INCREASING CHILDHOOD LEAD SCREENING IN HIGH-RISK REGIONS OF VIRGINIA THROUGH PHYSICIAN PRACTICE EDUCATION AND PERFORMANCE EVALUATION

by

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Abstract

Despite years of elimination efforts, lead poisoning remains one of the most devastating and costly environmental health risks for children. “Lead poisoning often has been called a silent epidemic because its presence is often not recognized until after damage has occurred. Young children with elevated blood lead levels most often show no symptoms, yet are suffering from the real and harmful effects of lead poisoning.”

(Summit for 2010, 2005)
Increasing Childhood Lead Screening in High-Risk Regions of Virginia through

Physician Practice Education and Performance Evaluation

Blood lead concentrations overall have decreased in the United States, yet there are nearly half a million children who have blood lead levels high enough to cause irreversible damage (National Center for Environmental Health) “What we do as a society collectively to assure the conditions in which people can be healthy” (IOM, 1988) is the mission of local public health systems.

Lead poisoning was identified as a significant public health problem in the 1960s. The Lead Based Poisoning Prevention Act in 1971 started the movement toward decreasing the amount of lead in the environment. The Lead Contamination Control Act of 1988 authorized the Centers for Disease Control and Prevention (CDC) to initiate program efforts to eliminate childhood lead poisoning in the U.S. Implementation of federal and state regulations to control lead exposure has been a successful public health initiative over the last several decades. However, certain populations and geographic regions within the U.S. remain at disproportionately high risk for childhood lead exposure (CDC, 2005).

Before the initiation of lead screening programs, the first sign of lead poisoning in children were severe neurological findings, such as acute encephalopathy requiring immediate treatment. Children with lead poisoning are often asymptomatic and require blood lead screening to identify. In 1991, the CDC recommended universal lead screening for all children aged twelve to seventy-two months. A national survey in 1994 identified that only one fourth of US children were being screened, and of those screened only one third were at high-risk for lead exposure. In 1997, the CDC recommended that
states utilize state surveillance data to develop plans to increase screening and management of elevated lead levels targeting populations and regions most at risk for lead exposure. Without statewide plans, universal lead screening continued to be recommended.

The U.S. Department of Health and Human Services (DHHS), *Healthy People 2010*, proposes to eliminate elevated blood lead levels in children age one to five years, which is different than previous initiatives focusing on decreasing blood lead levels. Ongoing research conducted since 1991 indicates that even low lead exposure in childhood has lasting health effects (CDC, 2005). The CDC and the American Academy of Pediatrics (AAP) propose to eliminate childhood lead poisoning through primary prevention requiring years to achieve. Dr. Sergio Piomelli concurs in *The Pediatric Clinics of North America* that lead poisoning will only be eliminated through primary prevention, but he continues; “Until the enormous logistic, economic, and political difficulties inherent in this task are solved, screening of children to detect the victims of overexposure to lead remains the only viable alternative.” (Piomelli, 2002) Most U.S. children have ample lead exposure risk to justify at least one blood lead concentration performed according to a Policy Statement from the American Academy of Pediatrics (AAP, 2005). A multilevel approach including primary prevention in addition to secondary prevention through identification and management of elevated blood lead levels is necessary to eliminate childhood lead poisoning. The current shift toward primary prevention of lead exposure increases the need for education on how to minimize exposure and lead poisoning prevention (Bland, Kegler, Escoffery, and Malcoe, 2005).
In August 2005, the CDC issued a statement, "Preventing Lead Poisoning in Young Children" recommending that health care providers continue to provide anticipatory guidance as part of routine well-child care, assessing risk for exposure to lead, conducting blood lead screening in children, and treating children identified with elevated blood lead levels. Expansion of health care provider roles is to include remaining updated on current research identifying the health effects of lead exposure, especially focusing on neurocognitive development in children. Health care providers also should advocate for specific plans to eliminate childhood lead poisoning in their local and state communities (CDC, 2005).

Kaufmann, Clouse, Olson, and Matte (2000) noted in an article from Pediatrics that the ideal approach to lead poisoning is primary prevention, which has been partially achieved through removal of lead from gasoline, food, water, cans, house paint and plumbing. There continues to be sources of lead exposure; therefore secondary prevention through screening to identify children with lead exposure followed by environmental remediation and treatment remains an important activity (CDC, 2005 May).

