

CHAPTER X

STROKE, INCLUDING REHABILITATION

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"All the world is a laboratory to the inquiring mind"
Martin H. Fischer (1879 - 1962).

Stroke remains one of the least recognised and the least treated of the chronic diseases of lifestyle in South Africa. In 1992 Steyn, *et al.*¹ found that 24,5% of deaths of all South Africans were attributable to chronic diseases of lifestyle. Strokes were the second commonest cause (7,2% of all deaths and 7,9% of deaths of persons aged 35 - 64 years), exceeded only by ischaemic heart disease (8,7% of all deaths and 9,6% of deaths of persons aged 35 - 64 years). Some facts about stroke:

- Stroke is a major problem in South Africa, which does not respect ethnic, age or sex boundaries.
- The effect of a stroke may be very debilitating since death is not the inevitable outcome.
- Patients with a stroke may lose their ability to be wage earners and may become a physical burden on a family and community poorly equipped to deal with such a problem.
- The image of stroke patients in the community is very negative.
- There is less medical, financial and community support for stroke rehabilitation programmes than for almost all other chronic diseases of lifestyle.
- There are few stroke prevention programmes.
- The generalised vascular risk factors of smoking, hypertension, diabetes, and hypercholesterolaemia contribute to thrombotic, embolic and haemorrhagic stroke. In addition, underlying coronary artery disease, arrhythmias, rheumatic valvular heart disease, subacute bacterial endocarditis and cerebral artery aneurysms can cause strokes in any age group.
- Warning signs of stroke such as transient ischaemic attacks are not well recognised by either the general community or many health workers.
- The natural history of stroke recovery with and without the intervention of allied medical workers has not been assessed formally in South Africa.
- There have been no projects evaluating the role of risk factor therapy in stroke prevention in South Africa.

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Much of the epidemiological and clinical data described in this chapter will relate to socio-economic status and population groups. This trend reflects the marked difference in disease presentations, incidence and aetiologies in the white, Indian, coloured (mixed white and black origin) and black patients in South Africa.

Stroke patients use a significant proportion of hospital and other resources. The aim of this chapter is to consider the needs of stroke patients. Medical services which concentrate on diagnosing and curing pathology have a relatively minor role to play. Preventive and educational programmes for the community to diminish stroke risk factors, early recognition of stroke and, equally important, a complete programme to maximise rehabilitation utilising collaborative health services, will all be addressed in this chapter. The evaluation of the role of supportive services such as physiotherapy, speech therapy, occupational therapy, district nursing services and social workers will be discussed. In particular, methods of assessing the value of these services will be considered.

The solution of utilising combined services of allied medical workers in many chronic diseases of lifestyle must be considered, especially in the elderly. At present there is very little knowledge of effective specific interventions. At the level of individual patient management, random, often irrational, decisions are made because of the lack of scientific data on the value of interventional therapy. Scientific evidence and areas where such evidence is lacking will be addressed. Current information is poor and needs urgent improvement. Resources devoted to stroke should be equally divided to address prevention, acute therapeutic intervention and management of the disabled patient.

PRESENT STATUS OF KNOWLEDGE AND CARE OF STROKE PATIENTS IN SOUTH AFRICA.

Although stroke is the second highest cause of death due to chronic diseases of lifestyle in South Africa, its major impact on the community is via the chronically disabled patients who require care and attention. This section will consider epidemiology, prevention and degree of disability, and the availability of and need for rehabilitation of patients with strokes.

Epidemiology

There are no accurate incidence or prevalence data available on stroke in South Africa. Much of the knowledge concerning stroke incidence in South Africa is divided into that on fatal and non-fatal strokes. Since South Africa has an ageing population, it is estimated that the incidence of non-fatal stroke in people over 75 years of age is likely to increase from 100 - 200/100 000 to 2000/100 000.²

A study by Wyndham in 1982³ suggests that mortality rates for stroke in South Africa have fallen, although they remain higher than those in Western countries, specially in the elderly and the coloured people.

In studies in the USA, UK, and other industrialised countries, mortality rates from stroke reached a peak in the late 1960s followed by a decline.^{4,5} The studies conducted by Wyndham⁶ comparing the situation in 1970 and 1980 of preventable causes of death in whites in the RSA may be criticised on the grounds that it was not conducted over a sufficiently lengthy period of time.

In 1992, under the auspices of the University of Cape Town Department of Community Health, a project was undertaken by the Fourth-year medical students (D.E. Bourne - personal communication). Although time and resources were limited, some of the data obtained may provide information that could assist in the formulation of a more rigorously designed future investigation. The study looked at mortality trends in Indian, coloured and white South Africans from 1949 to 1985. Suitable figures for blacks were not available.

In this student project, decline in mortality from stroke starting in the early 1970s was noted in Indian males and females up to 65 years of age and in white males and females up to 75 years of age. The decline in the younger white patients started in the early 1960s and represented a 30 - 50% decline in mortality rates, similar to the decline seen in the reports from the USA and UK.⁵ In the older age group, Indians over 65 years and whites over 75 years, a steady increase in mortality from stroke was observed during the past 40 years. Similarly all the coloured stroke patients have shown a progressive increase in mortality.

