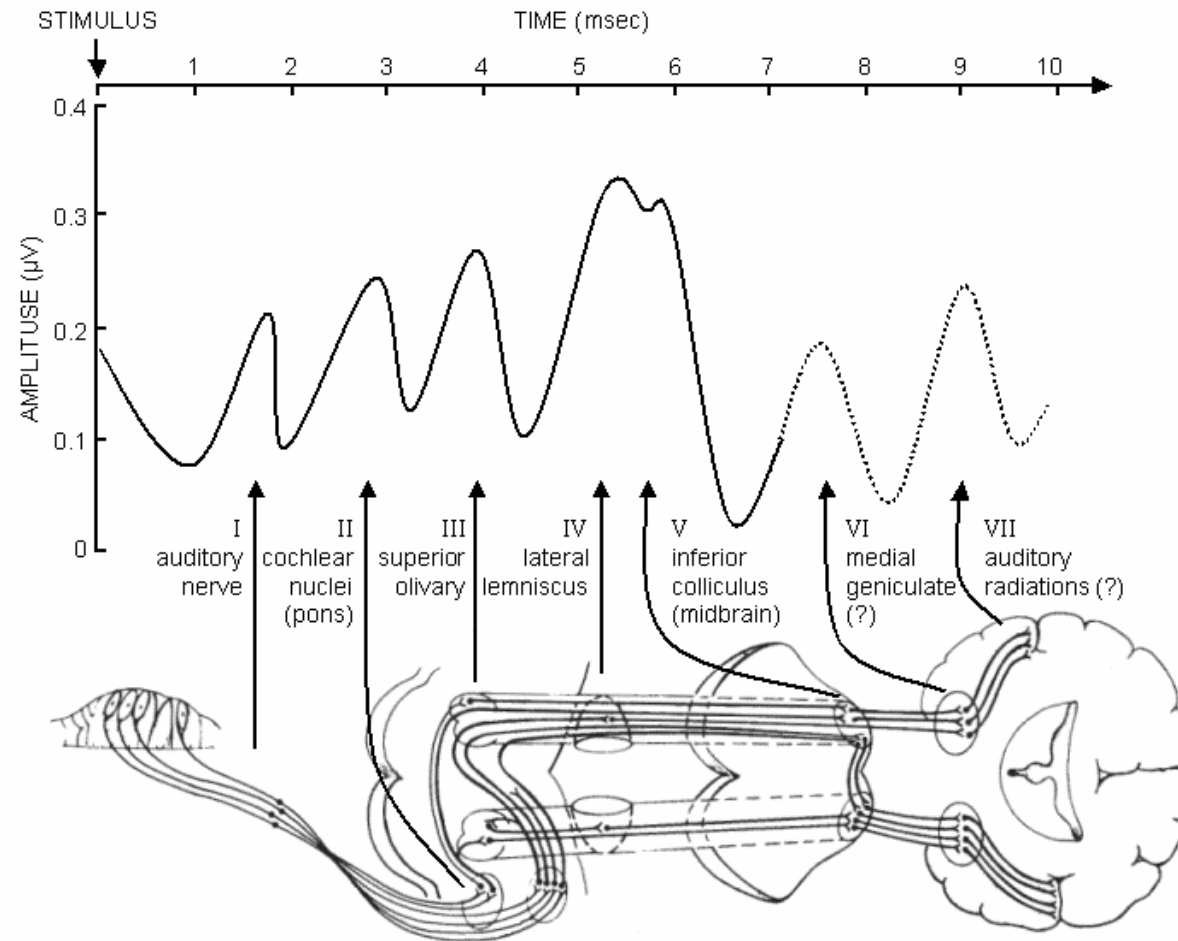
Somatosensory evoked potentials



Visual evoked potentials



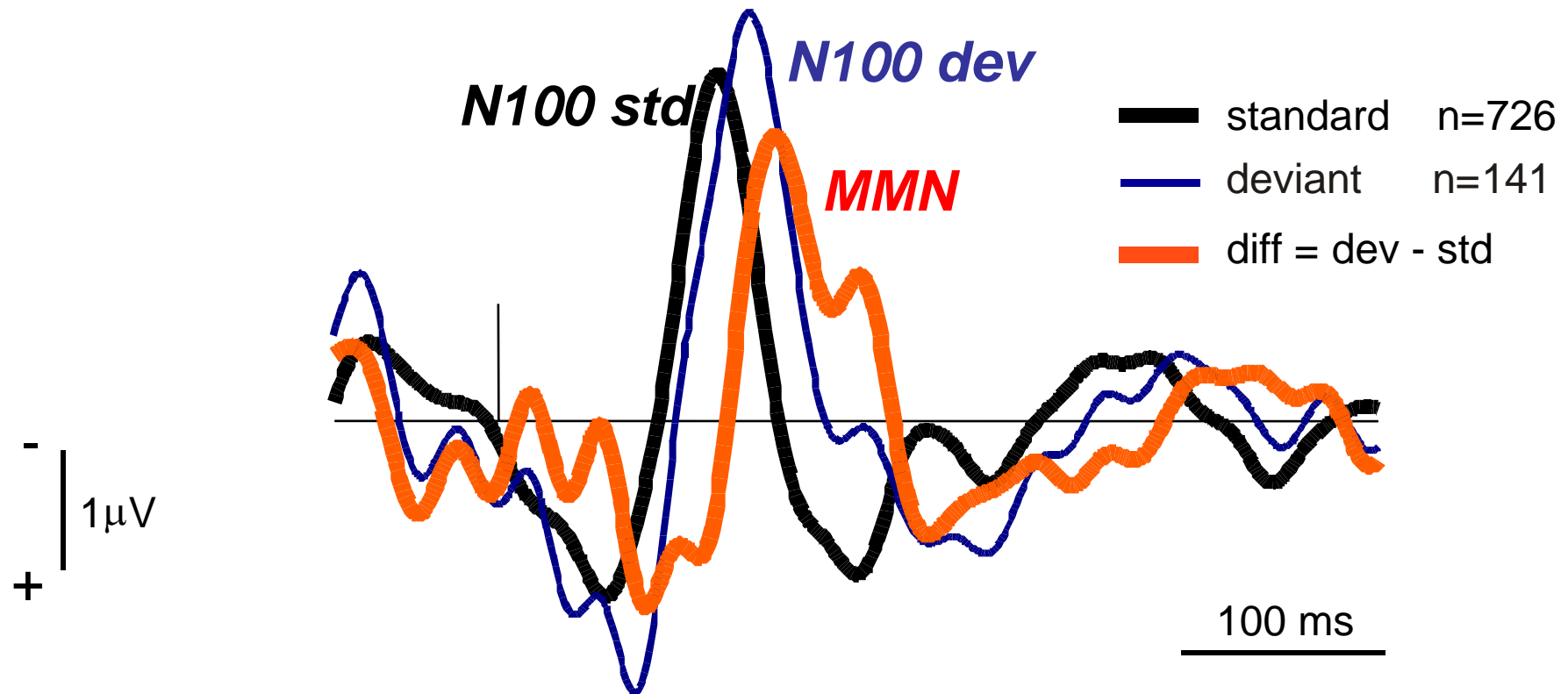
Auditory brainstem evoked potentials



Mismatch negativity

presence of MMN -> outcome better than VS

n=64; 100% specificity



Biochemical markers



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Biochemical markers

- NSE : neuron specific enolase < neurons & neuroectodermal cells
>33 µg/l at D 1 to 3 (1 class I 4 class III and 1 class IV studies)
(FPR = 0%; 95% CI: 0 – 3)
 - time-consuming >24h
 - hemolysis increases values (NSE < platelets)
 - cutoff points for a 0 FPR vary from 20 to 65 µg/l
 - NSE is lower in induced hypothermia
- S100 protein : calcium-binding astroglial protein
(1 class I 4 class III and 1 class IV studies)
values measured <D2 : poor prognostic indicator
- Creatine kinase brain isoenzyme (CKBB) < neurons & astrocytes
(6 class III studies) poor prognostic ability
- Neurofilament in CSF
(1 class IV study) FPR of 10%.

