Rapid, Routine Emergency Department Screening for Child Physical Abuse - a validation tool for use in MHS/DHA emergency departments

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DECLARATION OF INTEREST

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RAPID, ROUTINE EMERGENCY DEPARTMENT SCREENING FOR CHILD PHYSICAL ABUSE - A VALIDATION TOOL FOR USE IN MHS/DHA EMERGENCY DEPARTMENTS

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14. ABSTRACT-

Study Hypothesis: Routine emergency department (ED) screening for child physical abuse has been widely implemented to improve recognition, but prior studies have been unable to identify subsequent abuse beyond a single hospital system. By linking statewide protective services data, we tested the hypothesis that routine ED screening decreases subsequent physical abuse.

Methods: This was a retrospective cohort study. Data was collected for children <6 years old with an ED encounter in two large healthcare systems, only one of which implemented routine ED screening. The main outcome was a protective services referral 3-180 days after the ED encounter for physical abuse. Outcomes were compared for two-year periods before and after screening was implemented. Screening was conducted by the child's primary nurse and included two multi-part questions regarding signs of physical abuse. We used generalized estimating equations, adjusting for sex, age, race/ethnicity, payor and prior ED visits.

Results: During the study period, there were 331,931 eligible ED encounters, with 30% in screening EDs, and 51% in the screening period. In screening EDs, screening was completed in 82% of eligible encounters, and was positive in 0.43%. 6586 (2.0%) encounters had a subsequent protective services referral, including 503 with moderate or severe abuse. Rates of subsequent abuse decreased during the screening period only for non-screening EDs (aOR 0.88; 95%CI 0.82-0.9), and this decrease was significantly different than screening EDs (aOR 0.90; 95%CI 0.81-1.00).

Conclusion: Our program of routine ED screening was not associated with a significant decrease in subsequent physical abuse.

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1.0 EXECUTIVE SUMMARY

Child physical abuse is often missed by medical providers. When abuse is missed, children are at increased risk for recurrent abuse, escalating injury, and death. In an effort to decrease rates of missed abuse and subsequent injury, several organizations have implemented routine, emergency department (ED) screening for signs and symptoms associated with abuse, in hopes of improving early recognition. While this routine ED screening has been found to be feasible, acceptable, and to identify children at high risk for abuse, it is not clear whether it ultimately decreases subsequent abuse. Prior studies have been unable to test this because they are unable to identify episodes of abuse after the initial ED visit, or if the child's subsequent abuse does not involve the same healthcare system as the initial ED visit.

We overcame this gap by linking statewide child protective services data to ED visits for two large healthcare systems, only one of which implemented routine screening. We tested whether one system's implementation of routine screening decreased subsequent abuse relative to the other, non-screening system.

We examined ED visits for children <6 years old for two years before and after routine ED screening was deployed. Our main outcome was a Child Protective Service (CPS) referral for physical abuse or an injurious environment 3-180 days after the ED visit. We used generalized estimating equations, adjusting for sex, age, race/ethnicity, payor and prior ED visits.

To our surprise, routine screening was *not* associated with a decrease in subsequent abuse. Indeed, while rates of the main outcome remained relatively steady in the screening EDs, there was a small but statistically significant decrease in the main outcome in *non-screening* EDs.

2.0 INTRODUCTION

Physical abuse is a significant source of morbidity and mortality for children, estimated to affect >120,000 US children each year, and leading to >600 deaths and billions of dollars in healthcare costs and lost productivity.[1] Because violence is often a chronic, escalating phenomenon, it is important to recognize abuse early in its course, when injuries are relatively minor.[2–4] Physical abuse is notoriously difficult to detect because signs and symptoms may be subtle, young children are unable to report abuse themselves, and caregivers may give incomplete or misleading information.[5] Despite decades of education and awareness-building, physical abuse continues to be missed frequently, especially in emergency department (ED) settings.[6–8] Approximately 32% of abusive head trauma and 20% of abusive fractures are missed on their initial presentation.[2,9,10]

To improve recognition, several centers have deployed routine ED screening, in which all children presenting for emergency care are evaluated for historical and physical signs of abuse, or for injuries that have been highly associated with abuse.[6,11–16] The intention of these programs is to improve early recognition so that secondary prevention will reduce subsequent, serious abuse. Routine screening has been shown to be feasible, and to identify children at increased risk of abuse.[6,13] However, because prior studies have been unable to link ED visits with and without screening to subsequent episodes of abuse that are recognized outside a single healthcare system, available data has not tested whether routine screening ultimately reduces subsequent abuse.[17] Screening might fail to prevent subsequent abuse if it only identifies cases that would have been identified without screening, if it fails to improve secondary prevention, or if it identifies cases with low risk of recurrence or escalation.

