

Oregon
Traumatic and
Acquired
Brain Injury
Provider Training
Manual

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WELCOME

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Welcome

More than 5.3 million Americans live with a disability as a result of a traumatic brain injury (TBI). Many of these individuals and their families are confronted with inadequate or unavailable TBI services and supports. Passage of the Traumatic Brain Injury Act of 1996 (PL 104-166) signaled a national recognition of the need to improve state TBI service systems. The Act authorized the Health Resources and Services Administration to award grants to states for the purpose of planning and implementing needed health and related service systems change.

This training is a project of the Michigan Department of Community Health's Traumatic Brain Injury Implementation Grant, a funded project of the Health Resources and Services Administration (HRSA Grant # 6 H21 MC 00039-03-01). This training is intended to assist agencies to meet the needs of people with brain injury. It contains resource materials and hands-on tools to assist the state agency staff to better serve individuals with brain injuries and their families.

It is hoped that this manual will serve as a resource.

This document has been updated and modified by the Brain Injury Association of Oregon and includes Oregon information.

For additional resource information and trainings please contact:

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Training Materials

It is important to note that nearly all the materials in this training manual were taken directly from other sources, with the authors' permission. These sources were originally written for other works and for a variety of audiences. Applicable materials are cited as resources throughout this manual. The following are the major sources for the material contained within this document:

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Braunling-McMorrow D, Niemann GW, and Savage RC (eds.), Training Manual for Certified Brain Injury Specialists (CBIS) Level 1. Texas: HDI Publishers, 1998.

Corrigan JD, Relationship between Traumatic Brain Injury and Substance Abuse. Ohio Valley Center, 2003. <http://www.ohiovalley.org/abuse>

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Introduction to Brain Injury

Brain Injury Definitions

A **brain injury** is any injury that results in brain cell death and loss of function.

Traumatic Brain Injury (TBI) is caused by an external trauma to the head or violent movement of the head, such as from a fall, car crash or being shaken. TBI may or may not be combined with loss of consciousness, an open wound or skull fracture.¹

Acquired Brain Injury (ABI) is an injury to the brain that has occurred after birth and includes: TBI, stroke, near suffocation, infections in the brain, etc. (Brain Injury Association of America, 1997)

Significance of Brain Injury

According to the Brain Injury Association of America's web page, the Centers for Disease Control and Prevention (2001) reports:

- 1.5 million Americans sustain a traumatic brain injury every year².
- Each year, 80,000 Americans experience the onset of long-term disability following TBI².
- More than 50,000 people die every year as a result of TBI².
- 5.3 Million Americans (2% of the U.S. population) currently live with disabilities resulting from a brain injury².
- After one brain injury, the risk for a second is three times greater; after the second injury, the risk for a third injury is eight times greater³.

1 Thurman D.J., Sniezek J.E., Johnson D., Greenspan A, Smith S.M. (1994). Guidelines for Surveillance of Central Nervous System Injury, Centers for Disease Control and Prevention.

2 Centers for Disease Control. "Traumatic Brain Injury in the United States: A Report to Congress" (January 16, 2001). <http://www.cdc.gov/ncipc/pub-res/tbicongress.htm>.

3 Annegers JF, Garbow JD, Kurtland LT, et al. The Incidence, Causes and Secular Trends of Head Trauma in Olmstead County, Minnesota 1935-1974. *Neurology*, 1980; 30:912-919

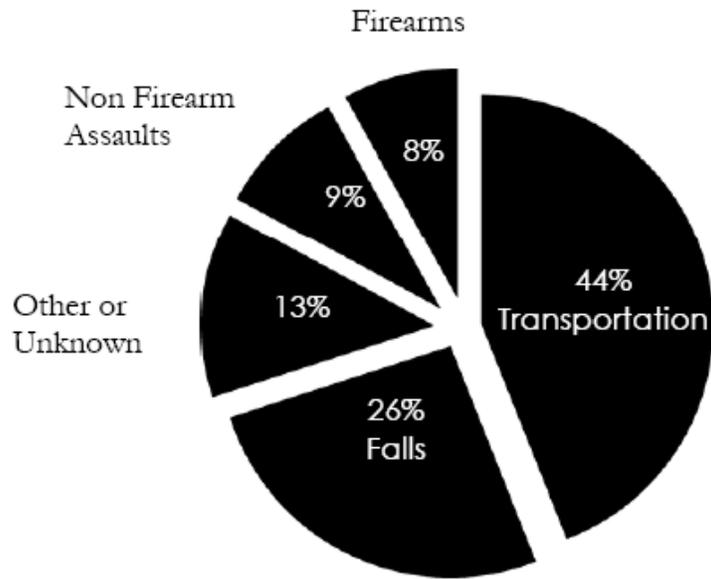
- The risk of TBI is highest among the elderly, adolescents and young adults.⁴
- Males are twice as likely to sustain a brain injury than females.

Percentage of TBI Causes

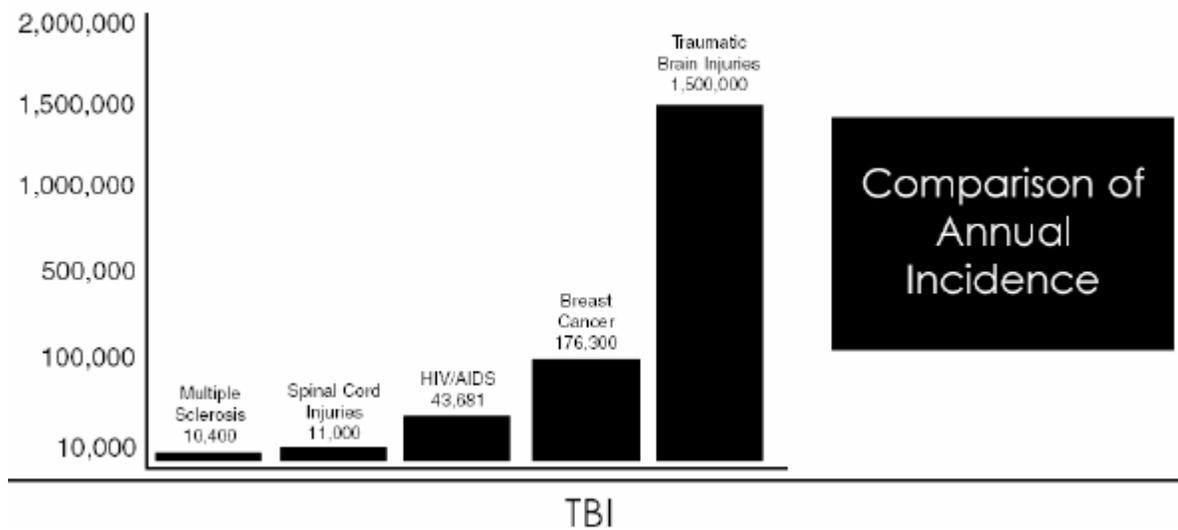
1995-1996 -14 States*

*Rhode Island, New York, Maryland, South Carolina, Minnesota, Louisiana, Nebraska, Oklahoma, Utah, Alaska and California (Sacramento County Only)

Vehicle Crashes are the leading cause of brain injury. Falls are the second leading cause, and the leading cause of brain injury in the elderly.



A Comparison of Traumatic Brain Injury and Leading Injuries or Diseases



⁴ Analysis by the CDC National Center for Injury Prevention and Disease Control, using data obtained from state health departments in Alaska, Arizona, California, Colorado, Louisiana, Maryland, Missouri, New York, Oklahoma, Rhode Island, South Carolina and Utah

Traumatic Brain Injuries in Oregon

An estimated 79,200 Oregon residents currently live with disabilities resulting from traumatic brain injury.⁵ The CDC estimates that each year in Oregon there are 17,100 new traumatic brain injuries each year, 982 TBI cases of long term disabilities, 13,512 TBI-related emergency department visits, 2,886 TBI-related hospitalizations, and 614 TBI-related fatalities⁶.

The CDC estimates that children 0-14 sustain:

- 33 TBI-related fatalities⁷
- 455 TBI-related non-fatal hospitalizations⁸
- 5,343 emergency department visits annually
- And 12,284 TBI's each year.

5 Calculations based on CDC estimates that 2% of the US population is currently living with a disability resulting from a TBI and CDC estimates including 0-14.

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8 Calculations based on CDC estimates that 2% of the US population is currently living with a disability resulting

Brain Injury Severity

A standardized scale is used to evaluate the degree of impairment and to identify the seriousness of injury in relation to outcome. The Glasgow Coma Scale involves three determinants: eye opening, verbal responses and motor responses. Brain injury may be mild (such as from a concussion), moderate or severe. *See Appendix for Glasgow Coma Scale and Rancho Los Amigos Scale.*

It is important to note that the severity is determined at the time of injury and does not always predict long-term outcomes

Mild

Mild brain injury is also known as a concussion. It can be medically defined as any period of loss of consciousness; any loss of memory for events immediately before or after the accident; any alteration in the mental state at the time of the accident (e.g., feeling dazed, disoriented or confused). It generally does not include posttraumatic amnesia greater than 24 hours⁹. Many people do not seek medical assistance because, at the time, they do not believe the injury is severe. Symptoms may not appear until later. “Post concussive syndrome” can include temporary headaches, dizziness, mild mental slowing and fatigue. Symptoms of mild brain injury usually improve over 1-3 months.

75% of all brain injuries are mild

Moderate

A moderate brain injury is one that can be medically defined as a loss of consciousness can last minutes or a few hours and is followed by a few days or weeks of confusion. Persons with moderate TBI may have a longer period of impaired consciousness, more impaired verbal memory shortly after the injury and a lower likelihood of achieving a good recovery within 6 months¹⁰.

Severe

Severe brain injury is medically defined by a loss of consciousness, or coma, for 6 hours or longer, either immediately after the injury or after an intervening period of clarity. Individuals who suffer a severe TBI are at risk for long-term disability. Their behavior can be inhibited, and at times they may disregard social conventions. Some have difficulty remaining employed, maintaining pre-injury relationships and establishing new social contacts¹¹.

⁹Rehabilitation of Persons with Traumatic Brain Injury. Consequences of Traumatic Brain Injury, NIH Report of the Consensus Development Panel. 1998 Oct 26-28: 1-3.

¹⁰ Rehabilitation of Persons with Traumatic Brain Injury. Consequences of Traumatic Brain Injury, NIH Report of the Consensus Development Panel. 1998 Oct 26-28: 3.

¹¹ Rehabilitation of Persons with Traumatic Brain Injury. Consequences of Traumatic Brain Injury, NIH Report of the Consensus Development Panel. 1998 Oct 26-28: 3.

Brain Injury Events:²

Primary Event

Destructive events that occur during the initial phase of injury (i.e., contusion, hemorrhaging, shear injuries).

The skull is hard and inflexible. The brain is rather soft, like firm jello. When the skull makes a rapid movement, it moves as a solid object. The brain, encased inside of the skull, moves at a different rate than the skull because it is soft. Also, different parts of the brain move at different speeds because of their relative lightness or heaviness. The differential movement of the skull and brain when the head is struck results in direct brain injury from two main causes: **axonal shearing** and **contusion (bruising)**.

Axonal Shearing

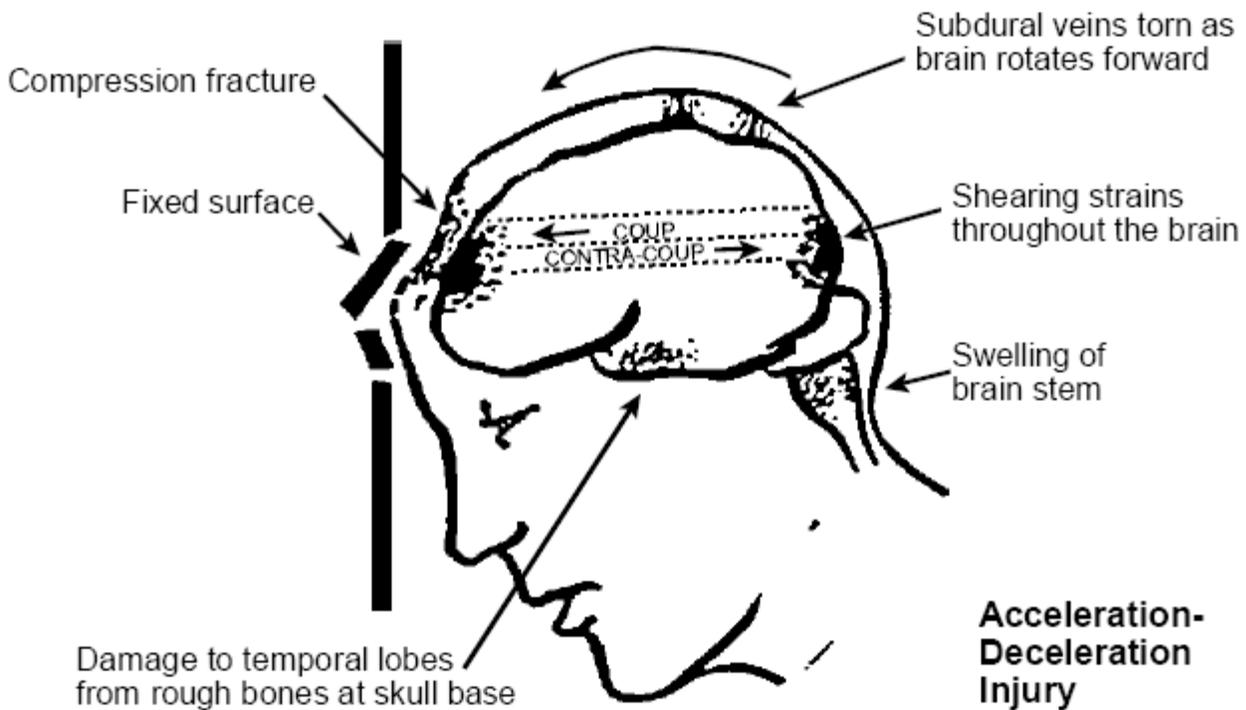
When the brain is slammed back and forth inside the skull after a head trauma, it is alternatively compressed and stretched because of its soft, jello-like structure. The long, fragile axons of the neurons that make up the brain are also compressed and stretched. If the impact is severe enough, axons can be stretched until they are torn. This is called axonal shearing. When this happens, the neuron dies. This is a major cause of brain damage after a traumatic brain injury and cannot be directly treated at this time.

Contusion

The brain's violent slamming against the bones of the skull can also result in contusion, bruising and bleeding from the impact. This results from tearing of small blood vessels. It can result in the death of neurons and is the second leading cause of neuron death after a traumatic brain injury. Small contusions are usually not treated (concussion) if blood flow is interrupted.

¹² Material on pages 6-9 were taken, with permission, from: Braunling-McMorrow D, Niemann GW, and Savage RC (eds.), Training Manual for Certified Brain Injury Specialists (CBIS) Level 1. Texas: HDI Publishers, 1998.

Types of Damage in Closed Head Injury



Coup-Contracoup

After a traumatic brain injury, contusion can occur anywhere in the brain. Often, most of the contusions will be on the underside of the frontal and temporal lobes because of the irregular and rough texture of the bones underlying these parts of the brain. In addition, specific sites of bruising and contusion can occur at the site of the blow to the head (“coup”) and the site directly opposite to where the blow was struck on the head (“contracoup”).

Skull Fracture

Bones of the skull are broken or cracked. Injury severity can range from simple, undisplaced fractures to compound fractures which involve loose bone fragments placing pressure or penetrating injury to the brain.

Damage to the brain may occur at the time of impact, or may develop sometime after the injury (due to swelling or bleeding). When the head is hit with sufficient force, the brain turns and twists on its axis (the brainstem) causing a loss of consciousness. If the injury is severe the area of the brain where the impact occurred may be bruised and damaged. It is because of this twisting and rebounding that people with traumatic brain injury usually receive damage to multiple parts of their brain.

If the person remains unconscious for more than a brief period of time he is considered to be in a coma. When in a coma the person is unable to open his eyes, speak or follow commands.

Secondary Event

Additional insult occurring within the first hours or days post-injury (i.e., squeeze from increasing intracranial pressure, glutamate/nitric oxide cytotoxic effects).

Brain Swelling (Cerebral Edema)

The brain also swells after a severe trauma, just like any other part of the body. This is also a major cause of damage after brain injury. Very severe swelling can cause death by compressing the brain stem. Brain swelling can lead to neuron damage by squeezing the cells or from anoxia caused by disrupting the flow of blood and oxygen to the brain.

Hematomas

If the blood vessels damaged by the impact inside the skull are large enough, they may bleed enough to create a pool of blood or **hematoma**. A hematoma can cause brain injury by directly damaging the neurons it comes in contact with or by squeezing neurons through increased pressure in the brain due to its volume. The treatment for a hematoma is to surgically drain it, if possible.

Increased Intracranial Pressure

Intracranial pressure occurs because of a build up of pressure within the skull. Because the brain, membranes and cerebrospinal fluid are encased with the bones of the skull, the fluid formed as a result of swelling or bleeding “backstop” in the brain causing increased pressure inside the brain which results in further damage to brain tissue.

Hypovolemic Shock

After injury, loss of blood volume further compromises healthy brain tissue.

Anoxia

As previously mentioned, anoxia is a lack of oxygen to the brain and subsequent further damage to brain cells.

Tertiary Event

Late stage events may arise weeks or months post-injury (i.e., seizures, hydrocephalus)

Seizure Disorders

A secondary effect of brain injury can be a **seizure disorder** caused by a specific injury that leads to a disruption in electrical activity of the brain. Seizure disorders can occur at any point after a brain injury (immediately, soon or much later). Seizures are usually treated with anticonvulsant drugs.

Hydrocephalus

The flow of cerebrospinal fluid in the ventricles of the brain can sometimes be blocked or disrupted after a brain injury. When this happens, the fluid constantly being made in the ventricles can accumulate in the brain, causing increased pressure. This problem is called **hydrocephalus**, and it can be a serious secondary effect of a brain injury. Hydrocephalus can be treated by inserting a needle valve into the ventricles to draw off the fluid down a tube into the abdominal cavity. This procedure, called a **ventriculo peritoneal shunt**, reduces pressure inside the brain.

Secondary systemic insults

Secondary systemic insults (outside the brain) that may lead to further damage to the brain are extremely common after brain injuries of all grades of severity, particularly if they are associated with multiple injuries. Thus people with brain injury may have combinations of low blood oxygen, high blood pressure, heart and lung changes, fever, blood coagulation disorders, and other adverse changes at recurrent intervals in the days following brain injury. These occur when the normal regulatory mechanism by which the cerebrovascular vessels can relax to maintain an adequate supply of oxygen and blood during such adverse events is impaired as a result of the original trauma.

Common forms of secondary systemic insults are listed below:

- Hypoxemia (Low blood oxygen)
- Arterial hypotension (high or low blood pressure)
- Hypercarbia (carbon dioxide accumulation)
- Severe hypocarbia (low carbon dioxide)
- Pyrexia (fever)
- Hyponatremia (low sodium)
- Anemia (low iron)
- Abnormal blood coagulation
- Lung changes
- Cardiac (heart) changes
- Nutritional (metabolic) changes

Acquired Brain Injury (ABI)

An injury to the brain that is not hereditary, congenital, or degenerative. These types of injuries to the brain can occur and are not considered “traumatic.” For instance, if someone nearly drowns and loses oxygen to their brain, they may well have the same issues to deal with as someone who has been injured by physical force. However, loss of oxygen (anoxia), is not considered a traumatic brain injury. Non-traumatic injury would also include illnesses such as encephalitis (swelling of the brain), stroke, brain tumors, and high fever.

Acquired Brain Injury Includes:

Stroke

The brain has the most complex system of blood vessels in the body. Weighing only about three pounds, it requires about twenty percent of the blood flow to keep it alive. Only a few minutes without sufficient blood flow can cause irreversible death of neurons. If the blood flow is blocked through a stroke (also called Cerebro-Vascular Accident or CVA), cell death in the area deprived of blood will result. If there is bleeding in or over the brain (Hemorrhage or Hematoma) because of a tear in an artery or vein, loss of blood flow and injury to the brain tissue by the blood will also result in brain damage.

Infections

The brain and surrounding membranes are very prone to infections if the special blood-brain protective system is breached. Viruses and bacteria can cause serious and life-threatening diseases of the brain (encephalitis) and meninges (meningitis) that are very difficult to treat.

Anoxia and Hypoxia

If the blood flow is depleted of oxygen, irreversible brain injury from ANOXIA (no oxygen) or HYPOXIA (reduced oxygen) can result in just a few minutes. Anoxia and hypoxia are often caused by heart attacks, respiratory failure, drops in blood pressure, and a low oxygen environment. This type of brain injury can result in severe cognitive and memory deficits.

Metabolic Disorders

Brain damage due to metabolic disorders can result when harmful chemicals damage the neurons. Such injury can be caused by being exposed to toxins like insecticides and solvents.

Drugs and Alcohol

The pre-injury lifestyle of a person with a brain injury may have included use of drugs and alcohol, either habitually or recreationally. Families are generally unprepared for the negative effects created when drugs and alcohol are consumed after brain injury. Abuse of alcohol and illegal substances frequently occurs post-injury. It can also occur in the life of an individual after they have acquired a brain injury, when it was not present in their pre-injury lifestyle.

Things to remember:

- When alcohol and/or other substances were used prior to the brain injury without appropriate intervention and guidance, the problem is usually exaggerated after the injury.
- Even though abuse was a problem before the brain injury and may even have contributed to the injury, therapeutic intervention involving both the individual and caregivers during rehabilitation enhances management of substances post-injury.
- All treating professionals should discuss the risks associated with the use of alcohol or substances after TBI and its effect on cognitive functioning. In the absence of professional instructions, the individual with brain injury typically assumes that drinking and/or drug use is as harmless as they thought pre-injury.
- It is not uncommon for substance abuse to surface some months or years after injury as an emotional response to depression when life does not return to “normal.” Reestablishing relationships with old friends and the desire to return to pre-injury social settings where substances were used can sabotage rehabilitation goals.

