

Neuropsychological and Psychosocial Consequences of Traumatic Brain Injury



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Abstract

Majority of traumatic brain injury (TBI) survivors in addition to neurological deficits also suffer from neuropsychological and psychosocial sequelae. Emotional instability, slowed thinking, personality changes, deficits in memory, attention, concentration and intelligence, self-awareness and motivational problems are some of the neuropsychological sequelae of TBI. Reactions of family members to the TBI survivor, social breakdown, employment problems and life satisfaction are some of the psychosocial consequences of TBI. The time course for recovery from such consequences and their management are reviewed. Rehabilitation of the TBI survivor is a major challenge. Pharmacological treatment includes antidepressants, antipsychotics, mood stabilizers, and stimulants. Controlled treatment trials for TBI are lacking. Non pharmacological treatments including psychotherapy and behavior therapy are also useful. Family and individual counseling can greatly help the patient and the family reconcile themselves to the reality of the behavioral changes in the patient post-TBI.

Keywords: Traumatic brain injury; Head injury; Neuropsychological effects; Psychosocial effects; Rehabilitation

Abbreviations: TBI: Traumatic Brain Injury; PTA: Post-Traumatic Amnesia; CNS: Central Nervous System; AEDs: Anti-Epileptic Drugs; CBT: Cognitive Behavior Therapy

Introduction

Traumatic brain injury (TBI) is a leading cause of death and disability in young adults all over the world. The increasing availability of advances trauma and life support techniques has resulted in dramatic increase in survival rates after severe TBI. This has led to a 'silent epidemic' of an increasing number of survivors, majority of whom are young adult males, with multiple physical, cognitive and emotional disabilities posing a challenge not only to healthcare systems, but their families and society [1-10]. Interest in major head injury has existed since long before, but the focus was more on post-concussion syndrome and neuropsychiatric sequelae. More recently focus has shifted neuropsychological and psychosocial consequence of TBI and their management which will be reviewed here.

How much recovery can be expected?

There is considerable variability in the outcome of acute TBI [11-13]. While damaged parts of the brain do not regenerate, swollen and bruised areas of the brain may heal and regain their

function. Sometimes recovery happens because undamaged part of the brain taking over some of the functions of the damaged parts [14]. The immediate neuropsychological and psychosocial difficulties may persist up to 3 months after minor TBI [15,16]. However, the results of several other studies have revealed a more optimistic neuropsychological outcome by about one month after minor TBI [17]. On the other hand the neuropsychological deficits following severe TBI may persist for long periods [18]. There are two important points about recovery after brain damage. The first is that the frequency and type of rehabilitation affects how soon and how much improvement takes place. The second is that there is a limit to how much recovery can take place [14]. Ohio Valley Center's Advisory Council (based on reports) [19-23] has identified the following challenges that are most likely to affect the quality of life:

- a. Substance abuse
- b. Depression

- c. Inability to earn an adequate income
- d. Lack of supports/services to live independently
- e. Lack of transportation
- f. Difficulties finding meaningful employment
- g. Lack of opportunities for leisure activities
- h. Isolation from other people and the community
- i. Reduced mobility and self-care after head injury.
- j. Lack of assistance identifying and choosing options
- k. Lack of coordination among service providers.

Consequences of TBI

Short-term Neuro-psycho-social consequences of TBI

Immediately after TBI the individual may or may not lose consciousness, for a brief or protracted period. On recovery of consciousness, patients develop confusion, agitation, disorientation and even delirium [24]. Significant impairment of neuropsychological functions, in the absence of other positive neurological findings, does in fact seem to occur within days of minor head injury [18]. In the early part of recovery from TBI poor memory for recent events is commonly seen. Students will have difficulty in classes and lectures. Others cannot read a book for any useful length of time, they cannot look at TV for long, and they cannot hold onto the thread of a story [25].

Long-term Neuropsychological consequences

Poor memory for recent events

This is seen most commonly in the early part of recovery. It is still severe six months post-injury in about 75% of persons whose period of post-traumatic amnesia (PTA) exceeded four weeks; in about 3% in those with PTA between 3 - 4 weeks, and usually absent in those with a PTA of less than 2 weeks [26]. The social and personal effects of disordered memory can be devastating, e.g. When a physiotherapist is trying to teach a patterned form of movement such as walking, the client forgets what was said just 15 minutes ago which frustrates the physiotherapist and client alike. If they have household responsibilities they cannot tidy things up, the house gets in a mess and things get put away without any order. They may neglect their personal hygiene. They forget to put out their cigarette before going to sleep, pay bills, and turn off the iron before going out. Friends find that they have to constantly repeat the things they spoke to them about the week before. Their friends get tired of this and eventually just keep social conversations at a very superficial level, if they maintain contact at all. They forget and therefore do not follow instructions given at work [14].

