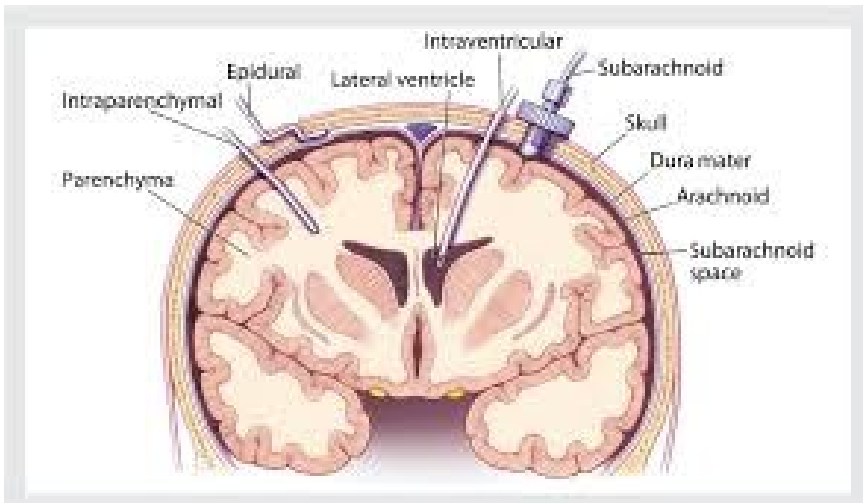
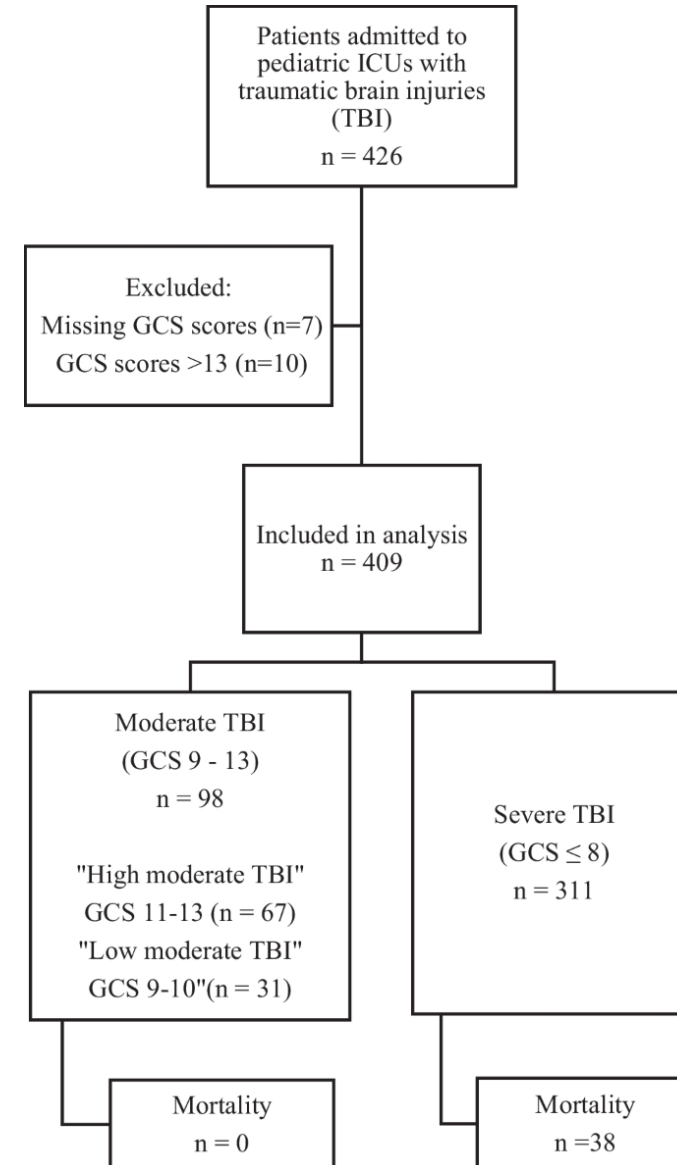


A multicenter observational study on outcomes of moderate and severe pediatric traumatic brain injuries—time to reappraise thresholds for treatment



Journalclub 29-4-2024, Dianne van der Weerden

- multi centre study
- Prospectief observationeel (juni '18 tot oktober '22)
- 28 PICU's 3 continenten
- Klinische data en follow up na 3 maanden
- Primary outcome is functional outcomes at 3 months