Studies suggest that overall private health care practices have low levels of preventive service performances including childhood lead screening (Randolph, Fried, Loeding, Margolis, and Lannon, 2005). Childhood lead screening is important as lead poisoning is asymptomatic; therefore according to the Lead-Safe Virginia Program, sponsored by the Virginia Department of Health (VDH), blood lead testing should be performed based on risk and not just symptoms (Lead-Safe Virginia, 2004). Without healthcare providers engaging in a systematic approach to lead exposure prevention,
childhood lead poisoning will continue to be a significant environmental public health problem.

Effects of childhood lead poisoning. Lead is an environmental hazard that can affect every system in the body, particularly the central nervous system. The effects of lead are extremely toxic and cumulative developing after prolonged exposure. Among children, lead is associated with decreased intelligence, developmental disabilities, attention and behavioral disturbances. Other effects of lead exposure may include blood anemia, hearing loss, decreased stature and growth, memory disturbances, severe stomachaches, muscle weakness and kidney damage lasting into adult years. Young children, especially those under the age of two, are more susceptible to the effects of lead due to developing a central nervous system and higher absorption of lead in the environment than adults. The CDC defines elevated blood lead levels greater than 10 micrograms per deciliter, yet studies show that lower blood lead levels also have detrimental neurocognitive health effects (Dignam et al., 2004).

Major sources of lead exposure. Lead has long been recognized as a harmful environmental pollutant. There are many ways in which humans are exposed to lead, and most often individuals are unaware of the lead exposure. Lead may be found anywhere in the environment, but lead-contaminated house dust is the most common source of lead intake during early childhood (Lanphear, Hornung, Ho, Howard, Eberly, and Knauf, 2002). The primary sources of exposure for children are lead-laden paint chips and dust on interior surfaces because of deteriorating lead-based paint. The use of lead-based paint on interior surfaces had been declining in the U.S., but lead-based paint was not
banned until 1978. Twenty-five percent of housing for U.S. children continues to have lead contamination in paint, dust and surrounding soil (AAP, 2005).

Lead crosses the placenta; consequently blood lead concentrations of infants are similar to the blood lead concentration of the mother. The blood concentration of the infant reflects two thirds from dietary intake and one third from skeletal lead of the mother. Only a small portion of lead is transferred through breast milk. (AAP, 2005).

Lead plumbing can contaminate water elevating blood lead concentrations. The extent of lead exposure from water is unknown (AAP, 2005).

Who is at highest risk for lead exposure? Children are more vulnerable to lead exposure than adults. Children are at highest risk at age one to two due to increased finger-to-mouth activity ("Sources of Lead", 2005).

CDC monitors U.S. children for lead exposure utilizing two databases: the National Health and Nutrition Examination Surveys (NHANES) and state and local surveillance data (Niskar et al., 2005). NHANES is an ongoing series of cross-sectional surveys on health and nutrition representing the non-institutionalized U.S. population and is conducted by CDC’s National Center for Health Statistics. NHANES provides a national perspective and trends of childhood lead exposure without state and local community variation. NHANES has documented a dramatic decline in U.S. children with blood lead levels greater than ten micrograms per deciliter from 88.2% in the late 1970s to 4.4% in the early 1990s with a further decline to 2.2% in the late 1990s. (Niskar et al., 2005). Studies indicate that the risk for lead exposure is greater within certain U.S. populations and regions, and that many children at high-risk are not being tested. NHANES data indicate that Medicaid enrollees aged one to five years accounted for 83%
of the blood lead levels greater than twenty micrograms per deciliter, and only 20% of these children are screened, even with requirements for blood lead screening in the Medicaid Program. Children at greatest risk for lead exposure are those who are African American, living in housing built before 1946 and living with low-income families (Niskar et al., 2005).

Children enrolled in Medicaid are identified on a national level as a population at increased risk for elevated blood lead levels due to living in older housing with exposed lead hazards (Summit for 2010, 2005). Federal Medicaid policy requires that all children receive lead screening blood tests at 12 months and 24 months; lead screening blood tests are required for children 36 months to 72 months, if they have never been tested.

