Neuropharmacologic agents are used in traumatic brain injury (TBI) to enhance cognitive function, treat emotional disorders, minimize behavior dysfuction, decrease muscle tone, treat seizures, pain management, and treat sleep disorders.

Cognitive function: As a general rule, the first step in any protocol for the use of neuropharmacologic agents is to do a review the patient's medications and, if possible, eliminate or reduce the dose of those with potential adverse cognitive side effects. There are few controlled studies regarding pharmacologic enhancement of cognitive functions after TBI. The most used agents as neurostimulants are: Methylphenidate is an indirect catecholamine agonist that is frequently used as a neurostimulant with cognition-enhancing properties. (Braha, R., Joyce, B., & Smith, L., 1999) (Glenn, M, 1998) (Kaelin, D., Cifu, D., & Matthies, B.,1996). Amantadine is a dopaminergic agent and it has been successfully used in the several cognitive disorders following TBI. Amantadine may improve visual attention, speed of information processing and concentration (Gualtieri CT, Evans RW., 1998). Bromocriptina is a dopaminergic agent effective in managing several cognitive dissorders associated with frontal lobe lesions (Passler, J. and Riggs, R., 2001) (Powell, J., Al-Adawi, S., Morgan, J., & Greenwood, R., 1996). Carbidopa/L-dopa is a dopaminergic agent used as the same indications as amantadine or bromocriptina. (Kraus, M. & Maki, P., 1997) (McDowell, S., 1996).

Behaviour dysfunction. The most frequent problems after TBI are those related with agitation and aggressive behaviours. Anti-seizure medications, such as carbamazepine and valproic acid (Wroblewski, B.A., Joseph, A.B., Kupfer, J., & Kalliel, K., 1997) (Horne, E. & Lindley, S., 1995) may be helpful for treating patients with episodic behavioural dyscontrol. Buspirone is an anxiolytgic agent that is chemically unrelated to benzodiazepines and may decrease agitation in TBI patients (Gualtieri, C.T., 1992). Benzodiazepines and anti-psychotic medications are not considered first-line medications in the treatment of agitation because of their negative impact on neurologic recovery following TBI but they can be used (low doses) when a patient poses an immediate danger to himself or aggressive behaviour interferes with patient management.

Emotional disorders are usual after a TBI. Anxiety associated with TBI may manifest as restlessness, poor endurance, decreased concentration, and irritability. Buspirone may be an effective anxiolytic for some patients. Some commonly prescribed agents include amitriptyline, nortriptyline and doxepin. Short half-life benzodiazepines can be used (alprazolam or lorazepam). The prevalence of depression following TBI is reported to range from 10 percent to 60 percent (Kaplan M., 2000). Several antidepressant medications has been shown to be effective for depressed TBI patients. Selective sertotonin reuptake

inhibitors (SSRI) such as fluoxetine (Seliger, G.M., Hornstein, A., Flax, J., Herbert, J. et al., 1992) (Sloan, R.L., Brown, K.W. & Pentland, B., 1992) and sertraline (Mukand, J., Kaplan, M., Senno, R., & Bishop, D., 1996).

Anti-Spasticity Medications.One of the most disabling aspects of acquired brain injury is the development of spasticity . Spasticity of cerebral origin occurs when inhibitory neural input to the final common pathway in the spinal cord is impaired, damaged or eliminated by brain disease or injury. Spastic hipertonia is characterized by velocity-dependent increases in tonic stretch reflexes with exaggerated tendon jerks, and is one component of the upper motor neuron sydrome seen in TBI. (Young RR, Delwaide PJ., 1981) (Katz RT.,1992). It may interfere with parcial motor function, limit de range of motion, or cause pain. It can also impede mobility, transfers, sitting posture , sleep and the others activities of daily living. Spasticity contributes to the development of pressures sores and joint contractures with a decrease in the functional status of the patient. Spasticity should be managed with a interdisciplinary approach that may include inhibitive casting, splinting, pharmacological treatments, neurolytic blocks, intrathecal therapies, and, in extreme cases, neurosurgical treatment. Medications , including baclofen, tizanidine, diazepam, and dantrolene sodium ,, are of limited success in treating spasticity of TBI and sedation may be particulary detrimental in this type of patients (Gormley et al., 1997).

Seizures treatment. Patients who have had late seizures subsequent to TBI, anti-convulsant treatment should be done. Medications that are indicated for treatment include phenytoin, carbamazepine, valproic acid and gabapentin (Shierhowt E, et al., 1998).

Pain Management. Headache pain in the brain-injured patients is complex (Zafonte, 1999). Headache and neck pain are the most common physical complaints, experienced by up to 70% of patients early after mild brain injury (Zasler ND, 1996). Pharmacological management of headache consists in nonsteroidal anti-inflammatory medications. Narcotic medication is relatively undesirable as a first-line analgesic; however, if deemed clinically necessary, a short-acting, mild narcotic should be chosen preferentially over the longer-acting agents. Skeletal muscle relaxants are often prescribed for painful musculoskeletal disorders associated with muscle spasm and for spasticity. . Anticonvulsivants and antidepressants have been used in clinical practice for treatment of many different pain syndromes, particularly peripheral neurogenic pain.

Sleep Disorders. Sleep disorders are common after TBI. Disturbed sleep may affect brain injury survivors' arousal, cognition and behaviour. (Clinchot et al., 1998). Pharmacological management of sleep includes benzodiazepine hypnotics, clonazepam, antidepressants (amitriptiline), but more recently

trazodone has been used as an effective medication to enhance sleep disorder with low daytime sedation.