Baseline characteristics of pediatric patients with moderate traumatic brain injury (GCS 9–13)

Patient characteristics	"High GCS" moderate TBI, GCS 11–13 (hmodTBI) (N = 67)	"Low GCS" moderate TBI, GCS 9–10 (lmodTBI) (N = 31)	p value
Age, years (median, [IQR])	7.00 [2.00, 10.50]	6.00 [3.00, 10.00]	0.484 ^a
Female sex, n (%)	26 (38.8)	13 (41.9)	0.826 ^b
Mechanism of injury, n (%)			0.628 ^b
- Road traffic accident	27 (40.3)	12 (38.7)	
- Fall	33 (49.3)	15 (48.4)	
- Child abuse	1 (1.5)	2 (6.5)	
- Others	6 (9.0)	2 (6.5)	
Lowest GCS in first 24 h (median, [IQR])	12.00 [11.00, 13.00]	10.00 [9.00, 10.00]	< 0.001 ^{a*}
Polytrauma, n (%)	N = 19 8 (42.1)	N = 11 6 (54.5)	0.707 ^b
- Long bone fractures			
- Intrathoracic injury	10 (52.6)	8 (72.7)	0.442 ^b
- Intra-abdominal injury (Exclude simple abrasions or superficial wounds)	4 (21.1)	3 (27.3)	1.000 ^b
Seizures occurred post injury, n (%)	N = 58 5 (7.5)	N = 25 1 (4)	0.663 ^b
Bilateral pupils fixed, n (%)	N = 63 3 (4.5)	N = 28 6 (21.4)	0.022 ^{b*}
Findings on initial CT Brain, (n, %)	N = 66		
- Subarachnoid hemorrhage	13 (19.7)	6 (19.4)	1.000 ^b
- Subdural hemorrhage	19 (28.8)	7 (22.6)	0.626 ^b
- Extradural hemorrhage	30 (45.5)	7 (22.6)	0.043 ^{b*}
- Intraparenchymal/intraventricular hemorrhage	16 (24.2)	13 (41.9)	0.097 ^b
- Diffuse axonal injury	1 (1.5)	1 (3.2)	0.539 ^b
- Cerebral edema	12 (18.2)	5 (16.1)	1.000 ^b
- Pneumocephalus	8 (12.1)	4 (12.9)	1.000 ^b
- Brain stem injury/uncal herniation	2 (3.0)	1 (3.2)	1.000 ^b
- Skull fracture	43 (65.2)	18 (58.1)	0.509 ^b
- Undetermined	1 (1.5)	0 (0.0)	1.000 ^b
PIM 3 predicted probability of death (median, [IQR])	N = 63 1.00 [0.08, 1.00]	N = 28 1.00 [1.00, 1.00]	

N number was specified when there was missing data
PIM 3 pediatric index of mortality

^aNon-parametric test (Mann —

Whitney U test)

^bFisher exact test

p < 0.05

Treatment and interventions received by patients with moderate traumatic brain injury (GCS 9–13)