Some suggested strategies for caregivers coping with addiction or pre-addictive behaviors include:

- Don't forbid consumption without risking the “dare me” syndrome. Casually and frequently discuss the hazards of using alcohol/substances and their effect on cognitive functioning.
- Enlist the assistance of a doctor. Information from a medical professional is more meaningful. The doctor should emphasize the danger inherent with the use of drugs and alcohol in conjunction with anti-convulsions and other prescription drugs used by some individuals with brain injury.
- Contact the National Brain Injury Association, the Utah State Brain Injury Association, or your ABI Support Coordinator for articles and other helpful information about brain injury and addictive disorders.
- If there's a need to “fit in” when others are consuming alcohol, try cocktail-sized glasses, or add a twist, cherry, or olive to a non-alcoholic beverage. Many people in bars and restaurants order “virgin” drinks (without alcohol), so it's socially acceptable.
- Take a strong stand. Impress upon the “old gang” that use of alcohol/substances post-injury could be very dangerous and expect their cooperation in helping the person with the brain injury stay healthy and safe.

- When the problem is related to depression, take inventory of what the individual is doing (or not doing) during the day that contributes to their depression. Use your imagination to find something that stimulates and motivates the individual to see the world around them. Busy people have less reliance on “crutches.”
- Once an addiction problem is identified and the individual is willing to get help, get into AA or Narcotics Anonymous (NA). The selection of a sponsor is important and that person needs to be made aware of brain injury and its consequences.
- Addiction is a major public health problem and difficult to control after ABI. Treatment works but requires that lessons learned be reinforced on an ongoing basis.

Alcohol

Alcohol is a central nervous system depressant and acts as a mild anesthetic and tranquilizer. It is toxic in large quantities. When a person drinks alcohol, the alcohol is absorbed by the stomach, enters the bloodstream, and goes to all the tissues. The effects of alcohol are dependent on a variety of factors, including a person's size, weight, age, and sex, as well as the amount of food and alcohol consumed. The dis-inhibiting effect of alcohol is one of the main reasons it is used in so many social situations. Other effects of moderate alcohol intake include dizziness and talkativeness. The immediate effects of a larger amount of alcohol include slurred speech, disturbed sleep, nausea, and vomiting. Alcohol, even at low doses, significantly impairs the judgment and coordination required to drive a car safely. Low to moderate doses of alcohol can also increase the incidence of a variety of aggressive acts, including domestic violence and child abuse. Hangovers are another possible effect after large amounts of alcohol are consumed; a hangover consists of headache, nausea, thirst, dizziness, and fatigue.

Prolonged, heavy use of alcohol can lead to addiction (alcoholism). Sudden cessation of long term, extensive alcohol intake is likely to produce withdrawal symptoms, including severe anxiety, tremors, hallucinations, and convulsions. Long-term effects of consuming large quantities of alcohol, especially when combined with poor nutrition, can lead to permanent damage to vital organs such as the brain and liver. In addition, mothers who drink alcohol during pregnancy may give birth to infants with fetal alcohol syndrome. These infants may suffer from mental retardation and other irreversible physical abnormalities. In addition, research indicates that children of alcoholic parents are at greater risk than other children of becoming alcoholics.

Alcoholism, also known as alcohol dependence, is a disease that includes the following four symptoms:

- Craving--A strong need, or urge, to drink.
- Loss of control--Not being able to stop drinking once drinking has begun.
- Physical dependence--Withdrawal symptoms, such as nausea, sweating, shakiness, and anxiety after stopping drinking.

- Tolerance--The need to drink greater amounts of alcohol to get "high."

Like many other diseases, alcoholism is chronic, meaning that it lasts a person's lifetime; it usually follows a predictable course; and it has symptoms. The risk for developing alcoholism is influenced both by a person's genes and by his or her lifestyle.

Symptoms of alcohol use include:

- slurred speech
- lack of coordination
- decreased attention span
- impaired judgment

Alcohol and other drugs can cause or worsen a wide range of medical problems. For example, alcohol increases the risk of some stomach and heart diseases. Some people get gastritis (inflammation of the stomach lining) or high blood pressure because of drinking too much alcohol.

Drugs

Drug abuse is the use of illicit drugs or the abuse of prescription or over-the-counter drugs for purposes other than those for which they are indicated or in a manner or in quantities other than directed. Drug dependence (addiction) is a compulsive use of a substance despite negative consequences, which can be severe. Drug abuse is simply excessive use of a drug or use of a drug for purposes of which it was not medically intended.

Physical dependence on a substance (needing a drug to function) is not necessary or sufficient to define addiction. There are some substances that don't cause addiction, but do cause physical dependence (for example, some blood pressure medications). Other substances cause addiction but not classic physical dependence (cocaine withdrawal, for example, doesn't have symptoms like vomiting and chills; it is mainly characterized by depression).

Types of Drugs and Consequences of their Use

Stimulants

Stimulants (for example, cocaine, "crack," amphetamines) give a temporary illusion of enhanced power and energy. As the initial elevation of mood fades, however, a depression emerges. Stimulant abuse can lead to serious medical problems:

- Heart attacks—even in young people with healthy hearts
- Seizures
- Strokes
- Violent, erratic, anxious, or paranoid behavior

Marijuana

The most widespread and frequently used illicit drug, marijuana is associated with the following consequences:

- Short-term memory loss
- Accelerated heartbeat
- Increased blood pressure
- Difficulty with concentrating and information processing
- Lapses in judgment
- Problems with perception and motor skills

Heroin

Heroin, which can be smoked, eaten, sniffed, or injected, produces an intense—but fleeting—feeling of pleasure. Serious withdrawal symptoms begin, however, after 4 to 6 hours:

- Chills
- Sweating
- Runny nose and eyes
- Abdominal cramps
- Muscle pains
- Insomnia
- Nausea
- Diarrhea

Hallucinogens

Hallucinogens are drugs such as LSD ("acid") or the new "designer" drugs (for example, "ecstasy") that are taken orally and cause hallucinations and feelings of euphoria. Dangers from LSD include stressful "flashbacks"—re-experiencing the hallucinations despite not having taken the drug again, sometimes even years later. Excessive use of ecstasy, combined with strenuous physical activity, can lead to death from dehydration or an exceptionally high fever.

Inhalants

Inhalants are breathable chemicals—for example, glue, paint thinner, or lighter fluid. They are commonly abused by teenagers because they are easy to obtain and because they produce mind altering effects when "sniffed" or "huffed." These chemicals reach the lungs and bloodstream very quickly and can be deadly. High concentrations of inhalant fumes can cause heart failure or suffocation. Long-term abuse of inhalants can cause permanent damage to the nervous system.

Sedatives

Sedatives are highly effective medications prescribed by physicians to relieve anxiety and to promote sleep. Unfortunately, harmful effects can occur when they are taken in excess of the

prescribed dose or without a physician's supervision, such as when they are obtained illegally. Combining sedatives with alcohol or other drugs greatly increases the likelihood of death by overdose. Women who abuse sedatives during pregnancy may deliver babies with birth defects (for example, cleft palate) who may also be physically dependent on the drugs.

Frequently Used Prescription Drugs for People who have Brain Injuries

Anticonvulsants

Anticonvulsants (i.e., carbamazepine, valproic acid, phenytoin, phenobarbital, tiagabine, lamotrigine, gabapentin, topiramate) act to prevent abnormal firing patterns of neurons. This can occur as a result of direct injury to the cell or due to chemical changes around the cell. These seizures either can be generalized or focal events. Focal seizures may involve sensory, motor or behavioral regions of the brain. One way in which anticonvulsants (i.e., benzodiazepines, barbiturates, valproic acid) may prevent seizures is by increasing the activity of an inhibitory neurotransmitter, GABA. They also may decrease the firing rates by preventing the "snowball" effect of seizure production called kindling (i.e., carbamazepine).

Anticonvulsants can be used not only to prevent seizures, but also to:

- (1) decrease irritability,
- (2) improve frustration tolerance,
- (3) decrease headache and
- (4) stabilize mood swings.

Balance problems also may respond to certain anticonvulsants. Once these anticonvulsant medications are prescribed, follow-up blood testing may be required to ensure that the concentrations of medication in the blood falls within the therapeutic range. This is the level required to inhibit seizures in 95% of persons. These tests also may involve assessment of liver function and blood counts (CBC) to monitor potential toxicity of these agents.

Side effects commonly encountered with these agents include: fatigue (barbiturates, benzodiazepines), dizziness (phenytoin, carbamazepine) and gastrointestinal irritation (valproic acid). Abruptly stopping these medications without medical guidance can result in severe seizures and even death.

Antidepressants

Antidepressants were first developed in the 1940s, and many refinements have occurred in the years since. Types of antidepressants include monoamine oxidase inhibitors (MAOI), tricyclics (TCA), heterocyclics and specific serotonin re-uptake inhibitors (SSRI). Novel antidepressants also have been developed which have combination effects. MAOIs (i.e., phenelzine, tranylcypromine) act by slowing the breakdown of neurotransmitters at the synapse (the junction where neural impulses are transmitted). The agents currently available require strict dietary control to prevent toxic reaction, which will elevate blood pressure to lethal levels.

MAOIs tend to increase energy but may cause insomnia, even at low dosages. Prescription of these agents must be supervised closely to prevent accidental drug-drug interaction (i.e., avoiding meperidine, decongestants, diet pills).

TCAAs (i.e., amitriptyline, imipramine, desipramine, nortriptyline, protriptyline, clomipramine) are related closely to antihistamines and possess many of the same characteristics. They act by decreasing the reabsorption of neurotransmitters into the releasing neuron (“re-uptake inhibition”).

No dietary restrictions are necessary with TCAs. They act to increase two neurotransmitters—serotonin and norepinephrine. Onset of action generally is two to four weeks after treatment is started. This allows the development of certain blood concentrations and then for the agent to cross into the neuron. Periodic assessment of blood level is useful to ensure an effective concentration. Side effects with TCAs largely are caused by their antihistaminic and anticholinergic properties. They tend to be more sedating and commonly induce initial sleep improvement. They also tend to cause dry mouth, delayed urination, sexual dysfunction, constipation and lightheadedness. These side effects also can assist in alleviating some types of posttraumatic dizziness. Some cardiac changes may be evident, including increased heart rate and, rarely, skipped beats. TCAs also may lower the seizure threshold after brain injury. These medications can be used for:

- (1) explosive episodes,
- (2) emotional instability,
- (3) headache relief,
- (4) chronic pain management,
- (5) insomnia,
- (6) post-traumatic stress disorder and
- (7) typical depressive symptoms.

SSRIs (i.e., fluoxetine, fluvoxamine, sertraline, paroxetine, nefazadone, citalopram) are the newest agents in this class. SSRIs prevent the reabsorption of serotonin into the releasing neuron and increase its availability to the next neuron downstream. These powerful medications have a more rapid action onset. Usually, they have no cardiac side effects. Principle side effects relate to nausea, dizziness, fatigue and, occasionally, tremor. SSRIs also may cause sexual dysfunction. Interaction with anticonvulsants also can influence seizure threshold.

Novel antidepressants combine serotonin re-uptake inhibition with norepinephrine re-uptake inhibition (i.e., venlafaxine) or dopamine blockade (i.e., amoxapine). Side effects are similar to other agents. However, amoxapine may cause involuntary movements as can neuroleptics. Bupropion causes re-uptake inhibition of serotonin, norepinephrine and dopamine. It may be associated with overstimulation or seizures.

Anti-anxiety Agents

Anti-anxiety agents (i.e., lorazepam, diazepam, alprazolam) exert their effect by increasing the inhibitory neurotransmitter, GABA. This then slows the firing rates of all neurons in the region. For thousands of years, alcohol has been used to do this as well.

Currently used agents primarily are benzodiazepines, although barbiturates still are prescribed. The effect of these agents is to reduce the individual's awareness of environmental stress and disrupt memory of the events. Buspirone acts to decrease the impact of environmental events on aggression through interference with serotonin activity in the hippocampal/amygdala (memory processing) regions of the brain. Side effects of

GABA-potentiating agents include:

- (1) sedation,
- (2) short-term memory disruption,
- (3) muscle relaxation and
- (4) development of tolerance.

They act to raise the seizure threshold and have some use as secondary anticonvulsants. These agents cannot be stopped without medical supervision as they can result in severe withdrawal delirium, including potentially lethal seizures. The use of ethanol with these agents greatly increases their sedating properties and can result in slowing or stopping breathing. Short-term use is appropriate if closely supervised by a physician.

Neuroleptics

Neuroleptics (i.e., chlorpromazine, haloperidol, thioridazine, risperidone, pimozide) act by blocking the transmission of dopamine-stimulated nerve impulses. They rarely are used for agitation and aggressive behavior, as studies have shown that they may slow the recovery rate after brain injury.

Neuroleptics may be required in severe cases of delusional thinking or hallucinations. Other similar medications are used to decrease nausea and vomiting and enhance the effect of narcotic pain relievers. Side effects include: (1) abnormal involuntary movements,

- (2) weight gain,
- (3) low blood pressure,
- (4) lowered seizure threshold, and
- (5) decreased memory.

Permanent movement disorders can be seen. Newer agents such as clozapine, olanzapine, ziprasidone and quetiapine are less likely to cause movement problems, although lowered production of blood cells can be observed with clozapine.

AntiParkinson Agents

AntiParkinson Agents (i.e., levodopa, amantadine, bromocriptine, pergolide, pramipexole, ropinirole, bntropine) act to increase dopamine activity or decrease cholinergic activity at the synapse. This may be beneficial in certain types of amotivational syndromes and initiation deficits. They are used to increase endurance – both cognitive and physical – and improve swallowing in certain individuals. They also can improve initiation and mood. Side effects include:

- (1) agitation,
- (2) nausea,
- (3) blood pressure changes and
- (4) headache.

High dosages also may induce hallucinations or paranoid delusions.

Psychostimulants

Psychostimulants (i.e., methylphenidate, dextroamphetamine, pemoline) are used to:

- (1) decrease daytime drowsiness,
- (2) increase attention and concentration and
- (3) increase mood temporarily.

They act by increasing the release of already-produced norepinephrine and dopamine from storage areas of the neuron. Their onset of action is within hours, and their duration is usually less than 24-hours (with the exception of Pemoline). Long-term use must be monitored closely by a physician, because of the abuse potential and possible lowering of the seizure threshold. These agents also can trigger paranoid thoughts and insomnia. Modafinil is a new agent that is useful in combating fatigue associated with neurological dysfunction.

Anticholinergic Agents

Anticholinergic Agents (i.e., meclizine, scopolamine) may be used to increase tolerance for certain types of dizziness, increase endurance and relieve insomnia at the beginning of the night. The ability of these agents to lower seizure threshold and to cause dry mouth, constipation and confusion at high doses requires close monitoring.

Antihypertensives

Antihypertensives are used for headache management, aggressive behavior and impulsivity. Beta-blockers (i.e., propranolol, atenolol) were the first of this class to be used successfully. Side effects include lowered heart rate and blood pressure. The agents cannot be used in persons at risk for hypoglycemia, as they mask the physical complaints. Certain medications (i.e., propranolol) also may increase depressive symptoms. Alpha blocking agents (i.e., clonidine) are used to decrease impulsivity and blood pressure. Calcium channel blockers (i.e.,

verapamil) have been used to treat migraine headaches after brain injury. Their primary side effects include light headedness and constipation.

Narcotic Antagonists

Narcotic antagonists (i.e., naltrexone) are a class of medications that block the brain's naturally produced opiates (endorphins) from attaching at receptor sites in the brain. These agents can be used to decrease self-injurious behavior, bulimic symptoms (binging and purging on food) and suicidality. These agents may decrease the craving for alcohol in those individuals with alcoholism. Side effects include potential liver irritation, confusion and headache.

Botox (Botulinum Toxin Type A)

This unique agent that is injected into muscle, prevents the release of chemical transmitters that cause muscles to contract. While other chemicals (i.e., phenol, local anesthetics) have been used to reduce this increased contraction (spasticity), Botox provides symptomatic relief of spasticity within three to seven days of injection. Repeated dosing may be necessary to achieve the desired reduction in tone.

See the National Institutes of Health web site at: <http://www.nlm.nih.gov/medlineplus/druginformation.html> for detailed information on specific medications.

Effects of Food, Alcohol, and Caffeine on Medications

Certain foods, beverages, alcohol, caffeine, and even cigarettes can interact with medicines. This may make them less effective or may cause dangerous side effects or other problems. Drug interactions may make a drug less effective, cause unexpected side effects, or increase the action of a particular drug. Some drug interactions can even be harmful. Read the label every time a Non-prescription or prescription drug is taken. You can reduce the risk of potentially harmful drug interactions and side effects with a little bit of knowledge and common sense.

Drug interactions fall into three broad categories:

- Drug-drug interactions occur when two or more drugs react with each other. This drug-drug interaction may cause you to experience an unexpected side effect. For example, mixing a drug you take to help you sleep (a sedative) and a drug you take for allergies (an antihistamine) can slow your reactions and make driving a car or operating machinery dangerous.
- Drug-food/beverage interactions result from drugs reacting with foods or beverages. For example, mixing alcohol with some drugs may cause you to feel tired or slow your reactions.
- Drug-condition interactions may occur when an existing medical condition makes certain drugs potentially harmful. For example, if you have high blood pressure you could experience an unwanted reaction if you take a nasal decongestant.

General Medication Interactions

Antihistamines (Allegra, Claritin, Benadryl)- It is recommended that prescription antihistamines be taken on an empty stomach to increase their effectiveness. Some antihistamines may increase drowsiness and slow mental and motor performance. Use caution when operating machinery or driving.

Arthritis & Pain Medications (Tylenol)-

For rapid relief, these medications should be taken on an empty stomach because food may slow the body's absorption of acetaminophen. Avoid or limit the use of alcohol because chronic alcohol use can increase your risk of liver damage or stomach bleeding. If you consume three or more alcoholic drinks per day talk to your doctor or pharmacist before taking these medications.

Non-Steroidal Anti-Inflammatory Drugs (Aspirin, Aleve, Ibuprofen)-

Because these medications can irritate the stomach, it is best to take them with food or milk. Avoid or limit the use of alcohol because chronic alcohol use can increase your risk of liver damage or stomach bleeding. If you consume three or more alcoholic drinks per day talk to your doctor or pharmacist before taking these medications. Buffered aspirin or enteric coated aspirin may be preferable to regular aspirin to decrease stomach bleeding.

Narcotic Analgesics (Percoset, Demerol, Vicodin, Tylenol #2, #3, or #4)-

Avoid alcohol because it increases the sedative effects of the medications. Use caution when motor skills are required, including operating machinery and driving.

Anti-Anxiety Drugs (Valium, Xanax)-

Alcohol may impair mental and motor performance (e.g., driving, operating machinery). Caffeine may cause excitability, nervousness, and hyperactivity and lessen the anti-anxiety effects of the drugs.

Anti-Depressants (Paxil, Zoloft, Prozac)-

Although alcohol may not significantly interact with these drugs to affect mental or motor skills, people who are depressed should not drink alcohol. These medications can generally be taken with or without food.

Substance Abuse and Brain Injuries

What is Substance Abuse?

Substance Use is the use of any psychoactive substance.

Substance Abuse, for the purpose of this module, is the problematic use of alcohol and street drugs; it also includes the problematic use of prescribed drugs.

Substance Abuse and Brain Injury often go hand in hand:

- Approximately one-third of (traumatic) Brain Injury survivors have a history of substance abuse prior to their injury.
- Alcohol or other drugs are directly involved in more than one-third of incidents that cause Brain Injury.
- Twenty percent of people who do not have a Substance Abuse problem become vulnerable to Substance Abuse after a Brain Injury.

Relationship between Traumatic Brain Injury and Substance Abuse¹³

Substance abuse is more prevalent among persons with disabilities than society in general;^{14 15 16} yet, research and treatment specific to this segment of the population has been minimal.¹⁷ Among disability groups with unique issues of substance abuse are those individuals who have experienced traumatic brain injury. There has always been acknowledgment of the relationship between intoxication and injury,^{18 19} but only more recently has attention been given to the mediating effects of substance abuse on rehabilitation outcomes following traumatic brain injury.^{20 21} Clinicians and researchers

13 Material on pages 9-11 were taken, with permission, from: Corrigan JD, Relationship between Traumatic Brain Injury and Substance Abuse. Ohio Valley Center, 2003. <http://www.ohiovalley.org/abuse>

14 Moore, D. and L. Polsgrove (1991). "Disabilities, developmental handicaps, and substance misuse: A review." *International Journal of Addictions* 26(1): 65-90.

15 Moore, D. and L. Li (1994). "Substance abuse among applicants for vocational rehabilitation services." *Journal of Rehabilitation* 60(4): 48-53.

16 Center for Substance Abuse Treatment (1998). Substance use disorder treatment for people with physical and cognitive disabilities. Treatment Improvement Protocol (TIP) Series. Washington, DC, U.S. Government Printing Office. Number 29.

17 National Association on Alcohol Drugs and Disability (1998). Access Limited--Substance Abuse Services for People with Disabilities: A National Perspective. San Mateo, CA, NAADD.

18 Jernigan, D. H. (1991). "Alcohol and head trauma: Strategies for prevention." *Journal of Head Trauma Rehabilitation* 6(2): 48-59.

19 Corrigan, J. D. (1995). "Substance abuse as a mediating factor in outcome from traumatic brain injury." *Archives of Physical Medicine and Rehabilitation* 76(4): 302-9.

20 Kreutzer, J., A. Witol, et al. (1996). "Alcohol and drug use among young persons with traumatic brain injury." *Journal of Learning Disabilities* 29(6): 643-51.

21 Corrigan, J. D., J. A. Bogner, et al. (1999). Substance abuse and brain injury. Rehabilitation of the adult and child with traumatic brain injury. M. Rosenthal, E. R. Griffith, J. D. Miller and J. Kreutzer. Philadelphia, PA, F.A. Davis Co. 3rd Edition.

have repeatedly observed that cognitive and emotional impairments caused by brain injury present unique problems when addressing co-existing substance abuse problems.^{22 23}

There is growing evidence that persons with traumatic brain injury and substance abuse problems have significantly worse problems than persons with traumatic brain injury alone. Among patients with the most severe brain injuries, alcohol or other drug consumption declines in the immediate post-injury period; however, people tend to return to pre-injury levels of use by two years post-injury.^{18 24 25} Approximately 20% of persons who abstained or were light drinkers pre-injury, become high volume users after.²² Persons with traumatic brain injury and substance abuse problems are less likely to be working^{26 27 28}, and have lower life satisfaction²⁶.

Persons with traumatic brain injuries face several challenges when seeking treatment from substance abuse providers²¹.

