ORIGINAL ARTICLE

Comparison of PECARN clinical decision rule and clinician suspicion in predicting intra-abdominal injury in children with blunt torso trauma in the emergency department

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ABSTRACT

BACKGROUND: The Pediatric Emergency Care Applied Research Network (PECARN) developed a clinical decision rule to identify children at low risk for intra-abdominal injury requiring acute intervention (IAI-I) for reducing unnecessary radiation exposure of abdominal computed tomography (CT) after blunt torso trauma. This study aimed to compare the PECARN decision rule with clinician suspicion in identifying children at low risk of intra-abdominal injuries that an abdominal CT scan can be safely avoided.

METHODS: This study is a retrospective review of children with blunt torso trauma in an academic emergency department (ED) between 2011 and 2019. Patients were considered positive for the PECARN rule if they exhibited any of the variables. Clinician suspicion was defined as actual CT ordering of the treating physician. The primary outcome was IAI-I detected by imaging or surgery within 1 month after the trauma, and the secondary outcome was any intra-abdominal injury (IAI) presence.

RESULTS: Among the 768 children included, 48 (6.25%) had intra-abdominal injuries and 21 (2.73%) of whom underwent acute intervention. Four hundred and fifty-three (59%) children underwent abdominal CT scanning. If the PECARN rule had been applied, 232 patients would have undergone abdominal CT. The rule revealed 90.48% (95% CI=68.17–98.33%) sensitivity for IAI-I and 81.25% (95% CI=66.9–90.56%) for IAI. Clinician suspicion revealed sensitivities of 100% (95% CI=80.76–00%) and 93.75% (95% CI=81.79–98.37%) for IAI-I and IAI, respectively. Sensitivities of the rule and clinician suspicion were statistically similar for both IAI-I (p=0.5) and IAI (p=0.146).

CONCLUSION: In this study, the PECARN abdominal rule and clinician suspicion performed similarly in identifying intra-abdominal injuries in children with blunt torso trauma. However, our study supports the use of PECARN abdominal rule in addition to clinical judgment to limit unnecessary abdominal CT use in pediatric patients with blunt torso trauma in the ED.

Keywords: Clinical decision rule; clinician suspicion; computed tomography; intra-abdominal injury; pediatric trauma.

INTRODUCTION

Trauma is the most common cause of mortality and morbidity in children.[1] Timely diagnosis of intra-abdominal injury (IAI) is crucial to prevent mortality and morbidity due to delayed or missed diagnosis in pediatric blunt trauma.[2] However, accurate diagnosis of IAI is challenging in the complex initial evaluation of injured children.

Computed tomography (CT) is the current reference standard for the diagnosis of IAI in hemodynamically stable children.[3] CT provides detailed diagnosis and grading of the severity of injury, helping the clinicians in management decisions. Yet, its drawbacks, particularly higher lifetime risk for radiation-related malignancy, cannot be neglected.[4] In addition to significant variations between centers and clinicians,[5] CT use increased substantially in recent years.[6] Further-

more, the current evidence indicates that clinician suspicion is not highly accurate and clinicians perform advanced imaging despite a low probability of clinically significant injury.[7]

Evidence-based clinical decision rules can help to protect children from unnecessary radiation exposure by accurately targeting of CT scanning to children at risk of IAI. In 2013, Pediatric Emergency Care Applied Research Network (PECARN) developed a clinical decision rule with seven variables based on history and physical examination (evidence of abdominal wall trauma/seatbelt sign, Glasgow Coma Scale score lower than 14, abdominal tenderness on examination, evidence of thoracic wall trauma, complaint of abdominal pain, decreased breath sounds, or history of vomiting) to identify low-risk children for IAI requiring acute intervention (IAI-I). Children without any risk factors in the decision rule were considered at very low risk for an IAI-I.[3] The rule indicates that for children at very low risk for IAI-I abdominal CT scanning can safely be avoided. This rule is not widely validated or used in daily practice. There are also limited data regarding the performance of the rule for identifying children with any IAI.[8]

The aim of this study was to compare the performance of PECARN abdominal clinical decision rule and unstructured clinician suspicion in identifying children at low risk for IAI-I and IAI who were evaluated in the emergency department (ED) due to blunt torso trauma.