The increasing mortality with age in the white and Indian groups is similar to the trend described by Wolfe and Burney,⁷ who found that the effect of age was linear with an increasing mortality with age in both sexes. The incidence of stroke also rises exponentially with increasing age.⁸

In 1980 in South Africa as a whole, cerebrovascular accidents (CVA) accounted for 298/100 000 deaths in coloured patients 35 - 74 years of age, while ischaemic heart disease only accounted for 245/100 000. In whites, however, the CVA death rate was only 100/100 000, whereas ischaemic heart disease accounted for 361/100 000 deaths.⁹ These two diseases took the highest toll in both population groups taking into account diseases such as tuberculosis, pneumonia, carcinoma, motor vehicle accidents and chronic obstructive pulmonary disease.¹⁰ The incidences of violent deaths and motor vehicle accident deaths have risen sharply since this report in 1981.

A study by Rossouw, *et al.*¹¹ examined the association between median head of household income level, all-cause and selected-cause specific mortality for coloureds and whites in the greater Cape Town area for the age group 35 - 74 years. Although CVA mortality showed no consistent relationship to income, the high CVA mortality rate in this coloured population was consistent with a high prevalence of hypertension (27% of males and 31% of females), smoking (59% male and 41% female) and hypercholesterolaemia (25% male and 26% female).¹² In 1978, national figures indicated a higher smoking rate (79% male, 52% female) for coloureds than for whites (58% male, 31% female).¹³

The impact and importance of risk factor control will be discussed further in the section dealing with stroke prevention. Hypertension is common to all ethnic groups as a risk factor, but cigarette smoking and hypercholesterolaemia may be less important in black patients with stroke.^{14,15}

Figures for black patients with stroke in South Africa are sparse and difficult to obtain. Death certificate diagnosis and demographic details for the black population are still unreliable and incomplete.¹⁶ In 1991, Joubert¹⁴ described the MEDUNSA Stroke Data Bank - an analysis of 304 patients seen between 1986 and 1987. This study assessed both transient ischaemic attack (TIA) and stroke in patients over 14 years of age admitted to a large hospital (Garankuwa Hospital) over a 1-year period. The death rate was up to 33% after 1 month, more than double the UK rate described in the Oxfordshire Community project.⁴ Hypertension was the most important risk factor (63% had raised systolic and 59% raised diastolic pressures), but smoking appeared to be an uncommon risk factor.

In 1986 Rosman¹⁷ reported on the epidemiology of stroke in an urban black population. This project was expanded more fully into a Ph.D. thesis, which is probably the most scientific work on the profile of strokes in an urban black population published in South Africa to date.¹⁵ The study was conducted at the Kalafong Hospital situated in Atteridgeville and serving the populations of Mamelodi and Atteridgeville. The total population is 233 980 with 114 931 over 20 years of age (1980 population census). This is the only hospital or clinic serving these two areas and all admissions with stroke were entered into the study. There are no other privately owned hospitals or specialist physicians except those in the hospital group described.

From these analyses the following incidence rates were determined in 212 black patients: 39/100 000 in the young stroke group (under 45 years of age), 244/100 000 in the 55 - 64-year group, 615/100 000 in the 65 - 74-year age group, and 543/100 000 in the group 75 years and

older. The death rate was 33% - almost identical to the figures described by Joubert.¹⁴ Hypertension was again found to be the most important risk factor (69,8% of patients), whereas smoking was not very important. Only 27,8% had ever smoked and the average consumption was 8,8 cigarettes per day.

The South African epidemiological figures appear to match their counterparts in the UK fairly accurately. In the well known report by Derick Wade of the Rivermead Rehabilitation Centre in Oxford, which looked at epidemiologically based needs assessments of stroke,⁴ the prevalence of people with stroke in the UK was given as approximately 500 - 700/100 000. At least half of these patients were likely to be physically disabled and could be experiencing memory deficits. These figures were predominantly calculated from incidence and survival rates.

The estimated problem in South Africa is probably similar, but may be higher in the older age groups, coloured and black populations. Of considerable importance is the prevalence of young stroke patients. In the older age group there are numerous other causes of disability and stroke represents only one of many geriatric disabling disorders. Thus, stroke rehabilitation and care may be incorporated into general geriatric services. In younger people, however, trauma and strokes are the major causes of disability in South Africa.

It can be seen that the knowledge of the epidemiology of stroke in South Africa is very limited and inaccurate. More information and research projects into the incidence and prevalence of stroke are required in the total population and in ethnic and gender subgroups with differing risk factors. Genetic, environmental, dietary and socio-economic studies are required to help pinpoint the needs of stroke prevention programmes and effective therapeutic policies.

PREVENTION

The approximate estimate of 19 - 33% of deaths after a stroke still leaves a very large percentage of stroke patients, a number of them young, who will be permanently disabled. In an average month at Baragwanath Hospital in Soweto at least 3% of all medical admissions are stroke patients (\pm 70 per month; Prof. A. Dubb - personal communication). Many are not admitted because they can be looked after at home or they die before they come to hospital. Three major areas of cost-effective therapeutic interventions are possible to reduce the economic and social burden of stroke patients: stroke prevention is essential; acute stroke therapies may become cost-effective if they can diminish the disability burden; and the role and effectiveness of rehabilitation must be considered in detail.

