Transcranial Doppler Screening of Medicaid-Insured Children with Sickle Cell Disease

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Transcranial Doppler screening reduces the risk of stroke in children with sickle cell disease. We tested the effect of informational letters sent to parents and doctors of Medicaid-insured children on improving screening efficiency. The letters did not improve the low baseline screening rates, suggesting the need for more aggressive outreach. Hematologist visits were correlated with increased screening rates. *(J Pediatr 2015;166:188-90).*

Children with sickle cell disease (SCD) are at increased risk for stroke.[1,2] Transcranial Doppler (TCD) screening identifies those at highest risk,[3] and chronic blood transfusions reduce subsequent strokes by >90%.[4] Although annual TCD screening for children with SCD aged 2-16 years has been recommended for more than 10 years,[5-7] TCD delivery remains problematic,[8-10] despite published data confirming the effectiveness of real-world TCD screening programs (with 3- to 10-fold reductions in stroke incidence).[11,12] The primary aims of the present study were to quantify TCD delivery to Medicaid-insured children with SCD and to test whether mailed reminders to parents and primary care providers (PCPs) could improve TCD delivery.

Methods

Study data were Maryland Medicaid administrative data for the years 2002-2011. Children were assumed to have SCD if they had ≥1 inpatient visit, or ≥2 outpatient visits >30 days apart, with a primary diagnosis of SCD.[9,13] Children aged 2-16 years during the intervention window and enrolled in a Medicaid managed care organization (MCO) were retained.

Claims from a 1-year baseline period (November 1, 2010, to October 31, 2011) were reviewed for TCD billing codes. Children lacking TCDs were intervention-eligible. The intervention comprised of informational letters regarding the importance of TCD screening mailed to parents and PCPs by 1 Medicaid MCO. Children enrolled in 6 other Maryland Medicaid MCOs served as controls. The intervention MCO mailed letters in November 2011; this month, plus an additional 15 days for dissemination, defined our intervention period (November 1, 2011, to December 15, 2011).

MCO	Managed care organization
PCP	Primary care provider
SCD	Sickle cell disease
TCD	Transcranial Doppler
WCC	Well-child care

The letters (**Appendices 1** and **2**; available at www.jpeds.com) stated that the child was a candidate for TCD screening and appeared to not have received it in the preceding year, described screening and its benefits/risks, and encouraged parents/clinicians to contact each other to discuss. Parents and PCPs of control group children did not receive the letters.

Children were followed for 6.5 months (December 16, 2011, to June 30, 2012) to quantify the intervention's impact. We performed a logistic regression analysis in which receipt of TCD screening was the dependent variable, the intervention was the main explanatory variable, and demographic, Medicaid enrollment, and utilization variables were covariates. Utilization variables included inpatient, emergency department, hematologist, and well-child care (WCC) visits. This study was approved by the Johns Hopkins Medicine, University of Maryland Baltimore County, and Maryland Department of Health and Mental Hygiene Institutional Review Boards.

Results

A total of 829 children met study inclusion criteria; approximately one-fourth received TCD screening during the baseline period (**Table I**). Unscreened children (n = 571) were eligible for the intervention. Twenty-one subjects received TCD screening during the intervention period and were excluded from subsequent analyses. In the final sample (n = 550), the intervention group was demographically similar to the

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Table I. Receipt of TCD screening, demographic data, Medicaid enrollment, and health services use by intervention group and study period

	Intervention MCO (n = 117)*	Control MCOs (n = 433)*	*P* value
TCD screening receipt, %†			
Baseline period (11/1/2010-10/31/2011)	23 (n = 192)	24 (n = 637)	.77
Intervention period (11/1/2011-12/15/2011)	2.9 (n = 136)	2.8 (n = 435)	.91
Follow-up period (12/16/2011-6/30/2012)	7.2 (n = 117)	8.6 (n = 433)	.61
Demographics			
Age, y, mean SD	8.0 ± 3.9	8.5 ± 3.9	.15
Female sex, %	52	49	.54
High-density residential region, %‡	77	94	<.0001
Disabled Medicaid category, %§	24	25	.74
Medicaid enrollment, d, mean ± SD			
Baseline period	322 ± 62	326 ± 59	.60
Intervention period	43 ± 5.3	44 ± 4.6	.10
Follow-up period	175 ± 33	173 ± 40	.57
Health services use¶			
ED visits, n, mean ± SD			
Baseline period	4.8 ± 9.6	4.0 ± 6.4	.37
Intervention period	0.60 ± 1.8	0.44 ± 1.3	.39
Follow-up period	1.9 ± 3.5	1.5 ± 3.0	.25
Inpatient days, n, mean ± SD			
Baseline period	1.2 ± 2.5	1.7 ± 8.0	.22
Intervention period	0.19 ± .75	0.22 ± 1.2	.75
Follow-up period	0.43 ± 1.2	0.63 ± 1.4	.18
Outpatient hematologist‖ visits (≥1 in interval), %			
Baseline period	56	44	.02
Intervention period	8.6	8.6	1.0
Follow-up period	33	21	.01
WCC visits (≥1 in interval), %			
Baseline period	63	56	.02
Intervention period	14	8.8	.11
Follow-up period	20	19	.86

