Dedication

To the healthcare professionals dedicating their time and efforts to the study of amyotrophic lateral sclerosis.

Acknowledgements

The collective knowledge generated from academic and applied research, summarized in various references has been critical in the creation of this sourcebook which is best viewed as a comprehensive compilation and collection of information prepared by various official agencies which directly or indirectly are involved in amyotrophic lateral sclerosis. All of the Official Patient’s Sourcebooks derive from various agencies and institutions associated with the United States Department of Health and Human Services, and in particular, the Office of the Secretary (OS), the Administration for Children and Families (ACF), the Administration on Aging (AOA), the Agency for Healthcare Research and Quality (AHRQ), the Agency for Toxic Substances and Disease Registry (ATSDR), the Centers for Disease Control and Prevention (CDC), the Food and Drug Administration (FDA), the Healthcare Financing Administration (HCFA), the Health Resources and Services Administration (HRSA), the Indian Health Service (IHS), the institutions of the National Institutes of Health (NIH), the Program Support Center (PSC), and the Substance Abuse and Mental Health Services Administration (SAMHSA). In addition to these sources, information gathered from the National Library of Medicine, the United States Patent Office, the European Union, and their related organizations has been invaluable in the creation of this sourcebook. Some of the work represented was financially supported by the Research and Development Committee at INSEAD. This support is gratefully acknowledged. Finally, special thanks are owed to Tiffany LaRochelle for her excellent editorial support.
CHAPTER 1. THE ESSENTIALS ON AMYOTROPHIC LATERAL SCLEROSIS: GUIDELINES

Overview

Official agencies, as well as federally funded institutions supported by national grants, frequently publish a variety of guidelines on amyotrophic lateral sclerosis. These are typically called “Fact Sheets” or “Guidelines.” They can take the form of a brochure, information kit, pamphlet, or flyer. Often they are only a few pages in length. The great advantage of guidelines over other sources is that they are often written with the patient in mind. Since new guidelines on amyotrophic lateral sclerosis can appear at any moment and be produced by a number of sources, the best approach to finding guidelines is to systematically scan the Internet-based services that post them.

The National Institutes of Health (NIH)\(^5\)

The National Institutes of Health (NIH) is the first place to search for relatively current patient guidelines and fact sheets on amyotrophic lateral sclerosis. Originally founded in 1887, the NIH is one of the world’s foremost medical research centers and the federal focal point for medical research in the United States. At any given time, the NIH supports some 35,000 research grants at universities, medical schools, and other research and training institutions, both nationally and internationally. The rosters of those who have conducted research or who have received NIH support over the years include the world’s most illustrious scientists and physicians. Among them are 97 scientists who have won the Nobel Prize for achievement in medicine.

\(^5\) Adapted from the NIH: http://www.nih.gov/about/NIHoverview.html.
Although the sequence of emerging symptoms and the rate of disease progression vary from person to person, eventually patients will not be able to stand or walk, get in or out of bed on their own, or use their hands and arms. Difficulty swallowing and chewing impair the patient’s ability to eat normally and increase the risk of choking. Maintaining weight will then become a problem. Because the disease usually does not affect cognitive abilities, patients are aware of their progressive loss of function and may become anxious and depressed. Health care professionals need to explain the course of the disease and describe available treatment options so that patients can make informed decisions in advance. In later stages of the disease, patients have difficulty breathing as the muscles of the respiratory system weaken. Patients eventually lose the ability to breathe on their own and must depend on ventilatory support for survival. Patients also face an increased risk of pneumonia during later stages of ALS.

**How Is ALS Diagnosed?**

No one test can provide a definitive diagnosis of ALS although the presence of upper and lower motor neuron signs in a single limb is strongly suggestive. Instead, the diagnosis of ALS is primarily based on the symptoms and signs the physician observes in the patient and a series of tests to rule out other diseases. Physicians obtain the patient’s full medical history and usually conduct a neurologic examination at regular intervals to assess whether symptoms such as muscle weakness, atrophy of muscles, hyperreflexia, and spasticity are getting progressively worse.

Because symptoms of ALS can be similar to those of a wide variety of other, more treatable diseases or disorders, appropriate tests must be conducted to exclude the possibility of other conditions. One of these tests is electromyography (EMG), a special recording technique that detects electrical activity in muscles. Certain EMG findings can support the diagnosis of ALS. Another common test measures nerve conduction velocity (NCV). Specific abnormalities in the NCV results may suggest, for example, that the patient has a form of peripheral neuropathy (damage to peripheral nerves) or myopathy (muscle disease) rather than ALS. The physician may order magnetic resonance imaging (MRI), a noninvasive procedure that uses a magnetic field and radio waves to take detailed images of the brain and spinal cord. Although these MRI scans are often normal in patients with ALS, they can reveal evidence of other problems that may be causing the symptoms, such as a spinal cord tumor, a herniated disk in the neck, syringomyelia, or cervical spondylosis.
are no longer able to maintain oxygen and carbon dioxide levels, these devices may be used full-time.

Patients may eventually consider forms of mechanical ventilation (respirators) in which a machine inflates and deflates the lungs. To be effective, this may require a tube that passes from the nose or mouth to the windpipe (trachea) and for long-term use, an operation such as a tracheostomy, in which a plastic breathing tube is inserted directly in the patient’s windpipe through an opening in the neck. Patients and their families should consider several factors when deciding whether and when to use one of these options. Ventilation devices differ in their effect on the patient’s quality of life and in cost. Although ventilation support can ease problems with breathing and prolong survival, it does not affect the progression of ALS. Patients need to be fully informed about these considerations and the long-term effects of life without movement before they make decisions about ventilation support.

Social workers and home care and hospice nurses help patients, families, and caregivers with the medical, emotional, and financial challenges of coping with ALS, particularly during the final stages of the disease. Social workers provide support such as assistance in obtaining financial aid, arranging durable power of attorney, preparing a living will, and finding support groups for patients and caregivers. Home care nurses are available not only to provide medical care but also to teach caregivers about tasks such as maintaining respirators, giving tube feedings, and moving patients to avoid painful skin problems and contractures. Home hospice nurses work in consultation with physicians to ensure proper medication, pain control, and other care affecting the quality of life of patients who wish to remain at home. The home hospice team can also counsel patients and caregivers about end-of-life issues.

What Research Is Being Done?

The National Institute of Neurological Disorders and Stroke, part of the National Institutes of Health, is the Federal Government’s leading supporter of biomedical research on ALS. The goals of this research are to find the cause or causes of ALS, understand the mechanisms involved in the progression of the disease, and develop effective treatment.

