

banning dangerous activities and equipment. Air bags have helped tremendously to eliminate many types of injuries in automobiles, and many lives have been saved. Whiplash, head and neck trauma, and eye injuries have been less serious since air bags have been installed in automobiles. With bicycle riders especially, wearing a helmet is the single most effective safety device available to reduce fatal injury to the brain and disfiguring injury to the face from crashes. The best investment against bicycle, scooter, skateboard, and in-line skate injuries is protective gear.

New technologies and advanced training in sports medicine for health care professionals have greatly advanced complete recovery for unintentional injuries received in competitive sports. Artificial turf, though easier to care for, causes many knee and back injuries from slipping. Biotechnology has made great advances in providing safer equipment for sports participants, more effective imaging technology (such as magnetic resonance imaging, or MRI, and computed tomography, or CT, scanning equipment) for diagnosing all injuries, and physical therapy techniques and equipment to help those who have disabling injuries such as those involving the spinal cord. New materials and designs for limb prostheses are aiding those who have lost limbs to lead normal lives, even in competitive sports. There have been several examples of runners being competitive despite a leg or foot prosthesis. Pharmaceutical research is making advances in medications that can control pain without being addictive, for those with behavior problems and depression resulting from severe head trauma.

For seniors, a simple screening test can accurately identify those who are most likely to fall. Constant review and adjustment of medications by a physician are musts for preventing side effects such as dizziness, drowsiness, or disorientation. Installing grab bars in the shower and around the toilet, installing rails on both sides of the stairs, increasing lighting throughout the home and encouraging its use, and removing tripping hazards have been very effective in preventing falls. Most important for seniors is the encouragement of regular exercise to improve strength and balance.

Measures to prevent poisoning include labeling of household products, elimination of lead from gasoline, use of carbon monoxide detectors, and improved monitoring of exposure to toxic elements within industry and throughout the environment. The telephone number of a poison control center should be posted at home and in the workplace. More than 50 percent of accidental poisonings in 2000 happened in the home and involved such products as aspirin, barbiturates, insecticides, and cosmetics. Awareness, safety, and education are the keys to preventing accidents involving poisons.

Improvements in burn care have resulted in fewer deaths and better infection control. Technological advances in the provision of skin substitutes, improved monitoring techniques, surgical instrumentation, and better understanding of the underlying metabolic changes have all contributed to successful therapy.

—Virginiae Blackmon

**See also** Asphyxiation; Balance disorders; Bleeding; Brain damage; Brain disorders; Bruises; Burns and scalds; Casts and splints; Choking; Coma; Concussion; Critical care; Critical care, pediatric; Death and dying; Drowning; Electrical shock; Emergency medicine; Emergency medicine, pediatric; Emergency rooms; First aid; Food poisoning; Fracture and dislocation; Fracture repair; Frostbite; Hip fracture repair; Hip replacement; Hyperbaric oxygen therapy; Intensive care unit (ICU); Laceration repair; Lead poisoning; Mercury poisoning; Paramedics; Poisoning; Poisonous plants; Prostheses; Radiation sickness; Resuscitation; Safety issues for children; Safety issues for the elderly; Shock; Snakebites; Spinal cord disorders; Sunburn; Unconsciousness; Whiplash; Wounds; Zoonoses.

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textures. Consequently, injuries attributable to a lack of awareness of potential hazards or super sensitivities to temperature or texture may result. One example would be an elderly woman overdressing or under dressing for the weather because of an inability to judge the outside temperature properly. Another would be an elderly man cutting or wounding himself out of a lack of awareness of the sharpness of an object. Finally, both taste and smell may change, creating a situation in which subtle tastes and odors become imperceptible or in which tastes and smells that were once pleasant become either bland or unpleasant.

Health problems among the aged often demand increased management as well. Coordination of drug therapies and other medical interventions by a case manager is critical, as a result of increasing sensitivities in elders to physical interventions. Typical health conditions bringing elderly people into long-term care settings may include heart disease and stroke, hypertension, diabetes mellitus, arthritis, osteoporosis, chronic pain, prostate disease, and cancers of the digestive tract and other vital organs. Estimates are that approximately 86 percent of the aged are affected by chronic illnesses. Long-term care addresses both the medical management of these chronic illnesses and their impact on the individual.

