

Supplemental Table 1. Definition of the seven risk criteria according to Oman *et al.*, (2006) and match with definitions used in our dataset

DEFINITION (Oman et al., 2006)	ADAPTATION
<p>1 Evidence of significant skull fracture Evidence of skull fracture includes but it is not limited to any signs of basilar skull fracture (periorbital or peri-auricular ecchymosis, hemotympanum, and drainage of clear fluid from the ears or nose) or signs of depressed or diastatic skull fracture (a palpable step-off of the skull, a stellate laceration from a point source, or any injury produced by an object striking a localized region of the skull (e.g. a baseball bat, club, pool cue, golf-ball, baseball, pipe).</p>	<p>Presence of either one of the following was defined as satisfying risk criterion:</p> <ul style="list-style-type: none"> A. Obvious palpable skull fracture: <u>YES/unknown</u> B. Possible skull fracture on palpation: <u>YES/unknown</u> C. Open skull fracture: <u>YES/unknown</u> D. Signs of basal skull fracture: <u>YES/unknown</u> E. Was the injury caused by high speed projectile? <u>YES/unknown</u> F. Was the injury caused by a high impact object? <u>YES/unknown</u>
<p>2 Altered level of alertness Abnormal level of alertness is evidenced by a variety of findings, including but not limited to a Glasgow coma score of 14 or less; delayed or inappropriate response to external stimuli; excessive somnolence; disorientation to person, place, time or events; inability to remember three objects.</p>	<p>Presence of either one of the following was defined as a satisfying risk criterion:</p> <ul style="list-style-type: none"> A. What is the current GCS? <u>14 or less</u> B. Is your patient abnormally drowsy/difficult to wake? <u>YES/unknown</u> C. Is your patient slow to respond to speech? <u>YES/unknown</u> D. Does your patient have an altered mental status? <u>YES/unknown</u>
<p>3 Neurological deficit Neurologic deficits may include motor deficit which is a finding of abnormal weakness in any 1 or more of the 4 extremities, as determined by systematic testing of muscle strength in all 4 limbs; gait abnormality which is the inability to walk normally as a result of inadequate strength, loss of balance, or ataxia as determined by systematic testing of gait, including tandem and heel-to-toe walking, and Romberg testing; cerebellar abnormality which is manifested by ataxia, dysmetria, dysdiadokinesis, or other impairment of cerebellar function as determined by systematic testing of cerebellar function, including tests of ataxia, and finger-nose-</p>	<p>Is there any focal neurology present? <u>YES/unknown</u></p>

finger, heel-to-shin, and rapid alternating movement testing; cranial nerve abnormality which is an abnormality of cranial nerve II to XII, determined by systematic testing of each of these cranial nerves.

4 **Persistent vomiting**

High-risk vomiting is evidenced by recurrent, projectile, or forceful emesis (either observed or by history) after trauma or vomiting associated with altered sensorium.

*Has there been more than one episode of vomiting? YES/unknown **AND/OR** Have there been 3 or more discrete episodes? YES*

5 **Scalp haematoma**

A significant scalp haematoma includes any swelling of traumatic origin to the soft tissues overlying the calvarium. Injuries to the face, neck, and jaw are not considered scalp haematomas.

*Scalp Haematoma: YES/unknown; **AND Location MUST BE: either frontal, or temporal, or occipital or parietal (or more than one of these)***

6 **Abnormal behavior**

Abnormal behavior is any inappropriate action displayed by the victim. It includes such things as excessive agitation, inconsolability, refusal to cooperate, lack of affective response to questions or events, and violent activity.

Presence of either one of the following was defined as satisfying risk criterion:

- A. *Is your patient irritable or agitated? YES/unknown*
- B. *Is your patient asking questions repetitively? YES/unknown*
- C. *According to the parent/guardian, is your patient acting abnormally? YES/unknown*

7 **Coagulopathy**

Coagulopathy is any impairment of normal blood clotting such as occurs in hemophilia, secondary to medications (e.g. Coumadin, heparin, aspirin, etc.), hepatic insufficiency and other conditions.

Is there a bleeding disorder? YES/unknown

GCS = Glasgow Coma Scale

Supplemental Table 2. Comparison between CT findings consistent with clinically important intracranial injury according to Mower *et al.*, and corresponding CT findings coded in this study

	ICI definitions (Mower et al., 2005)	ICI definition as coded in the current study
1	Substantial epidural or subdural haematoma (>1.0 cm in width or causing mass effect)	Intracranial hemorrhage/contusion – extra-axial (subdural/extradural)
2	Substantial cerebral contusion (>1.0 cm in diameter or >1 site)	Intracranial hemorrhage/contusion – parenchyma
3	Extensive subarachnoid hemorrhage	Intracranial hemorrhage/contusion – sub-arachnoid
4	Mass effect or sulcal effacement	<i>Not available</i>
5	Signs of herniation	Midline shift or brain herniation
6	Basal cistern compression or midline shift	Midline shift or brain herniation
7	Hemorrhage in the posterior fossa	Intracranial hemorrhage/contusion
8	Intraventricular hemorrhage	Intracranial hemorrhage/contusion
9	Bilateral hemorrhage of any type	Intracranial hemorrhage/contusion
10	Depressed or diastatic skull fracture	Diastasis of skull OR/AND Skull fracture - depressed
11	Pneumocephalus	Pneumocephalus
12	Diffuse cerebral edema	Cerebral edema
13	Diffuse axonal injury	Diffuse axonal injury