Scientists are seeking to understand the mechanisms that trigger selective motor neurons to degenerate in ALS and to find effective approaches to halt
Topic Pages: MEDLINEplus

For patients wishing to go beyond guidelines published by specific Institutes of the NIH, the National Library of Medicine has created a vast and patient-oriented healthcare information portal called MEDLINEplus. Within this Internet-based system are “health topic pages.” You can think of a health topic page as a guide to patient guides. To access this system, log on to http://www.nlm.nih.gov/medlineplus/healthtopics.html. From there you can either search using the alphabetical index or browse by broad topic areas. Recently, MEDLINEplus listed the following as being relevant to amyotrophic lateral sclerosis:

- Guides on Amyotrophic Lateral Sclerosis
  
  **Amyotrophic Lateral Sclerosis**

  **Amyotrophic Lateral Sclerosis**

- Other Guides
  
  **Alcohol Consumption**

  **Charcot-Marie-Tooth Disease**

  **Degenerative Nerve Diseases**

  **Neuromuscular Disorders**

  **Spinal Cord Diseases**
Reasons for Living with ALS
Source: ALS Association
http://www.alsa.org/als/living.cfm

- Specific Conditions/Aspects
  
  Ask the Experts: Amyotrophic Lateral Sclerosis (ALS) - Diagnosis, Symptoms and Treatments
  Source: Muscular Dystrophy Association
  http://www.mdausa.org/experts/ask_als.html

  Frequently Asked Questions (FAQ) About the ALS/Virus Connection
  Source: Muscular Dystrophy Association
  http://www.mdausa.org/research/alsvirusfaq.html

  Understanding ALS: Genetic Testing for ALS
  Source: ALS Association
  http://www.alsa.org/als/gentest.cfm

- From the National Institutes of Health
  
  Amyotrophic Lateral Sclerosis (ALS)
  Source: National Institute of Neurological Disorders and Stroke

- Journals/Newsletters
  
  ALS Newsletter
  Source: Muscular Dystrophy Association
  http://www.mdausa.org/publications/als/index.html

- Latest News
  
  Study Identifies Gene That Prevents Nerve Cell Death
  Source: 10/25/2002, National Institute of Neurological Disorders and Stroke
  http://www.ninds.nih.gov/news_and_events/news_article_nerve_cell.htm
Cervical: Pertaining to the neck, or to the neck of any organ or structure. [EU]

Chronic: Persisting over a long period of time. [EU]

Conduction: The transfer of sound waves, heat, nervous impulses, or electricity. [EU]

Contracture: A condition of fixed high resistance to passive stretch of a muscle, resulting from fibrosis of the tissues supporting the muscles or the joints, or from disorders of the muscle fibres. [EU]

Diaphragm: The musculofibrous partition that separates the thoracic cavity from the abdominal cavity. Contraction of the diaphragm increases the volume of the thoracic cavity aiding inspiration. [NIH]

Dysarthria: Imperfect articulation of speech due to disturbances of muscular control which result from damage to the central or peripheral nervous system. [EU]

Dysphagia: Difficulty in swallowing. [EU]

Dystonia: Disordered tonicity of muscle. [EU]

Dystrophy: Any disorder arising from defective or faulty nutrition, especially the muscular dystrophies. [EU]

Electromyography: Recording of the changes in electric potential of muscle by means of surface or needle electrodes. [NIH]

Enzyme: A protein molecule that catalyses chemical reactions of other substances without itself being destroyed or altered upon completion of the reaction. Enzymes are classified according to the recommendations of the Nomenclature Committee of the International Union of Biochemistry. Each enzyme is assigned a recommended name and an Enzyme Commission (EC) number. They are divided into six main groups; oxidoreductases, transferases, hydrolases, lyases, isomerases, and ligases. [EU]

Epidemic: Occurring suddenly in numbers clearly in excess of normal expectancy; said especially of infectious diseases but applied also to any disease, injury, or other health-related event occurring in such outbreaks. [EU]

Fasciculation: A small local contraction of muscles, visible through the skin, representing a spontaneous discharge of a number of fibres innervated by a single motor nerve filament. [EU]

Hyperreflexia: Exaggeration of reflexes. [EU]

Intermittent: Occurring at separated intervals; having periods of cessation of activity. [EU]

Lobe: A more or less well-defined portion of any organ, especially of the brain, lungs, and glands. Lobes are demarcated by fissures, sulci, connective tissue, and by their shape. [EU]

Myopathy: Any disease of a muscle. [EU]
influence your well-being. This is true for both minor conditions and serious illnesses. For example, a study on female breast cancer survivors revealed that women who participated in support groups lived longer and experienced better quality of life when compared with women who did not participate. In the support group, women learned coping skills and had the opportunity to share their feelings with other women in the same situation.

In addition to associations or groups that your doctor might recommend, we suggest that you consider the following list (if there is a fee for an association, you may want to check with your insurance provider to find out if the cost will be covered):

- **Amyotrophic Lateral Sclerosis Association**
  
  Address: Amyotrophic Lateral Sclerosis Association; 27001 Agoura Road, Suite 150; Calabasas Hills, CA 91301-5104
  
  Telephone: (818) 880-9007; Toll-free: (800) 782-4747
  
  Fax: (818) 880-9006
  
  Email: alsinfo@alsa-national.org
  
  Web Site: http://www.alsa.org

  Background: The Amyotrophic Lateral Sclerosis Association (ALSA) is a national not-for-profit voluntary health organization dedicated to the fight against Amyotrophic Lateral Sclerosis (ALS). Amyotrophic Lateral Sclerosis, also known as 'Lou Gehrig's Disease,' is a rapidly progressive motoneuromuscular disease characterized by degeneration of the motor neurons responsible for transmitting electrical impulses from the brain to the voluntary muscles throughout the body. ALSA consists of a growing network of over 135 local volunteer chapters and support groups across the United States. The Association seeks to encourage, identify, fund, and monitor cutting-edge research into the cause, prevention, and possible cure of ALS. The organization also offers support on how to cope with the disease, provides referrals, and serves as the national information resource on ALS for medical professionals, affected individuals, and family members. The Information Center provides basic information about ALS and answers specific questions about the disease. ALSA also makes referrals to physicians, clinics, extended care facilities, home health agencies, visiting nurse agencies, transportation assistance, and medical equipment supplies. In addition, ALSA has a patient registry of individuals with the disease and distributes information on the latest research and clinical trials regarding ALS.

  Relevant area(s) of interest: Amyotrophic Lateral Sclerosis, Lou Gehrig's Disease, Motor Neuron Disease, Primary Lateral Sclerosis
The Combined Health Information Database

Another comprehensive source of information on healthcare associations is the Combined Health Information Database. Using the “Detailed Search” option, you will need to limit your search to “Organizations” and “amyotrophic lateral sclerosis”. Type the following hyperlink into your Web browser: http://chid.nih.gov/detail/detail.html. To find associations, use the drop boxes at the bottom of the search page where “You may refine your search by.” For publication date, select “All Years.” Then, select your preferred language and the format option “Organization Resource Sheet.” By making these selections and typing in “amyotrophic lateral sclerosis” (or synonyms) into the “For these words:” box, you will only receive results on organizations dealing with amyotrophic lateral sclerosis. You should check back periodically with this database since it is updated every 3 months.

The National Organization for Rare Disorders, Inc.

The National Organization for Rare Disorders, Inc. has prepared a Web site that provides, at no charge, lists of associations organized by specific diseases. You can access this database at the following Web site: http://www.rarediseases.org/search/orgsearch.html. Select the option called “Organizational Database (ODB)” and type “amyotrophic lateral sclerosis” (or a synonym) in the search box.

