

RESEARCH LETTER

COMPARATIVE EFFECTIVENESS RESEARCH

Association Between Parental Preference and Head Computed Tomography in Children With Minor Blunt Head Trauma

Natale et al¹ recently reported that race/ethnicity is independently associated with head computed tomography (CT) use among children with minor blunt head trauma. They showed parental anxiety as an important factor influencing head CT orders in non-Hispanic white children regardless of brain injury risk.¹ In a Japanese pediatric cohort of patients with minor blunt head trauma, we conducted a study with similar objectives attempting to identify factors that influence a physician's decision to order a head CT in children.

Methods. As part of a larger hospital quality improvement activity, we conducted a cohort study comprising children younger than 15 years seen at the St Luke's International Hospital outpatient emergency clinic after experiencing a minor blunt head trauma between October

2007 and July 2012. Inclusion was limited to patients with available quality improvement data recorded by the physician onto a data collection template regarding the parents' preference for a head CT examination (deferred to physician's decision, strongly preferred, favored, and opposed) and relevant clinical data that were used to classify patients into brain injury risk categories (low, intermediate, and high) based on a validated prediction rule.² Electronic medical records were accessed to obtain data on whether a head CT scan was performed within 12 hours of being seen, child's age and sex, time of visit (working hours, evening, and night), and department of attending physician (pediatrics, emergency department, and other). Complete data for all variables were available for 2020 patients. This series of patients showed similar demographic characteristics and proportion of head CT examination as those patients who were not included. We used Poisson regression specifying a robust error variance and calculated relative risks (RRs) and 95% confidence intervals to evaluate factors associated with head CT order and, additionally, used a recursive partitioning method, Chi-squared Automatic Interaction Detection (CHAID),³ to explore and visualize potential higher-order relationships that are often difficult to detect with traditional regression procedures. SPSS statistical software version 20.0 (IBM Japan Ltd) was used.