Reduced attention and concentration spans

Persons with concentration difficulties have some obvious limitations for, e.g. students have difficulty in classes and studies.

They cannot read a book for any useful length of time, cannot look at TV for long, and cannot hold onto the thread of a story. If they are well and active, as the young head-injured person usually is, they demand more attention, become more and more restless, until their tension builds up to an explosion point [14].

Intelligence

In acute and chronic phases of severe TBI both performance and verbal IQ are reduced [27]. Severity of injury (assessed by duration of post-traumatic amnesia) is significantly related to poor performance on the learning and nonverbal intelligence tests. Recovery of verbal IQ is faster. Performance IQ continued to be lower even after three years. About 10% of TBI patients with prolonged coma develop some intellectual deterioration. Severity of TBI, multiplicity of head trauma, more than 60 years of age, alcoholism and atherosclerosis are factors predisposing to the development of posttraumatic dementia. The 'punch drunk' syndrome may occur in boxers [28].

Self-awareness/motivational problems

A large part of the misery for the clients, family and therapists that is associated with head injury arises out of an inability to use abstract thinking, to be aware of and utilize their errors and to be self-critical of their changes. The inability to use concepts beyond the concrete level leads to difficulties in day to day problem solving. TBI survivors may be unaware of making mistakes, deny making them and naturally may blame others for things going wrong. They develop a reputation for being careless, untidy and selfish. Their heavily reduced insight into their changes prevents any self-directed attempts to regain lost functions and to become as independent in ADL as possible. Their difficulty handling abstract concepts means that they are not amenable to reason or to counseling given its insight base. They are however capable of learning from experience. Unfortunately, the experiences are often negative [14]. Motivation is affected in injuries to the orbitofrontal cortex, medial frontal cortex, ventral pallidum and ventral tegmentum [29].

Emotional instability

When they are tackled this instability comes to the fore with a heated explosion at home or in therapy. They emerge from the angry outburst confused and depressed, convinced they are being "picked on". It is neuro-anatomically impossible for them to take responsibility for what has lead to the "blowout" and to take responsibility for emotional control during it. This emotional liability is very much a feature of the young person with TBI [14].

Slower thinking and acting

TBI almost always results in reduced working and thinking speed. Disruption to any of the brain's routines at virtually any cortical site leads to a general lowering of cortical tone. The TBI survivor may work and think at half the speed they used

to before the TBI. This makes job placement difficult though not always impossible. Psychomotor retardation may reach its maximum level at a later stage. This must be kept in mind particularly when trying to place a person in a physical skill job. Progressive assessment should indicate whether or not it is feasible to expect vocationally useful improvement before any lasting decision based on work speed is made [14].

Personality changes

Personality changes are the most disruptive consequences at 1, 5, and 15 years after TBI. The first and most significant personality change is the lack of insight. Rarely are they fully aware of their reduced intellectual skills and interpersonal insensitivity. They deny changes, particularly in the early stages. Only after months of repeated failures will they admit they are not the person they once were. The second personality change is ego-centricity. They are eventually seen as headless, selfish and at times insensitive. They are more hyperactive and impulsive. Their sexual relationships become insensitive and sometimes brutal. Reduced sexual desire and sexual dysfunction may occur in 40-60% due to damage to neuroanatomic and physiologic substrate of human sexual behavior or hypogonadism.

Their marriages are in great danger, and almost half break up within six to eight months after they return home from the rehabilitation centre or hospital [30]. Because they find repetition exceedingly difficult to manage they resist therapists in any of their attempts to structure a program of daily activity. Self-control problems and impulsiveness mean not only marriage break-ups but they often lead to remain at their job. Their self-esteem and self-assurance plummets. Their sense of bewilderment and self-doubt may be overwhelming. After a year after TBI severe psychological complications can be seen. Depressive and paranoid reactions are not uncommon. Apathy may be seen without depression. Paranoid reactions are hardly surprising when it is remembered that their self-awareness/self-critical faculties may not be operational [14,31].