Our objective was to test the impact of a program of routine screening on subsequent physical abuse in a large healthcare system by linking statewide child protection data to ED visits. Our hypothesis was that routine screening would be associated with a significant decrease in subsequent physical abuse relative to a network that did not implement screening.

3.0 METHODS, ASSUMPTIONS AND PROCEDURES

This was a retrospective, cohort study - a natural experiment comparing rates of subsequent abuse in two large, geographically similar US healthcare systems, only one of which implemented routine screening. We adhered to the STROBE guidelines for observational studies.[1] The protocol was granted exemption from review by the Colorado Multi-Institutional Review Board.

3.1 Participants and Settings

Because we were interested in reducing ED visits with missed abuse, and because patients may have multiple ED visits in different hospitals and healthcare systems without a reliable way to determine which visits occurred after the abuse, we used the ED visit, rather than the patient, as the unit of analysis. We identified ED visits for children <6 years (72 months) old in two large healthcare networks in a single US state. One system, the "screening system," implemented routine screening on October 3, 2019, while the other, the "non-screening system" did not implement routine screening. The screening system included 27 general EDs, including 12 hospital-based and 15 freestanding EDs. The non-screening system was composed of 5 hospital-based pediatric EDs.

We included ED visits from October 3, 2017 – October 2, 2021. One ED in the non-screening system implemented routine screening January 27th, 2021 and visits from this ED were analyzed separately. Each system used its own, integrated electronic health record (EHR; Epic EMR, Verona, WI) from which data was extracted.

3.2 Routine Screening Program

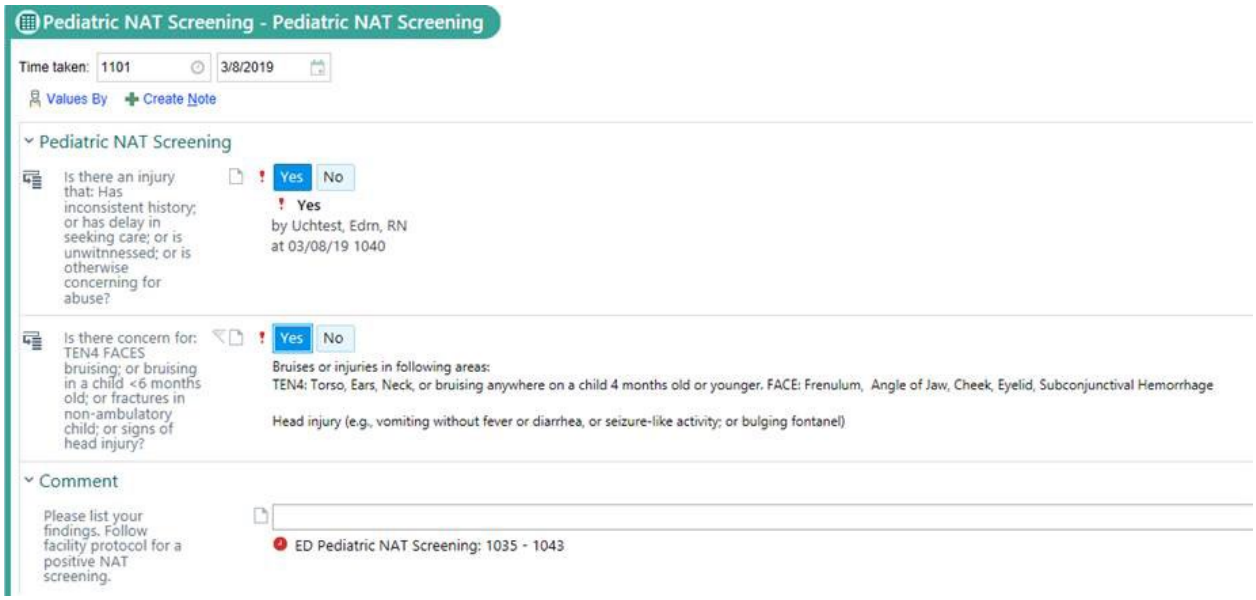

Figure 1. Routine Screening Tool. The primary nurse was prompted to complete this tool for children <6 years old. If either question was marked with concern for abuse, the nurse was prompted to detail the concern in free text and to communicate directly with the child's clinician.

