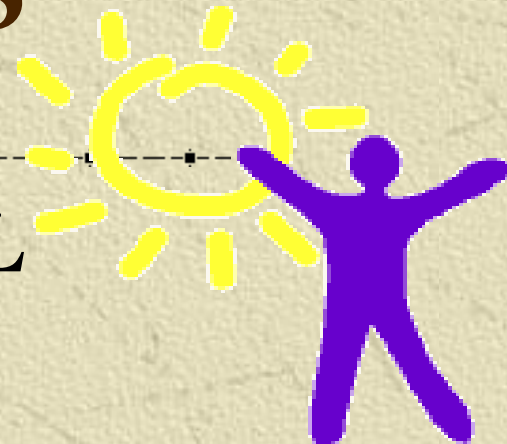


REHABILITATION in NEUROLOGICAL CONDITIONS

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What is Rehabilitation?

✧ Development of a person to their fullest potential consistent with their physiological or anatomical impairment and environmental limitations.

- ◆ Physical
- ◆ Psychological
- ◆ Social
- ◆ Vocational
- ◆ Avocational and
- ◆ Educational



Neurological Rehabilitation

- ✧ Process to try to restore the neurologically injured patient to their highest possible functional level, despite possible permanent impairment
 - ◆ Promotes recovery of loss of function
 - ◆ Prevent complications that might impair recovery
 - ◆ Teach compensatory techniques that allow performance despite physical incapacity

Neurological Conditions

✧ Commonest neurological disorders that result in chronic problems requiring long term care

- ◆ Stroke – CVA / ICH
- ◆ Head Injury
- ◆ MS
- ◆ Parkinsons disease
- ◆ Dementia
- ◆ Spinal cord injury
- ◆ Back pain
- ◆ Muscular disorders



WHO Definitions - 1980



✧ IMPAIRMENT

- ✧ Loss or abnormality of physiological, psychological or anatomical structure or function

✧ DISABILITY

- ✧ Restriction resulting from an impairment of the ability to perform an activity in a manner considered normal

✧ HANDICAP

- ✧ Disadvantage resulting from an impairment or disability that prevents the fulfilment of a role that is normal for an individual.

WHO Definitions - 1997

✧ IMPAIRMENT

- ✧ Loss or abnormality of physiological, psychological or anatomical structure or function

✧ ACTIVITY (rather than disability)

- ✧ The nature and extent of functioning at the level of the person

✧ PARTICIPATION (rather than handicap)

- ✧ The nature and extent of a persons involvement in situations in relation to impairments, activities, health conditions and environmental factors.

Organisation of Rehabilitation

✦ Multi-disciplinary

- ◆ Parallel and discipline oriented
- ◆ Team members only address skills related to their discipline
- ◆ Treatment is the sum of each disciplines activities

✦ Inter-disciplinary

- ◆ Different disciplines work together towards a common goal
- ◆ Contribute to a group effort
- ◆ Treatment program is synergistic

Realistic Goals

-
- ✧ Determined by team and person
 - ✧ Working to optimise level of function
 - ◆ Despite residual disability
 - ◆ Even if the impairment is caused by a irreversible pathological process
 - ✧ Increased independence
 - ✧ Improved quality of life
 - ✧ Reduced carer burden

Case Conference

- ✧ Communicate
- ✧ Collaborate - interactive
- ✧ Consolidate knowledge
- ✧ Goal setting and actions determined and evaluated
- ✧ Problem solving
- ✧ Decision making
- ✧ Co-ordinated, non-fragmented and cost effective treatment program established



Treatment Strategies

1. Prevent or correct additional disability
2. Enhance systems unaffected by pathology
3. Enhance functional capacity of affected system
4. Use adaptive equipment to promote function
5. Modify social and vocational environment
6. Psychological techniques to enhance performance
7. Patient education

