

REHABILITATION OF THE PATIENT WITH RECURRENT FALLS*

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Sir Stanley Davidson, Professor of Medicine in Edinburgh for 21 years, was an inspirational teacher, an influential writer and a generous benefactor. It is most appropriate that his name should be applied to a lecture on the rehabilitation of falls. Aspects of his character, his life, his professional endeavours and his approach to medicine are of particular relevance to this distressing trouble of so many older people. Davidson was keenly interested in the welfare of his most disadvantaged patients. He was a man of compassion and curiosity, a good listener and a free thinker who would bring clarity and insights to the most complex problems. A good athlete in his youth, he was severely wounded in World War I and spent a year in hospital undergoing rehabilitation and convalescence. Wars have usually provided surges of interest in the development of rehabilitation techniques. In Edinburgh he re-organised the old Poor Law Hospitals, which housed frail and disabled elderly people. He attracted clinical staff of high calibre and converted them into teaching hospitals, power houses of intellectual activity which provided first-class standard care. He was always interested in apparently mundane conditions and had an admiration for simple, pragmatic research. His work at Cambridge in his early days was done with the most basic facilities and the minimum of equipment. He urged researchers to admit to areas of doubt or ignorance.¹

Falls have perhaps been regarded as constituting a humdrum problem. Much geriatric rehabilitation has been practised in underprivileged hospitals and the many advances which have been made, particularly by some of the giant figures in the specialty, such as Sheldon, Droller, Howell and Exton-Smith have arisen from shoe-string research.

WHAT IS REHABILITATION?

Rehabilitation is the process of restoring individuals with physical disabilities to their optimum levels of function and wellbeing. Rehabilitation medicine focuses on disability (affecting activities of daily living, e.g. walking, dressing, bathing) and handicap (the social consequences).

The practice of rehabilitation has gradually evolved but received most attention in wartime. Injured soldiers received therapy in the hope that they could be restored to health and activity, some to return to battle, others to productive work. Therapy was practised in hospitals. The soldier would be a passive recipient of care, which was predominantly physical. The specialists believed they knew what was best and prescribed courses of treatment, the scientific bases of which were poorly established.

In peacetime, rehabilitation became more of a peripheral specialty and few

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doctors were attracted to it. Rehabilitation appeared to be something left to others once the doctor had reached his therapeutic limit. Demographic and societal changes have now greatly altered the nature of rehabilitation. Most disabled people are in their seventies and eighties. The attitudes of consumerism and the recognition that the patient is the focus of the rehabilitation process and also a member of the 'team' have replaced paternalism. The goals of treatment are set by the patient. Thus rehabilitation requires active involvement.

The mechanistic approach has been replaced by the holistic. Therapy in hospital for a finite period by an individual therapist has been replaced by therapy in the patient's home or in day-care settings using an interdisciplinary team. Although the use of physical procedures may cease after a time, the psycho-social influence of therapy may continue long after the patient goes home. Whilst full restoration of function can be achieved, rehabilitation also involves prevention and adaptation. Much assistance is given to the disabled elderly by informal caregivers, who are actively involved in rehabilitation. These people have been called 'carers'. This word is being replaced by 'caregivers' who help the individual patient to retain as much independence as possible. The involvement of such supporters in the rehabilitation process is central to its success.

Rehabilitation is thus concerned with wellbeing (overcoming handicap) and independence (minimising disability). The techniques used include physiotherapy, speech therapy and occupational therapy, as well as environmental modifications and the provision of aids and appliances; less tangible processes include active listening, motivating, educating and counselling. Good practice requires an assessment of the patient's problems and the use of rating scales to measure disability and monitor progress, and the setting of clearly defined, realistic and agreed goals.²

OLDER PEOPLE WHO RECURRENTLY HAVE FALLS

In a sample of 553 people over the age of 65 living in New Zealand, Campbell and colleagues³ found that one in three fell at least once during a year. The incidence of falling increased with age: 45 per cent of those in their eighties and 56 per cent of people aged 90 or more had fallen. In another study of a rural township,⁴ 761 people over the age of 70 were studied prospectively for a year; 493 did not fall at all, 149 fell once and 119 (16 per cent) fell two or more times. Those who fall at least twice during a year are regarded as 'recurrent fallers'. After only a quarter of falls did the patient seek medical attention which emphasises the importance of prospective studies. Most of the patients in these studies lived in single-storey buildings so that falls on stairs were generally not an important factor. This illustrates that caution is needed when comparing research in this topic from different countries.

