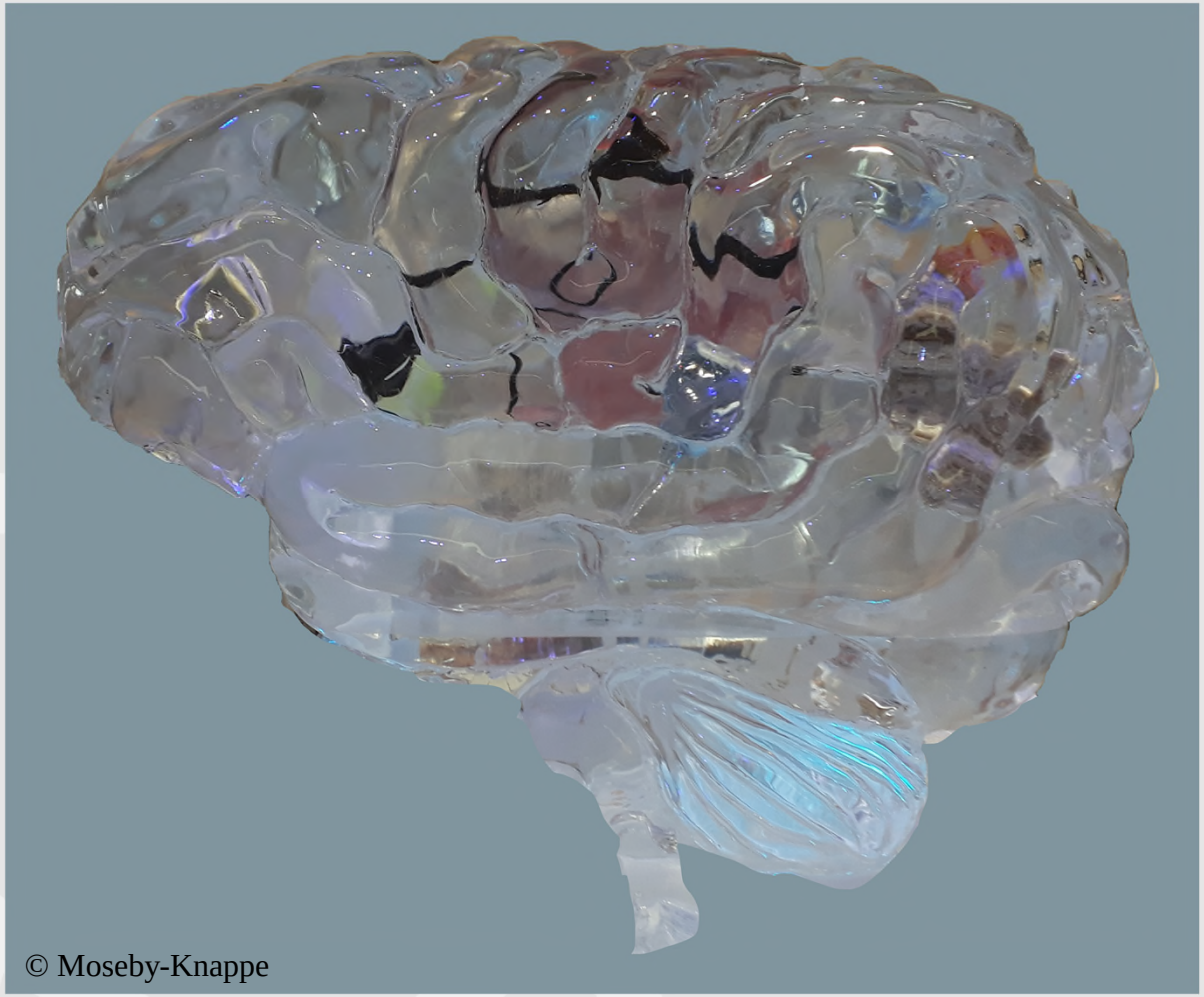
Neurologiskt utfall efter hjärtstopp


© Moseby-Knappe

Marion Moseby Knappe

Specialistläkare i neurologi
Skånes universitetssjukhus
Post-doc Centrum för hjärtstopp
Lunds universitet

Hur mycket har hjärnan tagit skada?



Hur mycket har hjärnan tagit skada?

PROGNOS?



Hur mycket har hjärnan tagit skada?



AVSLUTA BEHANDLING?

Hur mycket har hjärnan tagit skada?



FORTSÄTTA BEHANDLA?

Hur mycket har hjärnan tagit skada?



FORTSÄTTA BEHANDLA?