MATERIALS AND METHODS

Study Design

This retrospective, observational study was performed in a pediatric population with blunt torso trauma presented to a tertiary ED, which has 55,000 patient admissions annually, from 2011 to 2019. The study center was an academic adult ED that also cares for children with trauma. Approval was obtained from the ethics committee of the institution with the project number KÜ GOKAEK 2018/70. To obtain the records of possible trauma-related admissions to other centers within 1-month follow-up after the first admission, screening was performed with the permission of Provincial Directorate of Health.

Study Population

All trauma presentations under the age of 18 were manually reviewed from the triage team's and electronic medical records. Children were considered eligible if they did not have penetrating mechanism of injury, burns, lacerations, isolated head/face, or extremity trauma. Patients were additionally excluded for any of the following: Sustained trauma >24 h before admission to the ED, known pregnancy, neurological disease that could preclude reliable examination, and lack of medical records. Children with blunt torso trauma (motor vehicle accidents, pedestrian and bicycle accidents, falls, and including abdominal) confirmed with ICD-10 codes

(S30.0-S30.9, S36.0-S37.9, T00.1, T00.8, T00.9, T04.8-9, V02-9, V10-99, W01-24, and Y30-32) were included in the study.

Study Protocol

Data were abstracted by researchers from all of emergency physicians' documentations, nursing flowsheets, forensic case notification forms, laboratory results, radiology reports, and operative notes. The variables that were not particularly emphasized in the patient files or electronic records were coded absent. Abdominal CT results were the final reports of faculty of radiology department.

No clinical decision rules or institutional algorithms were applied in the evaluation of abdominal trauma in this center between the dates of the study. Injured children were managed according to Advanced Trauma Life Support principles in the study setting.

Applying the PECARN rule, the presence or absence of abdominal injury risk was determined at the analysis stage. Patients were considered positive for the PECARN rule if they exhibited any of the variables. Low-risk patients for IAI were those who had none of the variables of the prediction rule.

For study purposes, clinician suspicion was defined as actual CT ordering of the treating physician at his discretion for initial trauma evaluation as introduced before.[9]

All hospital registrations and records in the city were reviewed in terms of trauma-related presentations or IAI of included patients over a 1-month period after the index ED visit.

Outcomes

The primary outcome of interest was the presence of IAI-I. IAI-I was defined as death caused by IAI, angiographic embolization, and laparotomy due to bleeding, blood transfusion for anemia due to bleeding from the IAI, or at least two nights IV fluid resuscitation for pancreatic or gastrointestinal injury, in accordance with the original PECARN study.[3]

The presence of any IAI was determined as the secondary outcome. IAI was defined as an injury to the spleen, liver, urinary system, gastrointestinal system (including the bowel or associated mesentery from the stomach to the sigmoid colon), pancreas, gallbladder, adrenal gland, intra-abdominal vascular structure, or traumatic injury to the fascia recognized with imaging methods or during surgery.[3]

Statistical Analysis

SPSS version 21 (IBM SPSS Statistics for Macintosh, Version 21.0, Armonk, NY: IBM Corp.) was used to analyze the data. Distributions were examined analytically by Kolmogorov–Smirnov test. Descriptive statistics were summarized using means with standard deviations or medians with 25–75% interquartile ranges for continuous variables, and percentiles

and rates for categorical variables. A Chi-square test was used for the comparison of categorical variables, and an independent samples t-test or Mann–Whitney U-test was used for the comparison of continuous variables, as appropriate.

Performance of PECARN clinical decision rule and clinician suspicion in predicting the presence of IAI-I and IAI was calculated with clinical research calculators at vassarstats.net. The sensitivities of the decision rule and clinician suspicion to detect IAI-I and IAI were compared with the McNemar test. In all analyzes, P < 0.05 was considered as statistically significant.

