Minimum Technical Standards and Recommendations for Traumatic Brain Injury Rehabilitation Teams in Sudden-Onset Disasters

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Abstract

Current advances in disaster response and management have improved survival rates of disaster victims, resulting in overwhelming number of survivors with injuries relative to mortality. These include complex and long-term disabling injuries, such as traumatic brain injury (TBI), spinal cord injury, peripheral nerve injury, musculoskeletal injuries and others. Despite lack of accurate data on TBI in sudden-onset disasters (SODs), it remains a common neurological consequence of armed conflict worldwide. TBI is complex and survivors often have long-term physical, cognitive and behavioural disabilities, residual neurological deficits, medical complications and lifestyle consequences. These necessitate comprehensive interdisciplinary management, including medical, surgical and rehabilitation. The goal of rehabilitation in disaster settings is to improve functional independence and successful reintegration into the community, with an emphasis on patient education and self-management. Rehabilitation of TBI survivors should commence from early-response phase during disasters to minimise disability, prevent secondary injury and should be continued long-term in the community. Specialized rehabilitation teams in any SODs are deployed based on the skill-base and response required to meet specific local needs at the request of host health authorities. These interdisciplinary teams (specialized cells) need to be integrated into emergency disaster response and management plans. This report extends the previously published guidelines for WHO Emergency Medical Teams (EMTs) to establishe minimum standards for development and deployment of TBI specialized rehabilitation team in SODs. Overview of rehabilitation input for TBI survivors by EMT type, and specific recommendations and considerations for the management of the TBI victims for EMTs are provided. These include: deployment decision-making process; elements of making rapid assessment of existing TBI care capacity; leadership & operational support; outreach services; medical and surgical input; human resources, skill mix, team competencies and team configuration; equipment including consumables and pharmacological supplies; discharge & referral; data collection, management and health care records; and exit strategy.

Keywords: Disaster, rehabilitation, standards, traumatic brain injury

Foreword

The rehabilitation of individuals who have suffered from traumatic brain injury can be a complex process. This predominately relates to managing a variable combination of medical, physical, cognitive, behavioral, and emotional symptoms stemming from the widespread impairment of neuronal function caused by the brain trauma. These problems not only affect the individuals involved in terms of limiting their activities and participation in daily life, but also have a direct impact on families, friends, and work colleagues. The multidisciplinary team of doctors, nurses, and therapists involved in the acute care and rehabilitation of people with traumatic brain injury must be highly organized and work in a structure that can prioritize treatments and engage in realistic goal setting with patients and their family.

This is a complicated process in a standard working environment, but becomes much more difficult in the face of a disaster situation where routine management procedures are disrupted and the available resources are often limited. Furthermore, there can be significant disruption of the family

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support structures available to the individual and access to past medical records. The patients' situation in the postacute phase of disaster relief can be further compromised by the addition of symptoms of posttraumatic stress disorder.

These minimum technical standards and recommendations for traumatic brain injury specialized rehabilitation teams in disaster settings management have been produced by Professor Fary Khan and her team from the Royal Melbourne Hospital in Australia supported by an advisory group including national and international experts in the acute and rehabilitation management of people with traumatic brain injury and/or expertise in disaster relief situations. The Royal Melbourne group has now completed training in disaster relief and has gained clinical experience by having been directly involved in a number of relief efforts after natural disasters in neighboring countries.

As a rehabilitation physician who has specialized in traumatic brain injury rehabilitation for over 30 years, I found the guide comprehensive, well written, and structured for use in the field. The practical experience of the authors and their advisory panel gives this prescriptive guide to managing the acute and rehabilitation treatment of traumatic brain injury in a disaster situation the credibility to be a useful tool in this stressful situation to guide the emergency medical teams and health-care workers through the process of treating this complex condition.

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- World Health Organization. Emergency medical teams: minimum technical standards and recommendations for rehabilitation. Licence: CC BY-NC-SA 3.0 IGO. Geneva: WHO; 2016
- Norton I, von Schreeb J, Aitken P, Herard P, Lajolo C. Classification and Minimum Standards for Foreign Medical Teams in Sudden Onset Disaster. Geneva: WHO; 2013
- Emergency Medical Teams: Minimum Technical Standards and Recommendations for Spinal Cord Injury Specialist Care Teams. (International Spinal Cord Society [ISCoS] Disaster Committee and Handicap International [HI]), 2017 (currently in draft phase).

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Background

Sudden-onset disasters (SODs) (such as earthquakes, hurricanes, floods, fire, and storms) are escalating worldwide, with considerable destruction and significant human casualties.[1] Advances in disaster management have improved the survivor rates of disater victims, resulting in an overwhelming number of survivors with injuries relative to mortality. These include complex and long-term disabling injuries, such as brain and/or spinal cord injury, peripheral nerve injury, burns, and trauma/musculoskeletal injuries.[2-4] These problems necessitate comprehensive interdisciplinary management, including medical, surgical, and rehabilitative support in the acute phase and in longer-term in the community.[3,5]

Traumatic brain injury (TBI) is defined as "*a traumatically induced structural and/or physiological disruption of brain function due to an external force, indicated by new onset or worsening of at least one of the clinical signs, immediately following the event. These include any period of loss or reduced level of consciousness; any loss of memory for events immediately before or after the injury; any alteration in mental state at the time of the injury (confusion, disorientation, slowed thinking, etc.); neurological deficits (weakness, imbalance, praxis, etc.) that may or may not be transient; or an intracranial lesion*."[6] TBI can be categorized as "*closed*" or "*penetrating*" based on damage to the skull and meninges. Its severity ranges from concussion to minimal conscious state (MCS) and can de classified into mild, moderate, and severe based on the extent of damage to the brain [Table 1].[7,8]

TBI is a multifaceted and complex pathophysiological process that originates with an acute primary injury, which can progress over time resulting in a variety of secondary injuries.[9] Many TBI survivors often have long-term physical, cognitive, and behavioral disabilities; residual neurological deficits; medical complications; and lifestyle consequences,[7,10] which may limit their activities of daily living and participation.[11] It is estimated that 40% of those hospitalized with nonfatal TBI sustain impairments that lead to long-term disability.[8] Based on the WHO International Classification of Functioning, Disability and Health (ICF) framework,[12] the impact of TBI may include impairments (e.g., motor/sensory dysfunction, pain, spasticity, and memory impairment), which in turn limit activity (mobility, self-care, and behavioral changes) and participation restriction (e.g., impaired social and coping skills, apathy, unemployment, interpersonal relationships, driving, etc.). Issues of psychosocial adjustment can progress over time with significant economic impact in terms of delayed return to work and/or normal activities, health service utilization, and caregiver burden.[7,13]

The global incidence of TBI is estimated to be between 100 and 300/100,000 population, with mild injuries accounting between 70% and 90% of all TBIs.[14] Approximately 2.2 million emergency department visits and 50,000 deaths occur annually due to TBI in the United States (US) alone.[15] It is a leading cause of death and disability in young people (aged 30 years and below).[16] In Australia, lifetime cost per incident for severe TBI is estimated to be approximately $4.8 million.[10] TBI is the most commonly documented neurological consequence of armed conflict worldwide;[17] however, there are no accurate epidemiological data of

Table 1: Classification of traumatic brain injury severity

Criteria	Mild	Moderate	Severe
Structural imaging	Normal	Normal or abnormal	Normal or abnormal
LOC	0-30 min	>30 min and <24 h	>24 h
AOC/mental state	Up to 24 hours	>24 hours; severity based on other criteria	
PTA	0-1 day	>1 and <7 days	>7 days
GCS*	13-15	9-12	<9
AISS	1-2	3	4-6

Adapted from AHRQ 2012.[8] AISS: Abbreviated Injury Severity Scale, AOC: Alteration of consciousness, GCS: Glasgow Coma Scale (*best available score in the first 24 h), LOC: Loss of consciousness, PTA: Posttraumatic amnesia

TBI in natural disaster settings. In SODs, severe TBI is often sporadic because of low survival rates.[18] A recently published review reported that TBI was the most common nonorthopedic injury reported in earthquakes, followed by thoracic and abdominal injuries.[19] Another review estimated the mean incidence of TBI at 16.7% of total injuries per event.[20] These data may be underestimated and need to be interpreted with caution, as many mild TBI cases may be missed during disasters, as focus is more on visible motor injuries[18,19] and not on cognitive emotional and behavioral changes.

Medical rehabilitation is "*a set of interventions designed to optimize function and reduce disability in individuals with health conditions (disease [acute or chronic], disorder, injury, or trauma) in interaction with their environment*."[21] Overall, the primary aim of medical rehabilitation, specifically in SODs, is complex and includes assessment of injury patterns and management; needs and resource requirements (including long term); establishment of patient triage, discharge, referral, and tracking systems; collaboration with other health-care service providers; coordination with emergency response systems, host health system, and government managers; education of local health-care providers; and data collection/management.[2,3,22] The goal is to improve functional independence and enhance participation with an emphasis on patient education and self-management.[23] The interdisciplinary team includes rehabilitation physicians, nurses, and allied health professionals.

The overriding objective of brain trauma care has now extended beyond survival and acute management to successful reintegration of the patient into home and community.[7] The WHO minimum standards for rehabilitation[18] recommendations for managing patients with TBI following SODs are provided in Box 1.

