

health  
**technology**  
assessment



REPORT

**STROKE  
REHABILITATION**

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## ***EXECUTIVE SUMMARY***

Stroke has been found to be a leading cause of morbidity and the third leading cause of death in developed and developing countries. Patients who had survived the acute event are often left with considerable residual disability, which requires help with, one or more of the activities of daily living as well as rehabilitation and long-term care. Rehabilitation of stroke patients had shown a significant reduction in mortality and morbidity. Thus, the effectiveness and cost implications of stroke rehabilitation was studied.

Literature shows that after stroke, 19% were very severely disabled, 4% severely disabled, 26% moderately disabled, and 41% had minor disability, 10% had no disability (Jorgensen et al, 1995). However, after complete stroke rehabilitation, 91.9% of the stroke survivors were fully independent in self-care activities (Venketasubramaniam, 1998). All stroke survivors were found to have benefited from organized stroke rehabilitation services regardless of the severity of the stroke, age and the timing of rehabilitation.

Rehabilitation is an integral part of stroke care and should begin as soon as the condition of the patient permits. To be effective it needs to be coordinated by a multi-disciplinary rehabilitation team, which include specialized nurses, physiotherapist, occupational therapist, speech therapist and dietician. Efforts towards this direction had shown to prevent complications, enhance recovery, reduce length of hospital stay, and improving the functional activity and self-care of stroke patients.

With respect to costs, figures from other countries show that the overall cost (direct and indirect) ranges from US\$ 30 - 40 billion. The cost per patient varies from about US\$ 12 000 – 40 000, of which about 93% of the cost was for in-patient care (Wolf, 1995).

In conclusion there was sufficient evidence to indicate the need for organised multi disciplinary stroke rehabilitation services to help reduce mortality and morbidity as well in reducing health care costs in the long term.

The following is recommended:

- Establishment of organized stroke rehabilitation services
- Specialised personnel from various professional groups are required to co-ordinate the stroke care services.
- Local data on the prevalence, incidence and other epidemiological data of stroke for this country were needed.

## **TABLE OF CONTENTS**

<b>1. INTRODUCTION</b>	<b>1</b>
<b>1.1 Incidence and Prevalence of Stroke</b>	<b>1</b>
1.1.1 Age and Gender	2
<b>1.2 Risk Factors for Stroke</b>	<b>2</b>
<b>1.3 Consequences of Stroke</b>	<b>2</b>
<b>1.4 Stroke Mortality</b>	<b>2</b>
<b>1.5 Disability due to Stroke</b>	<b>3</b>
<b>1.6 Stroke Recurrence</b>	<b>3</b>
<b>1.7 Management of Stroke</b>	<b>3</b>
<b>1.8 Rehabilitation in Stroke</b>	<b>4</b>
<b>1.9 Options for Rehabilitation</b>	<b>5</b>
<b>2. OBJECTIVE</b>	<b>5</b>
<b>3. METHODOLOGY</b>	<b>5</b>
<b>4. RESULTS AND DISCUSSION</b>	<b>6</b>
<b>4.1 Benefits of Rehabilitation</b>	<b>6</b>
4.1.1 Reduction in mortality	6
4.1.2 Reduction in morbidity & improved functional outcome	6
4.1.3 Length of hospital stay	7
<b>4.2 Timing of Rehabilitation</b>	<b>7</b>
<b>4.3 Potential for Recovery</b>	<b>8</b>
<b>4.4 Aspects of Rehabilitation</b>	<b>8</b>
4.4.1 Nursing	8
4.4.2 Physiotherapy	8
4.4.3 Occupational Therapy	9
4.4.4 Psychosocial support	9
4.4.5 Speech therapy	9
4.4.6 Other supportive therapy	9
<b>4.5 Organised Stroke Rehabilitation Services</b>	<b>9</b>

4.6	<i>Rehabilitation Facilities</i>	10
4.7	<i>Cost Implications of Stroke</i>	10
5.	<b>CONCLUSIONS</b>	11
6.	<b>RECOMMENDATIONS</b>	11
7.	<b>REFERENCES</b>	19
8.	<b><i>EVIDENCE TABLE</i></b>	12
	<b><i>APPENDIX</i></b>	43

# STROKE REHABILITATION

## 1. INTRODUCTION

Stroke is defined by the World Health Organisation (WHO) as '*rapidly developing clinical signs of focal (or global) disturbance of cerebral function, with symptoms lasting 24 hours or longer or leading to death, with no apparent cause other than vascular origin*'. This definition includes subarachnoid haemorrhage, but excludes transient ischemic attacks, subdural haematoma and haemorrhage or infarction caused by infection or tumour (The Lancet 1992; 339:342).

