

**TABLE 7** Diagnostic Testing of cTBI and TBI-CT From CDR Predictors Within Vomiting Cases (*N* = 3389)

	Predicting Likelihood of cTBI							Predicting Likelihood of TBI-CT						
	Sensitivity	Specificity	PPV	NPV	aOR	95% CI	<i>P</i>	Sensitivity	Specificity	PPV	NPV	aOR	95% CI	<i>P</i>
LOC	23.84	92.08	2.55	99.28	1.39	(0.61–3.15)	.435	20.70	92.13	3.68	98.77	1.51	(0.73–3.14)	.263
Headache	45.35	79.64	1.90	99.41	2.29	(1.28–4.11)	.005	41.40	79.72	2.88	98.94	2.55	(1.52–4.27)	<.001
Acting abnormally (according to parents)	40.12	87.10	2.64	99.40	1.86	(1.03–3.37)	.040	37.19	87.22	4.05	98.97	1.83	(1.09–3.96)	.020
Amnesia	22.67	91.82	2.36	99.27	1.24	(0.57–2.69)	.582	20.35	91.87	3.50	98.76	1.50	(0.76–2.97)	.239
Seizure	7.56	98.55	4.35	99.19	2.12	(0.65–6.85)	.211	7.02	98.58	6.69	98.65	1.61	(0.50–5.21)	.423
NAI concern	6.98	99.55	11.88	99.19	4.71	(0.80–27.76)	.087	5.61	99.57	15.84	98.64	6.75	(1.54–29.69)	.011
Altered mental status	27.33	98.00	10.63	99.36	2.35	(1.04–5.33)	.041	20.70	98.05	13.35	98.84	2.02	(0.95–4.31)	.069
Skull fracture	76.16	98.66	33.08	99.79	80.13	(43.38–148.61)	<.001	73.33	99.05	52.78	99.61	112.96	(66.76–191.14)	<.001
Abnormal GCS ( $\leq 13$ )	6.98	99.38	8.89	99.19	0.79	(0.19–3.33)	.750	5.26	99.39	11.11	98.64	0.93	(0.25–3.53)	.918
Neurologic deficit	4.07	98.69	2.63	99.16	0.46	(0.09–2.38)	.356	3.51	98.70	3.76	98.60	0.52	(0.13–2.42)	.344
Scalp hematoma	69.19	65.89	1.74	99.59	0.80	(0.44–1.46)	.465	71.23	66.12	2.96	99.37	1.24	(0.74–2.55)	.413

**TABLE 1** Outcome Definitions

ciTBI Outcomes	TBI-CT Outcomes
Death	Intracranial hemorrhage or contusion
Intubation for >24 h	Cerebral edema
Neurosurgery	Traumatic infarction
Hospital admission of $\geq 2$ nights	Diffuse axonal injury
	Shearing injury
	Sigmoid sinus thrombosis
	Intracranial contents or signs of brain herniation
	Midline shift
	Diastasis of the skull
	Pneumocephalus
	Depressed skull fracture

Retrieved from Dayan PS, Holmes JF, Atabaki S, et al; Traumatic Brain Injury Study Group of the Pediatric Emergency Care Applied Research Network. Association of traumatic brain injuries with vomiting in children with blunt head trauma. *Ann Emerg Med.* 2014;63(6):657–665.

**TABLE 4** Prevalence of Traumatic Brain Injuries in APHIRST Patients With Isolated Vomiting and Vomiting Plus 1 Other Factor Based on Age-Specific CHALICE Prediction Rule Factors

