Diagnostic testing

A diagnostic test is the first venous BLL test performed within 6 months on a child with a previously elevated BLL on a screening test. If the diagnostic test is not performed within 6 months, the next test is considered a new screening test, and decisions about follow-up testing should be made on the basis of the new test, and not on the basis of the original screening test.

It is relatively common for children to have slightly elevated screening test results that do not persist on additional testing. For this reason, it is preferable to base interventions on the results of diagnostic testing.

Exception to the recommended schedule

If a child with an elevated screening test result is less than 12 months old, or if there is reason to believe that a child’s BLL may be increasing rapidly, consider performing the diagnostic test sooner than indicated in the accompanying schedule.
5.2. Follow-up testing for children with elevated diagnostic BLLs.

- Children with diagnostic BLLs of 10-14 μg/dL should have at least one follow-up test within 3 months.

- Children with diagnostic BLL tests of 15-19 μg/dL should have a follow-up test within 2 months.

- If the result of follow-up testing is ≥20 μg/dL, or if the child has had two or more venous BLLs of 15-19 μg/dL at least 3 months apart, the child should receive clinical management (see next section).

- Children with diagnostic BLLs ≥20 μg/dL should receive clinical management, which includes additional follow-up testing (see next section).
Follow-up testing

A follow-up test is a venous BLL test used to monitor the status of a child with an elevated diagnostic BLL test.

Regular measurement of the BLL of a child with an elevated diagnostic test result is important because the BLL may continue to rise. Rising BLLs are especially likely in children 6 months to 2 years of age because this is the age group in which mouthing behavior is most frequent.
6. **Provide clinical management for children when appropriate.**

Clinical management includes:


6.2. Family lead education and referrals.

6.3. Chelation therapy, if appropriate.

6.4. Follow-up testing at appropriate intervals.
Clinical management

Clinical management is part of comprehensive follow-up care and is defined as the care that is usually given by a health-care provider to a child with an elevated BLL.

Office visits for clinical management should be complemented by activities that take place in the child’s home, such as home visits by a nurse, social worker, or community health worker; environmental investigation; and control of lead hazards identified in the child’s environment.

See Table 4.3. for a summary of comprehensive follow-up care.

Note: The accompanying recommendations about clinical management are based on the experience of clinicians who have treated lead-poisoned children. They should not be seen as rigid rules and should be used to guide clinical decisions.
6.1 **Perform a clinical evaluation.**

**Table 4.2. Clinical evaluation**

<table>
<thead>
<tr>
<th><strong>Medical history.</strong></th>
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<tbody>
<tr>
<td>Ask about:</td>
<td></td>
</tr>
<tr>
<td>• Symptoms.</td>
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<tr>
<td>• Developmental history.</td>
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<tr>
<td>• Mouthing activities.</td>
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<td>• Pica.</td>
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<tr>
<td>• Previous BLL measurements.</td>
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<tr>
<td>• Family history of lead poisoning.</td>
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<table>
<thead>
<tr>
<th><strong>Environmental history.</strong></th>
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<tbody>
<tr>
<td>Ask about:</td>
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<tr>
<td>• Age, condition, and ongoing remodeling or repainting of primary residence and other places that the child spends time (including secondary homes and day-care centers). Determine whether the child may be exposed to lead-based paint hazards at any or all of these places.</td>
<td></td>
</tr>
<tr>
<td>• Occupational and hobby histories of adults with whom the child spends time. Determine whether the child is being exposed to lead from an adult’s workplace or hobby.</td>
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<tr>
<td>• Other local sources of potential lead exposure.</td>
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</table>

<table>
<thead>
<tr>
<th><strong>Nutritional history.</strong></th>
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<tbody>
<tr>
<td>• Take a dietary history.</td>
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<tr>
<td>• Evaluate the child’s iron status using appropriate laboratory tests.</td>
<td></td>
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<tr>
<td>• Ask about history of food stamps or WIC participation.</td>
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</table>

<table>
<thead>
<tr>
<th><strong>Physical examination.</strong></th>
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<tbody>
<tr>
<td>Pay particular attention to the neurologic examination and to the child’s psychosocial and language development.</td>
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</tr>
</tbody>
</table>
Clinical evaluation

Medical history. Developmental progress should be monitored carefully. If there are delays or lags, the child should be referred to an early intervention program for further assessment.