The routine screening tool was completed by the primary nurse at the time of the initial evaluation and consisted of two multi-part questions, which were adapted from previously published routine screening programs (Figure 1).[2–4] The first question asked about historical factors including inconsistency and delay in seeking care. The second prompted nurses to

consider the presence of injuries concerning for abuse including TEN-4-FACESp bruising, fractures in non-ambulatory children, or signs of head injury.[5,6] If either question indicated concern, the nurse was prompted to describe the concern in a free-text field and to speak directly with the child's ED clinician. The EHR triggered a hard stop alert and prompted the clinician to acknowledge the concern for abuse and chart their response prior to the child's disposition from the ED. The alert was not deployed if there was an order for a skeletal survey or a consultation was requested from the child protection team, social work, or forensic nursing. The tool was not triggered for children who left or were discharged prior to being assigned a primary nurse, but these ED visits were included in all analyses.

3.3 Outcomes and Data Abstraction

Clinical data was abstracted from the EHRs of the participating hospital systems. Structured data (demographics, dates, dispositions, screening completion and results) were abstracted from structured fields in the EHR. Un-structured fields (injuries identified, consideration of abuse, decision to report to CPS by the clinical team, complaints) were abstracted by a trained chart reviewer (JR) who was not aware of the child's screening status or results.

Child protective services (CPS) data were abstracted from the CPS case management and information system for the state in which the screening and non-screening hospital systems are located. These data contained information for each child aged less than 6.5 years who received a referral to CPS (screened-in or screened-out) between October 2019 and April 2022. First, middle and last name, sex and birthdate were included with the CPS dataset to facilitate linkage to clinical data (see below). For each referral that was screened in and received a response from a CPS agency, the CPS data also provided a measure of severity of the allegation (minor, moderate, severe) and an indicator of the type of maltreatment (e.g. physical abuse, trafficking, injurious environment, etc).

Our main outcome was subsequent physical abuse, defined as a referral to CPS 3-180 days after the ED visit that was accepted for investigation and coded as "physical abuse" or an "injurious environment." We excluded CPS referrals that occurred within 3 days of the index ED visit in order to focus on *subsequent* abuse, and not abuse that was diagnosed at the time of the index ED visit.

Secondary outcomes included referrals rated by CPS as moderate or severe abuse and referral rates for any reason within 2 days of the ED visit (to test whether routine screening increased referral rates).[19] Clinical charts were reviewed for all children with a CPS designation of physical abuse, or with moderate or severe injurious environment. We also reviewed a random 5% sample of children coded as mild, injurious environment (n=325/6501). Information abstracted about the index ED visit included whether there was a history of trauma, the child's chief complaint, consults related to abuse (social work, child protection team, forensic nursing), any mention of abuse or non-accidental trauma, screening studies obtained, injuries identified, reports to CPS, hospital admission, and length of stay.

For children who had a subsequent referral with moderate or severe abuse, we reviewed medical records from the participating institutions to identify subsequent serious injury, defined as fracture(s), traumatic brain injury, burns >5% total body surface area, intra-abdominal or intra-thoracic injury, or any injury resulting in hospitalization, surgery, or death.[7]

The social constructs of race, ethnicity, and socioeconomic status have been shown to impact the occurrence, recognition, reporting, and diagnosis of child abuse.[8–11] To determine whether

screening or CPS referrals were impacted by race or socioeconomic status, we collected self-reported or family-reported race and ethnicity data and payor status from the EHR. Race and ethnicity were grouped as White/Non-Hispanic, Non-White/Non-Hispanic, Hispanic, and Unknown/Not Reported. Payor classes were grouped as Private, Public, Tricare/Military insurance, and self-pay/no insurance.

3.4 Linkage Methods

We used a hybrid linkage method that leverages the effectiveness of deterministic linkage and the flexibility of probabilistic linkage.[12–14] Deterministic linkage is highly efficient but susceptible to data error and probabilistic linkage methods are more error-resistant but computationally expensive.[15–18] Because records from the two hospital systems and CPS do not share a common unique identifier, pseudo identifiers, including first name, last name, middle name, date of birth, home address, and sex were used to determine the linkage. Data preprocessing was conducted to ensure text and date values followed the same format from each data source.

Record linkage operation is often computationally expensive because of comparisons performed between two records to be linked.[19] To improve the efficiency of the probabilistic methods, data blocking methods, or blocking schemes, are used to narrow down the number of comparisons needed between two or more datasets. The blocking scheme divides the datasets into smaller, manageable subsets, known as "blocks." These blocks are constructed based on certain attributes or features shared between records in both datasets. For example, if we have two datasets of people's information, we could create blocks based on the first letter of their last names. All records with the same initial letter will be placed in the same block. When a blocking scheme is applied, only records in the same block are compared. The following blocking schemes were used: Blocking scheme 1 (Soundex of first name; Soundex of last name; Year of birth; Sex) Blocking scheme 2 (Soundex of first name; Soundex of last name; City; State; Sex).