Online Support Groups

In addition to support groups, commercial Internet service providers offer forums and chat rooms for people with different illnesses and conditions. WebMD®, for example, offers such a service at their Web site: http://boards.webmd.com/roundtable. These online self-help communities can help you connect with a network of people whose concerns are similar to yours. Online support groups are places where people can talk informally. If you read about a novel approach, consult with your doctor or other healthcare providers, as the treatments or discoveries you hear about may not be scientifically proven to be safe and effective.

Finding a Neurologist

The American Academy of Neurology allows you to search for member neurologists by name or location. To use this service, go to http://www.aan.com/, select “Find a Neurologist” from the toolbar. Enter your search criteria, and click “Search.” To find out more information on a particular neurologist, click on the physician’s name.

If the previous sources did not meet your needs, you may want to log on to the Web site of the National Organization for Rare Disorders (NORD) at http://www.rarediseases.org/. NORD maintains a database of doctors with expertise in various rare diseases. The Metabolic Information Network (MIN), 800-945-2188, also maintains a database of physicians with expertise in various metabolic diseases.

Selecting Your Doctor

When you have compiled a list of prospective doctors, call each of their offices. First, ask if the doctor accepts your health insurance plan and if he or she is taking new patients. If the doctor is not covered by your plan, ask yourself if you are prepared to pay the extra costs. The next step is to schedule a visit with your chosen physician. During the first visit you will have the opportunity to evaluate your doctor and to find out if you feel comfortable with him or her. Ask yourself, did the doctor:

- Give me a chance to ask questions about amyotrophic lateral sclerosis?
- Really listen to my questions?
- Answer in terms I understood?
- Show respect for me?
- Ask me questions?
- Make me feel comfortable?
- Address the health problem(s) I came with?

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12 This section has been adapted from the AHRQ: www.ahrq.gov/consumer/qntascii/qntdr.htm.
treatment.” This treatment, like a placebo, has no effect on amyotrophic lateral sclerosis and does not harm patients.

Researchers assign patients “randomly” to the treatment or control group. This is like flipping a coin to decide which patients are in each group. If you choose to participate in a clinical trial, you will not know which group you will be appointed to. The chance of any patient getting the new treatment is about 50 percent. You cannot request to receive the new treatment instead of the placebo or sham treatment. Often, you will not know until the study is over whether you have been in the treatment group or the control group. This is called a “masked” study. In some trials, neither doctors nor patients know who is getting which treatment. This is called a “double masked” study. These types of trials help to ensure that the perceptions of the patients or doctors will not affect the study results.

Natural History Studies

Unlike clinical trials in which patient volunteers may receive new treatments, natural history studies provide important information to researchers on how amyotrophic lateral sclerosis develops over time. A natural history study follows a patient volunteer to see how factors such as age, sex, race, or family history might make some people more or less at risk for amyotrophic lateral sclerosis. A natural history study may also tell researchers if diet, lifestyle, or occupation affects how a disease or disorder develops and progresses. Results from these studies provide information that helps answer questions such as: How fast will a disease or disorder usually progress? How bad will the condition become? Will treatment be needed?

What Is Expected of Patients in a Clinical Trial?

Not everyone can take part in a clinical trial for a specific disease or disorder. Each study enrolls patients with certain features or eligibility criteria. These criteria may include the type and stage of disease or disorder, as well as, the age and previous treatment history of the patient. You or your doctor can contact the sponsoring organization to find out more about specific clinical trials and their eligibility criteria. If you are interested in joining a clinical trial, your doctor must contact one of the trial’s investigators and provide details about your diagnosis and medical history.
Is there a higher than expected occurrence of ALS among deployed veterans as compared to non-deployed Gulf War veterans?

Condition(s): Amyotrophic Lateral Sclerosis

Study Status: This study is no longer recruiting patients.

Sponsor(s): Department of Veterans Affairs; Department of Veterans Affairs Cooperative Studies Program; Department of Defense; Centers for Disease Control and Prevention; Department of Health and Human Services; ALS Association

Purpose - Excerpt: Recently, concern has arisen regarding a possible elevated occurrence of ALS among veterans who served in the Persian Gulf during Operations Desert Shield (August 2, 1990 - January 15, 1991), Desert Storm (January 16, 1991 - February 28, 1991) and Clean-up (March 1, 1991 - July 31, 1991). This study involves an epidemiologic investigation into the occurrence of ALS among veterans of the Gulf War. This study will further define the epidemiology of this neurological disease among younger individuals while determining whether there is a higher than expected occurrence. It will also ascertain the etiologic importance of deployment to the Persian Gulf and exposure to specific environmental factors in that geographic area. VA is leading this joint federal government epidemiologic study that also involves DoD, HHS, CDC, and academic centers of excellence in neurology, with advice from the ALS Association.

Study Type: Observational

Contact(s): North Carolina; VAMC - DURHAM, NC, Durham, North Carolina, 27705, United States

Web Site: http://clinicaltrials.gov/ct/gui/show/NCT00007722;jsessionid=4E5EFD2BA86E06D032EA585C0089E4B1

A Multi-Center Phase III Trial of Minocycline in Amyotrophic Lateral Sclerosis

Condition(s): Amyotrophic Lateral Sclerosis

Study Status: This study is not yet open for patient recruitment.
Benefits and Risks\textsuperscript{17}

What Are the Benefits of Participating in a Clinical Trial?

If you are interested in a clinical trial, it is important to realize that your participation can bring many benefits to you and society at large:

- A new treatment could be more effective than the current treatment for amyotrophic lateral sclerosis. Although only half of the participants in a clinical trial receive the experimental treatment, if the new treatment is proved to be more effective and safer than the current treatment, then those patients who did not receive the new treatment during the clinical trial may be among the first to benefit from it when the study is over.
- If the treatment is effective, then it may improve health or prevent diseases or disorders.
- Clinical trial patients receive the highest quality of medical care. Experts watch them closely during the study and may continue to follow them after the study is over.
- People who take part in trials contribute to scientific discoveries that may help other people with amyotrophic lateral sclerosis. In cases where certain diseases or disorders run in families, your participation may lead to better care or prevention for your family members.

The Informed Consent

Once you agree to take part in a clinical trial, you will be asked to sign an “informed consent.” This document explains a clinical trial’s risks and benefits, the researcher’s expectations of you, and your rights as a patient.

What Are the Risks?

Clinical trials may involve risks as well as benefits. Whether or not a new treatment will work cannot be known ahead of time. There is always a chance that a new treatment may not work better than a standard treatment. There is also the possibility that it may be harmful. The treatment you receive may cause side effects that are serious enough to require medical attention.

\textsuperscript{17} This section has been adapted from ClinicalTrials.gov, a service of the National Institutes of Health: http://www.clinicaltrials.gov/ct/gui/c/a1r/info/whatis?JServSessionIdzone_ct=9jmun6f291.
stimulation of the muscle. Myotonia is a characteristic feature of myotonic disorders. [NIH]

**Neurophysiology:** The scientific discipline concerned with the physiology of the nervous system. [NIH]

**Paraplegia:** Paralysis of the legs and lower part of the body. [EU]

**Psychomotor:** Pertaining to motor effects of cerebral or psychic activity. [EU]

**Quinidine:** An optical isomer of quinine, extracted from the bark of the Cinchona tree and similar plant species. This alkaloid dampens the excitability of cardiac and skeletal muscles by blocking sodium and potassium currents across cellular membranes. It prolongs cellular action potential, and decreases automaticity. Quinidine also blocks muscarinic and alpha-adrenergic neurotransmission. [NIH]

**Solvent:** 1. Dissolving; effecting a solution. 2. A liquid that dissolves or that is capable of dissolving; the component of a solution that is present in greater amount. [EU]

**Toxicity:** The quality of being poisonous, especially the degree of virulence of a toxic microbe or of a poison. [EU]
Studies 75
to communication problems that manifest as dysarthria, apraxia, or aphasia. After defining and describing these three communication disorders, the author suggests strategies for improved communication. One sidebar explains the use of voice amplifiers. 5 references.

