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Assessment of Tobacco Smoke Exposure in the Pediatric Emergency Department

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Abstract

Objective—Tobacco smoke exposure (TSE) causes significant childhood morbidity and is associated with a multitude of conditions. National organizations recommend TSE screening at all pediatric clinical encounters. Data regarding TSE screening in the pediatric emergency department (PED) is sparse, although children with TSE-associated conditions commonly present to this setting. We aimed to determine the frequency and outcome of TSE screening in the PED, and assess associated sociodemographic/clinical characteristics.

Methods—This retrospective review included pediatric patients presenting to a large PED in Cincinnati, Ohio between 2012 and 2013. Variables extracted included: age, sex, race/ethnicity, insurance, child's TSE status, triage acuity, diagnosis, and disposition. Regression analyses examined predictors of TSE screening and TSE status.

Results—116,084 children were included in the analysis. Mean child age was 6.20 years (SD ±5.6); 52% were male. Nearly half of children did not undergo TSE screening; only 60% of children with TSE-related illnesses were screened. Predictors of TSE screening were: younger

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age, male, African American, non-commercial insurance, high acuity, TSE-related diagnoses and non-intensive care admission. Of children screened for TSE, 28% were positive. Children more likely to screen positive were non-Hispanic, had non-commercial insurance and TSE-related diagnoses. Non-African American children triaged as low acuity were more likely to have TSE, yet less likely to be screened.

Conclusion—Despite national recommendations, current TSE screening rates are low and fail to identify at risk children. PED visits for TSE-associated conditions are common, thus further research is needed to develop and assess standardized TSE screening tools/interventions in this setting.

Introduction

Tobacco smoke exposure (TSE) is a significant cause of preventable pediatric morbidity and healthcare costs. TSE is associated with childhood conditions such as preterm birth and low birth weight, sudden infant death syndrome (SIDS), asthma, atopy, acute respiratory infections and middle ear disease.[1–4] Over $4.6 billion dollars in medical expenditures alone is spent annually for childhood illnesses of parent/caregiver smoking.[5]

Despite these findings and the knowledge that there is no safe level of TSE in children, an estimated 40% of children ages 3–11 years continue to be exposed to tobacco smoke in the United States.[6] Therefore, improved screening programs are needed to determine children at risk for TSE so that parents and caregivers can be appropriately identified and counseled.

Pediatric-based TSE prevention programs have shown promise. Screening programs in the pediatric inpatient setting are feasible.[7] Smoking cessation interventions during admission and out-patient visits for respiratory illnesses and non-respiratory illnesses in children encourage parents/caregivers to stop smoking and reduce child TSE. [8–10] However data regarding TSE screening in the pediatric emergency department (PED) is sparse, even though children with TSE-associated conditions commonly present to this setting and PED visits can serve as “teachable moments” for prevention interventions.[11]

The overall aim of this study was to examine the implementation of TSE screening that was part of current practice in a large, urban PED. We examined the relationship between TSE screening and sociodemographic and clinical characteristics. We also assessed the relationship between TSE status and patient characteristics. Since prior research suggests that TSE disproportionately affects children, non-Hispanic blacks, and those living in poverty,[6] we hypothesized that TSE frequency would vary with sociodemographics.

Methods

We examined electronic medical records (EMR) of a consecutive sample of patients aged 0–18 years presenting to the PED of a Level 1 pediatric trauma center from March 2012 – August 2013. There were no TSE screening or tobacco counseling interventions or initiatives in place during the study period.