3.5 Analytic Approach

We modeled the binary outcome of subsequent physical abuse after an ED visit using generalized estimating equations (GEE), a method which models the odds of the outcome occurring based on covariates while accounting for the possibility of correlation among ED visits associated with the same person. We used a binomial family model, an exchangeable working correlation matrix, and we performed inference robust (sandwich) standard errors. Our models included covariates to measure the marginal effects of hospital system (screening/no screening), period (before/after screening deployment), sex, age, race/ethnicity, financial class (determined by insurance type) and number of previous ED visits. The primary effect of interest was measured via the interaction between screening status and period, which measures the extent to which the deployment of screening changed the log odds of the outcome differently than EDs that did not deploy routing screening (a difference-in-differences model on the log scale). We present inferences obtained from unadjusted and adjusted odds ratios (aOR), using a threshold for statistical significance of $p<0.05$ for the main outcome. Similar GEE models were fit to secondary outcomes of screening occurrence. GEE models were also fit with additional interaction with race or financial class with screening status and period to assess whether the deployment of screening modified existing racial or class-based disparities.

4.0 MAJOR EVENTS/MILESTONES/SUCCESS

Y1Q1

- Secured agreement for statewide child protective services (CPS) data
- Transferred data to secure SLCE server on campus
- Requested clinical data from campus data warehouse

Y1Q2

- Obtained clinical data from two large, healthcare networks.

Y1Q3

- Linked clinical data to CPS reports.

Y1Q4

- Completed chart review for >1,000 clinical charts with subsequent abuse
- Abstract accepted for the Helfer Society Annual Meeting

Y2Q1

- Realized that we needed to include "injurious environment" designations with "physical abuse. Began repeat linkage and chart review process.

Y2Q2

- Completed final chart review
- Initial comparisons of subsequent abuse

Y2Q3

- Completed main analyses

Y2Q4

- Completed disparities and testing completion analyses
- Completed draft manuscript for submission.

5.0 RISK ASSESSMENT

This retrospective study had few risks. We were quickly able to obtain and link statewide data from healthcare and protective services agencies. Specific aspects of protective services data (e.g., the need to include injurious environment designations with physical abuse designations) led to additional rounds of recurrent data analysis, but the project was nevertheless completed within time and budgetary restrictions.

6.0 TRANSITION PLAN

6.1 Military Relevance – Child physical abuse affects over 110,000 new victims annually, leading to 560 deaths and billions of dollars of avoidable healthcare spending.[1-3] Children of military families in lower pay grades or with military mothers are at elevated risk for the most severe forms of abuse.[4-6] Early signs of abuse frequently go un-recognized, leading to subsequent serious injury or death.[7-10] Early identification facilitates treatment, counseling, and support, whereas later identification (after serious injuries) means a perpetrating service member is unlikely to return to full readiness.[11, 12] Emergency Departments (EDs) play an essential role in abuse recognition because they provide care to well-appearing children, *before* the occurrence of severe, permanent outcomes.[13]

6.2 Transition Strategy – Because our results suggest that routine screening was ineffective at reducing subsequent abuse, we would not recommend pursuing the strategy further at this time. We will submit our findings for publication in peer reviewed scientific journals and for presentation at relevant meetings. Additional research is required to develop methodologies that can effectively reduce subsequent child abuse. If future research successfully identifies methods to reduce subsequent abuse, implementation and training programs would be developed to provide this capability to civilian and military emergency departments.

7.0 RESULTS

We identified 331,931 ED encounters for children <6 years old in the two participating healthcare systems. The number of ED visits over the course of the study period is shown in Figure 2, showing a decrease in ED visits five months after the routine screening was deployed in the screening system, coinciding with the COVID-19 pandemic.