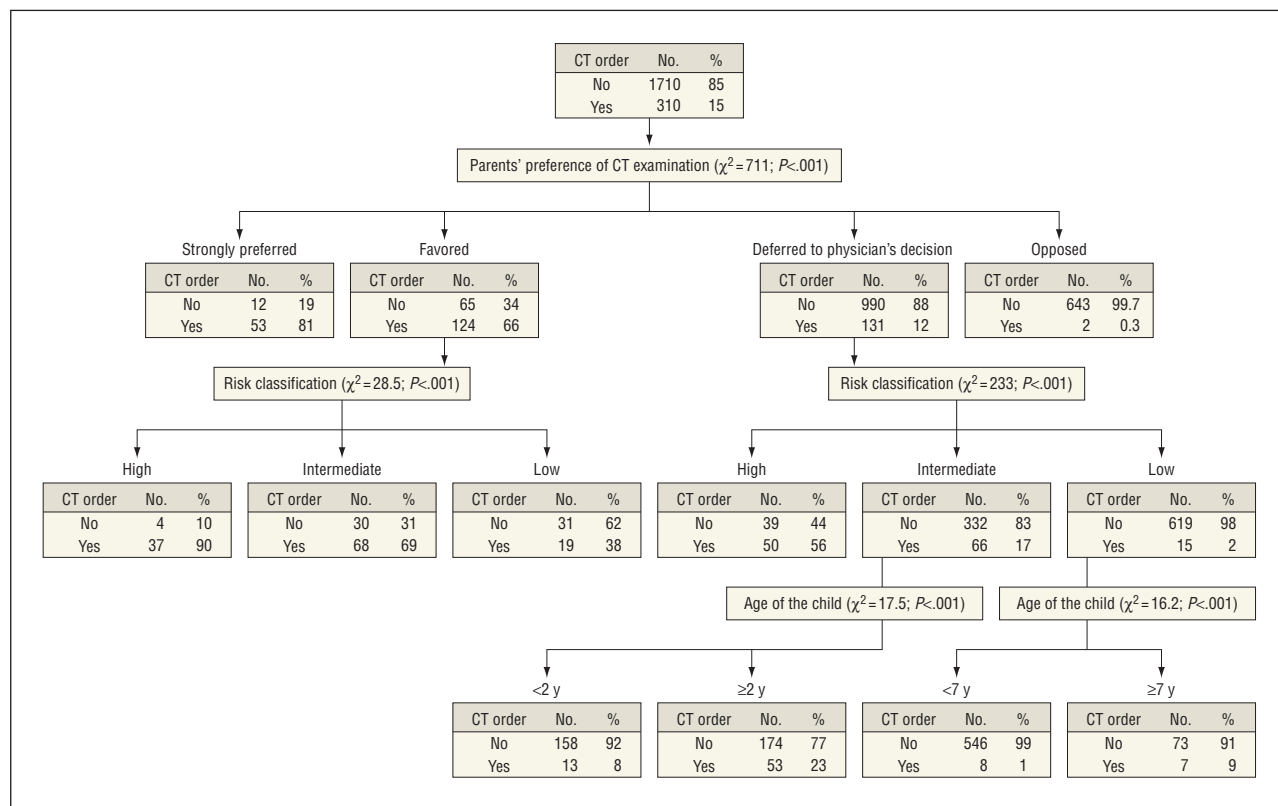


Figure. A graphical representation of the Chi-squared Automatic Interaction Detection (CHAID) analysis. Through a process of recursive partitioning based on degree of statistical significance of the χ^2 tests for independence, the CHAID algorithm evaluated which explanatory variables (eg, parental preference and brain injury risk categories), if split, most "explain" the dependent variable (head computed tomography [CT] scan). Cut points for child's age were selected by the CHAID algorithm.

Results. Of 2020 patients, 310 (15.3%) underwent head CT scan. Using multivariate Poisson regression, head CT scan was independently associated with older age (age ≥ 7 years vs < 2 years: RR=2.01; 95% CI, 1.57-2.57), strong parental preference (vs deferred to physician: RR=4.39; 95% CI, 3.43-5.60), high brain injury risk classification (vs low: RR=6.61; 95% CI, 4.85-9.01), and emergency department attending physician (vs pediatrics: RR=1.54; 95% CI, 1.21-1.97) (eTable, <http://www.jamapeds.com>). Complementary to these results, recursive partitioning based on CHAID first selected parental preference as providing the most evidence in discriminating whether a head CT scan was performed (**Figure**). Stratification also showed that nearly 40% of children in the low injury risk group underwent a head CT scan if their parents "favored" one, in contrast to only 2% of children in this risk group if the decision was deferred to the physician (Figure). Evidence suggesting higher-order interactions with child's age was observed.

Comment. The overuse of cranial CT in children,⁴ even for minor blunt head trauma, is a concern particularly in light of a recent report⁵ that showed CT scans in children delivering cumulative doses of about 50 mGy and 60 mGy might almost triple the risk of leukemia and brain cancer, respectively. Our results indicate that medically irrelevant factors such as parental preference may affect physician decision making and can result in unnecessary exposures to children. Furthermore, CHAID analysis suggested interaction between parental preference, injury risk classification, and child's age, but a tendency for overfitting the data is a possibility with this algorithm. Thus, additional studies would help to clarify these higher-order relationships.

Although clinical benefits likely outweigh the small risks in most cases, radiation doses from CT should be kept as low as reasonably achievable,⁶ and alternative procedures should be considered, when appropriate.

Yasushi Ishida, MD, PhD
Atsushi Manabe, MD, PhD
Aya Oizumi, RHIA
Norio Otani, MD
Michio Hirata, MD
Kevin Urayama, PhD, MPH
Yukihisa Saida, MD
Isao Kusakawa, MD, PhD
Tsuguya Fukui, MD, PhD, MPH

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Author Affiliations: Departments of Pediatrics (Drs Ishida, Manabe, Hirata, Urayama, and Kusakawa), Medical Informatics (Ms Oizumi), Emergency (Dr Otani), and Radiology (Dr Saida), St Luke's International Hospital (Dr Fukui), Tokyo, Japan.

Correspondence: Dr Ishida, Department of Pediatrics, St Luke's International Hospital, 9-1 Akashi-cho, Chuo-ku, Tokyo 104-8460, Japan (yaishida2009@yahoo.co.jp).

Author Contributions: *Study concept and design:* Ishida, Manabe, Hirata, Saida, Kusakawa, and Fukui. *Acquisition of data:* Ishida, Oizumi, Saida, and Fukui. *Analysis and interpretation of data:* Ishida, Oizumi, Otani, Hirata, Urayama, Kusakawa, and Fukui. *Drafting of the manuscript:* Ishida and Otani. *Critical revision of the manuscript for important intellectual content:* Ishida, Manabe, Oizumi, Hirata, Urayama, Saida, Kusakawa, and Fukui. *Statistical analysis:* Ishida and Urayama. *Obtained funding:* Ishida. *Administrative, technical, and material support:* Manabe, Oizumi, Otani, Hirata, Saida, and Fukui. *Study supervision:* Saida, Kusakawa, and Fukui.

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