- **Treatment Efficacy: Dysarthria**


  Summary: This article discusses treatment efficacy issues in speech language therapy for dysarthria. The author first defines dysarthria and then reviews the disorders of Parkinson's disease, stroke, traumatic brain injury, amyotrophic lateral sclerosis, and cerebral palsy. These disorders represent important clinical diagnoses in which dysarthria is a frequent and debilitating symptom. The roles played by speech-language pathologists include participation in differential diagnosis, provision of speech treatment, staging of treatment, and timely education so that clients and families can make informed decisions about communication alternatives. The author presents both scientific and clinical evidence that suggests that individuals with dysarthria benefit from the services of speech language pathologists. Group treatment studies, single-subject studies, and case reports illustrate the effectiveness of various types of speech treatment. Research into the effectiveness of augmentative and alternative communication systems for individuals with cerebral palsy is also presented. 2 tables. 116 references. (AA-M).

- **Electrical Occupations and Neurodegenerative Disease: Analysis of U.S. Mortality Data**


  Summary: Previous investigations suggest that occupations involving electrical and magnetic field exposure may be associated with a variety of health problems including neurological disease. The authors conducted a case-control study of males using U.S. death certificates with occupational coding to compare 256 cases of Alzheimer's disease (AD), 168 cases of Parkinson's disease (PD), and 114 cases of amyotrophic lateral sclerosis (ALS; Lou Gehrig's disease). Controls died of causes other than leukemia, brain cancer, and breast cancer. The data showed a modest overall association with electrical occupations. The adjusted odds ratios were 1:2 for AD, 1:1 for PD, and 1:3 for ALS. Some electrical
**Amyotrophic Lateral Sclerosis: Lou Gehrig's Disease**


Contact: American Academy of Family Physicians. 11400 Tomahawk Creek Parkway, Leawood, KS 66211-2672. (800) 274-2237 or (913) 906-6000. E-mail: fp@aafp.org. Website: www.aafp.org.

Summary: This journal article provides health professionals with information on the pathology, epidemiology, etiology, clinical features, diagnosis, and management of amyotrophic lateral sclerosis (ALS). This progressive neuromuscular disease, commonly called Lou Gehrig's disease in memory of the famous baseball player who died of ALS in 1941, is characterized by weakness, muscle wasting, fasciculations, and increased reflexes. Approximately 30,000 Americans currently have the disease. The annual incidence rate is 1 to 2 cases per 100,000 people. The disease is most commonly diagnosed in middle age and affects more men than women. The etiology of the disease is unknown. Current research is focused on abnormalities of neuronal cell metabolism involving glutamate and the role of potential neurotoxins and neurotrophic factors. ALS usually presents with problems in dexterity or gait resulting from muscle weakness. Difficulty in speaking or swallowing is the initial symptom in the bulbar form of the disease. Over a period of months or years, patients who have ALS develop weakness, progressive muscular weakness and other symptoms caused by loss of function in both upper and lower motor neurons. Sphincter control, sensory function, intellectual abilities, and skin integrity are preserved. Patients become completely disabled, often requiring ventilatory support and gastrostomy. Death usually occurs within 5 years of diagnosis and is attributed to respiratory failure or cachexia. Diagnosis of ALS is clinical, and is based on the characteristic signs of progressive weakness, atrophy, fasciculations, and hyperreflexia affecting several regions of the body. The management of ALS is a complex and demanding team effort requiring individualized therapy and continual adaptation of medications and therapies. The only agent currently labeled for the treatment of ALS is riluzole. This drug is believed to decrease glutamate release. Various symptomatic treatments may also be helpful. Spasticity may be relieved by use of baclofen, diazepam, or dantrolene. Physical therapy can help relieve many of the painful symptoms of ALS. Nonsteroidal anti-inflammatory drugs and anticonvulsants may also be helpful. Mechanical suction devices are useful in preventing aspiration of excess saliva. Tricyclic antidepressants are widely used in the treatment of ALS because of their multiple effects. Supportive therapies, including physical, occupational, and speech therapy and nutritional support, also
You can perform targeted searches by various criteria including geography, date, as well as topics related to amyotrophic lateral sclerosis and related conditions.

For most of the studies, the agencies reporting into CRISP provide summaries or abstracts. As opposed to clinical trial research using patients, many federally funded studies use animals or simulated models to explore amyotrophic lateral sclerosis and related conditions. In some cases, therefore, it may be difficult to understand how some basic or fundamental research could eventually translate into medical practice. The following sample is typical of the type of information found when searching the CRISP database for amyotrophic lateral sclerosis:

- **Project Title: 1H MRSI OF AMYOTROPHIC LATERAL SCLEROSIS**

  Principal Investigator & Institution: Weiner, Michael W.; Director, Magnetic Resonance Unit; Northern California Institute Res & Educ for Research and Education; San Francisco, CA 94121

  Timing: Fiscal Year 2001; Project Start 1-SEP-2000; Project End 1-JUL-2003

  Summary: The primary goal of this project is to establish an 1H MRSI measurement of N-acetylaspartate (NAA) as a surrogate marker for quantitative measurement of upper motor neuron (UMN) loss in amyotrophic lateral sclerosis (ALS), and to detect ALS in an early stage of the disease. This proposal uses a newly developed short TE multislice 1H MRSI method with high test retest reproducibility, which samples surface cerebral cortex with minimal lipid contamination and which provides atrophy corrected [NAA], [creatine(Cr)], (choline (Cho)], and [myo-inositol (mi)]. MRI segmentation quantifies the gray and white matter, and cerebrospinal fluid in each MRSI voxel. A pilot study showed significant decreases in NAA (-11.9%), Cre (-10.7%), and Cho (-19.5%) in motor cortex of ALS after 3 months of enrollment in our study. This technique will be used to study the following subject groups in a longitudinal fashion. Clinically definite or probable ALS (n=20) and clinically possible or suspected ALS (n=20) will have MRI/1H MRSI every 3 months. Age and sex matched controls will have one MRI/1H MRSI. Hypotheses: 1) Regional metabolic changes: The greatest neuron loss (assessed from [NAA] loss) in ALS brain occur in the primary motor cortex and the corticospinal tract (CST), 2) NAA as a surrogate marker of UMN function: Neuron loss (assessed from [NAA] loss) in motor cortex and CST of ALS patients correlates with clinical measures of UMN dysfunction, 3) Prediction of course of ALS: The long term time course of motor cortex neuron loss (assessed from (NAA]) in an individual can be predicted from 2-3 measurements in 6-9 months, 4) Early detection of...
pathogenesis of familial amyotrophic lateral sclerosis (FALS) in patients with inherited mutations in Cu/Zn superoxide dismutase (SOD1). Structure/function studies will be accomplished using site-directed mutagenesis and expression of CCS in cells from mice with a germline deletion of the CCS gene. The interaction of CCS and SOD1 in intact, living single cells will be analyzed using blue and green fluorescent fusion proteins and fluorescence resonance energy transfer microscopy. The molecular and cellular mechanisms determining copper trafficking to CCS from cytoplasmic or storage sites will be elucidated by identification and characterization of novel CCS interacting proteins. Finally, the precise role of CCS in the pathogenesis of FALS will be evaluated by examining disease onset and progression in FALS SOD1 transgenic mice bred onto the genetic background of CCS deficiency. Taken together the results of these studies will permit new insights into the mechanisms of intracellular copper homeostasis and may allow for novel nutritional strategies to prevent or ameliorate human disease. The long-range objective of these studies is to define the cellular and molecular determinants of human copper metabolism. Four specific aims are identified: 1. To perform a detailed structural and functional analysis of the copper chaperone for superoxide dismutase (CCS). 2. To define the spatial and temporal interaction of CCS and SOD1 in living cells. 3. To elucidate the mechanisms of intracellular copper trafficking to CCS. 4. To examine the role of CCS in the pathogenesis of neuronal degeneration in familial amyotrophic lateral sclerosis (FALS).