TBI rehabilitation focuses on comprehensive assessment for neurological and functional limitations and individualized treatment program for specific functional goals with ongoing monitoring of outcomes. Rehabilitation should commence from early-response phase of any disasters for timely/early diagnosis and treatment of disaster survivors to minimize impairments/complications and prevent secondary injury. TBI survivors need support for acquisition of essential skills for maximum return to their previous level of functional independence, regardless of whether specific impairments can be eliminated.[24] Further rehabilitation interventions educate survivors to adapt to disabilities or to make modifications appropriate for their needs during their long-term recovery. There is evidence that comprehensive rehabilitation programs for trauma survivors (including TBI) improve functional outcomes and quality of life.[25]

In many disaster-prone countries, there is a lack (or limited and/or still in infancy stage) of sufficient rehabilitation capacity and specialized services to treat complex injuries such as TBI.[26,27] The situation is much worse in a large-scale disaster, when local health infrastructure (including rehabilitation resources) can be destroyed or overwhelmed by the influx of new victims. Shortages and/or lack of skilled health-care workforce can further hinder comprehensive management.[28,29] Hence, in disasters, many countries depend on global humanitarian and medical assistance, reflected by the growing number of emergency medical teams (EMTs) responding to many disasters worldwide.[18,30] Specialist TBI teams integrated into a disaster response and management plan optimize early diagnosis and management of TBI and prevent early complications. These skills need to be shared with local rehabilitation and health-care providers through mentoring and educating/training.[18]

Box 1: World Health Organization emergency medical team rehabilitation group summary for considerations for rehabilitation after traumatic brain injury in disasters[18]

Cognitive and neurological changes need monitoring and regular, documented assessments
Depending on expected duration of inpatient stay and rehabilitation needs, plans for referral to a step-down facility should be made early; and local rehabilitation providers and support networks identified
For long-term mobility deficits, early identification of appropriate local providers of mobility aids
Patients with long-term or permanent nerve injury should be considered for provision of an orthotic device, sought from local providers to replace any temporary device provided by the EMT
EMTs should identify referral pathways for microsurgery for appropriate patient

EMT: Emergency medical team

Emergency Medical Team for Traumatic Brain Injury

Specialized care teams

Specialized care teams are defined by the WHO as: [18] "*national or international teams embedded into EMTs or a national facility to provide specialist care*" (rehabilitation teams may fall into this category). Specialized care teams are deployed based on the assessment of quality and services and respond to meet specific needs at the request of the host Ministry of Health (MoH). Specialized care teams adhere to the same guiding principles and core standards as other EMTs as described in the WHO core guidelines "*Classification and Minimum Standards for Foreign Medical Teams in Sudden Onset Disaster*"[31] and "*Emergency medical teams: minimum technical standards and recommendations for rehabilitation*"[18] [Box 2]. EMT rehabilitation referral pathway for TBI survivors is detailed in Figure 1.

Scope

This guidance extends the minimum standards proposed in the "EMT Classifications and Minimum Standards" document[31] and builds on the previous work, the "Minimum Standards and Recommendations for Rehabilitation."[18] It establishes minimum standards for the development and deployment of TBI specialized rehabilitation team and can be used as evidence in the EMT verification process [Annex 1].

An overview of rehabilitation input for TBI survivors by EMT type and specific discharge considerations in the WHO EMT Rehabilitation Guidelines is detailed in Annex 2. The standards are for use in the context of SODs, such as earthquakes and are also applicable to conflict situations, characterized by a significant increase in TBI cases. The recommendations provided in this document are based on the currently available TBI clinical practice guidelines from the rehabilitation perspective.[6,32-35] It is recommended that EMTs support local capacity (rather than provide definitive care) and leave a legacy of trained staff after their departure. This guidance includes the following:

- Deployment decision-making process
- Elements of making rapid assessment of existing TBI care capacity
- Leadership and operational support
- Outreach services
- Medical and surgical input
- Human resources, skill mix, team competencies, and team configuration
- Equipment including consumables and pharmacological supplies
- Discharge and referral
- Data collection, management, and health-care records
- Exit strategy of the EMTs.

Box 2: Minimum standards[18]

A specialized care team for rehabilitation should be multidisciplinary and comprised of at least three rehabilitation professionals

Specialized care teams embedded into a local facility must remain for at least 1 month, unless a shorter duration of support is requested by the facility. A team that embeds into an EMT should stay for the minimum length of stay of that EMT (3 weeks for a type 2 and 4-5 weeks for a type 3)

Specialized care teams must either deploy with equipment and consumables required for self-sufficiency for at least 2 weeks or provide a written agreement that such materials will be provided by the EMT or local facility into which they will be embedded

Specialized care teams must align their services with local practice and consider service provision after their departure with mutually agreed structured support for the purposes of local capacity building

TBI: Traumatic brain injury, EMT: Emergency medical team

Deployment Decision-Making Process

Following a SOD, a specialized TBI team deployment will be made following a request from the host MoH and assessment from the EMT Coordinating Cell (EMT-CC). As aforementioned, new TBI cases occur frequently in natural disasters and are more common following an earthquake. Therefore, in disasters (specifically high-magnitude earthquakes), it is desirable for specialized cells to declare their availability for a rapid deployment. The host MoH or national trauma center can request support of a TBI specialized care team following a rapid assessment of the estimated number of cases and mapping of the existing capacity in the host country. TBI specialized care teams must

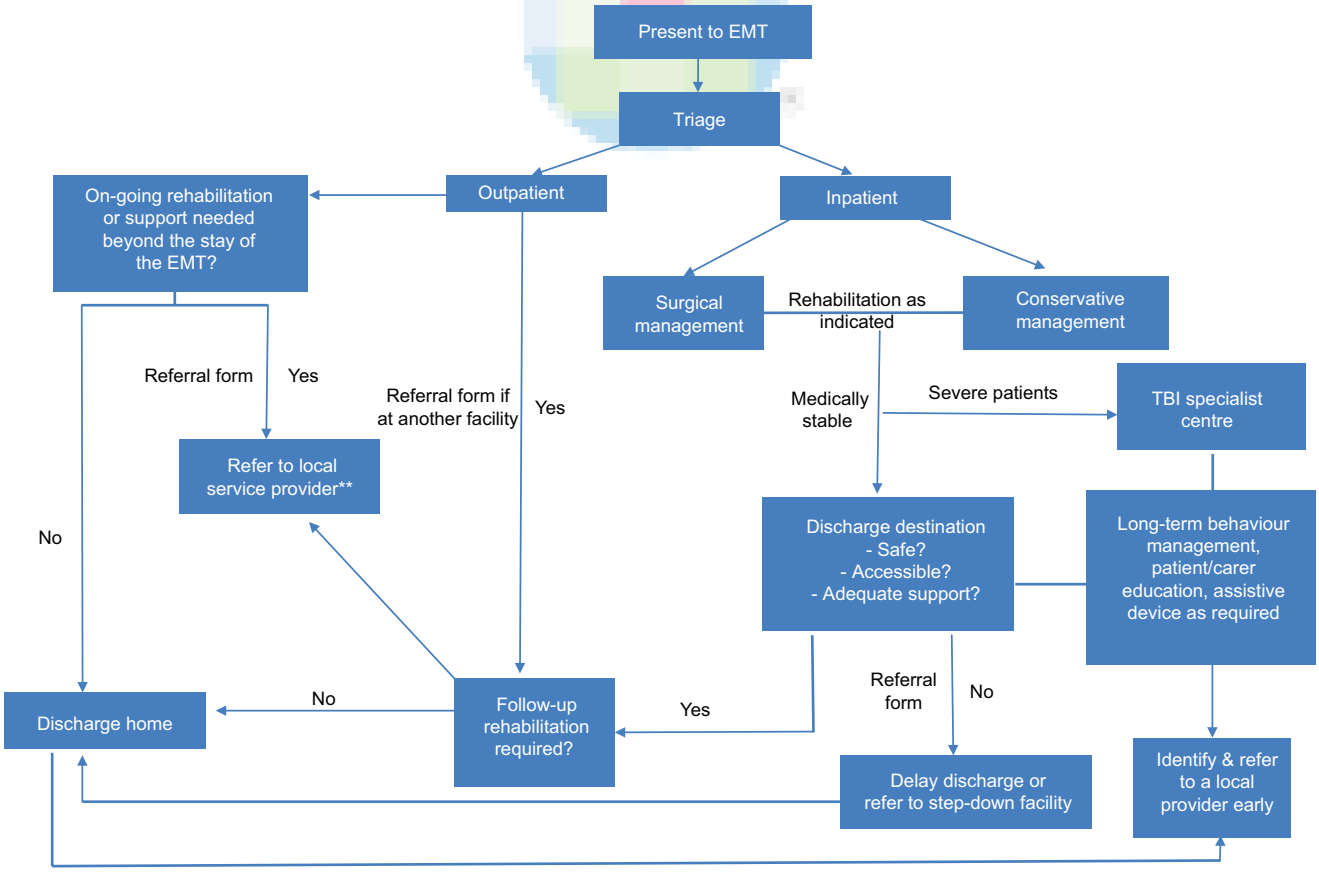

Figure 1: Emergency Medical Team rehabilitation referral pathway for traumatic brain injury

coordinate with local teams to avoid service duplication or usurping the existing local services. As such, it is advisable that disaster-prone countries should have regular mapping of trauma and injury centers, including TBI care capabilities, as part of their preparedness activities and disaster management plans. Any decision to deploy a TBI specialized care team will involve verification by the local MoH regarding the status of trauma services in country and the expected number of TBI victims resulting from the disaster. TBI cases should be differentiated from other injuries to enable effective management, as the majority of severe TBI cases require comprehensive multidisciplinary management in specialized facilities. Following a disaster, the MoH should rapidly assess the situation, engage with services, and request international assistance and the level of support needed. Preference should be given to local and/or regional specialized care teams. The length of the deployment needs to be agreed with the MoH (and any local partner organization), prior to deployment. This guidance establishes that EMT TBI specialized care teams must be adequately prepared to provide not just human resources, but also operational and medical supplies and meet all EMT standards for life support. Figure 2 provides flowchart for deployment decision-making for EMTs.