Long-term Psychosocial consequences

Family Reactions to a Brain-Injured Member

Living with a TBI survivor who is socially de-skilled and has undergone major personality change can strain relationships and marriages. The effect of injury on the family was studied in a group of 35 head injured cases, showing that family burden within six months of injury was related to the presence of childish behavior and loss of interest in the patient, together with other behavioral and affective changes [27]. Primary caregivers (especially spouses) of head-injured individuals perceive greater levels of unhealthy family functioning relative to published norms for non-patient and medical patient samples, but showed better functioning than psychiatric samples [32].

Family reactions vary depending on the severity of TBI. Mild injuries may have no impact on the family. However, the initial

concern of family members may be followed by alienation of the survivor, if post-concussive symptoms persist [33,34]. In more severe TBI, Lezak proposed six stages in the evolution of family reactions to a brain-injured member [35]. The first stage occurs in the initial three months following TBI. The survivor is perceived as being difficult, but this is attributed to fatigue, lack of strength, or resulting from the indulgences of hospital staff. Six to nine months after the survivor returns home the second stage begins. Family members perceive the survivor as uncooperative, unmotivated and self-centered, hindering a full recovery. Family members are bewildered and anxious. The third stage occurs between 6-9 and 9-24 months but may continue indefinitely. As the survivor's strength and vigor returns, he may attempt to return to premorbid activities that are no longer safe for him, but avoid simpler tasks, such as helping with household chores. The survivor is perceived as irresponsible, self-centered, irritable and lazy.

Family members blame themselves, and feel disappointed, guilty, depressed and frustrated. The fourth stage begins around nine months after coming home and may continue indefinitely. Family members understand the full extent and chronicity of the survivor's deficits, leading to feelings of depression and despair. This allows the primary caretaker to more realistically consider the welfare of the survivor and the future and wellbeing of the family. Families are likely to ask for psychological help during this stage. The fifth stage begins about 15 months after returning home, and is time-limited. The survivor is perceived as a difficult, childlike, dependent person. Family members understand that the survivor will not regain his premorbid functioning. The sixth stage begins 18 to 24 months after the survivor's return home. Members of the family begin reorganizing their lives for more emotional satisfaction and personal growth. Caregivers may detach themselves emotionally from the survivor. During this stage separation or divorce may occur [34,35].

On the other hand, Perlesz, Furlong and McLaughlan [36] observed that during adaptation post TBI families must negotiate four tasks. These tasks are not sequential. The first task is 'grieving', which becomes complicated as it occurs in the presence of the survivor. Restructuring the role of family members is the second task. This restructure occurs initially in the 'crisis' period following TBI when family life is dominated by medical and rehabilitation appointments. Thereafter family members need to acknowledge losses and accept that the family restructure is permanent to enable an active lifestyle. The third task is the development of a new identity. All family members, including the survivor, experience changes to their identities as a result of the TBI and must come to terms with these changes. The family members accept the losses and also the fact that recovery will be incomplete. The fourth task is 'growing through adversity'. Family members must recognize their strengths and courage, and appreciate the knowledge and experience they have gained in coping with adverse circumstances [34,36].

Employment

Returning to work after TBI is a major problem for many survivors. One year after TBI about 50% of severe TBI survivors fail to return to work, while 20% mild TBI survivors are unemployed [37]. Failure to return to work after TBI comes at great personal and economic costs to the survivors, their family and society. However, thirty-five to fifty percent of persons sustaining brain injury were not employed at the time of the injury. Given the relatively young age of the population, many of these individuals would have been preparing to enter the workforce at the time of the injury. Others may not have been working due to other reasons [38]. The prediction of vocational success following TBI has received considerable attention in the literature. Persons with more severe injuries and disabilities after TBI have more difficulty in returning to work. For example, studies find poorer outcomes for persons who experience fatigue, have emotional problems, poor neuropsychological functioning such as problems with memory, sequencing and judgment, are unable to drive, and are dependent on others in their activities of daily living [39-41]. Service elements that aid TBI survivors in returning to work include: Providing Vocational Rehabilitation services (on-the-job training, counseling and guidance, job placement services) [42-44] early in the rehabilitation process [45-47], creating a supportive work environment [47], providing cognitive skills training [48,49] and supplying assistive technology and training in its use [50].

