EMR-Based Intervention Improves Lead Screening at an Urban Family Medicine Practice

Kathryn McGrath, MD; Krys Foster, MD, MPH; Patrick Doggett, MD; Marc Altshuler, MD; Jewel Osborne-Wu, MD; Christine Castellan, MD; Kelly Lopez, MD; Pheobe Askie, MD, MPH; Daniel Chung, MD; Laura Parente, MD; Yury Parra, MD

BACKGROUND AND OBJECTIVES: Elevated blood lead levels have well-described detrimental effects to growth and development in children, yet screening rates remain low. We sought to determine if a reminder within the electronic health record (EHR) could change provider behavior and improve blood lead level (BLL) screening test ordering rates in an urban academic family medicine practice.

METHODS: Baseline BLL test ordering rates were calculated for children ages 9–72 months. An update adding reminders to screen was made to the electronic note template used during pediatric well and sick visits at the practice. Data from the 10-week periods both before and after the change was made were compared through a retrospective chart review.

RESULTS: A total of 210 children were seen during the pre-intervention period. Forty-eight percent (n=101) had already been screened. Of the 109 eligible for screening, 23 had tests ordered, and 18 of those had tests completed. Eighty-four children were eligible for screening in the post-intervention period. Forty-one of those children had tests ordered, and 15 had tests completed. Provider ordering rates increased from 21% of eligible patients to 49%. Test completion rates only increased from 17% to 18%.

CONCLUSIONS: An electronic note-based reminder system significantly improves provider ordering rates of BLL tests. Researchers are currently investigating how the use of point-of-care BLL sample collection can improve test completion rates and therefore increase the frequency of successful screening.

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In Philadelphia, due to environmental risks, it is recommended that every child be screened at 12 and 24 months. However, only 26.8% of the children under seven were screened in 2013. We sought to establish baseline screening rates in our family medicine practice and design an intervention to increase testing.

Alerts, such as pop-up screens, within a patient’s electronic health record (EHR) can help guide clinicians to order appropriate screening tests. However, many of these systems have been limited by alert fatigue. To our knowledge, no studies exist evaluating the effect of standardized note amendments. The group hypothesized that designing an amendment to the electronic note used during pediatric visits could increase the rate of BLL screening.

Methods
This study was conducted at the Jefferson Family Medicine Associates (JFMA) office in Philadelphia, PA, and was approved by Thomas Jefferson University’s Institutional Review Board. JFMA is a large, urban, academic practice with approximately 75 providers (attendings, residents, and nurse practitioners). In 2015, there were approximately 1,000 patients ages 12–72 months cared for in the practice, with 60% enrolled in a Medicaid insurance plan.

Documentation of pediatric visits at JFMA is completed through the use of a unique note template within
the practice’s EHR (Allscripts Enterprise EHR, ©1998-2014 Allscripts LLC). The researchers designed a multi-part addition to the pediatric EHR note template used during well and sick visits (see Figure 1). The providers in the practice were made aware of the changes but were not provided with additional education.

A retrospective chart review of all patients ages 9–72 months seen between October 1, 2014 and December 15, 2014 was used to determine the number of patients for whom a test was ordered during the study periods, as well as for whom a test result became available during that same period. Patients with one prior lead screening result were considered to have completed screening and were excluded. The researchers implemented the EHR note template change in January 2015. A second retrospective chart review was used to analyze visits from January 19, 2015 to March 30, 2015.

We calculated the percentage of patients for whom a BLL result already existed to get a baseline rate and then excluded those patients from further analysis. After analyzing the demographics of the study population, the percentage of patients for whom initial BLL testing was ordered during both the pre-intervention and the post-intervention periods was calculated. Additionally, the researchers determined the percentage of patients with BLL testing ordered who also had a test result during that same period. The Fischer’s Exact test was used to compare the groups and calculate statistical significance.

## Results

There were 210 patients ages 9 to 72 months seen in the office during the pre-intervention period and 166 patients seen during the post-intervention period (see Table 1). In the pre-intervention period, 48% (n=101) had at least one documented lead test result within the EHR and were thus considered to be adequately screened. Forty-nine percent (n=82) of the patients in the post-intervention period were up to date. In the period prior to the EHR additions, 21% (n=23) had BLL testing ordered. In the period after the EHR additions were made, 49% (n=41) had BLL testing ordered ($P<.0001$). See Figure 2.