Post-anoxic coma



Special Article
NEUROLOGY 2006;67:203-210

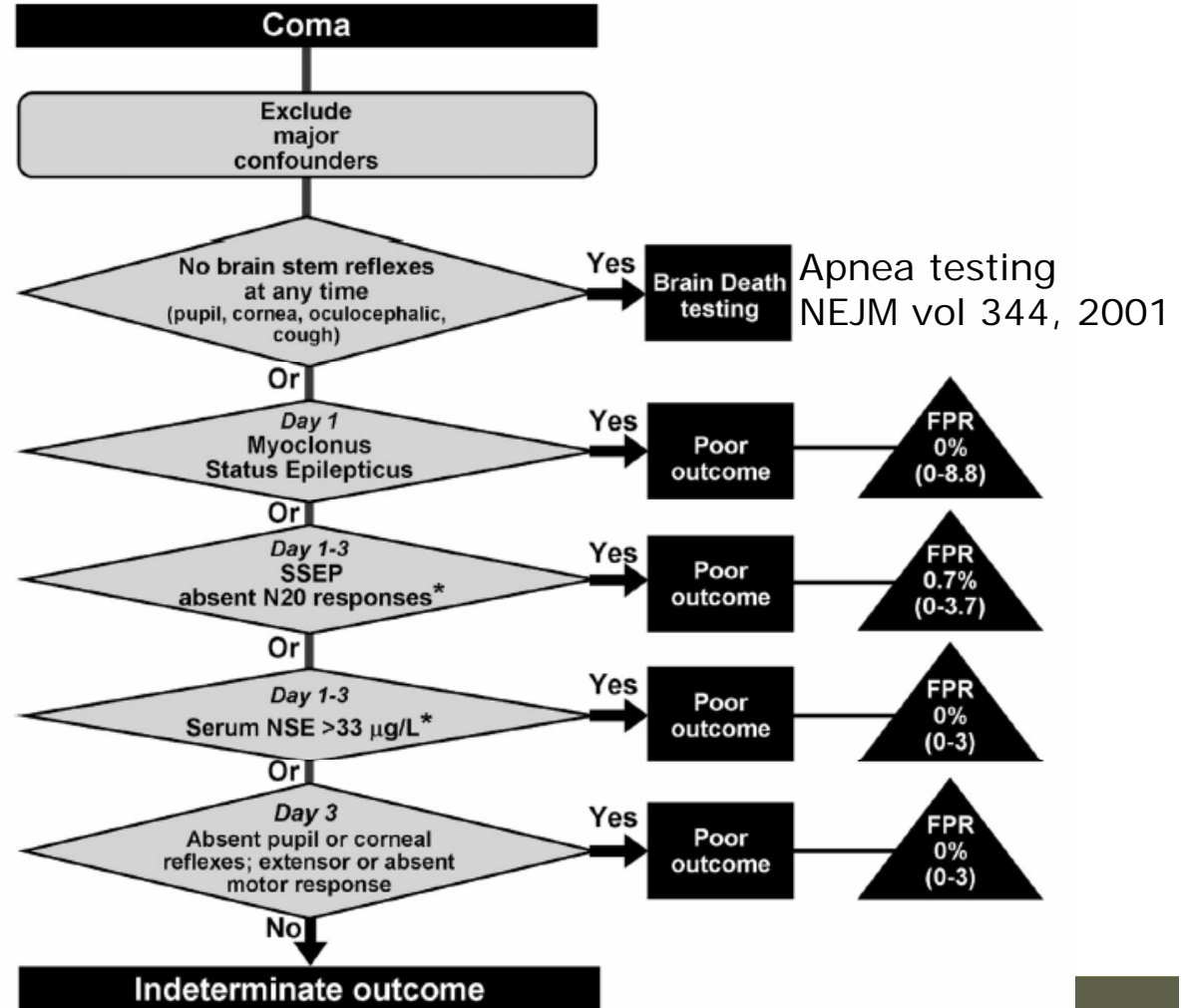
Practice Parameter: Prediction of outcome in comatose survivors after cardiopulmonary resuscitation (an evidence-based review)

Report of the Quality Standards Subcommittee of the American Academy of Neurology

E.F.M. Wijdicks, MD; A. Hijdra, MD; G.B. Young, MD; C.L. Bassetti, MD; and S. Wiebe, MD

EEG generalized suppression
EEG burst suppression
FPR = 3% (95% CI: 0.9 to 11)