Stroke is a challenging disease for health care providers, patients and the community. It has been found to be a leading cause of morbidity and the third leading cause of death in developed and developing countries (Venketasubramaniam, 1998). In addition, it is an important cause of hospital admission, as well as of long-term disability in most industrialised populations (The Lancet 1992; 339: 342: Stroke octet: Epidemiology of Stroke). The recurrence of stroke is a major threat facing stroke patients and the risk is high especially in the early phase of illness. Consequently, secondary stroke prevention is essential in all stroke patients.

### 1.1 Incidence and Prevalence of Stroke

The incidence and prevalence of stroke varies widely in various countries. In addition, the trends have not been consistent. Some studies showed no significant change in stroke incidence over time (Bonita et al, 1993; Stegmayr and Asplund, 1996; Barker and Mullooly, 1997; Ryglewicz et al, 1997; Truelsen et al, 1997), whereas, others showed a decreasing trend (Shimamoto et al, 1996; Tuomilehto et al. 1996; Fogelholm et al, 1997). However, a few studies showed an increasing incidence (La Rossa et al, 1993; Korv et al, 1996). The age-adjusted incidence of the first-ever stroke in developed countries is 100 to 300 per 100 000 population per year (Feigin et al, 1995; Lopez et al, 1995; Thorvaldsen et al, 1995; Stegmayr and Asplund, 1996; Cabral et al, 1997; Fogelholm et al, 1997; Abdul Ghaffar et al, 1997) depending on the method of assessment, country of origin, and the structure of the population in the survey.

To measure stroke incidence and prevalence accurately, prospective community-based registries are necessary, but these are expensive and laborious. Most studies on stroke incidence and prevalence come from developed countries, with only a few from Hong Kong and Japan. Data on the incidence and prevalence on stroke from ASEAN countries is scanty. In addition, many of these are developing countries with their own unique patterns of health-related issue. Thus, the data may not reflect the true situation in these countries. (Venketasubramaniam, 1998). In ASEAN countries, stroke accounted for 0.9 – 4.5% of total medical admissions and 9.2 – 30% of all admissions to the neurological wards (Nadir and Thomas, 1998). The prevalence of stroke has been documented as being in the range of 161 – 690 per 100 000 population (Nadir and Thomas, 1998; Venketasubramaniam, 1998). However, information about aspects of stroke may be

inaccurate due to incomplete case detection, incomplete health screening, inaccurate diagnosis, lack of investigative equipment and technology, and a low level of stroke awareness among the public.

Statistics on cerebral vascular diseases in Malaysia obtained from government hospitals under Ministry of Health reflect an increasing trend in the total admissions since 1992, whereas, the inpatient hospital mortality rates are decreasing (Table 1). However, specific local data regarding the incidence and prevalence stroke is lacking due to the absence of a national stroke registry.

Table 1: Cerebral Vascular Diseases in Government Hospitals in Malaysia (ICD 9 code 430-438)

Years	Total	Discharge	Death	In-hospital Mortality (%)
1992	11 449	9 033	2416	21.1
1993	11 740	9 402	2338	19.9
1994	12 622	10 132	2490	19.7
1995	14 057	11 422	2635	18.7
1996	14 975	12 365	2610	17.4

Source: Information and Documentation System Unit, Ministry of Health Malaysia

### 1.1.1 Age and Gender

The incidence of stroke increases significantly with age (Manolio et al, 1996; Matenga, 1997). This could be because the incidence of hypertension, diabetes mellitus, and heart disease also increase with age. The incidence of stroke has been reported to be more in men compared to women (Hu et al, 1992; al-Rajeh et al, 1993; Lopez et al, 1995; Korv et al, 1996; Rozenthul-Sorokin et al, 1996). However, one study showed similar incidence in both men and women (Manolio et al, 1996).