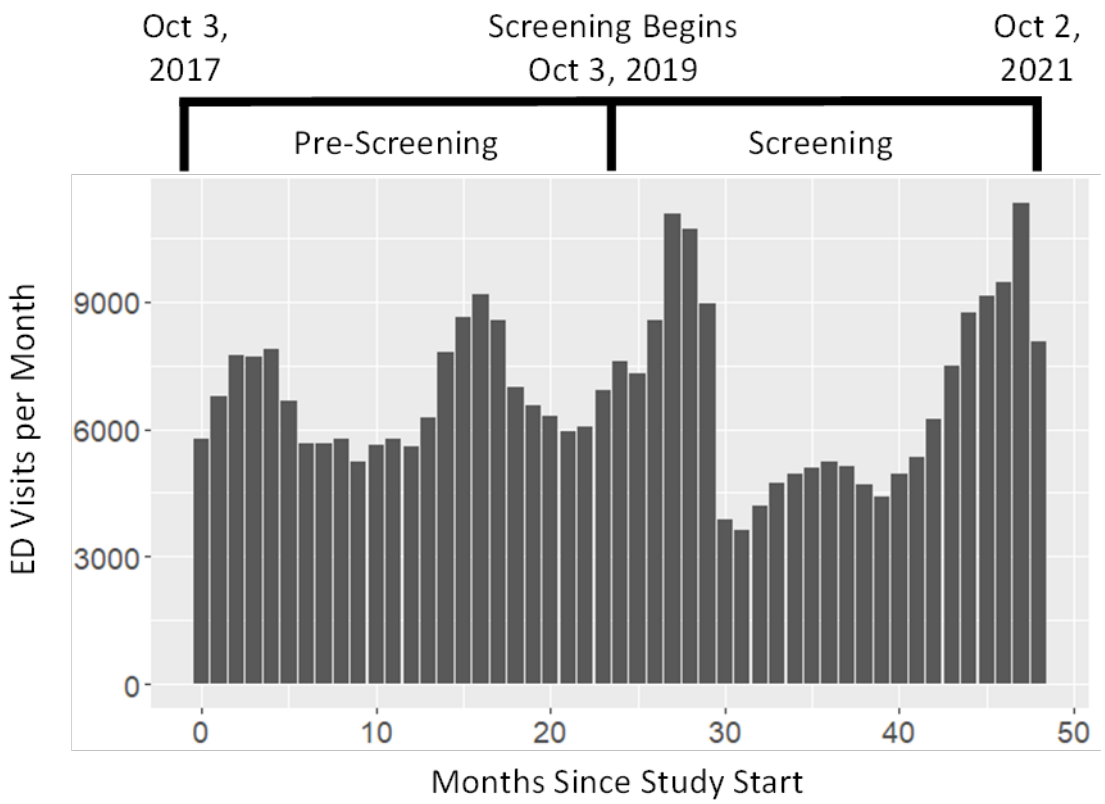

Figure 2. Total ED visits during the study period for both hospital systems. Note the substantial decrease coinciding with the onset of the COVID-19 pandemic soon after the implementation of routine screening.

Participant characteristics are shown in Table 1. During the screening period, screening was completed for 34,257/42,003 (82%) ED visits in the screening system. Screening was coded as positive for 148 (0.43%) visits.

Table 1. Encounter Characteristics. Patient characteristics are listed by encounter (Participants with more than one ED visit will be counted for each visit

Overall n=331,931	Pre-Screening Period n(163,862)		Screening Period n(168,069)	
	Non-Screening (n=105,706)	Screening (n=58,156)	Non-Screening (n=126,066)	Screening (n=42,003)
Age in years (mean, SD)	2.39 (1.69)	2.49 (1.69)	2.36 (1.69)	2.61 (1.69)
Male Sex	57,957 (54.8)	31,243 (53.7)	69,323 (55.0)	22,507 (53.6)
Payor Status				
Private	39,664 (37.5)	12,349 (21.2)	49,203 (39.0)	8,461 (20.1)
Public	59,516 (56.3)	37,378 (64.3)	64,779 (51.4)	26,939 (64.1)
Tricare	2,785 (2.6)	5,932 (10.2)	8,797 (7.0)	4,264 (10.2)
None/Self-pay	3,741 (3.5)	2,497 (4.3)	3287 (2.6)	2,339 (5.6)
Race/Ethnicity				
Hispanic	38,307 (36.2)	20,688 (35.6)	43,082 (34.2)	15,758 (37.5)
Non-White/Non-Hispanic	23,500 (22.2)	7,216 (12.4)	21,323 (16.9)	5,194 (12.4)
White/Non-Hispanic	38,671 (36.6)	26,900 (46.3)	51,804 (41.1)	18,877 (44.9)
Unknown/Non Reported	5,228 (4.9)	3,352 (5.8)	9,857 (7.8)	2,174 (5.2)
Visit number				
First	59,020 (55.8)		60,208 (47.8)	20,202 (48.1)
Second	21,996 (20.8)			8,468 (20.2)