Website: http://commons.cit.nih.gov/crisp3/Crisp_Query.Generate_Screen

- **Project Title: DEPRESSION AND END OF LIFE CARE IN ALS**

Principal Investigator & Institution: Albert, Steven M.; Gertrude H Sergievsky Center; Columbia University Health Sciences OGC; New York, NY 10032

Timing: Fiscal Year 2001; Project Start 30-AUG-2000; Project End 1-JUL-2004

Summary: (Adapted from investigator's abstract) Amyotrophic lateral sclerosis (ALS) is a progressive neurodegenerative disease that results in death, usually from respiratory insufficiency or aspiration, within 3 to 5 years of diagnosis. The disease affects all voluntary motor function except eye movement and sphincter control. In the final 6-9 months of life, patients must choose (either explicitly or by default) palliation or tracheostomy and long-term mechanical ventilation (LTMV). In this 4 year project, we will follow 140 patients diagnosed with definite or probable ALS who face a high likelihood of death within 6-9 months, as
disease. To address the cell specific origin of mutant (m) Cu/Zn superoxide dismutase (SOD1) induced disease, we have generated lines of transgenic mice using glial or neuronal specific promoters which allow expression of MSOD1 restricted to either neuronal or glial population. These lines do not develop motor weakness, raising the possibility that disease expression requires both neuronal and glial dysfunction induced by mSOD1. To test this hypothesis, we will determine whether crossing glial and neuronal restricted transgenic lines expressing mSOD1 will reconstitute the disease process in mice and lead to motor neuron degeneration. We will also use a spinal cord organotypic slice model of motor neuron degeneration to address specific mechanisms underlying interactions in fALS, we will generate chimeric mice from wild type and conventional mSOD1 mice, as well as derive chimera from conventional mSOD1 mice and either glial or neuronal specific mSOD1 transgenic liens. These experiments will determine whether glial/neuronal dysfunction involves cell-cell autonomous processes and ascertain whether the disease can be rescued by normal functioning glia. Although the exact mechanism of mSOD1 toxicity is still unknown, recent evidence has supported a critical role for zinc and copper ions. Because neurons and glia both express a repertoire of genes related to zinc/copper binding including the metallothioneins (MTs), we predict that both cell types will manifest abnormal MT expression patterns. In addition, we hypothesize that targeted deletion of neuronal or glial MT genes will significantly accelerate mSOD1- induced disease. Overall, these experiments will test the hypothesis that both neuronal and astroglial dysfunction is required for manifestation of disease in a transgenic murine model of fALS. These results will provide critical insights into mechanisms underlying human motor neuron disease and have important implications for future therapeutic interventions.

Website: http://commons.cit.nih.gov/crisp3/Crisp_Query.Generate_Screen

E-Journals: PubMed Central

PubMed Central (PMC) is a digital archive of life sciences journal literature developed and managed by the National Center for Biotechnology Information (NCBI) at the U.S. National Library of Medicine (NLM). Access

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19 Adapted from the National Library of Medicine:

20 With PubMed Central, NCBI is taking the lead in preservation and maintenance of open access to electronic literature, just as NLM has done for decades with printed biomedical literature. PubMed Central aims to become a world-class library of the digital age.
offers full text of its journals, PubMed will provide links to that site, as well as to sites offering other related data. User registration, a subscription fee, or some other type of fee may be required to access the full text of articles in some journals.

To generate your own bibliography of studies dealing with amyotrophic lateral sclerosis, simply go to the PubMed Web site at www.ncbi.nlm.nih.gov/pubmed. Type “amyotrophic lateral sclerosis” (or synonyms) into the search box, and click “Go.” The following is the type of output you can expect from PubMed for “amyotrophic lateral sclerosis” (hyperlinks lead to article summaries):

- **Amyotrophic lateral sclerosis associated with pregnancy.**
  Author(s): Tyagi A, Sweeney BJ, Connolly S.
  Source: Neurology India. 2001 December; 49(4): 413-4.

- **Amyotrophic lateral sclerosis in a patient with Wegener's granulomatosis.**
  Author(s): Papaioannides D, Nikolos SM, Anoplidis D, Akritidis N.

- **Amyotrophic lateral sclerosis in Olmsted County, Minnesota, 1925 to 1998.**
  Author(s): Sorenson EJ, Stalker AP, Kurland LT, Windebank AJ.

- **Amyotrophic lateral sclerosis with very slow progression.**
  Author(s): Finsterer J.

a search tool for accessing literature citations and linking to full-text journal articles at Web sites of participating publishers. Publishers that participate in PubMed supply NLM with their citations electronically prior to or at the time of publication.
- Environmental exposure to trace elements and risk of amyotrophic lateral sclerosis: a population-based case-control study.

- Ethical standards for authors, and for the Journal of Amyotrophic Lateral Sclerosis and other motor neuron diseases.
  Author(s): Swash M.

- Euthanasia and physician-assisted suicide among patients with amyotrophic lateral sclerosis in the Netherlands.
  Author(s): Veldink JH, Wokke JH, van der Wal G, Vianney de Jong JM, van den Berg LH.

- Evidence that accumulation of ceramides and cholesterol esters mediates oxidative stress-induced death of motor neurons in amyotrophic lateral sclerosis.
  Author(s): Cutler RG, Pedersen WA, Camandola S, Rothstein JD, Mattson MP.

- Existential issues in palliative care: interviews of patients with amyotrophic lateral sclerosis.
  Author(s): Bolmsjo I.
High frequency of systemic mycoplasmal infections in Gulf War veterans and civilians with Amyotrophic Lateral Sclerosis (ALS).
Author(s): Nicolson GL, Nasralla MY, Haier J, Pomfret J.

hNT neurons delay onset of motor deficits in a model of amyotrophic lateral sclerosis.
Author(s): Willing AE, Garbuzova-Davis S, Saporta S, Milliken M, Cahill DW, Sanberg PR.