Utilizing Epic, our hospital-wide EMR software, the following variables were extracted from patient's charts: age, sex, race/ethnicity, insurance type, child's TSE status, triage acuity, discharge diagnosis, and disposition. Insurance type was classified as commercial insurance or non-commercial insurance (Medicaid, Medicare, other governmental insurance, self-pay, or other). High acuity patients (triage levels 1–2) were those with higher potential to deteriorate clinically (e.g., active seizure, respiratory distress) and low acuity patients (triage levels 3–5) were those with a lower risk of clinical deterioration (e.g., earaches, ankle injury). Triage acuity and disposition were assessed to determine if these factors were associated with an increased or decreased likelihood of documenting TSE status. TSE status was assessed within the "Social History" section of the EMR with the prompt "Tobacco/ Smoke Exposure". Blank responses in this field were coded as not TSE screened. Those who had a "Yes" or "No" response documented were coded as TSE screened. Those with a "Yes" response were coded as positive TSE status and those with a "No" response were coded as negative TSE status. Any healthcare provider could have completed TSE documentation, whether on the index visit or on a previous patient encounter.

Discharge diagnoses were based on *International Classification of Diseases, 9th Revision, Clinical Modification (ICD-9-CM)* and categorized as either TSE-related diagnoses or non-TSE related diagnoses. ICD-9 codes for the following conditions or symptoms were considered potentially TSE-related: any respiratory infections, otitis media, otorrhea, otalgia, rhinitis, asthma, wheeze, cough, shortness of breath, tachypnea, throat pain, laryngeal spasm, SIDS, apnea, hypoxemia and respiratory failure.[2–4, 12–15]

Our primary outcomes were chart documentation of TSE screening and TSE status. Descriptive statistics, frequencies and cross-tabulations by TSE screening and TSE status were performed. A series of univariate logistic regression analyses were performed to examine predictors of TSE screening and TSE status. We subsequently performed multivariable logistic regression analyses examining all predictors and TSE screening in one model and TSE status in another model. Data were analyzed using SPSS (version 22.0). The Institutional Review Board approved this study.

Results

There were 116,084 children aged 0–18 years who presented to the PED during the study time period. Mean child age was 6.20 years (SD ± 5.626 years); 52.1% were male, 95.2% were non-Hispanic, and 70.7% had non-commercial insurance. Regarding race, 45.1% were white, 42.8% were African American, and 12.1% were of other race. Most patients (80.2%) were triaged as low acuity. For disposition, 82.6% were discharged to home, long term facility, or jail; 13.4% were admitted to any non-intensive care unit (ICU) hospital service; 1.1% was admitted to the ICU; and 2.9% were included in the other disposition category.

TSE Screening based on Patient Characteristics

TSE screening was performed for 54.6% of all patients. More than one-fifth (23.6%; *n*=14,984) of participants who were screened had a TSE-related diagnosis based on ICD-9 codes. Univariate logistic regression analyses of TSE screening revealed that patients were more likely to be screened for TSE if they: were younger, male, African American, non-

Hispanic; had non-commercial insurance; were triaged as high acuity; had a TSE-related diagnosis; and were discharged to home, long term facility, or jail or were admitted to any service (Table 1). Patients of other race were less likely to be screened for TSE compared to their white counterparts. The adjusted odds ratios of the multivariable regression analysis revealed patients were more likely to be screened for TSE if they: were younger, male, African American; had non-commercial insurance; were triaged as high acuity; had a TSE-related diagnosis; and were admitted to non-ICU. Patients were less likely to be screened for TSE if they were of other race and discharged to home, long term facility, or jail.

TSE Status based on Patient Characteristics

Of 63,399 patients who had documentation of TSE screening, 28.4% screened positive for TSE. Univariate logistic regression analyses of TSE status revealed that patients were less likely to have a positive TSE status if they were younger; male; African American or other race; triaged as high acuity; discharged to home, long-term facility, or jail; and admitted to any service (Table 2). Patients were more likely to have a positive TSE status if they were non-Hispanic and had non-commercial insurance compared to their counterparts who were Hispanic and had commercial insurance. No statistically significant difference was found between TSE status and TSE-related diagnoses. The adjusted odds ratios of the multivariable analysis revealed patients were more likely to have a positive TSE status if they: were non-Hispanic, had non-commercial insurance, or had a TSE-related diagnosis. Patients were less likely to have a positive TSE status if they were younger; African American or of other race; triaged as high acuity; or discharged to home, long term facility, or jail.