## 1.2 Risk Factors for Stroke

Cerebral infarction accounted for the majority of stroke cases (50% - 87%), followed by cerebral hemorrhage, 20% - 30% (Hu et al, 1992; Jerntorp and Berglund, 1992; Nwosu, 1992; Caicoya et al, 1996; Rozenthul-Sorokin et al, 1996; Ng, 1998). Hypertension, diabetes mellitus and previous stroke are the other most frequent risk factors for stroke (Nwosu et al, 1992; Du et al, 1995; Feigin et al, 1995; Shimamoto et al, 1996; Nadir and Thomas, 1998; Rylewicz et al, 1997; Venketasubramaniam, 1998).

## 1.3 Consequences of Stroke

Stroke is mainly a disease of the elderly but it can affect people of all ages. In Australia, for example, about 50% out of the 40,000 people who suffer a stroke each year, are above 75 years of age. At least 4.6% (approximately 1 850 per year) are found to be less than 45 years of age (young stroke). It has been estimated that about one third of these patients will die within 12 months as a direct consequence of the illness. (National Stroke Foundation: Executive Summary of National Stroke Strategy, Stroke Australian Task Force). A large proportion of the survivors of stroke suffer from significant residual physical, cognitive, and psychological impairments, so that many are left with mental and physical disabilities (American Heart Association, 1998). Patients with stroke not only



have physical disabilities, but also psychosocial and vocational problems. In addition, it also creates major economic and social problems.

#### **1.4 Stroke Mortality**

The early mortality rate of stroke (within the first 30 days) is about 10%-35% (Von Arbin et al, 1992; Dennis et al, 1993; Feigin et al, 1995; Thorvaldsen et al, 1995; Barker and Mulooly, 1997; Cabral et al, 1997; Carolei et al, 1997; Fogelholm et al, 1997; Matenga, 1997; Ryglewicz et al, 1997; Venketasubramaniam, 1998). The rate is higher in men than in women (Ryglewicz et al, 1997). The case fatality rate is estimated to be around 38 per 100 000 inhabitants. Those who survived had an average annual risk of death of 9.1% (2 to 3 fold risk higher than general population) and this risk is worse in the elderly (Dennis et al, 1993).

Among ASEAN countries, stroke is among the top four leading causes of death since 1992. Overall inpatient mortality of stroke was 21% and the crude death rate ranges from 10.9 - 54.2 per 100 000 population (Venketasubramaniam, 1998).

#### **1.5 Disability due to Stroke**

Stroke disability and outcomes depend on the severity of neurological deficits at presentation - 19% were very severely disabled, 4% severely disabled, 26% moderately disabled, and 41% had minor disability, while the remaining 10% had no disability. After complete stroke rehabilitation, 11% of the stroke survivors still had very severe or severe neurological deficits, 11% had moderate disability and 78% have no or only minimal disability (Jorgensen et al, 1995). A study in Singapore showed that after complete stroke rehabilitation, 91.9% of the stroke survivors were fully independent in self-care activities (Venketasubramaniam, 1998).

#### **1.6 Stroke Recurrence**

Patients with a first episode of stroke have a high risk of recurrence of stroke (13% - 15 times more than the general population), especially in the first year, (Burn et al, 1994). This happens especially among those with multiple stroke risk factors. The overall stroke recurrence rates were less than 5% per year with cumulative rates of 5.7%, 19.3% and 28.8% at 1, 5 and 10 years respectively (Hier et al, 1991). The mortality rate and the degree of disability of the second and subsequent stroke are much higher than in the first stroke (Socco et al, 1989).