In a St Louis community study⁵ 27 per cent of 1,358 people over sixty reported a fall in the previous year; 8 per cent had fallen two or more times. Multiple falls were associated with the ingestion of drugs including diazepam, diuretics and calcium-channel blockers. Another study in the USA of people over 60 who had fallen in the previous year revealed that 25 per cent fell once and 31 per cent two or more times in the subsequent twelve months.⁶ Multiple fallers were more likely to have arthritis or Parkinsonism and to have difficulty rising from a chair. A prospective study also in the USA⁷ of 4,270 people over seventy iterated the problems of pathology, impairment and disability which characterised

the 12 per cent who fell two or more times in the year of follow-up. They were more likely to have arthritis, stroke, heart disease and visual and hearing difficulties. They had problems dressing, bathing, toileting—unlike single fallers, who had no more functional disability than those who did not fall.

Most people living at home do not fall in any given year and of those who do, most fall once. Recurrent fallers are generally a less robust group, with neurological, locomotor or cardiac disease, sensory impairment and an increased intake of centrally-acting or cardiovascular drugs. These who are at risk of further falls tend to be over 75 years, are often unable to walk outdoors independently. After previous falls many have remained on the floor for an hour or more.⁸ The at risk individuals are the frail elderly who are no longer fully mobile or independent.

Though many frail and dependent old people continue to live in their own home, some move to nursing homes. As might be expected, these people are more likely to fall repeatedly. In a survey of nearly 800 Finnish residents who were monitored over six months, 36 per cent of fallers fell two or more times.⁹ Most falls were in the day, in the residents' own rooms and were not observed by staff. Of the 55 per cent of cases where an external cause was identified, tripping, falling out of bed and missing the chair were the precipitating factors. Fallers had impaired vision, were more likely to be demented, to have Parkinsonism or postural hypotension, tended to use walking frames.

In a study of all falls recorded by nurses in a geriatric hospital in England,¹⁰ one in five patients fell, one in ten falling more than once. Fortunately, three-quarters of the falls did not cause injury (most falls in old people living at home likewise do not cause physical harm). Those most at risk were those whose balance had been impaired by recent illness. Hemiplegic patients in the early stages of their treatment tended to have multiple falls. Falls were more likely at busy times—in the early mornings, rather than during the night. As in nursing homes, few falls were observed by the staff, raising questions about design of geriatric wards.

IS REHABILITATION EFFECTIVE?

It is important to evaluate critically the effectiveness of what we do. At first sight, the hard evidence is scanty. Attempts have been made to prevent falls by modifying the environment as well as by use of therapeutic techniques.

Environmental risk factors can be changed or removed. It would seem sensible to improve illumination in poorly-lit parts of a house, raise low seats, remove loose mats and other clutter from the floor. However, objects which the occupational therapist predicted could be hazardous proved not to be so; loose mats were identified as potential hazards in numerous cases but only caused a fall in five instances.⁴ When a health visitor in Wales assessed and corrected potential environmental hazards and referred elderly people for exercise therapy, there were no significant differences in falls or fracture rates between intervention and control groups.¹¹ In practice, most domestic falls occur over normal household objects in an uncluttered setting. It is unlikely that assessment of homes and removal of presumed risky items would be effective for the general population of older people.

Crilly and colleagues recruited older women who lived in sheltered housing to a randomised trial of exercise therapy.¹² Postural sway was measured, with

eyes open and closed, on a force platform. The treatment group had group therapy supervised by a physiotherapist. Exercises for balance, co-ordination, flexibility and strength took place three times a week, but did not improve sway.