Dr. Lanphear in a *JAMA* editorial (2005) wrote that the nearly half of million U.S. preschool children at risk for lead poisoning are concentrated in two groups: poor children living in older maintained rental property and more affluent children living in housing being renovated. There is limited data to determine if high-risk children are being targeted for lead exposure screening.

**Statewide plan in Virginia.** During 2004, the Virginia Department of Health (VDH) established a statewide strategic plan, *A Collaborative Strategic Pan to Eliminate Childhood Lead Poisoning in Virginia by 2010*, utilizing a work group of community and public health agency leaders. This collaborative effort will bring together various organizations and agencies throughout Virginia with the mission of eliminating lead as a hazard for Virginia children less than six years of age by 2010. Eliminate is defined as having a statewide annual prevalence of less than or equal to one percent of children under the age of six with blood lead levels greater than or equal to ten micrograms per
deciliter, the CDC’s definition of elevated blood lead levels. Children are defined as those less than the age of six years (72 months), but the program will target children less than the age of three years (36 months) (Commonwealth of Virginia, 2004).

The Lead-Safe Virginia Program coordinates with local health departments and housing agencies to provide information regarding areas with a high-risk of lead hazard utilizing surveillance systems to develop community risk assessments and evaluate progress. The CDC, EPA and Housing and Urban Development (HUD) provide most of the financial support targeting the lead problem in Virginia.

An elevated blood level in children is a reportable condition in Virginia. The Virginia Department of Health Office of Epidemiology is the centralized location responsible for gathering, tracking and maintaining information regarding any child age fifteen years or younger with an elevated blood lead level greater than or equal to ten micrograms per deciliter. A statewide database for children screened has been established.

According to the Code of Virginia, sections 32.1-46.1, all children who are identified at high risk for lead exposure are required to be screened for elevated blood lead levels at the age of one year (12 months), at the age of two years (24 months), and between the ages of three to five years (36 to 72 months) if never previously tested, or a risk of lead exposure is identified. These regulations were effective in July 2001 requiring health care providers to test children if determined to be at risk for lead poisoning.

The Lead-Safe Virginia Program, sponsored by the VDH, provides Guidelines for Childhood Lead Poisoning Screening in Virginia, which were last revised in 2004. These guidelines are considered the protocol for testing children for lead exposure, and case
management and environmental follow-up. They provide the most current high-risk zip codes and references to legislation requiring health care providers to test children determined to be at risk. By using the guidelines, only children at high-risk of lead poisoning are targeted for blood lead level testing. The guidelines include screening and risk factor assessments, confirmation of screening results that explain when to perform diagnostic tests on venous blood after finding an elevated capillary screening test, and guidelines for management of children with confirmed elevated blood lead levels. Allowing local communities to assess for specific lead screening needs, a statement on the form indicates that local knowledge can override these guidelines as determined by collaboration between the local health director and the private physician.

For the last several years, one of the goals of the Virginia Childhood lead Poisoning Prevention Program is to increase screening of children less than three years of age and Medicaid eligible children both statewide and in high-risk regions (Lead-Safe Virginia, 2004).

The CDC provided funding for specific urban areas in Virginia for lead poisoning prevention activities during 2003 and 2004. The EPA also contributes funding within Virginia for risk assessor training, environmental sampling, educational brochures and the development and production of predictor maps. The EPA provided additional funding in 2003 and 2004 for collaborative education activities targeting high-risk populations in non-urban areas utilizing surveillance data that indicate areas with increased numbers of children with lead poisoning. (Lead-Safe Virginia, 2004)

Several other initiatives are being implemented within Virginia, such as the media campaign Make Your Home a Lead-Safe Zone, the inexpensive primary prevention
environmental cleaning process, *Lead Dustbusters* for targeted high-risk areas, and the *Pre-Renovation Education Rule* to educate contractors, painters landlords and others performing renovations for compensation on housing built before 1978 about the federal requirement to provide a lead hazard pamphlet, *Protect Your Family from Lead in Your Home*, to the building owners and the occupants before starting the renovations (Lead-Safe Virginia, 2004).

*Prevalence of elevated blood lead levels in Virginia.* Based on the Centers for Disease Control and Prevention (CDC) predictor model, Virginia ranks fourteenth among the fifty states in the estimated number of children with elevated blood lead levels. From the Lead-Safe Virginia 2003 Annual Report, there are an estimated 13,800 children less than the age of six with elevated blood lead levels (Lead-Safe Virginia, 2004).

