Amyotrophic lateral sclerosis, usually shortened to ALS, damages the nerve cells that control muscle movement. These cells, called motor neurons, carry the signals needed to move the arms and legs, speak, swallow, and breathe. As the neurons deteriorate and die, the muscles they serve receive less effective stimulation. Strength declines, movements become harder, and some abilities are eventually lost. ALS is neurodegenerative, meaning it involves the progressive deterioration of nerve cells. "Progressive" means the condition generally worsens over time, although the pace can vary considerably. It is also called Lou Gehrig's disease, after the American baseball player whose illness brought it widespread attention. There is currently no cure, but medicines, specialized care, and equipment can help manage the disease's effects and support daily life (National Institutes of Health Health).

Movement depends on communication between different levels of the nervous system. Upper motor neurons begin in the brain and communicate with lower motor neurons in the brainstem and spinal cord. Lower motor neurons extend connections to the muscles, delivering the signals that make them contract. ALS can damage both levels, which helps explain a combination of symptoms that might otherwise seem contradictory. Upper motor neuron damage can produce spasticity, abnormal muscle tightness and stiffness, along with exaggerated reflexes. Lower motor neuron damage can cause weakness, atrophy, the shrinking of muscle tissue, and fasciculations, brief involuntary muscle twitches. A limb can therefore become weak while also feeling stiff. The problem involves the nervous system's ability to activate and regulate the muscle (Muscular Dystrophy Association Muscular Dystrophy Association).

The first noticeable change may be small enough to resemble an ordinary inconvenience. Someone may struggle with buttons, drop objects, catch a foot on the floor, or find stairs increasingly difficult. When the disease begins with the arms or legs, doctors call it limb-onset ALS. Another person may first develop slurred speech or difficulty swallowing, a pattern called bulbar-onset ALS, referring to the involvement of pathways associated with the brainstem. Dysarthria means difficulty producing clear speech because the muscles involved are impaired; dysphagia means difficulty swallowing. The location of the first symptoms influences the early experience of the disease. Over time, weakness commonly spreads to additional regions, although its sequence and speed differ between people. An isolated symptom, including twitching, has many possible explanations and cannot establish an ALS diagnosis (Veterans Affairs; International Alliance of ALS/MND Associations Veterans Affairs).

Inside affected nerve cells, researchers find disturbances involving the molecules that keep cells functioning. Proteins carry out many of the body's working tasks, and their shape, location, and regulation influence whether they can perform those tasks properly. In many ALS cases, a protein called TDP-43, which helps process cellular genetic messages, becomes abnormally distributed and accumulates in clumps. Researchers also study problems involving cellular energy production, inflammation, the transport of materials along nerve fibers, and excessive chemical stimulation. These findings provide

clues about how neurons become vulnerable and die. They have not produced one complete explanation that accounts for every case. ALS can involve several biological pathways, and different genetic forms may reach similar patterns of weakness through different underlying processes (Muscular Dystrophy Association Muscular Dystrophy Association).

Most people who develop ALS have no known family history of it. This is called sporadic ALS. Approximately five to ten percent of cases occur in families with a recognized history of ALS or a related condition, a pattern called familial ALS. Those terms describe what is known about the family pattern; genetic influences can still be present in someone whose relatives have never received an ALS diagnosis. Most cases develop during later adulthood, although younger people can also be affected. For many individuals, doctors cannot identify a specific cause. Scientists continue investigating how inherited susceptibility, aging, and environmental factors may interact. ALS is noncontagious: ordinary contact, caregiving, and sharing a home do not transmit the disease (International Alliance of ALS/MND Associations; National Institutes of Health; CDC als-mnd.org).

A gene is a section of DNA containing instructions used by cells. A genetic variant is a change in that DNA sequence, and some variants increase the likelihood of developing ALS. Many inherited forms follow an autosomal dominant pattern, in which a relevant change in one copy of a gene can increase disease risk. A parent carrying such a variant generally has a fifty-percent chance of passing it to each child. The chance of inheriting the variant and the chance of eventually developing the disease are separate questions, because some variants do not cause illness in everyone who carries them. Genetic counseling helps families interpret these uncertainties. Expert consensus guidelines published in 2023 recommended offering genetic testing and counseling to everyone diagnosed with ALS, including people without an affected relative, partly because results may influence treatment and research opportunities (ALS Association; evidence-based ALS genetic-testing consensus guidelines The ALS Association).