MMN
marks outcome better than VS



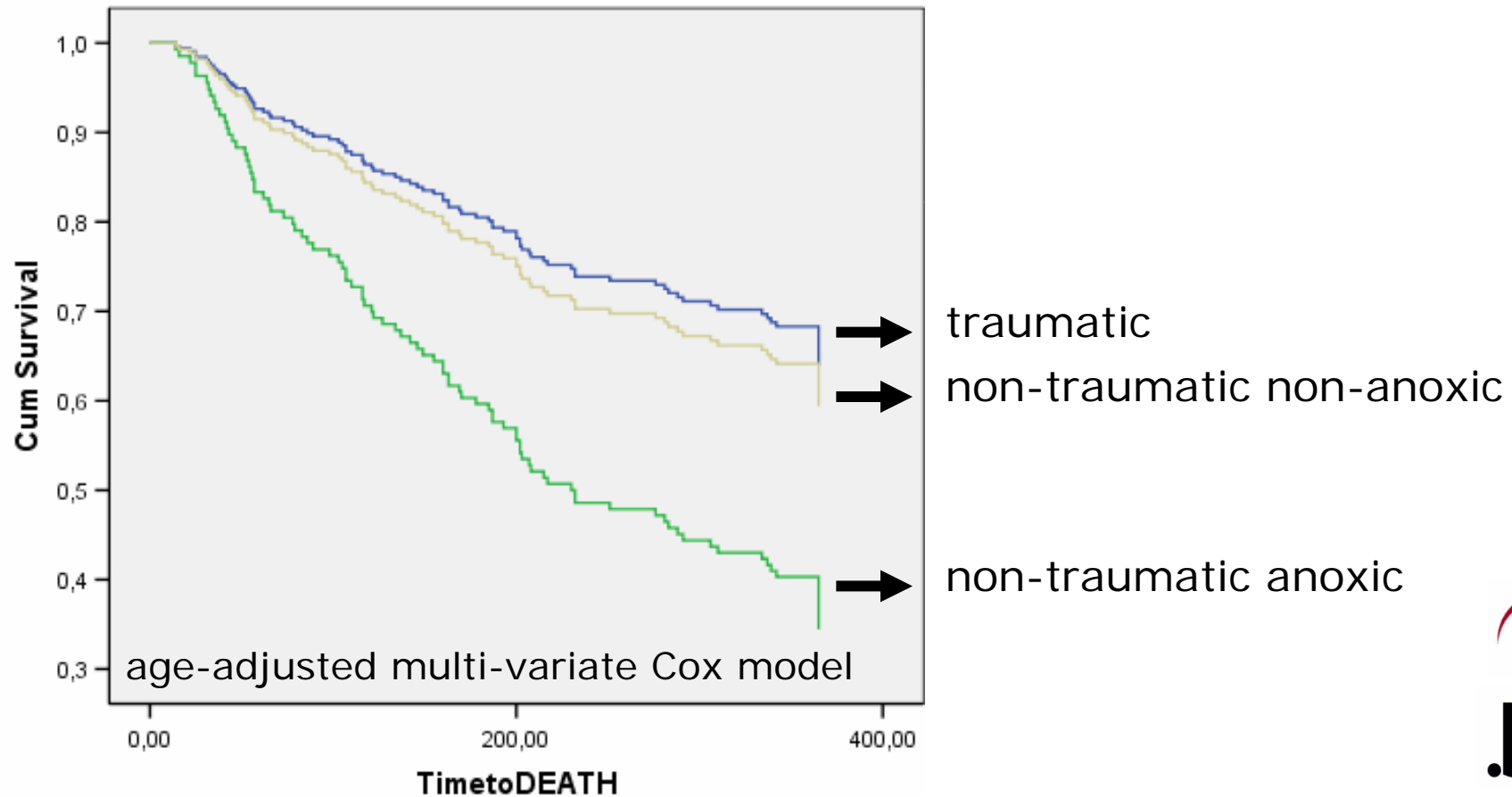
Chronic disorders of consciousness



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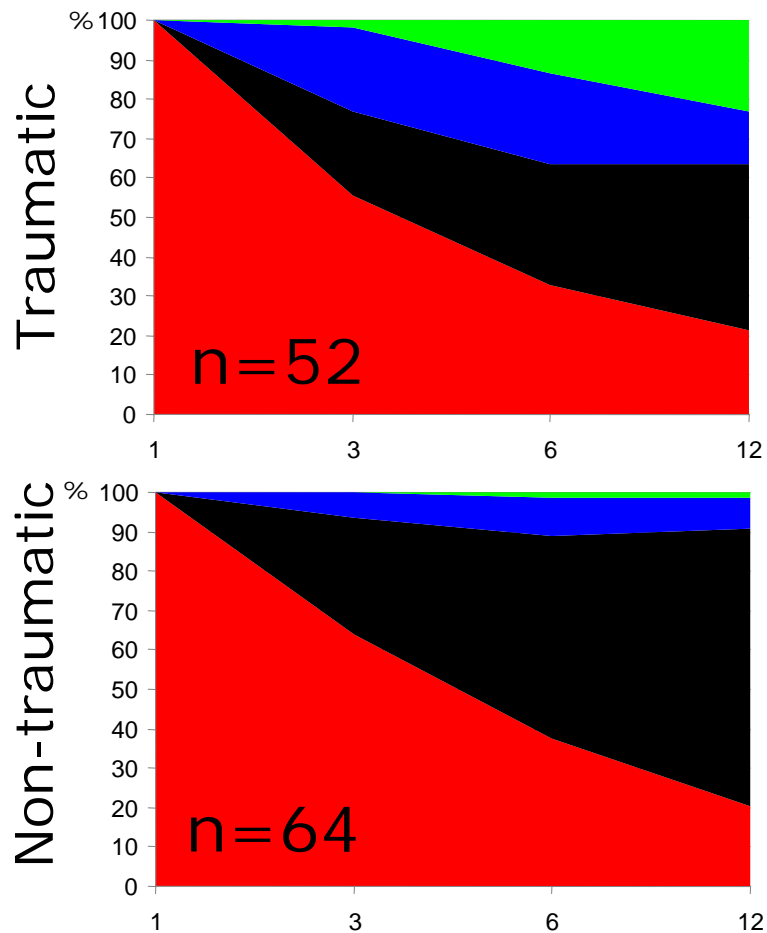
One year survival : etiology

