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on

GUIDELINES FOR REHABILITATION OF PHYSICALLY WOUNDED IN DISASTER SITUATIONS

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Guidelines for Rehabilitation of Physically Wounded in Disaster Situations

The basic draft of this document was prepared by **Reuben Eldar** with the assistance of Eli Isakov, Mario Cohen and Amiram Catz (all from the **Loewenstein Hospital - Rehabilitation Centre, in Raanana, Israel**) in September 1995.

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The revised draft was then reviewed by a group of experts (see list in Annex 2) during a one-and-a-half day WHO Consultation, held in Ljubljana, Slovenia (February 19 and 20, 1996) and finalized in its present form in April 1996.

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Introduction

A disaster, by definition, produces morbidity on such a scale that a significant overload is placed on existing medical facilities and available professionals, including those for rehabilitation of injured.

In such conditions, existing rehabilitation facilities need to be expanded and institutions available for other purposes may have to be converted into facilities engaged in rehabilitation. This entails deployment of health care professionals without rehabilitation competence, or volunteers in the expanded or converted facilities, with rehabilitation specialists coordinating and supervising activities.

Policy and goals of adequate rehabilitation care of disaster casualties should pervade all elements of such an enlarged rehabilitation system; all those working in it should be aware of the tasks expected of the system and of the appropriate way to perform these tasks.

In order to facilitate such a common purpose, it is essential to share information and to offer guidance[1] how best to care for physically wounded in need of rehabilitation. Guidelines are needed that will outline the adequate rehabilitation care of various impairments.

The guidelines presented here are written primarily for professionals not possessing rehabilitation education, training and experience in caring for trauma casualties, but may be involved in their rehabilitation. These guidelines would also be useful to rehabilitation specialists who would have to lead such

professionals, train them on the job and supervise them. Lastly, these guidelines are also meant for primary care professionals who will have to continue the long-term management of the disabled in the community, as well as for leaders of such communities.

It is recognised that the goal of rehabilitation is to enable persons with disabilities to reach their optimal psychosocial potentials. These guidelines address the rehabilitation of persons with traumatic amputations, brain and spinal cord injuries, and those with peripheral nerve damage, focusing only on the physical aspects. It should be noted, however, that a physical impairment is usually accompanied by psychological reactions, and these may be particularly severe in disaster situations in which impairments occur suddenly and unexpectedly (rather than gradually, as in the course of a chronic condition) and may be compounded by bereavement, disintegration of family, disruption of life, destruction of home, loss of freedom and other psychological trauma. Psychological difficulties may impede the process of rehabilitation and their neglect may have severe, long-term consequences. All health workers engaged in rehabilitation have to be aware of these difficulties and relate to them in the management of casualties, and they have to know when to invoke specialist assistance. However, detailed aspects of these difficulties, their manifestations and management are beyond the scope of these guidelines.

Guidelines highlight only practical steps and procedures without detailed descriptions and explanations; they are not intended to be a shortened textbook or manual, but rather a systematic reminder, for step-by-step performance.

Guidelines are meant for categories of casualties as a group and may not be appropriate for a given individual. They cannot address every problem or

nuances of circumstances as they apply to the specific casualty, family or community, and will have to be adapted and modified according to relevant conditions.

Adherence to guidelines in disaster situations is essential since they are tools for the attainment of efficiency, effectiveness and quality of care.

Disasters

A disaster is a destructive event that causes many casualties within a short period of time. A minor disaster has 25 to 100 casualties injured or killed (10 to 50 injured requiring admission to hospital), a moderate has 100 to 1000 casualties (50 to 250 requiring admission) and a major one has more than 1000 casualties (more than 250 requiring admission). A simple disaster is one in which the structure of the community in which it occurs remains intact, whereas in a compound disaster the structure of the community is destroyed.[2]

Disasters may be due to natural causes (earthquakes, floods, tornadoes, tsunami waves, hurricanes, volcanic eruptions, meteoric collisions, avalanches) or to man-made causes (traffic accidents, explosions, collapse of buildings or bridges, fires, poisonous gases, civil disturbances, acts of terrorism, armed conflicts, wars). The epidemic occurrence of poliomyelitis may also be regarded as a disaster, particularly in view of the implications for rehabilitation.

A minor disaster will be of concern at local level and individual hospital, the moderate may involve regional organizations, and the major is likely to be of national and possibly, international concern.