Diagnosis requires assembling evidence about the person’s symptoms, examination, and course over time. A neurologist, a physician specializing in disorders of the nervous system, evaluates muscle strength, reflexes, muscle bulk, coordination, speech, and other findings. The doctor looks for a pattern of motor neuron dysfunction and considers whether another condition could explain it. Problems such as spinal cord compression and certain other nerve or muscle disorders can resemble parts of ALS. Identifying those alternatives is important because their treatments may differ substantially. ALS remains a clinical diagnosis, meaning the conclusion depends on the overall medical assessment. No single test is relied upon by itself to establish or exclude it. Sometimes further examinations are needed as the pattern becomes clearer (UC San Diego Health UC San Diego Health).

Several tests contribute different kinds of information. Electromyography, or EMG, records electrical activity in muscles, often using a fine needle electrode. It can reveal

changes consistent with impaired nerve supply to muscle. Nerve conduction studies assess how electrical signals travel through nerves and help distinguish different kinds of nerve problems. Magnetic resonance imaging, or MRI, produces detailed pictures of internal structures and can help identify conditions affecting the brain or spinal cord that resemble ALS. Blood tests and, in selected circumstances, other investigations help evaluate additional possibilities. Each result answers a particular question. The diagnostic reasoning comes from how those answers fit together with the examination and the history of progressive weakness (International Alliance of ALS/MND Associations; National Institutes of Health als-mnd.org).

The effects on movement also need to be separated from the effects on thinking. Many people retain substantial intellectual ability and awareness even as speech and physical movement become severely impaired. Slurred speech, slow typing, or difficulty responding physically cannot by themselves show how well someone understands a conversation. At the same time, ALS can involve changes in thinking, language, behavior, or judgment. Some people develop frontotemporal dementia, a group of brain disorders that can substantially affect personality, behavior, language, and decision-making. Other people experience milder changes. This range makes individual assessment important. Sensory abilities such as hearing, sight, taste, and touch are generally relatively preserved, while pain can still arise from cramps, stiffness, positioning, and reduced mobility (MedlinePlus; international ALS–frontotemporal spectrum consensus criteria; Muscular Dystrophy Association medlineplus.gov).

Emotional expression can change in another way called pseudobulbar affect, often shortened to PBA. It causes episodes of laughing or crying that are difficult to control and may be much stronger than the situation would ordinarily produce. The outward expression may also differ from what the person is feeling. Someone might laugh while distressed or cry in response to something only slightly moving. This involves neurological control of emotional expression. Depression, anxiety, grief, and PBA require careful assessment because they can overlap while representing different experiences. Recognizing PBA helps families and clinicians interpret an episode accurately and consider treatment that may reduce it. A person’s facial expression or sudden laughter does not always communicate the emotional state others assume it does (Baylor College of Medicine bcm.edu).

ALS is a life-limiting disease, and its prognosis needs to be discussed honestly while preserving the uncertainty of an individual course. Population estimates commonly describe survival of approximately two to five years after symptoms begin, while some people live considerably longer. Prognosis means the expected course and outcome of an illness. These estimates describe groups; they cannot determine a particular person’s remaining time. The point from which survival is measured also matters: symptoms may begin well before diagnosis. The location of onset, rate of progression, genetic background, respiratory function, and care needs can influence the course. Respiratory failure—when breathing can no longer adequately support the body—is a major cause of

death. Breathing support and other care can influence survival as well as comfort (CDC; National Institutes of Health CDC).

