Improving Universal Pediatric Lipid Screening

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Objective To evaluate whether the release of national guidelines, electronic health record (EHR) modifications, and educational initiatives correlated with changes in pediatricians' universal lipid screening practices.

Study design Retrospective review of EHRs in an academic general pediatric practice was performed to measure the prevalence of order placement. A child was "screened" if an order was placed during a well-visit between 9 and 21 years of age. The prevalence of order placement for lipid screens on 22 374 patients from January 2010 to December 2015 was analyzed for date of order and patient age, then compared with timing of guidelines, local educational initiatives, and EHR modifications. Primary study outcome was lipid screening order placement over time.

Results Order placement increased from 8.9% (95% CI 8.3%-9.5%) before any intervention to 50.0% (95% CI 48.8%-51.2%) over the last 12 months of the study period ($P < .001$). All age groups showed significant increases in order placement. Changes in screening were seen following guideline publications, educational initiatives, and EHR modifications (for all, $P < .0001$). Order completion was 69.6% (95% CI 68.9%-70.3%). The composite prevalence of screening (order placement multiplied by order completion) was 46.8% over the 6-year study period.

Conclusions Improved adherence to recommendations for universal lipid screening is possible through educational initiatives and EHR modifications. Inclusion of 12- to 16-year-old adolescents/teenagers as a targeted group for universal screening in addition to recommended age groups improved screening prevalence. Similar efforts could be applicable for implementation of other guidelines. *(J Pediatr 2017;188:87-90).*

In 2011, the National Heart, Lung, and Blood Institute (NHLBI) released pediatric cardiovascular risk reduction guidelines, endorsed by the American Academy of Pediatrics (AAP), that included recommendations for universal lipid screening between 9 and 11 years and again between 17 and 21 years of age.[1] One goal of this universal screening recommendation is to increase detection rates for heterozygous familial hypercholesterolemia (FH), which is an autosomal-dominant disorder of lipid metabolism that is characterized by marked elevation of low-density lipoprotein cholesterol that is present from birth. It is the most common life-threatening inherited metabolic condition, affecting 1 in 200-300 people.[2-4] FH can increase an individual's chance of early cardiovascular disease by 6- to 20-fold.[5-8] Early identification of individuals with the FH phenotype is needed to initiate lipid-lowering treatment and prevent early cardiovascular disease.[6,7] In children with FH, data demonstrate that lipid-lowering medications are safe and effectively lower low-density lipoprotein cholesterol in the short and intermediate term.[9,10] Universal pediatric lipid screening would increase early identification of individuals with FH. Screening based on family history or individual risk factors fails to identify 30%-60% of children with severe dyslipidemia.[11,12] Simulations of cascade screening for FH show it does not achieve reasonable detection rates within the population without some form of population-based screening as well.[13]

Despite the recommendation for universal pediatric lipid screening from the NHLBI and the AAP, provider compliance with the recommendation remains low.[14-16] Potential explanations include unfamiliarity with these guidelines and discomfort in treating lipid disorders,[14] as well as concerns about cost-effectiveness and lack of long-term studies on treatment outcomes.[17] Little is known about the efficacy of different strategies to improve provider adherence to the screening recommendations. One study showed use of a reminder card system was only modestly effective, and only with resident physicians.[18]

Shortly after the NHLBI guidelines were released, our academic general pediatric and pediatric preventive cardiology groups developed a task force to review the evidence and rationale for lipid screening in children. Educational activities, generally in the form of lectures and facilitated discussions, took place. These included pediatric departmental grand rounds, presentations at general pediatrics division meetings by the task force, and educational meetings with physicians and nurses at individual clinics. Modifications were made in the electronic health record (EHR) to remove barriers to universal screening, including the addition of an order set for the nonfasting lipid screen, display of age-appropriate lipid reference ranges, an alert reminding providers when screening is due, and the addition of lipid screening to a list of recommended activities on the well-child visit template.

AAP	American Academy of Pediatrics
EHR	Electronic health record
FH	Familial hypercholesterolemia
HDL-C	High-density lipoprotein cholesterol
NHLBI	National Heart, Lung, and Blood Institute

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The goal of our study was to measure the prevalence of pediatric lipid screening in an academic general pediatric practice over time and to determine whether national guidelines publication, EHR modifications, and educational initiatives correlated with changes in provider screening.

Methods

This study was deemed exempt by the institutional review board. Our group defined compliance with the recommendation for universal screening as placement of an order for ≥1 fasting or nonfasting lipid profile between the ages of 8 years, 9 months and 21 years in any patient who presented for a well-child visit at least once between January 1, 2010, and December 31, 2015. Use of 8 years, 9 months permitted inclusion of children presenting for a 9-year well visit before their birthday.