During 2003, 50,070 Virginia children less than six years of age were screened for elevated blood lead levels, with 1,048 children reported as having an elevated blood lead level. Figure 1 shows the prevalence of children less than six years of age who were tested over the last four years. The prevalence of children with elevated blood lead levels is decreasing as shown in 2003 with an overall 2.1% for the state (Lead-Safe Virginia, 2003).

The 2003 Annual Report Summary of Surveillance Data for Virginia Children with Elevated Blood Lead Levels reports the mean blood lead level as 14.8 micrograms per deciliter and the mean age as 2.3 years. In 2001 through 2003 in Virginia, age one year was the most frequently reported age for children with elevated blood lead levels.
During 2004, the screening rate for elevated blood lead levels increased by twenty-five percent in Virginia children less than six years of age. Figure 2 taken from the Lead-Safe Virginia Program 2004 Annual Report shows the increase in number of Virginia children screened for elevated blood lead levels over the last five years. The report indicates that the increase potentially may be credited to the regulations requiring health care providers to test children at risk for lead exposure and requiring testing laboratories to report the results electronically.

There were 66,820 Virginia children under six years of age screened, with 953 children reported as having at least one elevated blood lead level and 466 children confirmed as new cases. The prevalence of elevated blood lead levels in Virginia children under six years of age has decreased to 1.4% overall, but Medicaid eligible children continue to have a higher prevalence of 1.6%. Medicaid eligible children
accounted for 49% of the children screened, and 57% of the children with elevated blood lead levels (Lead-Safe Virginia, 2004). The blood lead level screening continues to increase throughout Virginia, but populations of children at the highest risk for lead exposure are not being tested.

**Figure 2: Blood Screening Results for Virginia Children < 72 Months of Age**

![Graph showing blood screening results for Virginia children](image)

**Note:** Results based on one test per child per year, and may include single capillary tests. The reporting of elevated blood lead levels is required under the Regulations for Disease Reporting and Control. Data reported prior to July 1, 2001 were voluntarily submitted by laboratories. These estimates are preliminary, as the database will accept historical data as made available, and continuous data quality controls may depict minor changes in reported annual total number of children tested.

Figure 2 from the Lead-Safe Virginia Childhood Lead Poisoning Prevention Program, 2004 Annual Report

**Prevalence of elevated blood lead levels in Roanoke.** The City of Roanoke is one of Virginia’s highest risk cities for childhood lead poisoning. According to the Lead-Safe Roanoke website, Roanoke has the fourth highest percentage of children with elevated blood lead levels in the state of Virginia. Only other urban areas, such as Richmond, Fairfax and Norfolk, have higher percentages (Lead-Safe Roanoke).

According to *Census 2000*, more than half (56%) of Roanoke’s housing units were constructed before 1960, and 87% of Roanoke’s housing units were built before
1980. With lead-based paint being banned in 1978, most of the houses in Roanoke contain lead-based paint resulting in potential lead exposure. Rental properties in Roanoke are not regularly tested for lead, even high risk properties. Very young children, who are highly vulnerable to lead poisoning, and who are living in these older homes, are not being screened for lead. (City of Roanoke, 2003)

According to Census 2000, the total population of Roanoke is 94,911, with the population of children under the age of six at approximately 8,750 or nine percent. Approximately 5,025 children under the age of six live in the inner city neighborhoods of Roanoke, noted through high-risk zip code lists, where the oldest homes and the highest concentration of children who have tested positive for lead are found. Lead-Safe Virginia reports (2001) that of the children under six years of age who were tested for lead poisoning, 28% in the inner city of Roanoke tested positive for elevated levels of lead in their blood. One in eighteen of the state’s children younger than six who were poisoned by lead between 1995 and 2001 came from Roanoke. In the years of 2001 through 2003, the Roanoke City Health District had 98 reported cases of children with elevated blood lead levels (City of Roanoke, 2003). The Roanoke City Health District has the third highest per capita rate of children age 0 to 14 years in Virginia with blood lead levels greater than or equal to 10 micrograms per deciliter at 116.6 per 100,000 children. (VDH, 2003)