	cITBI				<i>p</i> <sup>a</sup>	TBI-CT <sup>b</sup>				<i>p</i> <sup>a</sup>
	<i>n</i>	<i>N</i>	%	95% CI		<i>n</i>	<i>N</i>	%	95% CI	
Isolated vomiting <3 times only	0	682 <sup>c</sup>	0.0	(0.0–0.0)	<.001	0	682 <sup>c</sup>	0.0	(0.0–0.0)	<.001
Plus LOC >5 min	1	12	8.3	(0.0–24.7)	.229	3	12	25.0	(0.0–50.6)	.005
Plus amnesia >5 min	5	117	4.3	(0.6–8.0)	.102	8	117	6.8	(2.2–11.4)	.029
Plus abnormal drowsiness	16	158	10.1	(5.4–14.9)	<.001	21	158	13.3	(8.0–18.6)	<.001
Plus suspicion of NAI	1	15	6.7	(0.0–19.7)	.278	3	15	20.0	(0.0–41.0)	.011
Plus seizure	6	45	13.3	(3.3–23.4)	<.001	8	45	17.8	(6.5–29.1)	<.001
Plus GCS <14, or 15 if age <1 y	5	43	11.6	(1.9–21.3)	.002	7	43	16.3	(5.1–27.4)	<.001
Plus suspicion of depressed or penetrating injury	9	34	26.5	(11.4–41.5)	<.001	13	34	38.2	(21.7–54.8)	<.001
Plus signs of base-of-skull fracture	3	17	17.7	(0.0–36.3)	.005	5	17	29.4	(7.1–51.7)	<.001
Plus positive neurology	2	34	5.9	(0.0–13.9)	.164	4	34	11.8	(0.8–22.8)	.021
Plus presence of bruise, swelling, or laceration >5 cm if age <1 y	8	341	2.4	(0.7–4.0)	.688	14	341	4.1	(2.0–6.2)	.310
Plus high speed MVC	10	90	11.1	(4.6–17.6)	<.001	12	90	13.3	(6.3–20.4)	<.001
Plus fall from >3 m	9	145	6.2	(2.3–10.2)	.003	15	145	10.3	(5.4–15.3)	<.001
Plus high-speed injury from a projectile or other object	4	101	4.0	(0.1–7.8)	.188	5	101	5.0	(0.7–9.2)	.249
Isolated vomiting ≥3 times only	1	344 <sup>c</sup>	0.3	(0.0–0.9)	.001	2	344 <sup>c</sup>	0.6	(0.0–1.4)	<.001
Plus LOC >5 min	1	3	33.3	(0.0–98.7)	.071	2	3	66.7	(1.3–100.0)	.006
Plus amnesia >5 min	2	72	2.8	(0.0–6.6)	.691	6	72	8.3	(1.9–14.8)	.128
Plus abnormal drowsiness	14	158	8.9	(4.4–13.3)	<.001	22	158	13.9	(8.5–19.3)	<.001
Plus suspicion of NAI	1	8	12.5	(0.0–37.0)	.178	1	8	12.5	(0.0–37.0)	.305
Plus seizure	2	15	13.3	(0.0–31.1)	.049	2	15	13.3	(0.0–31.1)	.140
Plus GCS <14, or 15 if age <1 y	3	35	8.6	(0.0–18.0)	.050	4	35	11.4	(0.7–22.1)	.065
Plus suspicion of depressed or penetrating injury	1	15	6.7	(0.0–19.7)	.309	3	15	20.0	(0.0–41.0)	.026
Plus signs of base-of-skull fracture	2	23	8.7	(0.0–20.5)	.104	5	23	21.7	(4.5–39.0)	.003
Plus positive neurology	0	27	0.0	(0.0–0.0)	>0.999	0	27	0.0	(0.0–0.0)	.629
Plus presence of bruise, swelling, or laceration >5 cm if age <1 y	3	126	2.4	(0.0–5.1)	>0.999	5	126	4.0	(0.6–7.4)	>0.999
Plus high-speed MVC	3	35	8.6	(0.0–18.0)	.050	3	35	8.6	(0.0–18.0)	.200
Plus fall from >3 m	9	102	8.8	(3.3–14.4)	<.001	13	102	12.8	(6.2–19.3)	<.001
Plus high-speed injury from a projectile or other object	2	59	3.4	(0.0–8.1)	.650	3	59	5.1	(0.0–10.7)	.743

Retrieved from Dunning J, Daly JP, Lomas JP, Lecky F, Batchelor J, Mackway-Jones K: Children's Head Injury Algorithm for the Prediction of Important Clinical Events Study Group. Derivation of the Children's Head Injury Algorithm for the Prediction of Important Clinical Events decision rule for head injury in children. *Arch Dis Child*. 2006;91(11):885–891.

<sup>a</sup> Fisher's exact *P* value.

<sup>b</sup> TBI-CT includes those with and without cITBI.

<sup>c</sup> Total isolated and nonisolated vomiting.