Third Fourth or more	10,553 (10.0) 14,137 (13.4)	34,884 (60.0) 11,812 (20.3) 5,231 (9.0) 6,229 (10.7)	26,370 (20.9) 13,839 (11.0) 25,649 (20.3)	4,730 (11.3) 8,603 (20.5)
CPS referrals Any referral 3-180 days Any referral <3 days Referral 3-180 days for moderate/severe abuse	2,051 (1.9) 254 (0.2) 165 (0.2)	1,508 (2.6) 281 (0.5) 138 (0.2)	2,211 (1.8) 330 (0.3) 150 (0.1)	1,088 (2.6) 222 (0.5) 66 (0.2)

Screening was more likely to be completed for visits with private insurance compared to public (aOR 1.43, 95%CI 1.33-1.54), Tricare (aOR 1.52; 95%CI; 95%CI 1.37-1.67), or self-pay/no insurance (aOR 2.63; 95%CI 2.33-2.94). Relative to ED visits for White, non-Hispanic children, screening was more likely to be completed for Hispanic children (aOR 1.08; 95%CI 1.02-1.15) and less likely for non-White, non-Hispanic visits (aOR 0.61; 95%CI 0.57-0.66). While we did not identify significant differences in positive screening rates by race or ethnicity, screening was more likely to be positive for children with self-pay/no insurance, relative to those with private insurance (aOR 1.96, 95%CI 1.03-3.70).

Overall, 6586 ED visits (2.0%) were associated with a subsequent CPS investigation that was coded as physical abuse or injurious environment 3-180 days from the ED visit, including 503 (15 per 10,000 encounters) with moderate or severe abuse. Time from ED visit to CPS referral is shown in Figure 3. Among the 148 ED visits with positive screening, 47 had a CPS referral within 48 hours of the ED visit and 24 had a referral 3-180 days from the ED visit (6 of which were physical abuse or injurious environment).

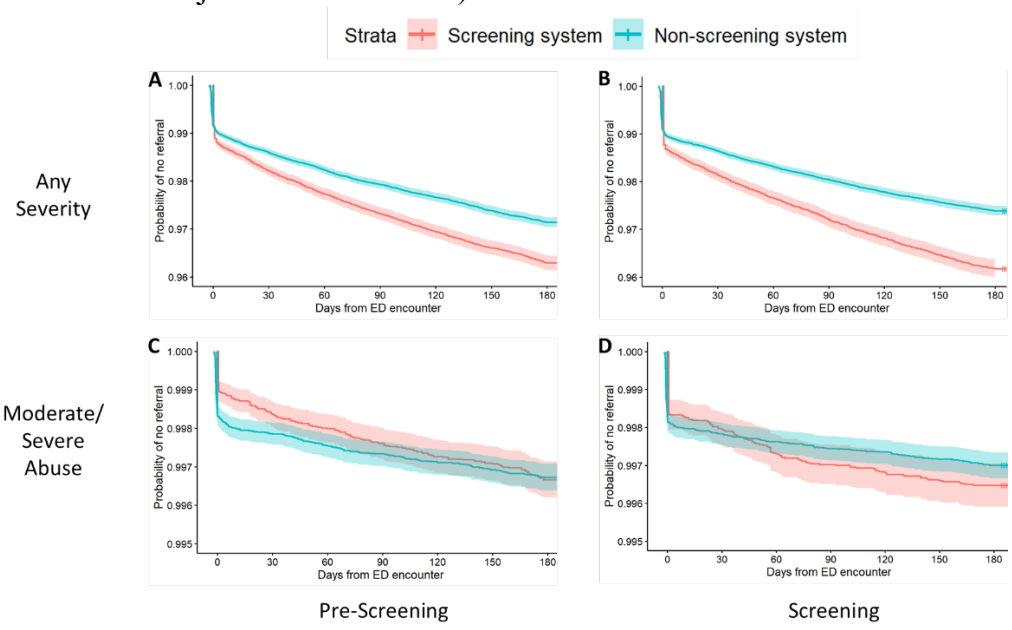

Figure 3. Timing of subsequent abuse from ED visit. Pink lines represent the screening EDs. Blue lines represent non-Screening EDs A. Any severity, pre-screening period. B. Any Severity, Screening Period. C. Moderate/Severe abuse, pre-screening period. D. Moderate/Severe abuse, screening period.