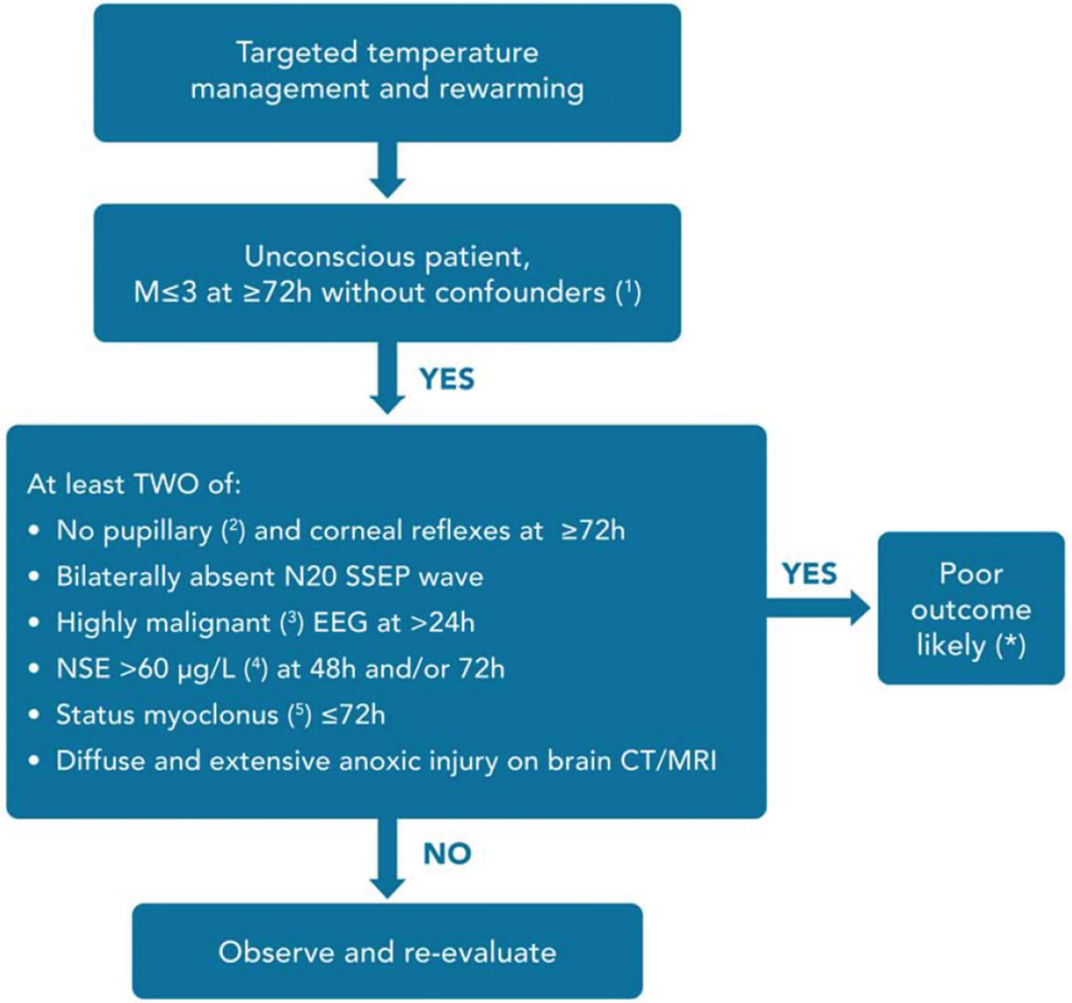
-HUR LÄNGE?

Syftet med prognosbedömningen

- Undvika önödigt lidande
- Informera anhöriga
- Fördelning av sjukvårdsressurser
- Identifiera patienter i behov av fortsatt vård

NEUROPROGNOSTICATION FOR THE COMATOSE PATIENT AFTER RESUSCITATION FROM CARDIAC ARREST

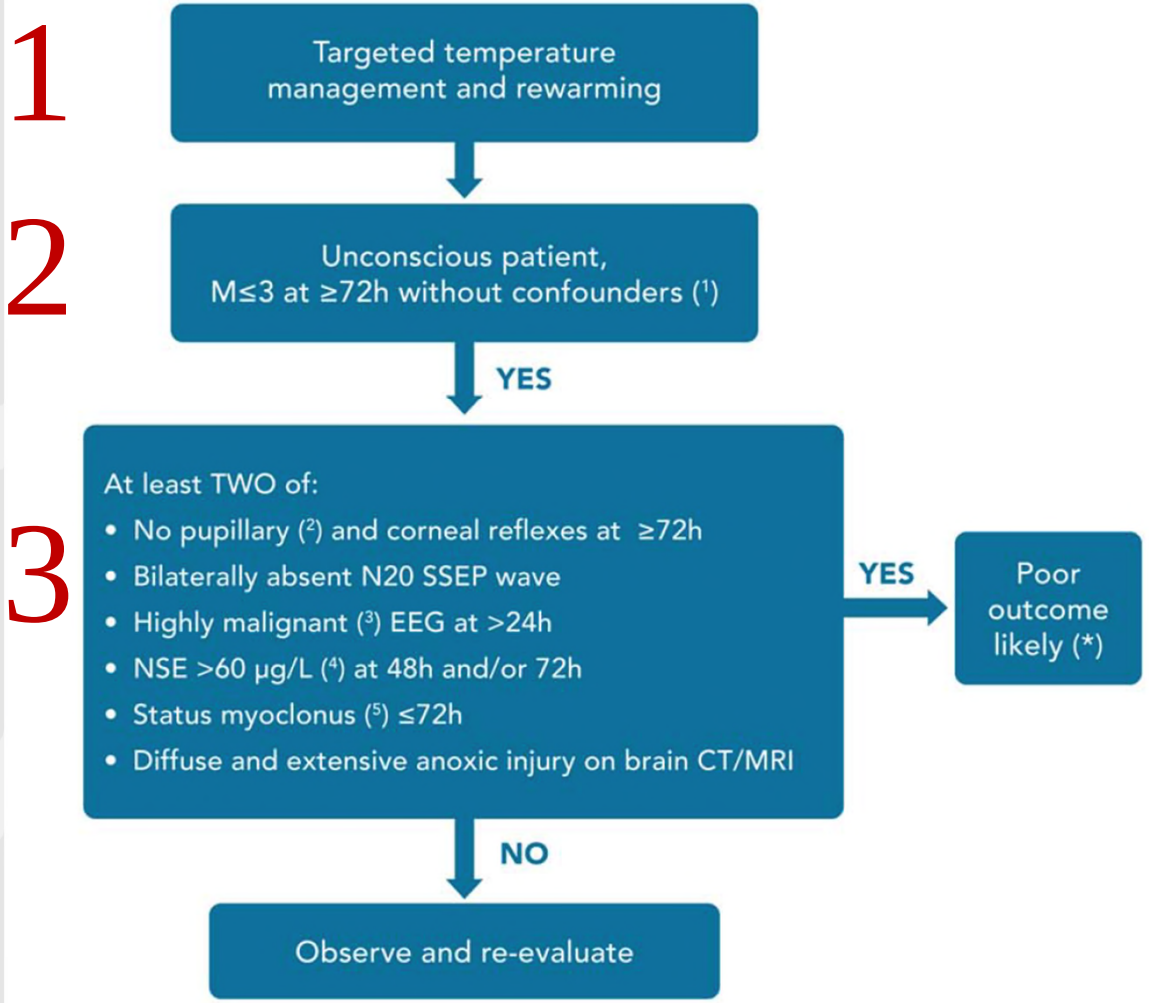
EUROPEAN RESUSCITATION COUNCIL GUIDELINES 2021