DISCUSSION

The American Academy of Pediatrics currently recommends documentation of TSE at all clinical encounters.[16] Failure to screen for TSE represents a missed opportunity to counsel families on the negative health impact of childhood TSE and to provide tobacco cessation interventions.

Prior research has shown that brief interventions (less than three minutes) are effective at improving tobacco abstinence and that universal screening is widely performed when TSE documentation is part of a mandatory EMR nursing assessment.[18, 7] However, our study found that nearly half of children who presented to the PED did not undergo TSE screening. Potential barriers that may have contributed to low rates of screening include time constraints within the busy PED and/or provider discomfort with tobacco screening and counseling.[17] Further research is warranted to determine how universal TSE screening can be best implemented in the PED.

National data using biomarkers for tobacco exposure estimate that 40% of children have TSE, and that TSE is more common among African American children and those living in poverty.[6] We did observe that those with non-commercial insurance were 3.3 times more likely to report TSE than those with commercial insurance. However, we observed lower documented TSE in our population (28.4%) overall with significantly lower than expected TSE among African American children (24.7%). Multiple factors may have contributed to

these findings. First, caregivers may have underreported TSE, as tobacco use is often associated with a negative stigma and caregivers may have been reluctant to disclose TSE to their children's healthcare providers. Second, since the TSE screening prompt was within the Social History section of the EMR and was not a mandatory field, some providers may not have been aware that this prompt was present. This could explain the lack of standardization in screening practices as only 55% of patients were screened. Third, caregiver report of childhood TSE varies across provider types (i.e. nurses, residents and ED providers) when compared to biomarkers of TSE.[7] Although some studies have confirmed TSE self-report with biochemical validation of TSE using cotinine,[19–20] widespread use of biochemical validation in the PED is impractical. Thus changing assessment procedures, such as using structured caregiver interviews which are sensitive for assessing TSE during pediatric visits,[7] may offer improved findings in the PED.

Our study also demonstrated that current screening patterns fail to identify children who are most at risk for TSE. Only 60% of children with TSE-related illnesses were screened. These children would potentially benefit the most if their caregivers were screened and engaged in tobacco cessation interventions. Moreover, children who were not African American and those triaged as low acuity were less likely to be screened for TSE, yet more likely to have exposure to tobacco. These findings suggest that all clinical encounters in the PED, present "teachable" moments to address TSE in children of all demographics.

Our study has several limitations. First, the study was conducted in the PED of a large, urban, freestanding children's hospital, in which the majority of patients are of low socioeconomic status; the findings may therefore have limited generalizability to other clinical settings. Second, assessment of TSE screening was based on caregiver report as documented in one field of the EMR. It is possible that TSE screening may have occurred more frequently, was not documented, and/or was documented outside of the social history field in the EMR. Thus, our predictors of TSE screening are valid only for the portion of the population that was screened and may not be representative of the entire study population. Last, although we identified disparities in screening across race and markers of socioeconomic status, we did not examine whether these differences correlated with healthcare worker variables (e.g., role, attitudes, or behaviors), which could also influence screening practices.

Conclusion

Despite national recommendations to document TSE at all clinical encounters, we found that a sizeable proportion of children presenting to the PED do not undergo TSE screening. Furthermore, a disproportionate number of children most at risk for exposure to tobacco smoke are not screened, although PED visits for TSE-associated conditions are common. Further research is warranted to develop standardized TSE screening tools for the PED and assess the efficacy of routine universal screening and brief counseling interventions in this setting.

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Highlights

Nearly half of children did not undergo TSE screening in the emergency department.

Only 60% of children with TSE-related illnesses were screened.

Of children screened for TSE, 28% were positive.

Current TSE screening rates are low and fail to identify at risk children.

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Table 1

Characteristics associated with tobacco smoke exposure screening among pediatric emergency department patients in Cincinnati, Ohio, 2012–2013.