Environmental history. State and local health departments may provide additional questions about local exposure sources.

Nutritional status. Identified nutritional problems should be corrected.

• Deficiencies of calcium and iron may increase lead absorption or toxicity.

• A diet high in fat may result in increased lead absorption.

• Because more absorption of lead may be increased when the stomach is empty, the scheduling of smaller and more frequent meals may be helpful.

Physical examination. Findings of language delay or other neurobehavioral or cognitive problems should prompt referral to appropriate programs. Children may need early intervention programs and further examinations during the early school years to facilitate entry into an appropriate educational program.
6.2. Provide family lead education and referrals.

See Section 4 for topics that should be covered as part of family lead education.

Refer children for appropriate social services if problems such as inadequate housing, lack of routine health care, or need for early intervention educational services are discovered.
Family lead education and referrals

The first opportunity to educate families about the causes and consequences of a child’s elevated BLL usually occurs in the health-care provider’s office. Health-care providers should discuss both short-term repercussions of elevated BLLs (e.g., the need for follow-up testing and treatment, the need to control lead hazards in the child’s environment) and long-term repercussions (e.g., the potential for future learning problems, the availability of early-intervention services).

Health departments may provide printed materials, flipcharts, and videos that can assist in the family-education process.

The health department may also provide referral sources, such as social-service agencies, parent-support groups, and housing services.
6.3. Provide appropriate chelation therapy.

A child with a BLL ≥45 µg/dL should be treated promptly with appropriate chelating agents and be removed from sources of lead exposure.

**BLL testing for children undergoing chelation.**

Before chelation therapy is initiated, a child with a BLL <70 µg/dL should have a second BLL test, performed on a venous specimen, to ensure that therapy is based on the most recent and reliable information possible. Children with screening BLLs of 60-69 µg/dL should have a venous BLL test within 24 hours.

Children with BLLs ≥70 µg/dL should have an urgent repeat BLL test, but chelation therapy should begin immediately, and not be delayed until the test result is available.

A child who is receiving chelation therapy should be tested at least once a month. When chelation is terminated, BLLs should be monitored frequently until sources of lead exposure have been identified and addressed.
Chelation therapy

Chelation therapy should be initiated immediately for all children with an initial screening-test result that is $\geq 70$ µg/dL. If such an elevated BLL is obtained on a fingerstick sample, the health-care provider should order an immediate diagnostic test and consider initiating chelation while that test is being performed, if there is reason to believe that the results of the screening test are accurate (e.g., if it was obtained by a skilled phlebotomist under controlled conditions).
6.4. Provide follow-up BLL testing at appropriate intervals.

Children who are receiving clinical management should be tested at 1- to 2-month intervals until these three conditions are met:

1) The BLL has remained <15 µg/dL for at least 6 months, and

2) Lead hazards, e.g., chipping, peeling, lead-based paint, traditional remedies, etc., have been removed, and

3) There are no new exposures.

When these conditions are met, children should be tested approximately every 3 months.

Children for whom these three conditions are met and who have reached 36 months of age no longer need to receive follow-up testing.
Follow-up testing

A follow-up test is a venous BLL test used to monitor the status of a child with an elevated BLL on a diagnostic test.

Children who are receiving clinical management should receive follow-up testing to monitor the effectiveness of services they receive (e.g., lead education, home visitation and environmental investigation, lead-hazard control, chelation therapy).
7. Participate in a follow-up team.