- Cognitive impairments may affect a person's learning style, making participation in didactic training and group interventions more difficult.
- Misinterpretation of memory problems as resistance to treatment can undermine a treatment relationship.
- Damage to the frontal lobes affects executive thinking skills and promotes socially inappropriate behavior.
- Environmental cues may not be perceived, creating consternation for fellow clients and staff.

It is easy to interpret these behaviors as intentionally disruptive, particularly when the individual with a brain injury shows no visible signs of disability²⁹.

22 Langley, M. J. (1991). Preventing post-injury alcohol-related problems: A behavioral approach. *Work Worth Doing: Advances in Brain Injury Rehabilitation*. B. T. McMahon and L. R. Shaw. Orlando, FL, Paul M Deutsch Press, Inc.

23 Center for Substance Abuse Treatment (1998). Substance use disorder treatment for people with physical and cognitive disabilities. Treatment Improvement Protocol (TIP) Series. Washington, DC, U.S. Government Printing Office. Number 29.

24 Corrigan, J. D., E. Rust, et al. (1995). "The nature and extent of substance abuse problems among persons with traumatic brain injuries." *Journal of Head Trauma Rehabilitation* 10(3): 29-45.

25 Corrigan, J. D., K. Smith-Knapp, et al. (1998). "Outcomes in the first 5 years after traumatic brain injury." *Archives of Physical Medicine and Rehabilitation* 79(3): 298-305.

26 Sander, A. M., J. S. Kreutzer, et al. (1996). "A multicenter longitudinal investigation of return to work and community integration following traumatic brain injury." *Journal of Head Trauma Rehabilitation* 11: 70-84.

27 Bogner, J. A., J. D. Corrigan, et al. (1997). "Integrating substance abuse treatment and vocational rehabilitation following traumatic brain injury." *Journal of Head Trauma Rehabilitation* 12(5): 57-71.

28 Corrigan, J. D., J. A. Bogner, et al. (1997). "Systematic bias in outcome studies of persons with traumatic brain injury." *Archives of Physical Medicine and Rehabilitation* 78(2): 132-7.

29 Center for Substance Abuse Treatment (1998). Substance Use Disorder Treatment for People With Physical and Cognitive Disabilities. Treatment Improvement Protocol (TIP) Series. Washington, DC, U.S. Government Printing Office. Number 29.

Why do clients with this co-occurring condition fall through the cracks?

- Providers are trained to identify and treat either Brain Injury or Substance Abuse, not both.
- Clients with this co-occurring condition often lack insight and may not realize the seriousness of the problem.
- Substance Abuse programs may screen out clients identified as having a Brain Injury.
- Symptoms of Brain Injury and Substance Abuse can present in similar ways and may go unidentified.
- The effects of a Brain Injury can be invisible but they may prevent clients from successfully following a Substance Abuse program.
- Clients with Brain Injuries may lack the motivation necessary to begin Substance Abuse programs.

Brain Injury and Substance Use can be a dangerous mix:

- Alcohol and drugs are neurotoxins that negatively affect recovery after a Brain Injury by interfering with the ability of nerve endings to reconnect.
- Alcohol and drugs have a more intense effect after a Brain Injury.
- Substance Abuse can increase cognitive impairment, depression, seizures and disinhibition; and can cause problems with balance, walking and talking.
- Substances interact with prescribed medication.
- Substance Abuse can lead to another Brain Injury.
- Each subsequent Brain Injury requires less force to do more damage.

How Substance Abuse emerges:

As long as client is in hospital or in rehabilitation, Substance Abuse may not be a problem. It can begin or return to previous levels within two years of discharge and can accelerate two to five years after discharge.

Symptoms that may be common to both Brain Injury and Substance Abuse:

- short- term memory loss
- impaired thinking
- difficulty with balance and co-ordination
- impulsivity
- mood disturbances (diminished emotional control)
- personality changes
- diminished judgment
- fatigue
- depression
- sleep problems
- decreased frustration tolerance

Symptoms of Brain Injury that are NOT associated with Substance Abuse:

- problems with learning, attention and memory (inability to focus, concentrate and remain on task; decreased ability to process information or read; decreased comprehension; decreased ability to follow);
- difficulty with problem-solving;
- initiation problems (difficulty getting started, following through, being motivated);
- word-finding difficulty;
- perseveration (repetition of an idea or action);
- disorganization (poor time-management, misplacing items);
- tangential remarks (going off topic);
- sequencing difficulties (inability to do tasks in order or follow steps);
- inappropriate social behavior;
- headaches, dizziness or poor balance;
- disorientation (becoming lost or having trouble locating addresses, remembering landmarks);
- lack of insight (inability to recognize one's own deficits; inability to appreciate the consequences of own behaviors; low self-awareness);
- difficulty generalizing learning from one situation to another

Information for Brain Injury Providers:

Red flags: indicators that increase risk of use:

- prior history of Substance Abuse;
- a social isolation (estrangement from friends, family and co-workers);
- strained family/marital relations and lack of support;
- boredom (not working, no activities);
- difficulty in adjusting to changed circumstances (client may be angry, depressed, anxious);
- self-medicating to feel "normal" (to deal with chronic pain, grief and sense of loss)

Signs that your consumer may be using:

- deterioration in functioning;
- increased irritability and agitation;
- decreased self-care/change in physical appearance;
- increased erratic behavior;
- missed appointments;
- physical evidence of alcohol: smell/red eyes;
- physical evidence of street drugs: dilated pupils

Progression of Substance Use:

Substance Use often proceeds through the following five stages.

- Use: social or recreational use
- Misuse: occasional bouts of problematic use
- Abuse: repeated occasions of misuse
- Dependency: using as a coping strategy
- Addiction: physiological dependence on the substance leading to withdrawal if use is discontinued

What Brain Injury Providers can do about Substance Abuse:

- Educate client and family about the risks of clients with Brain Injuries using substances. Engage family/social network in actively supporting the client to address the issue.
- Take a history of client's prior and current use. Be specific —ask, “What's the most you've used? The least?”
- Ask client about his/her family history of Substance Use.
- Ask what effect use is having on client's life (social, family, job, legal).
- Use CAGE Questionnaire (to be found in this module) and Weighing the Pros and Cons of Use (to be found in this module) to engage client with the issue.
- Gain an understanding of the Model for Change (to be found in this module). It may help to move the consumer through the stages
- Assess stressors and risk factors that might cause client to begin using (isolation, boredom, depression, job loss, etc).
- Help client find meaningful substance-free activities.
- Provide support for behavioral changes before, during and after the Substance Abuse program to build motivation and reinforce new behaviors.
- Establish ongoing contact with professionals in Substance Abuse programs to exchange information and make sure the Substance Abuse program is meeting the client's learning needs.

CAGE Questionnaire to screen for a possible drinking problem

(Ewing J.A., *Detecting Alcoholism. The CAGE Questionnaire. JAMA 1984; 252; 1907*):

1. Have you ever felt you ought to cut down on your drinking?
2. Have people annoyed you by criticizing your drinking?
3. Have you ever felt bad or Guilty about your drinking?
4. Have you ever had a drink first thing in the morning (Eye-opener) to stop your nerves or get rid of a hangover?

Two or more affirmative answers indicate probable alcoholism. Any single affirmative answer deserves further evaluation.

Make Contact

Make contact with Substance Abuse providers to help identify potential Substance Use and move client into appropriate Substance Abuse program. Maintain ongoing contact with Substance Abuse provider to help individualize program changes and monitor client’s progress.

Weighing the Pros and Cons of Change:

Make copies of the following questionnaire for your consumers. It may help you approach the topic of Substance Abuse in a non-confrontational way. Its purpose is to help consumers reach a clear decision about whether they want to change their behavior. (Miller, W.R, & Rollnick, S. (1991). *Motivational Interviewing*. New York: Guilford)

Quitting Drinking / Drug Use

PROS

(what’s good about quitting)

CONS

(what’s not good about quitting)

Continuing to Drink / Use Drugs

PROS

(what’s good about continuing)

CONS

(what’s not good about cont’)

Suggestions for Substance Abuse Treatment Providers Working with Persons Who Have Limitations in Cognitive Abilities³⁰

The substance abuse provider should determine a person's unique communication and learning styles.

- Ask how well the person reads and writes; or evaluate via samples.
- Evaluate whether the individual is able to comprehend both written and spoken language.
- If someone is not able to speak (or speak easily), inquire as to alternate methods of expression (e.g., writing or gestures).
- Both ask about and observe a person's attention span; be attuned to whether attention seems to change in busy versus quiet environments.
- Both ask about and observe a person's capacity for new learning; inquire as to strengths and weaknesses or seek consultation to determine optimum approaches.

The substance abuse provider should assist the individual to compensate for a unique learning style.

- Modify written material to make it concise and to the point.
- Paraphrase concepts, use concrete examples, incorporate visual aids, or otherwise present an idea in more than one way.
- If it helps, allow the individual to take notes or at least write down key points for later review and recall.
- Encourage the use of a calendar or planner; if the treatment program includes a daily schedule, make sure a "pocket version" is kept for easy reference.
- Make sure homework assignments are written down.
- After group sessions, meet individually to review main points.
- Provide assistance with homework or worksheets; allow more time and take into account reading or writing abilities.
- Enlist family, friends or other service providers to reinforce goals.
- Do not take for granted that something learned in one situation will be generalized to another.
- Repeat, review, rehearse, repeat, review, rehearse.

³⁰ Material on pages 11-12 were taken, with permission, from: Corrigan JD, Suggestions for Substance Abuse Treatment Providers Working with Persons Who Have Limitations in Cognitive Abilities. Ohio Valley Center, 2003. <http://www.ohiovalley.org/abuse>

The substance abuse provider should provide direct feedback regarding inappropriate behaviors.

- Let a person know a behavior is inappropriate; do not assume the individual knows and is choosing to do so anyway.
- Provide straightforward feedback about when and where behaviors are appropriate.
- Redirect tangential or excessive speech, including a predetermined method of signals for use in groups.

The substance abuse provider should be cautious when making inferences about motivation based on observed behaviors.

- Do not presume that non-compliance arises from lack of motivation or resistance, check it out.
- Be aware that unawareness of deficits can arise as a result of specific damage to the brain and may not always be due to denial.
- Confrontation shuts down thinking and elicits rigidity; roll with resistance.
- Do not just discharge for non-compliance; follow-up and find out why someone has not showed or otherwise not followed through.

Brain Injury Consequences and Interaction Strategies

The Brain and How it Works

The brain is a soft gelatin-like organ that weighs approximately 3 pounds in an adult, about the size of a grapefruit. It is protected by a rough and bony thick layer of bone (the skull) and is surrounded by cerebrospinal fluid, which allows the brain to “float” slightly within the skull. This fluid also fills the open areas within the brain (the ventricles). It is the control board for all of the body’s functions, including thinking, moving and breathing. It receives messages, interprets them and then responds to them by enabling the person to speak, move or show emotion. The brain is comprised of the **cerebrum**, where most thinking functions occur; the **cerebellum**, which coordinates movement; and the **brain stem**, which controls consciousness, alertness and basic bodily functions. See functional domain of the brain diagram on page 16.

Cerebrum³¹



The cerebrum is the largest part of the brain and is divided into the left and right hemispheres. The left hemisphere generally controls movement and receives messages from the right side of the body and the right hemisphere controls movement and receives messages from the left. The dominant hemisphere (usually the left hemisphere) controls verbal functions (speaking, comprehension, writing, reading, calculating), while the right hemisphere generally controls functions that are more abstract in nature (creativity, visual memory, copying, drawing, musical skills).

The cerebral hemispheres are divided into four “lobes” (frontal, temporal, parietal and occipital), each of which specializes in particular functions and skills.

31 Material on pages 13-17 were taken, with permission, from: Braunling-McMorrow D, Niemann GW, and Savage RC (eds.), Training Manual for Certified Brain Injury Specialists (CBIS) Level 1. Texas: HDI Publishers, 1998.

Frontal lobe

The frontal lobe is located in the front of the brain. It is the largest and most evolved of the lobes. The frontal lobe provides “executive” control over much of the brain’s higher functions. The frontal lobe is concerned with the **output** of behavior and contains the neurons connected to the brain stem and spinal cord that control voluntary movement. The **right frontal lobe** controls movements of the left side of the body and the **left frontal lobe** controls movements of the right side of the body. The frontal lobe plans, initiates and controls all purposeful actions.

Through complex connections to all parts of the brain, the frontal lobes are also involved in controlling attention and concentration, abstract and complex thinking, decision-making, mental flexibility, higher judgment and reasoning, and emotional responses. The left frontal lobe also contains an area called **Broca’s area**, which is responsible for producing speech and language output, such as speaking and writing. When a frontal lobe is injured, weakness (**hemiparesis**) and even total paralysis (**hemiplegia**) can result on the side of the body opposite to that lobe. Injury to the frontal lobes often results in distractibility, difficulty concentrating, inflexible thinking, simplistic or “concrete” thinking, the inability to plan or think ahead, poor judgment and inappropriate emotional behavior.

Temporal lobe

The temporal lobe is a large, thumb-shaped extension of the cerebral hemispheres located near the temples of the head. In both cerebral hemispheres, the top of the temporal lobe has a small area about the size of a poker chip that is responsible for hearing (the **auditory cortex**). The temporal lobe is also involved in perception and memory.

The two temporal lobes perform different functions. The **left temporal lobe** is primarily specialized in the comprehension of languages, including listening, reading and verbal memory. The **right temporal lobe** is primarily specialized in comprehending music and memory for visual information. The specific type of disability produced by injury will depend on whether a person is right or left-handed and requires careful evaluation.

Parietal lobe

The parietal lobe (Latin for “forming the sides”) is located on the upper sides of each cerebral hemisphere, above and in front of the occipital lobe, above the temporal lobe, and behind the frontal lobe. The parietal lobe is responsible for perceiving, analyzing and assembling touch information from the body. It is also in the parietal lobe where visual, auditory, and touch information combine to make sense of the world. The **left parietal lobe** is also believed to be the area where letters come together to form words and where words are put together in thoughts. The **right parietal lobe** is responsible for understanding the “spatial” nature of the world, including recognizing faces and shapes, being aware of body states and deficiencies, and knowing directions.

When the parietal lobe is injured, the inability to recognize touch sensation from the opposite side of the body can result.

Occipital lobe

The **occipital lobe** is in the extreme rear of the cerebral hemisphere at the back of the head. The occipital lobe is devoted entirely to vision and is often called the visual cortex. The occipital lobe can be injured by disease or trauma, but is most often injured by a stroke causing loss of blood flow or bleeding. Damage to the occipital lobe can result in disorders of perception, called **agnosia** (not knowing), such as impaired color vision or the inability to recognize objects. Even blindness can result if the injury is severe enough.



Cerebellum

The cerebellum is a cauliflower shaped structure located beneath the occipital lobe and behind the brain stem. It has a right and left hemisphere, and is the size of two large plums. It has two main functions: balance and coordination.



Brain Stem

The brain stem has two main functions; basic life and arousal. It connects the cerebrum with the spinal cord. The lower portion (medulla oblongata) controls breathing, heart beat, and other involuntary muscle activity. The brain stem also controls eye movement through the midbrain.

Interacting Parts Of The Brain

Most higher, complex behavior is the result of the interaction of many different parts of the brain. In particular, the “higher” thought processes of the cortex can powerfully influence functions of the brain done by “lower” brain areas. Below are a couple of common examples:

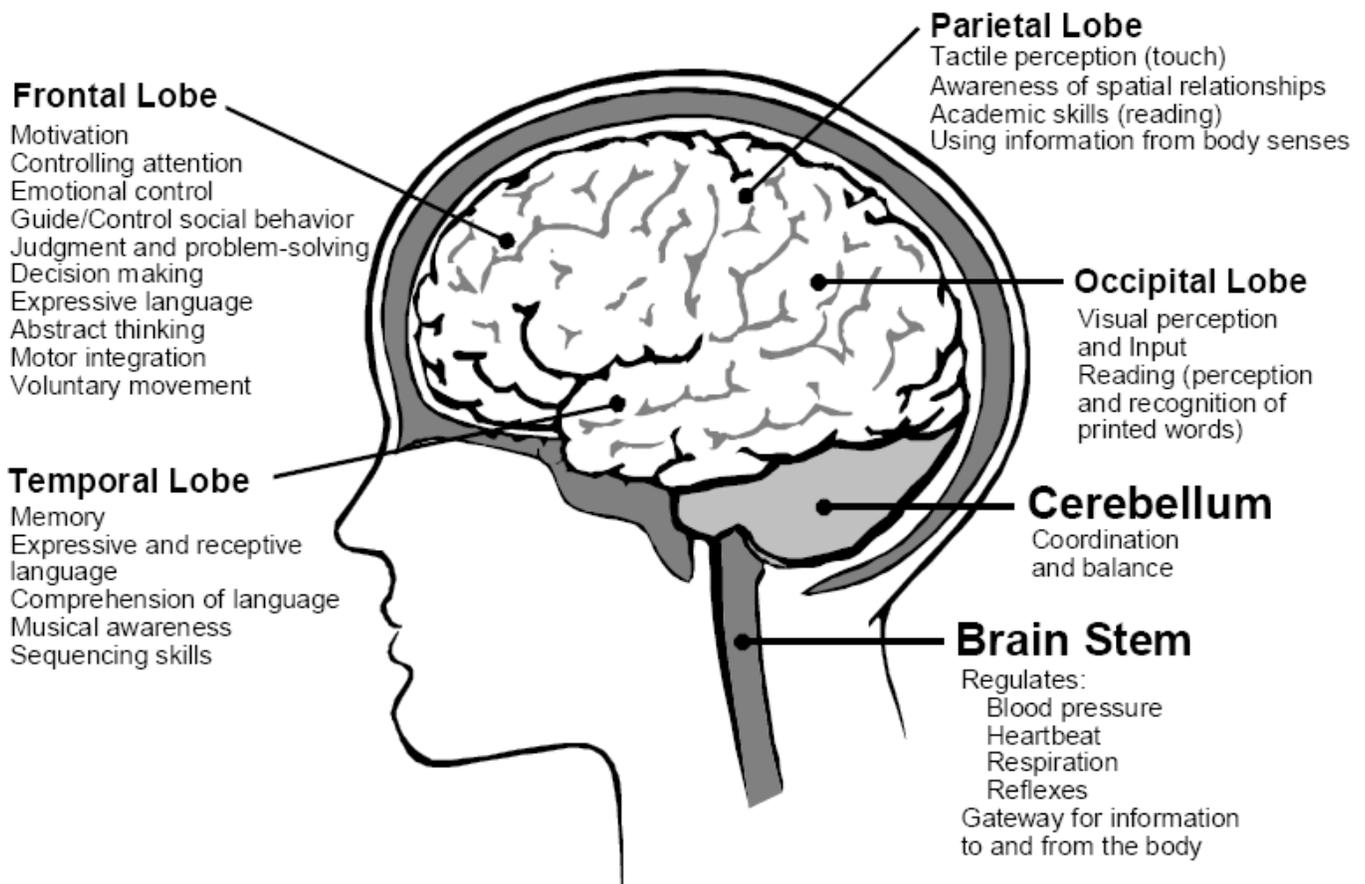
Frontal-Brain Stem Connections: Thoughts and Arousal

The **frontal lobes** of the brain are responsible for controlling and regulating much of the brain’s activities. The **reticular activating system**, or RAS, of the brain stem is responsible for arousing and alerting the brain. However, these two parts of the brain often interact to regulate alertness. For example, when an individual has been awake for 24 hours without sleeping, the RAS will usually become inactive so that the individual can sleep. However, if the individual is driving home from a long trip and needs to stay awake, the thought processes of the frontal lobes (e.g., “I have to stay awake!”) can influence the RAS to keep functioning and, therefore, keep the individual awake. In this way, thoughts influence arousal.

Frontal-Limbic Connections: Thoughts and Emotions

Again, the frontal lobes of the brain are responsible for controlling and regulating brain activity. Emotions are complex states or “feelings” that are produced by the **limbic system**. There are direct neuron pathway connections between the frontal lobes and the limbic system. Thoughts generated in the frontal lobe of the cortex travel down to the limbic system to influence the production of emotional states. For example, an individual sees a rattlesnake in front of him and thinks, “This is a rattlesnake – he will bite me – I’m scared!” These thoughts impact the limbic system to produce an emotional state of fear. This, in turn, results in fearful avoidance behavior in the individual.

Functional Domains of the Brain



General Patterns of Dysfunction by Location of Injury

Left Side of Brain

- Difficulties in understanding language (*receptive language*)
- Difficulties in speaking or verbal output (*expressive language*)
- Catastrophic reactions (*depression, anxiety*)
- Verbal memory deficits
- Decreased control over right-sided movements
- Impaired logic
- Sequencing difficulties

Right Side of Brain

- Impairments in visual-spatial perception
- Left-neglect or inattention to the left side of space or body
- Decreased awareness of deficits
- Altered creativity and music perception
- Loss of the gestalt, or “big picture”
- Visual memory deficits
- Decreased control over left-sided movements

Diffuse Injury

- Reduced thinking speed
- Increased confusion
- Reduced attention and concentration
- Increased fatigue
- Impaired cognitive functions across all areas

Just as each individual is unique, so is each brain injury. Recovery from a brain injury is often slow and the person may exhibit an have changes, for better or worse, which may effect them the rest of their lives. Difficulties with thinking, including, attention, motivation and arousal, communication and language, learning, vision and hearing, and understanding. Personality, mood, and emotions are often altered. Physical, cognitive and personality changes may occur following a brain injury. Each person’s recovery is unique due to pre-injury personality, learning style, location and severity of injury, time elapsed since the injury and the individuals psychological reaction to the injury. Changes in cognition and behavior may appear years after the initial injury and last a lifetime. Frequently reported problems include the following:

Physical Consequences³²

Many of the physical challenges a person with a brain injury experiences may be evident. Others may be more subtle and present at differing times. Some of the more common physical challenges caused by brain injury include:

Motor

The person may experience paralysis of one side of the body (hemiparesis), paralysis involving both legs and both arms (Quadraparesis), poor balance, lowered endurance, a loss of ability to plan motor movements (ataxia) and abnormal tone and muscle stiffness (spasticity). The individual may also lose the ability to stabilize his trunk even though his limbs are functional (proximal instability). Direct damage to muscular and bony tissue may be sustained.

Balance and Coordination

The ability to use appropriate righting and equilibrium reactions to maintain and upright position. It is usually tested in sitting and standing positions.

Fatigue

Physical or mental weariness resulting from exertion.

