Journal of Pediatric Surgery (2005) **40**, 114–119

ELSEVIER

Journal of Pediatric Surgery

www.elsevier.com/locate/jpedsurg

The multi-institutional validation of the new screening index for physical child abuse☆

David C. Chang[a], Vinita Misra Knight[b], Susan Ziegfeld[b], Adil Haider[c], Charles Paidas[d,*]

[a]*Johns Hopkins Bloomberg School of Public Health, USA*
[b]*Department of Pediatric Surgery, Johns Hopkins Medical Institutions, Baltimore, MD 21287, USA*
[c]*New York Medical College, USA*
[d]*Chief, Pediatric Surgery, University of South Florida, Tampa General Hospital, Tampa, FL 33601, USA*

Index words:
Pediatric trauma;
Child abuse;
Screening index

Abstract

Background/Purpose: There is currently no evidence-based screening instrument to assist in the detection of physical child abuse patients. The screening index for physical child abuse (SIPCA) was previously developed as a potentially new tool for this need. It is a scale that assigns point values, on the basis of variable weights from logistic regression models, to age and patterns of injuries (including fracture of base or vault of skull, contusion of eye, rib fracture, intracranial bleeding, multiple burns), with higher scores indicating greater suspicion for abuse. The purpose of this study is to validate this new tool in another independent data set.

Methods: A cross-sectional hospital discharge database from 1961 hospitals in 17 states is used (n = 58558). Children aged 14 years or younger with *International Classification of Diseases, Ninth Revision, Clinical Modification* codes 800 to 959 are included for analysis. Child abuse cases are identified by E codes and certain *International Classification of Diseases, Ninth Revision, Clinical Modification* codes in the 995.5x range. Screening index for physical child abuse performance is evaluated by discrimination (receiver operating characteristic) and goodness of fit (pseudo r^2).

Results: A total of 447 abused patients (0.76%) was identified. The receiver operating characteristic of SIPCA in this data set is 0.89 as compared with 0.86 in the development data set. The pseudo r^2 of SIPCA in this data set is 0.26 as compared with 0.28 in the development data set. A SIPCA score of 3 has a sensitivity of 86.6% and a specificity of 80.5% for detecting physical abuse; raising the threshold to a score of 4 improves the specificity to 93.1% but at a loss of sensitivity to 71.8%.

Conclusions: The validity of the new SIPCA instrument is supported by its performance in an independently derived data set. A score of 3 on SIPCA represents a balanced trade off in the sensitivity and specificity of the instrument in detecting physical abuse and is an optimal threshold above which to begin considering abuse in differential diagnosis. Application of the instrument could assist clinicians in detecting physical child abuse cases among pediatric trauma patients.

© 2005 Elsevier Inc. All rights reserved.

Presented at the 35th Annual Meeting of the American Pediatric Surgical Association, Ponte Vedra, Florida, May 27-30, 2004.

☆ Conflict of interest: No author has any financial or proprietary interest in the subject matter or materials discussed in the manuscript.

Dr Chang is supported by a National Research Service Award fellowship from the National Institute of General Medical Sciences. The study is supported by the Johns Hopkins Hospital Pediatric Trauma Service.

* Corresponding author. Chief, Pediatric Surgery, University of South Florida, Tampa General Hospital, Tampa, FL 33601, USA. Tel.: +1 813-844-7315.
E-mail address: cpaidas@hsc.usf.edu (C. Paidas).

0022-3468/05/4001-0020$30.00/0 © 2005 Elsevier Inc. All rights reserved.
doi:10.1016/j.jpedsurg.2004.09.019

Child abuse is a significant public health problem. In 2001, more than 1.7 million cases were referred to child protective services across the country for investigation, of which 490000 (27.5%) were ultimately substantiated [1]. The detection of the physical cases of child abuse, which may pose the greatest threat to life, is especially important for a pediatric trauma service, which may be the final stop in the health care system before the abuse case escalates into fatality.

To that goal, many have described the specific clinical problems that are commonly seen in abused patients such as head [2], thoracic [3], abdominal [4], or extremity trauma [5]. A few authors have described the general characteristics of child abuse cases (lengths of stay, mortality, etc) as part of a broad general analysis on injury patterns [6,7]. However, there have been few studies that tried to comprehensively characterize abused pediatric trauma patients and compare them with other pediatric trauma patients. More importantly, there has been no attempt to develop a discriminative screening tool from a comparative study of abused vs nonabused patients.