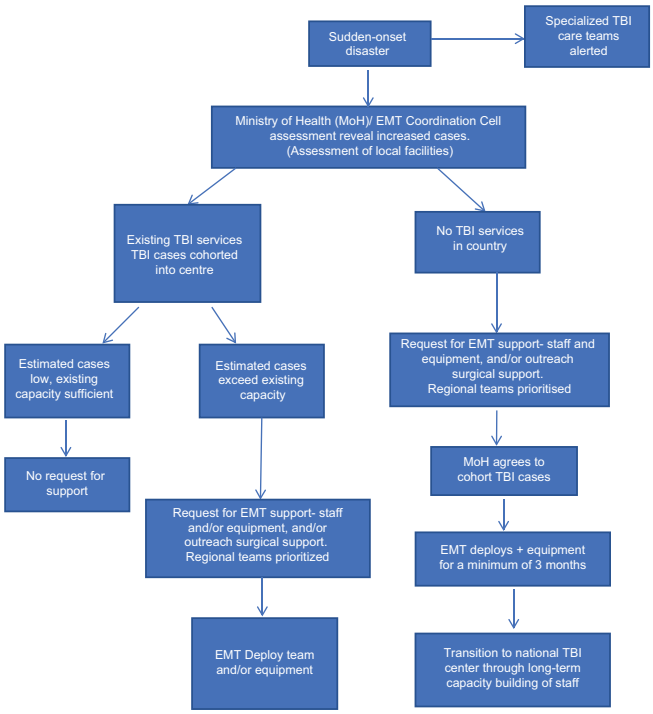

Figure 2: Deployment decision-making process

Type of deployment

The following four scenarios for the type of deployment are considered as possible examples:

- Scenario A: Local TBI specialized/trauma center/s or specialized TBI rehabilitation center/s remain intact, but short-term surge in capacity is requested in the form of staffing to meet increased patient numbers and/or outreach to other medical teams
- Scenario B: Local TBI specialized/trauma center/s or specialized TBI rehabilitation center/s is intact or partly functioning, but surge capacity is requested for inpatient and/or outreach services in the form of additional equipment (including beds) and staffing
- Scenario C: Local TBI specialized/trauma center/s or specialized TBI rehabilitation center/s is damaged or not functioning, but surge capacity is requested to establish a 20-bed inpatient facility alongside an existing tertiary hospital or rehabilitation center. Outreach services in the form of additional equipment (including beds) and staffing may also be part of this activity
- Scenario D: No specialized TBI, TBI rehabilitation center, or rehabilitation expertise exists in the host country/region and support is requested to establish a 20-bed facility alongside an existing tertiary hospital or rehabilitation center. Outreach services in the form of additional equipment (including beds) and staffing may also be part of this activity.

Outreach services

For all four above-mentioned scenarios, it is possible for a TBI specialized rehabilitation cell to offer outreach services to support patient cases who are outlying in nonspecialized centers and who are medically unstable and in need of admission or are waiting for bed space. This service aims to reduce the secondary complications following TBI, thereby reducing the length of stay in hospital and improving coordination between TBI specialized services and trauma hospitals.[22] It is recommended that outreach services include national health-care workers (including community health-care/rehabilitation workers) as well as international staff to promote a good liaison and efficiency. Outreach visits must only be carried out at the invitation of the hospitals to be visited.

Outreach Teams' Terms of Reference

- Provision to provide medical advice and support to local health-care staff in managing TBI cases
- Assistance with identification and triage of TBI cases
- To train family members in essential skills such as mobility, skin care, and positioning to limit pressure ulcer development, bowel/bladder care, diet, etc.
- Make a rapid assessment of identified specialized TBI and/or trauma care centers on the spot.

Recommendations

1. Teams should be prepared to make a rapid assessment on identified TBI care centers and local facilities (including information technology), train local health staff (and family members) in safe moving and handling practices, and TBI-specific rehabilitation skills. This will improve local capacity and enable safe staffing levels to be implemented and care continued after the departure of the deployed EMTs
2. Specialized cells should maximize opportunities to exchange knowledge and competence in rehabilitation with local personnel in various disciplines
3. Where feasible teams should develop appropriate educational resources in local languages (preferably pictorial) to support patient and carer education
4. Training of local health workers should be consistent with local practice; local rehabilitation standards and culture should be acknowledged; and exchange of knowledge for application to the local context should be sought.

Medical and surgical input

Early diagnosis and treatment is a priority in all TBI incidents, to manage the acute primary injury and to minimize the development of secondary injuries.[9] Overall, most causes of the mortality from brain injury (65%) are due to secondary brain damage resulting from hypoxia and hypotension.[36] Neurosurgery can be available following a SOD either provided by the local or EMT neurosurgeons. Neurosurgery is a technically demanding specialty requiring expensive resources and, in many developing countries, the availability of this is scarce.[9,37]

Surgical treatment of intracranial mass lesions can be basic (burr hole) or advanced (including craniotomy, craniectomy, and treatment of intracerebral hematoma).[38] The aim is to timely decompress space-occupying lesions and thereby to prevent secondary brain injury.[38] In addition, TBI specialized care teams may have the capability to offer the deployment of team members (if requested), specifically neurosurgeons, to embed into a tertiary facility (national or Type 3 EMT), and to advise on the acute management of TBI. This would include:

- Advice on decision-making regarding surgical versus conservative management
- Support for the host facility surgeons in operative management as clinically indicated
- Review outcomes of surgery and advice on the suitability for transfer to rehabilitation settings or return to surgery for further procedures.

The length of deployment is likely to be shorter than that of the specialized rehabilitation team. It would be linked directly to the team; however to ensure rehabilitation is available from the earliest outset. Specific equipment and consumables/instruments for deployment is recommended in Table 2.

Exit strategy

Any exit strategy should be coordinated with the host MoH, EMT-CC, and local TBI rehabilitation services. For Scenarios A and B described above, discussions with the host center about the need for medium term support would ideally be initiated at or before 6 weeks of deployment. This could be better formulated if outcomes of rapid assessment on the existing TBI care are available and further communication plan is set up for ongoing support.

Technical Standards

Traumatic brain injury Specialized care team

Skill requirements

Minimum standards

1. Registration with the relevant medical board in the home country
2. Rehabilitation professionals specialized in TBI should have experience in managing patients in the acute and subacute phases of trauma and medical rehabilitation
3. TBI Specialized care teams must have experience and/or training to work in austere environments
4. Specialized care teams should be able to provide early rehabilitation to patients with TBI while they await specialist brain injury rehabilitation
5. Rehabilitation professionals should make an effort to maintain consistency in the treatment approaches by the use of evidence-based guidelines, protocols, and common predeployment training.

Team configuration

Recommendations

1. TBI specialized care team should be multidisciplinary and comprised of at least three rehabilitation professionals including rehabilitation physician and at least one physiotherapist as well as other disciplines such as occupational therapy, specialist nurses, speech therapists, prosthetics and orthotic technicians, and others
2. Teams should be able to demonstrate evidence that they can be released from their current employment at short notice.

Qualification and experience

Recommendation

1. Rehabilitation professionals in TBI specialized care teams should have at least bachelor's degree or equivalent in their respective discipline
2. TBI specialized care team members should have undergone training in working in austere environments and have at least 3 years of clinical experience in TBI rehabilitation, preferably having had experience in emergency response
3. TBI specialized care team members can be from different institutions, preferably from the same town and country.

Table 2: Specialized traumatic brain injury rehabilitation equipment and consumables

Items	Quantity per 20 beds	Notes
Inpatient wheelchairs	2	Need not be configured to each patient; should be used for transport only in the facility
Pressure-relieving mattresses/Craig bed to remain in the hospital if applicable	20	Mattresses should be made of high-specification foam. Air devices with pumps (such as alternating air mattresses) are not suitable for EMTs because of the danger of over- or under-inflation, unreliable or incompatible power sources, and maintenance Pressure-relieving mattresses do not replace manual pressure relief and regular repositioning
Beds with IV stand	20	Beds should provide a firm, flat surface to adequately nurse an unstable spinal fracture (essential). They should be height adjustable or wheelchair height (desirable)
Sheet, bed, woven 180 cm × 290 cm	80	
Pillows, waterproof, 1 size, non-feather	80	
Pillow cases	160	
Water proof pillow covers	80	
Bed pan	4	
Screen, foldable 3 panel, on castors	2	
Slide sheets	20	
Single-patient use, to remain in the hospital		
Patslide or equivalent rigid transfer board®	2	
Portable commodes	2	
Shower chair	2	
Template for a prone trolley	1	To be made in country if needed
Patient washbowl	4	
Rigid adjustable cervical collars	5	Range of sizes, including pediatric
Three-point spinal brace (if multitrauma)	3	Jewett hyperextension brace limits flexion and extension from T6-L1
Neuro tip pins for sensory examination	50	
Personal protective equipment		
Gloves, examination	1 box of each size	Sizes: small, medium, and large
Gloves surgical	10 of each size	Sizes 6.5, 7, 7.5, and 8
Goggles, protective, plastic	2	
Aprons, plastic, protective, single use	2 rolls	Should be water resistant
Container for sharps disposal	2	
Identify bracelet	25	
Bag, plastic, biohazardous materials	25	
Cardio respiratory		
Vital signs portable monitor including SaO_2, ECG, BP, temperature	4	
Stethoscope	4	
Incentive spirometer	10	
Spirometer, with disposable tubes	1 portable plus 40 single patient use mouth pieces	
Nasal specs	5	
Oropharyngeal airway	10	Range of sizes
Nasal pharyngeal airway	10	Range of sizes
Suction tubing		
Suction catheters	50	Range of sizes (8-16)
Tube gastric	10	CH 18, CH 16, CH 12
Oxygen facial masks	10	Adult and pediatric
Yankauer suction CH 20 and suction tubing	5	
Portable, reusable suction unit	2	
Bag valve mask (ambu bag)	2	Adult and pediatric
Nebulizer		

Contd...

Table 2: Contd...