Hemiplegia or Hemiparesis

Paralysis or weakness of one side of the body as a result of injury to neurons carrying signals to muscles from the motor areas of the brain.

Mental Health/Chemical Health

The use of drugs and alcohol after brain injury is a controversial and hotly debated issue. The excitatory or depressing effects of alcohol are more extreme after brain injury. Smaller doses of alcohol yield more powerful effects than before. Additionally, alcohol consumption is known to kill brain cells. People with brain injuries must decide if the additional brain damage is an acceptable risk.

Perceptual

The ability to make sense of what one sees, hears, feels, tastes, or smells. Perceptual losses are often very subtle. All senses may be affected, producing changes in hearing, vision, taste, smell and touch. Changes may involve an increase, decrease or loss of sensitivity. This could result in the inability to see items on one side of the visual field, (visual field deficit), sensitivity to movement (vestibular deficits) or difficulty in understanding where his limbs are in relation to his body.

³² Material on pages 18-19 was taken, with permission, from: Black, K, Caregiver College Presentation. Michigan: Detroit Medical Center, Rehabilitation Institute of Michigan, 1998

Speech and Language

The person may have difficulty understanding what is said to him (receptive aphasia), or difficulty expressing his thoughts (expressive aphasia). Some people have a specific difficulty recalling nouns or names, or pronouncing or articulating words (dysarthria).

Regulatory

The person may become easily fatigued and require rest periods throughout the day. Changes may also occur in the person's ability to regulate his body temperature, consumption of foods and liquids. Loss of bowel and bladder control may also occur.

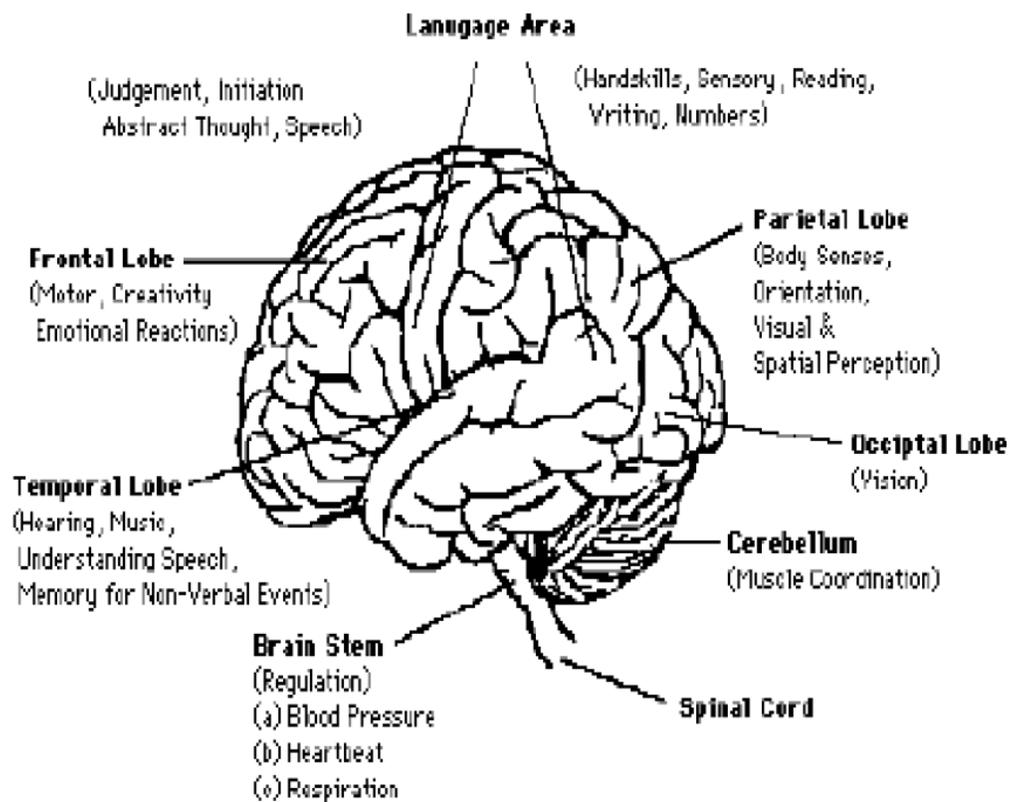
Traumatic Epilepsy

Following a brain injury, a person may experience seizures. Seizures may occur immediately following the injury or may not develop months or years later. Two types of seizures may occur. First, a major motor or generalized seizure in which the patient may begin making rapid body movements, lose consciousness, lose bowel and bladder control, and breathe irregularly. After a few minutes the person may regain consciousness on his own after a few minutes, and expresses feeling confused and complain of soreness. The second type is focal motor seizures. It may also cause aggression or other behavioral change. This type of seizure exhibits twitching or jerking movements. The person usually does not lose consciousness and may not be aware the seizure occurred.

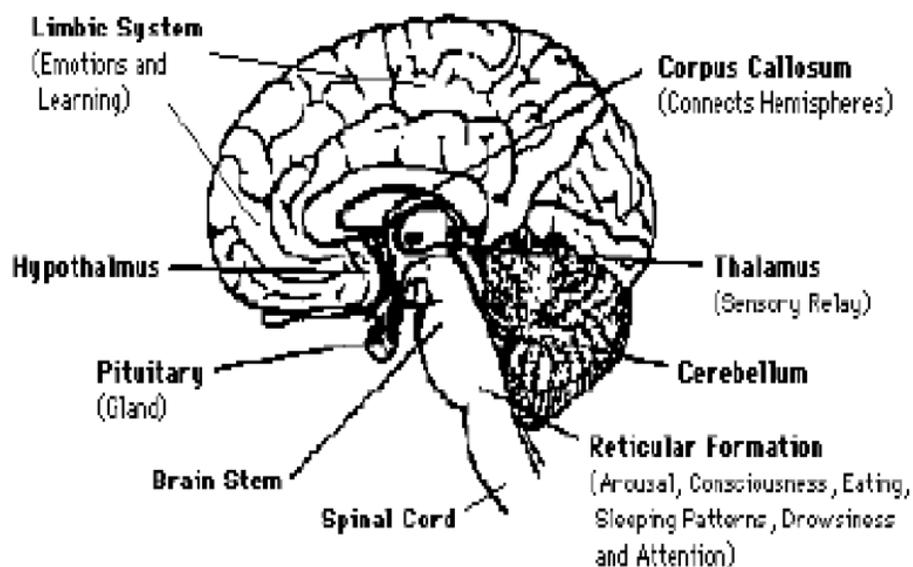
Visual Field Defect

Inability to see objects located in a specific region of the field of view ordinarily received by each eye. Often the blind region includes everything on the right half or left half of the visual field.

SURFACE VIEW



MID-LINE VIEW



Strategies to Address Physical Consequences³³		
PROBLEM AREA	BEHAVIOR	STRATEGY
Impairment of movement	Poor balance, reduced motor coordination, weakness on one side, jerky walking, reduced endurance, fatigue	Walk slowly, follow instructions of Physical Therapist.
Spasticity of limbs	Muscles that are tight, difficulty walking, stiff legged	Maintenance of Range of Motion and stretching programs to reduce tone. These need to be done under the direction of a Licensed Physical Therapist.
Labored speech	Slow, slurred speed, at times unintelligible	Encourage person to take their time and articulate. Utilize written communication if clarity is poor.
Visual & perceptual difficulties	Double vision, loss of visual fields, blurred vision, depth perception difficulties	Encourage person to turn their head to compensate for loss of field. Cover one eye if seeing double.
Seizure disorder	Staring spells, leg jerks, Grand mal - falling down, loss of bladder control	Maintenance of medical follow up, take medications as prescribed, don't use alcohol or illegal drugs
Swallowing difficulties	Coughing, choking, difficulty chewing, drooling	Video swallow can provide information regarding the problems that occur. There are various diets that can be prescribed. Need to ensure that the patient is getting adequate nutrition. Oral motor exercises may also help.
Apraxia	Inability to perform purposeful movements. May or may not see loss of coordination, motor function, or sensation. May affect oral and speech movements, limb movements, constructional skills	Allow adequate time to initiate and restart. Provide visual or physical cues—gestures, pictures, models, hand guidance.
Sensory	Increased light and sound sensitivity. Impaired smell and taste. Tactile defensiveness. Body temperature and weight fluctuations. Tinnitus.	Increase deficit awareness of how daily tasks may be affected by sensory impairments. Medical follow-up and medications may be necessary.
Pain Episodic/ Continuous. Headaches.	Effect on cognitive/emotional status. Exaggerated pain reactions.	Pain management program. Counseling. Rating scales for pain. Medications.

33 The table was taken, with permission, from: Beckwith, B, Dimambro, L. TBI Basics. Brain Injury Association of Michigan Annual Conference, 1996-2002.

Cognitive Consequences³⁴

Many families find that the cognitive deficits and personality changes that occur are the most difficult to accept. When we can see a disability, it is easier for us to understand the limitations of the individual and what we can expect of him. Cognitive and personality changes cannot be easily “seen,” therefore, they are often more difficult to explain, understand, and accept.

People with brain injuries often are confused about the current time, where they are, who they are and who the people around them may be (disorientation). In addition, the person with a brain injury may exhibit an inability to focus on a task without being distracted (attention deficits), inability to maintain attention a task over a period of time (concentration), difficulty recalling and “string” recent information (memory) and difficulty learning new information. They may also display poor judgment and an inability to plan events or tasks, difficulty drawing conclusions and making decisions (problem-solving), difficulty switching from one topic or task to another (perseveration), and may have difficulty adapting to changes in daily routines (inflexibility). The person may also be unable to understand abstract concepts.

Many people with brain injuries may lack an awareness of or appreciation of, their current situation. This can be caused by both the actual damage to the brain and by the person’s reaction to the injury. Their families may also have this reaction to their loved ones injury. The person and/or the family may completely deny that a disability is present, refuse treatment, and therefore, unknowingly place them at risk. This is particularly an issue for those persons who appear to function well, but may have impaired judgment or problem solving.

Basic Cognitive Strategies³⁵

Damage to the brain can compromise some or all of an individual’s skills or abilities, particularly the execution of cognitive functions as identified in earlier modules. Cognitive limitations must be taken into account when supporting individuals in achieving their targeted outcomes. Also, an individual’s cognition, or the way they think, is a significant factor in analyzing antecedents.

Remember, when providing cognitive support to individuals with brain injury, their cognitive functions worked adequately to support them prior to the injuries. They also probably remember how they used to function, and the present challenges may frustrate them. They should be approached as you would any other person their same age. Do not speak down to a person or “baby” them. Treat people with dignity and respect, as you would want to be treated if you had the same injury.

34 Material on page 21 taken, with permission, from: Black, K, Caregiver College Presentation. Michigan: Detroit Medical Center, Rehabilitation Institute of Michigan, 1998

35 Material on pages 21-27 taken, with permission, from: Braunling-McMorrow D, Davie, C, Ferriera-Bedford, T, et al. Acquired Brain Injury Programs, Preservice Materials Manual. Illinois: Mentor, 2000.

The following are common cognitive impairments and the basic strategies that can be used as support for each.

- Memory
- Attention/Concentration
- Language – Comprehension/Understanding Difficulties
- Language – Expressive Difficulties
- Sequencing Difficulties
- Planning and Organization Difficulties
- Problem-Solving Difficulties

Memory

Memory impairment is considered the most common deficit that results from a brain injury. Memory refers to the process of first organizing and storing information, then recalling that information at a later time. Different types of memory have been identified and are affected to different degrees following a brain injury. Memory deficits affect an individual's ability to acquire new information.

Strategies and support that can be provided to individuals with memory difficulties fall into two broad categories. There are those strategies that help them **store** the new information presented to them if the brain cannot do this effectively. There are also those strategies that assist them in **retrieving** the information that gets stored in their memory. The strategies identified here provide both types of assistance to the individual.

Suggested Techniques:

- Use a memory book, date book or journal. It should be personalized to the needs of the individual. The individual should be encouraged to carry it at all times.
- Hang a wall calendar in the individual's room or residence, and note important appointments and dates on the calendar.
- Use cueing systems, such as an alarmed watch, as a reminder of important times during the day like medication times.
- Post a map of the city, residence or home in which the individual lives (if they are not familiar with the area).
- Label cabinets and drawers to aid with locating items in the kitchen and bedroom.

Attention/Concentration

Attention and concentration difficulties are also common following a brain injury. In order to benefit from any rehabilitation program, the individual must be able to attend to the information and concentrate on the therapy tasks.

The process of attention and concentration has several components. First, the individual must be able to screen out all irrelevant information and activity going on around him/her. For example, this happens when a person has a conversation at home with a family member while the television is on in the same room. During the conversation, the person screens out the television noise in order to attend to what the family member is saying. The second part of attention is the ability to sustain that focus for a period of time without reinforcement.

Individuals with attention and concentration difficulties following their brain injuries will face certain challenges during the rehabilitation process. They will require support and assistance simply to participate in their therapy program. The following techniques will help to structure the environment around the person to maximize attention and concentration abilities.

Suggested techniques:

- Make sure the individual's working environment is clear and quiet.
- Engage the individual in tasks that are shorter in length, initially.
- Designate a space in the residence where the individual can work uninterrupted.
- Assist the individual to keep personal space (e.g., room, bathroom) organized and free of clutter.

Language – Comprehension/Understanding Difficulties

Comprehension difficulties limit a person's ability to make sense of what is happening in the environment. It affects the ability to understand what is said or even read. Their ability to understand words that were once common may be affected. The speed with which this information is taken into the brain can also be affected. Conversation may now be difficult, especially if it involves more than one person. If the individual once enjoyed reading, this may no longer be a fun activity. Watching a television program or listening to a radio report may be difficult, and the individual may need a lot of explanation for things to make sense.

The following strategies will support the individual and structure the flow of information around them to provide the greatest opportunity for comprehension:

Suggested Techniques:

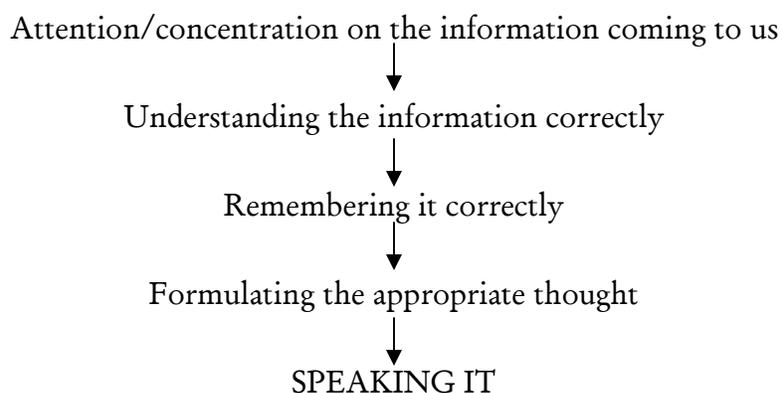
- Speak to the individual in shorter sentences – *not baby talk or talking down!* Simply make your sentences short – put one thought in each sentence. Instead of saying, "Will you go to the utility room and get my dress out of the dryer – I want to wear it today," say "Will you go to the utility room?" (pause) "Get my dress out of the dryer, please?" (pause) "Bring it to me, thanks!"
- Speak at a slower pace to the individual to allow time for the information to be understood.
- Encourage the individual to ask for clarification if the communication seemed

confusing. In the initial stages of rehabilitation, you may need to model and later prompt the questioning. For example, when you deliver a communication, you may simply ask, “Did I make sense to you?” instead of, “Did you get that?” The first type of question may take the edge off and reduces the likelihood of the individual becoming defensive.

- Support any communication you deliver with simple gestures, like pointing to or picking up the object mentioned. Do not make the gestures elaborate – that may only add to the confusion.

Language – Expressive Difficulties

Expression is the other part of the communication process. We must first take information, process it, AND understand it before we can express our thoughts. Expressing ourselves is the reflection of a number of cognitive processes we have mentioned:



We do this every day without thinking about it. Individuals with brain injuries may have difficulty putting thoughts together to make a complete thought. They may have difficulty coming up with a particular word to make the thought complete, or the production of the communication may be slowed. They may say irrelevant things, ramble on without a clear point to the communication, or speak completely off-topic.

The following strategies can support individuals with a brain injury in communicating with clarity.

Suggested Techniques:

- Set up a discrete cueing system that will let the person know if she/he is wandering from the topic (a hand signal or finger motion).
- When in private, respectfully let the person know when she/he wanders off topic, yet be direct.
- Avoid lengthy, in-depth discussions. Discuss topics in shorter segments with less detail.
- Use wh- questions (i.e., who, what, when, where, why) as a structure for written and verbal communication.

Sequencing Difficulties

Sequencing refers to the ability to put the steps of daily activities in the proper order. These skills are directly related to memory. Individuals with brain injuries may have difficulty sequencing daily activities such as laundry, grocery shopping and room cleaning.

Suggested Techniques:

- Create a checklist of the steps required to complete a task. Each step can be marked off as it is completed. When creating the checklist, be alert for hidden steps that are often completed automatically without thinking. They will need to be spelled out.
- For grocery shopping, make a checklist that is organized according to the layout of the store. This checklist will help to organize the shopping trip, as well as make sure the necessary items are purchased.
- For cooking tasks, create an individualized cookbook that includes checklists of ingredients required, equipment needed, and checklist for the recipe. By laminating the recipes, they can be wiped off and used again.

Planning and Organization Difficulties

Planning and organization are among the higher level thinking processes. To plan and organize requires the ability to look ahead, put things in an order, and consider multiple factors simultaneously. It requires concentration, memory and sequencing. Difficulties in any one of these areas will result in difficulties with planning and organization. For most of us, this is an unconscious activity – we do not realize when we do this on a daily basis.

The following supportive strategies for individuals with brain injuries will provide systems that help this process become more conscious for them:

Suggested Techniques:

- A memory or date book can serve as a supportive strategy for difficulties with planning and organization. This book can help to organize important information the individual may need – phone numbers, addresses, goals on which they are working, items to purchase, etc.
- Assist the individual in creating a system for organizing their living space. Label dresser drawers so that clothes are always put in the same area. Desktop organizers are sometimes effective for this purpose. Whatever is developed must be useful for the individual – they must be able to use it. No strategy, however creative, is effective if the individual cannot use it!

Problem-Solving Difficulties

To problem-solve a situation, individuals must be able to integrate all of the skills identified so far. Attention, concentration, memory, sequencing and planning all come into play when we

attempt to solve problems. The steps in which we engage are often unconscious and happen in a split second, may now be challenging. Strategies to support them in this area of unconscious problem solving involve cueing the steps required and allowing for a slow and deliberate process.

Suggested Techniques:

- Support the use of external cueing systems for problem-solving when they must address each step in order and not skip anything. Key parts include: stating the problem, identifying several possible solutions, identifying the advantages and disadvantages of each possible solution, picking a solution, trying it, and evaluating the solution tried (did it work?).
- Allow people an ample amount of time to work through difficult, challenging situations. This will allow them to process all aspects and arrive at a well throughout solution.

Strategies to Address Cognitive Consequences³⁶		
PROBLEM AREA	BEHAVIOR	STRATEGY
Impaired alertness	Inability to attend to environment. Reduced alertness, may appear sleepy. Very slow processing speed. Slow	Stimulation - in correct amounts based on level of injury. Allow time to respond as needed. External cue timers.
Impaired attention/ concentration	Easily distractible (internal and external stimuli). Cannot sustain attention to new target. Cannot pay attention to two things at once.	Control environmental distractions. Notes and lists assist in shifting/dividing attention. Timers to cue to new task. Pacing to avoid “overload.” Train
Impaired learning and memory	Decreased ability to store/retrieve new information (verbal or visual). Forgets details easily. Decreased rate of new learning.	Repetition - overlearn new skills. Notes, lists, tape recorders, timers, planners as memory aids. Avoid learning multiple new things.
Impaired abstraction	Gets “stuck” on one view or situation. Misinterprets - especially hidden meanings. Difficulty understanding	Cues to direct alternate viewpoints and speak more concrete terms. Give examples.
Impaired conceptualization	Difficulty seeing links between situations or events. Difficulty applying behavior to new situations (generalization).	Written/verbal cues to assist comparing and contrasting ideas. Practice new skills in different environments.
Impaired problem solving	“Stubborn!” Decreased flexibility - can only see one alternative. Difficulty seeing cause/effect, prioritizing, and organizing	Don’t get angry. Explain alternate solutions and assist evaluating. Minimize change. Establish routines.
Perseveration	Repetitive phrases. Decreased ability to switch to new tasks.	Increase awareness of behaviors. Direct intervention to break pattern.
Impaired communication skills	Receptive or expressive deficits. Impaired word finding. Disorganized communication. Impaired social language (pragmatics)	Give extra time for processing and expression. Verbal cues/feedback to assist pragmatics. Group/peer activities excellent way to facilitate
Impaired orientation	Confusion in new environments. Disoriented to person, place, and time. Gets lost easily.	Planners and calendars. Prepare for new changes in environment. Daily environment orientation by caregivers.

36 Table was taken, with permission, from: Beckwith, B, Dimambro, L. TBI Basics. Brain Injury Association of Michigan Annual Conference, 1996-2002.

Strategies to Address Executive Consequences³⁷		
PROBLEM AREA	BEHAVIOR	STRATEGY
Impaired ability to plan/organize/follow through on goals	Low motivation. Cannot maintain skills (jobs, social relationships). “Going nowhere.” Unfinished tasks.	Written/verbal cues to set specific goals with timelines and evaluate progress. List steps in a goals—break things down. Reinforce small successes.
Impaired ability to initiate	Looks “lazy.” No forward action on tasks (simple or complex). Needs constant prompts to start.	Checklists to cue tasks, broken into steps. Timers to cue when to begin tasks. Verbal cues as needed.
Impaired ability to self-evaluate, monitor and self correct ongoing behavior	Inappropriate behavior to situation. Cannot correct mistake even when given feedback	Provide consistent direct feedback to correct inappropriate responses. Video-tape or peer review to increase self-awareness. Troubleshooting - anticipate potential problems and script possible responses.

Behavioral/Emotional Consequences³⁸

Individuals with brain injury may show a lack of interest in the world around them (apathy) and a decrease in motivation. They may exhibit extreme and rapid changes in emotion (emotional lability), irritability, depression and a lack of initiative. Difficulty controlling impulses and emotions (disinhibition), resulting in temper flare-ups, aggression, cursing, and generally lowered frustration tolerance may be exhibited. This may cause some to act upon sexual impulses inappropriately. Such persons may also exhibit social immaturity by making “overly friendly” or “silly” comments.