Prevent Additional Disability

✧ Medications

◆ Secondary stroke prevention

- Anti-platelet
- Hypertension
- Hypercholesterolemia

✧ Passive joint ROM

- ◆ Avoid contractures in weak limb
- ◆ Avoid DVT

✧ Nutritional supplementation

- ◆ Prevent malnutrition

✧ Shoulder sling

- ◆ Prevent subluxation

Enhance Functional Capacity

✧ Graded exercise programs

- ◆ Deconditioned

✧ Progressive resistive exercises

- ◆ Weakened muscles to enhance strength

✧ Training dysarthric speakers

- ◆ Reduce speaking rates for improved intelligibility

✧ Visual written cues

- ◆ Assist memory function

Use Adaptive Equipment

- ✧ Sticks, crutches and frames as mobility aids
- ✧ Augmentative communication devices for patients with unintelligible dysarthric speech
- ✧ Wheelchair training when walking is not possible
- ✧ Equipment to extend hand function in dressing
 - ◆ Long shoehorns, stocking pullers, buttonhooks
- ✧ Shoe modifications to promote standing balance

Enhance Unaffected Systems

- ✦ Progressive resistive exercise to the non-paralysed side of a stroke patient to aid in transfers
- ✦ Visual feedback for hand function in patients with a sensory deficit

Modify Social Environment

- ✧ Rails on stairs to promote stair climbing
- ✧ Assistance in the home for physically dependent
- ✧ Widen bathroom doorways to allow a wheelchair
 - ◆ Redesign work areas for wheelchair users
- ✧ Modified diet for certain swallowing problems
- ✧ Train family members not to reinforce sick role

Psychological and Education

- ✧ Repetition in training patients with memory problems
- ✧ Teach new skills by verbal instruction for patients problems
- ✧ Teach new skills by demonstration for patients with language deficits
- ✧ Group therapy for patients with similar disabilities

Functional Independence Measure

✧ Scale that describes the functional activity and the specific assistance levels required for each activity

✧ 13 Motor

◆ Self care

- Eating, grooming, bathing, dressing upper body, lower, toileting

◆ Sphincter control

- Bladder and Bowel

◆ Mobility

- Bed, Toilet, shower, walk, stairs

✧ 5 Cognitive tasks

◆ Communication and Cognition

- Comprehension, expression, interaction, problem solving, memory

Functional Independence Measure

✧ Score out of 7

✧ Assess disability and burden of care

- ✧ 7 – Complete Independence – no help required
- ✧ 6 – Modified Independence – assistive device
- ✧ 5 – Supervision or setup required
- ✧ 4 – Minimal assistance – <75% effort
- ✧ 3 – Moderate assistance – 50-75% effort
- ✧ 2 – Maximal assistance – 25-50% effort
- ✧ 1 – Total assistance - <25% effort

Concord Parkinson's Clinic

✧ Multi-disciplinary clinic

- ✧ Clinical Nurse Co-ordinator - 02 9767 7917

✧ Allied Health Assessment – 4 hours

- ✧ Physiotherapist
- ✧ Occupational Therapist
- ✧ Speech Pathologist
- ✧ Dietician
- ✧ Psychologist (if required)

✧ Neurologist review – 1 hour

- ✧ History, examination, management review

✧ Case conference

- ✧ Discuss patient and formulate management plan

Physiotherapy

✧ Improve gait pattern and avoid immobilisation

✧ Walking

- ✧ Take larger steps and raise toes when stepping forward
- ✧ Feet approx 12 inches apart and upright posture
- ✧ Swing arms - takes body weight off legs and reduces fatigue
- ✧ Floor markings - visual cues and encourages stepping
- ✧ Walking over obstacles to encourage weight bearing
- ✧ Music to help regain rhythmic movement
- ✧ Walking aids - tend to carry but rollator frame best
- ✧ Maintain good posture and head control

Physiotherapy

✧ Restore normal body alignment

- ◆ Minimise risk of falls
- ◆ Stimulate balance reactions
- ◆ Teach how to regain balance when centre of gravity changed
- ◆ Encourage weight transfer with correct head and trunk movements