RESULTS

Among the 6938 children who presented to the ED from 2011 to 2019 due to any trauma, 1289 were eligible according to ICD-10 codes. When exclusion criteria were applied, the data of 768 children were included in the analysis (Fig. 1). The mean age was 9, and 514 (66.7%) were male. The most common mechanisms of trauma were motor vehicle crash (35.3%) and pedestrian or bicycle struck by motor vehicle (20.6%). Abdominal computed tomography scans were obtained for the initial trauma evaluation of 453 (59%) children in the ED. If PECARN rule was applied, 232 (30%) of all children would undergo abdominal CT scanning. The characteristics of the study population with data regarding to the presence of intra-abdominal injuries are shown in Table 1.

There were 48 (6.3%) children diagnosed with IAI, 21 (43.8%) of whom required at least one of the interventions described. Spleen (n=19) and liver (n=16) were the most common in-
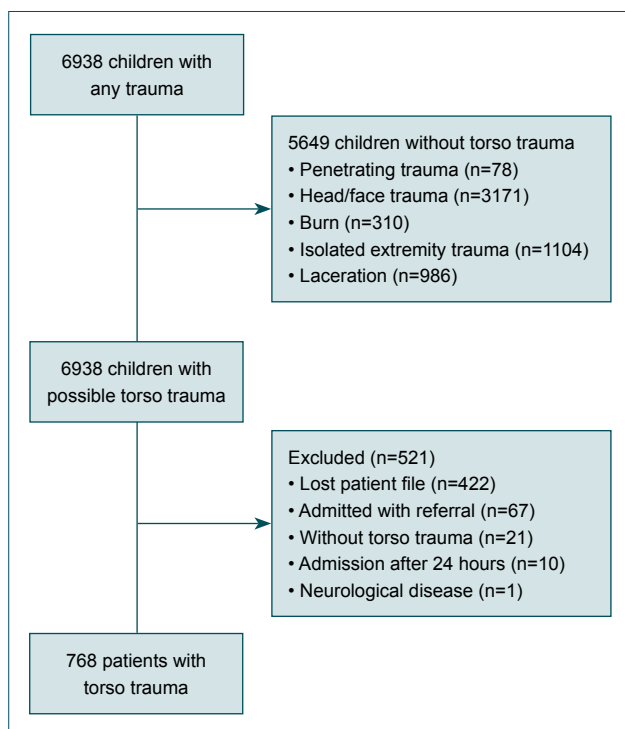
Table 1. Baseline characteristics of children with and without intra-abdominal injuries

Characteristics	No IAI (n=720)	IAI (n=48)
Age, median (IQR)	9 (5–13)	9 (6–12)
Male, n (%)	484 (67.2)	30 (62.5)
Trauma mechanism, n (%)		
Motor vehicle crash	261 (36.3)	10 (20.8)
Pedestrian/bicyclist vs MVC	140 (19.4)	18 (37.5)
Fall from an elevation	126 (17.5)	12 (25)
Bicycle collision or fall	61 (8.5)	4 (8.3)
Motorcycle/ATV/scooter collision	47 (6.5)	2 (4.2)
Fall down stairs	32 (4.4)	2 (4.2)
Struck by an object	16 (2.2)	0 (0)
Assault	13 (1.8)	0 (0)
Fall	5 (0.7)	0 (0)
Ski/skateboard injury	3 (0.4)	0 (0)
Unknown	16 (2.2)	0 (0)
GCS <14	17 (2.4)	3 (6.3)
Disposition, n (%)		
Discharged	555 (77.1)	1 (2.1)
Admitted to wards	142 (19.7)	36 (75.0)
Admitted to ICU	11 (1.5)	6 (12.5)
Referral to another center	2 (0.3)	4 (8.3)
Left against medical advice	10 (1.4)	1 (2.1)

IAI: Intra Abdominal Injury; MVC: Motor vehicle collision; GCS: Glasgow Coma Scale; ICU: Intensive Care Unit.

jured organs followed by genitourinary injuries. Three patients underwent laparotomy, 19 patients received blood transfusion, and four patients received fluid resuscitation for intestinal or pancreatic injuries. There was no death, and no angioembolization was performed. None of the children were identified with delayed diagnosis or trauma-related complications during the 30-day follow-up period.