The cost of assessing stroke risk can be high, and there is no consensus as to how detailed such a risk assessment should be. However, it is generally agreed that the cost for even the most sophisticated evaluation is much less expensive than the astronomical cost for stroke after-care.¹⁸

The purpose of preventive therapy is to identify stroke risk factors and treat them before they cause a stroke. Some risk factors predispose to atheroma and as such all coronary artery risk factors are also stroke risk factors (e.g. hypertension, smoking, diabetes and hyperlipidaemia). Some cardiac abnormalities are likely to predispose to cerebral emboli, e.g. atrial fibrillation. Hypertension stands alone as being the largest risk factor for stroke in all patients. Some clinical situations make the possibility of having a stroke more likely and TIAs fit into this category. Patients with hypercoagulable states, e.g. haematological abnormalities and cancer, are also more at risk of stroke than the general population.

Modifiable risk factors

Hypertension

This has been dealt with in some detail in this document by Prof. Opie (see Chapter II). Diastolic and systolic hypertension are strongly and independently related to stroke risk. The relationship of

stroke to blood pressure elevation is significant in both men and women and persists in all age groups studied, from 35 to 94 years of age.¹⁹ This observation from the Framingham study has been duplicated throughout the world. Controlled trials have also repeatedly demonstrated that reducing blood pressure reduces the risk of subsequent stroke even at relatively mild levels of blood pressure.⁴ In South Africa epidemiological research into hypertension has been very active. In 1978 Seedat, *et al.*²⁰ found the prevalences of hypertension in an urban Zulu population of 65 - 74 years to be 50% and 60% for males and females respectively. Most were undiagnosed and untreated.

In a normative study of over 10 000 black job seekers, Seftel, *et al.*²¹ established the prevalence of hypertension in a black urban population in South Africa. Using a diastolic blood pressure of 100 mmHg as the diagnostic level, they found 26,9% of all males and 39,5% of all females in the over 60-year age group to have hypertension. Most were untreated.

The urban coloured group had an overall prevalence of hypertension ($\geq 140/90$ mmHg) of 61,5% in males and 57,6% in females.¹ Steyn, *et al.*¹ reported an unusually higher prevalence of hypertension that was observed in a rural black group in QwaQwa compared with urban black populations.

A comparison of the prevalence of hypertension in the rural whites in 1979 and in 1991 indicated a marked reduction when intervention took place, especially in cases of mild hypertension.¹

It has often been suggested that hypertension in blacks and whites differs and that haemorrhage occurs more commonly in black hypertensive patients.²²⁻²⁴ This observation is probably not correct. Joubert¹⁴ looked at 316 stroke patients of whom 82% underwent CT scanning; 63% were hypertensive and 71,2% had cerebral infarction, i.e. less than 30% of the strokes were caused by haemorrhage. In Rosman's study¹⁷ in black stroke patients (confirmed by CT), 54% had infarcts (embolic or thrombotic) and 28% had haemorrhages. The rest were lacunes (small 'end-vessel' intracerebral infarcts). Thus, vigorous identification of hypertension and effective therapy are likely to prove cost-effective in future stroke prevention. This topic is of major concern in South Africa and guidelines for hypertensive therapy have been laid down.²⁵

Diabetes, Hypercholesterolaemia and Smoking

These three are all proven risk factors for atheroma in white patients. Control of these factors will diminish coronary artery disease and thus diminish a potent embolic source for stroke.²⁶ These risk factors also enhance the likelihood of causing extracranial carotid artery atheromatous disease, especially in whites, coloureds and Indians, and control may diminish the risk of emboli from the carotid tree. Diabetes predisposes to small- and large-vessel disease. Patients with diabetes are prone to have strokes without warning TIAs²⁷ because collateral flow is less likely to develop with small emboli. Diabetes, like hypertension, is a universal risk factor for white, coloured, Indian and black stroke patients in South Africa. This is discussed further by Levitt and Mollentze in Chapter VII.

Although Steyn, *et al.*¹ showed that 23% of rural blacks and 27% of urban blacks smoke more than 10 cigarettes/day compared with 37% of coloureds and 47% of whites, the actual number of black patients who were smokers in both Joubert¹⁴ and Rosman's¹⁷ studies were less than 25%, and most smoked less than 10 cigarettes per day. This is in marked contrast to the study by Fritz of 525 white South African patients with TIA,²⁸ in which 73% were smokers. In a comparative study by Giovannoni and Fritz²⁹ of 798 young and old white TIA patients in South Africa, 49% (< 45 years) and 47% (> 45 years) were smokers.

Hyperlipidaemia, overnutrition and obesity are also discussed in detail in this document by Seftel and Walker in Chapters IV and V. Up to 74% of urban coloureds, 72% of urban Indians and 86% of rural whites have some form of hypercholesterolaemia.¹ However, Steyn, *et al.* reported that of the percentage prevalence of risk factors in South African males 64 years of age standardised

against a world population, only 15% of rural blacks and 31% of urban blacks could fit into the category of any form of hypercholesterolaemia.¹ In Rosman's study¹⁵ only 4 in 212 patients had a raised total serum cholesterol level.

