



Summary of Evidence-based Guideline for **PATIENTS** and their **FAMILIES**

CONGENITAL MUSCULAR DYSTROPHY

This fact sheet is provided to help you understand the current evidence for diagnosing and managing congenital muscular dystrophy (CMD).

The American Academy of Neurology (AAN) is the world's largest association of neurologists and neuroscience professionals. Neurologists are doctors who identify and treat diseases of the brain and nervous system, including neuromuscular disorders. The American Association of Neuromuscular & Electrodiagnostic Medicine (AANEM) is an association of neurologists, doctors of physical medicine and rehabilitation (PMR), and other health care professionals. PMR doctors specialize in rehabilitation. The AAN is dedicated to promoting the highest quality patient-centered neurologic care. The AANEM is dedicated to advancing the care of patients with muscle and nerve disorders.

Experts from the AAN and AANEM carefully reviewed the available scientific studies on diagnosing and managing CMD. The following information is based on evidence from those studies and other key information. The information summarizes the main findings of the 2015 AAN and AANEM guideline on CMD.

To read the full 2015 guideline, visit AAN.com/guidelines.

CMD is a group of several subtypes (disorders). With an accurate diagnosis, unnecessary tests or treatments may be avoided. Knowing the specific subtype is important for getting the best possible care. Consistent care within subtypes will help children with CMD get the right diagnosis and best possible health outcomes. Ongoing research in CMD is important to continue to improve diagnosis and care.

What is CMD?

CMD is a type of muscular dystrophy (MD). MD is a group of several different genetic diseases. It causes muscle wasting (damage) and weakness. This affects the muscles of the arms and legs. In some cases it may affect muscles of the face and muscles that control breathing and swallowing.

The muscle weakness is progressive. This means the muscle damage gets worse and spreads over time to involve other muscles. Muscle weakness can make it difficult to move or to lift objects. It also affects posture, or the ability to hold the body upright.

The rate of ongoing muscle damage depends on both the person and the subtype. Some subtypes can shorten lifespan. However, in many subtypes, the disorder progresses slowly.

In CMD, symptoms appear within the first two years of life. Typically symptoms are present at birth. Babies with CMD may have weak muscles that make them floppy. However, there also may be stiffness at certain joints. In some cases, they cannot straighten an arm or leg. These problems result from low muscle strength (weakness) and low muscle tone. Strength is the ability to contract (tighten) the muscles. Tone is tension or resistance in muscles. It is measured when muscles are at rest or being stretched. Healthy tone allows the body to bend or move, or to stay in one position. Babies with low tone have trouble holding up or moving their heads. They usually have poor reflexes. As they develop, these babies may have trouble rolling over, sitting up, or learning to walk. Some may not be able to perform these movements at all. Many children with CMD cannot walk or have trouble walking. The muscle weakness in CMD often worsens over time.

CMD can cause many symptoms, and symptoms can differ by subtype. Almost all subtypes lead to weak muscles with low tone. In the most common subtypes, symptoms include:

- Muscle weakness and low muscle tone
- Joints that are too loose or dislocated (out of place), especially in the hands and feet
- Limbs that do not straighten completely
- Spinal deformities (a spine that is abnormally stiff or cannot be straightened completely)

CMD can affect body organs other than the muscles and bones. This leads to complications, and some can be life-threatening. The symptoms that result include:

- Breathing/lung problems
- Heart problems
- Feeding difficulties
- Trouble swallowing, including choking or breathing in food or fluid
- Problems with brain and eye formation
- Thinking (cognitive) and learning problems
- Seizures

Subtypes that involve the brain and eyes tend to be severe. In these subtypes, the child may have seizures or problems with thinking and communicating.

What causes CMD?

CMD is a group of genetic disorders. The disorders are caused by changes or errors in a person's genes. Genes are part of the cells of the body. Everyone is born with a set of genes from both of their parents. The genes contain a program that tells the cells what to do.

Changes or errors in genes are known as *mutations*. They interfere with the cells' ability to build proteins that help muscles develop or function. Different mutations affect different proteins. In CMD, the patient has one or more mutations in his or her genes that cause the disorder. Often, one or both parents pass the mutation down. However, sometimes it cannot be traced to either parent. In these cases, the mutation happens unexpectedly in the person's genetic code. There are several dozen known genes that cause these diseases. Each CMD subtype is caused by mutation(s) of one or more of these genes. Researchers continue to discover new mutations and genes linked to CMD. Thus, new subtypes continue to be found.

