**Tables**

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| **Table 1.** Characteristics of the APHIRST comparison cohort |
| **Demographics** | **APHIRST study sample (n=18,913)** |
| Mean age, years (SD) | 5.7 (4.6) |
| Patients < 2 years | 5,046 (26.7%) |
| Female | 6,840 (36.2%) |
| **Presenting signs and symptoms** |  |
| Headache | 3,785 (20.0%) |
| History of vomiting | 3,094 (16.4%) |
| Witnessed disorientation | 2,425 (12.8%) |
| Known or suspected loss of consciousness | 2,468 (13.1%) |
| History of amnesiaa | 1,591 (8.4%) |
| **Mechanism of head injury** |  |
| Fall-related | 13,337 (70.5%) |
| Head hit by high-impact object or projectile | 1,228 (6.5%) |
| Motor vehicle incident | 745 (3.9%) |
| Suspected non accidental injury | 81 (0.4%) |
| Values are mean (standard deviation) and n (%) unless otherwise indicatedaDoes not include pre-verbal children |

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| **Table 2.** Comparison of application of clinical decision rules to APHIRST data for economic evaluation: numbers indicated for CT scan and numbers of ciTBIs identified and missed |
|  | **Base Case analysis** | **Sensitivity analysis for PECARN** |
| **Outcome measures** | **Usual care** | **PECARN** | **CATCH** | **CHALICE** | **Intermediate allocated to low riska** | **Intermediate allocated to high riskb** |
| **High risk (receives cranial CT scan)** | **1,579 (8.3%)** | **3,324 (17.6%)** | **5,707 (30.2%)** | **4,166 (22.0%)** | **1,808 (9.6%)** | **8,812 (46.6%)** |
| ciTBI, neurosurgical | 24 | 21 | 23 | 22 | 18 | 24 |
| ciTBI, non-neurosurgical | 134 | 120 | 124 | 126 | 102 | 135 |
| No TBI | 1,421 | 3,183 | 5,560 | 4,018 | 1,688 | 8,653 |
| **Low risk (no cranial CT scan)** | **17,334 (91.7%)** | **15,589 (82.4%)** | **13,206 (69.8%)** | **14,747 (78.0%)** | **17,105 (90.4%)** | **10,101 (53.4%)** |
| Missed ciTBI, neurosurgical | 0 | 3 | 1 | 2 | 6 | 0 |
| Missed ciTBI, non-neurosurgical | 2 | 16 | 12 | 10 | 34 | 1 |
| No TBI | 17,332 | 15,570 | 13,193 | 14,735 | 17,065 | 10,100 |
| **a** Patients considered to be intermediate risk of head injury were all allocated to the low risk group (no CT indicated)**b** Patients considered to be intermediate risk of head injury were all allocated to the high-risk group (CT indicated)ciTBI, clinically important traumatic brain injury; TBI, traumatic brain injury; CT, computed tomography. |