#### **1.7 Management of Stroke**

The management of stroke must take into consideration three main components, namely, prevention, management of the acute stroke event, and rehabilitation (WHO Task Force on Stroke and Other Cerebrovascular Disorders, 1989). Efforts to prevent strokes are effective, but the impact of these measures will be evident only in the long term (WHO Task Force on Stroke and Other Cerebrovascular Disorders, 1989). In the management of the acute stroke episode, the use of thrombolytic agents during the acute cerebral ischaemic episode has shown benefit in some studies, but only a small proportion of

patients are suitable for such therapy. Furthermore, its routine use in clinical situations has not gained universal acceptance (Wardlaw et al, 1997). Those patients who survive the acute event, but are left with considerable residual disability, will require help with one or more activities of daily living such as bathing, dressing, feeding and mobility, as well as rehabilitation and long term care. Organised stroke rehabilitation services will assist and accelerate the recovery of impaired function of these patients.

A comprehensive stroke service should provide the following:

- early assessment and investigation of stroke disease in both in-patient and out-patient settings;
- acute care for stroke in-patients to manage their medical and surgical problems;
- rehabilitation for patients with persisting functional problems.

### *1.8 Rehabilitation in Stroke*

The goal of rehabilitation is to reduce dependence and improve physical ability. Often old skills have been lost and new ones are needed and it is important to maintain and improve a person's physical condition whenever possible. It has been estimated that 71% of stroke survivors have impaired vocational capacity, 16% may remain institutionalised, 31% need assistance in self-care, and 20% require assistance for ambulation. Studies show that people with the least impairment are likely to benefit the most. However, even in those patients with slight impairment, with rehabilitation the person may be able to return home rather than stay in an institution.

The increasing proportion of younger adults affected by the disease, and the emergence of new acute stroke therapies, will result in an increase in the number of survivors living with disabilities. Hence, the number of patients needing stroke rehabilitation will continue to increase. Published information on stroke rehabilitation and coordinated rehabilitative programmes has been scarce. Communication between clinicians and those engaged in rehabilitation medicine has been minimal. It has been shown that rehabilitation should be the major thrust in stroke management. Since many patients who suffer the consequences of a stroke have severe deficit from the outset with little or no warning, rehabilitation medicine offers an avenue by which they can return to the normal stream of daily living. For the most part, successful rehabilitation depends on the:

- extent to which the brain is affected
- attitude of survivor
- skill of rehabilitation team
- cooperation of family and friends

Stroke rehabilitation is an active process that consumes a tremendous amount of manpower and financial resources (Stroke Unit Trialists' Collaboration, 1998; Pan European Consensus Meeting on Stroke Management, 1995). Since the pattern of the stroke survivors with disability is increasing, the total direct and indirect costs are increasing simultaneously.

Significant also is the role of the stroke survivor's family in rehabilitation. A caring and able spouse can be one of the most vital positive factors in the rehabilitation process. The knowledge of family members matters a great deal. They need to understand what the stroke survivor has been through, how disabilities can affect the person, know what to expect, and also how to handle problems that arise after the person leaves the hospital (American Heart Association, 1998).

### **1.9 Options for Rehabilitation**

These can be categorised as hospital based, community based and institution based. Hospital based rehabilitation includes outpatient and day care rehabilitation facilities. Outpatient rehabilitation care is for the discharged patient who visits the hospital for rehabilitation services that are provided by physiotherapists and occupational therapists. Rehabilitation can also be provided on a day-care basis where the patient spends part of his / her day at the hospital. Whereas, community based rehabilitation is essentially domiciliary rehabilitation where care is generally provided by a team consisting of physiotherapists and occupational therapists, with or without nursing staff, and a social worker or psychologist. Institution based rehabilitation care is administered at nursing homes and homes for the elderly. Patients discharged to these institutions are mainly based on age (associated with dementia), presence of multiple illness, severity of stroke (severe disability), and the lack of carers or social support at home.

## **2. OBJECTIVE**

To determine the effectiveness and cost implications of stroke rehabilitation.

## **3. METHODOLOGY**

In general, the Medline and Healthgate databases were searched from 1988-1998 inclusive. The key words used for search included stroke rehabilitation, stroke prognosis, stroke outcome, stroke mortality, stroke morbidity, rehabilitation teams, stroke units, stroke management, resources, facilities, units, manpower, personnel, training and assistive devices, physical therapy, occupational therapy, speech therapy, dietician, psychosocial support and complications, stroke epidemiology, stroke incidence, stroke recurrence, young stroke, stroke unit, stroke burden, stroke cost, institution, and domiciliary. These words were used singly or in various combinations. The Cochrane Library was also used to search for information regarding stroke rehabilitation. Non-English articles were excluded from the search. Reference papers and cross-references were accessed where applicable. Problems encountered in the literature search were related to the paucity of large randomised control clinical trials in the area of stroke rehabilitation, and the lack of specific evidence in certain areas. Consequently, findings of papers are presented as general conclusions in some of the relevant areas involved.