	No TSE Screening (*n*=52,685)	TSE Screening (*n*=63,399)	Univariate Analysis		Multivariable Analysis	
Item	***n* (%)**	***n* (%)**	**OR**	**95% CI**	**AOR**	**95% CI**
Age						
≤5 years old	28,053 (43.8)	35,981 (56.2)	1.15	(1.13, 1.18)	1.18	(1.15, 1.21)
>5 years old	24,632 (47.3)	27,418 (52.7)	(Ref)	(Ref)	(Ref)	(Ref)
Sex						
Male	26,906 (44.5)	33,589 (55.5)	1.08	(1.05, 1.10)	1.06	(1.03, 1.08)
Female	25,766 (46.4)	29,810 (53.6)	(Ref)	(Ref)	(Ref)	(Ref)
Race						
White	23,841 (45.7)	28,381 (54.3)	(Ref)	(Ref)	(Ref)	(Ref)
African American	21,815 (44.0)	27,765 (56.0)	1.07	(1.04, 1.10)	1.11	(1.08, 1.15)
Other	6,864 (48.8)	7,195 (51.2)	0.88	(0.85, 0.91)	0.91	(0.87, 0.95)
Ethnicity						
Non-Hispanic	48,982 (44.9)	60,068 (55.1)	1.10	(1.04, 1.16)	1.03	(0.97, 1.10)
Hispanic	2,589 (47.2)	2,899 (52.8)	(Ref)	(Ref)	(Ref)	(Ref)
Insurance Type						
Non-Commercial[1]	36,317 (44.3)	45,733 (55.7)	1.17	(1.14, 1.20)	1.21	(1.18, 1.25)
Commercial	16,368 (48.1)	17,663 (51.9)	(Ref)	(Ref)	(Ref)	(Ref)
Triage Acuity						
Low Acuity	43,386 (47.3)	48,424 (52.7)	(Ref)	(Ref)	(Ref)	(Ref)
High Acuity	7,885 (34.8)	14,781 (65.2)	1.68	(1.63, 1.73)	1.42	(1.37, 1.47)
TSE Diagnosis						
TSE-related[2]	10,200 (40.5)	14,984 (59.5)	1.29	(1.25, 1.33)	1.20	(1.16, 1.23)
Non-TSE related	42,485 (46.7)	48,415 (53.3)	(Ref)	(Ref)	(Ref)	(Ref)
Disposition						
Discharge[3]	45,654 (47.6)	50,182 (52.4)	2.01	(1.87, 2.16)	0.90	(0.82, 0.98)
Admit Non-ICU	4,329 (27.8)	11,249 (72.2)	4.76	(4.40, 5.15)	1.94	(1.76, 2.14)

Item	No TSE Screening (*n*=52,685) *n* (%)	TSE Screening (*n*=63,399) *n* (%)	Univariate Analysis OR	95% CI	Multivariable Analysis AOR	95% CI
Admit ICU	531 (40.4)	782 (59.6)	2.70	(2.37, 3.07)	0.98	(0.84, 1.14)
Other[4]	2,171 (64.7)	1,186 (35.3)	(Ref)	(Ref)	(Ref)	(Ref)

Ref indicates referent.

[1]Non-commercial insurance includes Medicaid, Medicare, other governmental, self-pay, and other insurance.

[2]TSE-related diagnoses includes any respiratory infections, otitis media, otorrhea, otalgia, rhinitis, asthma, wheeze, and cough, shortness of breath, tachypnea, throat pain, laryngeal spasm, SIDS, apnea, hypoxemia, and respiratory failure.

[3]Discharge disposition includes discharge to home, long term facility, or jail.

[4]Other disposition includes discharge to clinic, discharge to a center that evaluates child abuse, dismissed since patient never arrived, transfer to other facility, transfer to an urgent care, discharge against medical advice, left without being seen before triage, left without being seen before any physician or advance practice nurse, eloped after resident, eloped after physician or advance practice nurse, deceased, and deceased on arrival.

Table 2

Characteristics associated tobacco smoke exposure status among pediatric emergency department patients in Cincinnati, Ohio, 2012–2013.