Care is usually organized around a multidisciplinary team, meaning professionals from several fields work together on one person's needs. A neurologist may coordinate with respiratory specialists, physical and occupational therapists, speech-language pathologists, dietitians, nurses, social workers, and mental health professionals. Each contributes to a different part of living with ALS. Repeated assessments of movement, breathing, weight, swallowing, and communication help the team anticipate changes. Timing is important because equipment, training, and home arrangements can take time to obtain. Specialized ALS clinics have been associated with better outcomes and can help coordinate care that might otherwise become fragmented across separate appointments. The plan changes as the person's abilities, symptoms, and preferences change (Muscular Dystrophy Association Muscular Dystrophy Association).

Medicines used to influence the disease have different aims and evidence. Riluzole can modestly extend survival; its original trials showed a survival benefit without a corresponding improvement in measured muscle strength. Edaravone, sold as Radicava in intravenous and oral formulations, was shown to reduce decline in daily physical functioning in the population studied for its initial approval. These benefits are different from restoring movement that has already been lost. A disease-modifying treatment attempts to alter the illness's course, while symptomatic treatment addresses problems such as cramps, stiffness, pain, or excessive saliva. A care plan may include both. The choice of medicine considers the person's circumstances, the evidence, treatment requirements, and monitoring for adverse effects (FDA-approved riluzole prescribing information; U.S. Food and Drug Administration RILUZOLE tablet).

Tofersen, sold as Qalsody, illustrates why the genetic cause can affect treatment. It is approved in the United States for adults with ALS associated with a disease-causing change in the SOD1 gene. The medicine reduces production of SOD1 protein and is delivered into cerebrospinal fluid, the fluid surrounding the brain and spinal cord, through a procedure performed in the lower back. Its initial accelerated approval in 2023 relied on lowering blood levels of neurofilament light, a marker of nerve injury. A biomarker is a measurable biological sign used to study a condition or response to treatment. Accelerated approval allows reliance on a marker considered reasonably likely to predict clinical benefit while further evidence is gathered. This treatment applies to a particular genetic form, which is why identifying that form can change the available options (U.S. Food and Drug Administration FDA).

Research results also change which treatments remain available. Relyvrio, a medicine previously marketed for ALS, had its FDA approval withdrawn in 2025 after a larger trial failed to meet its prespecified measures of benefit. That history shows why promising early results need continued testing. A clinical trial is a study designed to evaluate an intervention in people, using defined methods and outcomes. Researchers may examine physical function, breathing, survival, symptoms, or biological markers. Those measures

answer related but different questions. A change in a laboratory marker needs interpretation alongside evidence about how people function and live. Continued research involves testing new approaches and revising conclusions when stronger evidence becomes available (U.S. Food and Drug Administration, Federal Register withdrawal notice public-inspection.federalregister.gov).

Breathing deserves particular attention because it depends on muscles working continuously, usually without conscious effort. The diaphragm, a large muscle beneath the lungs, and muscles between the ribs help move air. When ALS weakens them, breaths can become shallower and coughing less effective. Ventilation is the movement of air into and out of the lungs; inadequate ventilation can allow carbon dioxide to accumulate. Changes may first become noticeable through disrupted sleep, morning headaches, daytime sleepiness, breathlessness when lying flat, or a weak cough. Respiratory assessments help establish a baseline and detect decline. The central problem is often the weakened muscular pump moving the air, so treatment must address that mechanical need as well as any additional lung illness (International Alliance of ALS/MND Associations als-mnd.org).

Noninvasive ventilation supports breathing through an interface such as a mask over the nose or mouth. A machine assists the movement of air, often beginning with use during sleep and expanding as needed. It can improve symptoms, sleep, and quality of life and can prolong survival. Cough-assistance techniques and equipment help clear secretions when an ordinary cough becomes weak. Another option is ventilation through a tracheostomy, an opening made through the neck into the windpipe. This brings substantial equipment, training, and caregiving requirements. These choices involve medical assessment and the person's preferences about daily life and future care. Supplemental oxygen addresses oxygen supply, while ventilation addresses air movement; the respiratory team determines the support appropriate to the actual problem (NICE; ALS Association; International Alliance of ALS/MND Associations NICE).