Life Satisfaction

Among TBI survivors, those with disabilities affecting physical function have been more widely investigated than those with cognitive disabilities. Not having a preinjury history of substance abuse, health status, income, and participation in activities, particularly in work, leisure, and religious activities, have each been found to be highly related to subjective well-being [51,52]. Severity of injury is related to functional outcomes after TBI, but not with quality of life [51,53-55]. Relations demonstrated between injury severity and life satisfaction are considered "anomalous" as survivors with the most severe injuries reported higher life satisfaction one or more years after TBI [51,56,57]. Only a minority of survivors evaluated 5-8 years after a severe TBI observed that their quality of life had deteriorated since their injuries, despite the presence of severe neuropsychological and psychosocial deficits [58]. Quality of life after TBI does not appear to be related to functional disability, and physical or cognitive impairment. A significant relation between physical disability and quality of life was reported in studies conducted soon after TBI [51,59,60].

However studies conducted many years after TBI failed to find a significant relation of QOL to physical disability [58,61-63]. Subjective well-being at 1-2 years post-TBI was not related to cognitive function at initial discharge from hospital [51]. Subjective well being 2-6 years after TBI was not related to the severity of cognitive impairments or neurologic deficit after

severe TBI [63,64]. Limitations in activity and requirement for help with activities of daily living is related to functional outcomes after TBI, but only weakly related to life satisfaction several years after injury [54,65-67]. Perceived self-efficacy, particularly perceived self-efficacy for the management of cognitive symptoms, was the most important predictor of global life satisfaction and also mediated the relation between community integration and global life satisfaction [68].

Social break-downs

Many survivors of TBI are lonely, self conscious about their disability, lack energy, are aggressive, irritable, impulsive, self-centered, disinhibited, and have rapid mood changes. Consequently spouses and caregivers report increased levels of stress, anxiety, depression, reduced social interaction and isolation commonly referred to as the 'caregiver's burden' [69]. Studies indicate that wives of severely brain-injured men report lower marital adjustment than moderately brain-injured persons [70]. Wives of 55 men with TBI reported greater dyadic adjustment when the initial injury was relatively mild, when their husbands were better psychosocially adjusted and when they experienced low levels of financial strain [71]. Examination of 18 couples 1-7 years after the male partner had sustained a TBI revealed that the marital and sexual satisfaction was significantly reduced [72]. TBI thus affects marital relationships adversely. Two studies reported divorce rates of 58% at five years and 52% at six years after TBI [73,74].

Stages of Head-Injured Person Through Therapy

Early stages

It lasts usually up to third to sixth month post-injury. In the early stage the physical model predominates with heavy involvement of medical staff, occupational therapists, physiotherapists and speech pathologists.

Stage of social model

At about the sixth month stage the social model parallels this physical one, but by the twelfth month stage social model gradually begins to predominate. As the TBI survivor develops a better understanding of what has happened and the family sees the subtle changes not apparent in hospital, the extremely difficult psycho-social adjustment stage begins.

Psycho-social adjustment stage

The primary needs of the person with TBI include occupational counseling, assistance for work adjustment, personal counseling, family counseling and support. What is obviously needed here is a good supply of bright, adaptable social workers and vocational counselors [14].

Stage of follow-up assessment of success and further needs

Through the next few months continuing assessment checks the success of retraining intervention and highlights further

needs. This ideal will be more achievable as computer programs are introduced.

Management of Neuropsychiatric and Psychosocial Sequelae

Underscoring the importance of addressing TBI sequelae, Robert Karol warns that treatment providers who attend “only to cognitive and physical deficits after brain injury and downplay emotional concerns are unlikely to ameliorate behavioral dyscontrol” [75]. We divide the discussion of rehabilitation issues into social/self, symptoms and syndromes.

Self/social issues include vocation/financial, physical skills, appearance, intelligence/thought, relationships, and sexual functioning. Post-TBI job loss results in loss of income, sometimes a supportive spouse, and a disability application. Common issues related to symptoms include behavioral outbursts, emotional adjustments, cognitive deficits, and physical concerns. The link between ability to adjust to TBI and the capacity to do so is complicated by a major factor. Common syndromes seen post-TBI include: behavioral disinhibition, depression/anxiety/psychosis, substance abuse, attention/cognitive disorders, and motor/sensory disorders. There currently are no U.S. FDA-approved interventions for post-TBI neuropsychiatric syndromes. Key rules of thumb for these syndromes are to start lower and go slower. Brain injury confers increased sensitivity to the active agents of the central nervous system (CNS); therefore, treatment and side effects may be accentuated at lower doses in patients after TBI. Second, to systematically approach treatment in TBI beyond pharmacological interventions, three areas are important to keep in mind: 1. identification of target symptoms, 2. consideration of coexisting medical problems and iatrogenic contributions, and 3. implementation of nonpharmacological treatment [75].

