1-21-2008

Barriers to Pediatric Blood Lead Screening

Amanda Abramson

Catherine Avener

Jillian Brennan

Elizabeth Hill

Britton Keeshan

See next page for additional authors

Authors
Amanda Abramson, Catherine Avener, Jillian Brennan, Elizabeth Hill, Britton Keeshan, Jeffrey MacLean, Kelly Mebust, Sanchit Maruti, Wendy Davis, Austin Sumner, and Jan Carney

BARRIERS TO PEDIATRIC BLOOD LEAD SCREENING

Amanda Abramson, Catherine Avener MS, Jillian Brennan, Elizabeth Hill, Britton Keeshan MPH, Jeffrey MacLean MS, Kelly Mebust, Sanchit Maruti MS, Wendy Davis MD, Austin Sumner MD, MPH and Jan Carney MD, MPH

University of Vermont School of Medicine and Vermont Department of Health

Background

The pernicious effects of lead on the health of children are well-documented. The severity of many of these effects directly correlates with increasing blood lead levels (BLLs). The current recommendation from the Centers for Disease Control and Prevention (CDC) and the American Academy of Pediatrics (AAP) is that BLLs ≥10 μg/dL are dangerous.[1] However, new evidence demonstrates that there is no safe BLL and that children with BLLs <10 μg/dL exhibit neurological and social deficits.[2] The Vermont Department of Health (VDH) currently recommends universal blood lead screening for 12 and 24 month-old children.[3] In 2006, 79% of 12 month-old children and 41% of 24 month-old children were screened in Vermont.

Objectives

- To identify barriers preventing Vermont pediatricians from performing blood lead screening on 24 month-old children.
- To identify specific predictors associated with lower rates of screening using data from a descriptive population study.

Methods

- A web-based survey was distributed to all currently licensed Vermont primary care pediatricians to obtain descriptive information regarding current lead screening practices.
- Pediatricians were assigned to a higher, lower or unknown screening group based on blood lead screening rates from the Vermont Immunization Registry and the Childhood Lead Poisoning Prevention Program Registry.
- Univariate and multivariate analyses were used to assess factors associated with higher versus lower blood lead screening rates.

TABLE 1: Demographic characteristics of survey respondents

Demographic characteristic	All (n=72)	Higher screening (n=30*)	Lower screening (n=31*)	p-value†
Sex (% male)	40.3	36.7	38.71	ns (0.87)
Age (% ≤ 50 years)	52.8	60	48.39	ns (0.36)
Residency training city size (% ≤ 500,000 people)	56.9	60	54.84	ns (0.68)
Years in practice (% ≤ 15)	44.4	46.7	41.94	ns (0.71)
Practice in Chittenden County	37.5	26.7	54.84	**0.025**
Practice type				
Academic practice (%)	15.3	26.7	9.68	ns (0.08)
Group practice (non-academic) (%	73.6	60	83.87	**0.04**
Solo practice (%)	11.1	13.3	6.45	ns (0.37)
Proportion of patient population on Medicaid				
1st tercile (0-39%)	31.9	3.3	58.1	
2nd tercile (40-53%)	31.9	43.3	29	**<0.001**
3rd tercile (54-100%)	36.2	53.3	12.9	

*Information on screening rate is unknown for 11 respondents.
†p-values calculated to compare participants who had higher and lower screening rates. Bold type indicates statistical significance ($\chi 2$ one-tailed alpha, p ≤0.05).

TABLE 2: Prevalence Odds Ratios (POR) for Vermont pediatricians as indicators of lower blood screening

	All (n=72)		Higher screening (n=30*)		Lower screening (n=31*)			
Description of Pediatric Practices	N	%	N	%	N	%	Prevalence Odds Ratio	95% CI†
Reported blood lead level at which risk for negative health outcomes begins (>10 μg/dL)	36	50	10	33.3	20	64.5	**3.64**	**1.12-11.99**
Reported routinely screen 12 month olds	61	84.7	28	93.3	24	77.4	0.24	0.05-1.29
Reported routinely screen 24 month olds	37	51.4	20	66.7	12	38.7	**0.32**	**0.11-0.90**
Collected blood samples in Office	60	83.3	25	83.3	26	83.9	1.04	0.27-4.03
Collected blood samples at hospital	43	59.7	20	66.7	16	51.6	0.53	0.19-1.50
Collected blood samples at public health/WIC clinic	61	84.7	26	86.7	26	83.9	0.8	0.19-3.32
Reported adequate reimbursement for lead screening	38	52.9	14	46.7	18	58.1	1.58	0.58-4.35
Report that there is sufficient evidence to warrant universal blood lead screening in VT children	61	84.7	25	83.3	27	87.1	1.35	0.33-5.60
Reported awareness of the VDH's current lead screening recommendation	64	88.9	30	100	25	80.7	§	§
Reported agreement with the current VDH recommendation	36	50	21	70	10	32.3	**0.2**	**0.07-0.60**

*Information on screening rate is unknown for 11 respondents.
†PRs calculated to compare participants who had higher and lower screening rates. Bold type indicates statistical significance (CI excludes the null).
§Variable predicts outcome perfectly.