Nolan et al. *Resuscitation* (2021) 220-269

NEUROPROGNOSTICATION FOR THE COMATOSE PATIENT AFTER RESUSCITATION FROM CARDIAC ARREST

EUROPEAN RESUSCITATION COUNCIL GUIDELINES 2021



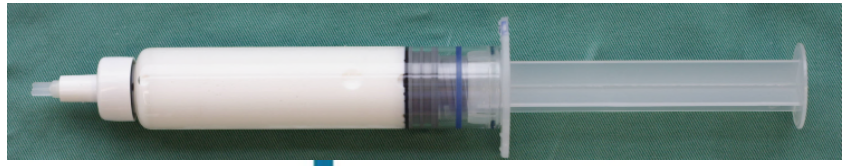
Nolan et al. *Resuscitation* (2021) 220-269

Andra orsaker till medvetslöshet?

NEUROPROGNOSTICATION FOR THE COMATOSE PATIENT AFTER RESUSCITATION FROM CARDIAC ARREST

EUROPEAN RESUSCITATION COUNCIL GUIDELINES 2021

1



2

Unconscious patient,
M≤3 at ≥72h without confounders (1)

YES

3

At least TWO of:

- No pupillary (2) and corneal reflexes at ≥72h
- Bilaterally absent N20 SSEP wave
- Highly malignant (3) EEG at >24h
- NSE >60 µg/L (4) at 48h and/or 72h
- Status myoclonus (5) ≤72h
- Diffuse and extensive anoxic injury on brain CT/MRI

YES → Poor outcome likely (*)

NO → Observe and re-evaluate

Nolan et al. *Resuscitation* (2021) 220-269

Andra orsaker till medvetslöshet?



- Total dos sedering/muskelrelaxantia/smärtlindring/antiepileptika senaste dygnet?

- Minst 5 halveringstider av läkemedlet med längst halveringstid!
- Propofol (halveringstid elimination 5-25 timmar)

Nolan et al. *Resuscitation* (2021) 220-269

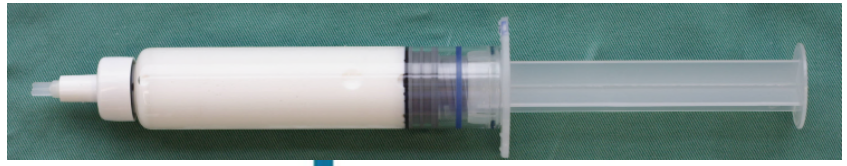
Andra orsaker till medvetslöshet?

Vakenhetsgrad?

NEUROPROGNOSTICATION FOR THE COMATOSE PATIENT AFTER RESUSCITATION FROM CARDIAC ARREST

EUROPEAN RESUSCITATION COUNCIL GUIDELINES 2021

1



2

Unconscious patient,
M≤3 at ≥72h without confounders (1)

YES

3

At least TWO of:

- No pupillary (2) and corneal reflexes at ≥72h
- Bilaterally absent N20 SSEP wave
- Highly malignant (3) EEG at >24h
- NSE >60 µg/L (4) at 48h and/or 72h
- Status myoclonus (5) ≤72h
- Diffuse and extensive anoxic injury on brain CT/MRI

YES → Poor outcome likely (*)

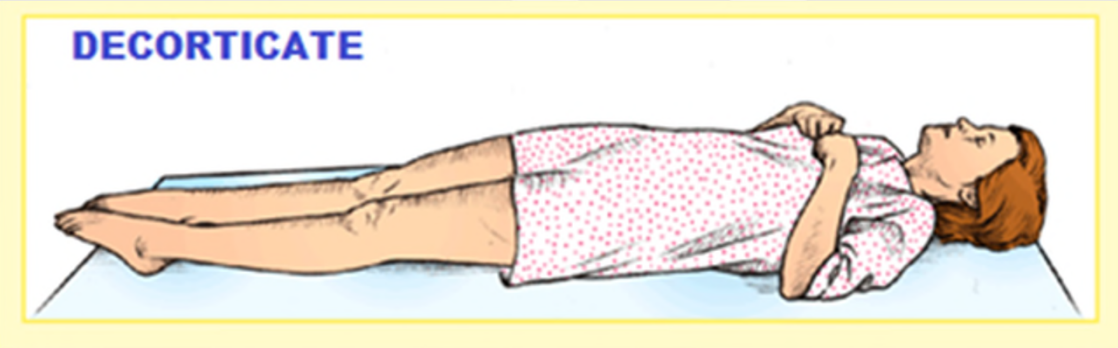
NO → Observe and re-evaluate

Nolan et al. *Resuscitation* (2021) 220-269

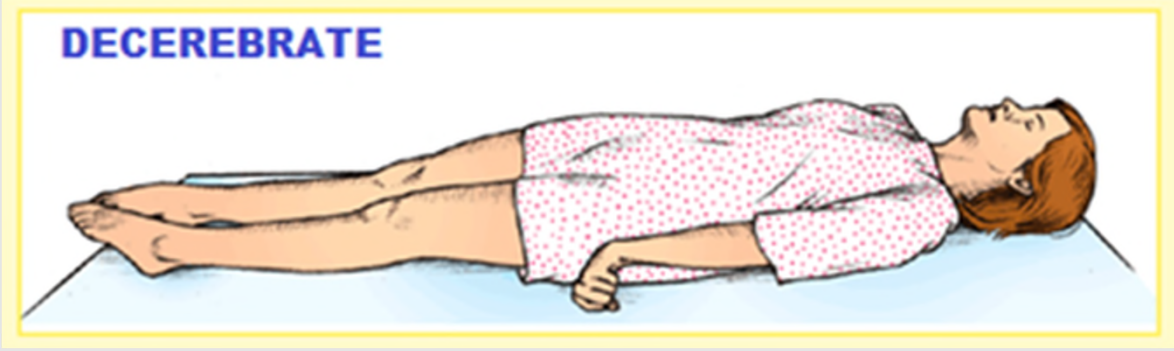
2	Unconscious patient, M≤3 at ≥72h without confounders (1)

GCS-M 1: Ingen motorisk reaktion (confounders?)