When the PECARN abdominal rule was strictly applied to the study population, 536 (69.8%) were classified as low risk. The rule failed to detect 9 (18.75%) children with IAI (Table 2), 2 (4.2%) of whom required acute blood transfusion due to splenic laceration and adrenal injury. The two children with IAI-I were injured with MVC. One of them was a 2-year-old girl presenting with hemodynamic instability and GCS of 14. She received red blood cell transfusion. She had renal capsule and adrenal hematoma and hemoglobin level of 9 g/dl. The other child was a 6-year-old boy with spleen laceration and hemoglobin level of 9.6 g/dl. He was admitted to intensive care unit and received red blood cell and plasma. The test characteristics of the PECARN rule for IAI-I and IAI are shown in Table 3.

Figure 1. Research flowchart.

Table 2. Characteristics of the 9 children with intra-abdominal injury not identified by the PECARN abdominal rule

Age, years	Trauma mechanism	GCS	Additional injury	Abnormal laboratory	Intra-abdominal injury	Outcome
6	Fell from a height of 3 meters	15	None	None	Kidney contusion	3 days hospitalization in the pediatric surgery department
7	Pedestrian struck by MV	15	Pubic ramus fracture	None	Spleen contusion	8 days hospitalization in the pediatric surgery department
2	Fell from the 2nd floor	15	Radius fracture	AST=230 U/L ALT=89 U/L Lipase=148 U/L	Liver contusion and laceration	5 days hospitalization in the pediatric surgery department
3	Fell down stairs	15	Linear fracture of the medial orbital wall	None	Spleen laceration	2 days hospitalization in the pediatric surgery department
2	MVC	14	Lung contusion	AST=457 U/L ALT=357 U/L	Kidney laceration, capsule hematoma, adrenal hematoma	7 days hospitalization in the pediatric surgery department, ES transfusion
10	Fell down a tree	15	Radius fracture	None	Spleen laceration	3 days hospitalization in the pediatric surgery department
3	Fell down stairs	15	Lung contusion, pneumothorax	AST=966 U/L ALT=564 U/L	Liver contusion and laceration	Referral for intensive care unit
11	Pedestrian struck by MV	15	Lung contusion, minimal pneumothorax	None	Spleen contusion	3 days hospitalization in the pediatric surgery department
6	MVC	15	None	None	Spleen laceration	2 days stay in the intensive care unit ES, FFP transfusion

MVC: Motor vehicle crash; AST: Aspartate aminotransferase; ALT; Alanine aminotransferase; ES: Erythrocyte suspension; FFP: Fresh frozen plasma.

Clinician suspicion, which was defined as actual abdominal CT ordering, yielded 100% and 93.75% sensitivity in children with IAI-I and IAI, respectively (Table 4). Three children with IAI who did not undergo CT were identified by abdominal ultrasonography performed due to pediatric surgeon request. Sensitivities of the rule and clinician suspicion for detecting IAI-I (p=0.5) and IAI (p=0.146) were statistically similar.

DISCUSSION

In this study, which we sought to externally validate the PECARN clinical prediction rule by comparing with unstructured clinician suspicion, the PECARN decision rule and clinician suspicion were found to perform statistically similar in identifying children with IAI-I and IAI after blunt torso trauma in the ED. Although statistically not significant, clinician suspicion was able to detect more IAI-I and IAI than the PECARN

abdominal rule but was able to do so at the expense of increasing the number of abdominal CT scans. In this study, if the PECARN abdominal rule was initially applied to children with blunt torso trauma, the number of abdominal CT scans would be reduced by half.

Accurate diagnosis of intra-abdominal injuries in children is challenging. The history is often limited and reliability of symptoms and signs is variable.[10] Hence, emergency providers mostly rely on CT for diagnosis in the initial trauma evaluation. Due to the lack of definitive indications or recommendations for CT scanning for injured children, great variability across facilities and among physicians exists. Most of the injured children are initially evaluated at non-pediatric EDs where CT rates are higher than dedicated centers. In these centers, radiation exposure of pediatric traumas is reported

Table 3. Test characteristics of PECARN abdominal rule for intra-abdominal injury presence and acute intervention requirement