In an American residential home, 160 ambulant people were randomised to an intervention or control group after a fall.¹³ The nurse practitioner recommended environmental modifications in nearly half of the treatment group (these included removal of rugs, lowering of beds and providing grabrails and raised toilet seats). She also advised gait training and the provision of mobility aids. After two years, the reduction in the number of falls was not statistically significant in the two groups, but the intervention group had 26 per cent fewer hospital admissions and spent 52 per cent less time in hospital during the study period. However as few of the environmental changes suggested by the nurse were actually put into practice the study has limited value.

In a review of the effect of rehabilitation in recovery and prevention of falls Campbell¹⁴ concluded that rehabilitation constituted an act of good faith. Only one published study had been well designed, and the effectiveness of rehabilitation programmes remained untried and unproved. Research in this area is not easy as falls occur sporadically, there are many aetiological factors and not all risk factors can be modified. Old people constitute a heterogeneous population; some fall because of internal problems (disease processes, drugs) others because of environmental factors and of the activities that they undertake. Many fall because of a combination of these.

Are we doing any harm?

Unless the patient perceives something as hazardous, it is better not to correct it. Removing familiar items may cause resentment. Older people are less likely to accept unquestioningly the advice of 'experts' than they once did. We must be certain that our recommendations are based on fact, and that our plans are mutually agreed. Geriatricians and therapists have long urged people with unsteadiness to wear sensible shoes. In a study of 125 people over 65 living in Birmingham who reported falls to their family doctor at the time of the fall 63 were wearing slippers, 17 were barefoot, and 3 had only stockings, only 42 were wearing shoes. Yet none of these people attributed the fall to inappropriate footwear.¹⁵

Well-meaning but inappropriate advice may cause patients emotional harm. Thoughtless design features in hospitals and homes can cause physical problems. Highly polished vinyl floor surfaces have a detrimental effect on gait and make some old people fearful of falling. A carpeted floor allows a greater speed of walking and a more confident gait. Yet many hospital floors are highly polished and look slippery and unsafe. On the other hand, thick carpets may add to the instability of old people with poor vision.¹⁶ Hospital lockers and bedside tables are often on castors and unsteady patients may reach for them or lean on them and fall when these pieces of furniture move.¹⁷ Restless or confused older people may climb over bed side rails and fall from a greater height than if the rails had not been present. The use of other mechanical restraints can increase the risk of fall-related injuries.¹⁹ Chairs may be too low or without arms and cause difficulty in rising safely. Fifteen per cent of older people admitted to hospital have an accident and, in 40 per cent of cases, ward furniture is implicated.¹⁸ Problems include ineffective brakes on beds, chairs and commodes. The design and safety of ward equipment should be critically reviewed.

Gadgets which improve mobility can also cause falls. A survey of over 200 users of walking frames revealed that 25 per cent had fallen or nearly fallen while using their frame.²⁰ Repeated falls onto a frame can cause metal fatigue; such a frame may subsequently break, precipitating a further fall. One in eight frames show signs of damage or previous repair.²¹ Tinetti found that the inappropriate or incorrect use of a walking aid was the most common environmental factor associated with falling in nursing home residents.²²

Wheelchairs can be associated with falls. Those who fall from them may do so because of faulty brakes, the lack of a lap-strap, or poor technique in negotiating stairs, kerbs or inclines. Of 174 wheelchair users, 24 had fallen from their chairs, some more than ten times.²³ In institutions, old people in wheelchairs fall more often than those using sticks and frames.²⁴ Sometimes falls from wheelchairs are fatal; a survey of wheelchair accidents which caused deaths showed that 77 per cent were the result of falls.²⁵ The incidence of falling out of or being tipped out of a wheelchair increases with age. Many of these accidents occur in institutions and involve stairs. Not all health professionals are taught how to propel wheelchairs or how to negotiate stairs and inclines. These basic skills should be acquired by everyone who cares for disabled people.

Are we doing any good?