ED, emergency department.
*Numbers represent participants unscreened in the baseline and intervention periods and therefore eligible for the intervention portion of the study.
†Current Procedural Terminology codes: 93886, 93888, 93890, 93892, and 93893.
‡High-density residential regions encompass the major metropolitan areas of Baltimore and Washington, DC; low-density regions are the remainder of Maryland.
§Categorically disabled in accordance with state and or federal criteria, which maps to coverage groups for Maryland Medicaid eligibility (Maryland Department of Health and Mental Hygiene, Guide to Maryland Medical Care Program Coverage Groups, August 2012 [available at: https://mmcp.dhmh.maryland.gov/SiteAssets/SitePages/Medicaid%20Coverage%20Groups/Maryland%20Medical%20Care%20Program%20Coverage%20Groups.pdf; last accessed May 13, 2014]).
¶Venue and procedure codes were used to isolate ED visits and inpatient admissions. ED and WCC (ie, preventative or health maintenance) visits are criteria consistent with National Committee for Quality Assurance, Healthcare Effectiveness Data and Information Set specifications.
‖Or medical oncologist visit claim with a primary visit diagnosis of SCD.

Table II. aOR of receipt of TCD screening during the follow-up period

Variables	Full model* aOR	Full model* 95% CI
In intervention group	0.89	0.35-2.1
Demographics		
Age, y	**0.91**	**0.82-1.00**
Female sex	1.11	0.53-2.3
High-density residential region	0.44	0.15-1.43
Disabled Medicaid category	**2.62**	**1.12-6.2**
Medicaid enrollment, d		
Baseline period	1.00	1.00-1.01
Intervention period	0.99	0.93-1.08
Follow-up period	1.01	1.00-1.03
ED visit		
Baseline period	1.00	0.95-1.05
Intervention period	**1.28**	**1.03-1.58**
Follow-up period	0.92	0.79-1.06
Inpatient admission		
Baseline period	0.95	0.79-1.03
Intervention period	0.73	0.43-1.03
Follow-up period	1.00	0.83-1.20
Outpatient hematologist visit†		
Baseline period	**0.37**	**0.14-0.89**
Intervention period	2.7	0.89-7.7
Follow-up period	**8.8**	**3.7-22**
WCC visit		
Baseline period	1.65	0.75-3.8
Intervention period	0.71	0.15-2.4
Follow-up period	1.28	0.53-2.9

Bold values are significant (P < .05).
*Adjusted R^2 = 0.27; χ^2 = 66, degrees of freedom = 20, P < .0001, area under the receiver operating curve = 0.78; Hosmer-Lemeshow goodness-of-fit test: χ^2 = 6.8, degrees of freedom = 8, P = .59.
†Or medical oncologist visit claim with a primary visit diagnosis of SCD.

control group, except intervention subjects were less likely to live in high-density residential regions. Secondary analyses confirmed that across all patient types, the intervention MCO had more rural clients than the control MCOs. Disability status, Medicaid enrollment, and healthcare use across all time periods were also similar in the 2 study groups, except for differences in baseline (hematologist and WCC) and follow-up (hematologist) visits.

Logistic regression produced a model with a fit that was significant and strong (Table II); post hoc outlier analysis confirmed those fits.[14,15] Accounting for other variables in the model, the intervention had no impact on TCD screening rates (aOR, 0.89; 95% CI, 0.35-2.1). Increasing age correlated with reduced odds of screening, and baseline disability increased the odds of screening. A hematologist visit in the baseline interval was associated with lower odds of screening during follow-up, and a hematologist visit in the follow-up period was associated with substantially increased odds of TCD screening (aOR, 8.8). Sensitivity analyses with fewer variables to minimize independent variable collinearity yielded similar results.

Discussion

In our study of Medicaid-insured children with SCD, <25% received recommended TCD screening in the preceding year, and <10% of unscreened individuals were screened during follow-up. Parent- and PCP-targeted informational letters had no measurable affect on TCD delivery. Hematologist visits, but not WCC visits, during the follow-up period were associated with TCD delivery, suggesting that the process is likely specialist-driven. The finding that children with a hematologist visit during the baseline period were less likely to be screened in the follow-up period may reflect the fact that many children seen by hematologists during the baseline period would not return until after the follow-up period, and thus would be less likely to undergo TCD in

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