It therefore appears that smoking and hypercholesterolaemia are not as yet major risk factors for stroke in the black population. Nevertheless, despite the relative lack of these two risk factors, there is a very high incidence of stroke in the black population.

For this reason, vigorous treatment of all four atheroma-related risk factors is important in all potential stroke patients in South Africa. If smoking and/or hypercholesterolaemia in blacks developed to the epidemic proportions seen in white and coloured patients, the potential stroke 'explosion' could be horrendous. Further studies are needed to see if the small studies discussed in this chapter are valid, and to assess the relative roles of raised cholesterol and especially smoking as stroke risk factors in black patients.

The general population should be made aware that HYPERTENSION • SMOKING • DIABETES & HYPERCHOLESTEROLAEMIA predispose to stroke and are risk factors for stroke - the second biggest killer in the country. Such risk factor campaigning has been effective in warning the public about coronary artery disease but extreme ignorance about stroke remains.

Transient Ischaemic Attacks

A brief episode of focal neurological deficit of presumed vascular origin is a warning sign of a stroke that most patients and doctors ignore. In fact only a minority of patients with TIAs present to medical services, mostly to their general practitioners, casualty services or clinics. In an analysis of the literature from 1958 to 1978, Millikan³⁰ selected out thirteen key articles in which patients with these minor strokes were not treated. Based on this and other data from Mayo Clinics³¹ it appears that about 25 - 40% of patients with an untreated TIA will have a cerebral infarction within 5 years. These patients with TIA likely to have a stroke need to be identified and vigorously treated to prevent stroke.

A stroke prevention clinic has been in operation at the Johannesburg Hospital under the Neurology Unit with strong support from the Vascular, Radiology and Cardiology Units. To date over 1 500 patients have been treated. Criteria for admission to this clinic are transient not permanent strokes, i.e. it functions as a stroke prevention clinic. Patients with asymptomatic carotid artery bruits have been followed at the clinic³² but only treated surgically if they developed TIA symptoms.

All patients undergo a detailed clinical history-taking and examination. Risk factors are evaluated and treated vigorously. Special emphasis is laid on cardiac and carotid artery evaluation.²⁹ In a study conducted at the TIA clinic by Hinton and Fritz,³³ ischaemic heart disease was found in 75% of patients with occlusive carotid artery disease. Of the patients 50% had an abnormal resting ECG and a further 25% with a normal ECG had an abnormal stress test. Resting 12-channel electrocardiography is carried out in all patients presenting with a TIA and if carotid artery disease is present the patients also undergo a stress test. Before 1987 the carotid artery of each patient entered into the study was assessed by a non-invasive battery of tests with a confirmed sensitivity of better than 95%.³⁴ After 1987 the carotid arteries of each patient were assessed by duplex Doppler ultrasonography with a confirmed sensitivity of 98% (Prof. V. Fritz, unpublished data). The patients at the TIA clinic have been divided into 5 major aetiological categories and treated accordingly.

The cerebrovascular category included extracranial artery and intracranial artery aetiologies. Extracranial abnormalities were subdivided into internal carotid artery (ICA) occlusions,^{35,36} ICA stenosis of 50% or greater, unilateral, or bilateral and ICA stenosis of less than 50%, which was always treated conservatively with aspirin.³⁷ Of the white patients over 45 years of age, 74% had evidence of extracranial carotid artery disease being at least an important risk factor in the stroke

mechanism, if not the actual cause.²⁹ Other unusual causes of potential stroke were identified and treated appropriately in the patients with TIA at Johannesburg Hospital, e.g. fibromuscular dysplasia,³⁸ external carotid artery stenosis with ICA occlusion,³⁹ and even cerebral tumours including stroke.⁴⁰

The cardiac category included valvular heart disease, arrhythmias and post-infarction left ventricular wall dysfunction or mitral valve regurgitation.²⁹ Less common aetiological causes such as hypercoagulable states, haemodynamic disorders and less common risk factors such as migraine and the oral contraceptive pill were sought, but these only constituted about 12% of the patients assessed.²⁹

METHODS OF PREVENTING STROKE BY MEDICAL OR INTERVENTIONAL THERAPY

Throughout South Africa there is a growing awareness of the value of treating transient or minor strokes to prevent major strokes. However, the public is not aware of the importance of taking a minor stroke seriously. A publicity campaign to alert the public to the major stroke risk factors and particularly to be aware of the importance of a minor stroke is extremely important.

In April 1993 a supplement of the journal *Cerebrovascular Diseases* was devoted to reporting the results of the second European Stroke Conference on Stroke Prevention.⁴¹ The articles in this journal summarise very accurately the methods of stroke prevention that are both effective and cost-effective in Europe and the USA. Recommendations that were made for the American and European communities would be of major interest and use in the South African community.