Currently, there are several dozen known genes related to CMD. These help determine the CMD subtype that develops. Each subtype includes a range of clinical problems. Thus, depending on the subtype, some children:

- May be more severely affected than others
- May have more complications of the disease than others
- May show symptoms at an earlier age than others

How is CMD diagnosed?

CMD can be difficult to diagnose for these reasons:

- It is rare—most health care providers have little experience diagnosing and treating people with these disorders
- It can be confused with other neuromuscular disorders—this may lead to the wrong diagnosis
- There are several subtypes that can look alike, affect similar muscle groups, and cause similar symptoms—thus, it may be difficult to tell one subtype from another
- Some genes can cause different phenotypes (groups of symptoms)
- Not all subtypes are known yet—patients may not be able to get a confirmed genetic diagnosis

For an accurate diagnosis, it is important for doctors to obtain key information. This includes:

- Detailed knowledge of the person's symptoms, including where he or she has muscle weakness
- Details from personal and family health history
- Information about the person's ethnic background and geographic/regional location
- Information from a complete physical examination, including:
 - Signs of heart problems
 - Signs of breathing/respiratory problems (trouble breathing)
 - Signs of scoliosis (a curved spine) or back stiffness
 - Signs of stiff joints in other areas
 - Signs of brain or eye involvement or seizures
 - Muscle bulk, tone, and strength

Helpful diagnostic testing may include:

- Results from breathing tests of pulmonary (lung) function—this checks whether the amount of air entering or exiting the lungs is reduced
- Results from blood tests for creatine kinase—an enzyme that leaks from damaged muscle and is found in high levels in some people with these diseases
- Muscle imaging such as MRI and ultrasound—certain patterns of injury may sometimes point to specific subtypes
- Brain imaging with MRI—this looks for lesions or other signs of damage to the brain that may be seen in certain subtypes
- Findings from a muscle biopsy—a procedure that involves removing a piece of muscle tissue for study
- Findings from a cardiac echocardiogram—a procedure that involves looking at ultrasound images of the heart
- Genetic testing—a blood test to confirm a change or error in the gene that causes these diseases and their symptoms

Genetic Testing

Sometimes a person has a CMD diagnosis but does not know the subtype. Genetic testing in many cases can help:

- Confirm the CMD diagnosis
- Identify a specific subtype

The right genetic test can rule out other disorders. It also can help identify a specific subtype. There is moderate evidence* that specific information about the person can point to which test to use. This includes:

- Details from personal and family health history
- Information about the person's ethnic background and geographic/regional location (in some subtypes)
- Specific findings on physical examination
- Results of muscle biopsy and imaging studies (in certain CMD subtypes)

However, sometimes this information is not enough. Low evidence* shows that, in these cases, specialized genetic tests may help to diagnose the subtype. Genetic testing may be costly and sometimes is not available. Talk with your doctor about whether genetic testing is right for you or your child. Genetic counseling can help in making the decision to be tested.

Talk with your doctor for more information on genetic counseling and testing. An accurate diagnosis often requires:

- The right health information, including disease signs and symptoms
- The right genetic test for the person's situation

How is CMD treated and managed?

Currently, there is no cure for CMD. However, therapies are available to help with complications. These are used to:

- Help the child grow and develop
- Improve functioning and quality of life
- Lower the risk of associated complications and early death

CMD complications require many types of care, including:

- Monitoring for and treatment of heart problems
- Monitoring for and treatment of breathing problems early in the disease course
- Monitoring for and treatment of stomach problems (reflux and constipation)
- Speech and language therapy (for speech and swallowing problems)
- Nutritional support (for weight loss from swallowing problems)
- Orthopedic therapy or surgery (for muscle problems and bone weakness)
- Physical and occupational therapy, including gentle exercise

Therapies may help with:

- Muscle symptoms (for example, pain, limbs that no longer straighten, problems with mobility)
- Breathing problems
- Speech problems
- Pain or difficulty in swallowing
- Thinking and learning problems

At this time, there is not enough evidence to show if any of these therapies is helpful in CMD. More research is needed to show a benefit.

Care may be best managed through certain multispecialty clinics. Families should look for clinics focused on evaluating and treating children with muscle diseases. Ask your pediatric specialist about clinics near you. Or contact:

- Cure Congenital Muscular Dystrophy (Cure CMD) at CureCMD.org
- Muscular Dystrophy Association (MDA) at MDAUSA.org

The table below presents the guideline recommendations.