Lead-Safe Roanoke. Lead-Safe Roanoke is a collaborative program designed to reduce lead poisoning in the City of Roanoke through the integration of community services focusing on lead hazard control or lead abatement, increased lead screening and testing, and education and outreach. The program is funded by the U.S. Department of
Housing and Urban Development. The U.S. Department of Housing and Urban Development provided funds to improve 100 homes with the goal of providing lead-safe housing for all children within Roanoke City. The Alleghany/Roanoke City Health District agency serving as the Roanoke Health Department, Roanoke City Housing Development, and the Roanoke Valley TAP Program coordinate through monthly meetings with the Lead-Safe Roanoke program to provide lead poisoning prevention and intervention activities. Community education and childhood lead screening within high-risk areas are valued activities, along with the ultimate goal of eliminating lead within the environment.

*Healthcare provider prevention services.* Prevention services are the foundation of primary care of children, yet rates of these services are low (Margolis, Lannon, Stuart, Fried, Keyes-Elstein, and Moore, 2004). Multiple studies over the last decade repeatedly indicate that physician practices do not routinely provide preventive services for children including lead screening.

The gap between recommended care and actual provided care is discussed by Dugan and Cohen (1998) in their chapter of *The Handbook of Health Behavior Change* retrieved from the CDC Chronic Disease Prevention Databases Web site. Factors contributing to the gap were noted in three areas: physician issues (lack of time and knowledge, difficulty evaluating performance), clinical practice issues (local constraints, nature of medical care, systems that cannot identify discrepancies), and the increasing number of clinical guidelines. There were other barriers, such as inability to incorporate recommended guidelines, lack of organizational support, decreased reimbursement,
limited materials, lack of patient compliance, and lack of adequate resources to go beyond the treatment of acute illnesses (Dugan and Cohen, 1998).

Studies have been conducted in various regions of the U.S. and findings suggest that there is a need for improvement, standardization and unification of lead screening guidelines (Feinberg and Cummings, 2005). Feinberg and Cummings (2005) found in a retrospective review of seven practices who serve a large population of children utilizing Medicaid serves that only 27.6% of the children had blood lead level testing. There is a need to understand the barriers to testing.

In 2001, the CDC and the Chicago Department of Public Health conducted a collaborative blood lead study in two Chicago communities to assess the prevalence of children with elevated blood lead levels who had not been previously tested, to obtain prevalence of children aged one to five years with elevated blood lead levels, and to identify demographic, behavioral and environmental risk factors for elevated blood lead levels. The Chicago communities tested twelve times higher than national prevalence and most children had not been tested for lead poisoning. The authors point out the need for targeted community outreach that includes testing blood lead levels in accordance with AAP (Dignam et al, 2004).

In the Summit for 2010 of the Coalition to End Childhood Lead Poisoning in Baltimore, Maryland on December 5, 2005, an overview of data from Maryland and the U.S. population indicated that lead screening testing had fallen short of the policy requiring universal testing for children enrolled in Medicaid services. The figures supported the results of the 1999-2002 NHANES survey indicating that 42.7% of Medicaid-enrolled children received blood lead testing.
Woolf and Cimino (2001) wrote in "Environmental illness: educational needs of pediatric care providers" that pediatric health professionals may not be updated with the most current information necessary to diagnose and manage environmental hazardous exposures. Healthcare professionals are increasingly being expected by the community to incorporate the information into their healthcare services, but further education is needed. Woolf and Cimino recommend further research in determining the best process for providing the education.

Healthcare provider lead poisoning preventive services in Roanoke. A collaborative project of the Roanoke City Health District and the Roanoke City Total Action Against Poverty (TAP) Head Start Program was conducted in 2005 to assess the efficiency of the current elevated blood lead level identification process in a high-risk population of Roanoke City. The project was determined to be a quality assurance activity by a local Institutional Review Board. The Roanoke City Health Department provided staff to conduct an audit of nine Roanoke City TAP Head Start sites, where the majority of the children are Medicaid-eligible. The children enrolled in the TAP Head Start program are at high-risk for lead exposure according to the Guidelines for Childhood Lead Poisoning Screening in Virginia requiring blood lead level testing to be obtained for all Medicaid-eligible children. School entry physical forms for the year 2004-2005 of children three to five years of age were reviewed to evaluate the percentage of children who had received blood lead testing. Of the 225 audited school physical forms, lead screening tests were documented on 93 or 41%. A letter from the District Health Director of the Alleghany/Roanoke City Health District and the Supervisor of Health Services for TAP Head Start was sent to each local physician practice.
acknowledging the findings and information regarding the local prevalence of lead poisoning, the Guidelines for Lead Poisoning Screening in Virginia, and the Lead-Safe Roanoke program. (Dooley, 2005)