Items	Quantity per 20 beds	Notes
IV catheter	20 of each size	Sizes 24G, 22G, 20G, 18G, 16G, and 14G
IV giving set	50	
IV fixation, for example, Tegaderm	50	
Syringe, single use, sterile	100 of each	1 ml, 5 ml, 10 ml, 20 ml, 50 ml
Sodium chloride 0.9%, 1 L	20	
Sodium chloride 0.9%, 10 ml, plastic amp	5	
Water for injection, 10 ml, plastic amp	100	
50-ml plastic medicine cups	2	
Anti-embolism stockings	40	Range of sizes (2 per patient)
Abdominal binder	10	1 per lesion above T10, range of sizes
Bladder care		
Silicone catheters	Indwelling: 4 per patient Intermittent: 24-60 per patient	Size 12 for women Size 14 for men Size 8 for children Silicone catheters have a lower occurrence of allergic responses and reduced likelihood of mineral encrustations in comparison to latex and PVC (20)
Condom sheaths and adhesives	5 per patient for 14 days	
Urine bags	Urometer bags: 1 per patient Urine collection bags: 10 per patient (changed weekly) Leg bags: 10 per patient	Urine bags are listed in the Type 2 rehabilitation kit but not in sufficient quantities and leg bags are not included
Bowel care		
Inco sheets	560	
Lubricant	For bowel care and catheter insertion: 250 per patient in single-use packets, or 2 tubes per week per patient	
Wipes	40 packs	
Skin care		
Plastic disposable forceps	50	
Basin, kidney	4	
Bowl	2	
Trolley dressing	2	
Tape	10	
Compress gauze	200	
Dressing scissors	2	
Apinate dressings suitable for cavity pressure ulcers with eschar, for example, MEDIHONEY™	150 packs	Change every 2-3 days unless leaking
Alginate dressings to assist with cleaning wounds	150 packs	Change every 2-3 days unless leaking. Assists with cleaning wounds, include a range of sizes
Hydrocolloid dressings to promote granulation of shallower wounds	150 packs	Change every 2-3 days unless leaking. Promotes granulation in shallower wounds, includes a range of sizes
Barrier cream	10	For skin protection from urine and feces on vulnerable areas
Povidone-iodine 10%, solution 500 ml	10	Skin preparation for surgery/cleaning
Handheld mirror	20	For use in preventing and monitoring pressure sores and intermittent female catheterization
Rehabilitation equipment		
Walking/standing frames	2	Ensure a range of sizes, including provision for pediatric patients and a forearm walker.
Discharge wheelchairs	4	Should be an appropriate fit for the patient but not bespoke. For temporary use in the community only and not for long-term use. All wheelchairs should have at least a pressure-relieving (high-specification foam or gel) cushion, depending on the patient's risk for pressure ulcers Arrange review for patients with a local partner organization

Contd...

Table 2: Contd...

Items	Quantity per 20 beds	Notes
Tape measure	4	2 rigid for wheelchair prescription 2 flexible for measuring wound dimensions
Goniometer	2	Suitable for measuring large joint dimensions
Reflex/percussion hammer	1	
Pressure-relieving cushions for wheelchairs		The size should correspond to the wheelchairs. Ensure that all are pressure-relieving cushions (made of high-specification foam and/or gel). Air cushions are not recommended because of the risk for over- or under-inflation and maintenance. Prescribe alongside training in pressure-relieving techniques
Additional pillows for positioning To remain in the hospital		May be supplemented with foam blocks and wedges. Attempt to obtain additional pillows from the host country once in the field
Cushion wedge+plastic cover	2 of each	
Bandages, elastic crepe	20	Useful for towel splinting
Transfer boards	2	Have made in host country. Import one to use as a template
Leg raisers for wheelchairs		Provide for both left and right lower limbs. Consider different sizes for the wheelchairs being imported
Prefabricated ankle and foot orthosis	5 right and left for shoe sizes 38-45 5 right and 5 left for shoe sizes 35-40	Not to be used for bed positioning Indicated for low-level injuries with foot drop and ability to ambulate
Pushing gloves	1 pair	Have made in host country. Import one to use as a template
Prefabricated wrist splints and positioning splints (palmar orthosis)		Range of sizes, including pediatric
Splinting kit Thermoplastic sheets Heat gun Portable water heater (pan) Velcro (adhesive hook and nonadhesive loop) Splinting scissors Strapping Drinks Sewing needles and thread Neoprene		Consider a range of thermoplastics. Ensure heat gun is compatible with power supply Include materials for dynamic splints if qualified personnel are available to make them, for example, hooks, rubber bands, and nylon thread

PVC: Polyvinyl chloride

Length of stay

Minimum standards

1. EMT that embeds into a local facility is recommended to stay for at least 1 month, with a minimum length of stay of 3 weeks for individuals within teams.

Common complications following traumatic brain injury

- Posttraumatic seizures and epilepsy
- Posttraumatic headache and hydrocephalus
- Autonomic dysfunction
- Posttraumatic agitation
- Neuroendocrine dysfunction: Hypothalamic pituitary dysfunction (syndrome of inappropriate antidiuretic hormone secretion, diabetes insipidus, hypogonadism, hyperprolactinemia, cerebral salt wasting, and growth hormone deficiency)
- Sleep disturbances: Hypersomnia, narcolepsy, obstructive sleep apnea, hypo-arousal
- Bowel dysfunction: Constipation, impaction, obstruction, and incontinence
- Bladder dysfunction: Detrusor hyperreflexia, reduced perception of bladder fullness, and poor sphincter control
- Gastrointestinal complications: Hypomotility, delayed gastric emptying, reflux, and erosive gastritis
- Cardiopulmonary complications: Pneumonia, neurogenic/dysfunctional breathing
- Deep vein thrombosis (DVT)/pulmonary embolism (PE)
- Visual, auditory, and olfactory dysfunctions
- Pressure ulcers
- Swallowing and nutritional dysfunction
- Motor: Weakness, spasticity, contractures risk, and ataxia
- Cognitive dysfunction: Arousal, attention, memory, speed of processing, and executive dysfunction
- Behavioral dysfunction and emotional regulation
- Heterotrophic ossification.

Recommended general competencies within the traumatic brain injury specialized care team

- Identify the mechanism of injury
- Awareness of the criteria for referral for further definitive airway management if required
- Trained and competent in the monitoring vital signs and proficient in the full neurological examination
- Ability to evaluate swallowing for aspiration risk
- Recognize indications of appropriate brain imaging (if available) based on clinical symptoms and neurological assessment
- Identify the mechanism of injury
- Awareness of the criteria for referral for further definitive airway management if required
- Trained and competent in the monitoring vital signs and proficient in the full neurological examination
- Ability to evaluate swallowing for aspiration risk
- Recognize indications of appropriate brain imaging (if available) based on clinical symptoms and neurological assessment
- Recognition of clinical symptoms and signs that require transfer for further definitive neurosurgical intervention
- Ability to categorize TBI based on relevant index of injury severity (e.g., Glasgow Coma Scale [GCS], loss of consciousness (LOC), and posttraumatic amnesia [PTA])
- Skilled in describing the state of a patient using GCS (EMV), each stratified according to increasing impairment
- Familiar with using an appropriate validated scale for PTA that is relevant in clinical practice in the host country
- Familiarity with acute and sub-acute management of potential complications of TBI
- Aware of presentation of mild TBI, its long-term sequelae, importance of the provision of information, and education to the patient/caregiver
- Familiarity with other multiple trauma and bleeding complications resulting from brain injury
- Referral for continued ongoing care and links with local service providers as appropriate
- Ability to provide early rehabilitation while awaiting transfer to specialist rehabilitation locally
- Identification of referral pathways for surgery or assistive devices for patients where this may be considered beneficial.

Recommended specific competencies within the traumatic brain injury specialized care team

1. GCS [Appendix 1]
2. Disorder of conscious state
   - Assessment of conscious state into coma, vegetative state, minimum conscious state, PTA, and emergence from PTA. Be familiar with appropriate, validated assessment scales such as Coma Recovery scale
   - Familiarity with the management needs specific to each of the arousal state and specific complications related to each arousal state
3. PTA
   - Assessment of PTA using an appropriately validated PTA scale for the host country (e.g., Westmead PTA scale and Abbreviated Westmead PTA scale) [Appendix 2]
   - Identify the severity of TBI based on PTA duration
   - Familiarity with different behavioral problems during acute symptomatic phase (impulsivity, agitation, uninhibited behaviors, aggression, and confabulation)
   - Knowledge and understanding of environment needed to manage PTA (such as low stimulus environments)
   - Provision psychological interventions including specific environmental strategies, behavioral management strategies, and education of family and/or support system about TBI and its behavioral manifestations
4. Cognitive dysfunction
   - Identify disorders of cognitive functioning resulting from TBI (e.g., arousal, attention, speed of information processing, memory, and executive dysfunction)
   - Skilled in the assessment of various domains of cognitive dysfunction
   - Provision of various strategies relating to specific cognitive impairment in relevant functional situations
   - Refer to a comprehensive neuropsychological rehabilitation program locally, with the aim of improving function for day-to-day activities
5. Behavioral and emotional disorders
   - Knowledge and understanding of challenging behaviors that are frequent neurobehavioral sequelae
   - Experience in the exclusion of other medically remediable causes of agitation (e.g., pain, mood disorder, urinary retention, constipation, drug/alcohol intoxication, and withdrawal)
   - Knowledge and understanding of principles of nonpharmacological interventions following TBI with challenging behaviors
   - Familiarity with using various pharmacological interventions and surveillance for their possible adverse effects when used as an adjunct for moderate levels of agitation/aggression
   - Ability to identify and manage various common psychological disorders such as depression, anxiety, PTSD, and sexual disinhibition
6. Posttraumatic seizures and epilepsy
   - Ability to identify major risk factors leading to posttraumatic seizures such as penetrating head injuries, hematoma, skull fractures, and early seizures

- Knowledge and understanding of the role of utilizing antiepileptic drugs as prophylaxis and treatment following brain trauma