14 VS expertise centres in Belgium 2004-07 (n=372)

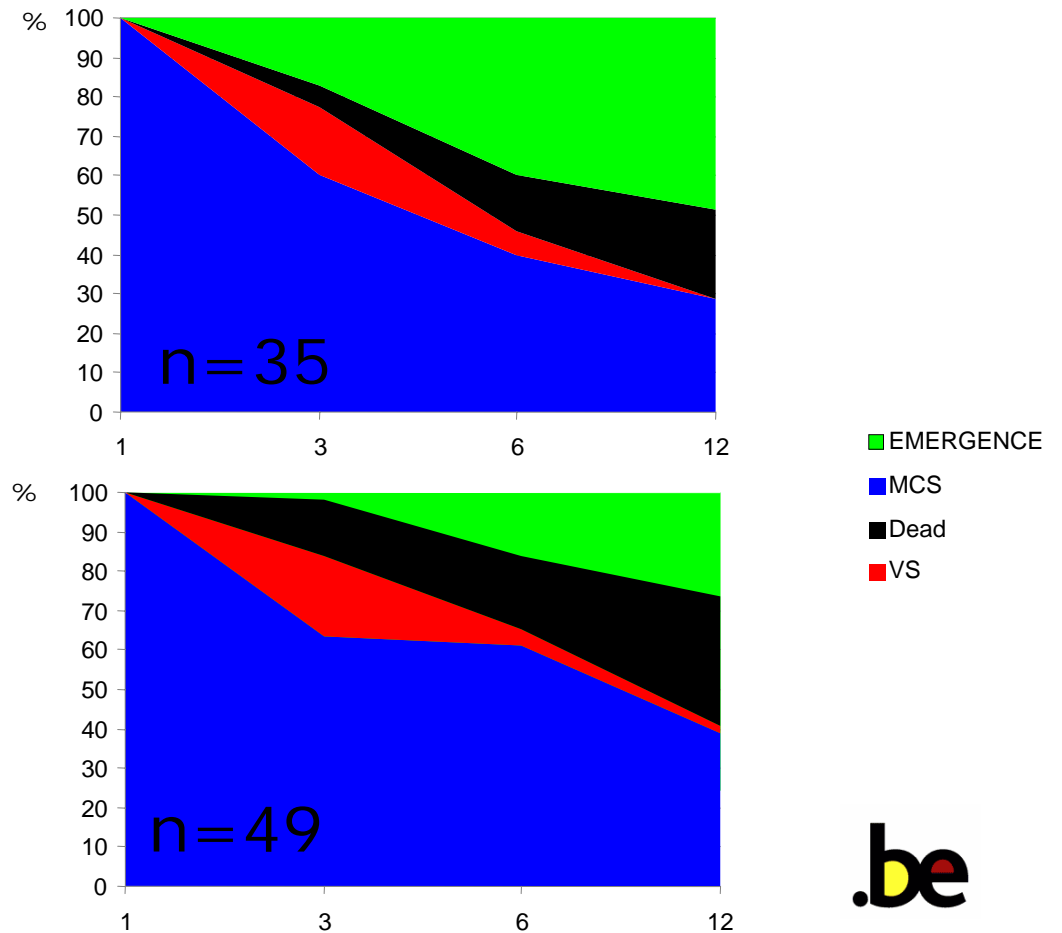


Outcome

Vegetative state (n=116)



Minimally conscious state (n=84)



Quality of life



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Cognition & quality of life

Cognitive and behavioral changes in 20-50%

long-term memory, executive function impairment, focal cognitive deficits

- O'Reilly et al Resuscitation 2003; 58: 73—9
- Nunes et al Resuscitation 2003 57:287—97.
- Drysdale et al Resuscitation 2000 47:27—32
- Grubb et al Stroke 2000; 31:1509—14
- Grubb et al BMJ 1996 313:143—6
- Roine et al J Am Med Assoc 1993 269:237—42