GCS-M 2: extension



GCS-M 3: flexion



Andra orsaker till medvetslöshet?

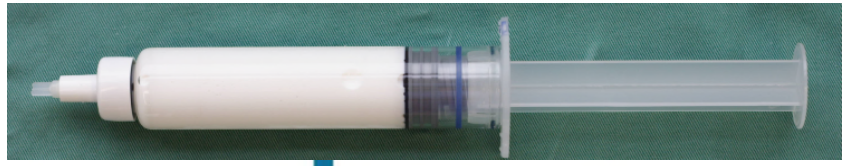
Vakenhetsgrad?

Kriterier för dåligt utfall

NEUROPROGNOSTICATION FOR THE COMATOSE PATIENT AFTER RESUSCITATION FROM CARDIAC ARREST

EUROPEAN RESUSCITATION COUNCIL GUIDELINES 2021

1



2

Unconscious patient,
M≤3 at ≥72h without confounders (1)

YES

3

At least TWO of:

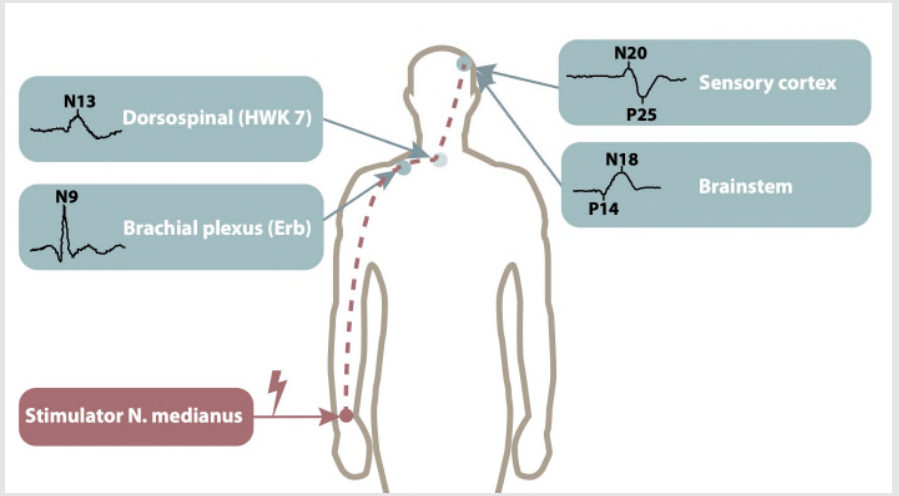
- No pupillary (2) and corneal reflexes at ≥72h
- Bilaterally absent N20 SSEP wave
- Highly malignant (3) EEG at >24h
- NSE >60 µg/L (4) at 48h and/or 72h
- Status myoclonus (5) ≤72h
- Diffuse and extensive anoxic injury on brain CT/MRI

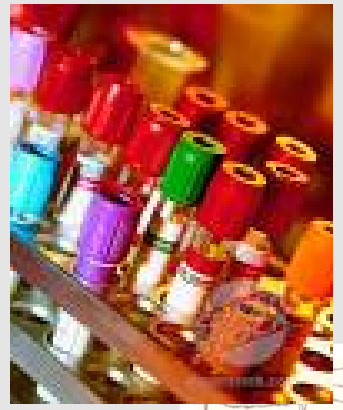
YES → Poor outcome likely (*)

NO → Observe and re-evaluate

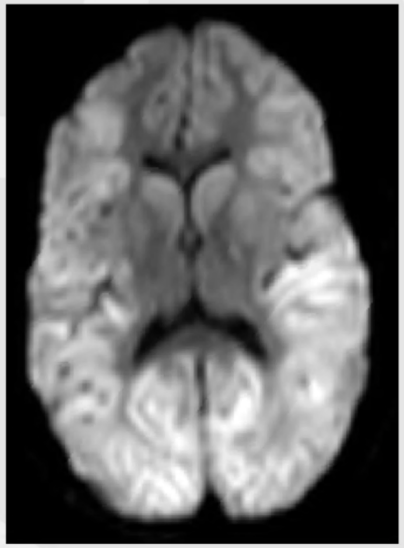
Nolan et al. *Resuscitation* (2021) 220-269







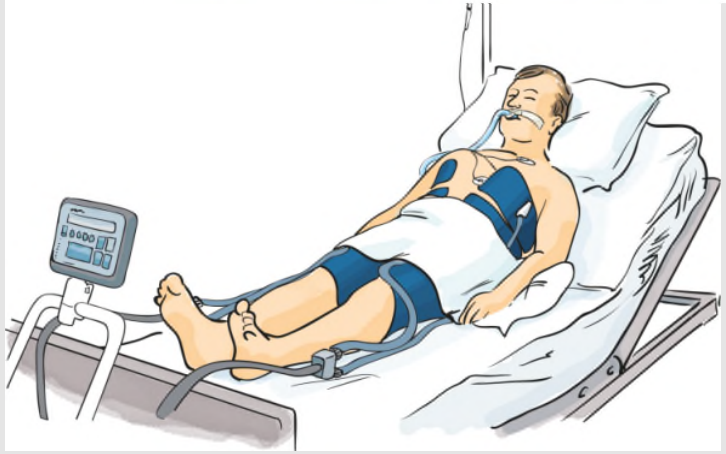
EUROPEAN RESUSCITATION COUNCIL
GUIDELINES 2021