We decided to do so in a previous analysis of the registry of our urban level I pediatric trauma center registry (n = 11919). In that study, we developed the screening index for physical child abuse (SIPCA) as a potentially new screening tool to assist in the detection of physical child abuse among pediatric trauma patients [8]. This new scale assigns point values, on the basis of modification of variable weights from logistic regression models, to age and patterns of injuries (including fracture of base or vault of skull, contusion of eye, rib fracture, intracranial bleeding, multiple burns; Table 1). Higher scores indicate a greater suspicion for physical abuse. The aim of this study is to validate this new tool in another independent data set.

Table 1 Discrimination and goodness of fit of the original logistic regression model and 2 versions of the resultant screening index for identifying physical child abuse cases among pediatric trauma patients from our earlier development work on the basis of our single level I pediatric trauma center 13-year registry [8]

Diagnostic categories	Logistic regression model	26-Point index	15-Point index (proposed SIPCA)
Fracture of base or vault of skull (800.xx and 801.xx)	$\beta = 2.1$	1 point	1 point
Contusion of eye (921.xx)	$\beta = 6.6$	3 points	2 points
Rib fracture (807.xx)	$\beta = 6.6$	3 points	2 points
Intracranial bleeding (852.xx and 853.xx)	$\beta = 9.3$	4 points	2 points
Multiple burns (946.xx)	$\beta = 6.8$	3 points	2 points
Age group 1-3	$\beta = 6.3$	3 points	2 points
Age group 0-1	$\beta = 25.0$	12 points	6 points
ROC	0.867	0.861	0.863
Pseudo r^2	0.317	0.261	0.280

The 15-point index was ultimately kept and proposed to be the SIPCA.

1. Materials and methods

1.1. Initial development of SIPCA

We previously identified 171 child abuse patients in a retrospective evaluation of 13 years of data from our urban level I pediatric trauma center registry (n = 11919). A total of 3026 different *International Classification of Diseases, Ninth Revision* (*ICD-9*) diagnosis codes was recorded among these patients.

The analysis began with a consolidation of the 3026 exact diagnosis codes into their integer *ICD-9* codes by integerizing the codes and eliminating the decimal portion of the codes after the dot. This produced 51 integer codes. The prevalence rates of these 51 codes were then examined to identify those that would occur frequently enough to be useful. It was found that only 15 of these codes had a prevalence rate greater than 5% among abused patients; the other 36 codes were thus eliminated from further analysis at this stage because they occurred too rarely to be useful.

Among the 15 codes that were selected on the basis of prevalence, it was found that 5 of them did not present with significantly different prevalence rates among abused vs nonabused patients (920.xx, facial contusion; 919.xx, multiple superficial injury; 821.xx, femur fracture; 823.xx, tibia and fibula fracture; and 922.xx, thoracoabdominal contusion). These codes would lack discriminative power to differentiate between abused vs nonabused patients and were thus removed from further analysis.

At this point, we decided to make several modifications to the list of codes on the basis of clinical knowledge to make the list more clinically meaningful: (1) We decided to discard 2 of the 10 codes (854.xx and 873.xx) that were less prevalent in child abuse cases than in nonabuse cases because all the other factors had a positive effect and because we believe that it would be confusing to develop an index that has a mix of positive and negative factors. We did examine the effect of these 2 diagnosis codes in the regression modeling process and found that it had minimal to no impact on the explanatory power of the models, thus supporting the decision to discard them. (2) After additional review of the records, it was decided to also discard code 924.xx because it included "unspecified sites" and was often used when the records were not clear as to the location of the contusion; this diagnosis code was thus not specific enough to be clinically useful. (3) The remaining 7 diagnosis codes were then further consolidated by combing them into 5 categories that were more clinically meaningful: contusion of the eye (to include only 921.xx), fracture of

Download English Version:

https://daneshyari.com/en/article/9374727

Download Persian Version:

https://daneshyari.com/article/9374727

Daneshyari.com