An issue related to health and physical problems in the aged is malnutrition. For a variety of reasons, elders often fall victim to malnutrition, which can contribute to additional health problems. For example, Vitamin D deficiency can increase both the severity of heart disease and the likelihood of osteoporosis and tooth loss. Thus, a vicious cycle of medical problems can be put into motion. Factors contributing to malnutrition are multifaceted. Poverty, social isolation, decreased taste sensitivity, and tooth loss combine with lifelong dietary habits that can sometimes predispose certain elders to malnutrition. As such, attention to the maintenance of healthy dietary habits in the elderly is critical to successful long-term care, regardless of the type of setting in which the care is being given.

Along with these physical aspects of aging come emotional and cognitive changes. Depression, anxiety, and paranoia over health concerns, for example, are not uncommon. Additionally, concerns about the threat of losing one's independence, friends, and former lifestyle may contribute to acute or chronic mood disorders. Suicide is a particular danger with the elderly when mood disorders such as depression are present. Elderly people are one of the fastest growing groups among those who commit suicide. The stresses accompanying losing a spouse or enduring a chronic health problem can often be triggers to suicide for depressed elders. One should note, however, that elders are not particularly prone to depression or suicide be-

cause of their age but that they are more likely to experience significant stressors that lead to depression.

More common, less lethal problems associated with conditions such as depression, anxiety, and paranoia are weight change, insomnia, and other sleep problems. Distractibility, decreased ability to maintain attention and concentration, and rumination over distressing concerns are also common. Finally, some elders may be observed as socially isolated and prone to avoidance behavior. As a result, some become functionally incapacitated because of distressing emotions.

What is critical to remember, in addition to these signs, is that some elders may not describe their problems as emotional at all, even though that is the primary cause of their discomfort. Individual differences in how people express themselves must be taken into account. Thus, while some elders may report being depressed or anxious, others may instead report feeling tired. Reports of low-level health problems that are vague in nature, such as aches and pains, are also common in elders who are depressed. It is not uncommon for emotional problems to be expressed or described indirectly as physical complaints.

Decreased cognitive functioning may result from more serious problems than depression, such as organic mental syndromes. These typically include problems such as dementias from Alzheimer's disease, Pick's disease, Huntington's disease, alcohol-related deterioration, or stroke related problems. Other causes may be brain tumors or thyroid dysfunction. With all dementias, however, the hallmark signs are a deterioration of intellectual function and emotional response. Memory, judgment, understanding, and the experience and control of emotional responses are affected. Functionally, these conditions reveal themselves as a combination of symptoms, including increased forgetfulness, decreased ability to plan and complete tasks, difficulties finding names or words, decreased abilities for abstract thinking, impaired judgment, inappropriate sexual behavior, and sometimes severe personality changes. In some cases, affected individuals are aware of these difficulties, usually in the earlier stages of the disease processes. Later, however, even though their behavior and abilities may be quite disturbed, they may be completely unaware of the severity of their problems. In these cases, long term care often begins as a result of outside intervention by concerned friends and family members.

#### **OPTIONS FOR LONG-TERM CARE**

Extended care for the aged requires an interdisciplinary effort that usually involves a team of nurses, nurse practitioners, physicians, psychologists, social workers, and other rehabilitative specialists. Depending on the nature of the problems requiring care and

courage the unnecessary use of animals when other methods are available.

—Carol A. Holloway;  
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**See also** American Medical Association (AMA); Ethics; Laboratory tests; National Institutes of Health (NIH); Veterinary medicine

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## ANKYLOSING SPONDYLITIS

**Category:** Disease/Disorder

**Also known as:** Ankylosing spondylitis

or hormone imbalance, and often tests on samples of cervical mucus and a portion of the endometrium (lining of the uterus). The primary goal of these initial tests is to determine whether ovulation is occurring. If ovulation is occurring, the problem likely involves an abnormal uterine condition or an endocrine imbalance that is interfering with implantation. Other problems might include some fault with the eggs that are released or with the ability of sperm to penetrate or fuse with the nucleus of the egg.