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| **Table 3.** Immediate and long term costs used in the economic model for each health state |
| **Immediate costsf** | **Abbreviation** | **Mean (95%CI, SE)** |  | **Distribution** | **Source** |
| Emergency department presentation (ED)  | cED | $380 ($372 to $388, $4) |  | Gammag | Hospital cost dataa |
| Emergency short stay unit (SSU) | cSSU | $459 ($396 to $522. $32) |  | Gamma | Hospital cost dataa |
| Inpatient stay, general ward | cWard | $2,886 ($2,715 to $3,057, $87) |  | Gamma | Hospital cost dataa |
| Inpatient stay, intensive care unit | cICU | $45,694 ($37,160 to $54,228, $4,354) |  | Gamma | Hospital cost dataa |
| Cranial computed tomography scan | cCT | $290e ($5.80 to $574) |  | Gamma | Australian Government, (2017)27 |
| Intubationb | cIntubation | $283e ($5.66 to $560) |  | Gamma | Tvede et al (2012)28\* |
| Neurosurgery | cNeurosurgery | $3702 ($3,341 to $4,063, $184) |  | Gamma | Hospital cost dataa |
| **Health state** |  | **Summary of resources utilised** |
|  | **Assessed as high risk and receives a CT scan** |
| ciTBI, neurosurgical |  | cED + cCT + cNeurosurgery + (cIntubation x pIntubation) + (pAttendance x cSSU, cWard, cICU) |
| ciTBI, non-neurosurgical |  | cED + cCT+ (cIntubation x pIntubation) + (pAttendance x cSSU, cWard, cICU) |
| No TBI |  | cED + cCT+ (pAttendance x cSSU, cWard, cICU) |
|  | **Assessed as low risk and did not receive CT scan initially** |
| Missed ciTBI, neurosurgical |  | Initial costs: cED + (pAttendance x cSSU, cWard, cICU)Re-presentation costs: cED + cCT + (cIntubation x pIntubation)] + cNeurosurgery + (pAttendance x cSSU, cWard, cICU) x 10% loading |
| Missed ciTBI, non-neurosurgical |  | Initial costs: cED + (pAttendance x cSSU, cWard, cICU)Re-presentation costs: cED + cCT + (cIntubation x pIntubation) + (pAttendance \* cSSU, cWard, cICU) x 10% loading |
| No TBI |  | cED + (pAttendance \* cSSU, cWard, cICU) |
| **Probabilities** | **Abbreviation** | **Probability** | **Distribution** | **Source** |
| Intubation | pIntubation | 0.0083 | Beta | Original patient data from Nishijma et al (2014)15  |
| Attendance | pAttendance=pSSU+pWard+pICU | Neurosurgical ciTBI e =0.083+1.0+0.292Non-neurosurgical ciTBI =0.067+0.941+0.081No TBI =0.759+0.247+0.0093 | Beta | Babl et al (2017)3 |
| **Long term costs** | **Variable name** | **Mean (95%CI, SE)** | **Distribution** |  | **Source** |
| Cost of care for GOS-E state 2 | cGOSE2:Year 1Year 2 onwards | $343,495e ($6,870 to $680,120) $55,362 ($5,166 to $511,408, $133,981) | Gamma |  | Fields et al, (2003)29bBeecham et al (2009)30Beecham et al (2009)30 |
| Cost of care for GOS-E state 3 | cGOSE3 | $80,976e ($1,620 to $160,332) | Gamma |  |
| Cost of care for GOS-E state 4 | cGOSE4 | $42,235e ($845 to $83,625) | Gamma |  |
| Cost of cancerc | cCancer | $35,030 ($19,826 to $50,234, 7,757) | Gamma |  | Adult hospital cost datad |
| a - Emergency department, short stay unit and inpatient cost data were drawn from the individual patient level 2013-14 financial data for the APHIRST patients at a specialist pediatric hospital in Melbourne, Australia. Admitted episodes were for children aged 0 to 18 years presenting with ICD-10 codes indicating head injury (ICD-10 S00-S16 and T20)b - Cost data taken from literature has been converted to Australian dollars and inflated to 2016 values using Reserve Bank of Australia figures 13th February 2018c - Costs of cancer were applied in the economic model over a 5-year period with a 10 year latency period assumedd - Based on 481 episodes of care in 2014/15 for 55 patients presenting to a specialist cancer centre in Melbourne, Victoria with primary diagnosis of high grade gliomae- in the absence of reported data on measures of variance, the SEs are assumed to be half the meanf- Costs of ED are based on average triage times in cubicle reported in minutes for level 2= 231 (SD 150) level 3=180 (SD 142), level 4=136 (SD 100), level 5=98 (SD 98). The SSU had an average time of 1.03 days (SD 0.34). SD=standard deviation.g- A gamma distribution was chosen for costing data to reflect the skewed nature of the data |

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| **Table 4.** Economic evaluation results, each strategy compared to usual care, head to head comparison of clinical decision rules and PECARN alternate allocation to low and high risk groups (per child presenting to the emergency department) |
|  | **Mean cost, $** | **Mean QALYS** |  **ICER** |
| **Economic comparison of each clinical decision rule to usual care** |
| Usual care versus  | 6,390 | 16.97686 | Dominant\* strategy |
| PECARN | 6,423 | 16.97567 | Dom |
| CHALICE |  6,433 | 16.97604 | Dom |
| CATCH | 6,457 | 16.97581 | Dom |
| **Comparison of multiple CDRs†** |
| PECARN versus | $6,423 | 16.97595 | $22,727\*\* |
| CHALICE |  6,433 | 16.97639 |
| **Sensitivity analysis, economic comparison of allocating intermediate PECARN patients to low risk and high risk groups to usual care**  |
| PECARN (low)a versus usual care | 6,408$6,390 | 16.9746416.97686 | DomDominant strategy |
| PECARN (high)b versus usual care | 6,5006,390 | 16.9770616.97686 | $550,000**††** |
|  | **Mean cost, $ (SD)** | **Mean QALYS (SD)** |  **ICER** |
| **Probabilistic Sensitivity Analysis: each rule compared to usual care** |
| Usual care versus CHALICEPECARNCATCH | 6,431 (2,690)6,467 (2,668)6,461 (2,714)6,465 (2,656) | 16.97706 (0.0060)16.97681 (0.0061)16.97693 (0.0064)16.97680 (0.0061) | Dominant strategyDomDomDom |

ICER=incremental cost effectiveness ratio, cost per QALY gained SD=standard deviation DOM=dominated strategy (more costly and less effective) CDR=clinical decision rule

\*”dominant” refers to a strategy being less costly and more effective and therefore preferred

\*\*CHALICE likely cost effective for a threshold of less than $50,000 per QALY gained

†Note that CATCH is excluded from the multiple comparison of CDRs due to being dominated by the other CDRS (more expensive and less effective)

†† PECARN (high) unlikely to be cost effective using a threshold of less than $50,000 per QALY gained

§ciTBI refers to a clinically important traumatic brain injury that did not require neurosurgery

a - All intermediate risk PECARN patients according to CDR were reallocated to the low-risk modelling group for analysis

b - All intermediate risk PECARN patients according to CDR were reallocated to the high-risk modelling group for analysis