Follow-Up of Abnormal Results from Lead Screening: Making Evidence-Based Decisions

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A report in this issue of the *Journal*[1] describes one family practice's Herculean efforts to care for young children found to have increased blood lead levels using the 1991 guidelines from the Centers for Disease Control and Prevention.[2] The Family Health Center in Pittsburgh, which cares for a population at high risk for lead exposure, found 99 children with capillary blood lead levels of 10 μg/dL or higher in an 18-month period. A sophisticated and costly computer-aided tracking system that required substantial nurse time was disappointingly ineffective in assuring follow-up of these children. The authors conclude that increasing the cutoff for follow-up from 10 to 15 or 20 μg/dL would greatly reduce their work load, allowing effort to be focused on the follow-up of children with the highest risk. It would be obviously inappropriate to suggest that we discontinue follow-up of children with blood lead levels of 10 μg/dL or more if there were proven clinical benefits from finding and treating them. One does not, for example, suggest reducing the effort required to follow up on positive Papanicolaou smears by restricting follow-up to the few women with smears showing frank neoplasia.

What then is the evidence for a benefit from identifying and treating children discovered to have mildly elevated lead levels?[3] There have been no controlled studies showing that treated children have better clinical outcomes than untreated children. Instead, it is widely assumed that if an intervention effectively reduces blood lead levels, it will also reverse or prevent the modest neurodevelopmental dysfunction with which mildly elevated lead levels have been associated.

Despite a lack of definitive evidence supporting this assumption, published intervention studies have focused on blood lead levels. Controlled studies, although limited in quality, suggest that among asymptomatic children with initial venous blood levels of 25 μg/dL or higher, residential lead hazard control and chelation therapy can substantially reduce blood lead levels. What is not known is whether these results can be extrapolated to children with initial lead levels as low as 10 or 15 μg/dL. Three randomized controlled trials that enrolled children with mildly elevated lead levels (mean 7-12 μg/dL) showed no clinically important effect on lead levels from household dust or soil abatement, or from advice to implement dust control measures.[4-6] No adequate trials have evaluated chelation therapy in children with initial levels of less than 20 μg/dL. Thus, evidence does not indicate that currently available interventions have any effect on mildly elevated lead levels, although interventions could reduce lead levels that are initially at least 25 μg/dL.

Family physicians must also consider the potential adverse effects of aggressively following up children with mildly elevated lead levels. Many children will have false-positive capillary screening test results, which lead to needless return visits and repeat tests that may cause discomfort, inconvenience, anxiety, school and parental work absenteeism, and financial costs. Intervention for mildly elevated levels also requires follow-up visits, school and work absenteeism, and other direct and indirect costs, including physician time and effort that might be spent on other preventive services. Lead abatement procedures could cause acute increases in lead levels, although this result is unlikely to occur with newer procedures that include occupant protection and relocation. Succimer (DMSA), while not ordinarily used in chelation therapy with children who have levels less than 25 mg/dL, appears to have only mild,

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reversible adverse effects. Long-term clinical experience with this drug is limited, however.

If resources were unlimited, it might be reasonable to track every child with mildly elevated lead levels despite the lack of scientific evidence that intervention is effective. In this era of constrained resources, however, decisions must be made regarding their allocation. Scientific evidence that weighs both benefits and harms provides a rational basis for making decisions to direct resources toward effective services and away from ineffective and unproven ones.[7] Block et al[1] have shown that substantial resources can be required to track all children found to have blood lead levels of 10 µg/dL or higher to little apparent effect.

Based on the evidence, family physicians should instead consider allocating these resources to the intensive follow-up of children for whom individual intervention is most likely to be effective, ie, those with blood lead levels of 25 µg/dL or more. It might be prudent to provide follow-up for children with lead levels as low as 20 µg/dL, as reported lead levels might differ from true levels by several micrograms per deciliter as a result of day-to-day biologic variability and laboratory analytic variation. Because lead levels typically continue to rise until 18 to 24 months of age, an even lower cutoff, eg, 15 µg/dL, might be appropriate for children aged less than 18 months. Resources formerly allocated to the follow-up of mildly affected children might also be spent training staff to perform venipuncture for initial blood samples, and thus reduce the costs and adverse effects from false-positive tests, making venipuncture potentially more cost-effective than fingerstick sampling.[8]