If the ova (eggs) are abnormal, then donor ova can be collected from another woman, followed by IVF with the male partner's sperm. Often the fault with abnormal ova is with the cytoplasm, so another possible treatment is to remove the nucleus from an abnormal ovum and place it into a donor ovum from which the nucleus has been removed. The resulting ovum would then have a nucleus derived from the mother and a cytoplasm derived from the donor. Although this approach is technically feasible, it has ignited ethical concerns similar to those raised about cloning.

If ovulation is not occurring, which is true in the majority of cases, then additional tests are required. Continued monitoring of hormone levels may identify an imbalance or timing problem that can be corrected with hormone treatments. Sometimes hormone treatments alone are able to normalize ovulation and restore fertility. In other cases, the problem involves a blockage or abnormal shape of the Fallopian tubes or uterus. Diagnostic procedures at this stage typically involve some form of imaging technology so that the condition of the reproductive organs can be assessed.

Hysteroscopy is a procedure for viewing the interior of the uterus; it can be done either in a doctor's office or in an outpatient setting at a hospital. In preparation for the procedure, the woman is usually given a mild analgesic such as acetaminophen or ibuprofen, as some minor cramping is common. The doctor then washes the vagina and cervix. A local anesthetic is administered to the cervix. The cervix is carefully dilated, and the hysteroscope is inserted through the cervix into the uterus. The hysteroscope contains a small light for illuminating the interior of the uterus and a small camera for viewing. Some conditions that can be detected using hysteroscopy include a septum that divides the uterus, fibroid growths or polyps, and cancerous or precancerous lesions. Often, the location where the Fallopian tubes enter the uterus can also be viewed. Many of these conditions can be asymptomatic. Surgical removal of a septum or other growths may restore fertility. If a woman is able to produce an egg to fertilize but is unable to carry the child herself, another option is surrogacy, which then involves legal procedures to establish parentage.

Hysterosalpingography can be used to view both the uterus and the Fallopian tubes. This x-ray procedure uses a contrast dye to visualize internal structures. Placing the dye into the uterus involves insertion of a special flexible catheter through the cervix. A balloon at the end of the catheter is inflated to hold the catheter in place as the contrast dye is pumped into the uterus. X rays are taken every few seconds as the dye travels through the uterus. Eventually, the dye travels the length of the Fallopian tubes. The images obtained can be used to identify many of the anomalies also detectable using hysteroscopy and can also identify problems with the Fallopian tubes. If the Fallopian tubes are blocked, then the dye will not travel their length, which will be visible in the x-ray photographs.

In some cases, none of these minimally invasive diagnostic procedures identifies a problem. In such cases, diagnostic laparoscopy can be used. Using a laparoscope, a flexible tube with a light and special lens at the end, a doctor can view internal organs directly. After administering regional or general anesthesia, an incision is made near the region of the peritoneal cavity to be imaged. Carbon dioxide is used to fill the peritoneal cavity to improve viewing conditions. The laparoscope is then inserted through the incision. If an abnormality is detected, then the doctor may insert another instrument to collect tissue for a biopsy. After laparoscopic examination is completed, the incision is closed. Laparoscopy is usually done in a hospital as an outpatient procedure, and the patient can go home the same day. Even after diagnostic laparoscopy, the cause of infertility may remain unknown.

## USES AND COMPLICATIONS

Assisted reproductive technologies are best suited to couples in which one or the other is infertile but otherwise in good health. Age may also be an important factor for the woman, as fertility, implantation, and normal development of the fetus are all affected as a woman ages, especially beyond thirty-five. Although these technologies can be successful in older women, the risks involved need to be assessed carefully with a doctor. They can also be more costly in older women, because more attempts using IUI and IVF are often required.