A disaster may cause a disproportion between the number and type of injured and the health care institutions available, either because it places an overload on existing facilities often necessitating their expansion and strengthening, or because facilities are destroyed, necessitating their replacement.
Advance planning may ensure that effective services are available when needed; it is based on the awareness of ways in which the disaster affects

health and on anticipation of tasks to be performed, as well as on allotment of adequate resources to carry out these tasks.

In many respects each disaster is unique; however, the problems that will be caused in a given area by a stated type of disaster will, to some extent, be predictable, at least qualitatively; hence, planning and preparedness for disaster situations are feasible.

Most planning has focused on the immediate health responses - rescue and evacuation of casualties and their treatment, as well as public health measures to prevent communicable diseases, malnutrition and exposure to physical hazards.

However, rehabilitation of disaster survivors should also be planned in advance, in a non-disaster situation. Disasters cause morbidity on a large scale, and improvements in emergency systems have increased the survival of injured with severe impairments. Therefore a large number will be in need of rehabilitation. During the Second World War, the Finnish Army sustained 200,000 casualties of whom 70,000 remained permanently disabled, including 6,500 with brain damage and 1,400 amputees[3]. In Croatia, until April 1992, nearly 1,800 casualties (10% of those admitted to hospitals) had impairments in need of rehabilitation, among them 240 brain injured, 215 amputees, 105 spinal cord injured, 306 with peripheral nerve injuries and 48 with burns; 27 persons lost their hearing and 21 their sight[4]. By November 1994 Croatia registered 26,448 wounded, among them 767 with amputations, 396 traumatic brain injuries, 122 spinal cord injuries and 658 with peripheral nerve damage[5]

The war in Bosnia and Herzegovina caused 172,369 wounded and as of December 1995, 12,296 disabled persons were registered, but estimates of persons requiring physical rehabilitation due to war injuries range from 40,000 to 70,000. There are between 3,000 to 5,000 amputations, 1,200 craniocerebral injuries, 750 spinal cord injuries and 3,000 peripheral nerve injuries[6] .

A rehabilitation system for disasters has been proposed[7] . Based on the anticipation that following a major disaster, needs will exceed existing rehabilitation facilities, the proposal suggested to establish three levels of rehabilitation, in order to ensure that only injured in need of specialized activities will be referred to the well-developed rehabilitation institutions, and the remaining be rehabilitated at other stations along the referral system.

According to the proposal, Level A would be provided to injured in acute care hospitals until transferred to a Level B or C facility, or discharged. Level B would consist of general rehabilitation measures (mainly nursing, physical and occupational therapy) provided in existing or converted rehabilitation or related facilities to persons who have sustained complicated or multiple injuries to their locomotor system. Finally, Level C rehabilitation would be provided only in specialized rehabilitation institutions to those in need of comprehensive care. This would be given by specialists in rehabilitation medicine, assisted by a multidisciplinary team, and would consist of nursing, physical, occupational and speech therapy, neuropsychological assessment and care, prosthetic, orthotic and engineering, as well as psychosocial services. These institutions would admit casualties with amputations, brain and spinal cord injuries

referred from all over the country (or the region, in large countries).
See Table 1.

Individuals with burns or peripheral nerve lesions would best be rehabilitated in specialized centers possessing the necessary surgical expertise and resources.

The recommended organizational preparations could be carried out in most European countries: in some, there may be difficulties in filling up positions suggested for levels B and C (see figures 2-5), but these suggestions could represent empirical standards and regarded as long-term goals to be strived at.

Rehabilitation of persons after amputations

Rehabilitation of persons after traumatic amputations involves:-

* Prescribing and fitting of a prosthesis to replace the missing limb(s).
* Training to diminish the physical loss and restore function.
* Assisting the person with amputation to deal with the body image imposed by the absence of a limb.
* Educating the amputee, and family, regarding realistic ideas and attitudes about the ensuing disability.

In disaster situation, as in trauma in general, amputations of the lower limb are more common than of the upper one, in a ratio of 10 : 1.

Phases of Management

1. Acute Postsurgical Phase

Occurs at level A, immediately after definitive surgery while sutures are still in place, and consists of prevention of contractures and improving the strength of remaining musculature.

1.1 Prevention of Contractures

a. The person should be instructed to lie prone at least 4 hours per day and have a well padded splint behind the knee of the amputated stump (to assure knee is in extension and maintain hip supine - prevention of hip and knee flexion contractures).

b. Not to hang stump over bed, or sit in wheelchair with stump flexed. While lying in bed, not to place pillow under hip or knee or under back (curving spine), and not to lie with knees flexed, not to rest stump on crutch handle, and not to place pillow between thighs or abduct above knee stump.

