

and the Children's Health Insurance Program, along with many insurers. Health maintenance and immunizations now are covered without co-pays for insured patients as part of the Patient Protection and Affordable Care Act.

## SCREENING TESTS

Children usually are quite healthy and only the following screening tests are recommended: newborn metabolic screening with hemoglobin electrophoresis, hearing and vision evaluation, anemia and lead screening, and tuberculosis testing. Children born to families with dyslipidemias or early heart disease should also be screened for lipid disorders. (Items marked by a *star* in *Bright Futures*' recommendations should be performed if a risk factor is found.) Sexually experienced adolescents should be screened for sexually transmissible infections. When an infant or child begins care after the newborn period, the pediatrician should perform any missing screening tests and immunizations.

### Newborn Screening

#### Metabolic Screening

Every state in the United States mandates newborn metabolic screening. Each state determines its own priorities and procedures, but the following diseases are usually included in metabolic screening: phenylketonuria, galactosemia, congenital hypothyroidism, maple sugar urine disease, and organic aciduria (see Section 10). Many states now screen for cystic fibrosis, testing for immunoreactive trypsinogen. If that test is positive, then a deoxyribonucleic acid (commonly referred to as *DNA*) analysis for cystic fibrosis mutations is performed.

#### Hemoglobin Electrophoresis

Children with hemoglobinopathies are at higher risk for infection and complications from anemia, which early detection may prevent or ameliorate. Infants with sickle cell disease are begun on oral penicillin prophylaxis to prevent sepsis, the major cause of mortality in these infants (see Chapter 150).

#### Hearing Evaluation

Because speech and language are central to a child's cognitive development, the hearing screening is performed before discharge from the newborn nursery. An infant's hearing is tested by placing headphones over the infant's ears and electrodes on the head. Standard sounds are played, and the transmission of the impulse to the brain is documented. If abnormal, a further evaluation is indicated, using evoked response technology of sound transmission.

### Hearing and Vision Screening of Older Children

#### Infants and Toddlers

Inferences about hearing are drawn from asking parents about responses to sound and speech and by examining speech and language development closely. Inferences about vision may be made by examining gross motor milestones (children with vision problems may have a delay) and by physical examination

of the eye. Parental concerns about vision should be sought until the child is 3 years of age and about hearing until the child is 4 years of age. If there are concerns, definitive testing should be arranged. Hearing can be screened by auditory evoked responses, as mentioned for newborns. For toddlers and older children who cannot cooperate with formal audiologic testing with headphones, behavioral audiology may be used. Sounds of a specific frequency or intensity are provided in a standard environment within a soundproof room, and responses are assessed by a trained audiologist. Vision may be assessed by referral to a pediatric ophthalmologist and by visual evoked responses.

#### Children 3 Years of Age and Older

At various ages, hearing and vision should be screened objectively using standard techniques as specified in the *Bright Futures*' recommendations. Asking the family and child about any concerns or consequences of poor hearing or vision accomplishes subjective evaluation. At 3 years of age, children are screened for vision for the first time if they are developmentally able to be tested. Many children at this age do not have the interactive language or interpersonal skills to perform a vision screen; these children should be re-examined at a 3- to 6-month interval to ensure that their vision is normal. Because most of these children do not yet identify letters, using a Snellen eye chart with standard shapes is recommended. When a child is able to identify letters, the more accurate letter-based chart should be used. Audiologic testing of sounds with headphones should be begun on the fourth birthday (although Head Start requires that pediatricians attempt the hearing screening at 3 years of age). Any suspected audiologic problem should be evaluated by a careful history and physical examination, with referral for comprehensive testing. Children who have a documented vision problem, failed screening, or parental concern should be referred, preferably to a pediatric ophthalmologist.

#### Anemia Screening

Children are screened for anemia at ages when there is a higher incidence of iron deficiency anemia. Infants are screened at birth and again at 4 months if there is a documented risk, such as low birth weight or prematurity. Healthy term infants usually are screened at 12 months of age because this is when a high incidence of iron deficiency is noted. Children are assessed at other visits for risks or concerns related to anemia (denoted by a ★ in the *Bright Futures*' recommendations at [http://brightfutures.aap.org/clinical\\_practice.html](http://brightfutures.aap.org/clinical_practice.html)). Any abnormalities detected should be evaluated for etiology. Anemic infants do not perform as well on standard developmental testing. When iron deficiency is strongly suspected, a therapeutic trial of iron may be used (see Chapter 150).

#### Lead Screening

Lead intoxication may cause developmental and behavioral abnormalities that are not reversible, even if the hematologic and other metabolic complications are treated. Although the Centers for Disease Control and Prevention (CDC) recommends environmental investigation at blood lead levels of 20 µg/dL on a single visit or persistent 15 µg/dL over a 3-month period, levels of 5 to 10 µg/dL may cause learning problems. Risk