Among 503 visits with subsequent moderate or severe abuse, 31 (5.8%) were noted to have been reported to CPS during the initial ED visit and abuse or non-accidental trauma was mentioned for 76 (14%). Seventy-eight (15%) had injuries or complaints that could potentially

be related to abuse (24 fractures, 24 cases of suspicious bruising, 8 cases of BRUE or loss of consciousness, 11 traumatic brain injuries, 10 drug exposures or poisonings, 2 abdominal injuries) and 69 (13%) had other traumatic injuries such as abrasions, burns, or oral injuries.

We identified 167 ED visits to participating EDs associated with subsequent moderate or severe abuse. These visits included: 75 hospitalizations, 24 ICU admissions, and 5 deaths. Serious injuries included 52 fractures, 32 traumatic brain injuries, and 1 intra-abdominal injury.

We identified 182 ED visits to participating EDs associated with subsequent minor physical abuse. Of these, 20 had a serious injury (12 fractures, 6 traumatic brain injuries, and 2 burns), 15 required hospitalization (10 ICU admissions), and 1 required surgery. In the random sample of 325 cases coded as minor injurious environment, we identified 25 associated ED visits, none with serious injuries.

Subsequent abuse was less likely for children with Hispanic ethnicity and for older children. Subsequent abuse was significantly more likely to occur for children without private insurance and with each additional ED visit (Table 2).

Table 2. Odds of Subsequent Abuse (Any Severity) by Demographic Characteristics

	Unadjusted		Adjusted*	
	OR	95% CI	aOR	95% CI
Age in years	**0.93**	**0.92 – 0.95**	**0.94**	**0.93 - 0.96**
Male Sex	1.02	0.97 – 1.07	1.03	0.98 - 1.08
Payor Status (Reference = Private)				
Public	**5.59**	**5.14 – 6.08**	**5.68**	**5.19 - 6.22**
Tricare	**1.37**	**1.15 – 1.63**	1.17	0.99 - 1.40
None/Self-pay	**3.04**	**2.58 – 3.58**	**3.19**	**2.70 - 3.76**
Race/Ethnicity (Reference = White/Non-Hispanic)				
Hispanic	1.04	0.98 – 1.10	**0.64**	**0.60 – 0.68**
Non-White/Non-Hispanic	**1.59**	**1.49 – 1.70**	**1.08**	**1.01 – 1.16**
Unknown/Not Reported	**0.74**	**0.65 – 0.84**	**0.64**	**0.56 – 0.72**
Visit number (Reference = First visit)				
Second	**1.20**	**1.13 – 1.28**	**1.10**	**1.03 – 1.17**
Third	**1.35**	**1.24 – 1.46**	**1.17**	**1.08 – 1.27**
Fourth or more	**1.50**	**1.41 – 1.60**	**1.24**	**1.16 – 1.33**

*Adjusts for hospital system (screening/not screening) and period (before/after) in addition to covariates listed.

The impact of screening on main and secondary outcomes is shown in Table 3. Prior to screening implementation, odds of the main outcome (subsequent abuse of any severity) were lower for pediatric vs. general EDs. Subsequent abuse did not decrease significantly in general EDs after routine screening was implemented, while in non-screening, pediatric hospitals, there was a significant decrease in subsequent abuse over the same period. The degree to which subsequent abuse decreased in non-screening pediatric hospitals over this period was significantly greater than for screening hospitals. Results were similar for the secondary outcomes of subsequent abuse deemed to be moderate or severe.

One non-screening, pediatric ED chose to implement its own program of routine screening in January, 2021, and data from this ED were analyzed separately, compared to non-screening pediatric EDs. Subsequent abuse in this ED was not significantly lower in the screening period relative to the pre-screening period (aOR 0.83; 95%CI 0.68-1.01).

During the entire study period, 3,845 ED visits were associated with a CPS referral for any reason within 48 hours of the ED visit. These early referrals increased in both screening EDs (aOR 1.18; 95%CI 1.05-1.32) and non-screening EDs (aOR 1.17; 95%CI 1.07-1.28).

Table 3. Odds of Subsequent Abuse in Screening and Non-Screening EDs

	Unadjusted		Adjusted*	
	OR	95% CI	aOR	95% CI
Non-screening vs. Screening *before screening implementation*				
Any Severity	**0.74**	**0.69 – 0.79**	**0.81**	**0.75 – 0.87**
Moderate/Severe Abuse	**0.67**	**0.53 – 0.84**	**0.72**	**0.57 – 0.91**
Screening vs. Pre-screening period *for screening hospitals*				
Any Severity	0.99	0.92 – 1.08	0.84	0.63 – 1.11
Moderate/Severe Abuse	0.82	0.62 – 1.08	0.81	0.61 – 1.07
Screening vs. Pre-screening period *non-screening hospitals*				
Any Severity	0.84	0.79 – 0.90	**0.88**	**0.82 – 0.94**
Moderate/Severe Abuse	0.74	0.58 – 0.94	**0.80**	**0.62 – 1.02**
Difference in Difference** Screening vs. Non-Screening EDs				
Any Severity	**1.19**	**1.08 – 1.33**	**1.14**	**1.02 – 1.25**
Moderate/Severe Abuse	1.14	0.79 – 1.67	1.05	0.72 – 1.54