1.2 Active motion exercises of proximal joints and muscles.

a. Upper limb: Scapular abduction and adduction, shoulder elevation, humeral flexion and extension, adduction and rotation, elbow flexion and extension, forearm pronation and supination.

b. Lower limb: Hip extension and hip adduction (done in prone position). Nurses and physical therapists to encourage, teach and supervise the positioning and exercises; each exercise to be done for a slow count of five, performed every two to three hours.

2. Pre-prosthetic Phase

Follows after sutures removed and scar is maturing, usually 3 weeks after eventless surgery. Ideally, at this stage injured should be transferred to Level C. This phase includes:

2.1 Stump wrapping

Elastic bandages (from distal to proximal site) or casting, to control edema, shrink and shape the residual limb; rewrap whenever bandage loosens or slips or whenever pain or stiffness develop.

2.2 Skin care

Teach hygiene of skin: mild soap to work up a lather, and rinse with lukewarm water, do not rub the stump (but pat only) daily, in the evening. Twenty-one days after surgery, whirlpool may be used and skin may be treated with olive oil. When pain present, tapping and gentle massaging of the distal soft tissues helps them keep mobile over the end of bone and desensitizes the area prior to wearing the prosthesis.

2.3 Ambulation

Start as soon as possible: in unilateral leg amputation teach balancing on one leg, with a walker or crutches. In TTA*, instant prosthesis (POP** wrapping of stump connected to prosthetic foot) may be started immediately after surgery; however, due to fast stump shrinkage it may fall off and have to be repeated. Twenty-one days after surgery has healed a pylon may be applied. Possible complications after surgery include sharp bone ends, stumps inadequately covered by soft tissues, adherent scars and contractures. These should be corrected before the prosthetic phase starts.

3. Prosthetic Phase

Begins whenever stump is ready, i.e. no wounds, no edema and scar closed. Consists of ·

* Trans-Tibial Amputation (TFA - Trans-Femoral Amputation)
** Plaster of Paris

3.1 Prosthetic Prescription

Done by a team, considering various characteristics of the amputee. Two main types of prosthesis: the modular and the conventional (non-modular) one; the former is preferred because it possesses adjustable alignment. Myoeletric arm prosthetics are not recommended in disaster situations.

3.2 Fabrication of Prosthesis

A prosthesis is a custom-fitted artificial limb, fitted by a prosthetist who is a rehabilitation professional and fabricated by a craftsmen. Stages of fabrication:

* plaster cast made of the residual limb
* plaster representation of the amputated limb (made from the plaster mold) plastic, laminate socket made over the plaster limb
* addition of components to the socket
* fitting and alignment

While the amputee is waiting for the prosthesis, a pylon, connected to a prosthetic foot, can be attached to the stump's dressing, including the rigid one (POP) if applied previously. In upper limb amputation, the terminal device and control cables can be attached to the rigid dressing 24 hours after surgery.

3.3 Prosthesis Check-Out and Training

3.3.1. Upper Limb:-

Occupational therapy training 2 hours daily, to shift hand dominance - if necessary - for ADL activities and household activities; training to include donning and doffing of prosthesis, use and care of it.

Lower Limb:-

Training by a physiotherapist experienced in gait training, balancing, strengthening and use of assistive devices. To include donning and doffing the prosthesis correctly, use and care of prosthesis, walking on level and irregular terrain, use of transport, climb and descend stairs, how to fall and get up from floor.

3.3.2 During early period of use, the amputee to be given specific schedule for wearing the prosthesis, at 15 minutes intervals, increasing the time as the skin tolerates it. Frequent skin checks are made for areas of reddening; reddened areas that do not clear within 30 minutes require prosthesis modification.

3.4 Discharge

Once the prosthesis is fitted and the stump ready, training of a traumatic lower limb amputee lasts, on the average, one week and at the end of it, the amputee can be discharged.

The upper limb amputee may be discharged prior to obtaining the device, so that all prosthetic training is provided on an outpatient basis by an occupational therapist with prosthetic experience.

4. Follow-Up Care

This is necessary for evaluating the amputee, detecting and correcting gait deviations, poor fit, skin or bone problems, maintenance problems. Should be carried out after 4 weeks and after 6 months (at this time, a lower limb prosthesis will, most probably, have to be changed).
From the beginning consideration should be given to home arrangements (grab bar in tub and shower area, safety bar in toilet, removal of architectural barriers, when indicated).

Young traumatic amputees manage to ambulate at home with crutches (at night going to toilet or when wearing of prosthesis not possible) but elderly persons may need a walker and a wheelchair for home use.