Roanoke City is a high-risk area for lead exposure. Lead-Safe Roanoke program provides resources for lead abatement, increased testing, and education. Further investigation is needed to evaluate the success of the program in educating local healthcare providers and the community about the importance of lead screening.

Recommendations for increasing healthcare provider preventive services. Thomas Schlenker in a 1999 commentary in the *Journal of Public Health Management Practice* stated that the success of public health initiatives is dependent on the collaboration with private physician practices (1999). Schlenker also refers to a statement made in a 1998 article written by Weitzman et al; “there is perhaps no other child health problem the prevention and treatment of which requires such close collaboration between personal health and public health services as is the case of lead poisoning.” Even with the national movement toward eliminating childhood lead poisoning promoted by the CDC in the mid to late 1990s, approximately 75% of US children remained unscreened for lead exposure.

Schlenker with ten years of experience collaborating identified seven action steps (Table 1) that demonstrate how local public health can change private practice lead screening behaviors in metropolitan areas with high and low prevalence of lead poisoning through collaboration. These steps were used over several years in Milwaukee, high prevalence of lead poisoning, and Salt Lake City, low prevalence of lead poisoning. Both areas increased private physician practice blood lead screenings dramatically as a
response to local public health efforts (Schlenker, 1999). These actions steps can be confirmed with recommendations from other sources.

**Table 1: Seven Action Steps Toward Effective Collaboration (Schlenker, 1999)**

<table>
<thead>
<tr>
<th>Establish rationale.</th>
<th>Engage local physician practices by communicating seriousness of disease, prevalence, adequacy of screening methods, and benefits/costs to community.</th>
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<tbody>
<tr>
<td>Document the problem.</td>
<td>Provide documented local prevalence and distribution information with continuing updates. Provide feedback to individual physician practices documenting the number of children screened in the individual practice, proportions of those children with elevated blood lead levels, and details regarding case follow-up.</td>
</tr>
<tr>
<td>Attend to logistics.</td>
<td>Assist private practices with developing screening processes within their practices. Offer staff training.</td>
</tr>
<tr>
<td>Clarify reimbursement.</td>
<td>Provide information regarding reimbursement and offer alternatives.</td>
</tr>
<tr>
<td>Make known available support.</td>
<td>Communicate competent local public health resources for remediating environmental lead poisoning hazards and managing the psychosocial issues.</td>
</tr>
<tr>
<td>Build demand.</td>
<td>Educate parents and the community about the risk of lead poisoning and empower to seek lead screening from their healthcare providers.</td>
</tr>
<tr>
<td>Demonstrate leadership.</td>
<td>Local public health agencies to serve as leaders in collaborations for childhood lead poisoning prevention.</td>
</tr>
</tbody>
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Effective strategies for changing physician behavior noted by Dugan and Cohen (1998) are changing motivation using the concepts of Transtheoretical Model for Behavior Change (TTM), and restructuring the physician practice environment through educational materials, actively participating in conferences, providing audits and feedback of performance and utilizing local consensus process, such as outreach visits,
identifying opinion leaders, reminders, and use of multifaceted approaches for changing behaviors.

Kemper and Clark (2005) found that the most common reason for not lead testing was a belief by the physicians that they practice in a low-risk area, even though 35% of those actually are in high-risk areas. Physicians with onsite blood testing were more likely to routinely test while those who did not routinely test often were unaware of the requirements. Kemper and Clark concluded that the rate of blood lead testing would be improved by local public health departments providing data regarding local risk of lead poisoning and considering the feasibility of working with practices to facilitate onsite blood collection for lead testing.