The initial steps of treatment include a comprehensive neuropsychiatric evaluation and testing. This may include neurological and psychiatric examination to document baseline deficits, diagnoses, and functioning. A neuropsychological battery documents the cognitive skills and limitations, and provides a baseline from which gains in cognitive rehabilitation can be benchmarked. Neurophysiological tests may show brain dysfunction and seizures [76]. When indicated, neuroimaging may be of benefit to show ischemia, hemorrhage, encephalomalacia, neuronal loss, and altered cerebral metabolism or perfusion [77]. Empirical support for this contention was provided by the finding that improvement in cognition was a prerequisite to improved agitation for patients who demonstrated both [78]. Serial assessments with 14-item scale Agitated Behavior Scale, [79] are particularly important when treatment interventions are being attempted.

Improving the support system

Patients who have suffered a TBI need a social support system to help them adapt to their new lives. The family is the main

source of this support. If the patient is unable to return to work a daily structure with vocational rehabilitation and volunteer programs is of benefit. Despite the deficits caused by TBI, the patient must be able to behave appropriately within the family and social settings. The spouse has the double responsibility of not only the primary caregiver for the TBI survivor, but may also be required to become the primary bread-winner. For the family members, the TBI survivor is often a different person than the one they knew before the TBI, and these changes are usually for the worse.

The TBI survivor is often less caring, more irritable, prone to violence as well as depressed, anxious, and withdrawn. The family must understand that the survivor is unable to control his behavior and function in the same manner as before the TBI. This does not mean the family has to accept the behavior, but to deal with it by working to modify the behavior by emphasizing that it is the behavior that is wrong, not the person. “Time-outs” and rewarding good behavior may make a significant difference in the patient’s actions and ease the tensions within the family. Individual and family therapy are useful in addressing issues of limit setting, boundaries, and forgiveness. Alcohol and substance use are strongly discouraged as they further disinhibit the survivor and is a prescription for disaster [75].

Resource and Service Coordination

Attempts by persons with a brain injury or their family members to coordinate opportunities for physical, cognitive, and vocational rehabilitation, in addition to independent living, education, and transportation are often met with despair and frustration. Although there are very real shortages of appropriate and obtainable services, there should exist in every state system of services that can be accessed. Some state agencies, e.g. mental health, developmental disability, and human services, should offer case management services to coordinate, plan and broker services to clients with TBI [38].

Improving motivation

Treatment of a motivational syndromes involves both pharmacological treatment and behavioral interventions. Motivation may be increased by stimulants and dopaminergic medications, as well as activating antidepressants such as bupropion. SSRIs and typical antipsychotics may worsen amotivational syndromes [80]. Nonpharmacological interventions to improve motivation include rewarding goal-directed behavior, psychological prostheses such as lists and prompting, behavior modification, and family intervention.

Control of co-morbid psychiatric symptoms / disorders

Agitation

Behavioral, environmental and pharmacological interventions, including one-to-one supervision, behavior modification, physical restraints, environmental modifications and medication, are effective in management of agitation during

rehabilitation [81]. Pharmacologic interventions which reduce agitation through sedation may delay the patients' cognitive and functional improvement during the acute phase of recovery [82]. Behavior modification is probably the most effective treatment for these patients. Efforts should be made to observe and document the triggers of and secondary gains from patient's aggressive outbursts. Antipsychotic medications are not effective in management of chronic, nonpsychotic aggression and may slow recovery from TBI. Further, akathisia, a common adverse reaction to typical neuroleptics, may actually increase violent behavior. Benzodiazepines and low dose buspirone are useful but may cause a paradoxical response in TBI patients. Other drugs that have been helpful include carbamazepine, valproic acid, gabapentin, oxcarbazepine and high-dose propranolol (up to 12 mg/kg/d). Lithium is useful in patients who display cyclic violence. Both TCAs and SSRIs have been reported to be useful [83,84].