With respect to goals, timing and outcome of rehabilitation and the potential for recovery, more than a thousand abstracts on stroke were screened. Of this, about 800 abstracts related to stroke rehabilitation were studied and 50 journal articles were analysed.

For the aspect of resources, 214 abstracts were reviewed and 21 papers were found to be relevant. In the area of options for rehabilitation, 600 titles were screened, of which 50 abstracts were found to be relevant, and 35 full articles were retrieved.

A systematic review of all relevant literature was done and the evidence graded according to the modified CAHTA scale (Appendix)

The following are the results of the search on stroke rehabilitation and treatment:

Key words	1993	1994	1995	1996	1997	1998	Total
Stroke Rehabilitation	24	33	31	14	31	1	134
Stroke Treatment	5	-	12	-	-	-	17

For the burden of illness, the following are the result of the search

Key word	1991	1992	1993	1994	1995	1996	1997	1998	Total
Stroke	2707	2750	3083	3149	3354	1889	2540	320	19792
Stroke epidemiology	1	1	1	0	5	271	0	1	280
Stroke incidence	10	20	27	28	25	27	22	3(1)	162
Stroke unit	13	11	11	17	30	14	18	27	119
Stroke rehabilitation	11	17	24	33	31	14	31	156	162
Stroke burden	0	0	0	1	0	0	0	0	1
Stroke cost	0	1	0	1	0	0	1	0	3
Stroke recurrence	5	6	3	12	6	5	11	0	48
Stroke young	5	2	4	6	2	1	2	0	22

## 4. RESULTS AND DISCUSSION

The interpretation of results of studies on stroke rehabilitation is not easy because it encompasses many aspects of care such as occupational therapy, physical therapy, speech therapy, as well as in-patient versus ambulatory care and home versus specialised institutional rehabilitation. This makes it difficult to specifically determine which of the factors are the most important in achieving the results. Another reason is the large variability, which characterises the material in this particular disease category. It is therefore more difficult to reach uniform conclusions concerning the relationship between resource inputs and the effects of results achieved by any specific method.

### 4.1 Benefits of Rehabilitation

#### 4.1.1 Reduction in mortality

A meta-analysis by Langhorne (Dennis, 1994) showed that at 17 weeks, the odds of death due to stroke was reduced by 28% (95% CI: 0.5 – 0.9); this was sustained at 1 year with the odds of death reduced by 21% (95% CI: 0.63 - 0.99). This reduction in mortality was maintained irrespective of where the patient was managed – in stroke wards, stroke teams, intensive rehabilitation and comprehensive rehabilitation. An extension of the meta-analysis to a further 12 trials corroborated the earlier findings – odds ratio (OR) for death at 12 months was 0.77 (95% CI: 0.62 – 0.98).

#### **4.1.2 Reduction in morbidity & improved functional outcome**

The reduction in morbidity as well as improved functional outcome was similar in trials evaluating the different types of care (Strand, 1985; Dennis, 1994; Eason et al, 1995; Stroke Unit Trialists' Collaboration, 1998). There was no evidence that morbidity was increased by improved survival in any of the trials (Dennis, 1994). All have shown definite benefit though in varying degrees (Young and Forrester, 1992; Ottenbacher and Jannel, 1993; Kalra, 1994; Kolila and Olli, 1984; Evans et al, 1995; Jorgensen et al, 1995; Colantino, 1996; Mayo et al, 1997; Stroke Unit Trialists' Collaboration, 1998). The various functional outcome measures looked at ranged from independent living, ability to return to work, to improvement in performing certain physical tasks involved in activities of daily living.