Human CCS gene: genomic organization and exclusion as a candidate for amyotrophic lateral sclerosis (ALS).

Human intrathecal transplantation of peripheral blood stem cells in amyotrophic lateral sclerosis.
Author(s): Janson CG, Ramesh TM, During MJ, Leone P, Heywood J.

Hyperphosphorylation of the retinoblastoma gene product and altered subcellular distribution of E2F-1 during Alzheimer's disease and amyotrophic lateral sclerosis.
Author(s): Ranganathan S, Scudiere S, Bowser R.
Vocabulary Builder

**Anxiety:** The unpleasant emotional state consisting of psychophysiological responses to anticipation of unreal or imagined danger, ostensibly resulting from unrecognized intrapsychic conflict. Physiological concomitants include increased heart rate, altered respiration rate, sweating, trembling, weakness, and fatigue; psychological concomitants include feelings of impending danger, powerlessness, apprehension, and tension. [EU]

**Auscultation:** The act of listening for sounds within the body, chiefly for ascertaining the condition of the lungs, heart, pleura, abdomen and other organs, and for the detection of pregnancy. [EU]

**Dislocation:** The displacement of any part, more especially of a bone. Called also luxation. [EU]

**Diverticulum:** A pathological condition manifested as a pouch or sac opening from a tubular or sacular organ. [NIH]

**Emphysema:** A pathological accumulation of air in tissues or organs; applied especially to such a condition of the lungs. [EU]

**Endoscopy:** Visual inspection of any cavity of the body by means of an endoscope. [EU]

**Fibrosis:** The formation of fibrous tissue; fibroid or fibrous degeneration [EU]

**Kinetic:** Pertaining to or producing motion. [EU]

**Laryngoscopy:** Examination, therapy or surgery of the interior of the larynx performed with a specially designed endoscope. [NIH]

**Larynx:** An irregularly shaped, musculocartilaginous tubular structure, lined with mucous membrane, located at the top of the trachea and below the root of the tongue and the hyoid bone. It is the essential sphincter guarding the entrance into the trachea and functioning secondarily as the organ of voice. [NIH]

**Motility:** The ability to move spontaneously. [EU]

**Neuroanatomy:** Study of the anatomy of the nervous system as a specialty or discipline. [NIH]

**Neuropsychopharmacology:** The branch of pharmacology dealing especially with the action of drugs upon various parts of the nervous system. [NIH]
CHAPTER 7. MULTIMEDIA ON AMYOTROPHIC LATERAL SCLEROSIS

Overview

Information on amyotrophic lateral sclerosis can come in a variety of formats. Among multimedia sources, video productions, slides, audiotapes, and computer databases are often available. In this chapter, we show you how to keep current on multimedia sources of information on amyotrophic lateral sclerosis. We start with sources that have been summarized by federal agencies, and then show you how to find bibliographic information cataloged by the National Library of Medicine. If you see an interesting item, visit your local medical library to check on the availability of the title.

Video Recordings

Most diseases do not have a video dedicated to them. If they do, they are often rather technical in nature. An excellent source of multimedia information on amyotrophic lateral sclerosis is the Combined Health Information Database. You will need to limit your search to “video recording” and “amyotrophic lateral sclerosis” using the “Detailed Search” option. Go directly to the following hyperlink: http://chid.nih.gov/detail/detail.html. To find video productions, use the drop boxes at the bottom of the search page where “You may refine your search by.” Select the dates and language you prefer, and the format option “Videorecording (videotape, videocassette, etc.).” By making these selections and typing “amyotrophic lateral sclerosis” (or synonyms) into the “For these words:” box, you will only receive results on video productions. The following is a typical result when searching for video recordings on amyotrophic lateral sclerosis:
• **Augmentative and Alternative Communication Intervention in Individuals with Amyotrophic Lateral Sclerosis**


Contact: Available from National Center for Neurogenic Communication Disorders, University of Arizona. P.O. Box 210071, Tucson, AZ 85721-0071. (520) 621-1472. Fax (520) 621-2226. PRICE: $25.00 plus shipping and handling. Order Number TR-53.

Summary: This videotape program, which is part of the Telerounds videoconference series from the National Center for Neurogenic Communication Disorders at the University of Arizona (funded partly by NIDCD), is the second teleconference in a three part series on augmentative and alternative communication (AAC). The speaker provides the viewer with a brief overview of speech impairments among people who have amyotrophic lateral sclerosis (ALS), focusing on the clinical features and epidemiology of ALS, the stages of speech decline, and the communication intervention needs of people who have ALS. The speaker reviews a staging model of communication intervention for progressive motor speech disorders. In addition, the viewer learns how to stage AAC interventions in response to changes in speech and upper and lower extremity function. Examples of interventions are provided for people who have adequate speech and hand function; people who have adequate speech but poor hand function; people who have poor speech, adequate hand function, and adequate mobility; people who have poor speech, adequate hand function, and poor mobility; people who have poor speech, poor hand function, and good mobility; and people who have poor speech, poor hand function, and poor mobility. Video segments are used to illustrate various AAC interventions. The program concludes by answering questions asked by the host and phoned in by the teleconference audience and by providing information about joining Centernet, the online forum operated by the Center.

• **What is ALS?**


Contact: Available from Amyotrophic Lateral Sclerosis Association (ALSA). 21021 Ventura Boulevard, Number 321, Woodland Hills, CA 91364-2206. (818) 340-7500 or (800) 782-4747; FAX (818) 340-2060. PRICE: $15.00.

Summary: This video program presents general information about amyotrophic lateral sclerosis (ALS). Topics discussed include prevalence...
- **Amyotrophic Lateral Sclerosis 3**

- **Amyotrophic Lateral Sclerosis 4, Juvenile**

- **Amyotrophic Lateral Sclerosis 5**

- **Amyotrophic Lateral Sclerosis with Frontotemporal Dementia**

- **Amyotrophic Lateral Sclerosis with Polyglucosan Bodies**

- **Amyotrophic Lateral Sclerosis, Juvenile, with Dementia**

**Genes and Disease (NCBI - Map)**

The Genes and Disease database is produced by the National Center for Biotechnology Information of the National Library of Medicine at the National Institutes of Health. This Web site categorizes each disorder by the system of the body. Go to [http://www.ncbi.nlm.nih.gov/disease/](http://www.ncbi.nlm.nih.gov/disease/), and browse the system pages to have a full view of important conditions linked to human genes. Since this site is regularly updated, you may wish to re-visit it from time to time. The following systems and associated disorders are addressed:

- **Muscle and Bone**: Movement and growth.
  Examples: Duchenne muscular dystrophy, Ellis-van Creveld syndrome, Marfan syndrome, myotonic dystrophy, spinal muscular atrophy.

- **Nervous System**: Mind and body.
  Examples: Alzheimer disease, Amyotrophic lateral sclerosis, Angelman syndrome, Charcot-Marie-Tooth disease, epilepsy, essential tremor, Fragile X syndrome, Friedreich’s ataxia, Huntington disease, Niemann-Pick disease, Parkinson disease, Prader-Willi syndrome, Rett syndrome,
Spinocerebellar atrophy, Williams syndrome.

- **Signals**: Cellular messages.