Adjusts for sex, age, race/ethnicity, insurance payor, and number of previous ED visits
**On the logged scale; reported effects are exponentiated to be interpreted as a factor change in odds ratios.

8.0 CONCLUSION/DISCUSSION

Our program of routine ED screening was not associated with a significant decrease in subsequent physical abuse relative to a geographically similar healthcare system that did not implement screening.

It is possible that screening was not consistently applied at some or all EDs in the screening system. Unlike other centers that have implemented routine screening, screening EDs did not consistently review cases of positive screening or identified abuse to ensure fidelity.[2] Further, other systems that have implemented routine screening have paired it with recommendations for follow-on testing and treatment for children identified with higher risk, which we did not implement.[20] Rates of positive screening, and of CPS reports for children who screened positive, were lower than those reported for other screening systems and lower than we found in the first 6 months after screening was deployed in our own system, suggesting that compliance may have waned over time.[2,4,21–23] It is also possible that our screening program, composed of only two, multi-part prompts, was less effective than other programs with 5-6 separate questions.[2,21]

The effects of routine screening might also have been overwhelmed by the impact of the COVID-19 pandemic, which caused significant changes in emergency care utilization, abuse recognition and the overall incidence of abuse starting just a few months after our program of routine screening was implemented.[24–26] However, it is not clear why these effects would have differential effects at pediatric/non-screening EDs relative to general EDs. Finally, it is possible that the pediatric EDs made other efforts to improve recognition of physical abuse coincident with the deployment of routine screening at general EDs.

Our data does not suggest that screening contributes to disparities based on race or ethnicity. While screening was slightly more likely to be completed for ED visits for Hispanic children, it was less likely to be completed for non-White children, and neither race nor ethnicity was associated with positive screening results. Conversely, screening was less likely to be completed for children without private insurance, and was more likely to be positive for those with no insurance.

Overall rates of subsequent moderate or severe abuse within 6 months of an ED visit were low in participating EDs (approximately 1:1,000). This implies that, even for a perfect screening tool and no recognition of abuse with usual care alone, screening would need to be applied to several hundred children to prevent one severe outcome. If validated, passive screening tools that did not require human effort might be better suited to a low-prevalence condition.[27]

Limitations

Most importantly, our study is limited by the use of protective services data to determine whether a child experienced subsequent abuse. Clearly, most episodes of abuse do not come to the attention of protective services, though we would expect this to be less significant for abuse that results in serious injury, hospitalization, or death.[28,29] Similarly, a CPS referral, with or without an indication or substantiation of abuse may include children who have not experienced physical abuse.[30]

Because we were unable to determine the source and reason for the CPS report, we chose to use a time window of 2 days from the ED visit as a surrogate marker of whether the protective services report was initiated in relation to the ED visit. This may have resulted in mis-categorization of some protective services reports if reports were delayed while the patient was hospitalized or for other reasons.

There may have been important, unmeasured differences in screening and non-screening EDs, especially because screening EDs were general EDs and non-screening EDs were pediatric EDs. The impact of screening may have been relatively minor compared to differential impacts of secular trends and events such as the COVID pandemic on pediatric and general EDs. If pediatric EDs were, for example, better able to identify and implement other evidence relative to the recognition of abuse, this might under-estimate the effect of screening by general EDs.[5,31,32]

Conclusion

One program of routine screening for physical abuse in a system of 27 general EDs did not result in a significant decrease in subsequent abuse relative to a geographically similar group of pediatric EDs.

9.0 DELIVERABLES

9.1 Publications: We are preparing to submit our manuscript to *Annals of Emergency Medicine*

9.2 Presentations: Results were presented to the Annual Meeting of the Helfer Society in April, 2023.

10.0 COST

The proposal was funded by DHA FY21 Restoral in the amount of $620K total cost. This study performed within the original cost.

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12.0 List of Symbols, Abbreviations and Acronyms

CPS – Child Protective Services

ED – Emergency Department.

EHR – Electronic Health Record

GEE – Generalized Estimating Equations