#### *4.1.3 Length of hospital stay*

Some studies have focused on the effect of organised stroke rehabilitation services on length of hospital stay (Dennis, 1994; Kalra, 1994; Jorgensen et al, 1995; Kalra and Eade, 1995; Mayo et al, 1997). A large community-based study from Copenhagen involving more than a thousand patients (Jorgensen et al, 1995) showed that there was a 30% reduction in the length of stay of stroke unit patients, with 1 313 bed days saved per 100 stroke patients, and 3 nursing home places saved per 100 stroke patients. Other studies also showed shortened length of stay in patients who received coordinated rehabilitation (Dennis, 1994; Kalra, 1994; Jorgensen et al, 1995; Kalra and Eade, 1995). One study specifically looked at the excessive non-medical bed stay by stroke patients because of lack of alternative levels of care including rehabilitation centres. This would translate to inappropriate expenditure for acute medical stay. Almost 50% of the stroke patients had to remain in acute medical wards because of non-availability of organised rehabilitation services (Mayo et al, 1997).

#### **4.2 Timing of Rehabilitation**

Rehabilitation for stroke patients when commenced early i.e. as soon as patient is medically stable has shown better outcome and a reduction of medical complications such as pneumonia and thrombo-embolic events (Wagner and Meijer, 1991; Ottenbacher and Jannel, 1993; Holas et al, 1994; Davenport et al, 1996). However, other studies have also shown that irregardless of the timing of rehabilitation, improvement in functional disability is still evident even if rehabilitation is started as late as a year post stroke (Kolila and Olli, 1984; Bulau et al, 1994; Gladman and Lincoln, 1994). The maximum

rate of improvement occurs at around 3 months and further improvements continue up to 1 year (Strand and Asplund, 1985; Indreavik, 1991; Young and Forrester, 1992; Bulau et al, 1994; Dennis, 1994; Gladman and Lincoln, 1994). The early institution of intensive therapy especially directed towards physical/cognitive deficits would allow mobilisation through early training – this may prevent complications such as pneumonia, pulmonary embolism and pressure sores (Holas et al, 1994; Davenport et al, 1996).

### **4.3 Potential for Recovery**

The potential for recovery following a stroke is dependent on several factors, which include the severity of stroke, presence of pre-morbid dementia, age and social factors (Reddy and Reddy, 1997; Falconer et al, 1994; Glass et al, 1993; Kalra, 1994; Ryglewicz et al, 1997). Younger patients usually fare better than the elderly do, though benefits in functional outcome are also seen in them (Vogel, 1994).

## **4.4 Aspects of Rehabilitation**

Stroke rehabilitation involves a co-ordinated, multi-disciplinary team approach. The team members include specialized medical and nursing staff. The benefits of rehabilitation are not restricted to any particular group of patients and there is no apparent systemic increase in the use of resources.

### **4.4.1 Nursing**

As a basic condition for a successful stroke rehabilitation programme, an appropriate therapeutic milieu is required. Nursing has diagnostic and therapeutic functions (Bohmer et al, 1997). The nurses' intervention of concern, attention and empathy combined with professional knowledge benefited the majority of patients and caregivers (Doswell et al, 1997). It was also demonstrated that there is a need for primary nursing for stroke patients after discharge (Laursen et al, 1995). Nurses' intervention benefits patients and caregivers (Doswel et al, 1997) and fewer patients were referred to nursing homes (Laursen, 1999). Early intervention reduces the length of hospital stay, and potentially reduces costs. Nursing intervention in the form of effective supportive-education in older adults resulted in significantly increasing individuals' perception of their self-care ability after stroke (Folden, 1993)

### **4.4.2 Physiotherapy**

Stroke patients are the most common chronically ill patients treated by physiotherapists in institutional care (Riken and Dekker, 1998). Patients showed improvement in outcome measures of functional independence measures, level of depression, self-esteem and socialization. More intense physiotherapy input was associated with a reduction in the combined poor outcome of death or deterioration, and may enhance the rate of recovery (Werner and Kessler, 1996). Intense physiotherapy in-put may in addition, enhance recovery (Lanaghorne et al, 1996). Physiotherapy treatment contributes to the success of ambulatory rehabilitation (Kruse and Gerotol, 1995). Significant functional gains can be attained with physiotherapy intervention (Werner and Kessler, 1996). Hemi paretic stroke patients may improve their aerobic capacity and submaximal exercise systolic blood pressure response with training, while sensory motor improvement is also related

to improvements in aerobic capacity (Potempa et al, 1995). Physiotherapy may enhance the restoration of ambulation and other motor functions in hemiparetic patients by active and repetitive training (Her et al, 1994). As with nursing, physiotherapy, too, reduced the length of hospital stay, reduced the frequency of discharge to a nursing home, and potentially reduced cost (Jorgensen et al, 1995).