The traditional 'medical' model has related outcome to a single aetiological factor. Recurrent falls require a different approach, the 'threshold' model, in which many contributor factors are modified.²⁶ Tinetti and colleagues evaluated a multifactorial intervention to reduce the risk of falling in old people at home.²⁷ At a year, there were fewer untoward events in the intervention group. Fewer people fell, fewer fractures were sustained and fewer falls needed medical care. The interventions included physiotherapy to improve strength and optimise balance and gait, a review of drug therapy, the removal of environmental hazards and the provision of safer furniture.

It is important to ensure that individual interventions are also evaluated. The type of surface on which an old person falls may not be important in reducing the risk of fracture.²⁸ The provision of elastic stockings may reduce the symptoms of postural dizziness, but many older people may be unable to don and doff them and so are deprived of potential benefit. The provision of alarms can give much reassurance to old people and their families. Yet many alarms are used inappropriately (usually because they are activated by visitors who mistake cords for light switches) and remote units are not often worn.²⁹ Part of the problem is aesthetic. Some pendant alarms are heavy, large, uncomfortable and get in the way, and they are easily triggered unintentionally.³⁰ A third of old people with alarms have not been told how to use them and a fifth do not use them in an emergency.³¹ Though the provision of an alarm may reduce a caregiver's stress, it may also lead to a reduction in the support given by friends and relatives. The benefits of alarms have yet to be proven by controlled trials.³²

Can we do any better?

As a general rule, extrinsic factors are less important in the genesis of falls in very old people and intrinsic factors are the main determinants.³³ Even so, both internal and external factors often contribute to an individual fall. There is clearly scope for improving the design, safety and provision of rehabilitation technology

and for environmental improvements. There may also be opportunities for modifying internal factors. It might be helpful to classify these factors as input, central and output.

Input. Several workers have emphasised the importance of poor vision in people prone to falls. Simple interventions such as correcting refractive errors and ensuring that spectacles are clean and worn when walking make obvious sense. Some falls occur when turning the head to either side. Cawthorne-Cooksey neck exercises appear to improve the range of neck movement and reduce unsteadiness but controlled trials are needed to confirm the clinical impression.

Central processing. The psychology of falls is an under-researched area. Downton³³ has shown how people limit their activities because of their fear of falling. We need to know how to reduce the fear of falls and how to mitigate anxiety about falls so that people are more able to get up unaided or summon help. Anxious fallers may push back in their chairs, stiffen their bodies, grab for furniture and unwittingly increase their risk of further falls.³⁵ Restoration of confidence can reduce anxiety, thereby perhaps improving equilibrium and righting reactions.³⁶

Output. More work is needed as how best to improve static and dynamic balance and postural adjustment, to increase range of movement, muscle strength and the pattern of walking. Recent work has shown that high-intensity resistance exercise training is a feasible and effective way of counteracting muscle weakness in very old people.³⁷ We should try to teach people how to fall safely and how to get up from the floor. At present, few therapists do this. In a survey of therapists in England and Wales, only 11 per cent of physiotherapists and 21 per cent of occupational therapists indicated that they would show people how to rise from the floor.³⁸ This subject receives little attention in the textbooks.

Sir Stanley Davidson died in 1981 at the age of 87. In his final years in a nursing home, he had personal experience of the frustrations caused by the physical limitations sometimes associated with great age. It is my hope that by applying his philosophy of medicine—his clarity of thought, a fascination with everyday problems, and a combination of compassion, intellectual rigour and open debate—that we can improve the wellbeing, as well as the independence of those older people who are prone to fall.

REFERENCES

- 1 Passmore R. Obituary. Sir Leybourne Stanley Patrick Davidson. Year Book of the Royal Society of Edinburgh 1983.
- 2 Young JB. Caring for Older People. Rehabilitation and Older People. *Br Med J* 1995 (in press).
- 3 Campbell AJ, Reinken J, Allan BC *et al.* Falls in old age: a study of frequency and related clinical factors. *Age Ageing* 1981; **10**: 264-70.
- 4 Campbell AJ, Borrie MJ, Spears GF *et al.* Circumstances and consequences of falls experienced by a community population 70 years and over during a prospective study. *Age Ageing* 1990; **19**: 136-41.
- 5 Cumming RG, Miller JP, Kelsey JL *et al.* Medications and multiple falls in elderly people. *Age Ageing* 1991; **20**: 455-61.
- 6 Nevitt MC, Cummings ST, Kidd S *et al.* Risk factors for recurrent nonsyncopal falls. *JAMA* 1989; **261**: 2663-8.
- 7 Dunn JE, Rudberg MA, Furrier SE *et al.* Mortality, disability and falls in older persons: the role of underlying disease and disability. *Am J Public Health* 1992; **82**: 395-400.