✧ Reduce increased tone

- ◆ ROM exercises - passive stretching
- ◆ Relaxation with facilitating techniques:
 - Light touching, vibration

Occupational Therapy

✧ Adaptive equipment

- ◆ Elevating chair and bed
- ◆ Rails for the bathtub and toilet
- ◆ Toilet aids - raised toilet and bath seats
- ◆ Feeding - large rimmed plates and plate guards
- ◆ Large comfortable handles
- ◆ Velcro closures on clothes rather than buttons
- ◆ Bedpoles and monkey bar

✧ Home visit to individualise needs

Speech Pathology

✧ Assessment

- ✧ Hypophonic dysarthria
- ✧ Hesitations and freezing during speech

✧ Formal therapy

- ✧ General speech and tongue exercises
- ✧ Provide appropriate communication aids
- ✧ Ice and stroking under chin (vibration of laryngopharyngeal muscles)
- ✧ Tilt head forward on swallowing

✧ Advise on dietary strategies

- ✧ Eat smaller portions more frequently
- ✧ Increase water intake to reduce constipation

Other Problems

✧ Urinary frequency and urgency

- ✧ Detrusor instability - TCA /oxybutinin
- ✧ Enlarged prostate

✧ Constipation

- ✧ Reduced mobility of bowel muscles – fluid intake

✧ Dietary imbalance

- ✧ Poor eating and drinking
- ✧ Loss of weight

✧ Autonomic dysfunction

- ✧ Postural hypotension and syncope

Mr BMJ

✦ 53 YO

✦ Hx of HT

✦ Sudden onset L hemiparesis UL>LL dysarthria

✦ CT brain – right MCA CVA

✦ Transferred to Balmain hospital for IP rehab

Dense Hemiplegia

✦ Poor motor return in upper and lower limb

- ◆ Power 0/5 UL

- ◆ Power 1/5 LL

- ◆ Tone initially normal

✦ To try to improve motor return return ,
functional electrical stimulation (FES) used
to stimulate muscles with electrical stimuli

Functional Electrical Stimulation

Form of therapeutic treatment

- ✦ Uses transcutaneous electrical current to initiate contractions in paralyzed extremities
- ✦ Used in individuals who have sustained spinal cord injuries and other neuromuscular illnesses.

Functional Electrical Stimulation

- ✧ 48 hemiplegic patients randomly divided into two groups for treatment with FES and shoulder pads
- ✧ The recovery of the patient's shoulder subluxation and movement function of upper extremities was evaluated at 6 weeks
- ✧ FES was better than shoulder pads in improving shoulder subluxation and motor function
- ✧ Stroke Aug 2005

Functional Electrical Stimulation

- ✦ 46 subjects, 70.9 ± 8.0 yo and 9.2 ± 4.1 days after stroke, randomly assigned to 1 of 3 groups receiving standard rehabilitation with FES, placebo stimulation or no stimulation (control)
- ✦ FES applied 30 minutes and placebo stimulation, 5 days per week for 3 weeks
- ✦ Outcome measurements included spasticity score, maximum isometric voluntary contraction of ankle dorsiflexors and plantarflexors and walking ability.

Functional Electrical Stimulation

- ✧ No significant differences in baseline measurements
- ✧ After 3 weeks reduction in spasticity score and improvement in the ankle dorsiflexion in the FES group compared with the other 2 groups ($p < 0.05$)
- ✧ All subjects in the FES group were able to walk after treatment and 84.6% returned home c.f. 53.3% in placebo and 46.2% of controls
- ✧ 15 sessions FES improved motor and walking ability
- ✧ Stroke Jan 2005

Post-Stroke Pain

- ✧ Within 2-3 weeks of onset of symptoms
 - ◆ Developed sharp shooting pain L side
 - ◆ Worse at night
 - ◆ Occasionally burning sensation
 - ◆ Occasional tingling and paraesthesia sensation