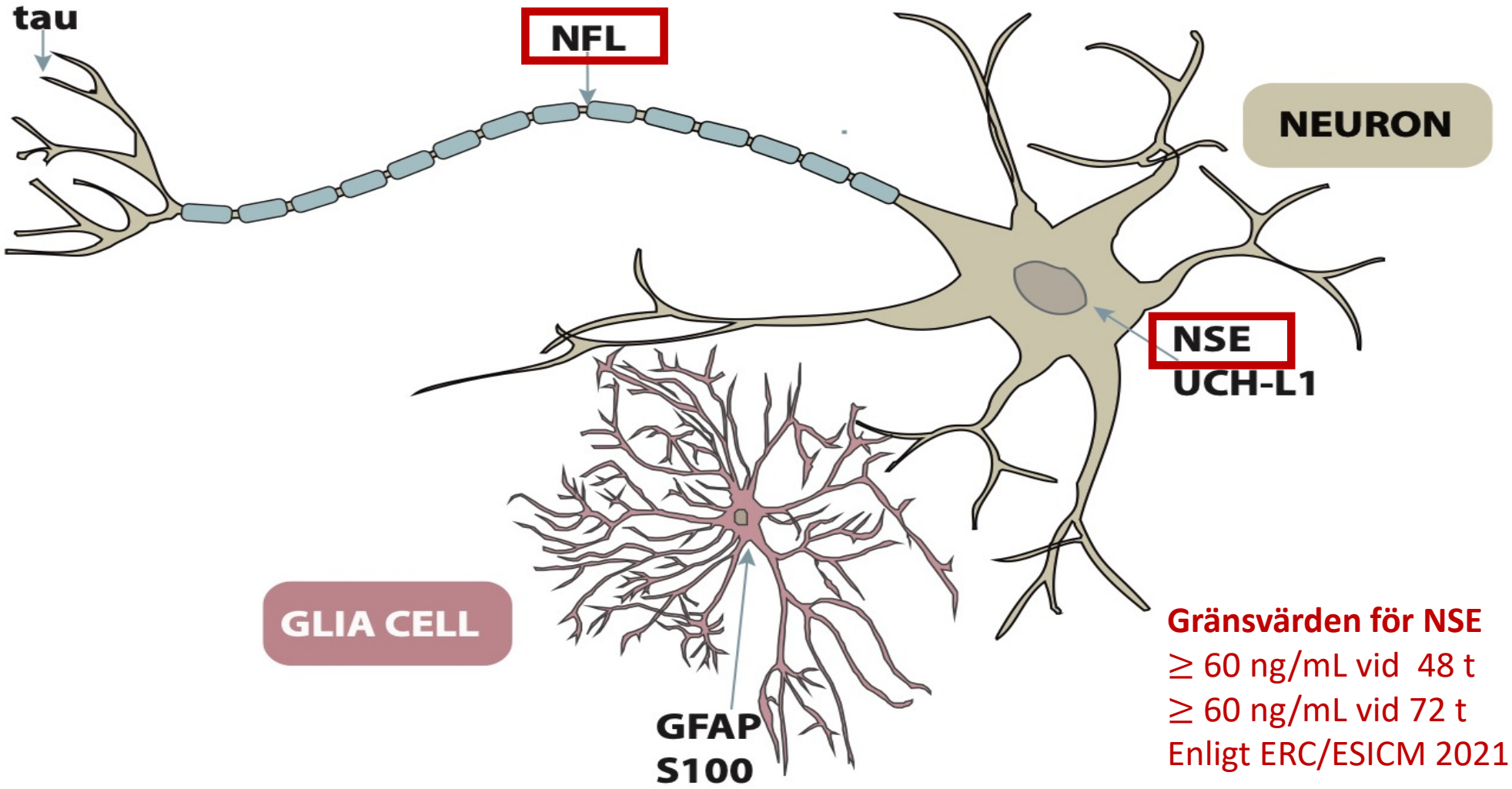
At least TWO of:

- No pupillary ([2]) and corneal reflexes at ≥72h
- Bilaterally absent N20 SSEP wave
- Highly malignant ([3]) EEG at >24h
- NSE >60 µg/L ([4]) at 48h and/or 72h
- Status myoclonus ([5]) ≤72h
- Diffuse and extensive anoxic injury on brain CT/MRI





Hjärnskademarkörer?



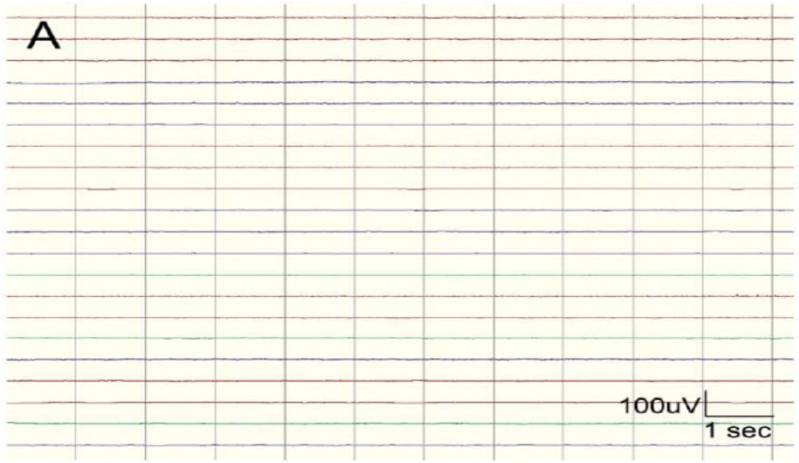
Gränsvärden för NSE
≥ 60 ng/mL vid 48 t
≥ 60 ng/mL vid 72 t
Enligt ERC/ESICM 2021