Hysteroscopy and hysterosalpingography are the most commonly used procedures for diagnosing infertility, once the more obvious causes have been ruled out. Although both can cause mild to moderate discomfort, they have very few associated risks and can be performed in most obstetrics/gynecology (OB/GYN) offices. If a clear diagnosis is obtained, then a number of problems may require surgery. Blockage, abnormalities of the Fallopian tubes or other reproductive or-

of cancer or other disease is involved, how far the disease has spread, and what other treatments are used. The types of biological therapies that are utilized today are predominately for treating cancer patients. These therapies include monoclonal antibodies, cancer vaccines, growth factors, cancer growth inhibitors, anti-angiogenics, interferons and interleukins, and gene therapy.

Monoclonal antibodies are specific antibodies developed in a laboratory that recognize only a single type of antigen or foreign invader in the body. Antigens are typically found on the surface of various cancer cells, and by producing specific antibodies for these antigens, one can selectively attack cancer cells of interest. A monoclonal antibody can also be programmed to act against cell growth factors, thereby interfering with the growth of cancer cells. Monoclonal antibodies can be developed to react with anticancer drugs or other toxins by attaching to the cancer cell and aiding in the destruction of that cell. Monoclonal antibodies can also be established to carry radioisotopes that, when attached to a cancer cell, will identify that cell and can then be used to identify the specific cancer type. Examples of monoclonal antibodies approved by the Food and Drug Administration (FDA) include rituximab (Rituxan) and trastuzumab (Herceptin). Rituxan is used for the treatment of non-Hodgkin's lymphomas, and Herceptin is used to treat breast cancer that involves an overproduction of the HER2 (ERBB2) gene and protein product.

Vaccines are another type of biological therapy that is widely used to prevent diseases, such as influenza, mumps, measles, and other infectious diseases. Vaccines are defined as substances that are used to help protect individuals from infection or disease. Cancer vaccines are currently being developed and are in use for only a few cancer types, such as human papillomavirus (HPV), which may give rise to cervical cancer, and Bacillus Calmette-Guérin (BCG), which is a vaccine typically used for tuberculosis but is being developed for bladder cancer. The advantage of a vaccine is that it has the ability to trigger an immune response in the body. White blood cells in the body can make antibodies that will recognize the proteins in the vaccine, whether the vaccine is from a virus, bacterium, or cancer cell. The antibodies will then be available to fight those antigens and prevent or decrease the impact of disease.

Growth factors are considered biological therapies because they are natural substances in the body that are used to stimulate the bone marrow to produce blood cells. Growth factors are used in conjunction with other types of cancer treatments, since chemotherapy devastates both the normal and the diseased population of blood cells in a cancer patient as its

means of killing the cancer cells, thus depleting the blood cells needed for health. After chemotherapy is completed, growth factors can be given to a patient to boost blood counts and help fight infection and further disease. Examples of growth factors are filgrastim (Neupogen) and pegylated G-CSF (Neulsta).

Cancer growth inhibitors or blockers are natural substances that can block a growth factor that will otherwise trigger a cancer cell to divide and grow. Growth factors that reside on the surface of cancer cells include epidermal growth factor (EGF) and fibroblast growth factor (FGF), which control cell growth, and platelet-derived growth factor (PDGF), which controls blood vessel development and cell growth. Each of these growth factors has a specific receptor molecule on the cell surface of the cancer cell, such as epidermal growth factor receptor (EGFR). Most cancer cell inhibitors currently used will block the signaling pathway of receptors, such as tyrosine kinase inhibitors and proteasome inhibitors. Examples of tyrosine kinase inhibitors are iminitab (Gleevec), used to treat chronic myeloid leukemia (CML), and bortezomib (Velcade), used to treat melanoma.

Anti-angiogenics are substances that block cancer blood vessel growth. Angiogenesis is the process of growing new blood vessels. Anti-angiogenic drugs are used to stop tumors from growing their own blood vessels. Since cancer cells need a blood supply to continue their growth and division process, blocking blood vessel growth will eventually kill the cancer cell. Anti-angiogenic drugs can block the growth factor from reaching the cell, block the signaling within a cell, or affect the signal between cells. One example of an anti-angiogenic drug is thalidomide, which affects the chemicals that cells use to signal one another. This drug has proven helpful in treating melanoma and other cancers.