PECARN Rule	IAI-I, n	IAI without intervention, n	Total IAI
Any variables present	19	20	39
No variables present	2	7	9
Total	21	27	48
	IAI-I, % (95% CI)	**IAI, % (95% CI)**	
Sensitivity	90.48 (68.17–98.33)	81.25 (66.9–90.56)	
Specificity	71.49 (68.08–74.67)	73.19 (69.77–76.36)	
Negative predictive value	99.63 (98.51–99.94)	98.32 (96.72–99.18)	
Positive predictive value	8.19 (5.13–12.69)	16.81 (12.36–22.39)	
LR (+)	3.17 (2.65–3.80)	3.03 (2.53–3.64)	
LR (-)	0.13 (0.04–0.5)	0.26 (0.14–0.46)	

IAI: Intra-abdominal injury; IAI-I: Intra-abdominal injury requiring intervention; LR: Likelihood ratio; CI: Confidence Interval.

Table 4. Test characteristics of clinician suspicion for intra-abdominal injury presence and acute intervention requirement

Clinician suspicion	IAI-I, n	IAI-I without intervention, n	Total IAI
Positive	21	24	45
Negative	0	3	3
Total	21	27	48
	IAI-I, % (95% CI)	**IAI, % (95% CI)**	
Sensitivity	100 (80.76–100)	93.75 (81.79–98.37)	
Specificity	42.17 (38.61–45.81)	43.33 (39.69–47.05)	
Negative Predictive Value	100 (98.5–100)	99.05 (97.01–99.75)	
Positive Predictive Value	4.64 (2.96–7.11)	9.93 (7.41–13.16)	
LR (+)	1.73 (1.63–1.84)	1.65 (1.5–1.82)	
LR (-)	0	0.14 (0.05–0.43)	

IAI: Intra-abdominal injury; IAI-I: Intra-abdominal injury requiring intervention; LR: Likelihood ratio; CI: Confidence Interval.

twice as much.[11] However, even in the settings of studies derivating or validating clinical prediction rules, specialized pediatric trauma referral centers report relatively high CT imaging rates based on the provider's even low suspicion of IAI.[7] Bearing this in mind, CT rates of our study setting seem reasonable with regard to concern of misdiagnosis.

Despite the high number of pediatric blunt torso trauma, the incidence of IAI is relatively low as fewer than 15%.[3,12] With respect to protect children from risks of unnecessary radiation exposure after blunt torso trauma, clinical decision rules may have potential benefits to guide physicians for reducing unnecessary CT scanning in initial trauma assessment. When used properly, they can improve patient care quality without

compromising patient safety and reduce the cost and disadvantages of tomography.

Various clinical decision rules with different parameters were introduced for targeted scanning in children with blunt abdominal trauma.[3,12–14] Although none of them is widely validated, the PECARN abdominal rule is the most studied prediction rule in the literature.[7,8,15] To date, it has been reported to be able to identify children at very low risk of IAI-I for whom CT scanning would safely be obviated. The rule was introduced with 97% sensitivity in the derivation study.[3]

In a retrospective single-center external validation study, Springer et al.[15] reported a 99% sensitivity of the rule for

IAI requiring acute intervention. In that study, the rule missed only one child with IAI requiring transfusion, not readily attributable to the IAI. Even with that conservative estimation method, this is the highest reported sensitivity of the rule. In our study, the PECARN abdominal rule could not identify two children requiring transfusion due to splenic laceration and kidney laceration concomitant with adrenal hematoma. This resulted in a rule sensitivity of 90.5% for intervention requirement which seems lower, although statistically not significant. However, the two children with IAI-I in our study both had clinical and laboratory features that could lead the physician to CT scan ordering avoiding misdiagnosis. The difference may also be due to subjectivity or inadequate documentation of low-risk criteria, despite all efforts of data abstraction.

We could not compare Springer et al.'s[15] results with the present study for the presence of any IAI, because the authors excluded those children with intra-abdominal injuries not requiring intervention. In addition, since the authors excluded children without injury, the rule's ability to obviate unnecessary CT scanning rates could not be interpreted.