**Entrez**

*Entrez* is a search and retrieval system that integrates several linked databases at the National Center for Biotechnology Information (NCBI). These databases include nucleotide sequences, protein sequences, macromolecular structures, whole genomes, and MEDLINE through PubMed. Entrez provides access to the following databases:

- **PubMed**: Biomedical literature (PubMed),

- **Nucleotide Sequence Database (Genbank)**,

- **Protein Sequence Database**,

- **Structure**: Three-dimensional macromolecular structures,

- **Genome**: Complete genome assemblies,

- **PopSet**: Population study data sets,

- **OMIM**: Online Mendelian Inheritance in Man,

- **Taxonomy**: Organisms in GenBank,

- **Books**: Online books,

- **ProbeSet**: Gene Expression Omnibus (GEO),
continually revised and updated to reflect the current state of scientific knowledge. Although GDB has historically focused on gene mapping, its focus will broaden as the Genome Project moves from mapping to sequence, and finally, to functional analysis.

To access the GDB, simply go to the following hyperlink: [http://www.gdb.org/](http://www.gdb.org/). Search “All Biological Data” by “Keyword.” Type “amyotrophic lateral sclerosis” (or synonyms) into the search box, and review the results. If more than one word is used in the search box, then separate each one with the word “and” or “or” (using “or” might be useful when using synonyms). This database is extremely technical as it was created for specialists. The articles are the results which are the most accessible to non-professionals and often listed under the heading “Citations.” The contact names are also accessible to non-professionals.

**Specialized References**

The following books are specialized references written for professionals interested in amyotrophic lateral sclerosis, sorted alphabetically by title, hyperlinks provide rankings, information, and reviews at Amazon.com:


**Vocabulary Builder**

**Audiology:** The study of hearing and hearing impairment. [NIH]

**Cerebellum:** Part of the metencephalon that lies in the posterior cranial fossa behind the brain stem. It is concerned with the coordination of movement. [NIH]


Vocabulary Builder

The following vocabulary builder gives definitions of words used in this chapter that have not been defined in previous chapters:

**Thyrotropin:** A peptide hormone secreted by the anterior pituitary. It promotes the growth of the thyroid gland and stimulates the synthesis of thyroid hormones and the release of thyroxine by the thyroid gland. [NIH]
treats the person to prevent health problems from arising, rather than treating symptoms after problems have occurred.

People use CAM treatments and therapies in a variety of ways. Therapies are used alone (often referred to as alternative), in combination with other alternative therapies, or in addition to conventional treatment (sometimes referred to as complementary). Complementary and alternative medicine, or “integrative medicine,” includes a broad range of healing philosophies, approaches, and therapies. Some approaches are consistent with physiological principles of Western medicine, while others constitute healing systems with non-Western origins. While some therapies are far outside the realm of accepted Western medical theory and practice, others are becoming established in mainstream medicine.

Complementary and alternative therapies are used in an effort to prevent illness, reduce stress, prevent or reduce side effects and symptoms, or control or cure disease. Some commonly used methods of complementary or alternative therapy include mind/body control interventions such as visualization and relaxation, manual healing including acupressure and massage, homeopathy, vitamins or herbal products, and acupuncture.

What Are the Domains of Alternative Medicine?44

The list of CAM practices changes continually. The reason being is that these new practices and therapies are often proved to be safe and effective, and therefore become generally accepted as “mainstream” healthcare practices. Today, CAM practices may be grouped within five major domains: (1) alternative medical systems, (2) mind-body interventions, (3) biologically-based treatments, (4) manipulative and body-based methods, and (5) energy therapies. The individual systems and treatments comprising these categories are too numerous to list in this sourcebook. Thus, only limited examples are provided within each.

Alternative Medical Systems

Alternative medical systems involve complete systems of theory and practice that have evolved independent of, and often prior to, conventional biomedical approaches. Many are traditional systems of medicine that are

44 Adapted from the NCCAM: http://nccam.nih.gov/nccam/fcp/classify/index.html.
Further evidence for corticomotor hyperexcitability in amyotrophic lateral sclerosis.
Author(s): Naka D, Mills KR.

Glutathione peroxidase in amyotrophic lateral sclerosis: the effects of selenium supplementation.
Author(s): Apostolski S, Marinkovic Z, Nikolic A, Blagojevic D, Spasic MB, Michelson AM.

Integrating manual and movement therapy with philosophical counseling for treatment of a patient with amyotrophic lateral sclerosis: a case study that explores the principles of holistic intervention.
Author(s): Cottingham JT, Maitland J.

Lead content of neuromuscular tissue in amyotrophic lateral sclerosis: case report and other considerations.
Author(s): Petkau A, Sawatzky A, Hillier CR, Hoogstraten J.

Marijuana in the management of amyotrophic lateral sclerosis.
Author(s): Carter GT, Rosen BS.
Finding a Local Medical Library

The quickest method to locate medical libraries is to use the Internet-based directory published by the National Network of Libraries of Medicine (NN/LM). This network includes 4626 members and affiliates that provide many services to librarians, health professionals, and the public. To find a library in your area, simply visit http://nnlm.gov/members/adv.html or call 1-800-338-7657.

Medical Libraries Open to the Public

In addition to the NN/LM, the National Library of Medicine (NLM) lists a number of libraries that are generally open to the public and have reference facilities. The following is the NLM’s list plus hyperlinks to each library Web site. These Web pages can provide information on hours of operation and other restrictions. The list below is a small sample of libraries recommended by the National Library of Medicine (sorted alphabetically by name of the U.S. state or Canadian province where the library is located):

- **Alabama**: Health InfoNet of Jefferson County (Jefferson County Library Cooperative, Lister Hill Library of the Health Sciences), http://www.uab.edu/infonet/
- **Arizona**: Samaritan Regional Medical Center: The Learning Center (Samaritan Health System, Phoenix, Arizona), http://www.samaritan.edu/library/bannerlibs.htm
- **California**: Kris Kelly Health Information Center (St. Joseph Health System), http://www.humboldt1.com/~kkhic/index.html
- **California**: Community Health Library of Los Gatos (Community Health Library of Los Gatos), http://www.healthlib.org/orgresources.html
- **California**: Consumer Health Program and Services (CHIPS) (County of Los Angeles Public Library, Los Angeles County Harbor-UCLA Medical Center Library) - Carson, CA, http://www.colapublib.org/services/chips.html
- **California**: Gateway Health Library (Sutter Gould Medical Foundation)
- **California**: Health Library (Stanford University Medical Center), http://www-med.stanford.edu/healthlibrary/

Matching your needs and those of your family members will result in the best possible benefits. Cheapest may not always be best. Your goal is high quality health benefits.

3. Look for quality. The quality of healthcare services varies, but quality can be measured. You should consider the quality of healthcare in deciding among the healthcare plans or options available to you. Not all health plans, doctors, hospitals and other providers give the highest quality care. Fortunately, there is quality information you can use right now to help you compare your healthcare choices. Find out how you can measure quality. Consult the U.S. Department of Health and Human Services publication “Your Guide to Choosing Quality Health Care” on the Internet at www.ahcpr.gov/consumer.

