What is meant by consciousness?

Normal conscious behavior requires arousal and awareness. Arousal refers to a person’s level of wakefulness and determines the capacity to detect events in the surrounding environment. Awareness, on the other hand, which by definition requires arousal, reflects a person’s ability to attend to the environment. Thus, consciousness can best be thought of as awareness of surrounding events and response to those events.

Consciousness is dependent on brain functioning, particularly an area called the ascending reticular activating system (ARAS). The reticular activating system is the attention center in the brain and is essential to “turning on” the brain (see Figure 1.0).

Disruption of the ARAS results in loss of consciousness and is believed to be the cause of the loss of consciousness associated with traumatic brain injury. Other brain areas can be associated with impaired consciousness, but the ARAS is always involved.

The reticular activating system is connected at its base to the spinal cord where it receives information projected directly from the ascending sensory tracts. The brain stem reticular formation runs all the way up to the mid brain. As a result, the reticular activating system is a very complex collection of neurons, which serve as a point of convergence for signals from the external world and from interior environment. In other words, it is the part of your brain where the world outside of you, and your thoughts and feelings from “inside” of you, meet. When the reticular activating system fails to activate the cortex, arousal and attention can be disrupted and a disorder of consciousness can result.

Disorders of Consciousness

Perhaps one of the best-recognized and most well defined disorders of consciousness is coma. Coma has been described as a state of “unarousable unresponsiveness.” It is a condition in which there is no evidence of awareness for either the self or the environment. People in coma have an absence of sleep/wake cycles, lack purposeful motor activity, and are unable to be awakened by sensory stimulation, including pain.

The vegetative state (VS) is the least understood and most controversial disorder of consciousness. The term “vegetative” is medical in nature and refers to neurological functions. It is not meant to refer to vegetables that we grow. In general, people in VS have lost their thinking abilities and awareness of their surroundings even though they may appear to be alert, based on eye opening. They are unable to interact with others, sustain purposeful or voluntary responses, or comprehend and use language. What movements do occur are largely confined to reflex withdrawals or posturing. Thus, some VS people may reflexively turn their head or dart their eyes toward a moving object, but will not
Once an individual is stabilized medically, the medical care team focuses on preventing medical complications for those who are still unconscious. This will often include preventing pneumonia and bedsores and providing balanced nutrition. Therapy focuses on enhancing natural brain recovery through stimulation of all of the senses. Physical therapy may be used to prevent permanent muscular contractions and deformities of the bones, joints, and muscles that would limit recovery for those who regain consciousness. Therapists may expose the person to varying levels of pressure and temperature. Efforts are also often made to establish functional communication and environmental interaction when possible.

Some people with alteration in consciousness do not meet the criteria for coma or VS. These people demonstrate signs of consciousness periodically, but not consistently. This condition has recently been defined as **minimally conscious state** (MCS). MCS is often a transition from coma or VS to a more wakeful state. MCS is distinguished from VS by the partial preservation of conscious awareness. Thus, people in MCS are able to demonstrate, even though inconsistently and often incompletely, some level of awareness of their surroundings. People in MCS, at times, may be able to follow simple commands, gesture or verbalize yes/no responses, or produce intelligible verbalizations. They may also exhibit appropriate episodes of crying, smiling, and laughter, and reach, touch, or hold objects. The episodes of responsiveness may be very short and unpredictable.

**Treatment**

Once an individual is stabilized medically, the medical care team focuses on preventing medical complications for those who are still unconscious. This will often include preventing pneumonia and bedsores and providing balanced nutrition. Therapy focuses on enhancing natural brain recovery through stimulation of all of the senses. Physical therapy may be used to prevent permanent muscular contractions and deformities of the bones, joints, and muscles that would limit recovery for those who regain consciousness. Therapists may expose the person to varying levels of pressure and temperature. Efforts are also often made to establish functional communication and environmental interaction when possible.

Although not extensively supported in research, strategies designed to engage individuals with their environment may be a beneficial adjunct to traditional medical treatment. Suggested activities include playing audiotapes of familiar voices, reading literature, exposing the individual to familiar smells, and including the individual as a passive participant in conversations and activities while in his/her presence.

**Prognosis, Outcome & Long-term Care**

Recovery from a disorder of consciousness is often gradual. Unfortunately, some individuals may remain in an unresponsive state until death or achieve only very basic responses. It is impossible to predict which people will regain consciousness. Some guidelines have been established based on research. The longer the person remains in an unresponsive state, the less likely it is that they will achieve consciousness or functional recovery. A coma rarely lasts more than 2 or 4 weeks. When coma persists beyond 4 weeks, there is an increased likelihood that the person will be severely disabled or unresponsive at one year. Similar findings have also been reported in the VS literature. Approximately 30 percent of people who are VS at three months following a traumatic brain injury will recover consciousness by one year. Thirty percent will still be exhibiting VS at one year after injury and the remaining third will have died, usually due to an infection. After six months in VS, the chance of recovery to consciousness declines to 15 percent. For those people in VS, the mortality rate 5 years post-injury is approximately 65%. In people that do emerge, it is likely that they will continue to experience long-term physical, cognitive, and/or psychological difficulties. For people in MCS, the chances of recovery tend to be better. At least one study has found that people in MCS improved more rapidly, showed a longer course of recovery, and had significantly better scores on a test of functional outcome than those in a persistent VS.

