

Amyotrophic Lateral Sclerosis (ALS)

Nathaniel Giovanni Yomogida, SPT

Chloë Kerstein, SPT

How to study ALS

To study ALS, I would begin with a 5 minute video to get a quick overview and lay the mental foundation for the future topics such as: [Khan academy ALS video](#).

The textbooks I recommend for further research or reference is:

- (PT Specific) Physical rehabilitation - O'Sullivan¹
- Neuromuscular disorders by Amato²
- Umphred's neurological rehabilitation³
- Continuum - AAN⁴

Lastly, I would then recommend going into true evidence based practice by using scientific articles to find up to date information on the topic.

introduction

What does “Amyotrophic Lateral Sclerosis” even mean?

- a -> no
- myo -> muscle
- Trophic -> Nourishment Thus Amyotrophic means “no muscle nourishment”

Amyotrophic lateral sclerosis (ALS), AKA Lou Gehrig's disease, is the most common and devastatingly fatal motor neuron disease (MND) among adults¹. ALS is characterized by the degeneration and loss of motor neurons in the spinal cord, brainstem, and brain, resulting in UMN and LMN clinical signs and symptoms¹. Recently, ALS is being recategorized as a multisystem disorder/syndrome with variable pathological involvement of extra-motor networks and connections, in addition to the LMNs and UMN¹

Epidemiology

Note

see Wolfson et al. (2023)⁵ for updated 2023 global metrics

Age

ALS can occur at any age but onset generally occurs in the mid-to-late 50s¹.

Gender

Most studies have found that the disease affects men slightly more than women, with an approximate ratio of 1.7:1. After age 65, the gender difference decreases¹.

Family History

About 5% to 10% of individuals have a family history of ALS (familial ALS, [FALS])¹. Familial ALS is phenotypically and genetically heterogeneous¹.

Most cases of FALS are autosomal dominant¹. Regardless, recessive and X-linked forms have been described¹. For example, the rare juvenileonset ALS is reported to be inherited in an autosomal recessive pattern¹.

FALS Categorization

FALS is categorized by mode of inheritance and further subcategorized by specific gene or chromosomal locus@osullivanPhysicalRehabilitation2019.

The very large majority of adult individuals with ALS have no family history of the disease (sporadic ALS)¹.

Note

A very small percentage of individuals with sporadic ALS do have a mutation in SOD1

Over 20 chromosomal regions and a number of identified genes have been linked to ALS. 20% of hereditary ALS cases are attributed to one of 100+ mutations in [superoxide dismutase 1 \(SOD1\)](#)¹. ~50% of individuals with an SOD1 ALS variant are symptomatic by 46yrs, and 90% are symptomatic by 70 years of age¹.

Onset

- ~70% to 80% of individuals develop limb-onset ALS, with initial involvement in the extremities¹.
- 20% to 30% develop bulbar-onset ALS, with initial involvement in the bulbar muscles¹.
- Bulbar-onset ALS is more common in middle-aged women, and initial symptoms may include difficulty speaking, chewing, or swallowing¹

Table 1: Motor Neuron Diseases (MNDs)¹

Subtype	Nervous system pathology
ALS	Degeneration of the corticospinal tracts, neurons in the motor cortex and brainstem, and anterior horn cells in the spinal cord
Primary lateral sclerosis	Degeneration of upper motor neurons
Progressive bulbar palsy	Degeneration of motor neurons of cranial nerves IX to XII
Progressive muscular atrophy	Loss or chromatolysis of motor neurons of the spinal cord and brainstem

References

1. O'Sullivan SB, Schmitz TJ, Fulk GD, eds. *Physical Rehabilitation*. 7th ed. F.A. Davis Company; 2019.
2. Amato AA, Russell JA. *Neuromuscular Disorders*. 2nd ed. McGraw-Hill Education; 2016.
3. Lazaro RT. *Umphred's Neurological Rehabilitation*. 7th ed. Elsevier, Inc; 2019.
4. Goutman SA. Diagnosis and Clinical Management of Amyotrophic Lateral Sclerosis and Other Motor Neuron Disorders. *CONTINUUM: Lifelong Learning in Neurology*. 2017;23(5):1332-1359. doi:[10.1212/CON.0000000000000535](https://doi.org/10.1212/CON.0000000000000535)
5. Wolfson C, Gauvin DE, Ishola F, Oskoui M. Global Prevalence and Incidence of Amyotrophic Lateral Sclerosis: A Systematic Review. *Neurology*. 2023;101(6):e613-e623. doi:[10.1212/WNL.0000000000207474](https://doi.org/10.1212/WNL.0000000000207474)