NBS Provider Fact Sheet for Spinal Muscular Atrophy (SMA)

What is Spinal Muscular Atrophy (SMA)?

SMA is an autosomal recessive neuromuscular disorder caused by deletions of the survival motor neuron 1 gene (*SMN1*). SMA is a leading genetic cause of death in children and occurs in approximately 1 in 10,000 infants at birth. With California's birth rate of some half million per year, it is estimated that 50 infants will be diagnosed each year.

Altered survival motor neuron (SMN) protein causes severe progressive neuromuscular degeneration of the motor nerve cells in the spinal cord, which without early treatment leads to progressive difficulty in movement, walking, and in some cases, swallowing and breathing. The most common form of SMA, ***Type I***, can present shortly after birth and if untreated, death from respiratory failure usually occurs in the first year of life. **Type II** usually appears by 6-12 months of age; these children typically sit independently but cannot walk and will require a wheelchair for mobility. **Type III** usually becomes apparent after 18 months of age and initially the child may be able to walk but this ability can deteriorate over time. **Type IV** is very rare and represents about 1% of SMA cases. Individuals are typically diagnosed in adulthood with mild motor impairment.

The survival motor neuron 2 gene (*SMN2*) also has a role in producing SMN protein and can help predict the severity of SMA. While the number of *SMN2* genes varies from person to person, individuals with more *SMN2* copies usually have a less severe form of SMA.

In California, the newborn screening program will be able to identify newborns that have homozygous deletions in the *SMN1* gene that are found in 90-95% of newborns with SMA. All newborns identified as screen-positive for SMA will be referred to a state-approved neuromuscular special care center where the diagnosis will be confirmed based repeat testing of SMN1 and determination of the SMN2 copy number that can help govern the course of treatment.

What are the treatments for SMA?

Fortunately, with early identification and treatment as a result of newborn screening, many of the classic signs and symptoms of SMA may never become apparent. Once a definitive diagnosis is made, the goal of treatment is to improve the child's quality of life, including supportive care, to slow the progression of the disorder. Earlier treatment onset is associated with improved quality of life and survival. Current treatments include intrathecal nusinersen, which needs to be administered intermittently throughout the life of the child, or gene therapy, with the current option being intravenous onasemnogene abeparvovec. Both treatments increase the expression of SMN protein, which improves muscle function. Many children will still need various types of supportive care (physical therapy, occupational therapy, speech therapy, respiratory therapy, or dietary management).

For more information about SMA, please refer to the following resources:

- **GeneReviews**: Clinical article on SMA (https://www.ncbi.nlm.nih.gov/books/NBK542369/)
- **Genetics Home Reference**: SMA information (https://ghr.nlm.nih.gov/condition/spinal-muscular-atrophy)
- **Cure SMA:** SMA information and support (https://www.curesma.org/)
- **Baby's First Test-Newborn Screening**: SMA information (https://www.babysfirsttest.org/newborn-screening/conditions/spinal-muscular-atrophy)