People in the midst of coma, VS, or MCS require a high level of care and supervision. It is difficult, but not impossible in some settings, for family members to provide the around-the-clock care that is necessary. In many cases, placement in a long-term treatment program is necessary. Depending on the situation, this could be a subacute care program or a skilled nursing facility. These facilities are able to
monitor medications and physical condition, provide therapy services, and assist in feeding, grooming, and bathing.

Life Support

People with impaired consciousness may be placed on a ventilator and/or feeding tube to assist with breathing and the delivery of proper nutrition. As the name “life support” suggests, these devices are critical in maintaining and prolonging the person’s life. Some families may face the difficult decision to withdraw life support from their loved one. This decision is reached after careful consideration of many factors, including the person’s current physical and cognitive status, prognosis, the person’s expected wishes, religious considerations, and the family’s emotional and financial burdens. In arriving at the decision to withdraw life support, the physician must first determine, with overwhelming probability, that the person’s higher-level brain functioning is no longer present. Second, the person’s opinions regarding life support are taken into account. If the person has indicated in the past that they would or would not desire life-support treatment, courts will typically uphold the person’s desires, if these wishes were “clearly and convincingly” expressed. In practice, most individuals do not have formal documentation of their opinions regarding life support. In those cases, decisions to terminate treatment are then made by family members or guardians acting on behalf of the person. One concern that families often express is that they fear the person will experience pain once the ventilator or feeding tube is removed. For one to feel pain, some level of consciousness must be present, suggesting that those in a coma will not be able to experience the sensation of pain as we know it. In some cases there may be legal challenges to removing life support, such as if there is disagreement among family members. The decision to remove life support obviously deserves careful and prolonged thought on the part of family members, with advice provided by medical professionals as well as religious authorities as appropriate.

About the Authors

- Thomas A. Novack, PhD, is the Director of UAB Traumatic Brain Injury Care System and is a Professor in the UAB Department of Physical Medicine & Rehabilitation, Psychology, UAB School of Medicine.
- Jay Meythaler, JD, MD, is the Director of Brain Injury Services at Spain Rehabilitation Center, UAB Hospital, serves as the Medical Director of the UAB Traumatic Brain Injury Care System and is a Professor in the UAB Department of Physical Medicine & Rehabilitation.
- Katie Fabrizio, MA, is a Psychology Intern, UAB Department of Physical Medicine & Rehabilitation.
- Heather Nissley, MA, is a Psychology Intern, UAB Department of Physical Medicine & Rehabilitation.

References


Online Resources

Coma Recovery Association  
807 Carman Ave.  
Westbury, NY 11590  
http://comarecovery.org  
Tel: (516) 997-1826  
Email: inquiry@comarecovery.org

Brain Trauma Foundation  
523 East 72nd St., 8th Floor  
New York, NY 10021  
http://www.braintrauma.org  
Tel: (212) 772-0608  
Email: info@braintrauma.org

Brain Injury Association  
8201 Greensboro Dr.  
Suite 611  
McLean, VA 22102  
http://www.biausa.org  
Tel: 1-800-444-6443  
Email: FamilyHotline@biausa.org

Family Caregiver Alliance  
690 Market Street  
Suite 600  
San Francisco, CA 94104  
http://www.caregiver.org  
Tel: 1-800-445-8106  
Email: info@caregiver.org

National Rehabilitation Information Center  
4200 Forbes Boulevard  
Suite 202  
Lanham, MD 20706-4829  
http://www.naric.com  
Tel: 1-800-346-2742  
Email: naricinfo@heitechservices.com

Rehabilitation Research Center for TBI & SCI  
Santa Clara Valley Medical Center  
751 South Bascom Avenue  
San Jose, CA 95128  
Tel: (408) 295-9896  
http://www.tbi-sci.org/tbiresource.html  
Email: tbisci@tbi-sci.org

Alabama Head Injury Foundation  
3100 Lorna Road  
Suite 226  
Hoover, AL 35216  
http://www.ahif.org  
Tel: (205) 823-3818 or (800) 433-8002  
Email: info@ahif.org  
*Contact this foundation for information on local support groups

Centers for Disease Control and Prevention  
Public Inquiries/MASO  
Mailstop F07  
1600 Clifton Road  
Atlanta, GA 30333  
Tel: (800) 311-3435  
http://www.cdc.gov/cts.do/sort/date/id/0900f3ec8000dbdc/contentL1/134

This paper is published by the UAB Traumatic Brain Injury Model System, supported by grant #H133A020509 from the National Institute of Disability and Rehabilitation Research, Office of Special Education and Rehabilitative Services, Dept of Education, Washington, DC. Opinions expressed are not necessarily those of the granting agency.

Permission to reprint this newsletter, in part or completely, is granted for educational purposes. Published by the UAB-TBIMS, Birmingham, AL” © 2004 Board of Trustees, University of Alabama.

UAB-TBIMS Project Director: Thomas Novack, PhD  
Editor: Shirley Estill, BS  
Email: tbi@uab.edu  
Visit our web site at www.uab.edu/tbi

UAB-TBI Model System  
Dept of Physical Medicine & Rehabilitation  
619 19th St South, SRC 529  
Birmingham, AL 35249-7330

205-934-3283 Office 205-934-4642 TDD