**TABLE 5** Prevalence of Traumatic Brain Injuries in APHIRST Patients With Isolated Vomiting and Vomiting Plus 1 Other Factor Based on Age-Specific PECARN Predictor Variables

	ciTBI				TBI-CT <sup>a</sup>			
	<i>n</i>	<i>N</i>	%	95% CI	<i>n</i>	<i>N</i>	%	95% CI
<b>Children age &lt;2 y</b>								
Isolated vomiting (ie, no other predictors)	0	457 <sup>b</sup>	0.0	(0.0–0.0)	0	457 <sup>b</sup>	0.0	(0.0–0.0)
Vomiting plus altered mental status (GCS <15, sleepiness, agitation)	10	124	8.1	(3.3–12.9)	17	124	13.7	(7.6–19.8)
Vomiting plus nonfrontal scalp hematoma	6	175	3.4	(0.7–6.1)	17	175	9.7	(5.3–14.1)
Vomiting plus LOC >5 s	0	37	0.0	(0.0–0.0)	1	37	2.7	(0.0–8.0)
Vomiting plus palpable skull fracture	4	34	11.8	(0.8–22.8)	13	34	38.2	(21.7–54.8)
Vomiting plus not acting normally per parent	8	196	4.1	(1.3–6.9)	14	196	7.1	(3.5–13.8)
Vomiting plus history of severe mechanism of injury	2	8	25.0	(0.0–57.1)	2	8	25.0	(0.0–57.1)
<b>Children age ≥2 y</b>								
Isolated vomiting (ie, no other predictors)	1	549 <sup>b</sup>	0.2	(0.0–0.5)	2	549 <sup>b</sup>	0.4	(0.0–0.9)
Vomiting plus altered mental status (GCS <15, sleepiness, agitation)	39	460	8.5	(5.9–11.3)	55	460	12.0	(9.0–14.9)
Vomiting plus any LOC	17	307	5.5	(3.0–8.1)	26	307	8.5	(5.4–11.6)
Vomiting plus clinical signs of basilar skull fracture	4	30	13.3	(1.0–25.7)	8	30	26.7	(10.6–42.8)
Vomiting plus severe headache	42	1104	3.8	(2.7–4.9)	64	1104	5.8	(4.4–7.2)
Vomiting plus severe mechanism of injury	17	75	22.7	(13.1–32.2)	21	75	28.0	(17.8–38.2)

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<sup>a</sup> TBI-CT includes those with and without ciTBI.

<sup>b</sup> Total isolated and nonisolated vomiting.

**TABLE 6** Case Synopses for Patients With Vomiting With No CDR Predictors

Age, y	Sex	No. Vomits	Mechanism	Admission	Final Diagnosis
13	Male	11	Struck by small, hard ball	Observed 5 h on day of injury  Represented 1 wk later with ongoing vomiting and headache then admitted for >2 d (no neurosurgery)	CT: temporal fracture, subacute epidural hematoma, and contusion MRI: underlying small dural nodule on MRI with bleeding into it
3	Female	1	Fall from bicycle, no helmet	Admitted <2 nights	Occipital contusion

嘔吐だけで経過観察後にCTで異常があった2例ですが、何れも経過中に嘔吐の増悪がありました。しかも1例には先天的に異常も見つかっています。  
嘔吐だけの場合は十分な経過観察が必要です。

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嘔吐がある場合の随伴症状です。  
aORの危険率を比べてみてください。

## 略語の表

### ABBREVIATIONS

aOR: adjusted odds ratio  
APHIRST: Australasian Paediatric  
Head Injury Rule  
Study  
CATCH: Canadian Assessment of  
Tomography for  
Childhood Head Injury  
CDR: clinical decision rule  
CHALICE: Children's Head Injury  
Algorithm for the  
Prediction of  
Important Clinical  
Events  
CI: confidence interval  
ciTBI: clinically important  
traumatic brain injury  
CT: computed tomography  
ED: emergency department  
GCS: Glasgow Coma Score  
LOC: loss of consciousness  
MVC: motor vehicle crash  
NAI: nonaccidental injury  
NPV: negative predictive value  
PECARN: Pediatric Emergency  
Care Applied Research  
Network  
PPV: positive predictive value  
TBI-CT: traumatic brain injury  
on computed  
tomography