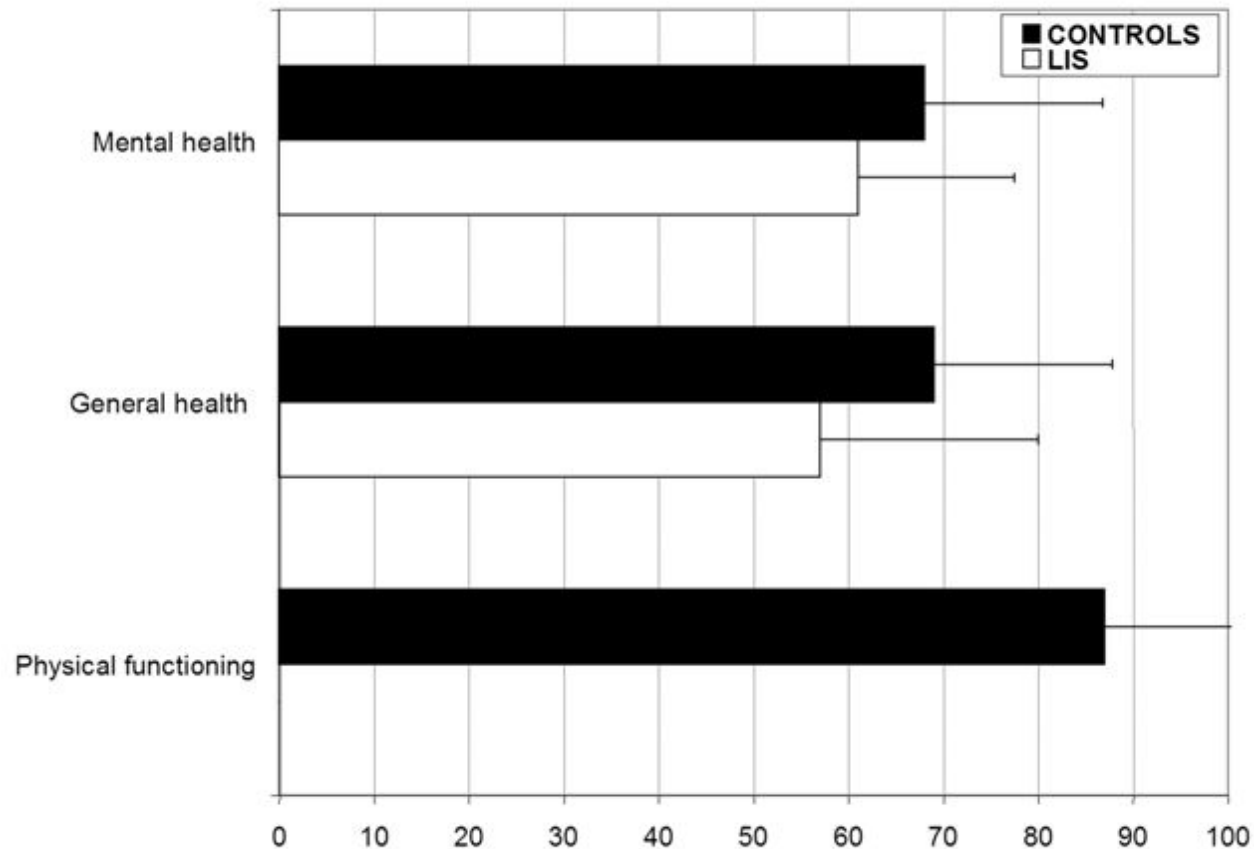
Posttraumatic stress disorder in 20-25% (more in younger patients)

- Griffiths et al Yearbook of IC & EM 2008: 891-905
- Gamper et al Crit Care Med 2004 32:378—83
- O'Reilly et al Br J Clin Psychol 2004 43:83—95
- Ladwig et al Am J Psychiatry 1999 156:912—9