7. Hydrocephalus
   - Identification of posttraumatic hydrocephalus, risk factors, and management
8. Neuroendocrine dysfunction
   - Familiarity with common neuroendocrine complications from hypopituitarism following TBI (including syndrome of inappropriate antidiuretic hormone secretion, diabetes insipidus, thyroid, and sexual dysfunction)
   - Local knowledge within the host country in order to facilitate further specialized medical evaluation and treatment
9. Pain
   - Ability to screen for presence of pain and to determine type of pain, its intensity, and impact/interference in the patient's activities of daily life
   - Knowledge and understanding of various types of pain relief medications for nociceptive and neuropathic pain, including the possible side effects
   - Identification of the etiology of headache, including posttraumatic headache and management
10. Wound
    - Experience and skills in the acute and sub-acute management of different types of woun
11. Fatigue
    - Awareness of primary and secondary fatigue, its impact, and management
12. Sleep
    - Assessment of sleep disturbances, sleep–wake cycle, circadian rhythm, and management of poor sleep patterns
13. Bowel
    - Recognition of the risk of constipation, fecal loading/impaction, and incontinence
    - Awareness of the impact of bowel dysfunction on behavior, spasticity, and bladder function
    - Familiarity with the use of aperients, including suppositories, to establish a structured bowel program
14. Bladder
    - Recognition of the risk of urinary retention, voiding dysfunction, and urinary incontinence
    - Recognition of the impact of urinary retention on behavior and spasticity
    - Ability to identify need for indwelling urethral catheter (IDC) insertion, competency in insertion of male and female urinary catheter
    - Familiarity with the prevention, monitoring, and treatment of urinary tract infections
    - Knowledge regarding bladder training using medications, behavioral management, and continence aids/devices
15. DVT prophylaxis
    - Awareness of the risk factors of DVT/PE, management, and prevention
16. Ulcer prophylaxis
    - Recognition of the need for antiulcer prophylaxis to prevent stress ulcer and erosive gastritis following TBI
17. Cardiopulmonary complications
    - Recognition of signs and symptoms of autonomic dysfunction and its pharmacological management
    - Knowledge and understanding of pharmacological management of dysautonomia, including possible side effects of medications
    - Familiarity with altered lung functions following multitrauma which involve the chest wall
    - Recognition of signs of respiratory distress, abnormal breathing patterns, and swallowing dysfunction
    - Knowledge of the principles of therapeutic interventions such as avoidance of respiratory failure with adequate oxygenation, ventilation, routine swallow evaluation to evaluate for aspiration risk, and aggressive pulmonary hygiene
18. Visual, auditory, and olfactory dysfunction
    - Recognition of the symptoms and signs of visual, auditory, and olfactory dysfunction and its management, including the indication for specialist referral
19. Pressure area care
    - Preservation of skin integrity with regular skin inspections, repositioning, and pressure-relieving products
20. Nutrition
    - Knowledge and capability to assess nutritional status using appropriate validated tools relevant to the host country
    - Skills in the management of malnutrition and dehydration, including artificial feeding
21. Spasticity
    - Ability to assess and measure spasticity using validated assessment tools and outcome measures.
    - Knowledge of pharmacological and nonpharmacological management of spasticity, indications for each treatment option, and the safety and side effects of treatment options
22. Heterotopic ossification
    - Identification of risk factors for heterotrophic ossification and management

C. Other essential clinical and nonclinical competencies

Clinical:

- Education of patient, carers, and support network regarding TBI, its complications, and likely prognosis
- Provision of re-training of patients and care providers in basic daily activities and provision of psychological support

- Basic splinting
- Assistive device prescription and application
- Patient mobilization, including early mobilization

Nonclinical:

- Discharge planning in austere environment
- Knowledge and understanding of disability and rehabilitation (including community-based rehabilitation) in resource-poor settings
- Basic data collection and documentation
- Cultural sensitivity
- Organization and administration
- Leadership, including communication, team building, and multitasking
- Resources for coaching, mentoring, and training staff regarding TBI at local facilities in the host country.

Rehabilitation Equipment, Consumables, and Pharmacological

Table 2 lists the equipment and consumables for TBI specialized cells/teams to support a 20-bed unit for 2 weeks. The quantity of equipment is provided as a guide only and, if patient numbers exceed 20, additional equipment and consumables will be needed correspondingly. The lists are not exhaustive and do not include equipment necessary to support patients with severe TBI or ventilated patients.

Table 3 lists the minimum medications needed for a 2-week period, names may vary from country to country and specialized teams may wish to add to this table to reflect the best practice in their place of work.

It is recommended that any remaining surplus equipment, consumables, and medication are handed over to support the ongoing center's needs at the end of the deployment, provided that staff present are competent in using the equipment, consumables, and medication prescription. Assistive device requirement will be based on the need assessments, as their provision requires early, careful consideration and referral to local services where these exist.

Table 3: Commonly recommended pharmacological agents for specialized care teams for traumatic brain injury management in disaster settings*

Item	Maximum daily dose**	Indications
Levitiracetam	3000 mg	Seizures
Phenytoin (IV loading dose)	10-15 mg/kg	Seizures
Phenytoin (oral)	300 mg	Seizures
Clonazepam (IV)	10 mg	Seizures
Diazepam (PR)	10 mg	Seizures
Propranolol	80 mg	Aggression
Sodium valproate	2000 mg	Agitation
Carbamazepine	800 mg	Agitation/aggression
Olanzapine (wafer/IM)	20 mg	Acute aggression/agitation
Quetiapine	300 mg	Acute aggression/agitation
Paracetamol	4 g	Nonneuropathic pain
Opioids	Based on type of opioid	Nonneuropathic/ neuropathic pain
Baclofen	100 mg	Spasticity
Movicol	3 sachets daily	Constipation
Docusate sodium	300 mg	Constipation
Sennakot	30 mg	Constipation
Microlax enema	5 ml (1 enema)	Constipation
Amitriptyline	150 mg	Neuropathic pain/ depression
Pregabalin	600 mg	Neuropathic pain
Low-molecular-weight heparin	5000 units BD	DVT prophylaxis

*This is not an exhaustive list and need to refer to relevant product information of host country for indications, appropriate dose, interactions, and adverse reaction, **All doses are based on MIMS (Australia).[39] and maximum dose can vary according to clinical severity of symptoms. DVT: Deep vein thrombosis, IV: Intravenous

Discharge and Referral

Recommendations for optimal patient care

1. Specialized care teams should adhere to the WHO minimum standards of care
2. TBI teams should plan for discharge and community reintegration from early stages of care to identify service gaps, which should be communicated to the host MoH
3. EMTs should endeavor to discharge patients only when they are medically stable and when they can safely access their discharge destination (as housing may be inaccessible) and only when they have adequate support to cope
4. Patients who continue to require care should be appropriately referred to a step-down facility or a local service provider and community rehabilitation services
5. Specialized care teams should handover to the local coordinating cell an updated list of all patients who require rehabilitation follow-up after discharge
6. All patients should be referred for follow-up as close to their home as possible
7. Specialized care teams should maximize opportunities to prepare patients and their families and care providers for discharge by providing education and functional retraining. This can relieve pressure on over-stretched service provider.

Information Management

Data collection, documentation, and reporting

Minimum standards

The number of patients with newly diagnosed TBI is included in the daily reporting forms for EMTs and submitted to the host MoH coordination cell, with any additional data as required. The ICF Brief core set[30] should be used to identify

patient-reported problems for "*body functions and structures*;" "*activity and participation,*" and "*environmental and personal factors*" components, where possible [Appendix 3].

Recommendations

EMT-CC standard paperwork for daily reporting form, patient referral form, and exit form should be used.

Nursing specific

Documentation should include a classification and tracking of pressure ulcers and wounds; monitoring/documentation of vital observations, fluid, continence, and cognitive and behavioral management.

Conclusion

SODs result in significant loss of life and long-term physical impairments including TBI. The overriding objective of TBI care has now extended to successful reintegration of the patient into the community. TBI rehabilitation focuses on a comprehensive assessment of neurological and functional limitations and individualized treatment program for specific functional goals with ongoing monitoring of outcomes. Rehabilitation of TBI survivors should commence from early-response phase of any disasters for timely/early diagnosis and treatment of the survivors to minimize impairments/complications and prevent secondary injury. Specialized rehabilitation teams in any disasters are deployed based on the response to meet specific needs required at the request of the host health authorities. These teams should be multidisciplinary and need to be integrated into a disaster response and management plan and their skills need to be shared with local rehabilitation and health-care providers through mentoring and educating/training. Specialized rehabilitation teams need to adhere to the WHO guiding principles and core standards as other EMTs. This report extends the WHO's "Minimum Standards proposed in the EMT Classifications" and "Minimum Standards and Recommendations for Rehabilitation" documents and establishes minimum standards for the development and deployment of TBI specialized rehabilitation team.

Glossary of terms

Coordination cell

A coordination cell is mandated to support (not replace) the host MoH (or equivalent national authority) in coordinating all responding EMTs to best meet the excess health-care needs resulting from the emergency or from damage to the existing capacity. The coordination cell matches available resources to identified needs, ensuring optimal resource use and maximum collective outcomes.

Emergency medical team

EMTs are groups of health professionals and supporting staff outside their area of origin (nationally or internationally), who provide health care specifically to populations affected by emergencies. They include governmental (both civilian and military) and nongovernmental teams. EMTs respond to SODs to treat trauma and surgical cases. Their value in other types of emergencies, such as communicable disease outbreaks, has been demonstrated more recently.

- EMT Type 1: Outpatient emergency care
  Outpatient initial emergency care of injuries and other significant health-care needs
- EMT Type 2: Inpatient surgical emergency care
  Inpatient acute care, general, and obstetric surgery for trauma and other major conditions
- EMT Type 3: Inpatient referral care
  Complex inpatient referral surgical care including intensive care capacity.

Disability

An umbrella term for impairments, activity limitations, and participation restrictions resulting from the interaction between people with health conditions and the environmental barriers they encounter (based on the ICF).

Disaster

A serious disruption of functioning of a community or a society causing widespread human, material, economic, or environmental losses, which exceed the ability of the affected community or society to cope using its own resources.

Medical rehabilitation

A set of interventions designed to optimize functioning and reduce disability in individuals with health conditions [disease [acute or chronic], disorder, injury, or trauma) in interaction with their environment.

Natural disaster

A serious disruption of functioning of a community or a society causing widespread human, material, economic, or environmental losses, which exceed the ability of the affected community or society to cope using its own resources.

Specialized care team

Specialized care teams are national or international teams embedded into an EMT or a local hospital to provide specialist care. They adhere to the same guiding principles and core standards as EMTs.

Step-down facility

A step-down facility is an inpatient unit with a mandate to provide interim care for medically stable patients while they are prepared for discharge into the community.

Sudden-onset disaster

Disasters that occur with little or no warning, meaning there is insufficient time for the complete evacuation of the at-risk populations.

Traumatic brain injury

A traumatically induced structural and/or physiological disruption of brain function due to an external force, indicated by new onset or worsening of at least one of the clinical signs, immediately following the event.