Wolf, *et al.*⁴² reiterated the methods described above, namely two preventive approaches. One, a public health approach, whereby the entire population is informed of the dangers of certain highly prevalent risk factors, e.g. by hypertension and diabetic awareness programmes, plus anti-smoking and cholesterol education national projects. The second approach should be more focused and requires treatment by physicians of individuals found to be at increased risk of stroke, such as described in the TIA programme at Johannesburg Hospital. Physicians should be made more aware of the importance of a TIA and the long-term value gained by treating diabetes, hypertension and hypercholesterolaemia and stopping smoking. Epidemiological studies are very important to institute such stroke prevention programmes formally and to evaluate their effectiveness. Stroke is the first and most important cause of disability in most developed countries.

Medical intervention

Primary and secondary prevention of stroke can be taken beyond the control of risk factors into the realm of active medical and surgical intervention. Medical intervention utilising aspirin, dipyridamole, sulfinpyrazone, and ticlopidine have been reviewed in detail.⁴³⁻⁴⁷ The best known data in this regard are probably from the antiplatelet trialists' overview about individual antiplatelet studies,⁴³ which appeared in the *British Medical Journal* in 1988. This study overall shows a reduction in vascular deaths by 15% using antiplatelet therapy. Meta-analysis sometimes underestimates the true benefit of treatment. The European groups tend to recommend low-dose aspirin regimens from 30 mg/day⁴⁴ to 75 mg/day,⁴⁵ whereas most American and Canadian groups favour the very high doses of 900 - 1200 mg/day.⁴⁶ In practice most centres in South Africa tend to compromise at about 150 - 300 mg/day (personal communication). The stroke prevention effect is probably within the region of 25%.⁴⁶

Dipyridamole plus aspirin versus aspirin alone probably favours the former by about 2%.⁴⁶ Even more patients have received ticlopidine directly compared with aspirin.⁴⁷ There was a 10% overall risk reduction favouring ticlopidine over aspirin. Ticlopidine was not available in South Africa at the time of writing this chapter. Antivitamin K anticoagulation (e.g. coumadin) is not commonly used for the prevention of atherothrombotic stroke. It is very important in primary cardiogenic disease which may result in secondary cerebral emboli, e.g. artificial heart valves and rheumatic valvular

heart disease. In 1991 the Framingham study conclusively showed that atrial fibrillation is an independent risk factor for stroke⁴⁸ and that the elderly are particularly vulnerable to cerebral ischaemic syndromes when atrial fibrillation is present. Low-dose coumadin therapy is the treatment of choice for this risk factor⁴⁹ and reduces ischaemic brain events by about two-thirds. Additional studies are under way comparing coumadin and aspirin therapy for stroke prevention in patients with isolated atrial fibrillation.⁵⁰

Surgical intervention

Most surgical forms of prophylactic intervention are expensive and controversial and will not be discussed.

However, the European Endarterectomy Trial⁵¹ and the North American Symptomatic Endarterectomy Trial⁵² showed that carotid endarterectomy conveys a beneficial effect greater than placebo and all other forms of medical therapy in a very specific group of potential stroke victims. These are symptomatic patients who have had a TIA or minor stroke in the carotid artery territory appropriate to a greater than 70% stenosed ICA. The data are in favour of endarterectomy in high-grade arterial stenosis, provided an experienced radiologist and surgeon are available who have had good experience and results with this operation. Low-grade stenosis should only be treated conservatively according to these studies. In the range of carotid artery stenosis between 30% and 70%, there are still ongoing multicentre endarterectomy trials to contribute to and clarify further indications for this operation. There are no studies completed as yet which satisfactorily clarify the issue about carotid endarterectomy in asymptomatic carotid artery stenosis.

In South Africa this whole field still requires further clarification. New studies will not be large enough to clarify the issue further than the giant American and European studies. Nevertheless, the importance of carotid stenosis as a stroke mechanism in black versus white patients and the results of surgery in the various South African centres are important areas of research.

To achieve the benefit gained by detailed screening of potential stroke patients is an expensive process. Economically the expense of a carotid endarterectomy, which presupposes at the very least a stress ECG, CT scan and cerebral angiography in a small, select population group, may be controversial. In addition, the value of an individual versus a statistical benefit must be considered.

The devastation of long-term disability and loss of socio-economic power of a stroke patient is so large that the cost of prophylaxis is, in my opinion, justified.

ACUTE TREATMENT OF STROKE

In the clinical context, stroke primary prevention addresses the prevention of initial or subsequent episodes of cerebral infarction or haemorrhage. Secondary prevention addresses both the prevention of brain cell destruction during the acute episode and the reduction of the physical and cognitive deficits resulting from cell death. In the treatment of acute stroke, respiratory and cardiac support, fluid and metabolic management, blood pressure control and treatment of elevated intracranial pressure are required.

