Thank you for your interest in the LOND Clinical Decision Tool, a resource for US-based first-line healthcare providers to **"LOND" and better identify late-onset neuromuscular disorders:**


## LOND Clinical Decision Tool

The Late-Onset Neuromuscular Disease Consortium (LONDC), a program of the American Neuromuscular Foundation (ANF), developed the LOND Clinical Decision Tool to improve the experiences and care of people living with late-onset neuromuscular disorders (LONDs).

This tool aims to encourage greater recognition of the signs and symptoms of LONDs and to facilitate earlier specialist referrals for further diagnostic evaluation.

## How it was Developed

The tool is the culminating work product of the LONDC's inaugural project spanning 2024-2026. The project included a robust research program to identify commonalities among LONDs in early signs and symptoms that could be used to raise awareness of the category broadly. Research included:

- More than a dozen key opinion leaders' clinical observations and summarizations of literature on commonalities among and distinguishing features of LONDs.
- More than 60 interviews with patients across 14 LONDs to understand first-hand experiences with early signs and symptoms of these diseases.
- More than 120 survey responses from primary care physicians (PCPs), advanced practice providers (APPs), and community-based neurologists to identify challenges in recognizing LONDs and making specialist referrals.

Research findings were brought forward for discussion with representatives of the ANF, LONDC Steering Committee, and clinical advisors to inform early development of the clinical tool. The proposed clinical tool was then brought through a virtual consensus process to further refine and ultimately gain alignment across clinical stakeholders on the:

- Presenting symptoms that differentiate LONDs from more common diagnoses.
- Diagnostic triggers that should signal the potential presence of a late-onset neuromuscular condition.
- Practical utility of the tool and ability to achieve its objectives.

We achieved consensus on the tool from a panel of 32 US-based neuromuscular specialists from both neurology and physical medicine rehabilitation. The consensus process used a modified Delphi methodology via multiple rounds of an anonymous online survey. The clinical tool was also reviewed by five (5) APPs via moderated focus group to gather feedback on clarity, usability, and integration with primary care and neurology practice workflows. The development of the clinical tool will be detailed in a forthcoming manuscript, which will be made available when published.

The clinical tool that follows is the first publicly available version, launched March 2026. The LONDC plans to audit feedback from the clinical community and revise the tool as needed in 2027 and biennially thereafter.

## How to Use

This tool is primarily intended for first-line healthcare professionals, including PCPs and APPs. It may also be of interest to and used by community-based neurologists and their practices. Of note:

- The tool is designed to be **highly sensitive** to ensure individuals with a wide range of LONDs are detected and referred to specialists. However, the tool is **not highly specific** and is **not intended as a diagnostic tool to discern specific LONDs** and therefore does not provide guidance on testing for specific conditions. Further assessment and differential diagnosis are at the provider's discretion.
- Throughout, **examples of how patients describe their experiences are provided to help clinicians recognize the various ways weakness may present or go unrecognized.** Research has revealed that patients may describe their symptoms in terms of impact on their daily activities, while healthcare professionals might be more attuned to listen for medical terms or descriptions of clinical impact.
- This tool **does not serve as a clinical guideline and does not replace clinical judgment**. Potential serious, acute, or imminently life-threatening causes of all symptoms should be evaluated and elevated as emergencies as indicated.

American Neuromuscular Foundation LONDC Late-Onset Neuromuscular Disease Consortium

American Neuromuscular FOUNDATION®

# Recognize and Refer Late-Onset Neuromuscular Disorders (LONDs) to Neuromuscular Specialists

A tool for US-based first-line healthcare providers to **LOND:**

LOOK FOR + ON TOP OF → NOW SUPPORT DIAGNOSIS

## L — LOOK FOR ...

**<u>the patient's hallmark sign or symptom as focal* or generalized muscle weakness or dysfunction – OR – muscle atrophy in limbs.</u>**

The patient may or may not recognize this as muscle weakness and may describe or experience this as a **change in their ability to conduct age-appropriate activities,** e.g.:

- Climbing stairs without tripping
- Standing from seated position without support
- Stepping on surfaces with steadiness
- Walking moderate distances comfortably
- Holding, carrying, or using items in hands without dropping them (e.g., toothbrush, razor, dishes, refrigerator items)
- Doing small tasks (e.g., opening jars, turning keys, typing on a keyboard, pulling item from wallet, turning/letting go of doorknob)
- Lifting arms overhead (e.g., combing or drying hair, reaching objects above shoulder height)
- Picking up items or children from the floor

The patient may describe muscle atrophy as a loss of muscle bulk or a **change in the way their limb muscles look**.