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Conflicts of interest

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References

1. Vos F, Rodriguez J, Below R, Guha-Sapir D. Annual Disaster Statistical Review 2009: The Numbers and Trends. Brussels: Centre for Research on the Epidemiology of Disasters; 2010.
2. Reinhardt JD, Li J, Gosney J, Rathore FA, Haig AJ, Marx M, *et al.* Disability and health-related rehabilitation in international disaster relief. Glob Health Action 2011;4:7191.
3. Khan F, Amatya B, Gosney J, Rathore FA, Burkle FM Jr. Medical rehabilitation in natural disasters: A review. Arch Phys Med Rehabil 2015;96:1709-27.
4. Amatya B, Galea M, Li J, Khan F. Medical rehabilitation in disaster relief: Towards a new perspective. J Rehabil Med 2017;49:620-8.
5. Rathore MF, Rashid P, Butt AW, Malik AA, Gill ZA, Haig AJ, *et al.* Epidemiology of spinal cord injuries in the 2005 Pakistan earthquake. Spinal Cord 2007;45:658-63.
6. Scottish Intercollegiate Guidelines Network. SIGN 130 Brain Injury Rehabilitation in Adults: A National Clinical Guideline. Edinburgh: SIGN; 2103.
7. Khan F, Baguley IJ, Cameron ID 4: Rehabilitation after traumatic brain injury. Med J Aust 2003;178:290-5.
8. Brasure M, Lamberty GJ, Sayer NA, Nelson NW, MacDonald R, Ouellette J, *et al*. Multidisciplinary Postacute Rehabilitation for Moderate to Severe Traumatic Brain Injury in Adults. (Prepared by the Minnesota Evidence-based Practice Center under Contract No. 290-2007-10064-I.) Publication No. 12-EHC101-EF. Rockville, MD: Agency for Healthcare Research and Quality; 2012.
9. Regens JL, Mould N. Prevention and treatment of traumatic brain injury due to rapid-onset natural disasters. Front Public Health 2014;2:28.
10. Access Economics. The Economics Costs of Spinal Cord Injury and Traumatic Brain Injury in Australia. Canberra: Victorian Neurotrauma Initiative; 2009.
11. Winker PA. Neurological rehabilitation. In: Umphred DA, editor. Traumatic Brain Injury. 5th ed., Ch. 17. Missouri: Mosby Elsevier; 2007. p. 532.
12. World Health Organization. International Classification of Functioning, Disability and Health (ICF). Geneva: World Health Organization; 2001.
13. Sloan S. Acquired Brain Injury Slow to Recover Program: Report of the therapy review program. Melbourne: Prepared for Victorian Government Department of Human Services ABI: STR Program by Osborn Sloan & Associates Pty Ltd.; 2008.
14. Cassidy JD, Carroll LJ, Peloso PM, Borg J, von Holst H, Holm L, *et al.* Incidence, risk factors and prevention of mild traumatic brain injury: Results of the WHO collaborating centre task force on mild traumatic brain injury. J Rehabil Med 2004;43 (Suppl):28-60.
15. Centers for Disease Control Prevention; National Center for Injury Prevention and Control; Division of Unintentional Injury Prevention. Report to Congress on Traumatic Brain Injury in the United States: Epidemiology and Rehabilitation. Atlanta, GA: Centers for Disease Control Prevention; 2014.
16. Brain Injury Association of America. Facts about Traumatic Brain Injury; 2011. Available from: http://www.biausa.org. [Last accessed on 2017 Sep 12].
17. Mateen FJ. Neurological disorders in complex humanitarian emergencies and natural disasters. Ann Neurol 2010;68:282-94.
18. World Health Organization. Emergency Medical Teams: Minimum Technical Standards and Recommendations for Rehabilitation. Licence: CC BY-NC-SA 3.0 IGO. Geneva: World Health Organization; 2016.
19. MacKenzie JS, Banskota B, Sirisreetreerux N, Shafiq B, Hasenboehler EA. A review of the epidemiology and treatment of orthopaedic injuries after earthquakes in developing countries. World J Emerg Surg 2017;12:9.
20. Missair A, Pretto EA, Visan A, Lobo L, Paula F, Castillo-Pedraza C, *et al.* A matter of life or limb? A review of traumatic injury patterns and anesthesia techniques for disaster relief after major earthquakes. Anesth Analg 2013;117:934-41.
21. World Health Organization. Rehabilitation in Health Systems. Licence: CC BY-NC-SA 3.0 IGO. Geneva: World Health Organization; 2017.
22. Rathore FA, Gosney JE, Reinhardt JD, Haig AJ, Li J, DeLisa JA, *et al.* Medical rehabilitation after natural disasters: Why, when, and how? Arch Phys Med Rehabil 2012;93:1875-81.
23. Wade D. Rehabilitation – A new approach. Part four: A new paradigm, and its implications. Clin Rehabil 2016;30:109-18.
24. Cicerone KD. Participation as an outcome of traumatic brain injury rehabilitation. J Head Trauma Rehabil 2004;19:494-501.
25. Zhang X, Reinhardt JD, Gosney JE, Li J. The NHV rehabilitation services program improves long-term physical functioning in survivors of the 2008 Sichuan earthquake: A longitudinal quasi experiment. PLoS One 2013;8:e53995.
26. Amatya B, Khan F. Overview of medical rehabilitation in natural disasters in the Pacific Island countries. Phys Med Rehabil Int 2016;3:1090.
27. Khan F, Amatya B, Rathore FA, Galea MP. Medical rehabilitation in natural disasters in the Asia-Pacific region: The way forward. Int J Nat Disaster Health Secur 2015;2:6-12.
28. Khan F, Amatya B, Mannan H, Burkle FM Jr., Galea MP. Rehabilitation in Madagascar: Challenges in implementing the World Health Organization disability action plan. J Rehabil Med 2015;47:688-96.
29. Rathore FA, New PW, Iftikhar A. A report on disability and rehabilitation medicine in Pakistan: Past, present, and future directions. Arch Phys Med Rehabil 2011;92:161-6.
30. Centre for Research on the Epidemiology of Disasters. The Human Cost of Natural Disasters: A Global Perspective. Brussels: Centre for Research on the Epidemiology of Disasters; 2015.
31. Norton I, von Schreeb J, Aitken P, Herard P, Lajolo C. Classification and Minimum Standards for Foreign Medical Teams in Sudden Onset Disaster. Geneva: World Health Organization; 2013.
32. Colorado Division of Workers' Compensation. Traumatic Brain injury medical treatment guidelines. Denver Colorado Division of Workers' Compensation, Department of Labor and Employment: Division of Workers' Compensation; 2013.
33. Management of Concussion/mTBI Working Group. VA/DoD clinical practice guideline for management of concussion/Mild traumatic brain injury. J Rehabil Res Dev 2009;46:CP1-68.
34. Wheeler S, Acord-Vira A. Occupational Therapy Practice Guidelines for Adults with Traumatic Brain Injury. Bethesda: American Occupational Therapy Association, Inc.; 2016.
35. Zasler ND. Brain Injury Medicine: Principles and Practice. 2nd ed. New York: Demos Publishers; 2013.
36. Chesnut RM, Marshall LF, Klauber MR, Blunt BA, Baldwin N, Eisenberg HM, *et al.* The role of secondary brain injury in determining outcome from severe head injury. J Trauma 1993;34:216-22.
37. Khan F, Amatya B, Mannan H, Rathore FA. Neurorehabilitation in developing countries: A way forward. Phys Med Rehabil Int 2015;2:1070.
38. Mock C, Lormand JD, Goosen J, Joshipura M, Peden M. Guidelines for Essential Trauma Care. Geneva: World Health Organization; 2004.
39. MIMS Australia. Monthly Index of Medical Specialties; 2017. Available from: https://www.mimsonline.com.au/Login/Login.aspx?ReturnUrl=%2fdefault.aspx. [Last accessed on 2017 Sep 15].

Annex 1: Specialized traumatic brain injury rehabilitation team

	TBI specialized rehabilitation team	Page
Team composition	Minimum technical standards	p 14, 20
	A TBI specialized rehabilitation team should be led by a rehabilitation physician and comprise of at least three other professionals from different disciplines, including rehabilitation medicine, nursing, physiotherapy, occupational therapy, speech and language therapy, and psychology. In addition, a team lead is required to represent the care team at health coordination level	
	Demonstration by team for verification	
	The team can provide a list of seven or more professionals representing at least medicine, nursing, and allied health disciplines who are available for rapid deployment	
Qualification and experience	Minimum technical standard	p 20
	Rehabilitation professionals in a TBI specialized care team should have at least 6 months' experience working in a TBI unit or with TBI patients in a major trauma center and at least 3 years of postqualifying clinical experience	
	At least one team member (preferable the team leader) should have experience in emergency response and all team members should have undergone training in working in austere environments	
	Demonstration by team for verification	
	The team can provide copies of professional qualifications and declarations of at least 3 years' clinical experience including 6 months of TBI experience	
Rehabilitation equipment	Minimum technical standard	p 27-33
	Specialized care teams for rehabilitation should have capability to rapidly provide the equipment listed in [Table 2]	
	Demonstration by team for verification	
	The team can present a stockpile of equipment, medications, and consumables listed in Tables 2 and 3, or present documentation of an arrangement to have the equipment rapidly provided (including financial and logistical capability) in the event of the team's deployment	
Length of stay	Minimum technical standard	p 21
	A team that embeds into a local facility should plan to stay for at least 1 month	
	Demonstration by team for verification	
	A team should declare its intended length of stay (no <1 month), to facilitate appropriate placement with an EMT or local facility if deployed. Evidence of a exist strategy and release mechanism should be demonstrated	

TBI: Traumatic brain injury, EMT: Emergency medical team

Annex 2: Rehabilitation input for traumatic brain injury survivors by emergency medical team type

EMT type	Rehabilitation considerations
Type 1	Basic neurological and cognitive assessment
	Refer as indicated
Type 2	Neurological, cognitive, and behavioral assessments
	Positioning, including splinting if indicated
	ROM, strength and functional retraining
	Patient and care provider education
	Refer to neurological specialized care team if indicated
Type 3	Neurological, cognitive, and behavioral assessments
	Positioning, including splinting if indicated
	ROM, strength and functional retraining
	Patient and care provider education
	Refer to neurological specialized care team if indicated
Referral and discharge considerations	Identify step-down facility if required
	Identify local providers of neurological rehabilitation.
	Provide long-term follow-up throughout neurological recovery
	Referral to local provider for long-term assistive devices if indicated

ROM: Range of motion, TBI: Traumatic brain injury, EMT: Emergency medical team, WHO: World Health Organization. Overview of rehabilitation input for TBI survivors by EMT type, and specific discharge considerations in the WHO EMT rehabilitation guidelines[18]