- ✧ Amitriptyline 10mg nocte
 - ◆ Marked improvement in pain
 - ◆ Improved sleep

- ✧ Gabapentin, Pregabalin

Foot Drop

✦ Over next month, some motor return in the LL

- ◆ Started to walk with quad stick
- ◆ Tripping over toes due to weakness of ankle dorsiflexion

✦ Ankle-Foot Orthosis (AFO)

- ◆ Custom made
- ◆ Stabilises inversion and eversion
- ◆ Improves dorsiflexion of ankle and toes

Shoulder Subluxation-Capsulitis

✦ Left shoulder pain

- ✦ Non-functional left upper limb
- ✦ Poor motor return
- ✦ Gravitational effect of weight of arm

✦ Westmead sling

✦ Anti-inflammatory medication

- ✦ Mobic
- ✦ LA and steroid injection

Upper Limb Spasticity

- ✦ Increased tone in upper limbs

- ✦ ROM

- ✦ Stretching

- ✦ Splinting

- ✦ Drugs

 - ◆ Baclofen

- ✦ **Second Skin**

 - ◆ Lycra splinting



SECOND SKIN—Dynamic Lycra

- ✦ Splinting has played an extensive role in spasticity management
- ✦ Lycra® splints are individually designed for clients according to their postural and tonal needs
- ✦ Lycra® splinting is appropriate for all aspects of muscle tone
 - ◆ spasticity, dystonia, ataxic or involuntary movement

SECOND SKIN—Dynamic Lycra

- ✦ Improved posture
- ✦ Improved sensory awareness
- ✦ Improved patterning of movement when moving away from the centre of gravity
- ✦ Improved bilateral arm use and bimanual hand use in specific skill areas e.g. play, leisure, self-care skills, work related skills
- ✦ Improved grasp/sustained hold and active release skills.

SECOND SKIN



- ✦ Supports their posture and reduces the impact of altered muscle tone
- ✦ Splinting is frequently a long-term approach to develop their functional skills or to prevent deformity
- ✦ The challenge is to individually design lycra® splinting with maximum contour and comfort to enable consistent splinting

Lower limb Spasticity

- ✦ Developed localised spasticity of left foot flexors
 - ◆ Interfering with walking
 - ◆ Tripping over toes when walking
- ✦ Muscle over-activity is one of the cardinal features of spasticity and common disability of stroke
- ✦ Responsible for several limitations that interfere in their daily activities and quality of life

Botulinum Toxin



- ✦ Action at CNS level mediated through afferent pathways originating at muscle spindles
- ✦ 75 units injected into 2 sites - **Flex. Hall. Ln**
- ✦ 75 units injected into 2 sites - **Tibialis Post**
- ✦ 50 units injected into 1 site - **Flex. Hallucis Brevis**

Botulinum Toxin



- ✦ Open-label, prospective study to assess effectiveness of BTX-A in improving functional mobility in early post-stroke population using individualised, flexible range of doses and targeted muscle groups
- ✦ 21 stroke patients (13 male, 8 female) injected with BTX-A - mean dose: 255 U; range: 185-300)
- ✦ Individualised BTX-A injection regimens effective, reversible and safe treatment option for patients with spasticity.
- ✦ Neurol Sci. Apr 2005

Botulinum Toxin



- ✦ 35 % of patients receiving oral therapy showed an improvement in pre-treatment functional targets
- ✦ 73% and 68% of patients treated with BTX-A first- and second-line therapy
- ✦ BTX-A treatment was also more cost-effective than oral therapy in the treatment of post-stroke upper limb spasticity (flexed wrist/clenched fist spasticity)
- ✦ J Rehabil Med. Jul 2005

Future Treatments

✧ Promising adjunct approaches include:

- ✧ Practice with robotic devices
- ✧ Practice in a virtual environment
- ✧ Electrical stimulation to increase cortical excitability during training
- ✧ Drugs to optimise molecular mechanisms for learning

✧ Biological strategies for neural repair may augment rehabilitation in the next decade

✧ Lancet Neurol. 2004 Sep;3(9):528-36