Complications

Common complications of prosthesis wearing are:

* Skin disorders - edema, contact dermatitis, epidermoid cysts, folliculitis, furuncles, eczema, intertriginous dermatitis, adherent scars, callus formation and ulceration.
* Phantom pains
* Not total contact prosthesis

Whenever these complications appear, the amputee should be referred to a specialist in orthopaedic rehabilitation.

Psychosocial Adjustment

Phases of adjustment to amputation usually include:-

* Shock - an overall helplessness (more marked in traumatic amputees who had no psychological preparation for the limb loss).
* Defensive Retreat - amputee begins to mobilize resources for the need to reduce anxiety, usually accomplished by avoidance mechanisms.
* Acknowledgement - amputee begins to deal realistically with the change (often with mourning and depression).
* Adaptation - amputee develops a renewed sense of self-respect, productivity, achievement and social acceptance.

Early fitting of a prosthesis with restoration of function (incl. temporary prosthesis and pylon) reduces shock and hastens acknowledgement and adaptation.

Adaptation is facilitated by encouraging the person after amputation to ask questions and think about the future and by a combination of individual and group therapy, to educate and provide support. A family conference is useful during the preprosthetic phase and prior to discharge, but not always feasible in disaster situations.

In young traumatic amputees, all phases should usually be overcome at the end of 21 to 28 days of inpatient rehabilitation (lower limb).

Setting up community support before discharge, helps minimize any remaining anxiety and facilitates the adaptation.

Vocational Implications

Most young persons after traumatic amputation who had professional, managerial or executive careers (white collar workers) are able to return to their former occupations. Amputees whose work involved heavy lifting and other manual work, may need training and education for a different occupation, which may have to be adapted to any disability in walking, climbing, standing, pushing or balancing, the extent of which depends on the level of amputation and whether, it is uni- or bilateral. Much depends on the motivation and personality of the amputee. A unilateral TT amputee can drive an automatic or standard transmission vehicle, while a unilateral TFA - or an upper limb amputee should preferably drive an automatic vehicle.

The climate of the work and home environment has to be considered when amputees return to an occupation: a hot and humid environment promotes skin maceration, friction between stump and socket, and prosthetic deviation, and may damage the prosthesis.

Physical rehabilitation of traumatic amputees is almost always successful, but return to productive employment varies among countries. In the U.S. only 52% were reemployed one year after amputation[9]. In Hungary 48.1% of persons after TT amputation were employed[8], whereas in the U.K. 95% of TT amputees returned to the workforce 10 months after injury[10].

Efforts must be made to return all persons after traumatic amputation to gainful employment; this entails opportunities for vocational rehabilitation and elimination of negative incentives to return to work (protracted litigations, delays in determining disability, loss of full medical coverage, change in legislation that refers to disability entitlement and so-called invalidity status).

Rehabilitation of Brain Injured

In disaster situations - particularly in those due to man- made disasters caused by explosives or firearms - penetrating and perforating head injuries are more common then closed, the latter predominating in accidents and natural disasters.

The majority of casualties have mild injuries (GCS* 13 to 15) and no neurological deficit and are discharged within a week[12].

Casualties with any of the following characteristics have moderate to severe injuries (GCS* 12 to 3), and are the subjects of these guidelines:

* skull fracture (closed or compound)
* unconsciousness (> 60 minutes)
* post-traumatic amnesia (> 24 hours)
* localizing or lateralizing signs.

These casualties commonly require surgery[13] (for depressed or compound fracture, or for epidural, subdural or intracranial haematoma) as well as conservative treatment (to prevent increase in intracranial pressure, secondary brain edema or minor, non-surgical haemorrhage and to enable adequate perfusion and oxygenation of the brain). These casualties should be admitted to hospitals that have neurosurgery, intensive care units and trauma surgery (many have associated polytrauma).

* Glasgow Coma Scale[11]

Rehabilitative Approach

Should be instituted from admission to hospital. Neurological recovery and functional restoration can be impeded by secondary disturbances (respiratory, cardiovascular, renal, metabolic) and infections, and these have to be prevented or treated early.

Similarly, weakness, contractures, spasticity, pressure sores, seizures and deep vein thrombosis also impede rehabilitation and must be prevented and treated, as follows:-

Contractures

Casualty unconscious, supine:-

Positioning - keep shoulders abducted and externally rotated, elbows at 105°, wrists extended, forearms pronated, ankle and feet at 90°.