Appendices

Appendix 1: Glasgow Coma Scale

GLASGOW COMA SCALE : Do it this way

GCS at 40 | EYES VERBAL MOTOR

Institute of Neurological Sciences NHS Greater Glasgow and Clyde

CHECK	OBSERVE	STIMULATE	RATE
For factors Interfering with communication, ability to respond and other injuries	Eye opening , content of speech and movements of right and left sides	Sound: spoken or shouted request Physical: Pressure on finger tip, trapezius or supraorbital notch	Assign according to highest response observed

Eye opening

Criterion	Observed	Rating	Score
Open before stimulus	✔	Spontaneous	4
After spoken or shouted request	✔	To sound	3
After finger tip stimulus	✔	To pressure	2
No opening at any time, no interfering factor	✔	None	1
Closed by local factor	✔	Non testable	NT

Verbal response

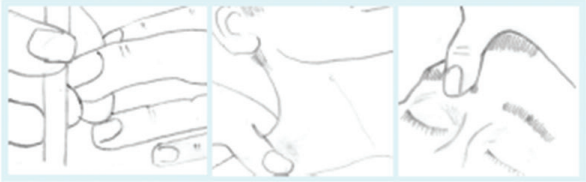
Criterion	Observed	Rating	Score
Correctly gives name, place and date	✔	Orientated	5
Not orientated, but communication coherent	✔	Confused	4
Intelligible single words	✔	Words	3
Only moans / groans	✔	Sounds	2
No audible response, no interfering factor	✔	None	1
Factor interfering with communication	✔	Non testable	NT

Best motor response

Criterion	Observed	Rating	Score
Obey 2-part request	✔	Obeys commands	6
Brings hand above clavicle to stimulus on head/neck	✔	Localising	5
Bends arm at elbow rapidly but features not predominantly abnormal	✔	Normal flexion	4
Bends arm at elbow, features clearly predominantly abnormal	✔	Abnormal flexion	3
Extends arm at elbow	✔	Extension	2
No movement in arms / legs, no interfering factor	✔	None	1
Paralysed or other limiting factor	✔	Non testable	NT

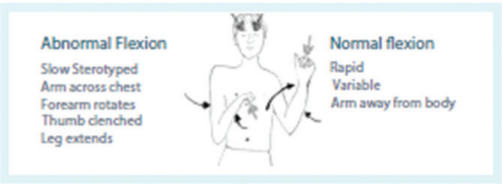
Sites For Physical Stimulation

Finger tip pressure | Trapezius Pinch | Supraorbital notch



Features of Flexion Responses

Modified with permission from Van Der Naalt 2004 Ned Tijdschr Geneeskd



For further information and video demonstration visit www.glasgowcomascale.org

Graphic design by Margaret Frej based on layout and illustrations from Medical Illustration M I - 268093

Appendix 2: Posttraumatic Amnesia Scales

Westmead Posttraumatic Amnesia Scale

Patient Label

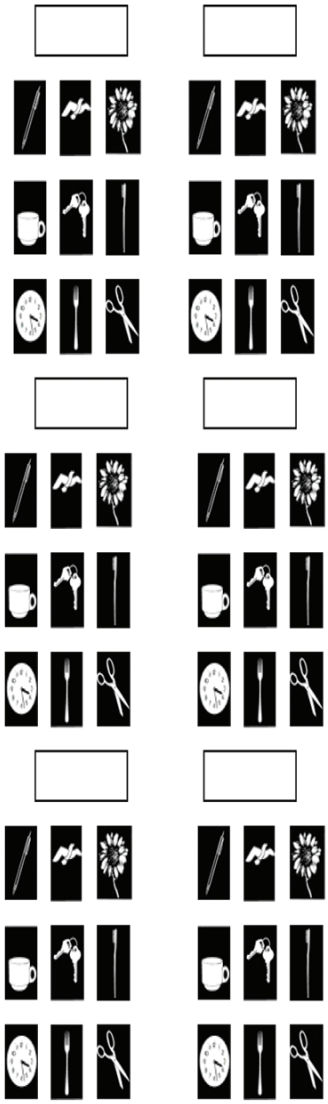
Westmead Post Traumatic Amnesia (P.T.A.) Scale

P.T.A. may be deemed to be over on the first of 3 consecutive days of a recall of 12
When a patient scores 12/12, the picture cards must be changed and the date of change noted.
P.T.A. may be deemed to be over on first day of a recall of 12 for those who have been in PTA for > 4weeks (Tate, R.L. et al. 2006)

Date of Onset: _____

Initial Examiner: _____ Alternate face cards used in examiners absence: _____

	Date:													
1. How old are you?	A													
	S													
2. What is your date of birth?	A													
	S													
3. What month are we in?	A													
	S													
4. What time of the day is it? (Morning / Afternoon / Night)	A													
	S													
5. What day of the week is it?	A													
	S													
6. What year are we in?	A													
	S													
7. What is the name of this place?	A													
	S													
8. Face	A													
	S													
9. Name	A													
	S													
10. Picture I	A													
	S													
11. Picture II	A													
	S													
12. Picture III	A													
	S													
Orientation:	7													
Recall:	5													
Total:	12													



A = Patient's Answer
S = Patient's Score (1 or 0)
* answers if three options given

Adapted by S.Swan, Queensland Health Occupational Therapy Gold Coast Hospital and Royal Brisbane & Women's Hospital, 2009; from Shores, E.A., Marosszeky, J.E., Sandanam, J. & Batchelor, J. (1986). Preliminary validation of a clinical scale for measuring the duration of post-traumatic amnesia. Medical Journal of Australia, 144, 569-572.

Abbreviated Westmead Posttraumatic Amnesia Scale

NSW GOVERNMENT Health

SECTION

Facility:

ABBREVIATED WESTMEAD POST TRAUMATIC AMNESIA SCALE (A-WPTAS)

INCORPORATING THE GLASGOW COMA SCALE (GCS) AND PICTURE RECOGNITION

FAMILY NAME | MRN

GIVEN NAME | ☐ MALE ☐ FEMALE

D.O.B. _____/_____/_____ | M.O.

ADDRESS

LOCATION / WARD

COMPLETE ALL DETAILS OR AFFIX PATIENT LABEL HERE

			Date										Date
			Time										Time
GLASGOW COMA SCALE •	EYES OPEN	Must be (4) to use A-WPTAS	Spontaneously	4									4
			To speech	3									3
			To pain	2									2
			None	1									1
	BEST VERBAL RESPONSE	Must be (3) or more to use A-WPTAS	Orientated (must achieve all)	5									5
			Person										
			Place										
			Reason for admission										
			Month										
			Year										
			Confused	4									4
			Inappropriate words	3									3
			Incomprehensible sounds	2									2
			None	1									1
	BEST MOTOR RESPONSE	Must be (6) to use A-WPTAS	Obeys commands	6									6
			Localises to pain	5									5
			Withdraws to pain	4									4
			Flexion to pain	3									3
			Extension to pain	2									2
			None	1									1
			TOTAL GCS SCORE (A)										
Picture Recognition			Picture 1 - Cup		Show 3 pics								Cup
			Picture 2 - Keys										Keys
			Picture 3 - Bird										Bird
			TOTAL PICTURE RECOGNITION SCORE (B)										
			TOTAL A-WPTAS SCORE (A+B)										
LIMB STRENGTH •	ARMS		Normal power	5									5
			Active movement against resistance	4									4
			Active movement against gravity	3									3
			Active movement gravity eliminated	2									2
			Flicker of movement	1									1
			No movement	0									0
	LEGS		Normal power	5									5
			Active movement against resistance	4									4
			Active movement against gravity	3									3
			Active movement gravity eliminated	2									2
			Flicker of movement	1									1
			No movement	0									0
EYE SIGNS	EYES + Reacts - No c Closed SL Sluggish	Right	Size										
			Reaction										
		Left	Size										
			Reaction										
			Initials										
	PUPIL SIZE (mm)		• 1 • 2 ● 3 ● 4 ● 5 ● 6 ● 7 ● 8										

Guide to using the Abbreviated Westmead Post Traumatic Amnesia Scale (A-WPTAS)

For in-depth information, please see the A-WPTAS Education Package.
For in-depth information on conducting neurological observations, please see the Adult Neurological Observation Chart and associated education package.

A-WPTAS is to be used within 24hrs of injury for patients with a suspected closed head injury and a GCS 13-15.
Patients must be opening their eyes spontaneously and obeying commands to be suitable for A-WPTAS.

Glasgow Coma Scale

Eyes open: Speak in a clear, strong voice. The patient must open their eyes spontaneously (4) to be suitable for use of the A-WPTAS.

Verbal response (orientation questions): A thorough orientation assessment is the core of the A-WPTAS. Must answer all questions correctly to be classified as orientated (5). Obtain the patient's attention and ask the following questions:

Question 1: What is your name?
The patient must provide their full name.

Question 2: What is the name of this place?
The patient has to be able to give the name of the hospital. No points scored for just "hospital."

If the patient cannot name the hospital, give them a choice of 3 local hospital options such as Westmead, Liverpool and Nepean Hospital. One of the options provided needs to be the correct hospital name.

Question 3: Why are you here?
The patient must know why they were admitted to hospital i.e. injured in a car accident. If they do not know, give them options including the correct reason.

Question 4: What month are we in?
The patient must name the month. If they respond "the 6th month," ask the patient "what is the 6th month?" If they do not know the month, give them 3 consecutive options including the correct month.

Question 5: What year are we in?
It is considered correct for patients to answer in the short form "08" instead of "2008". It is also acceptable to offer a prompt i.e. "the year is 2000 and what?"

- Inform the patient of any incorrect answers and advise what the correct answers are.

Best Motor Response: Give simple command e.g. "wiggle your fingers." The patient must obey commands (6) to be suitable for use of the A-WPTAS.

Picture recognition

First assessment: Show the patient the target set of 3 pictures (page 1) for about 10 seconds and ensure that they can repeat the names of each picture (cup, keys, bird). Tell the patient to remember the pictures for re-testing in one hour.

Subsequent assessments: Document the GCS then ask the patient - "What were the three pictures that I showed you earlier?"

Picture recognition scoring:

- Assign a score of 1 for each picture that is recalled correctly. If the total A-WPTAS score is 18/18, cease testing.
- If the patient is unable to recall all 3 pictures correctly, show them the set of 9 pictures (page 4) and ask them if they can recognise the 3 target pictures. Assign a score of 1 for each target picture that is recognised correctly. If the total A-WPTAS score is 18/18, cease testing.
- If the patient is not able to correctly recognise all 3 target pictures, show them the target pictures (page 1) again and ensure that they can repeat the name of each picture. Re-test the patient in 1 hour.