Eating and drinking can become demanding when the lips, tongue, throat, and related muscles weaken. Chewing takes longer, moving food through the mouth becomes harder, and coordinating a safe swallow may become less reliable. Aspiration occurs when material such as food, liquid, or saliva enters the airway, creating a risk of respiratory complications. Reduced intake can lead to dehydration and malnutrition, a shortfall in the nutrients and energy the body requires. Some people also have increased energy needs, making weight maintenance more difficult. A speech-language pathologist evaluates swallowing, while a dietitian helps plan adequate nutrition. Food textures, meal arrangements, positioning, and equipment are selected according to the person's abilities. Saliva management also belongs in this care because swallowing saliva can become difficult (International Alliance of ALS/MND Associations; MedlinePlus Genetics als-mnd.org).

A feeding tube can provide another route for nutrition, fluids, and suitable medicines when swallowing becomes unsafe or insufficient. A gastrostomy is an opening into the

stomach through the abdominal wall, allowing a tube to deliver those supplies directly. Some people use the tube to supplement what they can still take by mouth; others eventually rely on it for most or all nutrition. Being able to eat for enjoyment depends on an individual swallowing assessment. Planning considers weight, hydration, breathing function, the burdens of eating, and the person's wishes. The procedure supports nutrition while the neurological disease continues. Discussing it before a crisis allows time to consider the options and arrange the care needed afterward (ALS Association The ALS Association).

Movement and physical comfort require a changing approach as strength declines. Physical therapy addresses abilities such as movement, posture, flexibility, and safe transfers. Occupational therapy helps adapt everyday activities and environments, including dressing, bathing, writing, and using equipment. A tailored exercise plan may help maintain flexibility, reduce stiffness, and support remaining function, with activity balanced against fatigue. Braces can improve support, mobility aids can reduce falls, and wheelchairs can conserve energy and improve access. Adjustable beds and transfer equipment can make care safer for the person and those assisting. These choices respond to the particular pattern of weakness. Their usefulness often depends on obtaining them before an immediate need becomes a crisis (International Alliance of ALS/MND Associations als-mnd.org).

Communication can also be adapted as speech and hand movement change. Augmentative and alternative communication, or AAC, includes methods that support or replace ordinary speech. Options range from agreed gestures and alphabet boards to devices that turn selected or typed messages into spoken words. Depending on remaining movement, a person may control a device through touch, a switch, head movement, or eye gaze. Voice banking records samples that can be used to create a personalized synthesized voice; message banking preserves particular recorded phrases. Planning early gives the person time to try systems and develop confidence using them. Communication partners contribute by allowing sufficient response time, reducing background noise, and confirming what they understood. The purpose is to keep needs, choices, relationships, humor, and personal expression accessible as the body changes (International Alliance of ALS/MND Associations; ALS Association als-mnd.org).

Families and caregivers also need practical preparation. Assistance may grow to include transfers, positioning, personal care, equipment management, transportation, and coordination of appointments. Those responsibilities can affect sleep, employment, finances, and relationships. Training helps caregivers use equipment and provide assistance safely, while social workers and community organizations can help identify services and resources. Respite care provides a period of relief from caregiving responsibilities so someone else can take over temporarily. Support groups and counseling offer places to discuss the emotional strain and changing family roles. Care works more sustainably when the needs of everyone involved are recognized and

responsibilities are supported rather than left to one exhausted person (ALS Association The ALS Association).

Palliative care addresses comfort, symptoms, emotional strain, and decisions during a serious illness. It can begin early and continue alongside treatments intended to influence ALS or extend life. Hospice focuses on comfort and support near the end of life under the relevant care arrangements. Conversations about breathing support, feeding, communication, and preferred care settings can take place gradually, with time to revisit decisions. Advance care planning records and communicates wishes about future treatment, including who should speak for someone if decision-making becomes impaired. The person living with ALS remains central to those conversations. Accessible communication, clear explanations, and repeated opportunities to express preferences help ensure that care follows the life and priorities of the individual receiving it (ALS Association; NICE The ALS Association).