**Focal muscle weakness may include cranial muscles*

+

## O — ON TOP OF ...

**one or more of the following symptoms or findings, not attributable to other causes.**

- **Diplopia** (double vision) **or ptosis** (drooping eyelid)
- **Family history** of a neuromuscular disorder or genetic test result revealing predisposition for neuromuscular disorder(s); note family history may be present but not known or may include misdiagnoses
- **Fasciculations** (muscle twitching) or **muscle cramping**
- **Foot drop**
- **Gait disturbance** not associated with injury or other condition(s), such as a change in walking, balance, steadiness, ability to step over/onto something, ability to climb stairs; or an increase in stumbles, falls, near falls
- **Head drop**
- **Pseudobulbar affect** (signs of emotional lability such as uncontrolled/inappropriate crying and/or laughing)
- Reduced, absent, or pathologically increased **reflexes**
- **Sensory symptoms** (neuropathic pain, numbness, tingling in limbs)
- Trouble with **speech, swallowing, choking, or chewing; drooling**
- **Unexplained shortness of breath**

Note: Not ordered by severity or priority. These are select symptoms and findings which, when present alongside muscle weakness, dysfunction, or atrophy, may suggest a LOND. This list is not exhaustive of all presentations.

## ND — NOW SUPPORT DIAGNOSIS ...

**by referring patient with suspected LOND to a neuromuscular specialist, or if not available in your area, a neurologist or physical medicine and rehabilitation (PM&R) physician.**

Having identified the hallmark sign or symptom and additional symptoms/findings potentially indicative of a LOND, referral to a neuromuscular specialist (NMS) is recommended. If a NMS is not available in your area, a neurologist (NEURO) or physical medicine and rehabilitation (PM&R) physician who has experience diagnosing neuromuscular conditions and interpreting EMG testing may also be able to help with evaluation.

- Order serum creatine kinase (CK) lab with initial referral
- Include exam findings and any lab results gathered, indicating abnormal lab results
- Note patient is referred for muscle weakness, dysfunction, and/or atrophy with the symptoms or exam findings from the list above
- Indicate suspicion of LOND and whether patient has been informed of potential diagnosis

# Path to Diagnosis

Early recognition and referral of patients with suspected LONDs initiate further assessment and expedite the path to diagnosis.

## RECOMMENDED

**Refer to NMS, or if not available to NEURO or PM&R to:**

- Conduct neurological exam
- Order labs

**IF** **Indicative findings* on neuro exam** and/or **elevated serum CK#**

**THEN**

**Refer to NMS if not already, to:**

- Consider NCS/EMG
- Order additional labs
- Consult with genetic medicine as appropriate

## ALTERNATIVES, AS APPLICABLE

### LIMITED OR NO ACCESS TO NEURO OR NMS

**Conduct the following in consult with NEURO:**

- Neurological exam, including manual muscle test, by trained practitioner
- Lab work including serum CK, vitamin B12, HbA1c, thyroid function tests, comprehensive metabolic panel
- Serum AChR antibody test if binocular diplopia or ptosis is present

**IF** **Indicative findings* on neuro exam** and/or **elevated serum CK#**

**THEN**

**Refer to NEURO or PM&R for possible NCS/EMG by qualified electromyographer**

– AND/OR –

**Conduct additional labs at accredited or academic center lab^**

– AND/OR –

**Refer to genetic medicine as appropriate**

### POTENTIAL MEDICAL EMERGENCY

**Refer to ER if patient exhibits any:**

- Rapidly progressive weakness, worsening with days or weeks
- Bulbar involvement, such as problems speaking, chewing, swallowing
- Respiratory involvement
- Signs of stroke

**IF** **Emergency is addressed and LOND symptoms/ suspicion persist**

**THEN**

**Refer to NMS if not already**

### Referral Guidance

- Order serum creatine kinase (CK) lab with initial referral
- Include exam findings and any lab results gathered, indicating abnormal lab results
- Note patient is referred for muscle weakness, dysfunction, and/or atrophy with the symptoms or exam findings from the list above
- Indicate suspicion of LOND and whether patient has been informed of potential diagnosis

### Footnotes

* Indicative findings: confirm the hallmark sign or symptom and additional symptoms/findings indicative of a LOND as noted on prior page. May include, but are not limited to: weakness which may be fatigable, abnormal muscle stretch reflexes, muscle atrophy, fasciculations, myotonia, etc.

# Elevated serum CK: >5-10X upper limit of normal range

^ Labs to include: ESR, CRP, ANA, aldolase, myositis antibody panel, serum immunofixation with kappa and lambda free light chains, MuSK antibodies

### Key Terms

**ER:** emergency room
**NCS/EMG:** nerve conduction studies/electromyogram
**NEURO:** general neurologist
**NMS:** neuromuscular specialist
**PM&R:** physical medicine and rehabilitation

### Resources

**Resources and medical education content produced by the American Association of Neuromuscular & Electrodiagnostic Medicine (AANEM) to support the recognition and referral of LONDs are available here:**

*These include neurological exam instruction, video content, overview of many LONDs, and more.*