ABC of Spinal Cord Injury

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OCCUPATIONAL THERAPY

The months after a severe spinal cord injury are invariably an extremely difficult period for the patient, as he or she gradually adjusts to what will probably be a lifetime of disability.

The occupational therapist is particularly concerned in helping the patient reach the highest level of physical and psychological independence that his injury, home, and work environment will allow. The degree of involvement will largely depend on the neurological level of the spinal cord lesion, but the occupational therapist's skill is particularly important in managing the tetraplegic, in whom limited function in the arms can seriously hamper the common activities of daily living such as washing, dressing, and feeding. However, by the use of various aids and adaptations to the home and place of work some of these difficulties can be successfully overcome.

The overbed computer and word processor can be used by patients with any level of injury.

Splinting

Splints are essential for the tetraplegic to maintain the hands in the optimum position for function. They are made as soon as possible after admission to the spinal injuries unit and worn during the period of bed rest, being removed only while passive movements of the joints are performed and for washing. Once the patient is mobilised into a wheelchair he should still wear the splints at night as even at this stage irreversible flexion contractures of the metacarpophalangeal and the interphalangeal joints may occur.

Many tetraplegic patients also need a variety of splints to enable them to carry out normal daily activities, such as writing/typing splints and wrist support splints, feeding straps, and pushing gloves. All splints are made individually for each patient by his therapist.

Tetraplegic hands are splinted as soon as possible, this continuing throughout the period of rehabilitation.

Home visit and home alterations

A simple tipping device enables a tetraplegic to use a kettle safely.

Contact with the community physician and local social services department before a visit to the patient's home to assess its suitability for both short and long term wheelchair occupation is advisable as soon as possible after injury. This initial visit should involve a team from the spinal injuries unit, consisting of the occupational therapist, community liaison nurse or social worker, and also representatives from the patient's home area—the local domiciliary occupational therapist and, where necessary, the district nurse and care attendant organiser, as well as the patient's family. It is far from ideal that the patient is not included on this visit, but if there is to be a reasonable chance of alterations being completed before the patient's discharge from hospital (usually 4-12 months) the visit needs to take place well before the patient is fit to travel to his home. Nevertheless, no final recommendations should be made until all aspects have been fully discussed with the patient.

Once the decision has been made about the alterations required the family should apply for the necessary grants with the help of the local social services department so that plans may be drawn up and building start as early as possible. Depending on the family's financial circumstances grant aid is available from the patient's local district council or social services department.

Wheelchairs and cushions

Types of wheelchair

DHSS approved manual, eg Carters, Everest, Jennings	Supplied by the DHSS from local artificial limb and appliance centre
Manual lightweight	About half the weight of approved chair; easier to propel and adjust; better looking; requires private funding
Electrically operated for functional mobility in high tetraplegic (C5 and above)	Model for home or institutional use supplied by DHSS Model for outdoor use requires private funding

During the initial period of bed rest the patient is assessed for a wheelchair. The patient's weight, height, and expected functional disability are all taken into account when deciding on the type of chair required. If an electric wheelchair might also be necessary application for this is delayed until later in the patient's rehabilitation, when his needs can be more accurately evaluated. A stock of manually operated and electric wheelchairs should be held in the spinal injuries unit for assessment purposes.

Although a four inch foam cushion is normally ordered with the wheelchair, it is not always satisfactory because of unacceptable pressure developing under the ischial tuberosities and it may need to be changed to a more suitable type, such as a gel or Roho cushion. A wide range of cushions should be stocked in the unit to meet all requirements, so that the appropriate one may be obtained for the patient. It is emphasised to the patient that cushions should be reviewed regularly—for instance, a foam cushion is designed to last for only six months.

Activities of daily living

Level of injury	Functional ability
C4	Totally dependent Can use electric wheelchair with chin control Can type/use computer using a mouthstick Needs environmental control system (such as Possum) to turn on lights, open doors, etc operated by shoulder shrug or mouthpiece
C5	Can feed with a feeding strap/universal cuff Can wash face, comb hair, clean teeth—using feeding strap/universal cuff Can help in dressing upper half of body Can push manual wheelchair short distances on the flat provided pushing gloves are used with capstan rims on the wheels Electric wheelchair needed for functional mobility Unable to transfer
C6	Still needs strap to feed Still needs strap for self care Can dress upper half of body unaided Can help in dressing lower half of body Can propel wheelchair up gentle slopes Can sometimes transfer independently into car and on to bed but rarely achieved Can drive with hand controls
C7	Can be totally independent Can transfer, feed, and dress independently Can drive with hand controls
C8/T1	Totally independent wheelchair life

These expectations are general and depend on the patient's age, sex, physical proportions, physical condition before injury, degree of spasticity, and motivation.

Once patients are out of bed and physically strong all but those with the highest lesions are taught to dress. Where possible tetraplegic patients are also taught to feed, drink, brush their hair, clean their teeth, wash, and shave. They are also taught to sign their names, type, use a computer, the telephone and, when necessary, page turners and other forms of environmental control.

Light pressure on the control switch (under the right forearm) activates the page turner.

Recreation

Leisure activities are if anything more important for the disabled than for the able bodied. Many patients with spinal cord injuries are unemployed and therefore have more leisure time available. To maintain their self esteem suitable hobbies and sporting activities should be encouraged. Activities which the patient might have considered impossible may be pursued with a little thought and suitable adjustments—for example, a camera with an automatic winding device, a tripod lead, and a bracket to attach the camera to the wheelchair can enable a tetraplegic to have an interest in photography. Leisure pursuits involving patients with spinal cord injuries and the able bodied should also be encouraged to maintain the competitive instinct and to help integration back into the community.