These forms of treatment are important since they may improve prognosis by 20%. These measures may also make the difference between death and disability and thus actually enhance the number of disabled patients following stroke. Blood pressure should rarely be treated acutely since blood flow in acute cerebral ischaemia may depend directly on cerebral perfusion pressure. Exceptions to this 'no treatment' rule are cardiac ischaemia and cardiac, pulmonary or renal failure, and hypertensive encephalopathy.⁵³

Glucose and electrolytes are important. Dehydration and haemoconcentration should be avoided. In hypoxic environments high glucose levels are deleterious for neuronal function since the glucose

metabolism becomes anaerobic resulting in lactic acidosis. Cerebral oedema, especially cytotoxic oedema developing after 48 - 72 hours, may be treated with glycerol or mannitol.⁵³

More recently acute stroke therapy has concentrated on four major areas, viz. thrombolysis, anticoagulation, calcium channel blockers and gangliosides. Future reduction in stroke mortality in developed countries is likely to depend on finding effective specific therapies for acute stroke. At present there is no new therapy that has been accurately investigated. Trials are inadequately designed, small in number with imprecise triage and inadequate outcome measures.⁴⁹ This is an area that requires participation by academic and private neurologists in multicentre world trials rather than a local countrywide effort.

General measures in stroke care can, however be effective and inexpensive. These measures should be assessed. A question to answer is where is the most suitable place for the acute stroke patient? If a hospital is chosen, basic general measures to assess maximum aerobic cerebral perfusion as early as possible are required. If patients cannot be admitted to hospital, basic rules to monitor hydration, treat cardiac and respiratory failure and manage blood pressure long-term by home care services are necessary.

The future role of thrombolysis may change the face of stroke care. Thrombolysis does not work after 6 hours. In order to improve prognosis in the future it may be necessary to admit a stroke patient urgently to a specific stroke unit as a matter of emergency.

It appears that the ideal management of stroke in the future will be the need for acute stroke units linked to rehabilitation units for chronic stroke management.⁵⁴ These ideal units could be used to develop new treatments and approaches and work out both the cost-effective and clinical benefits of intensive stroke care.

The approach to stroke care must be balanced. It will not help to investigate and develop expensive acute stroke therapy without good preventive and rehabilitation programmes. Equally, to develop active rehabilitation without remaining in the forefront of diminishing the damage caused by an acute stroke is ultimately a wasted resource. Integrated stroke services need to be developed to evaluate stroke management in the country.

REHABILITATION

In the editorial to their book on stroke rehabilitation, Fritz and Penn⁵⁵ emphasise the multidisciplinary nature of the care-givers in stroke rehabilitation. Contributors that make up the ideal team will include some or all of the following: doctor, nurse, speech therapist, occupational therapist, physiotherapist and social worker. Other care-givers will of course include family, friends, volunteers, health workers and district nurses, and often a psychologist or psychiatrist.

Rehabilitation after a stroke may require hospitalisation, but learning to live in a normal environment with the care of health professionals and family is the ultimate goal.

In South Africa there are many programmes aimed at stroke rehabilitation, and some of these will be discussed here. The major problem is lack of co-ordination, lack of a central structure and central health plan and, often, ignorance of available facilities.

This section will be divided into a discussion of what facilities are available, and some suggestions of future directions which may improve the situation.

For purposes of rehabilitation, stroke needs to be classified into degrees of severity. Such a classification has been described by Wade.^{4,56} He suggested arbitrarily that a stroke patient should be reassessed 7 days after the event. Those that have recovered or have minor disability should be fully investigated for cause and intensive preventive measures applied. Those remaining disabled

will need care and disability services, but investigative and preventative measures are probably not required. Assessment by therapists at this stage will probably speed recovery and discharge from hospital. He also recommended research into defining severity using clinical signs and volume of infarction. Prognostic features are well known and it appears that the persistence of loss of consciousness, conjugate gaze palsy, complete paralysis, urinary incontinence and the presence of aphasia and neglect are all signs of poor long-term recovery.

Utilising the above systems, stroke patients fall into three fairly equal groups: those who die within 3 weeks; those who are disabled and need rehabilitation; those who make a fairly rapid recovery. This last section on rehabilitation therefore addresses approximately one-third of all stroke patients, i.e. as many as 300/100 000 of the population.

There is strong evidence that well organised rehabilitation services giving early intervention do improve patient outcome and also reduce the use of resources.^{50,57}

In the rehabilitation of a stroke patient there are four steps that will simplify a central protocol.⁵⁸ These are outlined below.

1. Severity of Illness

- Organ affected (e.g. (L) middle cerebral artery territory)
- Obvious functional loss (e.g. hemiplegia)
- Behavioural and psychiatric manifestations
- Social and economic consequences (e.g. sole wage earner, 5 dependent children).

This first assessment should be undertaken by a team of doctor, nurse, occupational, speech and physiotherapist and social worker. Ideally this should occur in the acute care hospital before discharge 7 - 14 days after the event. It is important to undertake research to discover how many stroke patients are admitted to hospital and how many hospitals have the basic paramedical support team described. If this type of assessment is not possible in hospital, then community teams, possibly including volunteers and clinic teams, may have to perform this task.

2. Rehabilitation Processes

- Setting of goals (e.g. identifying practical physical, mental and social goals)
- Analysing the problems that need to be overcome to achieve the goals (e.g. measuring motor loss, confusion, dependence, mobility, etc.)
- Planning a therapeutic programme
- Regular reassessment.