Basic Behavior Strategies³⁹

Human behavior is very complex. Researchers have been studying our behavior for centuries – what we do, why we do it and how we do it. Team members should have an understanding of basic behavior principles and how support provided to individuals will reinforce behaviors.

37 Table on page 28 taken, with permission, from: Beckwith, B, Dimambro, L. TBI Basics. Brain Injury Association of Michigan Annual Conference, 1996-2002.

38 Material on page 28, taken, with permission, from: Black, K, Caregiver College Presentation. Michigan: Detroit Medical Center, Rehabilitation Institute of Michigan, 1998

39 Material on pages 28-35 taken, with permission, from: Braunling-McMorrow D, Davie, C, Ferriera-Bedford, T, et al. Acquired Brain Injury Programs, Preservice Materials Manual. Illinois: Mentor, 2000.

Because every interaction with individuals with brain injuries may have a direct affect on their behavior, **active treatment** is a key part of the treatment philosophy. Active treatment is defined as:

“Any interaction between a staff member and another person that is intended to result in greater autonomy for the other person (McMorrow, 1994).”

You should become alert to your behavior, make sure that both your responses and interactions support the individual and the outcomes she/he desires.

Following is a discussion of several basic behavior principles that can help guide your behavior in working with an individual:

Predispositions

Any discussion of behavior principles should begin with a mention of predispositions. This refers to the principle that there are conditions that individuals bring to any situation that reduce the chance of the individual responding in a desired manner at that time (McMorrow, 1997). For example, if an individual is in pain, she/he may be more likely to be irritable or resistant to touch in a particular area. Or, if an individual did not sleep well the night before, she/he may have difficulty performing job tasks satisfactorily the next day. The following predispositions frequently affect all individuals:

- Medication side effects
- Relationship issues
- Disappointment related to visits
- Sleep irregularity
- Sexual deprivation
- Addictions
- Seizure activity
- Pain

Issues related to any of these predispositions can increase the likelihood that an individual may have problems handling difficult like situations. You should be alert to the presence of these conditions for all people you support. While not directly responsible for producing unwanted behaviors, they may be a factor. Your attention to predispositions may provide the support the person needs to avoid unwanted behaviors during a challenging life moment.

A – B – C’s of Behavior

As you begin to observe a specific behavior and understand the factors that may contribute to it, you should observe more than the behavior itself. That is, when discussing behavior, you should refer to all behaviors (e.g., eating, walking, social interactions) and not just unwanted behavior (e.g., verbal aggression, physical

aggression, property destruction). You need to look at what is occurring both before and after the behavior of interest. The A – B – C method of observation will help you do this. This method is explained as:

A = Antecedents: events that occur prior to a behavior

B = Behavior of interest

C = Consequences or results of the behavior

Two paths impact the behavior – focus on the antecedent or focus on the consequence.

Antecedents, again, are events that occur prior to a targeted behavior. For example, you are in the house with the windows open on a warm day. A thunderstorm blows up; it starts raining, and the storm blows rain in the house. You immediately close your windows. The antecedent to closing the windows was the rain blowing inside the house, since it occurred before the behavior of closing the windows.

Antecedents set the condition for the behaviors that follow them by serving as a signal that the behavior will be reinforced. For example, when the weather alert sirens sound in a community, most residents will hurry to a place of safety. The antecedent (the sounding of the weather alert sirens) sets the condition for the targeted behavior (moving to a place of safety) because in the past this behavior has had a reinforcing consequence (protection from a tornado or damaging storm).

People learn from the consequences of their past behaviors how to act in different situations; that is, they learn how to respond to different antecedents. The ability to discriminate between different antecedents and the behaviors appropriate to them enables an individual to behave in ways that will obtain reinforcers and avoid negative consequences.

Antecedents may be many different things, including the presence of a certain person, a specific event or action, a place, or even a thought. Questions to ask when identifying antecedents include:

- Where was the individual?
- Who else was around?
- What were they doing?
- What time of day did the behavior occur?

As a provider, be aware of behaviors you exhibit that may serve as antecedents for an unwanted behavior. Often we are unaware of the effect we are having, which is why we should analyze our behavior to determine antecedents. The PEARL scale is another guideline for structuring our interactions in a positive manner, reinforcing desired behaviors.

Identifying the targeted **behavior** is critically important. You should be careful to describe the behavior that was observed and not your interpretation of how someone felt or the attitude displayed. This will allow team members to key into the exact actions that occurred following the antecedent. Which of the following are behavioral observations?

1. Jan gets angry and threatens her sister every time she takes things from her room.
2. Juan answered all three questions correctly after reading the paragraph.
3. Carl is happy and enjoys being with his dog after school.
4. Terry clenched his teeth, shook his fist and yelled at his friend after he found out that he took his CD.
5. Sherry smiled and laughed when she played fetch with her dog.
6. Jeff understands most of what people say to him.
7. Brad was depressed after the movie.

Behavioral terms are accurate, objective words that give specific information about actions. Statements 2, 4 and 5 above provide the most accurate, objective description of the behavior that was observed. Words like “gets angry”, “is happy”, “understands”, and “was depressed” do not describe what the individuals were doing in those particular moments. Rather, those words represent someone’s interpretation of behavior that was observed. When describing a behavior, ask yourself: If another person observed the same situation, would his or her observation of the behavior be the same as yours?

Consequences of a behavior affect whether that behavior will be repeated in the future under the same conditions. If the consequence of the behavior resulted in something good happening (positive reinforcement), and we observe the behavior being repeated to achieve the same consequence, that behavior was probably reinforced and is likely to continue. If the consequence of the behavior resulted in the individual’s getting out of an unpleasant situation and helped him to avoid the situation altogether (negative reinforcement), the behavior, again, will likely occur in the future. Finally, some behaviors lead to unwanted consequences (punishment) that make it less likely for the behavior to be repeated.

Taking the time to analyze the behavior sequence of a targeted behavior is a critical step in understanding why a behavior is occurring and helps point to effective treatment planning. As a provider, you can support the rehabilitation team by providing input on predispositions and A – B – C observations for targeted unwanted behaviors or desirable behaviors that may occur in the residential setting. These observations will help the team to design effective treatment plans.

Methods for Reinforcing Behavior

As a provider, you will be expected to support individuals as they practice strategies for increased autonomy and independence. The following methods can be used to help them

experience success as they work to achieve their targeted goals:

- Shaping
- Fading
- Redirection

Shaping

You should not expect people with brain injuries to perform desired tasks completely without assistance from beginning to end, before they are praised or positively reinforced. In many cases, the tasks are multi-stepped and require increasing levels of endurance that the person may not have. **Shaping** can be used in these instances. It is a procedure where reinforcement is provided based upon an individual's getting repeatedly closer to the final target behavior.

For example, if one of the objectives for an individual with limited range of motion is to learn to put his shirt on independently, you should not expect that he will be able to perform the entire task right after the objective was targeted. The physical mobility required might be challenging for him, and he may have cognitive difficulties with sequencing the task. Shaping could be used in this situation.

The person with a brain injury might be provided with a checklist that identifies the steps in putting on a shirt, and he may need guidance or help as he learns each step. In the beginning of the training, the person may take the shirt out of the closet and lay it out on the bed. This would be the first successful step that is reinforced. The next training step would require him to pick up the shirt from the bed, and put his head through the neck opening. As he experiences success, other steps on the checklist can be added until he has learned the entire sequence.

Remember, if you move too fast using a shaping strategy, the activity of working on personal care tasks may no longer be reinforcing at all.

Fading

In some cases following a brain injury, an individual is unable to respond to environmental cues as effectively as she/he once could. **Fading** uses a gradual change from artificial cues to more natural cues.

For example, sometimes after a brain injury an individual can have difficulty reading any kind of printed material because their eyes do not track back to the beginning of a line of print. They are unable to use the natural cue of the margin to find the beginning of the next line. It may be necessary to use a thick, bold red line placed on the left margin of the desired reading material as the cue for the individual to find the left-hand margin. This line may be necessary on all reading material initially. As their eyes respond to the thick, bold red line, the thickness of the line may be narrowed. Then, the color may be faded to pink; the line may then become a set of

dashes until it disappears completely. The individual can use the blank margin as a cue for the beginning of the next line. The same principle holds true when we gradually withdraw our verbal prompts or praise statements as persons become more autonomous in other activities of daily living. It will then make the person less dependent on praise to perform more independently, and may more simulate real life.

Redirection

There may be instances during the rehabilitation process where you will be faced with supporting an individual who is exhibiting unwanted behaviors. Many factors affect individuals with brain injuries during the rehabilitation process including confusion, overstimulation, impulsivity and limited awareness of the challenges. Individuals who exhibit behavioral issues following brain injury simply may not possess the problem-solving skills to deal with difficult life situations any other way. Because of these and other problems we have identified in earlier modules. Confronting the individual who is exhibiting unwanted behaviors is usually not therapeutically indicated, since it may produce more intense emotional responding.

Regardless of the type of unwanted behavior – whether it is yelling, striking themselves, or property destruction – attempting to resolve the situation in the crisis moment may lead to further escalation. **Redirection** is a strategy that may be used in these situations. Redirection is actually directing the individual away from whatever is causing the unwanted behavior in order to bring about de-escalation of the behavior.

For example, if an individual has become verbally aggressive about a CD that is missing from her room, attempting to problem-solve the situation in that crisis moment may not be effective. Rather, you should redirect the individual to discuss a topic of interest – plans for attending an upcoming concert, a sporting event, or a favorite movie. In this case, the change in focus, away from the cause of the aggression – the missing CD – will often result in the reduction of the verbal aggression. Once the individual has been calm for a while, discussing the incident and other ways of responding to frustration can then be therapeutic. We all know that solving though problems in our lives is difficult when we are in emotional upset.

Environmental Factors

Our environment consists of everyone with whom we come in contact, and everything that happens around us. The environment's responses to our behaviors profoundly affect how we act, through reinforcement and punishment. Before we provide more explanation as to the application of these factors in daily life, we will provide further clarification.

Reinforcement

When we attempt to identify reinforcers for individuals, one fact is clear. Items, actions or events that reinforce one individual do not necessarily have the same effect on another

individual. We are individual human beings with different likes and dislikes, and this applies to reinforcers as well. You should be aware of, explore and clarify with the individual what things they desire and what things they avoid. This will also help you to monitor your own behavior so that your responses to the individuals are truly reinforcing.

For example, receiving a box of expensive chocolates as a thank you gift for watching a neighbor's house may be a positive reinforcement gesture. However, if you are allergic to chocolate, don't like the taste, or are trying to diet, it would not reinforce your actions. The individual nature of reinforcers will definitely impact your successful support of the persons you serve.

Rewards (Positive Reinforcement) - As was indicated earlier, when good things happen following a behavior and that behavior is repeated in the future in order to achieve that result, the behavior is likely to continue. The behavior has been strengthened or reinforced, hence the name positive reinforcement.

For example, if you work hard to make a special meal for a friend and that friend is surprised and very thankful, you will likely do other things to surprise or please that friend. However, if that friend grumbles and complains about not liking the choice of food, you will not be as eager to do other things to please your friend. Unwanted behaviors may also be maintained by this same reward/positive reinforcement principle. Reinforcement can happen unintentionally. We may be unaware of the effect we are having on maintaining a behavior – even though we may think we are working very hard to decrease it. As an example, unwanted behaviors are often followed by attention from others in the environment – other staff, family or even other people in the community. The attention given to the individual in the moment of upset may be enough to reinforce him or her and strengthen the behavior. As a provider, you should try to ensure that your responses to unwanted behavior do not inadvertently reinforce the unwanted behavior in the person.

Escape and Avoidance (Negative Reinforcement) - When behavior stops an unpleasant situation – or removes the threat of one – that behavior becomes strengthened. It is more likely to occur in the future. As with positive reinforcement, negative reinforcement strengthens many behaviors that allow us to escape or avoid unpleasant situations. The rehabilitation process can be very unpleasant and certainly painful at times. Cognitive activities can be difficult and confusing. Physical therapy and occupational therapy is demanding and can be physically painful – stretching contracted muscles certainly creates pain. If speech is slow and laborious, communicating with others can cause frustration. The individuals in these situations may discover that having an outburst or complaining of illness will get them out of these unpleasant situations.

As a member of the team, you should watch for this type of reinforcement occurring with unwanted behaviors during therapy times and in other daily activities.

Punishment

Behaviors that lead to unpleasant or negative consequences are less likely to happen again. This can complicate the rehabilitation process, where therapeutic interventions may result in unpleasant consequences such as pain, confusion or failure.

Most of us have learned what activities we do well, and what situations are troublesome. The same is true for individuals in rehabilitation. When the skills that are most important to an individual's recovery are followed by some type of punishment, those behaviors are weakened. An individual's ability to obtain positive reinforcement is then limited. The individual is likely to find other behaviors that are effective for him/her – even if the behaviors are undesirable.

Punishment does not teach anything. Its long-term effects often tend to be adverse. The individual does not learn what she/he should do, or what behavior is desirable. In addition, the side effects of punishment can be quite alarming (e.g., withdrawal, illness and anxiety). You should try to do whatever possible to diminish the unpleasant consequences that occur without intent. For example, tasks can be designed in such a way that the individual is more likely to succeed than to fail.

When unwanted behaviors develop as a result of any of these environmental factors, or due to the neurological challenges faced by an individual, you should stress that these are not the fault of the individual. The “fault” lies with the injury or with the environment's accidental strengthening of unwanted behaviors instead of the desired responses. The individual is probably not aware of the reasons for the behavior problems and probably does not want to exhibit these behaviors.

Strategies to Address Behavioral/Psychosocial Consequences⁴⁰

PROBLEM AREA	BEHAVIOR	STRATEGY
Impairments in social appropriateness	Rude and selfish, childlike behavior. Does not respond to social cues.	Group activities to utilize peer criticism/approval -vs.- professional criticism/approval, praise positive behaviors, model appropriate behaviors.
Inability to control emotions	Overreacts to situations, laughs too much, becomes angry easily, appears to be moody, apathetic, anxious, depressed, talking about suicide. Frustration tolerance	Focus on progress made, remain calm, give suggestions for getting in control, don't compare to how they were before.
Sexual dysfunction	Wanting to hug everyone, making sexual statements, inappropriate touching. Reduced sexual drive.	Let them know actions are inappropriate and you feel uncomfortable, give suggestions for appropriate behavior. Counseling and/
Temper Outbursts	Impatient, becomes irritable when trying to do tasks, using obscenities, yelling, hitting. Self-injurious behaviors.	Redirect person from cause of frustration, get their attention, present alternative and help guide them, review consequences of behavior/action, praise patient once in control, don't leave patient alone, keep surprises to a minimum, be consistent, keep a routine, model calm
Inability to form and maintain relationships	Boastful, fails to express empathy, fails to respect rights of others.	Redirect disrespectful behavior, encourage cooperative behavior, use role-playing.
Physical Hyperactivity, drowsiness, insomnia.	Medical monitoring.	Medications may be used. Counseling.
Behavioral Anxiety, depression, paranoia, mania.	Monitoring by psychiatrist, social worker, counselor.	May need medications and/or counseling.

⁴⁰ Table on page 36 was taken, with permission, from: Beckwith, B, Dimambro, L. TBI Basics. Brain Injury Association of Michigan Annual Conference, 1996-2002.

Interactions of Behavior, Environment and Brain Chemistry

Convergence of Disciplines

When students of the brain learned that neurons communicate through chemical messengers, the stage was set for developing a new area of inquiry: behavioral pharmacology. This new discipline was based on a simple logic--if the communication system of brain cells is mediated by specific chemicals, then compounds that interact with these chemicals should change the messages. Consider, for example, that the behavior of drinking when thirsty might be controlled by the release of acetylcholine by certain brain cells. It should be possible to artificially stimulate this system by adding acetylcholine from another source. In the same way that Otto Loewi was able to change the rate of the heart beating in the second beaker, it should be possible to get a non-thirsty animal to drink by administering the appropriate drug. Conversely, it should be possible to prevent a thirsty animal from drinking by giving a drug that blocks the chemical messenger that is being released by the brain cells. These and other more complicated forms of behavior were simply substituted for the physiological test objects (e.g, heart, spleen, pupil, etc.) that were used by Elliot, Dale, Loewi and other pioneers in the field. The experiments worked, and a new area of research was born.

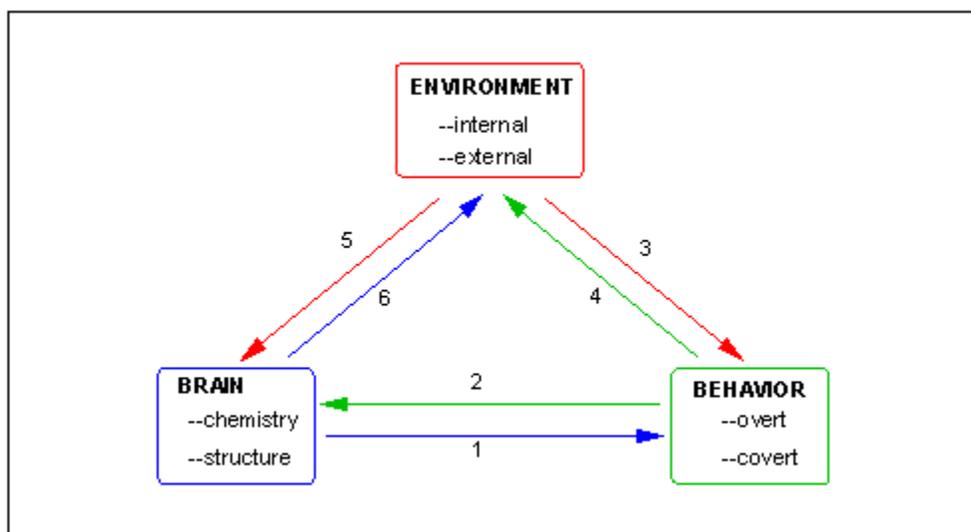
The ability to change behavior by altering brain chemistry underlined the importance of objective analysis of behavior. Behavior is more than a beating heart or a contracting eye muscle, and methods for the reliable observation of behavior were clearly needed. At about the same time that the early experiments in pharmacology were being conducted, a psychologist named B. F. Skinner was formulating a new approach for the study of behavior, which he called the analysis of operant behavior. This approach was published in a book entitled Behavior of Organisms (Skinner, 1938)-- a book, which became a benchmark in the study of behavior. The basic principles involved the careful control of the animal's environment and the measurements were limited strictly to the observable, objective responses of the animal (e.g, lever presses or key pecks.) Unobservable(s) such as fear, hunger, or thirst were specifically excluded from this system of analysis.

Skinner's system for the objective analysis of behavior was eagerly embraced by the students of the new pharmacology. The precision of the chemically specific transmitter systems was mirrored by the precision of the operant method of behavioral analysis. The convergence of these two systems became synonymous with behavioral pharmacology, and set forth the basic principle of the discipline: Specific changes in brain chemistry produce specific changes in behavior. The combination of operant analysis of behavior with pharmacological methods formed a powerful tool for researchers. It is an efficient and effective methodology for the development and screening of new drugs and, to a somewhat lesser extent, for the characterization of drug effects on behavior. But it is not enough. If we are to understand the broader implications of the chemistry of behavior, our considerations must go well beyond the effects of drugs on behavior.

Dynamics of Brain Chemistry and Behavior

Behavior has no clear beginning or end. The analysis of behavior starts out innocently enough to describe the interactions of the organism with the environment. More specifically, it is the interaction of the organism's brain with the environment. The environment includes not only the outside world, but also the organism's internal environment. Of course, the brain is a part of that internal environment and the behavior itself becomes a part of the environment. Lest we become tempted to pursue the logical proof that the universe is made up of behavior, let us return to some more direct issues to illustrate that these considerations are not just idle philosophical musings--we must understand the implications of these interactions in order to appreciate the dynamics of brain chemistry and behavior. These interactions are presented as six principles for understanding behavioral pharmacology:

The brain, behavior, and the environment have interpenetrating effects.



Principle 1. Changes in brain chemistry produce changes in behavior.

This is perhaps the most straightforward principle and, as indicated in our previous discussion, the one that has guided most of the research in behavioral pharmacology. Manipulation of the chemical system that controls behavior will change behavior.

Principle 2. Changes in behavior produce changes in brain chemistry.

This principle is a bit more subtle and offers the opportunity to confuse cause and correlation. The fact that behavioral change is correlated with the chemical changes that produced it is simply a restatement of Principle 1. The important point here is that behavioral change can actually produce changes in brain chemistry. One type of change is an increase in the efficiency of the chemical system that produces the behavior (analogous to increased muscle efficiency with exercise). This change may, in turn, produce changes in related chemical systems that were not directly involved in the first bit of behavior.

Principle 3. Changes in the environment produce changes in behavior.

This principle is the simple definition of behavior and requires little in the way of explanation. The major point that needs to be made is that the environment is quite extensive. It includes not only the relationships and contingencies of the external world, but also the internal milieu-- blood pressure, gastrointestinal activity, level of energy stores, memory of past experiences, etc. Until recently, the internal environment has been downplayed by the "black box" approach of experimental psychology.

Principle 4. Changes in behavior produce changes in the environment.

In some sense, the only role of behavior is to change the environment. In the simplest case, the behavior is operant and results in opened doors, captured prey, warmed cockles and the like. But just as the environment was expanded in the preceding paragraph, so must our notions of the effects of behavior be expanded to include, for example, changes in the internal environment either directly (as in the case of autonomic responses to a fear arousing situation) or indirectly (as in the case of nutritional changes).

Principle 5. Changes in the environment produce changes in brain chemistry.

We begin to complete the circuit through brain, behavior, and environment by noting that environmental changes can produce changes in brain chemistry. In some cases, the environment has tonic influences on brain chemistry as exemplified by responses to seasonal changes, temperature fluctuations, lighting changes and so forth. Other environmental changes are more closely interactive with behavior, and include responses to crowding, members of the opposite sex, complexity of the physical and behavioral environment, etc. These and many other types of environmental manipulations have been shown to alter the status of the neuro-chemical transmitter systems.

Principle 6. Changes in brain chemistry produce changes in the environment.

On the surface, this seems to be the least likely of the principles. Changes in brain chemistry obviously cannot directly perform operands like opening doors. It can, however, produce significant changes in the internal environment and set the stage for such operands to occur. The listing of these six principles is a formal way of stating the major considerations that must accompany our study of behavioral pharmacology. We do not recommend that you commit these principles to memory, because individually they represent an artificial analysis of the situation. There is a single statement that embodies all of these principles:

"Brain Chemistry, Behavior and the Environment Have Interpenetrating Effects."