Because effective interventions are available only for children with levels of at least 25 µg/dL, targeting screening to children at risk for such levels is also a more rational use of resources. In the second edition of the *Guide to Clinical Preventive Services*, the US Preventive Services Task Force recommended screening children at about 12 months of age only if they have individually recognized risk factors or if they live in communities in which the prevalence of blood lead levels requiring individual intervention (that is, levels of 25 µg/dL or higher) is high.[3]

As Dr. Birt Harvey editorialized in *Pediatrics* several years ago,[9] we can all agree that lead is a poison, and the less of it in the bodies of growing children the better; however, the contribution that follow-up and treatment of mildly elevated lead levels can make toward achieving this goal remains unclear. Like the prevention of traffic injuries or teenage smoking, the prevention of lead poisoning might be most effectively and efficiently performed outside the clinical setting. National efforts to reduce the lead content of gasoline, food cans, and paint have undoubtedly caused much of the reduction in lead levels that has occurred in the United States during the past decade.[10] Reducing the lead-based paint and dust hazard in existing housing stock is likely to be more difficult, but new federal requirements that residential property owners disclose the presence of known lead-based paint to prospective buyers or tenants could be a profitable first step. For the Shadyside Hospital Family Health Center and other family practices, there are better uses to be made of the substantial resources currently employed to prevent the modest effects of mildly elevated lead levels. Assuring that all child patients are immunized in a timely manner and screened for visual impairment by 4 years of age and that their parents are counseled on the provision of healthful diets and the prevention of household and recreational injuries[3] might be useful places to start.

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Pneumococcal Vaccine: A Preventive Care Winner

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Streptococcus pneumoniae is the leading cause of vaccine-preventable disease in this country and is responsible for more cases of severe illness and death than all childhood vaccine-preventable diseases combined. It is estimated to cause 3000 cases of meningitis, 50,000 cases of bacteremia, and 500,000 cases of pneumonia annually, with approximately 40,000 deaths each year from the most severe infections.[1,2] The incidence of pneumococcal disease is highest among the very young and the elderly, increasing steeply in those older than 65 years. The emergence of drug-resistant strains of pneumococcus, with incidences of up to 30 percent of isolates in some parts of the country, has made therapy for pneumococcal illnesses increasingly difficult.[3,4] Fortunately, the currently licensed 23-valent pneumococcal vaccine is effective in preventing invasive disease and has an overall efficacy in the range of 60 percent.[5] A recent epidemiologic study estimated that in the elderly immunocompetent patient vaccine efficacy was 75 percent and the duration of protection was at least 5 to 10 years.[6] Thus the current recommendation by the Advisory Committee on Immunization Practices is that high-risk patients, including all persons older than 65 years of age, receive one dose of vaccine.[7]

Despite these recommendations, national cumulative vaccine coverage levels are estimated to be only 28 percent for pneumococcal vaccine, whereas the annual coverage rate for influenza vaccine has reached 50 percent.[8] The disparity in these rates is puzzling, because pneumococcal vaccine is administered as a onetime dose, and success in achieving high levels of coverage is not dependent upon annual season-specific revaccination as with influenza vaccine. One probable barrier to achieving high rates of vaccination is the uncertainty that providers feel about the patient's history of vaccination. Because only one dose of vaccine is recommended, some physicians might be concerned about administering a second dose unnecessarily. Although a second dose is recommended for immunocompromised high-risk patients 5 years after the first dose,[7] there is currently no recommendation that a second dose be administered to persons older than 65 years, because there is no convincing evidence of efficacy in this population. The incidence of adverse reactions to a second dose of this polysaccharide vaccine, however, has been found to be no greater than to the first dose.[7,9]

In this issue of the *Journal*, Elangovan, Kallail, and Vargo[10] report the results of a 3-month educational campaign targeting all patients aged 65 or more who were visiting a university ambulatory care clinic. If the chart had no record of the patient receiving pneumococcal vaccine, the patient was asked about previous vaccination, and those who were confirmed not to have received the vaccine were provided educational literature and the opportunity to have questions answered by a nurse. If the patients consented to receiving the vaccine, the chart was flagged. Fifty-four percent of the study patients had previously received the vaccine; of the remaining group, 54 percent were vaccinated at the study visit, which increased the level of coverage of this cohort of patients to 79 percent.

This study has several major implications for national efforts to achieve higher pneumococcal vaccination rates. First, more than one half of the target population in this primary care clinic had

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