This is probably the worst area of the whole stroke programme in South Africa. It appears that with the exception of a few rehabilitation homes (mainly private) and some volunteer support clubs, no structure exists for this second phase of problem identification.

In order to rectify this, research needs to be undertaken to identify the problem and solutions more fully. It is possible to combine services, e.g. geriatric and stroke services, to utilise district nursing groups, to involve community clinics and even volunteer, church and community groups. It is possible that if a proper countrywide survey of this problem were undertaken, many services, especially in smaller rural areas, may be identified that could undertake part or all of this service.

3. Reassessment and Early Rehabilitation

- Once the problems have been identified a full health team and social service group will be required to undertake rehabilitation with the family's co-operation.
- Short-term goals (e.g. weeks) should be set and evaluated after the time period chosen.

This step presupposes that a mechanism has been established in step 2 to evaluate the problem, set the goals and provide the therapy.

The ideal choice is a rehabilitation home with a health team as described. Patients can either live at the home or come on a daily basis. Such a service is almost non-existent in South Africa. There are a few private institutions and more are being planned. Some provincial hospitals (e.g. Hillbrow and Johannesburg Hospitals) provide in- and outpatient rehabilitation facilities. Such facilities are non-existent in large urban areas such as Soweto or Alexandra township in Johannesburg or Guguletu or Khayelitsha in the Cape.

A study such as described under step 2 is required to identify both the problems and the solutions. Physiotherapy and speech therapy assistants are important. Often family members can be trained at a clinic and then can undertake much of the therapy at home. Such programmes have been tried, e.g. at MEDUNSA (Prof. J. Joubert - personal communication). Family of stroke patients have attended the paramedical programmes in the hospital during the acute admission. They then bring the patient back only monthly for support and reassessment. Often such programmes can include community skills for economic improvement, e.g. teaching family skills, cooking and sewing skills to family members who are unemployed. The research required to identify and set up programmes of this nature throughout the country will require mainly social and nursing services.

4. The Final Long-term Programme

Here the problem is almost exclusively socio-economic, also involving the occupational therapist. Questions to be answered are:

- Where will the patient live and what physical adaptations are required?
- What personal help will be needed?
- What role can the patient occupy in society?
- What will the patient do to occupy his/her free time?

This is a very personal step and again presupposes that a support team is in place in steps 2 + 3. It is therefore obvious that successful stroke rehabilitation depends upon a careful, patient-centred, problem-solving, goal-directed approach. The approach requires knowledge of the patient's prognosis, impairment and disabilities and social setting. It involves a team approach and will require an enormous amount of organisation in South Africa to provide an equitable rehabilitation approach.

EXISTING RESEARCH AND FACILITIES IN SOUTH AFRICA

In 1990 Dewar⁵⁹ investigated the outcome of acute stroke in 210 elderly hospitalised white patients. The patients had been admitted to a Durban-based provincial hospital with a diagnosis of acute stroke during the period 1 January 1983 to 31 December 1984. The patients were investigated by retrospective case review, and household follow-up. A structured rehabilitation programme was not utilised. Patients were only included in the study if stroke was the initial episode, the patient was discharged to a place of residence within the magisterial district of Durban and the patient remained alive at the time of follow-up.

Of the initial 210 patients, 113 (53,8%) died in hospital, 80 (38%) within the first week. This was an even higher percentage than that described in the studies by Joubert¹⁴ and Rosman,^{15,17} who only described a 33% death rate in hospital.

Of the 97 patients who were discharged from hospital, 16 had recurrent strokes, a further 24 died after discharge, 6 could not be traced and 16 were living outside the Durban magisterial district. Thus, eventually only 35 patients (16,6%) could be assessed as part of a 'household' follow-up.

Eight of these patients were under 65 years of age (mean age 73,5 years), yet ultimately only 2 patients (i.e. 1% of the initial 210 patients entered into the study) were employed outside the home. Thirteen patients (37%) were fully independent and 25 (over 70%) could dress, get onto a toilet, get in and out of bed and feed themselves. Seventeen (48,5%) could climb steps and shop.

Age, sex and side of weakness have no significant relationship to functional outcome scores. However, poor mental skills, depression and urinary incontinence caused low functional status scores. There was a very high degree of social isolation: 12 (34%) never left their homes and 11 (31%) were unable to use telephones. Most of the patients were assessed at about 30 months after their stroke.

The level of functional recovery in those patients that eventually lived was surprisingly good considering that no rehabilitation at all was provided. In his editorial comment on these results, Meiring⁶⁰ makes an opening statement: "As in many other places, care of stroke victims in South Africa leaves much to be desired". Ideally all cases should be admitted to a stroke unit where rehabilitation can proceed at a pace commensurate with the individual's potential for improvement.

In South Africa, especially in the provincial-controlled hospitals, regional hospitals and academic teaching hospitals, the pressure on beds is unbearable. Patients belonging to one ward are often boarded out all over the hospital. Thus all but the sickest patients must be discharged each week to make room for the new admissions. Stroke patients may sometimes be discharged with a nasogastric tube or catheter *in situ* and only rudimentary attempts to instruct an untrained relative on how to proceed in the future.