Total A-WPTAS scoring

Add the total GCS score (A) with the total picture recognition score (B) to give the total A-WPTAS score out of 18.

Continue the test hourly until the patient scores 18/18 (max 4hrs, clinical judgement required). See admission and discharge criteria below.

Once the total A-WPTAS score is 18/18, the patient is considered to be out of PTA and the A-WPTAS testing is ceased.

Discharge and admission criteria

Discharge

- Patients with an A-WPTAS score of 18/18 can be considered for discharge. Both the GCS and A-WPTAS should be used in conjunction with clinical judgement.
- Once considered for discharge, refer the patient to their GP if the patient scored <18/18 at any time.
- Provide thorough discharge advice and ensure the patient and/or carer understands the information provided on the Mild Head Injury Patient Advice Sheet.

Have you given the patient and/or carer:

VERBAL DISCHARGE ADVICE	☐ Yes	☐ No
MILD HEAD INJURY DISCHARGE LETTER	☐ Yes	☐ No
MILD HEAD INJURY PATIENT ADVICE SHEET	☐ Yes	☐ No

Admission

- Patients with a persistent A-WPTAS score of <18/18 at 4hrs post time of injury should be considered for admission. Clinical judgement and consideration of pre-existing conditions should be used where the picture recall component of A-WPTAS is abnormal but the GCS is normal (15/15).
- If admitted, consider repeating the A-WPTAS assessment at 24hrs post time of injury or commencing the use of a standard PTA assessment tool. If the patient continues to have an A-WPTAS score of <18/18, consult with the local brain injury rehabilitation service.

Appendix 3: International Classification of Functioning, Disability and Health Brief Core set for traumatic brain injury

BODY FUNCTIONS Physiological functions of body systems (including psychological functions) *How much impairment does the person have in ...*		No impairment	Mild impairment	Moderate impairment	Severe impairment	Complete impairment	Not specified	Not applicable
		0	1	2	3	4	8	9
b110	Consciousness functions	☐	☐	☐	☐	☐	☐	☐
	Sources of information: ☐ Case history ☐ Patient reported questionnaire ☐ Clinical examination ☐ Technical investigation							
	Description of the problem:							
		0	1	2	3	4	8	9
b130	Energy and drive functions (G)	☐	☐	☐	☐	☐	☐	☐
	Sources of information: ☐ Case history ☐ Patient reported questionnaire ☐ Clinical examination ☐ Technical investigation							
	Description of the problem:							
		0	1	2	3	4	8	9
b140	Attention functions	☐	☐	☐	☐	☐	☐	☐
	Sources of information: ☐ Case history ☐ Patient reported questionnaire ☐ Clinical examination ☐ Technical investigation							
	Description of the problem:							
		0	1	2	3	4	8	9
b144	Memory functions	☐	☐	☐	☐	☐	☐	☐
	Sources of information: ☐ Case history ☐ Patient reported questionnaire ☐ Clinical examination ☐ Technical investigation							
	Description of the problem:							
		0	1	2	3	4	8	9
b152	Emotional functions (G)	☐	☐	☐	☐	☐	☐	☐
	Sources of information: ☐ Case history ☐ Patient reported questionnaire ☐ Clinical examination ☐ Technical investigation							
	Description of the problem:							
		0	1	2	3	4	8	9
b164	Higher-level cognitive functions	☐	☐	☐	☐	☐	☐	☐
	Sources of information: ☐ Case history ☐ Patient reported questionnaire ☐ Clinical examination ☐ Technical investigation							
	Description of the problem:							
		0	1	2	3	4	8	9
b280	Sensation of pain (G)	☐	☐	☐	☐	☐	☐	☐
	Sources of information: ☐ Case history ☐ Patient reported questionnaire ☐ Clinical examination ☐ Technical investigation							
	Description of the problem:							
		0	1	2	3	4	8	9
b760	Control of voluntary movement functions	☐	☐	☐	☐	☐	☐	☐
	Sources of information: ☐ Case history ☐ Patient reported questionnaire ☐ Clinical examination ☐ Technical investigation							
	Description of the problem:							

BODY STRUCTURES Anatomical parts of the body such as organs, limbs and their components *How much impairment does the person have in the ...*			No impairment	Mild impairment	Moderate impairment	Severe impairment	Complete impairment	Not specified	Not applicable
			0	1	2	3	4	8	9
s110	Structure of brain	Extent	☐	☐	☐	☐	☐	☐	☐
			0	1	2	3	4	5	6	7	8	9
		Nature*	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
		Location**	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
	Sources of information: ☐ Case history ☐ Patient reported questionnaire ☐ Clinical examination ☐ Technical investigation											
	Description of the problem:											

* 0=no change in structure, 1=total absence, 2=partial absence, 3=additional part, 4=aberrant dimension, 5=discontinuity, 6= deviating position, 7=qualitative changes in structure, 8=not specified, 9=not applicable

** 0=more than one region, 1=right, 2=left, 3=both sides, 4=front, 5=back, 6=proximal, 7=distal, 8=not specified, 9=not applicable

ACTIVITIES AND PARTICIPATION Execution of a task or action by an individual and involvement in a life situation *How much difficulty does the person have in the ...* P = *performance of ...* C = *capacity in ...*			No difficulty	Mild difficulty	Moderate difficulty	Severe difficulty	Complete difficulty	Not specified	Not applicable
			0	1	2	3	4	8	9
d230	Carrying out daily routine (G)	P	☐	☐	☐	☐	☐	☐	☐
		C	☐	☐	☐	☐	☐	☐	☐
	Sources of information: ☐ Case history ☐ Patient reported questionnaire ☐ Clinical examination ☐ Technical investigation								
	Description of the problem:								
			0	1	2	3	4	8	9
d350	Conversation	P	☐	☐	☐	☐	☐	☐	☐
		C	☐	☐	☐	☐	☐	☐	☐
	Sources of information: ☐ Case history ☐ Patient reported questionnaire ☐ Clinical examination ☐ Technical investigation								
	Description of the problem:								
			0	1	2	3	4	8	9
d450	Walking (G)	P	☐	☐	☐	☐	☐	☐	☐
		C	☐	☐	☐	☐	☐	☐	☐
	Sources of information: ☐ Case history ☐ Patient reported questionnaire ☐ Clinical examination ☐ Technical investigation								
	Description of the problem:								
			0	1	2	3	4	8	9
d5	CHAPTER 5 SELF-CARE	P	☐	☐	☐	☐	☐	☐	☐
		C	☐	☐	☐	☐	☐	☐	☐
	Sources of information: ☐ Case history ☐ Patient reported questionnaire ☐ Clinical examination ☐ Technical investigation								
	Description of the problem:								
			0	1	2	3	4	8	9
d720	Complex interpersonal interactions	P	☐	☐	☐	☐	☐	☐	☐
		C	☐	☐	☐	☐	☐	☐	☐
	Sources of information: ☐ Case history ☐ Patient reported questionnaire ☐ Clinical examination ☐ Technical investigation								
	Description of the problem:								
			0	1	2	3	4	8	9
d760	Family relationships	P	☐	☐	☐	☐	☐	☐	☐
		C	☐	☐	☐	☐	☐	☐	☐
	Sources of information: ☐ Case history ☐ Patient reported questionnaire ☐ Clinical examination ☐ Technical investigation								
	Description of the problem:								
			0	1	2	3	4	8	9
d845	Acquiring, keeping and terminating a job	P	☐	☐	☐	☐	☐	☐	☐
		C	☐	☐	☐	☐	☐	☐	☐
	Sources of information: ☐ Case history ☐ Patient reported questionnaire ☐ Clinical examination ☐ Technical investigation								
	Description of the problem:								
			0	1	2	3	4	8	9
d920	Recreation and leisure	P	☐	☐	☐	☐	☐	☐	☐
		C	☐	☐	☐	☐	☐	☐	☐
	Sources of information: ☐ Case history ☐ Patient reported questionnaire ☐ Clinical examination ☐ Technical investigation								
	Description of the problem:								

ENVIRONMENTAL FACTORS Make up the physical, social and attitudinal environment in which people live and conduct their lives ***How much of a facilitator or barrier does the person experience with respect to ...*** You can also rate environmental factors as both a facilitator and barrier if applicable.		Complete facilitator	Severe facilitator	Moderate facilitator	Mild facilitator	No facilitator/barrier	Mild barrier	Moderate barrier	Substantial barrier	Complete barrier	Not specified	Not applicable
		+4	+3	+2	+1	0	1	2	3	4	8	9
e115	**Products and technology for personal use in daily living**	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
	Sources of information: ☐ Case history ☐ Patient reported questionnaire ☐ Clinical examination ☐ Technical investigation											
	Description of the facilitator/barrier:											
		+4	+3	+2	+1	0	1	2	3	4	8	9
e120	**Products and technology for personal indoor and outdoor mobility and transportation**	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
	Sources of information: ☐ Case history ☐ Patient reported questionnaire ☐ Clinical examination ☐ Technical investigation											
	Description of the facilitator/barrier:											
		+4	+3	+2	+1	0	1	2	3	4	8	9
e310	**Immediate family**	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
	Sources of information: ☐ Case history ☐ Patient reported questionnaire ☐ Clinical examination ☐ Technical investigation											
	Description of the facilitator/barrier:											
		+4	+3	+2	+1	0	1	2	3	4	8	9
e320	**Friends**	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
	Sources of information: ☐ Case history ☐ Patient reported questionnaire ☐ Clinical examination ☐ Technical investigation											
	Description of the facilitator/barrier:											
		+4	+3	+2	+1	0	1	2	3	4	8	9
e570	**Social security services, systems and policies**	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
	Sources of information: ☐ Case history ☐ Patient reported questionnaire ☐ Clinical examination ☐ Technical investigation											
	Description of the facilitator/barrier:											
		+4	+3	+2	+1	0	1	2	3	4	8	9
e580	**Health services, systems and policies**	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
	Sources of information: ☐ Case history ☐ Patient reported questionnaire ☐ Clinical examination ☐ Technical investigation											
	Description of the facilitator/barrier:											