	Negative TSE Status (*n*=45,413)	Positive TSE Status (*n*=17,986)	Univariate Analysis		Multivariable Analysis	
Item	***n* (%)**	***n* (%)**	**OR**	**95% CI**	**AOR**	**95% CI**
Age						
<5 years old	26,666 (74.1)	9,315 (25.9)	0.76	(0.73, 0.78)	0.63	(0.64, 0.69)
≥5 years old	18,747 (68.4)	8,671 (31.6)	(Ref)	(Ref)	(Ref)	(Ref)
Sex						
Male	24,211 (72.1)	9,378 (27.9)	0.95	(0.92, 0.99)	0.97	(0.94, 1.01)
Female	21,202 (71.1)	8,608 (28.9)	(Ref)	(Ref)	(Ref)	(Ref)
Race						
White	19,108 (67.3)	9,273 (32.7)	(Ref)	(Ref)	(Ref)	(Ref)
African American	20,894 (75.3)	6,871 (24.7)	0.68	(0.65, 0.70)	0.43	(0.41, 0.45)
Other	5,368 (74.6)	1,827 (25.4)	0.70	(0.66, 0.74)	0.64	(0.60, 0.68)
Ethnicity						
Non-Hispanic	42,706 (71.1)	17,362 (28.9)	1.84	(1.67, 2.02)	2.31	(2.07, 2.57)
Hispanic	2,374 (81.9)	525 (18.1)	(Ref)	(Ref)	(Ref)	(Ref)
Insurance Type						
Non-Commercial[1]	30,786 (67.3)	14,947 (32.7)	2.34	(2.24, 2.44)	3.27	(3.55, 3.91)
Commercial	14,626 (82.8)	3,037 (17.2)	(Ref)	(Ref)	(Ref)	(Ref)
Triage Acuity						
Low Acuity	34,556 (71.4)	13,868 (28.6)	(Ref)	(Ref)	(Ref)	(Ref)
High Acuity	10,730 (72.6)	4,051 (27.4)	0.94	(0.90, 0.98)	0.87	(0.83, 0.91)
TSE Diagnosis						
TSE-related[2]	10,732 (71.6)	13,734 (28.4)	1.00	(0.96, 1.04)	1.08	(1.03, 1.13)
Non-TSE related	34,681 (71.6)	4,252 (28.4)	(Ref)	(Ref)	(Ref)	(Ref)
Disposition						
Discharge[3]	36,078 (71.9)	14,104 (28.1)	0.80	(0.71, 0.90)	0.84	(0.74, 0.96)
Admit Non-ICU	7,980 (70.9)	3,269 (29.1)	0.84	(0.74, 0.95)	0.913	(0.79, 1.05)

Item	Negative TSE Status (*n*=45,413) *n* (%)	Positive TSE Status (*n*=17,986) *n* (%)	Univariate Analysis OR	95% CI	Multivariable Analysis AOR	95% CI
Admit ICU	559 (71.5)	223 (28.5)	0.81	(0.67, 0.99)	0.868	(0.70, 1.08)
Other[4]	796 (67.1)	390 (32.9)	(Ref)	(Ref)	(Ref)	(Ref)

Note. Ref indicates referent.

[1]Non-commercial insurance includes Medicaid, Medicare, other governmental, self-pay, and other insurance.

[2]TSE-related diagnoses includes any respiratory infections, otitis media, otorrhea, otalgia, rhinitis, asthma, wheeze, and cough, shortness of breath, tachypnea, throat pain, laryngeal spasm, SIDS, apnea, hypoxemia, and respiratory failure.

[3]Discharge disposition includes discharge to home, long term facility, or jail.

[4]Other disposition includes discharge to clinic, discharge to a center that evaluates child abuse, dismissed since patient never arrived, transfer to other facility, transfer to an urgent care, discharge against medical advice, left without being seen before triage, left without being seen before any physician or advance practice nurse, eloped after resident, eloped after physician or advance practice nurse, deceased, and deceased on arrival.