It is obvious that there is no single measure that could suffice to improve the quality of life and functional capacity of stroke patients in South Africa. However, there is a need for supportive community-based health services to enable patients to remain in their own homes and communities rather than to be institutionalised. Studies in Cape Town's Conradie hospital⁶⁰ and from Grahamstown⁶¹ found that it would have been possible to discharge many patients into the community had community support existed in their area. This observation is equally true of stroke patients, many of whom are geriatric. Thus the provision of proper stroke care in the older age group is practically synonymous with the elements of good geriatric care, because many of the same goals prevail. In younger stroke patients rehabilitation and re-establishment of self worth is possibly even more important.

In geriatric studies in East London⁶² and Cape Town⁶³ it has been shown that reallocation, realignment and co-ordination of people and facilities that are already in place may create good geriatric care without spending vast capital sums. These experiences can be applied to stroke patients fairly easily.

Perhaps the final word should go to P. de V. Meiring: "With reform and imminent prospects of a huge diversion of resources to redress the inequalities in our society on a broad social front, it is extremely unlikely that we will see the provision of a great financial bonanza for something as unproductive on the purely material plane as geriatric medicine or stroke care. It therefore becomes doubly important to co-ordinate these resources we already have, in a way which avoids duplication and unnecessary waste".⁶⁰

Some of these resources are available as published books and pamphlets.

1. *A guide to Health and Social Services in the Johannesburg area.*⁶⁴ This handy book by Avis Schreier was written for the paediatric community but has much important legal and accommodation advice for all ages. Lists of sheltered employment and social services are of particular value.

2. *Stroke, caring and coping*⁵⁵ gives practical advice by a full team of paramedical (physiotherapy, occupational therapy, speech therapy, social work) psychological, nursing and medical authors. Fritz and Penn give a list of resource centres on page 197 which provides information about stroke support groups (usually voluntary), the Independent Living Centre in each province, the National Council for the Physically Disabled, Highway Aged Council in Natal, the Cape Peninsula Organisation for the Aged and also international resources for the traveller.
3. The Cape Peninsula Organisation for the Aged has an information manual of services available for seniors in the Cape Peninsula.⁶⁵ This is a particularly useful manual for stroke patients and includes such sections as home help services, incontinence care, mental health and residence and homes for black senior citizens.

Facilities such as those mentioned above are a possible starting point for collating volunteer and self help care groups, but are by no mean comprehensive and have no central co-ordinating body.

CONCLUSIONS AND RESEARCH PRIORITIES

The theme of this chapter has been to assess information concerning stroke epidemiology, prevention and rehabilitation in South Africa. These data then must be collated and a practical programme for stroke in South Africa should be formulated. The Medical Research Council and all academic institutions as well as all nursing, social and paramedical groups will be required to co-ordinate this team approach.

Further epidemiological information is required. There are still no accurate incidence or prevalence data available for stroke in South Africa. Rigorously designed future information concerning mortality rates, causes and trends are needed. The prevalence of young versus old stroke patients as well as genetic, environmental, dietary and socio-economic influences need to be determined accurately.

Prevention of stroke requires a higher profile. Education concerning the importance of hypertension, diabetes, hypercholesterolaemia and smoking are important. The recognition of warning signs and symptoms, e.g. TIA and atrial fibrillation, needs to be emphasised. Studies looking at the relative contributions of risk factors to stroke in the differing ethnic groups in South Africa need to be carried out.

Therapy aimed at both stroke prevention and acute interventional therapy for acute stroke have not been emphasised in South Africa. Public health and health workers awareness programmes are required. The cost-effective, research-effective and therapeutic value of stroke units linked to rehabilitation units needs to be assessed.

These ideal units could not be placed in every centre but they would be useful as central co-ordinating centres for the country to develop new treatment approaches and work out both the cost-effective and clinical benefits of intensive stroke care. They could also act as training centres for future community workers. The feasibility of such stroke units needs to be intensively assessed. The feasibility of some form of integrated stroke service to evaluate stroke management in the country should be surveyed. The numbers of stroke patients admitted to hospital, the number of hospitals with basic paramedical support and the availability of community teams skilled to cope with planning rehabilitation should be researched.

Finally, extensive research is required into the field of rehabilitation before a good central co-ordinated rehabilitation programme can be achieved. The first priority should be an exhaustive countrywide survey of the social, educational and paramedical therapeutic programmes available in the country. Once this is known, a central comprehensive report of resources must be defined. Thereafter, utilising studies in other parts of the world, the value of programmes by each group participating in rehabilitation needs to be assessed. Examples are defining which patients need

physiotherapy or social work support, district nursing and/or occupational and speech therapists.

What are the goals of therapy and how long should therapy be given? Can family members be properly trained to learn such therapeutic support? Where must they go for community support? These issues require research so that duplication and pointless prolonged therapy are not carried out haphazardly.

The approach to stroke is multidisciplinary. It cannot fall upon one group, e.g. doctors, to coordinate. A central team representing each discipline involved is required to define the problem, coordinate the present resources and propose a comprehensive stroke programme for the future.

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