A retrospective review of the EHR was performed to measure the prevalence of pediatricians' order placement. A child was considered "screened" if an order for high-density lipoprotein cholesterol (HDL-C) was placed at least once during this time period. Once an order for HDL-C was placed, any future visits for that child were not included in further analysis. HDL-C served as a proxy for screening, because it is included in both the fasting lipid profile and the nonfasting lipid screen. An order for total cholesterol was not used, because measurement of total cholesterol alone will not permit calculation of non-HDL-C. Given low nationwide screening rates and limited ability to query the EHR for laboratory studies performed outside our healthcare system, we assumed any child new to our system did not have a previous lipid screen.

Order placement was analyzed based on the age and sex of the child, date the order was placed, and the child's type of insurance. The timing of national guidelines, local educational initiatives, and EHR modifications outlined previously were plotted against the prevalence of order placement. Data were analyzed to determine relationships between these events and overall order placement during the study period.

Demographic characteristics were summarized by means and SDs or frequencies and percentages. The prevalence of order placement was reported along with the corresponding 95% CIs. Changes in order placement between time periods, eg, pre- and postguideline release, educational initiatives, and EHR modifications, were evaluated with the χ^2 test. The association between changes in order placement over the surveillance period and demographic characteristics was evaluated by the use of univariate and multivariate generalized estimation equations analysis. All reported P values are 2-sided, and $P < .05$ was used to define statistical significance. Statistical analysis was conducted with SAS software (SAS Institute, Cary, North Carolina), version 9.4.

Results

There were 22 374 patients between January 1, 2010, and December 31, 2015, with a total of 45 627 visits analyzed. Demographic data are summarized in the Table.

Table. Demographics of pediatric lipid screening population at time of well-child visit

Demographics	n (%)
Sex	
Male	11 837 (53)
Female	10 537 (47)
Age at visit, y	
9-11	12 822 (57)
12-16	7826 (35)
17-21	3718 (8)
Insurance	
Public insurance	3360 (14.9)
Commercial insurance	18 994 (84.5)
No insurance	137 (0.6)

There were significant differences in the prevalence of order placement related to age at initial visit (Figure 1). We found that those in the 17- to 21-year-old age group were the most likely to be screened (45.4%, 95% CI 44.2%-46.5%), followed by those in the 9- to 11-year-old age group (32.5%, 95% CI 31.9%-33.2%), then those in the 12- to 16-year-old age group (30.3%, 95% CI 29.8%-30.9%). There was no difference in screening prevalence between male and female patients ($P = .22$). The prevalence of order placement was significantly greater in patients with public insurance than patients with private insurance in the 9- to 11-year-old age group (37.4% vs 31.7%, $P < .001$) and in the 12- 16-year-old age group (35.0% vs 29.6%, $P < .0001$) but not in the 17- to 21-year-old age group (47.2% vs 45.2%, $P = .35$).

Order placement significantly increased from a baseline of 8.9% (95% CI 8.3%-9.5%) before publication of the 2011 NHLBI guidelines to a peak of 60.9% for calendar year 2014 (95% CI 59.8%-61.9%) to 50.0% (95% CI 48.8%-51.2%) over the last 12 months of the study period ($P < .0001$) (Figure 2). There was no change in order placement in the first 8 months after opening of the pediatric preventive cardiology clinic in February 2011 ($P = .85$). There were significant changes following the NHLBI guideline publications in 2011 ($P < .0001$),

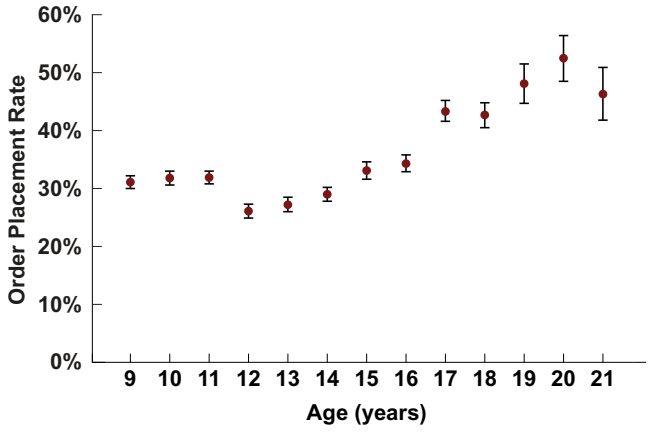

Figure 1. Pediatric lipid order placement by age in years.