Work

Work is of varying importance to patients, but most will see it as giving a sense of purpose to their life and will want to return to their former occupation if at all possible. Early contact with the patient's employer to discuss the feasibility of an eventual return to his previous job is important. If the degree of the patient's disability precludes this some employers are sympathetic and flexible, and will offer a job that will be possible from a wheelchair. However, many patients find life outside hospital difficult enough initially, even without the added responsibility of a job, and in these circumstances a period of adjustment at home is advisable before they return to work as it may be two or three years before a patient is psychologically rehabilitated.

When such a patient feels ready to consider some alternative employment he can then contact his local disablement resettlement officer for advice. If a patient is planning to return to his previous employer, school, or college the occupational therapist should assess the suitability of the premises for wheelchair accessibility. Recommendations are then made to the Manpower Services Commission or local education authority if alterations to the building or the installation of specialised equipment are needed to make it suitable for the patient.

Ideally, if a patient is considering returning to work he should spend some time in a rehabilitation workshop. In this environment he should be able to test his aptitude for activities such as carpentry, engineering, and electronics and for using computers, word processors, and other products of modern technology. In addition the patient will build up his strength and stamina and both he and the staff will have a clearer idea of his employment capabilities.

Keymaster keyboard emulator displays the computer keyboard on a TV screen (shown on the right). A light controlled by a touch sensitive or mouth controlled switch scans the screen to enable the user to control the computer.

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How effective is an earth leakage circuit breaker in preventing fatal electrocution when, for instance, the cable of an electric mower is severed? Is the time taken to start ventricular fibrillation longer than the reaction time of the circuit breaker?

Earth leakage circuit breakers, also known as residual current operated circuit breakers or residual current devices, are designed to minimise the duration of current flow when a contact is made between a live 240 volt conductor and an object in contact with earth. In the United Kingdom most earth leakage circuit breakers supplied for use in domestic premises respond to tripping currents of 20-30 mA and have a tripping time of 20-40 ms. These values are well within the safety parameters for the prevention of ventricular fibrillation put forward by Biegelmeier and Lee.¹ Biegelmeier described several "worst possible conditions" and concluded that for a body current of 1 A, and duration of not more than about 100 ms, the probability of fibrillation is less than 5% when contact occurs during the vulnerable period of the cardiac cycle (the downstroke of the T wave; R on T phenomenon).² As the probability of contact occurring during this period is only about 10%, there is a 99.5% chance of survival. Someone pushing an electric lawn mower is unlikely to receive a shock as the handle(s), and in recent years the frame, are usually adequately insulated. In most cases severing the cable causes the fuse in the plug top or consumer unit to blow. Occasionally, this does not happen, particularly if the cable has been cleanly severed, or a too highly rated fuse has been used, or the fuse has been replaced by a conductor such as a piece of wire. Danger then arises if the severed end is handled or if it comes into contact with an uninsulated part of the mower which the person is touching. A similar situation may arise if the cable is partially severed with the exposed live conductor trapped in the blades. If the operator is not adequately insulated from the metal frame a shock may be received. If the circuit is not protected by an earth leakage circuit breaker the current and duration of flow may be enough to precipitate ventricular fibrillation. If the circuit is protected by such a breaker there is no risk of ventricular fibrillation occurring.—J R BOWKER, senior occupational physician, Hove.

- 1 Biegelmeier G. New considerations on the threshold of ventricular fibrillation for ac shocks at 50-60 Hz. *Institute of Electrical Engineers Procedure* 1980;127:No 2, pt A (March).
- 2 Biegelmeier G. Curves from nowhere. *Elektrotechnische Zeitschrift* 1983;104:542-3.

British Standard 4293. *Residual current-operated circuit-breakers*. London: BSI, 1983.
Institute of Electrical Engineers. *Wiring regulations*. 15th ed. London: IEE, 1981:43.

"White noise" has been proposed to prevent the overhearing of confidential conversations and telephone calls in and around a surgery waiting and reception area. What is white noise? Is it likely to be unpleasant or harmful for staff or patients? Is it effective for this purpose? What alternatives should be considered?

Human perception of sound may be impaired if there is noise of similar frequency (-ies) at a sufficiently high intensity in the background; this response of the auditory system provides the basis for interference or masking systems. Masking noise that uses random frequencies over a wide band of the audible spectrum is called white or circuit noise. Pink noise is the corresponding name for narrow band interference noise. The choice depends on the required function, but sound intensity is constant across the selected frequencies. Masking may be used on an intermittent or continuous basis, and more sophisticated systems may be sound activated. Any negative effects will be related to the loudness and frequency. Continuous exposure above 90 decibels on the dBA scale for more than eight hours exceeds occupational threshold limits and may cause permanent damage. The effects at lower intensities are less clearly defined but include headache, irritability, and lowered concentration. Intermittent noise is more unpleasant than continuous. The interference effect of white noise is incomplete except at high sound intensities, and room insulation or playing background music, or both, would probably be more appropriate. If masking were used correct siting of the sound source would be important to achieve optimal masking effects.—D N BAXTER, specialist in community medicine (environmental health), Manchester.