TABLE 3: Percent of respondents reporting any influence of eight common barriers on his/her blood lead screening practices

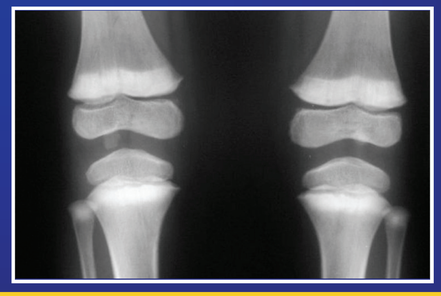
Self-reported barriers to lead screening (% Reporting)	All (n=72)	Higher Screening (n=30*)	Lower Screening (n=31*)	p-value†
Parental opposition	79.2	90	71	ns (0.06)
No exposure/risk on assessment	58.3	66.7	51.6	ns (0.23)
Difficulty obtaining sample	55.6	66.7	41.9	**0.05**
Patient compliance	49.7	70	51.6	ns (0.14)
Staffing	48.6	63.3	38.7	**0.05**
Time	47.2	56.7	41.9	ns (0.25)
Cost to physician	41.7	53.3	35.5	ns (0.16)
Cost to patient	37.5	46.7	32.3	ns (0.25)

*Information on screening rate is unknown for 11 respondents.
†p-values calculated to compare participants who had higher and lower screening rates. Bold type indicates statistical significance ($\chi 2$ one-tailed alpha, p ≤0.05).

TABLE 4: Logistic regression analysis of determinants associated with lower lead screening in 61 Vermont primary-care pediatricians

Determinants	Crude POR	95% CI	Adjusted POR	Adj. 95% CI	Coefficient¥	Std. Err.	p-value
Sex							
Female				*~~Referent~~*			
Male	1.09	0.39 to 3.07	**8.39**	1.11 to 62.92	2.13	1.03	0.039
Perceived lead level at which negative health outcomes begin							
≤10 μg/dL				*~~Referent~~*			
>10 μg/dL	3.64	1.26 to 10.47	**43.06**	4.03 to 460.09	3.76	1.21	0.002
Proportion of patient population on Medicaid							
1st tercile (0-39%)				*~~Referent~~*			
2nd tercile (40-53%)	0.04	0.004 to 0.34	**0.007**	0.000 to 0.131	-4.96	1.49	0.001
3rd tercile (54-100%)	0.01	0.001 to 0.14	**0.001**	0.000 to <0.0001	-7.07	1.85	<0.001

¥ Coefficients are used to predict Lower vs. Higher individual pediatrician's practice screening rate. Sex (1 if male); Lead level (1 if >10 μg/dL); 2nd Medicaid tercile (1 if Yes); 3rd Medicaid tercile (1 if Yes). *P>0.5* suggests a 24 month year old screening rate <37.5% [Sensitivity=0.90, Specificity=0.83, Positive Predictive Value (PPV)=0.85, Negative Predictive Value (NPV)=0.89]



Results

- 72 out of 98 pediatricians responded (~74%).
- Factors associated with lower lead screening rates included practicing in Chittenden County, belonging to a non-academic group practice and having a low self-reported Medicaid population (Table 1).
- 52.8% of pediatricians believed that they are not adequately reimbursed for blood lead screening. The reported mean cost of screening per patient was $22.30, while the desired reimbursement amount was $27.30 (the current Medicaid reimbursement rate is $4.00).[4]
- Pediatricians were more likely to be in the higher screening group if they reported that a BLL ≤10μg/dL is associated with negative health outcomes, reported agreeing with the VDH lead screening recommendations, or reported routinely screening all 24 month-old children for blood lead (Table 2).
- The three most-reported barriers to lead screening were parental opposition, difficulty obtaining samples and no risk on assessment (Table 3).
- Multivariate analysis indicated that the most significant determinants of lower versus higher screening rates are gender of the pediatrician (contributes 9%), perceived dangerous BLL (contributes 28%) and self-reported Medicaid population (contributes 63%) (Table 4).
- The top two sources of lead screening information utilized by pediatricians in this study were the VDH (88%) and the AAP (69%).

Conclusions

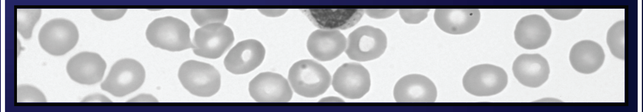
While survey data demonstrate that 50% of Vermont pediatricians disagreed with the VDH blood lead screening recommendations, the majority of respondents (88%) reported using the VDH as a primary source of information and guidance when establishing office policy. Therefore, the VDH has an opportunity to redesign its physician education to convey the importance of universal lead screening at 24 months through emphasis on the significant health risks associated with BLLs ≤10μg/dL. Multivariate analysis also indicates that physicians with larger Medicaid populations have significantly higher screening rates. We recommend that the VDH further investigate this association to determine strategies to increase blood lead screening rates in 24 month-old children.

Limitations

- Respondents were assigned to screening groups based on practice screening rates. Thus, while pediatricians practicing independently are accurately represented by these figures, those in group practice may have been assigned rates that are not representative of their individual screening.
- "Higher" screening was defined as a rate above the median (37.5%), thus many individuals in this group may still be far from achieving ideal screening practices.

Lessons Learned

While data collection often presents many challenges, the use of a web-based survey was an effective and timely method for gathering information regarding physician opinion. Data analysis and subsequent interpretation in light of public policy proved more difficult than anticipated.



References

[1] CDC. Preventing Lead Poisoning in Young Children: A Statement by the Centers for Disease Control. Atlanta, GA:Centers for Disease Control and Prevention. 1991.
[2] Chiodo LM, Covington C, Sokol RJ, Hannigan JH, Jannise J, Ager J, et al. Blood lead levels and specific attention effects in young children. Neurotoxicol Teratol 2007;29(5):538-46.
[3] Campbell JR, Schaffer SJ, Szilagyi PG, O'Conner, KG, Briss P, Weitzman, M. Blood lead screening practices among US pediatricians. *Pediatrics* 1996;98:372-377.
[4] Office of Vermont Health Access.