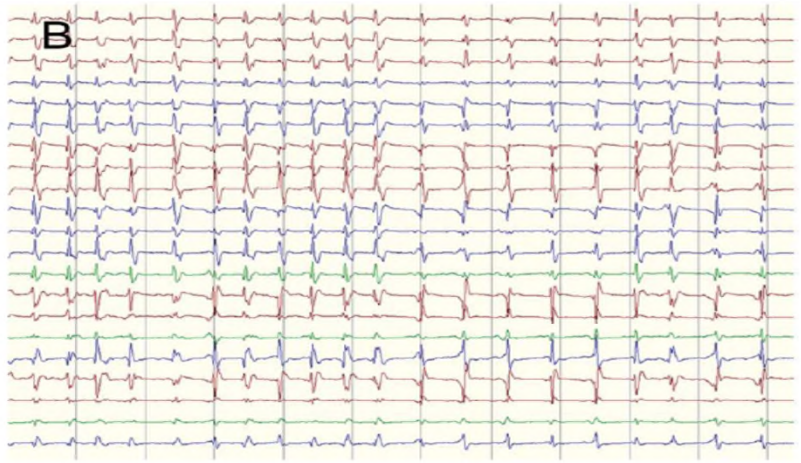
© Moseby-Knappe



EEG – highly malignant patterns

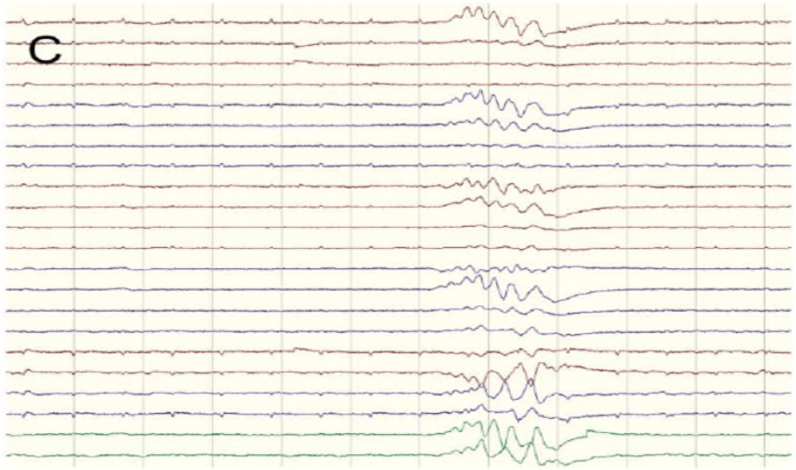
Suppressed background (amplitude ,10 **m**V, >99% of recording)





Suppressed background with discharges.