In the pre-intervention period, 17% (n=18) had a BLL test result after it had been ordered. The test completion rate was 78%. In the post-intervention period, 18% (n=15) of the patients had a BLL test result, with a completion rate of 36.5% ($P=.85$).

### Table 1: Demographics for Children Age <72 Months That Presented for an Office Visit During the Study Period

<table>
<thead>
<tr>
<th></th>
<th>Pre-Intervention</th>
<th>Post-Intervention</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>210</td>
<td>166</td>
</tr>
<tr>
<td>Age &lt; 24 months</td>
<td>59 (28%)</td>
<td>53 (32%)</td>
</tr>
<tr>
<td>24–36 months</td>
<td>33 (16%)</td>
<td>28 (17%)</td>
</tr>
<tr>
<td>&gt; 36 months</td>
<td>118 (56%)</td>
<td>85 (51%)</td>
</tr>
<tr>
<td>Gender Male</td>
<td>96 (46%)</td>
<td>89 (54%)</td>
</tr>
<tr>
<td>Female</td>
<td>114 (54%)</td>
<td>77 (46%)</td>
</tr>
</tbody>
</table>

## Figure 1: Amendments to EHR Pediatric Note Template

- **Anticipatory Guidance**
  - 12 Month Anticipatory Guidance_IUP
    - Health
    - Thermometer
    - Fever/colds
    - Meds
    - Passive smoking
    - Lead Assessment
    - Tooth brushing
    - Nutrition
    - Finger foods
    - Expectations of appropriate weight
    - Iron/Vit D
    - Cups
    - Spoon use
    - Fluoride
    - Nutritious snacks

- **Recommended Pediatric Screening IUP**
  - Lead Screening Status 12 months–6 years: Up to Date Yes/No

- **Progress Note Plan_IUP**
  - Content of Counseling or Plan of Care
  - Pediatric Screening_IUP
    - Counseling (12 months–6 yrs): (Check all that apply)
      - [ ] Lead
      - [ ] CBC
Discussion
The baseline rates of BLL screening at JFMA are approximately 48%. While this is higher than local and national screening averages, it is far from the recommended goal of universal screening.7

The implementation of a new EHR note template increased the rates of provider ordering during the study period from 21% of patients to 49% (P<.0001). This suggests that EHR reminders within an electronic note template can improve provider adherence to known recommendations for pediatric care. The sustainability of this system may be favorable over interventions implemented elsewhere, such as post-it note reminders or assistant directed chart review.8

Despite the changes in test ordering rates, the intervention did not significantly improve test completion rates (P=.85). Possible causes include a lack of in-office sample collection and a concurrent study that may have confounded the results. At JFMA, patients’ caregivers are provided with a prescription for BLL testing and asked to bring it to the lab for completion. In one 2001 study, the availability of in-office lead testing doubled the rates of eligible children screened.15 This suggests that providing point-of-care blood collection in the office may significantly increase rates of BLL test completion.

It was discovered after the conclusion of this study that a concomitant influenza study had taken place during the pre-intervention period. While doing blood draws for their study, the researchers had drawn a BLL test for any child who was due. This likely elevated the pre-intervention rate of test ordering and completion and therefore may have masked more significant changes than what were seen.

Limitations include the small sample size and short data collection period. Additionally, a practice-wide announcement and discussion of the project prior to the initiation of the study period may have contributed to a boost in ordering of BLL tests overall. Future studies will evaluate additional patients, monitor for alert fatigue among providers, and assess the benefits of in-office blood collection.

The introduction and use of a carefully designed note template within an EHR can significantly improve provider ordering behavior of recommended screening tests. By minimizing barriers to test ordering and completion, screening and detection of elevated lead levels will improve.

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CORRESPONDING AUTHOR: Address correspondence to Dr McGrath, Thomas Jefferson University Hospital, Department of Family and Community Medicine, 1015 Walnut Street, Suite 401, Philadelphia, PA 19107. 215-955-0647. Fax: 215-923-9186. kathryn.mcgrath@jefferson.edu.

References