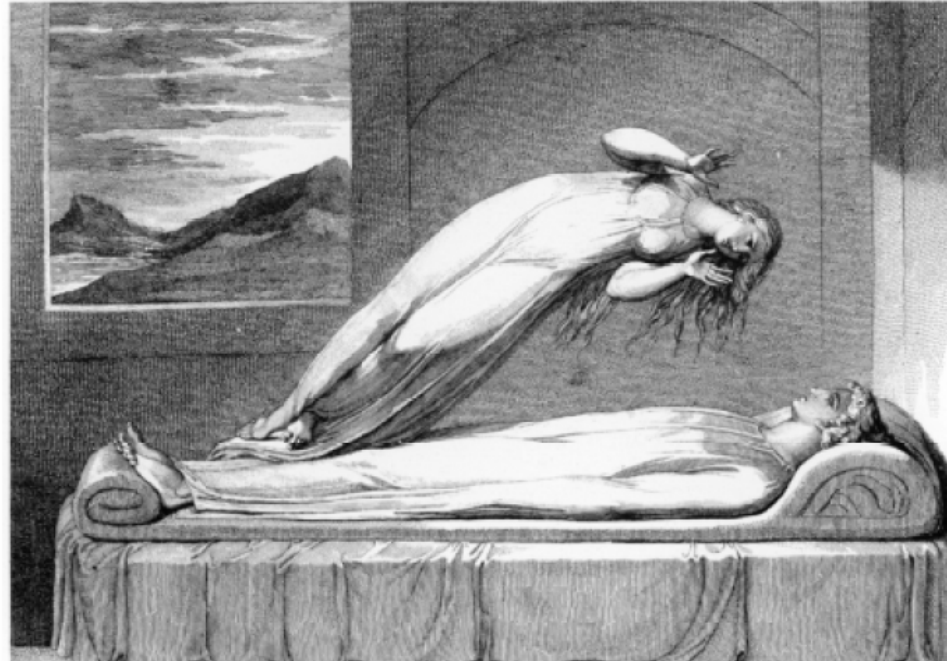
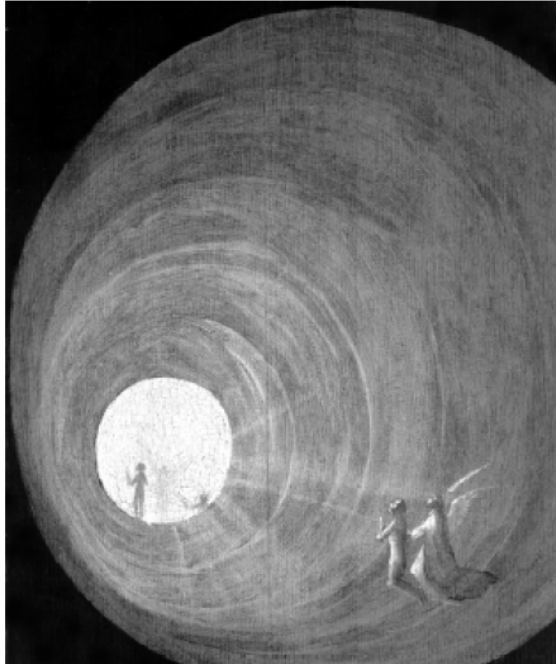
Preserved health related quality of life

- Horsted et al Resuscitation. 2007 72:214-8
- Bunch et al Crit Care Med. 2004 32:963-7
- van Alem et al Am J Cardiol. 2004 93:131-5
- Granja et al Resuscitation. 2002 55:37-44
- Nichol et al Acad Emerg Med 1999 6:95—102

Quality of life in locked-in



Near-death experiences



Greyson et al (2003)

n=27/1595 (2%)

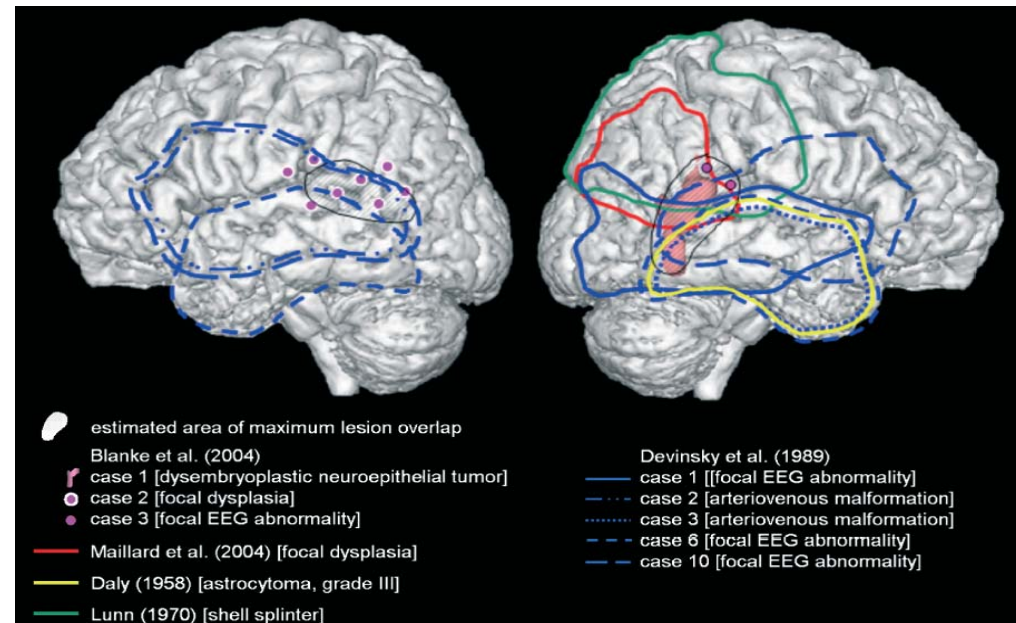
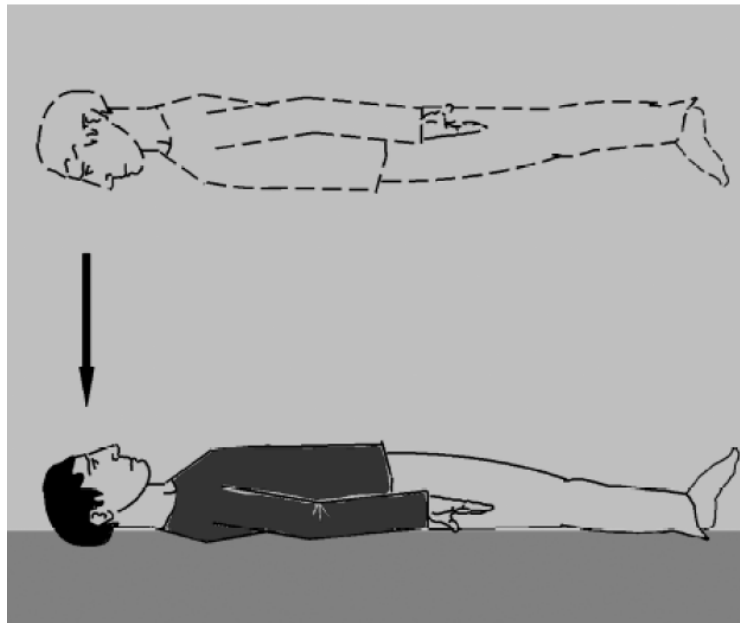
Parnia et al (2001)