Those reported sensitivities are for injuries that require intervention. Although the primary outcome of the rule was IAI-I, we evaluated its performance in identifying any injury as well. We believed that the performance of the rule that is expected to guide the physician in decision-making in injured children is also crucial for any IAI. The detection of injury would significantly change the management of pediatric trauma, affect the decision of hospitalization and follow-up.

Regarding to identify children with any IAI, the PECARN rule yielded a sensitivity of 92.5% in the original derivation study, of which IAI presence (6.3% vs. 6.25%) and intervention requirement (1.7% vs. 2.7%) rates were similar with this study.[3] Recently, the rule was reported to have 91.6% sensitivity and 98.3% negative predictive value in identifying low-risk children for any IAI.[8]

A clinical decision rule for imaging must have high sensitivity to detect significant diseases and the potential to reduce the use of imaging.[16] Based on the literature, if it is considered clinically important to reduce CT use by 10%, the potential value of the PECARN rule in this study population is quite high.[17] In our study, 453 of 768 children underwent abdominal CT, and of those, only 45 had intra-abdominal injuries. If the PECARN rule was initially applied, 285 children would fulfill low risk criteria, reducing CT scanning rates by half (50%). This finding suggests the potential of PECARN rule for reducing unnecessary radiation exposure for children. However, applying the rule alone for imaging decision would miss the intra-abdominal organ injury in nine children, two of whom underwent intervention. Similarly, in their decision tree model study comparing implementation PECARN rule with usual care, Nishijima et al.[18] reported lower abdominal CT use with an increased risk of IAI.

In total, IAI was detected in 48 patients, and acute intervention was performed in 21 patients. Clinician suspicion revealed sensitivity of 93.75% for any IAI presence and 100% for intervention requirement. In a secondary analysis of original derivation study, Mahajan et al.[7] reported the sensitivity of clinician suspicion as 82.8% in children with acute intra-abdominal injuries undergoing acute intervention. Although the authors in that study evaluated clinician suspicion with percentage risk ratios and put forward a more concrete approach, we believe that our findings are comparable because they considered the suspicion rates of 1% and above as positive during sensitivity estimation.

Compatible with our results, in the original PECARN abdominal rule derivation study, using the same definition of clinician suspicion, the authors reported the sensitivity of actual CT ordering as 99% for injuries requiring intervention.[3]

In this study, we could not determine the rationale and timing of CT scanning decision during the initial ED evaluation. Possible reasons might be the abnormalities of vital signs or laboratory parameters as well as the mechanisms of injury. Thus, among the nine children who were assigned as low risk by the PECARN rule, two had abnormal vital signs while three of them had abnormal laboratory parameters suggestive of IAI. Considering diagnostic adjuncts including suspicious mechanism of injury, vital signs, FAST, and laboratory results subsequent to PECARN abdominal rule application based on a patient-centered decision-making in ED evaluation of those children with blunt torso trauma would further limit misdiagnosis while reducing radiation exposure of unnecessary CT scanning.

Limitations

This study has several limitations most of which arise from its retrospective nature. The most notable limitation is the potential for misclassification of children due to incomplete documentation of the treating physician. The significant number of excluded children due to inaccessible medical records is also a limitation to the study.

We could not identify the rationale and timing of CT scanning decisions. Parental request might have influenced scanning decisions. Hence, we could not analyze the reasons influencing the clinicians' decisions to order CT scans. Since PECARN abdominal rule was not routinely considered in decision-making for pediatric trauma in the study center, we interpreted the results assuming that providers did not order CT scans based on PECARN abdominal rule. Even so, with a low probability, publication of the rule might have influenced clinician suspicion and ordering CT scan.

There might be children with unidentified IAI who did not undergo CT, require intervention, or did not worsen clinically during the follow-up period. In addition, pediatric trauma

expertise of treating physicians could not be documented. Possible variations of practice patterns and intervention decisions such as blood transfusion might have affected test characteristics. Carrying out future studies prospectively may provide the prediction ability of each variable of prediction rule and rationale of clinician suspicion.

Conclusions

In this study, the PECARN abdominal rule and clinician suspicion performed similarly in identifying intra-abdominal injuries in children with blunt torso trauma. However, our study supports the use of PECARN abdominal rule in addition to clinical judgment to limit unnecessary abdominal CT use in pediatric patients with blunt torso trauma in the ED.