4. Your plan’s summary plan description (SPD) provides a wealth of information. Your health plan administrator can provide you with a copy of your plan’s SPD. It outlines your benefits and your legal rights under the Employee Retirement Income Security Act (ERISA), the federal law that protects your health benefits. It should contain information about the coverage of dependents, what services will require a co-pay, and the circumstances under which your employer can change or terminate a health benefits plan. Save the SPD and all other health plan brochures and documents, along with memos or correspondence from your employer relating to health benefits.

5. Assess your benefit coverage as your family status changes. Marriage, divorce, childbirth or adoption, and the death of a spouse are all life events that may signal a need to change your health benefits. You, your spouse and dependent children may be eligible for a special enrollment period under provisions of the Health Insurance Portability and Accountability Act (HIPAA). Even without life-changing events, the information provided by your employer should tell you how you can change benefits or switch plans, if more than one plan is offered. If your spouse’s employer also offers a health benefits package, consider coordinating both plans for maximum coverage.

6. Changing jobs and other life events can affect your health benefits. Under the Consolidated Omnibus Budget Reconciliation Act (COBRA), you, your covered spouse, and your dependent children may be eligible to purchase extended health coverage under your employer’s plan if you lose your job, change employers, get divorced, or upon occurrence of certain other events. Coverage can range from 18 to 36 months depending on your situation. COBRA applies to most employers with 20 or more workers and
Speech impairment
Web site:

Swelling
Web site:

Ulcers
Web site:

Urinary frequency/urgency, increased
Web site:

Wasting
Web site:

Weakness
Web site:

Diagnostics and Tests for Amyotrophic Lateral Sclerosis

AMP
Web site:

ANA
Web site:

Biopsy
Web site:

Chest X-ray
Web site:
• Surgery and Procedures for Amyotrophic Lateral Sclerosis

Tracheostomy
Web site:

• Background Topics for Amyotrophic Lateral Sclerosis

ALS - support group
Web site:

Aspiration
Web site:

Choking
Web site:

Incidence
Web site:

Lateral
Web site:

Noninvasive
Web site:

Proximal
Web site:

Respiratory
Web site:
Online Dictionary Directories

The following are additional online directories compiled by the National Library of Medicine, including a number of specialized medical dictionaries and glossaries:

- Medical Dictionaries: Medical & Biological (World Health Organization): http://www.who.int/hlt/virtuallibrary/English/diction.htm#Medical
- Patient Education: Glossaries (DMOZ Open Directory Project): http://dmoz.org/Health/Education/Patient_Education/Glossaries/
- Web of Online Dictionaries (Bucknell University): http://www.yourdictionary.com/diction5.html#medicine
**Insulin:** A protein hormone secreted by beta cells of the pancreas. Insulin plays a major role in the regulation of glucose metabolism, generally promoting the cellular utilization of glucose. It is also an important regulator of protein and lipid metabolism. Insulin is used as a drug to control insulin-dependent diabetes mellitus. [NIH]

**Intermittent:** Occurring at separated intervals; having periods of cessation of activity. [EU]

**Intoxication:** Poisoning, the state of being poisoned. [EU]

**Intrathecal:** Within a sheath. [EU]

**Intrinsic:** Situated entirely within or pertaining exclusively to a part. [EU]

**Iodine:** A nonmetallic element of the halogen group that is represented by the atomic symbol I, atomic number 53, and atomic weight of 126.90. It is a nutritionally essential element, especially important in thyroid hormone synthesis. In solution, it has anti-infective properties and is used topically. [NIH]

**Kinetic:** Pertaining to or producing motion. [EU]

**Laryngoscopy:** Examination, therapy or surgery of the interior of the larynx performed with a specially designed endoscope. [NIH]

**Larynx:** An irregularly shaped, muscular, cartilaginous tubular structure, lined with mucous membrane, located at the top of the trachea and below the root of the tongue and the hyoid bone. It is the essential sphincter guarding the entrance into the trachea and functioning secondarily as the organ of voice. [NIH]

**Lesion:** Any pathological or traumatic discontinuity of tissue or loss of function of a part. [EU]

**Levodopa:** The naturally occurring form of dopa and the immediate precursor of dopamine. Unlike dopamine itself, it can be taken orally and crosses the blood-brain barrier. It is rapidly taken up by dopaminergic neurons and converted to dopamine. It is used for the treatment of parkinsonism and is usually given with agents that inhibit its conversion to dopamine outside of the central nervous system. [NIH]

**Levorphanol:** A narcotic analgesic that may be habit-forming. It is nearly as effective orally as by injection. [NIH]

**Lobe:** A more or less well-defined portion of any organ, especially of the brain, lungs, and glands. Lobes are demarcated by fissures, sulci, connective tissue, and by their shape. [EU]

**Lupus:** A form of cutaneous tuberculosis. It is seen predominantly in women and typically involves the nasal, buccal, and conjunctival mucosa. [NIH]

**Lysine:** An essential amino acid. It is often added to animal feed. [NIH]
another by electrical or chemical means); pertaining to synapsis (= pairing off in point-for-point association of homologous chromosomes from the male and female pronuclei during the early prophase of meiosis). [EU]

**Synaptosomes:** Pinched-off nerve endings and their contents of vesicles and cytoplasm together with the attached subsynaptic area of the membrane of the post-synaptic cell. They are largely artificial structures produced by fractionation after selective centrifugation of nervous tissue homogenates. [NIH]

**Thermal:** Pertaining to or characterized by heat. [EU]

**Thermoregulation:** Heat regulation. [EU]

**Thyrotropin:** A peptide hormone secreted by the anterior pituitary. It promotes the growth of the thyroid gland and stimulates the synthesis of thyroid hormones and the release of thyroxine by the thyroid gland. [NIH]

**Thyroxine:** An amino acid of the thyroid gland which exerts a stimulating effect on thyroid metabolism. [NIH]

**Tomography:** The recording of internal body images at a predetermined plane by means of the tomograph; called also body section roentgenography. [EU]

**Torsion:** 1. A type of mechanical stress whereby the external forces (load) twist an object about its axis. 2. In ophthalmology: any rotation of the vertical corneal meridians. [EU]

**Toxic:** Pertaining to, due to, or of the nature of a poison or toxin; manifesting the symptoms of severe infection. [EU]

**Toxicity:** The quality of being poisonous, especially the degree of virulence of a toxic microbe or of a poison. [EU]

**Toxicology:** The science concerned with the detection, chemical composition, and pharmacologic action of toxic substances or poisons and the treatment and prevention of toxic manifestations. [NIH]

**Trachea:** The cartilaginous and membranous tube descending from the larynx and branching into the right and left main bronchi. [NIH]

**Tracheostomy:** Surgical formation of an opening into the trachea through the neck, or the opening so created. [NIH]

**Transgenes:** Genes that are introduced into an organism using gene transfer techniques. [NIH]

**Transplantation:** The grafting of tissues taken from the patient's own body or from another. [EU]

**Tremor:** An involuntary trembling or quivering. [EU]

**Tricyclic:** Containing three fused rings or closed chains in the molecular structure. [EU]
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| Serine           | 85               |
| Serum            | 14, 30, 101, 107, 109, 131, 253 |
| Singultus        | 138              |
| Somatic          | 118, 132, 247, 249 |
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| Species          | 68, 84, 87, 92, 111, 118, 130, 249, 252 |
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