Burst-suppression

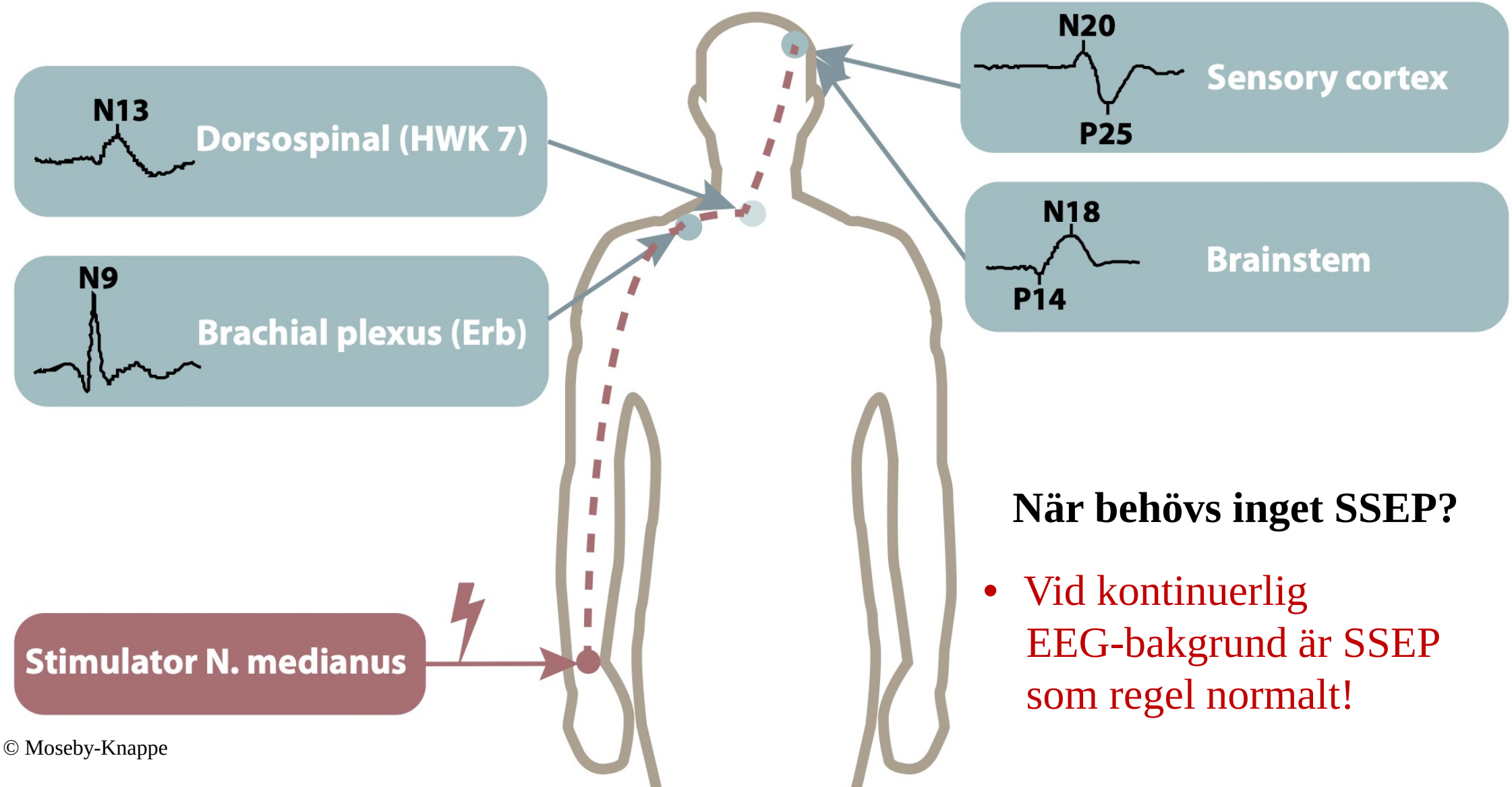




Burst-suppression with discharges

Westhall *et al*, Neurology, 2016

SSEP N20 bortfall



© Moseby-Knappe

När behövs inget SSEP?

- Vid kontinuerlig EEG-bakgrund är SSEP som regel normalt!

Kriterier för dåligt utfall

3

At least TWO of:

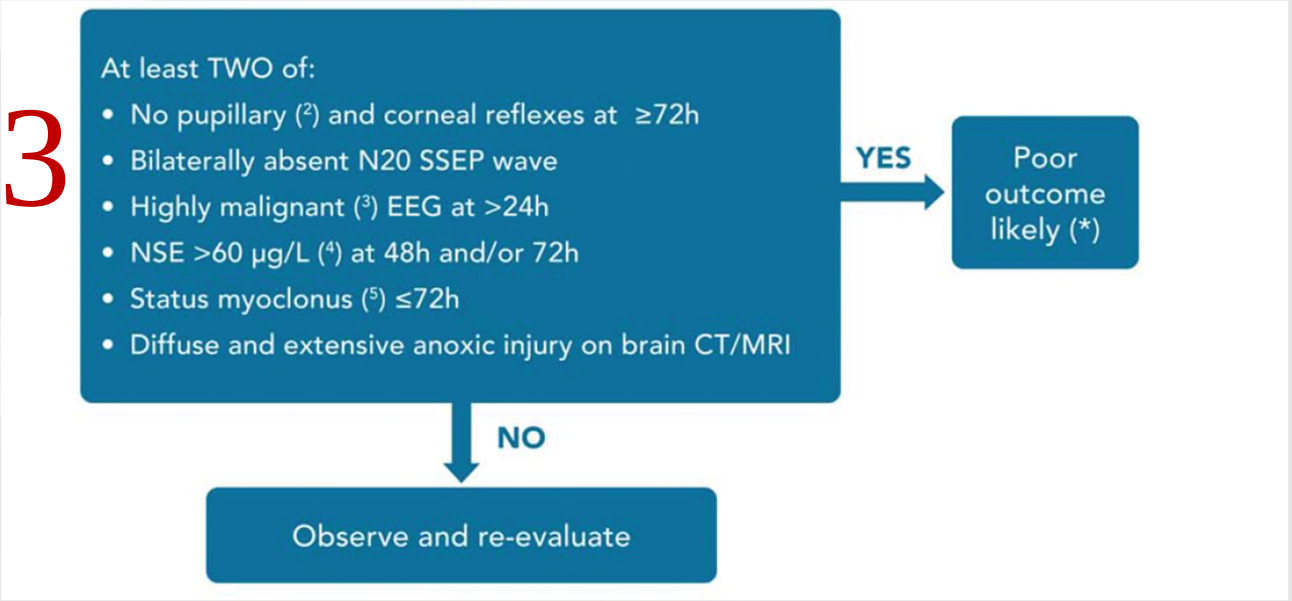
- No pupillary ([2]) and corneal reflexes at ≥72h
- Bilaterally absent N20 SSEP wave
- Highly malignant ([3]) EEG at >24h
- NSE >60 µg/L ([4]) at 48h and/or 72h
- Status myoclonus ([5]) ≤72h
- Diffuse and extensive anoxic injury on brain CT/MRI

YES → Poor outcome likely (*)