CT = computed tomography; ICI = clinically important intracranial injury

Supplemental Table 3. Characteristics of the 4 patients who did not present any of the NEXUS II risk criteria but showed ED CT findings consistent with ICI

ID	Age	Sex	GCS	Mechanism of injury	Injury recorded	Treatment
1	4 y	M	15	Fell from scooter without helmet	Pneumocephalus; basal skull fracture.	Neurosurgery: No; Admission: 2 days
2	5 y	M	15	Fall >3 m	Intracranial hemorrhage/contusion - extra-axial; pneumocephalus; basal skull fracture – non-depressed	Neurosurgery: No; Admission: 4 days
3	6 y	F	15	Fall 1.8m from home stairs.	Intracranial hemorrhage/contusion - extra-axial; pneumocephalus; skull fracture – non-depressed.	Neurosurgery: No; Admission: 5 days
4	15 y	M	15	Struck by/or collision with person.	Intracranial hemorrhage/contusion- parenchyma.	Neurosurgery: No; Admission: 5 days

CT = computed tomography; ED = emergency department; GCS= Glasgow Coma Scale; ICI = clinically important intracranial injury

Supplementary Table 4: Frequency and count of Individual Risk Criteria by ICI +/- for initial and follow up CT scans.

	ED CT		CT after initial ED visit				Either CT				CT-			
	ICI+		ICI-		ICI+		ICI-		ICI+		ICI-		CT-	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%
N	377		1585		6		119		383		1704		18022	
Risk Criteria Count														
0	4	1.1	156	9.8	0	0.0	51	42.9	4	1.0	207	12.2	9113	50.6
1	53	14.1	429	27.1	3	50.0	37	31.1	56	14.6	466	27.4	6433	35.7
2	99	26.3	488	30.8	2	33.3	24	20.2	101	26.4	512	30.1	1921	10.7
3	117	31.0	324	20.4	1	16.7	7	5.9	118	30.8	331	19.4	451	2.5
4	74	19.6	146	9.2	0	0.0	0	0.0	74	19.3	146	8.6	94	0.5
5	26	6.9	39	2.5	0	0.0	0	0.0	26	6.8	39	2.3	10	0.1
6	4	1.1	3	0.2	0	0.0	0	0.0	4	1.0	3	0.2	0	0.0
7	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Risk Criteria														
1 - Evidence of skull fracture	214	56.8	443	28.0	2	33.3	17	14.3	216	56.4	460	27.0	1357	7.5
2 - Scalp haematoma	237	62.9	631	39.8	2	33.3	23	19.3	239	62.4	654	38.4	4914	27.3
3 - Neurological deficits	41	10.9	147	9.3	0	0.0	5	4.2	41	10.7	152	8.9	433	2.4
4 - Altered levels of alertness	235	62.3	618	39.0	0	0.0	13	10.9	235	61.4	631	37.0	1032	5.7
5 - Abnormal behaviour	216	57.3	770	48.6	2	33.3	28	23.5	218	56.9	798	46.8	2582	14.3
6 - Persistent vomiting	98	26.0	522	32.9	3	50.0	16	13.5	101	26.4	538	31.6	1478	8.2
7 - Coagulopathy	11	2.9	43	2.7	1	16.7	4	3.4	12	3.1	47	2.8	258	1.4

CT = computed tomography; ED = emergency department; ICI = clinically important intracranial injury

Supplement Table 5. Diagnostic testing of NEXUS II ICI, tested by presence of any risk criteria (of the 7) – MISSING EXCLUDED

Total Cohort		
	Risk Criteria	
	Positive	Negative
Positive ICI	378	5
Negative ICI	10733	8993
Sensitivity (95% CI)	378/383	98.7 (97.0-99.6)
Specificity (95% CI)	8993/19726	45.6 (44.9-46.3)
PPV (95% CI)	378/11111	3.4 (3.1-3.8)
NPV (95% CI)	8993/8998	99.9 (99.9-100.0)

Initial CT Scan (ED CT)		
	Risk Criteria	
	Positive	Negative
Positive ICI	372	5
Negative ICI	1432	153
Sensitivity (95% CI)	372/377	98.7 (96.9-99.6)
Specificity (95% CI)	153/1585	9.7 (8.2-11.2)
PPV (95% CI)	372/1804	20.6 (18.8-22.6)
NPV (95% CI)	153/158	96.8 (92.8-99.0)

CT = computed tomography; ED = emergency department; ICI = clinically important intracranial injury; PPV = positive predictive value; NPV = negative predictive value