Table: CMD Recommendations

Category, Recommendation		Strength of Recommendation**
General		
Doctors caring for children with CMD	Consult a pediatric specialist in muscle diseases for diagnosis and management	Moderate
Pediatric specialists in muscle diseases caring for people with CMD	Coordinate multispecialty care when interested families have access to such resources	Moderate
Doctors caring for children with CMD	Help families access genetic counseling resources (if available to those families)	Moderate
Diagnosis: Key Health Information and Test Results		
Doctors caring for children who may have CMD	Use certain key health information to guide diagnosis of some CMD subtypes	Moderate
Doctors caring for children who may have CMD	Order muscle biopsies and tests for proteins to confirm diagnosis (if safe and appropriate for the patient)	Weak
Doctors caring for children who may have CMD	Have muscle biopsies performed at experienced testing centers (when ordering biopsies)	Moderate
Doctors caring for children who may have certain CMD subtypes	Order brain MRI (if safe and appropriate for the patient) to guide diagnosis of some CMD subtypes	Moderate
Doctors caring for children who may have certain CMD subtypes	Order certain muscle imaging of the lower limbs (if safe and appropriate for the patient)	Weak
Diagnosis: Genetic Testing		
Doctors caring for children who may have certain CMD subtypes	Order appropriate genetic testing (if available and affordable for the patient)	Weak
Management: Complications and Treatments		
Doctors caring for children who may have CMD	Advise families about areas that are unclear about expected health outcomes, lifespan, quality of life, and possible complications	Moderate
Doctors caring for children with CMD	Counsel patients and their families that breathing problems may not be noticeable early in the disease	Moderate
Doctors caring for children with CMD	Monitor the patient's breathing during waking and sleep hours	Moderate
Doctors caring for children with CMD	Refer to teams specializing in breathing and swallowing	Moderate
Muscle disease specialists caring for children with CMD	Coordinate with primary care providers to follow the patient's nutrition and growth	Moderate
Doctors caring for children with CMD	Order evaluation by teams of swallow therapists, digestion specialists, and imaging specialists (if patient has breathing problems, weight loss, or stunted growth)	Moderate
Multispecialty teams caring for children with CMD	Recommend a feeding tube be placed (if safe and appropriate for the patient and agreed on by the family)	Moderate
Doctors caring for children with CMD	Refer for a baseline heart evaluation	Moderate
Doctors caring for children with CMD	Discuss with families any increased risk from surgery or anesthesia	Moderate
Doctors caring for children with CMD	Monitor for complications for longer than average after any surgery or anesthesia	Moderate
Doctors caring for children with CMD	Refer to appropriate specialists for best possible care to prevent or slow muscle, joint, and bone complications	Moderate
Doctors caring for children with CMD	Recommend certain exercises, shoe inserts, or ankle surgery in certain situations	Moderate
Doctors caring for children with CMD	Avoid use of nerve-blocking drugs such as botulinum toxin	Weak
Doctors caring for children with CMD	Refer to advocates for special education and specialists in education and development (if appropriate)	Moderate

****Key to Recommendation Levels:**

Strong recommendation = In *almost all* circumstances, *almost all* patients would want the course of action described in the recommendation to be followed

Moderate recommendation = In *most* circumstances, *most* patients would want the course of action described in the recommendation to be followed

Weak recommendation = In *some* circumstances, *some* patients would want the course of action described in the recommendation to be followed

No recommendation made = The balance of the benefits, harms, and costs is unknown.

Note: When they write recommendations, the experts consider:

- The evidence
- The balance of potential benefit and potential harm of a diagnostic test or therapy
- The cost and availability of the test or therapy
- The patient's values and preferences

Cure CMD and the MDA reviewed the content of this fact sheet. Some information on disease background was provided by Cure CMD at CureCMD.org and by the MDA at MDAUSA.org.

This guideline was endorsed by the American Academy of Pediatrics, the American Occupational Therapy Association, the Child Neurology Society, and the National Association of Neonatal Nurses.

This statement is provided as an educational service of the American Academy of Neurology and the American Association of Neuromuscular & Electrodiagnostic Medicine. It is based on an assessment of current scientific and clinical information. It is not intended to include all possible proper methods of care for a particular neurologic problem or all legitimate criteria for choosing to use a specific procedure. Neither is it intended to exclude any reasonable alternative methodologies. The AAN and the AANEM recognize that specific patient care decisions are the prerogative of the patient and the physician caring for the patient, based on all of the circumstances involved.

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*After the experts review all of the published research studies, they describe the strength of the evidence supporting each recommendation:

Strong evidence = Future studies very unlikely to change the conclusion

Moderate evidence = Future studies unlikely to change the conclusion

Low evidence = Future studies likely to change the conclusion

Very low evidence = Future studies very likely to change the conclusion

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