Nolan et al. *Resuscitation* (2021) 220-269

Kriterier för dåligt utfall

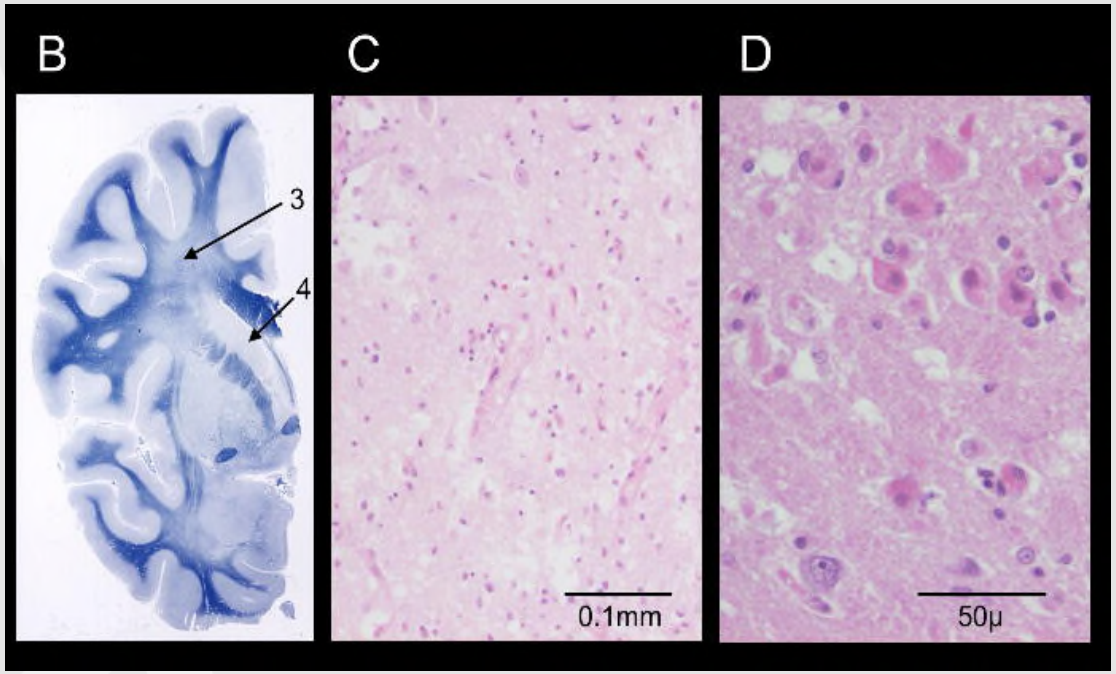
3



Nolan et al. *Resuscitation* (2021) 220-269

Kan vi förutspå bra neurologiskt utfall?

- Kontinuerlig EEG-bakgrund inom 12-24 timmar efter hjärtstopp
- Normal MR (men >20% kan ha normal MR trots dåligt utfall)



Cronberg T et.al, *Neurology*,2011



Normal blood levels of brain injury markers





	Good outcome	Poor outcome
Neuron-specific enolase (NSE)	82.2%	17.8%
Neurofilament light (NFL)	95.0%	5.0%

Moseby Knappe et al. Intensive Care Med 2021

>72 timmar

Underskatta inte läkemedlernas effekt!

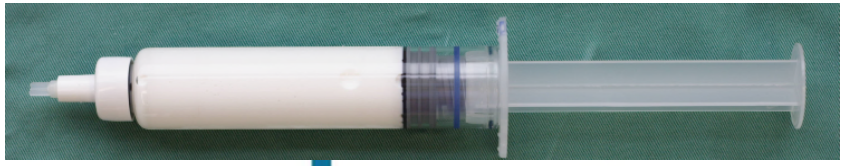
> 5 halveringstider innan bedömning!

Kombinera minst 2 metoder!

NEUROPROGNOSTICATION FOR THE COMATOSE PATIENT AFTER RESUSCITATION FROM CARDIAC ARREST

EUROPEAN RESUSCITATION COUNCIL GUIDELINES 2021

1



2

Unconscious patient,
M≤3 at ≥72h without confounders (1)

YES

3

At least TWO of:

- No pupillary (2) and corneal reflexes at ≥72h
- Bilaterally absent N20 SSEP wave
- Highly malignant (3) EEG at >24h
- NSE >60 µg/L (4) at 48h and/or 72h
- Status myoclonus (5) ≤72h
- Diffuse and extensive anoxic injury on brain CT/MRI

YES → Poor outcome likely (*)

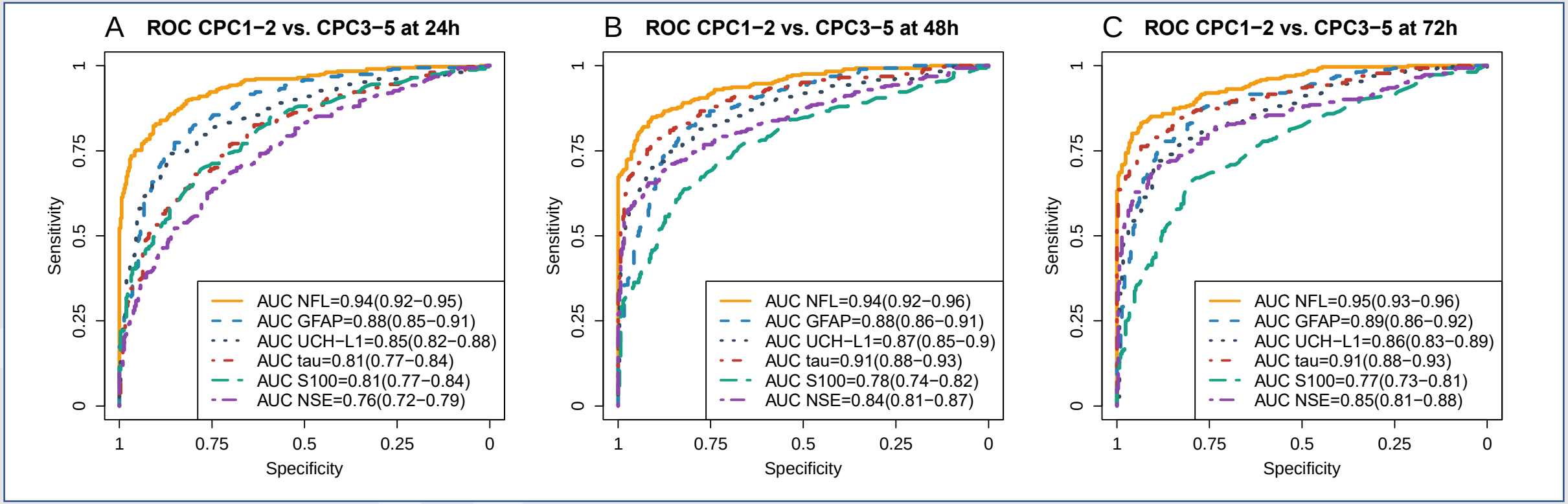
NO → Observe and re-evaluate

!!!

Nolan et al. *Resuscitation* (2021) 220-269

Framtida riktlinjer?

- Inkludera rekommendationer för patienter med GCS>3
- Prediktorer för bra utfall
- Olika hjärnskademarkörer (NFL?/tau?)
- Tidigare bedömning om ej TTM?



Moseby-Knappe *et al.* Intensive Care Med 2021