Table 4.3. Comprehensive follow-up services, according to diagnostic* BLL

<table>
<thead>
<tr>
<th>BLL (µg/dL)</th>
<th>Action</th>
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<tbody>
<tr>
<td>&lt;10</td>
<td>Reassess or rescreen in 1 year. No additional action necessary unless exposure sources change.</td>
</tr>
<tr>
<td>10-14</td>
<td>Provide family lead education. Provide follow-up testing. Refer for social services, if necessary.</td>
</tr>
<tr>
<td>15-19</td>
<td>Provide family lead education. Provide follow-up testing. Refer for social services, if necessary. If BLLs persist (i.e., 2 venous BLLs in this range at least 3 months apart) or worsen, proceed according to actions for BLLs 20-44.</td>
</tr>
<tr>
<td>45-69</td>
<td>Within 48 hours, begin coordination of care (case management), clinical management (described in text), environmental investigation, and lead hazard control.</td>
</tr>
<tr>
<td>70 or higher</td>
<td>Hospitalize child and begin medical treatment immediately. Begin coordination of care (case management), clinical management (described in text), environmental investigation, and lead hazard control immediately.</td>
</tr>
</tbody>
</table>

* A diagnostic BLL is the first venous BLL obtained within 6 months of an elevated screening BLL.
The follow-up team and comprehensive follow-up services

Comprehensive services are best provided by a team that includes the health-care provider, care coordinator, community-health nurse or health advisor, environmental specialist, social services liaison, and housing specialist. Coordination of care, environmental services (i.e., identifying and controlling sources of lead exposure) and relocation to safe housing are typically provided or coordinated by the health department.

Because childhood lead exposure is likely to be associated with poor and deteriorating communities, children with elevated BLLs may also have problems such as inadequate housing, lack of routine medical care, and poor nutrition. Children may also need educational services, and the team may be instrumental in ensuring that children with a history of elevated BLLs receive early intervention or special education services for which they are eligible.
8. **Collaborate with public health agencies.**

Health departments and child health-care providers should interact in a number of ways:

- They should exchange information on local exposures to lead.

- Providers should put complete information on laboratory BLL test-requisition slips and should report children with elevated BLLs to the health department, as required.

- Health departments should collect lab data, analyze it, and prepare reports for providers and the public.

- Providers should encourage health departments to review data and to adjust screening recommendations as necessary.
Working with the health department

Some states require that laboratories report the results of all children’s BLL tests, along with demographic and address information. These reports are the foundation of BLL surveillance systems and depend on complete and accurate information being placed on the lab slip by the provider.

On the basis of surveillance information and other information from health-care providers, state and local health departments will be able to review and improve screening recommendations so that they are as effective as possible.
The guidance in this document calls upon state and local health departments to use data and an inclusive process to develop screening recommendations. Some health departments are already carrying out this process. Others will need support for additional efforts. CDC provides resources and support to health departments to ensure that this guidance is implemented in an effective and timely way.

**Statewide plan.** CDC gives technical assistance to health departments in the statewide planning process and in the dissemination of screening recommendations.

**Census data.** U.S. census data are available from many sources. CDC offers assistance in analyzing and displaying these data, and, with other Federal agencies, has future plans to make appropriate parts of the census data files available on the Internet to support lead poisoning prevention activities.

**Grant program.** CDC provides funding to states and localities through the State and Community-Based Childhood Lead Poisoning Prevention Program grants for screening, for ensuring that follow-up care takes place, and for lead education and monitoring and surveillance activities. In the future, CDC will support grantees in developing and disseminating screening recommendations.
Blood lead surveillance data. CDC assists state and local lead programs in collecting, managing, analyzing, and disseminating surveillance data, and in evaluating the usefulness of these data for statewide planning.

Outreach and communication. CDC provides materials and technical assistance to health departments to aid them in communications with other agencies, child health-care providers, managed-care organizations, and the public. For example, CDC provides a prototype for a handbook for health-care providers. (See Section A)

List of additional information available from CDC.

A. Support for child health-care providers: a prototypic handbook for providers. For use by health departments in preparing materials for health-care providers, this template includes background information and space for additional state and local materials such as state policies, screening recommendations, patient-education brochures, and local referral sources.

B. Developing a statewide plan: materials for examining and analyzing data and making screening recommendations. For use by state and local health officials and epidemiologists, and their advisors in decision making, these materials provide important background.