ROM* exercises - twice daily

Casualty Conscious:-

Progressive mobilisation - active and assisted exercises (first in bed, then, when able to breathe without mechanical assistance on mat or exercise table)
- sitting, standing and walking exercises.

* Range of Motion

Spasticity

Positioning stretching and exercises

Cold Therapy - for 10 to 30 minutes, several times daily; ice baths (at 15.5°C) or ice towels (dipped in crushed ice) wrapped around body part

Medication - dantrolene sodium (dantrum) or clonazepam (baclofen or bioresal) is not recommended in brain injured.

Post-traumatic Seizures

Preventive, anticonvulsive medication in high risk casualties for seizures (gun shot wounds and depressed skull fractures with tear of dura and intracranial hemorrhage).

Pressure Sores

Change of positioning (every two hours), skin clean, dry and often inspected, sheets clean, dry and free of wrinkles, good nutrition.

Associated Injuries

Frequently overlooked (because of unconsciousness), particularly hip and cervical spine; treat in a way that permits earliest possible movement (including internal fixation of fractured long bones).

Active Rehabilitation Management

Starts while casualty still unconscious; therefore. transfer casualty to Level C facility as soon as medically and haemodynamically stable and all surgical procedures completed. Includes:-

While casualty unconscious:

* continue all measures described in "rehabilitative approach".
* exercising on a tilting board (stimulation of postural reflexes)
* graded sensorimotor stimulation (touch, vestibular, olfactory, visual, auditory) if possible with involvement of family in its implementation.

As soon as casualty able to cooperate

* if somnolent, ritalin* (to stimulate reticular system)
* functional movements
* creation of an atmosphere of calm and sympathetic understanding to manage psychomotor restlessness (limit tranquilizers or hypnotic medication that diminish alertness and voluntary activity)
* planning and executing of comprehensive rehabilitation programme, for each casualty individually, by a multidisciplinary team:-
  - focus first on assessment of impairment
  - then, on creating suitable therapies.
  - assess disabilities.

Damage caused to brain manifested by:

a. locomotor disorders: - hemispheric syndrome (rehabilitation techniques similar to those used in stroke patients), or brain stem and/or cerebellar injury (therapy aimed at ataxia and spasticity, and concomitantly at asynergia).

* methyl phenidate hydrochloride

b. changes in cognitive ability: - disturbances in attention, concentration, perception, praxis and thinking process.

c. communication disorders: - temporary mutism, aphasia, dysarthria, dysphonia and bucofacial apraxia.

d. behavioural disturbances and personality changes: - regression (up to childlike state of dependency), frontal lobe like syndrome, expressed by apathy, slowing down of activity and loss of initiative or tendency to aggression and violence.

   Depression and mourning may develop (responsive to elatrol or prozac) and anxiety (responsive to benzodiazepine and supportive treatment).

Complications of brain damage manifested by:-

a. epileptic seizures : - prevention by idantion and barbiturates at first, and tegretol (during rehabilitation). It may be discontinued if no seizure appears during one year from injury.

b. hydrocephalus: - manifested by arrest of rehabilitation, treated by shunt.

c. periarticular bone formation:-[14]

d. infections (usually from nose ears, sinuses)

e. disturbances of sleep[15]

A multidisciplinary team provides comprehensive care and teaches the injured to cope with the demands of immediate surroundings, initially the family and later the community, to return to on discharge from inpatient care.

This is continued as long as casualty shows progressive improvement in performance and/or is in need of multidisciplinary care. Average duration is 5 months.

Continuity of Care and Vocational Implications

After discharge, specific therapy as indicated (physical, occupational or speech, or psychosocial counselling) provided in the community on ambulatory basis.

Problems and difficulties may arise at home or at work and the person with the disability has to learn how to deal with them realistically and effectively; for this purpose an extended day-care clinic has been found useful[16] .

Involvement in work provides independence, earning capacity and self-esteem, develops self-confidence and enhances contacts and reintegration in society.

Early in the process of rehabilitation, efforts have to be initiated to provide vocational assessment and rehabilitation and placement. For each individual a place should be found in which he/she can function according to inherent potential matched with ability, and the ability has to be developed.

The successful work involvement - at a level commensuratee with abilities - is the objective criterion of the rehabilitation outcome[17] and may be divided into:

* incapable of work
* capable of work in sheltered setting
* capable of simple work in ordinary setting
* capable of skilled or professional work, or of higher studies.

Fifty percent to 70% of brain injured return to some type of activity, but most often at a lower level then pre-injury. Twenty percent do not go back to work and 30% do so only with difficulties (due to disorders of mentation rather than motor or communication problems).