Mood disorder

TCAs may be of benefit in treating anxiety and depression, their use is limited due to anticholinergic activity, sedation, and lowering the seizure threshold. SSRIs are preferred for mood and anxiety disorders after TBI because of their safety profile; however, side effects of sexual dysfunction, dyspepsia, drowsiness, and irritability limit their use. Few studies support the use of stimulants, amantidine, and anticholinesterase drugs [85]. Clonidine, carbamazepine, and divalproex are the drugs of choice for post-traumatic mania, while lithium is preferred in patients with a past history of mania. TCAs and a combination of dextromethorphan hydrobromide and quinidine sulfate are useful for the treatment of pseudobulbar affect [86].

Psychotic disorder

Post-TBI psychosis is treated with antipsychotics but the medication is started at one third to one half the usual doses due to increased risk of side effects in these patients. There is some evidence that antipsychotics may impede cognitive recovery [87]. Atypical antipsychotics are the drugs of choice. However, clozapine should be avoided because it lowers the seizure threshold and is strongly anticholinergic. Benzodiazepines should be used rarely, if at all [88].

Post-traumatic stress disorder and other anxiety disorders

Treatment includes family therapy to help family members adjust to the "new" person in their lives. Behavior therapy, including desensitization, can be helpful. Behavior therapy, including desensitization, can be helpful. In an acute stress situation a benzodiazepine is useful. Antiepileptic drugs (AEDs) may also be of use, especially in aggressive patients. SSRIs are also useful, but should be used carefully as they cause sexual dysfunction and may exacerbate apathy.

Somatization / partial seizure like phenomena

Somatoform disorders may be treated with cognitive behavior therapy (CBT) though studies of treatments for somatoform

disorders in TBI are lacking [89]. Majority (>90%) of patients with post TBI epilepsy or seizure disorder respond favorably to anticonvulsant treatment [90-91].

Personality changes

Management of personality changes includes counseling and CBT. If sleep is disturbed sleep hygiene is appropriate. The survivor should reduce his caffeine intake, abstain from alcohol and other psychoactive substances, avoid chronic opiates for pain relief, and follow an exercise plan. Pharmacological treatment with tricyclic and SSRI antidepressants may help with liability. Impulsivity may be controlled with low-dose stimulants, L-dopa, and dopamine agonists [92-93].

Rehabilitation

Social workers rely largely on a crisis intervention model to help the TBI survivor face the numerous crises that may start from the time they are discharged from the hospital or rehabilitation centre. The advice of vocational counselors is important to teach the survivor about the appropriate manner to compensate the abilities lost for proper work placement. Final decision regarding vocational ability of TBI survivors placed in moderate disability category of the Glasgow Outcome Scale six months after TBI should only be made about 18 months after TBI. However, less than 10% of TBI survivors categorized at six months post-injury as severely disabled will become a vocational prospect by this stage [14]. Psychological rehabilitation begins early with a baseline neuropsychological assessment to determine the deficits. Thereafter cognitive retraining and behavior management as required is given. Three main conditions are necessary to maximize recovery: (a) Clear and frequent feedback, (b) Repeated activity that is progressively difficult is advised.

This aims at errorless learning in order to avoid the establishment of incorrect patterns and (c) Rehabilitative activities structured on a thorough deficit analysis. Over subsequent months repeated assessment checks whether the retraining intervention is successful and highlights future needs with the assistance of computerized interventions. These include: (a) high speed in comprehensively assessing deficits, (b) expose the injured brain to an unending, carefully graded, progressively harder array of new learning situations and problem-solving tasks based on the principle that most of the improvements in brain injury come from trying to master new learning situations and (c) Provide clear feedback so that the brain can quickly assess the accuracy of its attempts to compensate for a damaged functional system. In addition to the above also must help the TBI survivor negotiate emotional and cognitive changes like denial, aggression against staff and family, loss of initiative, loss of self-esteem and depression [14].

Conclusion

Apart from physical and psychiatric disability TBI survivors suffer from numerous short and long term neuropsychological

and psychosocial consequences. Some of the consequences of TBI including cognitive deficits, lack of motivation, and lack of awareness of deficits, irritability, and mood changes complicate the individual's ability to undergo the rehabilitation process and adversely affect the family. Family members and various personnel involved in management and rehabilitation of these patients needs to be aware of these disabilities. For rehabilitation of the TBI survivors, prolonged physical, pharmacological and psychological management is required. Counseling the survivor and other members of the family is particularly useful in helping the TBI survivor and the family reconcile themselves and adjusts to the reality of the behavioral changes after TBI.

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