REFERENCES

1. National Vital Statistics System, National Center for Health Statistics, CDC. Available from: https://www.cdc.gov/injury/wisqars. Acessed Nov 03, 2018.

2. Connors JM, Ruddy RM, McCall J, Garcia VF. Delayed diagnosis in pediatric blunt trauma. Pediatr Emerg Care 2001;17:1–4. [CrossRef]

3. Holmes JF, Lillis K, Monroe D, Borgialli D, Kerrey BT, Mahajan P, et al. Pediatric emergency care applied research network (PECARN). Identifying children at very low risk of clinically important blunt abdominal injuries. Ann Emerg Med 2013;62:107–16. [CrossRef]

4. Hynick NH, Brennan M, Schmit P, Noseworthy S, Yanchar NL. Identification of blunt abdominal injuries in children. J Trauma Acure Care Surg 2014;76:95–100. [CrossRef]

5. Marin JR, Wang L, Winger DG, Mannix RC. Variation in computed tomography imaging for pediatric injury-related emergency visits. J Pediatr 2015;167:897–904. [CrossRef]

6. Acker SN, Stewart CL, Roosevelt GE, Partrick DA, Moore EE, Bensard DD. When is it safe to forgo abdominal CT in blunt-injured children? Surgery 2015;158:408–12. [CrossRef]

7. Mahajan P, Kuppermann N, Tunik M, Yen K, Atabaki SM, Lee LK, et al. for the ıntra-abdominal ınjury study group of the pediatric emergency care applied research network (PECARN). Comparison of clinician suspicion versus a clinical prediction rule in identifying children at risk for intra-abdominal injuries after blunt torso trauma. Acad Emerg Med 2015;22:1034–41. [CrossRef]

8. Özcan A, Ahn T, Akay B, Menoch M. Imaging for pediatric blunt abdominal trauma with different prediction rules. Is the outcome the same? Pediatr Emerg Care 2021;38:e654–8. [CrossRef]

9. Babl FE, Oakley E, Danziel SR, Borland ML, Phillips N, Kochar A, et al. Accuracy of clinician practice compared with three head injury decision rules in children: A prospective cohort study. Ann Emerg Med 2018;71:703–10. [CrossRef]

10. Yen K, Kuppermann N, Lillis K, Monroe D, Borgialli D, Kerrey BT, et al. and the ıntra-abdominal ınjury study group fort he pediatric emergency care applied research network (PECARN). Interobserver agreement in the clinical assessment of children with blunt abdominal trauma. Acad Emerg Med 2013;20:426–32. [CrossRef]

11. Nabaweesi R, Ramakrishnaiah RH, Aitken ME, Rettiganti MR, Luo C, Maxson RT, et al. Injured children receive twice the radiation dose at non-pediatric trauma centers compared with pediatric trauma centers. J Am Coll Radiol 2018;15:58–64. [CrossRef]

12. Streck CJ, Vogel AM, Zhang J, Huang EY, Santore MT, Tsao K, et al, for the Pediatric Surgery Research Collaborative. Identifying children at very low risk for blunt intra-abdominal injury in whom CT of the abdomen can be avoided safely. J Am Coll Surg 2017;224:449–58.e3. [CrossRef]

13. Holmes JF, Sokolove PE, Brant WE, Palchak MJ, Vance CW, Owings JT, et al. Identification of children with intra-abdominal injuries after blunt trauma. Ann Emerg Med 2002;39:500–9. [CrossRef]

14. Holmes JF, Mao A, Awasthi S, McGahan JP, Wisner DH, Kuppermann N. Validation of a prediction rule for the identification of children with intra-abdominal injuries after blunt torso trauma. Ann Emerg Med 2009;54:528–33. [CrossRef]

15. Springer E, Frazier SB, Arnold DH, Vukovic AA. External validation of a clinical prediction rule for very low risk pediatric blunt abdominal trauma. Am J Emerg Med 2019;37:1643–48. [CrossRef]

16. Cullison K, Milne WK, Crocco AG. Hot off the press: Comparison of clinical suspicion versus a clinical prediction rule when evaluating children following blunt torso trauma. Acad Emerg Med 2015;22:1034–41.