- ⁸ Wild D, Nayak USL, Isaacs B. Prognosis of falls in old people at home. *J Epidemiol Community Health* 1981; **35**: 200-4.
- ⁹ Jantti PO, Pyykko VI, Hervonen ALJ. Falls among elderly nursing home residents. *Public Health* 1993; **107**: 89-96.
- ¹⁰ Morris EV, Isaacs B. The prevention of falls in a geriatric hospital. *Age Ageing* 1980; **9**: 181-5.
- ¹¹ Vetter NJ, Lewis PA, Ford D. Can health visitors prevent fractures in the elderly? *Br Med J* 1992; **304**: 888-90.
- ¹² Crilly RG, Willems DA, Trenholm KJ *et al.* Effect of exercise on postural sway in the elderly. *Gerontology* 1989; **35**: 137-43.
- ¹³ Rubenstein LZ, Robbins AS, Josephom KR *et al.* The value of assessing falls in an elderly population. A randomised controlled trial. *Ann Intern Med* 1990; **113**: 308-16.
- ¹⁴ Campbell AJ. Role of rehabilitation in fall recovery and prevention. *Rev Clin Gerontol* 1992; **2**: 53-65.
- ¹⁵ Wild D, Nayak USL, Isaacs B. Description, classification and prevention of falls in old people at home. *Rheum Rehab* 1981; **20**: 153-9.
- ¹⁶ Lord SR, Clark RD, Webster IW. Visual acuity and contrast sensitivity in relation to falls in an elderly population. *Age Ageing* 1991; **20**: 175-81.
- ¹⁷ Coakley D. On the dangers of getting out of bed in hospital. *Health Trends* 1980; **12**: 5-6.
- ¹⁸ Tinetti ME. Mechanical restraint use and fall-related injuries among residents of skilled nursing facilities. *Ann Int Med* 1992; **116**: 369-74.
- ¹⁹ Tinker GM. Accidents in a geriatric department. *Age Ageing* 1979; **8**: 196-8.
- ²⁰ Mayfield W. A survey of walking frame issue and use. Institute for Consumer Ergonomics, Loughborough University of Technology 1984.
- ²¹ Mulley GP. Walking frames. *BMJ* 1990; **300**: 925-7.
- ²² Tinetti MD. Factors associated with serious injury during falls by ambulatory nursing home residents. *J Am Geriatr Soc* 1987; **35**: 644-8.
- ²³ Dudley NJ, Cotter DHG, Mulley GP. Wheelchair-related accidents. *Clin Rehab* 1992; **6**: 189-94.
- ²⁴ Kalchthaler T, Bascon RA, Quintos V. Falls in the institutionalised elderly. *J Am Geriatr Soc* 1978; **26**: 424-8.
- ²⁵ Calder CJ, Kirby RL. Fatal wheelchair-related accidents in the United States. *Am J Phys Med Rehab* 1990; **69**: 184-90.
- ²⁶ Hindmarsh JJ, Estes EH. Falls in older persons. *Arch Intern Med* 1989; **149**: 2217-22.
- ²⁷ Tinetti ME, Baker DI, McAvay G *et al.* A multifactorial intervention to reduce the risk of falling among elderly people living in the community. *N Engl J Med* 1994; **331**: 821-7.
- ²⁸ Grisso JA, Kelsey JL, Strom BL. Risk factors for falls as a cause of hip fracture in women. *N Engl J Med* 1991; **324**: 1326-31.
- ²⁹ McWhirter M. A dispersed alarm system for the elderly and its relevance to local general practitioners. *J Roy Coll Gen Pract* 1987; **37**: 244-7.
- ³⁰ Thornton P, Mountain G. A positive response: developing community alarm services for older people. York: Joseph Rowntree Foundation 1992.
- ³¹ Davies KN, Mulley GP. The views of elderly people on emergency alarm use. *Clin Rehab* 1993; **7**: 278-82.
- ³² Kennie DC. Preventive care for elderly people. Cambridge: CUP 1993.
- ³³ Nickens H. Intrinsic factors in falling among the elderly. *Arch Intern Med* 1985; **145**: 1089-93.
- ³⁴ Downton JH, Andrews K. Postural disturbances and psychosocial symptoms among elderly people living at home. *Int J Geriatr Psychiatry* 1990; **5**: 93-8.
- ³⁵ Squires A, Wardle P. To rehabilitate or not? In: Squires AJ (ed). *Rehabilitation of the older patient. A handbook for the multidisciplinary team.* London: Croom Helm 1989.
- ³⁶ Smyth L. *Practical Physiotherapy with Older People.* London: Chapman and Hall 1989.
- ³⁷ Fiatarone MA, O'Neill EF, Ryan MD *et al.* Exercise training and nutritional supplementation for physical frailty in very elderly people. *N Engl J Med* 1994; **330**: 1769-75.
- ³⁸ Simpson JM, Salkin S. Are elderly people at risk of falling taught how to get up again? *Age Ageing* 1993; **22**: 294-6.