Interferons and interleukins are substances that are part of the body's immune response, called cytokines. These cytokines work by interfering with the growth and cell division of cancer cells, by stimulating an immune response and enhancing the ability of killer T cells and other cells to attack and kill cancer cells, and by encouraging the cancer cell to produce chemicals that attract the immune system to them. Interferons and interleukin-2 are used to treat cancers such as melanoma, multiple myeloma, and some types of leukemia.

Gene therapies are currently experimental, but they have potential in the treatment of cancers and other diseases. Genes are made up of strands of deoxyribonucleic acid (DNA), which are coded messages for various functions in the body. Normal cells have a set of genes that are needed for normal growth, development, and maintenance of the body's systems and

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BLEPHAROPLASTY. SEE FACE LIFT AND BLEPHAROPLASTY.

## BLINDNESS

**Category:** Disease/Disorder

**Anatomy or system affected:** Eyes

**Specialties and related fields:** Geriatrics and gerontology, ophthalmology

**Definition:** The absence of vision, or its extreme impairment to the extent that activity is limited; about 95 percent of all blindness is caused by eye diseases, the rest by injuries.

**Key terms:**

*glaucoma*: excessive pressure inside the eye that can damage the optic nerve

*laser*: an intense light beam used in eye surgery

*macular degeneration*: a deterioration of vision in the most sensitive, central region of the retina

*retina*: a paper-thin membrane lining the inside surface of the eyeball, where light is transformed into nerve impulses

*trachoma*: a contagious eye infection primarily found in the developing world

### CAUSES AND SYMPTOMS

The major cause of blindness among older adults in the Western world is glaucoma. The aqueous fluid

produced inside the eye fails to drain properly and causes pressure to build up. In extreme cases, the eyeball becomes hard. Without prompt treatment, the outer layer of the optic nerve starts to deteriorate. The patient can still see straight ahead but not off to the side. When the cone of forward vision has narrowed to less than 20 degrees (called tunnel vision), the patient is considered legally blind.

Cataracts are another common defect of vision among the elderly. The lens of the eye develops dark spots that interfere with light transmission. Cataracts are not caused by an infection or a tumor but instead are a normal part of the aging process, like gray hair. There is no known treatment to retard or reverse the growth of cataracts, though they may be surgically removed.

Macular degeneration and diabetes mellitus can cause blindness as a result of hemorrhages from tiny blood vessels in the retina. The macula is a small region in the middle of the retina where receptor cells are tightly packed together to obtain sharp vision for reading or close work. With aging, blood circulation in the macula gradually deteriorates until the patient develops a black spot in the center of the field of view. Advanced diabetes also causes blood vessel damage in the eye. In serious cases, fluid can leak behind the retina, causing it to become detached. The resulting visual effect resembles a dark curtain that blacks out part of the scene.

Trachoma is a blinding eye disease that afflicts millions of people in poor parts of the world. It is a contagious infection of the eyelid similar to conjunctivitis (commonly known as pinkeye). If untreated, it causes scarring of the cornea and eventual blindness. Trachoma is caused by a virus that is spread by flies, in water, or by direct contact with tears or mucus.

Many kinds of injuries may cause blindness. Car accidents, sports injuries, chemical explosions, battle wounds, and small particles that enter the eye all can result in a serious loss of vision.

### TREATMENT AND THERAPY

An indispensable tool in the treatment of serious eye problems is the laser. Its intense light focused into a tiny spot, the laser's heat can burn away a ruptured blood vessel or weld a detached retina back into place. For glaucoma patients, medication to reduce fluid pressure in the eye may be effective for a while. Eventually, a laser can be used to burn a small hole through the iris in order to improve fluid drainage. The laser can be used only to prevent blindness, however, and not to restore sight.

Cataracts formerly were a major cause of blindness among older people. Once the eye lens starts to become cloudy, nothing can be done to clear it. Cataract