17. Holmes JF, Kelley KM, Wootton-Gorges SL, Utter GH, Abramson LP, Rose JS, et al. Effect of abdominal ultrasound on clinical care, outcomes and resource use among children with blunt torso trauma a randomized clinical trial. JAMA 2017;317:2290–6. [CrossRef]

18. Nishijima DK, Yang Z, Clark JA, Kuppermann N, Holmes JF, Melnikow J. A cost-effectiveness analysis comparing a clinical decision rule versus usual care to risk stratify children for intraabdominal injury after blunt torso trauma. Acad Emerg Med 2013;20:1131–8. [CrossRef]

ORİJİNAL ÇALIŞMA - *ÖZ*

Acil serviste künt gövde travmalı çocuklardaki intraabdominal yaralanmayı öngörmede PECARN klinik karar kuralı ile klinisyen şüphesinin karşılaştırılması

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AMAÇ: Çocuklarda künt travma sonrası yaralanmaları tanımada kullanılan abdominal bilgisayarlı tomografiye (BT) bağlı gereksiz radyasyon maruziyetini azaltmak için The Pediatric Emergency Care Applied Research Network (PECARN) grubu karıniçi yaralanma için düşük riskli çocukları tanımlamak amacıyla bir klinik karar kuralı tanımladı. Bu çalışmanın amacı; künt gövde travması sonrası karıniçi yaralanma riski düşük olan, bilgisayarlı tomografiden güvenle kaçınılabilecek çocukları tanımlamada PECARN klinik karar kuralı ile klinisyen şüphesinin performanslarını karşılaştırmaktır.

GEREÇ VE YÖNTEM: Bu çalışmada akademik bir acil servise 2011–2019 yılları arasında künt gövde travması ile başvuran çocuklar geriye dönük olarak gözden geçirildi. PECARN değişkenlerinden herhangi birinin varlığı pozitif olarak kabul edildi. Klinisyen şüphesi de doktorun abdominal BT istemesi olarak tanımlandı. Çalışmanın birincil sonlanım ölçütü girişim gerektiren intraabdominal yaralanma, sekonder sonlanım ölçütü de herhangi bir karıniçi yaralanma varlığı idi.

BULGULAR: Analiz edilen 768 çocuğun 21'inin (%2.73) akut girişim gerektirdiği 48'inde (%6.25) karıniçi yaralanma mevcuttu. Çocukların 453'üne (%59) abdominal BT çekildi. PECARN klinik karar kuralı uygulansaydı 232 çocuğa BT çekilecekti. PECARN kuralı girişim gerektiren karıniçi yaralanma için %90.48 (%95 GA = %68.17–%98.33) ve herhangi bir yaralanma varlığı için %81.25 (%95 GA = %66.9–%90.56) duyarlılık gösterdi. Klinisyen şüphesi ise sırasıyla girişim gerektiren yaralanmayı ve herhangi bir yaralanma varlığını öngörme için %100 (%95 GA = %80.76–%100) ve %93.75 (%95 GA = %81.79–%98.37) duyarlılıkta idi. Karar kuralı ve klinisyen şüphesinin karıniçi yaralanma için düşük riskli çocukları öngörme performansları girişim gerektiren yaralanmalarda (p=0.5) ve yaralanma varlığında (p=0.146) istatistiksel olarak benzerdi.

TARTIŞMA: Bu çalışmada PECARN karın kuralı ve klinisyen şüphesi, acil servisteki künt gövde travmalı çocuklardaki karıniçi yaralanmaları öngörmede benzer performans gösterdiler. Bununla birlikte, çalışmamız bu çocuklarda gereksiz abdominal BT çekilmesini sınırlandırmak için klinik yargıya ek olarak PECARN klinik karar kuralının kullanımını desteklemektedir.

Anahtar sözcükler: Bilgisayarlı tomografi; intraabdominal yaralanma; klinik karar kuralı; klinisyen şüphesi; pediatrik travma.