LESSONS FROM A SYMPOSIUM ON MANAGEMENT OF FALLS IN ELDERLY PEOPLE HELD IN THE COLLEGE ON 3 MAY 1995*

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Falls are common in the elderly and a major cause of morbidity and mortality, often resulting in the loss of independence. Falls are rarely the result of a single factor and a broad approach is required in both diagnosis and management. This symposium set out to address the causes and consequences of falls, the contribution of poor balance and syncope, the role of rehabilitation, and strategies for prevention. The multi-disciplinary nature of the problem was reflected in the audience which included nurses, doctors, occupational therapists, physiotherapists, social workers and a hospital manager.

Cardiovascular causes of falls

In patients who present with dizziness associated with falls, a feeling of faintness is more likely to have a cardiovascular cause (26%), vertigo or spinning to have an ENT cause (16%), and unsteadiness to have a central cause (36%). However, overlapping diagnoses are common and 22% of patients have more than one cause contributing to their fall. The most common cardiovascular diagnoses are carotid sinus syndrome, orthostatic hypotension and arrhythmia.

Syncope is defined as a brief loss of consciousness secondary to reduced cerebral perfusion and the annual incidence in the elderly is 6% with a prevalence of 23% over 10 years. In carotid sinus hypersensitivity, carotid sinus massage (CSM) for 5 seconds leads to an exaggerated baroreflex response. This may show as cardioinhibition with more than 3 seconds of asystole; vasodepression, with a fall in blood pressure of more than 50 mmHg systolic, or a mixed response where the reduction in blood pressure is still seen even if atropine is given to abolish the slowing in heart rate. Ten per cent of patients with carotid sinus hypersensitivity have to be tilted upright in order to elicit a positive response. CSM should not be performed within 6 weeks of a cerebrovascular event, within 3 weeks of cardiac event, or if the patient is digitoxic. Carotid sinus syndrome syncope is precipitated by increased vagal stimulation such as by head movement, prolonged standing, micturition and defaecation, occurs almost exclusively in the elderly, and is extremely rare under the age of 50 years. One third of patients with carotid sinus syndrome present with falls but deny syncope, due to retrograde amnesia for the event. The characteristic of such falls is that they are recurrent and unexplained. Patients with cardioinhibitory carotid sinus syndrome do well with insertion of a pacemaker, but those with the vasodepressor response are difficult to treat. Orthostatic hypotension, another cardiovascular cause of syncope, is not consistently reproducible and therefore repeated measurements are needed, preferably in the mornings. It is more readily detected in patients with other abnormal autonomic function tests.

In summary, patients with an underlying cardiovascular cause are likely to

*A list of speakers and the titles of their papers presented at this symposium is recorded in *Proceedings*, Vol. 25, p 537.