This statement is the major theme of Skinner's book, and emphasizes the need to appreciate the complexities of the nervous system. Yes, drugs change behavior. But the effect of a drug can be altered by the organism's behavior, which in turn has been produced by current and past changes in the environment. Drugs do not possess some essence that magically induces a

change in behavior. They act through the normal channels of our physiological response to the environment. As human organisms in a complex environment, we are fortunate that these interactions are complicated. As students of behavior, these physiological interactions are pushed to their limits in our feeble attempts to understand them. Do not despair; the thrill is in the pursuit.

Note:

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Communication Style

Family Involvement⁴¹

Services of mental health programs are needed by both people with brain injury and their families. It does no good to remind the survivor how “lucky” he/she is to have recovered physically, when that person is unable to work, friends have fled, and family relations are stretched to the limit.

Psychological disabilities affect not only the person with a brain injury, but have an impact on family members as well.

Family problems may not be apparent until several months after the injured member is discharged from the hospital of in-patient rehabilitation program. Because the family often has the responsibility of carrying out the follow-up program, they become partners in the long-term rehabilitation of the person with brain injury. It can be up to the community mental health professionals

who see the person regularly over an extended period of time, to recognize and begin to assist the family learning to deal with prolonged difficulties.

Adjustment problems, which occur as a result of changes in the behavior and personality of a family member, can be more difficult for the family and the survivor to deal with than physical disability. These problems include role changes within the family, relations with friends and relatives outside the immediate family, changes in occupational status, and economic changes. Dramatic role changes can occur within the family. A strong highly motivated person may now be dependent and apathetic. A reliable breadwinner may be childish and impulsive.

Relationships between husbands and wives are not the only ones to change. Siblings and children of people with brain injury may also be affected, with feelings of guilt over the injured family member, or feelings of being neglected or ignored because of the needs of that person.

It can be extremely difficult for the family of a person with brain injury to accept the fact that their loved one may never again be that same person as before.

⁴¹ Material were taken, with permission, from: Brain Injury Association of Michigan, Traumatic Brain Injury Manual – What You Need to Know. Michigan: Brain Injury Association of Michigan, 1996

It is important to recognize the individual with brain injury in the context of his/her various relationships with the family, friends, and society in general. Interviews can be helpful.

- Does the person go out of the house?
- Does the person do any cleaning, grocery shopping, cooking, watch the kids, drive a car, or see relatives outside the immediate family?
- What are the prospects for returning to work, and at what job?
- Does the person have any hobbies or belong to any organizations?
- What resources are available in the local community?
- Do people seem accommodating, or are they “turned off” by the characteristics shown by the person with a brain injury?
- Are they frightened by the term “brain damage”, and will they respond positively to information offered?

People often expect that when someone is sick, or injured, he/she will recover and be the same as before. What the family is told in the beginning stages of brain injury rehabilitation is frequently general and vague and is not adequate preparation for dealing with problems of long duration or disabilities, which may be permanent. Information about specific deficits, their severity, and expected duration can be most reassuring to the families of people with brain injury.

The family is the one constant, on-going factor in the rehabilitation process. Because this process may be long and the outcome unpredictable, it is important that families receive the support they need to help sustain them. Services of mental health programs are needed by both the person with brain injury and family members, who may be confused and uncertain about appropriate ways of dealing with an injured family member and confused by their own emotional reactions. Families may become focused on the injured person, and contacts with people outside the family may decrease. They may encourage dependency and try to avoid potentially difficult social situations.

Family members, particularly spouses, may feel trapped, even when the changes in the injured person are considered to be “mild”. Those changes which might be categorized as “moderate” present even greater difficulty. The person with brain injury is considered well enough to function at home and in the community, but once there, his/her behavior may become disruptive and unsettling to those in close proximity. For those family members who deny the existence of obvious personality problems, the contact with an injured family member who manifests behavior and personality changes can be a source of conflict and stress which can lead to depression. Denial can be a needed coping mechanism in the early stages of recovery, but in the long run can prevent family members from accepting and dealing with problems.

A goal of family counseling may be to overcome this denial, with an acceptance of the situation as it realistic, and the provision, whenever possible, of adaptive coping mechanisms for dealing with conflict and stress.

Some families may be overoptimistic, with expectation for the injured person unrealistically high. This can do more harm than good for the person with brain injury who is unable (or unwilling) to recognize the changes, which have occurred as a result of the brain injury, or, if aware of the changes, who may feel rejected by the family because of the fact that such changes exist. Factual, realistic information should be provided to family members, who may need to overcome their sense of loss, and learn to live with a “different” person than the one they knew before.

Key components to building a successful relationship.

Once a person can address and accommodate their disability through their own courage, determination and hard work, they have a depth of spirit few know little about. The way in which we interact is primarily influenced by how we view each person whom we serve. If we believe that someone who experienced an injury is helpless, we may approach him as helpless. If we view someone as defiant or non-compliant, rather than someone who may be confused, overwhelmed and in need of assistance, we may treat that person in ways that may be undignified. All people have the right to be treated with respect and dignity.

General Guidelines for Maintaining a Positive and Supportive Environment⁴²

The success of any effort provided will be directly related to the relationship that exists between all members. The amount of support you provide and the degree to which that support is accepted by the individual will be proportional to the relationship that the individual has with you.

Relationship development will make a difference in the outcomes of services. The following are other guidelines and suggestions for enhancing the relationship that you have with the individual to create a positive and supportive environment:

- Empathic Listening
- Use of Tone, Volume and Cadence
- Communication Do’s and Don’ts

Empathic Listening

This strategy employs the thinking that in order to really understand what the person is experiencing, you must “put yourself in their shoes.” Through your communication with them, you try to feel what they are feeling, experience events as they experience them, and understand their responses. This is accomplished in the following manner:

42 Material on pages 39-51 were taken, with permission, from: Braunling-McMorrow D, Niemann GW, and Savage RC (eds.), Training Manual for Certified Brain Injury Specialists (CBIS) Level 1. Texas: HDI Publishers, 1998.

1. Don't be judgmental. When you judge a persons actions or responses, you will be unable to gain an understanding of the origin. You cannot have a sense of what she/he is experiencing that led to that response, if you are judgmental.
2. Don't ignore. Communicate and try to make sense of the individuals' way of responding.
3. Carefully listen to messages.
4. Use silence. Stay with the individual, but do not always respond or fill the silence with talking.
5. Use reflective listening. Repeat back to the person what you think you are hearing.

Monitor the Tone, Volume and Cadence of your voice

These nonverbal components of communication will also send messages to the person despite the content of your message. Make sure the nonverbal components match the verbal components.

1. Tone. Make your tone smooth and supportive. Try to avoid inflections of impatience, condescension and inattention.
2. Volume. Keep the volume of your voice at a moderate level. Avoid shouting or whispering.
3. Cadence. Deliver your message at an even cadence or rhythm. Avoid jumpy or excited patterns.

Communication Do's and Don'ts

Following is a list of recommendations for communication that will further enhance a positive and supportive environment:

DO

DO be accepting
 DO take every issue seriously
 DO address people age appropriately
 DO convey respect
 DO assist them in problem solving
 DO state relevant facts to those that need to know
 DO remember that you don't know how they feel
 DO get all the facts
 DO be their equal
 DO be sincere

DON'T

DON'T be blame/fault finding
 DON'T ignore an issue
 DON'T talk down to anyone
 DON'T patronize
 DON'T take responsibility for their situations
 DON'T gossip
 AVOID saying things like "I know,"
 "I know how you feel."
 DON'T make promises you can't keep
 AVOID domination

All staff must work together in order for these components to come together; all members have a part to play and a responsibility for the outcomes. People with brain injuries and their families have unique roles to play – they must be clear about the outcomes they desire. Individuals must try the strategies and programs identified to see if they are successful and then practice them in functional settings.

A Word about Labels

Language reflects and reinforces both our perceptions and misperceptions of others. All too frequently the terms used for people with disabilities perpetuate stereotypes and false ideas.

Often people with disabilities feel they are not treated with respect or dignity. Using respectful language can improve the manner in which people with disabilities are treated. When referring to a person with a disability remember to make reference to the **person first**, then the disability (for example: A “person with a brain injury” rather than “brain injured person”).

Objectionable	Explanation	Preferable
(The) disabled	Sees people only in terms of their disabilities	People with disabilities
Invalid	Inaccurate, most people with disabilities are	None is needed
Wheelchair bound	Creates a false impression; wheelchairs liberate, not confine or bind; they are mobility tools from which people transfer to sleep, sit in chairs, drive cars, etc.	Uses a wheelchair
Physically Challenged	Euphemisms avoid reality and rob people of dignity	A person has a physical, cognitive or mental disability
Inspirational	People with disabilities are not collectively inspirational or courageous	Acknowledge the person’s abilities and Individuality

When referring to yourself, your family or the people you serve, please use words that reflect dignity.

From Harvard Medical School

...The words and images you use can create either a straightforward, positive view of people with disabilities or an insensitive portrayal that reinforces common myths and is a form of discrimination... Listed below are preferred words that reflect a positive attitude in portraying disabilities:

Nondisabled : Appropriate term for people without disabilities. Normal, able-bodied, healthy, or whole are inappropriate.

Psychiatric disability: Words such as crazy, maniac, lunatic, demented, and psycho are offensive and should never be applied to people with mental health problems...

Acceptable terms are people with psychiatric disabilities, psychiatric illnesses, emotional disorders, or mental disabilities.

Stroke: Stroke survivor is preferred over stroke victim.

—*Guidelines for Reporting and Writing About People with Disabilities. Research and Training Center on Independent Living for Underserved Population. Fifth Edition, 1996.*

Suggestions for Working with Individuals with Brain Injury⁴³

1. Consistency is important

If all those who work with individuals with brain injury get together regularly, common strategies can be developed for use by all. It helps to try to see the person from all aspects. Changes for people with brain injury are difficult to deal with.

2. Treat the individual as an adult

Although behavior may be immature at times, the individual is easily embarrassed and will resent being talked “down to.” The individual may be acutely suffering awareness of being “different” (even if denying problems).

3. Recovery from brain injury is a learning process

One who understands and practices behavior and learning theories can greatly help. However, any behavior technique must fit the cognitive and emotional deficits. For example, over-stimulation or techniques requiring little repetition will generally not be useful.

4. Be patient

Change is slow. Not all problem areas can be addressed at once. Try to develop small steps, which can reinforce progress.

5. Over stimulation can hinder progress

The person with a brain injury often takes information more slowly and takes longer to process it. The “normal” pace of conversation and activity may be too much to follow or understand. Watch for overload and signs of frustration.

6. Model calm and controlled behavior yourself

The individual with a brain injury may pick up on non-verbal cues better than verbal ones. An individual may have a keen perception of those who really are concerned. Body language conveys a lot . . . try to be calm and friendly. This is especially important when an individual is agitated or irritable. Your calm behavior will also help reduce their fear and anxiety.

7. Expect the unexpected

People with brain injuries are more subject to “ups and downs,” mood changes, differences in alertness and attention span. Ability to cope may vary day-to-day or minute-to-minute. Helping the person regain control and be steady is important.

8. People with brain injuries are more sensitive to stress

Changes in routines, sleep patterns, colds, minor illnesses, fatigue, unexpected events such as disagreements with others, unkept appointments, etc., can drastically affect function. The individual must concentrate 100% on a task. Any distraction or interruption may produce the inability to perform. These persons need structure, guidance, reasonable demands, and more frequent breaks for mental rest.

43 Material on pages 43-44 were taken, with permission, from: Brain Injury Association of Michigan, Traumatic Brain Injury Manual – What You Need to Know. Michigan: Brain Injury Association of Michigan, 1996.

9. Individual may get worse before getting better

As the recovery period lengthens, the person may become more aware of limitations, more frustrated at inability to deal with day-to-day demands. Behavior may worsen. If not recognized and treated appropriately this stage can become a block to further progress.

10. Redirect the person

People with brain injury are usually very suggestible. If agitated, confused, frustrated or otherwise behaving inappropriately, getting the person's attention and introducing another topic, stimulus, or person may be very effective.

Adjustment to Disability

- Brain injury can be a catastrophic event, which dramatically changes a person and their family. A host of emotional responses may result. Over time, people often find that they adjust to the changes created by the brain injury. Adjustment doesn't mean that people are happy about the changes. Adjustment means they recognize that they cannot be changed, and rather than struggle toward the impossible, begin to set goals and make decisions based on the new self.
- The person who has sustained the brain injury often must develop a new sense of self, and the family must develop a new vision of who the person is. This is a gradual evolutionary process, which can be different for each individual and for each family.
- For the person with a brain injury, learning what a brain injury is, identifying the changes the injury has caused and, ultimately, adjusting to the new limitations resulting from the brain injury can be a challenging and difficult, but often necessary process.
- Family members often experience a similar process. They have the dual challenge of changing their vision of the person with a brain injury while the family is redefined and their role in it changes, too.
- Three general types of individual and family intervention have been identified and may prove be helpful at different stages of recovery: Information and education; support, problem solving, and restructuring; and formal therapy.

How to Help

Things you need to remember:

1. Reinforce the behaviors you would like to see increase. Like a garden, "water the behaviors you'd like to grow."
2. When safety is not an issue, ignore the behaviors you would like to decrease.
3. Model the behaviors you would like to see.
4. Avoid situations that provoke behaviors you are trying to reduce.
5. Structure the environment; use cues for positive behaviors. Plan rest periods.
6. Redirect the person rather than challenge them.
7. Seek professional help sooner rather than later.

Appendix

GLASGOW COMA SCALE (GCS)

Assessment of Conscious Level

Eye Opening

Spontaneous	Opens eyes on own	E 4
Speech	Opens eyes when asked to in a loud voice	3
Pain	Opens eyes upon pressure	2
Pain	Does not open eyes	1

Best Motor Response

Commands	Follows simple commands	M 6
Pain	Pulls examiner's hand away upon pressure	5
Pain	Pulls a part of body away upon pressure	4
Pain	Flexes body inappropriately to pain (decorticate posturing)	3
Pain	Body becomes rigid in an extended position upon pressure (decerebrate posturing)	2
Pain	Has no motor response	1

Verbal Response (Talking)

Speech	Carries on a conversation correctly and tells examiner where he/she is, who he/she is and the month and year	V 5
Speech	Seems confused or disoriented	4
Speech	Talks so examiner can understand victim but makes no sense	3
Speech	Makes sounds that examiner cannot understand	2
Speech	Makes no noise	1

Classifying the Severity of Traumatic Brain Injury	
Mild	Loss of Consciousness <20 minutes Post-Traumatic Amnesia <24 hours GCS = 13-15
Moderate	Loss of Consciousness \geq 20 minutes and \leq 36 hours Post-Traumatic Amnesia \geq 24 hours and \leq 7 days GCS = 9-12
Severe	Loss of Consciousness > 36 hours Post-Traumatic Amnesia > 7 days GCS = 3-8

RANCHO LOS AMIGOS

Levels Of Cognitive Functioning

To assist all those involved with the treatment and rehabilitation of the Closed Head Injured, a “Levels of Cognitive Functioning Scale” was developed by the Head Injury Treatment Team at Ranchos Los Amigos Hospital in Downey, California. This scale depicts certain characteristics of each phase of the recovery process following a head injury.

LEVEL I: No Response

No observable wake/sleep cycle, eye opening or purposeful movement. There is a complete absence of observable change in behavior when the patient is presented with visual, auditory, tactile, proprioceptive, vestibular or painful stimuli.

LEVEL II: Generalized Response

Demonstrates generalized reflex response to painful stimuli. Responds to external stimuli with physiological changes, generalized gross body movement and/or no purposeful vocalization (i.e. eye opening, papillary dilation, etc.) Responds to repeated auditory stimuli with increased or decreased activity. Responses to stimuli may be the same regardless of type and location of stimuli and they may be significantly delayed.

LEVEL III: Localized Response

Demonstrates withdrawal or vocalization to painful stimuli. Turns towards or away from auditory stimuli. Blinks when a strong light crosses the visual field. Follows moving object, which is passed within the visual field. Responds to discomfort by pulling tubes or restraints. Inconsistent responses are noted to simple commands. May respond to some persons (especially family and friends) but not to others.

LEVEL IV: Agitated and Confused Response

The individual is alert and in a heightened state of activity. They will make purposeful attempts to remove restraints or tubes and crawl out of bed. May perform motor activities such as sitting, reaching and walking but without any apparent purpose or upon another’s request. Hypersensitivity to external and internal stimuli. May cry out or scream out to stimulus even after its removal. May exhibit aggressive or flight behavior. Moods may swing from euphoric to hostile with no apparent relationship to environmental events. Unable to cooperate with treatment efforts. Verbalizations are frequently incoherent and/or inappropriate to activity or environment. Short-term memory is impaired. Goal directed, problem solving, and self-monitoring behaviors are absent.

LEVEL V: Inappropriate and Confused, Non-agitated Response

Alert, not agitated but may wander randomly or with a vague intention of going home. May become agitated in response to external stimulation and/or lack of environmental structure rather than internal confusion. Not oriented to person, place or time. The patient is highly distractible, their memory is severely impaired and they may confuse the past and present. May be able to perform previously learned tasks when structure and cues provided. Difficulty learning new information. Goal directed, problem solving, and self-monitoring behaviors are absent. Able to respond appropriately to simple commands fairly consistently with external structure and cues. The patient appears more calm and alert, and responds to simple, familiar commands like “brush your teeth”. Responses to simple commands without external structure are random and non-purposeful. At this stage, the patient can monitor self-care activities with assistance but is unable to learn new information. Verbalizations are often inappropriate and confabulation may exist in this level.

LEVEL VI: Appropriate and Confused Response

Marked signs of recovery noted at this level. Consistently able to follow simple commands and actively participate in their therapy program. Memory for past events shows improvement but recent memory remains impaired. Able to use memory aide with maximum assist. With supervision, structure, and cues, goal directed behavior is demonstrated. External cues are required for task completion. Decreased ability to process information. Limited ability to identify consequences to actions. Beginning to show awareness of their impairments, disabilities and safety risks.

LEVEL VII: Automatic and Appropriate Response

Able to go through their daily routine automatically often demonstrating a robot-like appearance. Consistently oriented to familiar surroundings but memory may be impaired for specifics. Able to attend to highly familiar tasks for at least 5 minutes in a non-distracting environment. Demonstrates initiative and carry-over for new learning, and participates in recreational and social activities. Requires supervision due to lack of judgment, problem solving and planning skills. Sometimes unrealistic regarding future plans. They lack insight into and demonstrate superficial awareness of their disability, even though they can recognize their physical disabilities. They may overestimate their abilities and be unaware of others’ needs and feelings. May be uncooperative. Unable to recognize inappropriate social interaction behavior.

LEVEL VIII: Purposeful and Appropriate Response

Patient is alert and fully oriented. Able to integrate and recall past and recent information. Able to independently complete familiar tasks when working in a distracting environment for at least 1 hour. Able to initiate familiar activities with intermittent assistance. Able to use assistive memory devices to recall schedule. Records critical information for later use with intermittent assistance. Aware of their disability but unable to self monitor and recognize a problem while it is happening. Able to think about consequences of a decision or action with minimal assistance. May be depressed, irritable, and argumentative. Some deficits that still persist are, decreased abstract reasoning, slow rate of processing new information/learning, low frustration tolerance and poor judgment in stressful or unfamiliar situations.

LEVEL IX: Purposeful and Appropriate Response; Stand-by Assistance on Request

Able to independently shift back and forth between tasks for at least two consecutive hours. Requires assistance with unfamiliar personal, household, work and leisure tasks. Aware of and acknowledges impairments and disabilities when they interfere with task completion and takes appropriate corrective action but requires stand-by assist to anticipate a problem before it occurs and take action to avoid it. Accurately estimates abilities but requires stand-by assistance to adjust to task demands. Acknowledges other's needs and feelings and responds appropriately with stand by assistance.

LEVEL X: Purposeful and Appropriate; Modified Independent

Able to handle multiple tasks simultaneously in all environments but may require periodic breaks. Able to independently procure, create and maintain own assistive memory devices. Independently initiates and carries out steps to complete familiar and unfamiliar personal tasks but may require more than the usual amount of time and/or compensatory strategies to complete them. Anticipates impact of impairments and disabilities on ability to complete daily living tasks and takes action to avoid problems before they occur. Able to independently think about consequences of decisions or actions but may require more than the usual amount of time and/or compensatory strategies to select the appropriate decision or action. Accurately estimates abilities and independently adjusts to task demands. Able to recognize the needs and feelings of others and automatically respond in appropriate manner. Irritable and low frustration tolerance noted when ill, fatigued and/or under emotional stress.

Information on the Cognitive Stages of Recovery was taken from a study guide called "Cognitive Treatment of the Closed Head Injured Patient". Copyright, 1983. Cardinal Hill Hospital, Lexington, Kentucky and from "TBI Rehabilitation: An Interdisciplinary Approach Based Upon The Revised Rancho Levels of Cognitive Functioning", a presentation by Chris Hagen in June 2001 in Detroit, Michigan.

Identifying a Possible Brain Injury⁴⁴

A history of physical abuse, a fall, or an accident resulting in any of the following issues help to identify an individual with a brain injury.

Verbal Issues

- Poor speech
- Monotone
- Vulgarity/swearing
- Talks too loud or too soft
- Difficulty “finding” words
- Broken speech

Personality Issues

- Denies deficits
- Appears unmotivated
- Egotistical
- Doesn’t listen
- Asks a lot of questions
- Argumentative
- Manipulative
- Irritable
- Moody – laughs or cries easily

Social Issues

- Poor eye contact
- Inappropriate social interaction (overly formal, overly friendly)
- Interrupts conversation
- Goes off on tangents
- Doesn’t recognize “personal space”
- Inappropriate conversation (sex, drugs, alcohol abuse, etc)
- Fabricates stories/lies

Behavioral Issues

- Wanders off/runs away
- Impulsive (acts without thinking)
- Repeated invasion of personal space
- Short fuse

Thinking Issues

- Easily distracted
- Seems to “space out”
- Difficulty understanding
- Difficulty with reality
- Seems confused
- Poor memory
- Decreased safety awareness
- Slow to answer questions
- Difficulty organizing (time, etc.)