n=4/63 (6%)

van Lommel et al (2001)

n=41/344 (12%)

Out-of-body experiences

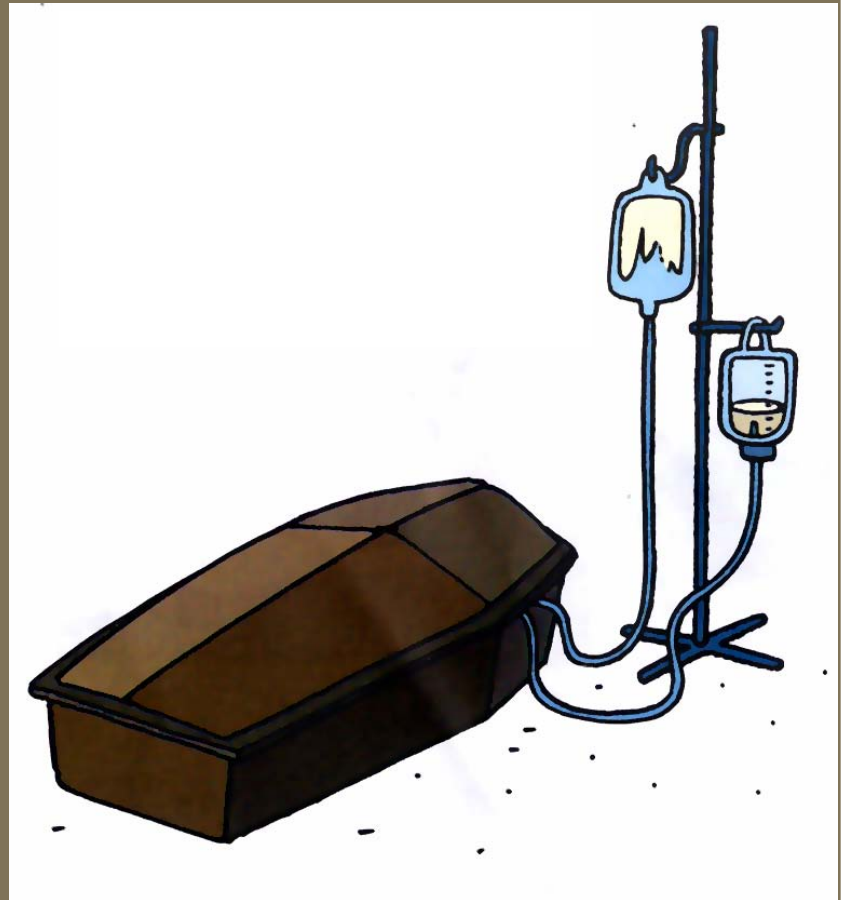


Bunning & Blanke *Prog Brain Res* 2005

Blanke et al *Nature* 2002

De Ridder et al *NEJM* 2007

Ethics



Ethical conclusions

- What is meaningful outcome?
- What is acceptable probability?