Peter Margolis et al (2004) reported findings from a randomized trial that continuing education combined with process improvement methods is effective in increasing rates of delivery of preventive care to children. The interventions utilized in the trial were based on the PDSA (Plan, Do, Study, Act) Cycle of Process Improvement. Initially a multidisciplinary improvement team was established with an experienced project leader who would be from outside the practice. This team reviewed effective delivery strategies for preventive services, selected performance improvement goals and evaluation methods, identified strategies to improve care and customized tools. The new approaches were piloted with a small group of patients to understand how to adapt to current routines using PDSA cycles. The new approaches were then established throughout the practice. There were several recommendations noted following the trial, such as a need for performance improvement and systems thinking to be included in core competencies for physicians and other health professionals. The limitations of this
approach are the large amount of time needed to disseminate new approaches and the cost of utilizing an experienced project leader.

Bauchner, Simpson, and Chessare (2001) found three factors other than societal norms that influence physician decision-making: experience and knowledge, patient characteristics and values, and external clinical evidence. They conclude that multiple approaches are necessary to change physician behavior, but measuring physician performance is critical. After reviewing numerous studies, these are approaches that may be effective: continuing medical education (CME) that is interactive rather than passive distribution of information, practice guideline implementation, reminders, educational outreach, financial incentives in some circumstances, audit and feedback information regarding the each individual’s performance. Organizational and personal barriers must be understood to change performance and approaches to promote change must reflect the specific situation.

A summary of strategies to increase lead testing by physicians include strengthening requirements, increasing physician education, offering incentives or penalties, providing feedback on provider testing rates, simplifying screening logistics, improving the linkages to community resources for environmental health interventions, and encouraging community and parental support and compliance (Summit for 2010, 2005).

Recommendations for Lead-Safe Roanoke. Opportunities exist to implement more progressive and intensive programs and policies at the local level to decrease the number of children with lead poisoning. Lead-Safe Roanoke should join forces with local healthcare providers to increase childhood lead screening prevention activities. Lead-Safe
Roanoke should include representatives from physician practices in program meetings. Engaging physician practices to actively participate in childhood lead prevention and utilizing their insights into barriers for childhood lead screening will only enhance the activities of Lead-Safe Roanoke. Identifying community resources and building constituencies should be part of the Lead-Safe Roanoke program.

Identifying childhood lead poisoning as a serious community health problem can be accomplished through education directed toward healthcare providers and the community. Healthcare providers must perceive childhood lead poisoning as a serious problem for individual children and their health as well as a long-term problem for the community utilizing local data to demonstrate the magnitude of the problem, seriousness of the consequences, and the effectiveness of available resources. Lead-Safe Roanoke should sponsor continuing medical education opportunities for physician practices to obtain current information regarding childhood lead poisoning, available community resources and updated local statistics. Local physicians should be asked to present at the conferences to encourage participation. Other incentives for participation should be considered.

Lead-Safe Roanoke in conjunction with the Roanoke City Health Department should continue to document local prevalence and distribution and to develop formal communication methods to local physician practices. In addition, processes should be established to monitor childhood lead screening preventive service performance by individual physician practices and provide feedback as to how many children were screened, proportion with lead exposure, and details of activities undertaken for lead abatement and treatment for children with lead exposure. Assistance should be offered to
physician practices in implementing increased childhood lead screening within their individual practices, advising on reimbursement processes and providing information directly to the physician practices about lead prevention resources.

Lead-Safe Roanoke should engage the community utilizing public health announcements and other readily available communication sources to engage the community about the importance of childhood lead screening testing and identifying environments with lead contamination before children are exposed to lead. The Roanoke community should be educated utilizing local, state and national statistics about the severity of childhood lead poisoning, the children at highest risk, sources of the lead exposure, benefits of decreasing lead exposure, risks of not preventing exposure, and the importance of having children screened for lead exposure.

Conclusions. With increasing scientific evidence documenting adverse cognitive and health effects of low blood lead levels, the necessity for immediate identification of children with lead exposure is critical. The long-term goal of primary lead prevention or complete removal of lead from the environment is ideal, but secondary prevention activities, such as childhood lead screening and community education regarding ways to minimize lead exposure, are required to promote the health of the community currently.

Physicians in high-risk areas for childhood lead poisoning are often unaware of the community health concern. Local public health departments should engage local physician practices to actively participate in community efforts toward childhood lead poisoning prevention.
References