⁴⁴ Material on page 50 was taken, with permission, from: Brain Injury Association of Michigan, Traumatic Brain Injury Manual – What You Need to Know. Michigan: Brain Injury Association of Michigan, 1996.

Some ways to identify clients with Brain Injuries in intake or any time you suspect a Brain Injury

Look for these signs:

- Physical signs like scars or irregularities of the face and head.
- Problems with balance, speech and/or co-ordination.
- Problems with thought processes a tangential thinking

Ask these questions :

- Have you ever been involved in a crash? (motor vehicle, fall, sports activity)
- Have you ever had a stroke?
- Have you ever fallen or been hit on the head? How often? When?
- Have you ever had periods of unconsciousness?
- Have you ever been hospitalized? Be specific. When? How many times?
- Was surgery done? When? Where?
- Are you on any seizure medication?
- Are you on any other medication? (Medication could be masking or exacerbating symptoms. This question will also rule out additional medical conditions)

How clients with Brain Injuries may present themselves in the program

They may:

- miss sessions
- not identify with group
- miss information, misunderstand what's said and fall behind
- ask about material already covered
- get stuck on one word or topic
- talk too much or go off on a tangent
- have difficulty keeping up with the conversation
- have poor follow-through on homework and assignments
- not pick up on social cues
- make socially inappropriate remarks (overly personal/blunt)
- become easily frustrated, irritable, impatient and overly emotional
- be unable to remember new information although historical memory is sound

How to modify your approach for consumers with Brain Injuries

- Simplify your language.
- Offer information in small bites.
- Give client extra time or individual time.
- Repeat information using short, simple phrases.
- Encourage note-taking or hand out printed notes.
- Anticipate a higher frequency of off-topic remarks.
- Keep instructions brief and clear.
- Get feedback — ask “Do you understand?”
- Summarize ideas and points.
- Redirect consumer when s/he goes off topic, talks excessively or behaves inappropriately.

What to keep in mind

- Client may lack insight as a result of the injury and may not recognize his/her cognitive deficits.
- Avoid confrontation over inappropriate behaviors. This will only escalate the situation. Instead, redirect client and roll with resistance. Be flexible, but make clear what's acceptable.
- Don't assume that non-compliance arises from lack of motivation or resistance. Check it out with client.

INTRODUCTION TO THE TRAUMATIC BRAIN INJURY MODEL SYSTEMS PROGRAM

In 1987, the National Institute on Disability and Rehabilitation Research of the United States Department of Education, authorized the establishment of a research and demonstration program which established model systems of care for person with traumatic brain injury (TBI).

Objectives of the TBI Model System programs are as follows: (1) Demonstrate and evaluate the cost benefit and service delivery outcomes of a comprehensive service delivery system for individuals with TBI; (2) Establish a research program to evaluate the development of a new database and conduct innovative analyses of research data; (3) Demonstrate and evaluate the development and application of improved and innovative methods essential to the care and rehabilitation of individuals with TBI; and (4) Participate in national studies of the TBI Model System concept by contributing to a national TBI database as prescribed by the Secretary of Education.

The model system of care provides a comprehensive, coordinated system of care for persons with traumatic brain injuries. The essential clinical components of a model system are: (1) Emergency Medical Services; (2) Acute neurosurgical and rehabilitative care in a trauma center environment; (3) Comprehensive rehabilitation services in an inpatient TBI rehabilitation unit; (4) Long-term interdisciplinary follow-up and outpatient rehabilitation services.

For further detailed information on the TBI Model Systems, please obtain the following references: (1) Rosenthal, M. (issue ed.) The Traumatic Brain Injury Model Systems of Care. Journal of Head Trauma Rehabilitation 1993;8(2); and (2) Caplan, B. (issue ed.) The National Institute on Disability and Rehabilitation Research TBI Model Systems Program. Journal of Head Trauma Rehabilitation 1996;11(5).

For more information about the TBI Model Systems, visit their web site at: <http://www.tbinc.org>

Current TBI Model Systems

Carolinas TBI Rehabilitation and Research System
Charlotte Institute of Rehabilitation
Charlotte, North Carolina
704-355-4330
Web site: <http://www.carolinashealthcare.org>

JFK-Johnson Rehabilitation Institute Traumatic Brain Injury Model System
Edison, NJ
732-906-2640
Web site: <http://www.njrehab.org/tbims>

Mayo Clinic Traumatic Brain Injury Model System
Mayo Medical Center
Department of Physical Medicine and Rehabilitation
Rochester, Minnesota
507-255-3116
Web site: <http://mayoresearch.mayo.edu/mayo/research/tbims>

New York TBI Model System
Mount Sinai School of Medicine
New York, NY
212-659-9372
Web site: <http://www.mssm.edu/nytbims>

North Texas TBI Model System
University of Texas Southwestern Medical Center
Dallas, TX
214-648-7613
Web site: <http://www.utsouthwestern.edu>

Northern California TBI Model System
Santa Clara Valley Medical Center
San Jose, California
408-793-6433
Web site: <http://www.tbi-sci.org>

The Ohio Regional TBI Model System
Ohio State University
Columbus, Ohio
614-293-3802
Web site: <http://www.ohiovalley.org>

National Data and Statistical Center for TBI Model Systems
(also the Rocky Mountain Regional Brain Injury System)
Craig Hospital
Englewood, Colorado
303-789-8565
Web site: <http://www.craighospital.org>

Southeastern Michigan Traumatic Brain Injury System
Rehabilitation Institute of Michigan
Detroit, Michigan
313-745-9763
Web site: <http://www.semtbis.org>

Spaulding/Partners TBI Model System at Harvard Medical School
Spaulding Rehabilitation Hospital
Boston, Massachusetts
617-573-2456
Web site: <http://www.spauldingrehab.org/ourprograms/tbims>

Moss TBI Model System
Moss Rehabilitation Research Institute
Philadelphia, PA
215-456-6544

Web site:
<http://www.einstein.edu/yourhealth/physicalrehab/braininjury/index.html>

TBI Model System of Mississippi
Methodist Hospital and Rehabilitation Center
Jackson, Mississippi
601-364-3448
Web site: <http://www.mmrc rehab.org>

University of Alabama at Birmingham TBI Care System
Spain Rehabilitation Center
Birmingham, Alabama
205-934-3283
Web site: <http://www.uab.edu/tbi>

University of Pittsburgh Medical Center TBI Model System
Dept. of Physical Medicine and Rehabilitation
Pittsburgh, PA
412-648-6979
Web site: <http://www.upmc.edu/tbi/>

The Virginia Commonwealth TBI Model System
Virginia Commonwealth University/Medical Center college of Virginia
Richmond, VA
804-828-3704
Web site: <http://www.tbi.pmr.vcu.edu/>

University of Washington TBI Model System
Seattle, Washington
206-685-0935
Web site: <http://depts.washington.edu/rehab/tbi>

Rehabilitation Research and Training Centers

Rehabilitation Research and Training Centers (RRTCs) are supported and funded by the National Institute on Disability and Rehabilitation Research (NIDRR). There are two RRTCs which specifically address traumatic brain injury and the needs of persons with brain injury.

RRTC on Community Integration of Persons with Traumatic Brain Injury

Mt. Sinai Medical Center
Department of Rehabilitation Medicine
One Gustave L. Levy, Box 1240
New York, NY 10029
(212) 348-7917
(212) 348-5901 Fax

RRTC on Rehabilitation Interventions in Traumatic Brain Injury

The Institute for Rehabilitation and Research
133 Moursund Avenue
Houston, TX 77030
(713) 666-9550
(713) 668-5210 Fax

Regional Traumatic Brain Injury Rehabilitation and Prevention Centers

There are currently two Regional Traumatic Brain Injury Rehabilitation and Prevention Centers. Each TBI center undertakes a number of specific projects to accomplish its goals. Activities of these centers include projects to: eliminate the barriers to the provision of services; develop innovative vocational rehabilitation programs for people with brain injury; conduct programs aimed at both primary and secondary prevention of brain injury; and develop models of community re-entry and substance abuse treatment. The two TBI Centers are:

Southeastern Comprehensive Head Injury Center

University of Alabama at Birmingham
1521 11th Avenue, South
Birmingham, AL 35294-4551
(205) 934-2442

Ohio Valley Center for Brain Injury Prevention and Rehabilitation

1335 Dublin Road, Suite 50-A
Columbus, OH 43215-1000
(614) 293-3802

Oregon Resources:

- **Brain Injury Association of Oregon**
2145 NW Overton Street
Portland OR 97210
(800) 544-5243 • (503) 413-7707
biaor@biaoregon.org • www.biaoregon.org
Support Groups statewide:
<http://biaoregon.org/supportgrp.htm>
- **Oregon Health Plan (OHP)**
Oregon Department of Human Services
Health Services
Office of Medical Assistance Programs
500 Summer St. NE E37, Salem, OR 97301-1079
(503) 945-5772 • (1-800) 527-5772
TTY: 1-800-375-2863
www.oregon.gov/DHS/healthplan/index.shtml
- **Oregon Advocacy Center**
620 SW 5th Avenue, 5th Floor
Portland, Oregon, 97204-1428
503-243-2081 • 1-800-452-1694
503-323-9161 (TTY) • 1-800-556-5351 (TTY)
- **Oregon Department of Vocational Rehabilitation**
PORTLAND
Central Portland OVRS
3945 SE Powell Blvd.
Portland, OR 97202-1721
503-731-3210 • 503-731-3211 (TTY)
www.oregon.gov/DHS/vr/officelocation.shtml
- **Independent Living Resources (ILR)**
2410 SE 11th Avenue
Portland, Oregon 97214-5308
503-232-7411 • TTY: 503-232-8408
ilrpxd@qwest.net • www.ilr.org
- **Pacific University Psychological Service Center**
511 SW 10th Ave, Suite 400
Portland, OR 97205
(503) 352-2400
- **Rehabilitation Institute of Oregon (RIO) Inpatient/Acute Services**
1015 N.W. 22nd Avenue
Portland, Oregon 97210
503-413-6931
- **Brain Injury Rehabilitation Center (BIRC)**
1815 SW Marlow, Suite 110
Portland, OR 97225
503-292-0765 • 800-320-0681
www.progrehab.com/prabrain.htm
- **Community Rehabilitation Services of Oregon**
Jan Johnson
1601 Oak St, Eugene, OR 97401
(541) 342-1980
- **University Of Oregon Speech- Language - Hearing Center**
State of the art cognitive rehabilitation services to children and adults; supervised by experienced speech-language pathologists, who consult with expert cognitive rehabilitation specialist, Dr. McKay Moore Sohlberg.
5252 University of Oregon
Eugene, OR 97403-5252
541 346 3593
- **Northwest Neurodevelopmental Training Center**
A non-profit who's primary focus is to provide a neurological evaluation for the purpose of creating a home-based developmental program that addresses causes of dysfunction rather than symptoms.
152 Arthur Street
PO Box 406 Woodburn, OR 97072
503-981-0635

Glossary of Terms for Brain Injury

A

Abstract Concept - A concept or idea not related to any specific instance or object and which potentially can be applied to many different situations or objects. Persons with cognitive deficits often have difficulty understanding abstract concepts.

Abstract Thinking - Being able to apply abstract concepts to new situations and surroundings.

Abulia - Absence or inability to exercise will-power or to make decisions. Also, slow reaction, lack of spontaneity, and brief spoken responses. Usually associated with damage to a cerebellar vessel. *See also cerebellum.*

Acalculia - The inability to perform simple problems of arithmetic. *See also parietal lobe.*

Acute Care - The phase of managing health problems which is conducted in a hospital on patients needing medical attention.

Acute Rehabilitation Program - Primary emphasis is on the early phase of rehabilitation that usually begins as soon as the patient is medically stable. The program is designed to be comprehensive and based in a medical facility with a typical length of stay of 1-3 months. Treatment is provided by an identifiable team in a designated unit. *See Program/Service Types.*

Adaptive/Assistive Equipment - A special device which assists in the performance of self-care, work or play/leisure activities or physical exercise. *See also adaptive equipment catalog.*

Affect - The observable emotional condition of an individual at any given time. *See also frontal lobe.*

Agnosia - Failure to recognize familiar objects although the sensory mechanism is intact. May occur for any sensory modality.

Agraphia - Inability to express thoughts in writing. *See also parietal lobe.*

Alexia - Inability to read. *See also parietal lobe.*

Ambulate - To walk.

Amnesia - Lack of memory about events occurring during a particular period of time. *See also:* anterograde amnesia, retrograde amnesia, post-traumatic amnesia.

Aneurysm - A balloon-like deformity in the wall of a blood vessel. The wall weakens as the balloon grows larger, and may eventually burst, causing a hemorrhage.

Anomia - Inability to recall names of objects. Persons with this problem often can speak fluently but have to use other words to describe familiar objects. *See also parietal lobe.*

Anosmia - Loss of the sense of smell.

Anoxia - A lack of oxygen. Cells of the brain need oxygen to stay alive. When blood flow to the brain is reduced or when oxygen in the blood is too low, brain cells are damaged.

Anterograde Amnesia - Inability to consolidate information about ongoing events. Difficulty with new learning.

Anticonvulsant - Medication used to decrease the possibility of a seizure (e.g., Dilantin, Phenobarbital, Mysoline, Tegretol). *See also* **pharmacology guide**.

Antidepressants - Medication used to treat depression. *See also* **pharmacology guide**.

Aphasia - Loss of the ability to express oneself and/or to understand language. Caused by damage to brain cells rather than deficits in speech or hearing organs. *See also* **frontal** and **temporal** lobes.

Apraxia - Inability to carry out a complex or skilled movement; not due to paralysis, sensory changes, or deficiencies in understanding. *See also* **parietal lobe**.

Apraxia - A condition in which there is a loss of production or comprehension of the meaning of different tones of voice.

Arousal - Being awake. Primitive state of alertness managed by the reticular activating system (extending from medulla to the thalamus in the core of the brain stem) activating the cortex. Cognition is not possible without some degree of arousal. *See also* **brain stem**.

Articulation - Movement of the lips, tongue, teeth and palate into specific patterns for purposes of speech. Also, a movable joint.

Aspiration - When fluid or food enters the lungs through the wind pipe. Can cause a lung infection or pneumonia.

Astereognosia - Inability to recognize things by touch. *See also* **parietal lobe**.

Ataxia - A problem of muscle coordination not due to apraxia, weakness, rigidity, spasticity or sensory loss. Caused by lesion of the cerebellum or basal ganglia. Can interfere with a person's ability to walk, talk, eat, and to perform other self care tasks. *See also* **cerebellum**.

Attendant Care - Provision of assistance in activities of daily living for a person with disability. Daily number of hours of required assistance, either physical or supervisory.

Atrophy - A wasting away or decrease in size of a cell, tissue, organ, or part of the body caused by lack of nourishment, inactivity or loss of nerve supply.

Attention/Concentration - The ability to focus on a given task or set of stimuli for an appropriate period of time.

Audiologist - One who evaluates hearing defects and who aids in the rehabilitation of those who have such defects.

Augmentative and Alternative Communication - Use of forms of communication other than speaking, such as: sign language, "yes, no" signals, gestures, picture board, and computerized speech systems to compensate (either temporarily or permanently) for severe expressive communication disorders.

ADL - Activities of daily living. Routine activities carried out for personal hygiene and health (including bathing, dressing, feeding) and for operating a household.

B

Balance - The ability to use appropriate righting and equilibrium reactions to maintain an upright position. It is usually tested in sitting and standing positions.

Behavior - The total collection of actions and reactions exhibited by a person. *See also* **Working with**

Behavior Disorders.

Bilateral - Pertaining to both right and left sides.

Brain Injury, Acquired - The implication of this term is that the individual experienced normal growth and development from conception through birth, until sustaining an insult to the brain at some later time that resulted in impairment of brain function.

Brain Injury, Closed - Occurs when the head accelerates and then rapidly decelerates or collides with another object (for example the windshield of a car) and brain tissue is damaged, not by the presence of a foreign object within the brain, but by violent smashing, stretching, and twisting, of brain tissue. Closed brain injuries typically cause diffuse tissue damage that results in disabilities that are generalized and highly variable.

Brain Injury, Mild - A patient with a mild traumatic brain injury is a person who has had a traumatically-induced physiological disruption of brain function, as manifested by at least one of the following: 1) any period of loss of consciousness, 2) any loss of memory for events immediately before or after the accident, 3) any alteration in mental state at the time of the accident (e.g., feeling dazed, disoriented, or confused), 4) focal neurological deficit(s) which may or may not be transient; but where the severity of the injury does not exceed the following: a) loss of consciousness of approximately 30 minutes or less; b) after 30 minutes, an initial Glasgow Coma Scale score of 13-15; c) Post Traumatic Amnesia not greater than 24 hours.

Brain Injury, Traumatic - Damage to living brain tissue caused by an external, mechanical force. It is usually characterized by a period of altered consciousness (amnesia or coma) that can be very brief (minutes) or very long (months/indefinitely). The specific disabling condition(s) may be orthopedic, visual, aural, neurologic, perceptive/cognitive, or mental/emotional in nature. The term does not include brain injuries that are caused by insufficient blood supply, toxic substances, malignancy, disease-producing organisms, congenital disorders, birth trauma or degenerative processes.

Brain Plasticity - The ability of intact brain cells to take over functions of damaged cells; plasticity diminishes with maturation.

Brain Scan - An imaging technique in which a radioactive dye (radionuclide) is injected into the blood stream and then pictures of the brain are taken to detect tumors, hemorrhages, blood clots, abscesses or abnormal anatomy.

Brain Stem - The lower extension of the brain where it connects to the spinal cord. Neurological functions located in the brain stem include those necessary for survival (breathing, heart rate) and for arousal (being awake and alert).

C

Case Management - Facilitating the access of a patient to appropriate medical, rehabilitation and support programs, and coordination of the delivery of services. This role may involve liaison with various professionals and agencies, advocacy on behalf of the patient, and arranging for purchase of services where no appropriate programs are available.

Catheter - A flexible tube for withdrawing fluids from, or introducing fluids into, a cavity of the body. Frequently used to drain the urinary bladder (Foley catheter).

Cerebellum - The portion of the brain (located at the back) which helps coordinate movement. Damage may result in ataxia.

Cerebral-spinal Fluid (CSF) - Liquid that fills the ventricles of the brain and surrounds the brain and spinal cord.

Chronic - Marked by long duration or frequent recurrence.

Circumlocution - Use of other words to describe a specific word or idea that cannot be remembered.

Client - A person under the protection of another; one who engages the professional advice or services of another. See Consumer and Patient.

Clonus - A sustained series of rhythmic jerks following quick stretch of a muscle.

Cognition - The conscious process of knowing or being aware of thoughts or perceptions, including understanding and reasoning.

Cognitive Rehabilitation - Therapy programs that aid persons in the management of specific problems in perception, memory, thinking and problem solving. Skills are practiced and strategies are taught to help improve function and/or compensate for remaining deficits. The interventions are based on an assessment and understanding of the person's brain-behavior deficits and services are provided by qualified practitioners.

Coma - A state of unconsciousness from which the patient cannot be awakened or aroused, even by powerful stimulation; lack of any response to one's environment. Defined clinically as an inability to follow a one-step command consistently; Glasgow Coma Scale score of 8 or less.

Communicative Disorder - An impairment in the ability to 1) receive and/or process a symbol system, 2) represent concepts or symbol systems, and/or 3) transmit and use symbol systems. The impairment may be observed in disorders of hearing, language, and/or speech processes.

Community Skills - Those abilities needed to function independently in the community. They may include: telephone skills, money management, pedestrian skills, use of public transportation, meal planning and cooking.

Comprehension - Understanding of spoken, written, or gestural communication.

Concentration - Maintaining attention on a task over a period of time; remaining attentive and not easily diverted.

Concrete Thinking - A style of thinking in which the individual sees each situation as unique and is unable to generalize from the similarities between situations. Language and perceptions are interpreted literally so that a proverb such as "a stitch in time saves nine" cannot be readily grasped.

Concussion - The common result of a blow to the head or sudden deceleration usually causing an altered mental state, either temporary or prolonged. Physiologic and/or anatomic disruption of connections between some nerve cells in the brain may occur. Often used by the public to refer to a brief loss of consciousness.

Confabulation - Verbalizations about people, places, and events with no basis in reality. May be a detailed account delivered.

Confusion - A state in which a person is bewildered, perplexed, or unable to self-orient.

Conjugate Movement - Both eyes move simultaneously in the same direction. Convergence of the eyes toward the midline (crossed eyes) is a disconjugate movement.

Contracture - Loss of range of motion in a joint due to abnormal shortening of soft tissues.

Convergence - Movement of two eyeballs inward to focus on an object moved closer. The nearer the object, the greater is the degree of convergence necessary to maintain single vision. See also [vision after head injury](#).

Cortical Blindness - Loss of vision resulting from a lesion of the primary visual areas of the occipital lobe. Light reflex is preserved.

Contrecoup - Bruising of brain tissue on the side opposite where the blow was struck.

CT Scan/Computerized Axial Tomography - A series of X-rays taken at different levels of the brain that allows the direct visualization of the skull and intracranial structures. A scan is often taken soon after the injury to help decide if surgery is needed. The scan may be repeated later to see how the brain is recovering.

D

Decerebrate Posture (Decerebrate Rigidity) - Exaggerated posture of extension as a result of a lesion to the prepontine area of the brain stem, and is rarely seen fully developed in humans. In reporting, it is preferable to describe the posture seen.

Decorticate Posture (Decorticate Rigidity) - Exaggerated posture of upper extremity flexion and lower extremity extension as a result of a lesion to the mesencephalon or above. In reporting, it is preferable to describe the posture seen.

Decubitus - Pressure area, bed sore, skin opening, skin breakdown. A discolored or open area of skin damage caused by pressure. Common areas most prone to breakdown are buttocks or backside, hips, shoulder blades, heels, ankles and elbows.

Diffuse Axonal Injury (DAI) - A shearing injury of large nerve fibers (axons covered with myelin) in many areas of the brain. It appears to be one of the two primary lesions of brain injury, the other being stretching or shearing of blood vessels from the same forces, producing hemorrhage.

Diffuse Brain Injury - Injury to cells in many areas of the brain rather than in one specific location.

Diplopia - Seeing two images of a single object; double vision. See also [vision after head injury](#).

Discipline - When referring to health care or education it means a particular field of study, such as medicine, occupational therapy, nursing, recreation therapy or others.