Treatments and interventions	"High GCS" moderate TBI, GCS 11–13 (hmodTBI) (N = 67)	"Low GCS" moderate TBI, GCS 9–10 (lmodTBI) (N = 31)	p value
Critical care interventions			
Mechanical ventilation during the first hour in PICU, n (%)	N = 63 17 (25.4)	N = 28 14 (50)	0.054 ^a
Duration of mechanical ventilation (days) (median, [IQR])	N = 26 3.00 [1.00, 5.00]	N = 23 4.00 [3.00, 7.00]	0.169 ^b
Length of PICU stay (days) (median, [IQR])	N = 65 4.00 [2.00, 5.00]	N = 30 5.00 [4.00, 9.75]	0.007 ^{b,*}
Length of hospital stay (days) (median, [IQR])	N = 64 8.00 [5.00, 12.25]	N = 29 13.00 [8.00, 17.00]	0.015 ^{b,*}
Specialized monitoring, n (%)			
- CVP monitoring	6 (9.0)	7 (22.6)	0.106 ^a
- IABP monitoring	17 (25.4)	17 (54.8)	0.006 ^{a,*}
- EEG monitoring	7 (10.4)	4 (12.9)	0.738 ^a
- ICP monitoring	3 (4.5)	10 (32.3)	< 0.001 ^{a,*}
- EVD	2 (3.0)	7 (22.6)	
- Subdural	0 (0.0)	1 (3.2)	
- Parenchymal bolt	1 (1.5)	2 (6.5)	
Neurosurgical interventions, n (%)			
- Evacuation of intracranial bleed	20 (29.9)	11 (35.5)	0.643 ^a
- Elevation of depressed skull fracture	5 (7.5)	1 (3.2)	0.661 ^a
- Decompressive craniectomy	4 (6.0)	3 (9.7)	0.675 ^a
- Craniotomy	14 (20.9)	8 (25.8)	0.610 ^a
ICP targeted therapies, n (%)			
- Head elevation 30 degrees, neutral position	57 (85.1)	27 (87.1)	1.000 ^a
- Hyperosmolar therapy	N = 66 41 (61.2)	22 (71.0)	0.495 ^a
- Sedative medications (excluding RSI)	22 (32.8)	16 (51.6)	0.118 ^a
- Paralytic medications	5 (7.5)	7 (22.6)	0.047 ^{a,*}
- Barbiturate therapy	3 (4.5)	4 (12.9)	0.203 ^a
- Hyperventilation	0 (0.0)	1 (3.2)	0.316 ^a

N number was specified when there was missing data

RSI rapid sequence induction

^aFisher exact test

^bNon-parametric test (Mann–Whitney U test)

*p < 0.05

**Association of GOS-E Peds score with TBI severity, age, gender,
and polytrauma with univariate and multiple linear regression**

Variable	Unadjusted coefficient (SE)	<i>p</i> value	Adjusted coefficient (SE)	<i>p</i> value
hmodTBI	Reference	–	Reference	–
lmodTBI	1.22 (0.58)	0.035*	1.24 (0.52)	0.018*
sTBI	2.05 (0.35)	< 0.001*	1.27 (0.33)	< 0.001*
Age	– 0.02 (0.03)	0.579	– 0.02 (0.02)	0.499
Sex (Male)	– 0.24 (0.28)	0.398	– 0.24 (0.24)	0.328
Polytrauma	1.31 (0.26)	< 0.001*	0.68 (0.25)	0.007*
Cerebral edema	2.43 (0.24)	< 0.001*	2.03 (0.25)	< 0.001*

GOS-E Peds Glasgow Outcome Scale-Extended Peds;
hmodTBI high moderate TBI, GCS 11–13;
lmodTBI low moderate TBI, GCS 9–10;
TBI traumatic brain injury; *sTBI* severe TBI;
SE standard error
 **p* < 0.05

Glasgow outcome scale-extended pediatric revision

Score	Definition	<i>Mild (GCS ≥13)</i>			<i>Moderate (GCS 9-12)</i>			<i>Severe (GCS ≤8)</i>		
		r	p-value	95% CI	r	p-value	95% CI	r	p-value	95% CI
1	Upper good recovery									
2	Lower good recovery									
3	Upper moderate disability									
4	Lower moderate disability									
5	Upper severe disability									
6	Lower severe disability									
7	Vegetative state									
8	Death									
	GOS & GOS-E (3-month)	0.698	<.0001	0.529, 0.810	0.769	<0.001	0.420, 0.911	0.885	<.0001	0.820, 0.925
	GOS & GOS-E (6-month)	0.708	<0.001	0.414, 0.861	0.698	0.002	0.307, 0.877	0.807	<.0001	0.704, 0.874

GOS, Glasgow Outcome Scale; GOS-E Peds, Glasgow Outcome Scale-Extended Pediatric.

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Hoe verhoudt zich dit tot onze praktijk?

- Flowchart vanaf eerste opvang op SEH
Voortzetting behandeling op PICU met stappenplan en vervolgstappen;
ook gericht op what-if's
- Uitleg en toelichting; vaststellen grenzen en reden herevaluatie
- Divisie N&N medisch kind: Neurotrauma bij de pediatrische patiënt
Flowchart én protocol gebruiken

Tot slot

Implicaties voor de PICU WKZ

- Is het resultaat van de studie relevant voor PICU WKZ? Ja/ Nee
- Indien Ja:
 - a. Wat zou je willen implementeren voor de PICU WKZ?
 - b. Is het nodig om een colloquium in te plannen met experts om dit vorm te geven?