Disinhibition - Inability to suppress (inhibit) impulsive behavior and emotions.

Disorientation - Not knowing where you are, who you are, or the current date. Health professionals often speak of a normal person as being oriented "times three" which refers to person, place and time.

Dorsiflexion - When applied to the ankle, the ability to bend at the ankle, moving the front of the foot upward.

Dysarthria - Difficulty in forming words or speaking them because of weakness of muscles used in speaking or because of disruption in the neuromotor stimulus patterns required for accuracy and velocity of speech.

Dysphagia - A swallowing disorder characterized by difficulty in oral preparation for the swallow, or in moving material from the mouth to the stomach. This also includes problems in positioning food in the mouth.

E

Edema - Collection of fluid in the tissue causing swelling.

Electroencephalogram (EEG) - A procedure that uses electrodes on the scalp to record electrical activity of the brain. Used for detection of epilepsy, coma, and brain death.

Electromyography (EMG) - An insertion of needle electrodes into muscles to study the electrical activity of muscle and nerve fibers. It may be somewhat painful to the patient. Helps diagnose damage to nerves or muscles.

Emotional Lability - Exhibiting rapid and drastic changes in emotional state (laughing, crying, anger) inappropriately without apparent reason.

Endotracheal Tube - A tube that serves as an artificial airway and is inserted through the patient's mouth or nose. It passes through the throat and into the air passages to help breathing. To do this it must also pass through the patient's vocal cords. The patient will be unable to speak as long as the endotracheal tube is in place. It is this tube that connects the respirator to the patient.

Evoked Potential - Registration of the electrical responses of active brain cells as detected by electrodes placed on the surface of the head at various places. The evoked potential, unlike the waves on an EEG, is elicited by a specific stimulus applied to the visual, auditory or other sensory receptors of the body. Evoked potentials are used to diagnose a wide variety of central nervous system disorders.

Extended Care Facility-Basic - Residential facility that supplies 24-hour nursing care and supervision and assistance with activities of daily life. See Program/Service Types.

Extended Care Facility-Skilled - A residential facility for the patient who requires 24-hour nursing care (IV, intramuscular injections, special feeding tubes, skin care, oxygen) and rehabilitative therapy, such as physical therapy, occupational therapy, or speech therapy on a less intensive basis than as an inpatient in a comprehensive rehabilitation center. An extended care facility can be a short-term alternative (a few months) prior to placement at home (with outpatient therapy) or in a nursing home. See Program/Service Types.

Extremity - Arm or leg.

F

Figure-Ground - The differentiation between the foreground and the background of a scene; this refers to all sensory systems, including vision, hearing, touch.

Flaccid - Lacking normal muscle tone; limp.

Flexion - Bending a joint.

Foley Catheter - This is a tube inserted into the urinary bladder for drainage of urine. The urine drains through the tube and collects into a plastic bag.

Frontal Lobe - Front part of the brain; involved in planning, organizing, problem solving, selective attention, personality and a variety of "higher cognitive functions."

Frustration Tolerance - The ability to persist in completing a task despite apparent difficulty. Individuals with a poor frustration tolerance will often refuse to complete tasks that are the least bit difficult. Angry behavior, such as yelling or throwing things while attempting a task is also indicative of poor frustration tolerance.

G

Gainful Occupation - Includes employment in the competitive labor market, practice of a profession, farm or family work (including work for which payment is "in kind" rather than in cash), sheltered employment, work activity (to the extent that there is net pay), and home industries or other home-bound work.

Gait Training - Instruction in walking, with or without equipment; also called "ambulation training."

GI Tube - A tube inserted through a surgical opening into the stomach. It is used to introduce liquids, food, or medication into the stomach when the patient is unable to take these substances by mouth.

Glasgow Coma Scale - A standardized system used to assess the degree of brain impairment and to identify the seriousness of injury in relation to outcome. The system involves three determinants: eye opening, verbal responses and motor response all of which are evaluated independently according to a numerical value that indicates the level of consciousness and degree of dysfunction. Scores run from a high of 15 to a low of 3. Persons are considered to have experienced a 'mild' brain injury when their score is 13 to 15. A score of 9 to 12 is considered to reflect a 'moderate' brain injury and a score of 8 or less reflects a 'severe' brain injury.

H

Head Injury - Refers to an injury of the head and/or brain, including lacerations and contusions of the head, scalp and/or forehead. See also **Brain Injury**.

Hematoma - The collection of blood in tissues or a space following rupture of a blood vessel.

Regarding Brain: Epidural--Outside the brain and its fibrous covering, the dura, but under the skull.

Subdural--Between the brain and its fibrous covering (dura). Intracerebral--In the brain tissue.

Subarachnoid--Around the surfaces of the brain, between the dura and arachnoid membranes.

Hemianopsia Hemianopia - Visual field cut. Blindness for one half of the field of vision. This is not the right or left eye, but the right or left half of vision in each eye. See also **vision after head injury**.

Hemiparesis - Weakness of one side of the body.

Hydrocephalus - Enlargement of fluid-filled cavities in the brain, not due to brain atrophy.

Hypoxia - Insufficient oxygen reaching the tissues of the body.

I

Impulse Control - Refers to the individual's ability to withhold inappropriate verbal or motor responses while completing a task. Persons who act or speak without first considering the consequences are viewed as having poor impulse control.

Incontinent - Inability to control bowel and bladder functions. Many people who are incontinent can become continent with training.

Initiative - Refers to the individual's ability to begin a series of behaviors directed toward a goal.

Interdisciplinary Approach - A method of diagnosis, evaluation, and individual program planning in which two or more specialists, such as medical doctors, psychologists, recreational therapists, social workers, etc., participate as a team, contributing their skills, competencies, insights, and perspectives to focus on identifying the developmental needs of the person with a disability and on devising ways to meet those needs.

Intracranial Pressure (ICP) - Cerebrospinal fluid (CSF) pressure measured from a needle or bolt introduced into the CSF space surrounding the brain. It reflects the pressure inside of the skull.

J

Jargon - Spoken language that has a normal rate and rhythm but is full of nonsense words.

Job Analysis - Involves the systematic study of an occupation in terms of what the worker does in relation to data, people, and things; the methods and techniques employed, the machines, tools, equipment, and work aids used; the materials, products, subject matter or services which result, and the traits required of the worker.

K

Kinesthesia - The sensory awareness of body parts as they move (see Position Sense and Proprioception).

L

Lability - State of having notable shifts in emotional state (e.g., uncontrolled laughing or crying).

Leg Bag - A small, thick plastic bag that can be tied to the leg and collects urine. It is connected by tubing to a catheter inserted into the urinary bladder.

Locked-in Syndrome - A condition resulting from interruption of motor pathways in the ventral pons, usually by infarction. This disconnection of the motor cells in the lower brain stem and spinal cord from controlling signals issued by the brain leaves the patient completely paralyzed and mute, but able to receive and understand sensory stimuli; communication may be possible by code using blinking, or movements of the jaw or eyes, which can be spared.

M

Magnetic Resonance Imaging (MRI) - A type of diagnostic radiography using electromagnetic energy to create an image of soft tissue, central nervous system and musculoskeletal systems.

Malingering - To pretend inability so as to avoid duty or work.

Memory, Episodic - Memory for ongoing events in a person's life. More easily impaired than semantic memory, perhaps because rehearsal or repetition tends to be minimal.

Memory, Immediate - The ability to recall numbers, pictures, or words immediately following presentation. Patients with immediate memory problems have difficulty learning new tasks because they cannot remember instructions. Relies upon concentration and attention.

Memory, Long Term - In neuropsychological testing, this refers to recall thirty minutes or longer after presentation. Requires storage and retrieval of information which exceeds the limit of short term memory.

Memory, Short Term - Primary or 'working' memory; its contents are in conscious awareness. A limited capacity system that holds up to seven chunks of information over periods of 30 seconds to several minutes, depending upon the person's attention to the task.

Money Management - Ability to distinguish the different denominations of money, count money, make change, budget.

Motor Control - Regulation of the timing and amount of contraction of muscles of the body to produce smooth and coordinated movement. The regulation is carried out by operation of the nervous system.

Motor Planning - Action formulated in the mind before attempting to perform.

Muscle Tone - Used in clinical practice to describe the resistance of a muscle to being stretched. When the peripheral nerve to a muscle is severed, the muscle becomes flaccid (limp). When nerve fibers in the brain or spinal cord are damaged, the balance between facilitation and inhibition of muscle tone is disturbed. The tone of some muscles may become increased and they resist being stretched--a condition called hypertonicity or spasticity.

N

Nasogastric Tube (NG Tube) - A tube that passes through the patient's nose and throat and ends in the patient's stomach. This tube allows for direct "tube feeding" to maintain the nutritional status of the patient or removal of stomach acids.

Neglect - Paying little or no attention to a part of the body.

Neologism - Nonsense or made-up word used when speaking. The person often does not realize that the word makes no sense.

Neurologist - A physician who specializes in the nervous system and its disorders.

Neuropsychologist - A psychologist who specializes in evaluating (by tests) brain/behavior relationships, planning training programs to help the survivor of brain injury return to normal functioning and recommending alternative cognitive and behavioral strategies to minimize the effects of brain injury. Often works closely with schools and employers as well as with family members of the injured person.

Non-ambulatory - Not able to walk.

Nystagmus - Involuntary horizontal, vertical, or rotary movement of the eyeballs. See also [vision after head injury](#).

O

Occipital Lobe - Region in the back of the brain that processes visual information. Damage to this lobe

can cause visual deficits.

Occupational Therapy - Occupational Therapy is the therapeutic use of self-care, work and play activities to increase independent function, enhance development and prevent disability; may include the adaptation of a task or the environment to achieve maximum independence and to enhance the quality of life. The term occupation, as used in occupational therapy, refers to any activity engaged in for evaluating, specifying and treating problems interfering with functional performance.

Orientation - Awareness of one's environment and/or situation, along with the ability to use this information appropriately in a functional setting.

Orthopedics - The branch of medicine devoted to the study and treatment of the skeletal system, its joints, muscles and associated structures.

Orthosis - Splint or brace designed to improve function or provide stability.

Outpatient - The patient residing outside the hospital but returning on a regular basis for one or more therapeutic services.

P

Paraplegia - Paralysis of the legs (from the waist down).

Parietal Lobe - One of the two parietal lobes of the brain located behind the frontal lobe at the top of the brain.

Perception - The ability to make sense of what one sees, hears, feels, tastes or smells. Perceptual losses are often very subtle, and the patient and/or family may be unaware of them.

Perseveration - The inappropriate persistence of a response in a current task that may have been appropriate for a former task. Perseverations may be verbal or motoric.

Persistent Vegetative State (PVS) - A long-standing condition in which the patient utters no words and does not follow commands or make any response that is meaningful.

Phonation - The production of sound by means of vocal cord vibration.

Physiatrist - Pronounced Fizz ee at' rist. A physician who specializes in physical medicine and rehabilitation. Some physiatrists are experts in neurologic rehabilitation, trained to diagnose and treat disabling conditions. The physiatrist examines the patient to assure that medical issues are addressed; provides appropriate medical information to the patient, family members and members of the treatment team. The physiatrist follows the patient closely throughout treatment and oversees the patient's rehabilitation program.

Physical Therapist - The physical therapist evaluates components of movement, including: muscle strength, muscle tone, posture, coordination, endurance, and general mobility. The physical therapist also evaluates the potential for functional movement, such as ability to move in the bed, transfers and walking and then proceeds to establish an individualized treatment program to help the patient achieve functional independence.

Plasticity - The ability of cellular or tissue structures and their resultant function to be influenced by an ongoing activity.

Plateau - A temporary or permanent leveling off in the recovery process.

Post Traumatic Amnesia (PTA) - A period of hours, weeks, days or months after the injury when the patient exhibits a loss of day-to-day memory. The patient is unable to store new information and therefore has a decreased ability to learn. Memory of the PTA period is never stored, therefore things

that happened during that period cannot be recalled. May also be called Anterograde Amnesia.

Posture - The attitude of the body. Posture is maintained by low-grade, continuous contraction of muscles which counteract the pull of gravity on body parts. Injury to the nervous system can impair the ability to maintain normal posture, for example holding up the head.

Pre-Morbid Condition - Characteristics of an individual present before the disease or injury occurred.

Problem-Solving Skill - Ability to consider the probable factors that can influence the outcome of each of various solutions to a problem, and to select the most advantageous solution. Individuals with deficits in this skill may become "immobilized" when faced with a problem. By being unable to think of possible solutions, they may respond by doing nothing.

Prognosis - The prospect as to recovery from a disease or injury as indicated by the nature and symptoms of the case.

Program/Service Types - The following program/service categories describe the array of organized services (not mutually exclusive) and not an exhaustive list available for the rehabilitation of persons with brain injury:

Acute Rehabilitation

Based in a medical facility; accepts patient as soon as medically stable; focuses on intensive physical and cognitive restorative services in early months after injury; typical length of stay one week to several months (short term); identifiable team and program with specialized unit.

Behavior Disorders

For the patient exhibiting patterns of behavior preventing participation in active rehabilitation, including destructive patient behavior to self and others; continuum of controlled settings.

Community Integration Program

Provides services designed to accomplish functional outcomes focused on home and community integration, including productive activity. Services may be provided in residential facilities, day treatment programs, the consumer's home. They may be of short-term (several weeks) or long-term duration (several months).

Independent Living

Community-based to maximize a person's ability to be empowered and self-directed; allows an individual to live in one's own home with maximum personal control over how services are delivered, combined with the opportunity to work as appropriate.

Lifelong Living

For persons discharged from rehabilitation who need ongoing lifetime supports; located in residential or skilled nursing environment; structured activities available on individual and group basis.

Postacute Rehabilitation

Are programs designed to provide intensive, 24-hour rehabilitation to improve cognitive, physical, emotional, and psychosocial abilities, to facilitate better independent living skills. Facilities typically provide a full spectrum of clinical therapies, as well as life-skills training in a residential setting.

Residential Services

Assumes a 24-hour residential environment outside the home and includes 24-hour provision of or access to support personnel capable of meeting the client's needs. (Adopted by the PostAcute Committee of ISIG on Head Injury October 28, 1991.)

Subacute

May follow a period of acute rehabilitation; not necessarily hospital based; typical length of rehabilitation stay 6-24 months (short to intermediate term); stay based on demonstrated improvement; identifiable team and program with specialized unit.

Supervised Living

Setting is a home that is like other homes in the neighborhood in terms of size and number of residents. Consumers are provided individualized care, supervision, support and training services to maximize and/or maintain function and self-direction. Staff is present at night and other times when the consumer is present.

Supported Independent Living

Setting is a home chosen by the consumer who is primarily independent. Program offers support to assist the resident in maximizing and/or maintaining independence and self-direction. Staff is available as needed and at planned intervals to offer assistance and support but not to provide supervision.

Transitional Living

Non-medical residential program providing training for living in a setting of greater independence. The primary focus is on teaching functional skills and compensating for abilities that cannot be restored.

Vocational Evaluation

An organized and comprehensive service staffed by specialists who systematically and comprehensively utilize work activities (real or simulated) and/or educational services as the focal point for educational and vocational assessment and exploration. In addition, psychological testing, counseling, social summaries, occupational information, etc., are other evaluation tools that are used. It incorporates the medical, psychological, social, vocational, educational, cultural, and economic data for establishment and attainment of individual goals.

Prone - Lying on one's stomach.

Proprioception - The sensory awareness of the position of body parts with or without movement. Combination of kinesthesia and position sense.

Psychologist - A professional specializing in counseling, including adjustment to disability.

Psychologists use tests to identify personality and cognitive functioning. This information is shared with team members to assure consistency in approaches. The psychologist may provide individual or group psychotherapy for the purpose of cognitive retraining, management of behavior and the development of coping skills by the patient/client and members of the family

R

Range of Motion (ROM) - Refers to movement of a joint (important to prevent contractures).

Reasoning, Abstract - Mode of thinking in which the individual recognizes a phrase that has multiple meanings and selects the meaning most appropriate to a given situation. The term "abstract" typically refers to concepts not readily apparent from the physical attributes of an object or situation.

Reasoning, Concrete - The ability to understand the literal meaning of a phrase.

Reasoning, Problem-Solving - The ability to analyze information related to a given situation and generate appropriate response options. Problem-solving is a sequential process that typically proceeds as follows: identification of problem; generation of response options; evaluation of

response option appropriateness; selection and testing of first option; analysis as to whether solution has been reached. A patient/client may discontinue making a cup of coffee because the sugar bowl is empty, even though sugar is readily available in a nearby cabinet. A patient/client may easily navigate his way into a room crowded with furniture, but request staff assistance to navigate his way out.

Reasoning, Sequencing - The ability to organize information or objects according to specified rules, or the ability to arrange information or objects in a logical, progressive manner. Nearly every activity, including work and leisure tasks, requires sequencing. For example, in cooking certain foods it is important that ingredients be added and mixed in a specified order; in dressing, undergarments must be put on prior to outer garments.

Recreation Therapist - Individual within the facility responsible for developing a program to assist persons with disabilities plan and manage their leisure activities; may also schedule specific activities and coordinate the program with existing community resources.

Rehabilitation - Comprehensive program to reduce/overcome deficits following injury or illness, and to assist the individual to attain the optimal level of mental and physical ability.

Rehabilitation Counselor - Also called Vocational Counselor. A specialist in social and vocational issues who helps the patient develop the skills and aptitudes necessary for return to productive activity and the community.

Rehabilitation Facility - Agency of multiple, coordinated services designed to minimize for the individual the disabling effects of one's physical, mental, social, and/or vocational difficulties and to help realize individual potential.

Rehabilitation Nurse - A nurse specializing in rehabilitation techniques as well as basic nursing care. Nurses assist the patient and family in acquiring new information, developing skills, achieving competence and exhibiting behaviors that contribute to the attainment of a healthy state.

Retrograde Amnesia - Inability to recall events that occurred prior to the accident; may be a specific span of time or type of information.

S

Seizure - An uncontrolled discharge of nerve cells that may spread to other cells nearby or throughout the entire brain. It usually lasts only a few minutes. It may be associated with loss of consciousness, loss of bowel and bladder control and tremors. May also cause aggression or other behavioral change.

Sensation - Feeling stimuli that activate sensory organs of the body, such as touch, temperature, pressure and pain. Also seeing, hearing, smelling and tasting.

Sensorimotor - Refers to all aspects of movement and sensation and the interaction of the two.

Sensory Integration - Interaction of two or more sensory processes in a manner that enhances the adaptiveness of the brain.

Sequencing - Reading, listening, expressing thoughts, describing events or contracting muscles in an orderly and meaningful manner.

Sheltered Workshop - A work setting certified as such by the Wage & Hour Division. It provides transitional and/or long-term employment in a controlled and protected working environment for those who are unable either to compete or to function in the open job market due to their disabilities. May provide vocational evaluation and work adjustment services.

Shunt - A procedure to draw off excessive fluid in the brain. A surgically-placed tube running from the

ventricles which deposits fluid into either the abdominal cavity, heart or large veins of the neck.

Somatosensory - Sensory activity having its origin elsewhere than in the special sense organs (such as eyes and ears) and conveying information to the brain about the state of the body proper and its immediate environment.

Spasticity - An involuntary increase in muscle tone (tension) that occurs following injury to the brain or spinal cord, causing the muscles to resist being moved. Characteristics may include increase in deep tendon reflexes, resistance to passive stretch, clasp knife phenomenon, and clonus.

Spatial Ability - Ability to perceive the construction of an object in both two and three dimensions. Spatial ability has four components: the ability to perceive a static figure in different positions, the ability to interpret and duplicate the movements between various parts of a figure, the ability to perceive the relationship between an object and a person's own body sphere, and the ability to interpret the person's body as an object in space.

Speech-language Pathology Services - A continuum of services including prevention, identification, diagnosis, consultation, and treatment of patients regarding speech, language, oral and pharyngeal sensorimotor function.

Spontaneous Recovery - The recovery which occurs as damage to body tissues heals. This type of recovery occurs with or without rehabilitation and it is very difficult to know how much improvement is spontaneous and how much is due to rehabilitative interventions. However, when the recovery is guided by an experienced rehabilitation team, complications can be anticipated and minimized; the return of function can be channeled in useful directions and in progressive steps so that the eventual outcome is the best that is possible.

Subdural - Beneath the dura (tough membrane) covering the brain and spinal cord.

Supine - Lying on one's back.

Suppository - Medicine contained in a capsule that is inserted into the rectum so that the medicine can be absorbed into the blood stream.

T

Tactile Defensiveness - Being overly sensitive to touch; withdrawing, crying, yelling or striking when one is touched.

Task Analysis - Breakdown of a particular job into its component parts; information gained from task analysis can be utilized to develop training curricula or to price a product or service.

Temporal Lobes - There are two temporal lobes, one on each side of the brain located at about the level of the ears. These lobes allow a person to tell one smell from another and one sound from another. They also help in sorting new information and are believed to be responsible for short-term memory. Right Lobe--Mainly involved in visual memory (i.e., memory for pictures and faces). Left Lobe--Mainly involved in verbal memory (i.e., memory for words and names).

Tracheotomy - A temporary surgical opening at the front of the throat providing access to the trachea or windpipe to assist in breathing.

Tracking, Visual - Visually following an object as it moves through space. See also **vision after head injury**.

Tremor, Intention - Course, rhythmical movements of a body part that become intensified the harder one tries to control them.

Tremor, Resting - Rhythmical movements present at rest and may be diminished during voluntary movement.

U

Unilateral Neglect - Paying little or no attention to things on one side of the body. This usually occurs on the side opposite from the location of the injury to the brain because nerve fibers from the brain typically cross before innervating body structures. In extreme cases, the patient may not bathe, dress or acknowledge one side of the body.

Urinary Tract Infection - When bacteria have reproduced to a large number in the bladder. This can cause fever, chills, burning on urination, urgency, frequency, incontinence or foul smelling urine.

V

Verbal Apraxia - Impaired control of proper sequencing of muscles used in speech (tongue, lips, jaw muscles, vocal cords). These muscles are not weak but their control is defective. Speech is labored and characterized by sound reversals, additions and word approximations.

Vestibular - Pertaining to the vestibular system in the middle ear and the brain that senses movements of the head. Disorders of the vestibular system can lead to dizziness, poor regulation of postural muscle tone and inability to detect quick movements of the head.

Source: www.braininjurybooks.com

Source: HDI Publishers “The Brain Injury Glossary.”

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