#### *4.4.3 Occupational Therapy*

Social and leisure pursuits decline in stroke patients even with good physical recovery. Specialised occupational therapy can be effective in raising leisure activity and can be translated into improved psychological well being (Parker et al, 1997). Whereas, domiciliary occupational therapy improves the functional out-come in stroke patients (Logan et al, 1997). Similarly, significant functional gains can be attained in post acute stroke patients by the use of intensive outpatient physical and occupational therapy (Werner and Kessler, 1996). Occupational therapy treatment contributed to the success of ambulatory rehabilitation of stroke patients (Kruse and Gerotol, 1995). Early liaison with rehabilitation staff and the quick provision of environmental aids would reduce unnecessary hospitalisation of patients. With occupational therapy intervention, patients were discharged home with improvements in self-care skills and motor strength (Chua and Kong, 1996).

#### *4.4.4 Psychosocial support*

It is important for stroke patients and their carers to receive social support (Hankle et al, 1997). A high level of social support was associated with faster and more intensive recovery of functional status after stroke. Social support may be a prognostic factor in recovery from stroke. Socially isolated patients may be at a particular risk for poor outcome (Glass et al, 1993).

#### *4.4.5 Speech therapy*

Stroke patients were referred to speech and language therapists besides the physiotherapist and occupational therapists (Soo and Kerr, 1996). In 38% of stroke patient's aphasia was present on admission and remain in 18% of these patients on discharge (Pederssen et al, 1995). In addition, speech therapists also play a role in assisting stroke patients who have swallowing difficulties (Chua and Kong, 1996).

#### *4.4.6 Other supportive therapy*

The dietician is a member of the stroke rehabilitation team, caring for the nutritional status of the patient (Soo and Kerr, 1996). The other important aspect of stroke rehabilitation includes patient and family education (Reddy and Reddy, 1997).

### **4.5 Organised Stroke Rehabilitation Services**

The importance of developing a comprehensive stroke service is to provide activities that can cause or increase recovery from disability or in other ways to reduce handicap. Stroke management has several modalities involving many professional groups, each having their own paramount roles. These modalities should be offered through an

organized service such as a Stroke Unit (Stroke Unit Trialists' Collaboration, 1998; Pan European Consensus meeting on Stroke management, 1995; The Melbourne Declaration of the Asia Pacific Consensus Forum on Stroke Management, 1997). Stroke units are beneficial for a number of reasons. They provide complex and varied interventions, including early detection and management of medical complications related to stroke, nursing, and rehabilitative therapy. It has been found that patients managed in a stroke unit had more rehabilitation in terms of physical, occupational and speech compared to controls.

A meta-analysis of 12 trials (Stroke Unit Trialists' Collaboration, 1998) showed that poor outcomes defined as death or institutionalisation was seen less frequently in stroke unit patients (OR 0.67; 95% CI: 0.56 – 0.80). Organised stroke rehabilitation services have shown benefits by way of reduction in mortality, morbidity (Indreavik et al, 199; AHCPR 1995; Henrik and Jorgensen, 1995; Kalra, 1995; Stroke Unit Trialists' Collaboration, 1998), as well as savings in terms of utilization of health care (Strand and Asplunk, 1985; Indrevick et al, 1991; Ottenbacher and Jannell, 1993; Henrik and Jorgensen, 1995; Stroke Unit Trialists' Collaboration, 1998). Stroke units have also been shown to reduce morbidity and improve functional outcome (Strand and Aplunk, 1985; Ottenbacher and Jannell, 1993; Kalra, 1994; Vogel, 1994; AHCPR, 1995; Eason et al, 1995; Stroke Unit Trialists' Collaboration, 1998). The cost of caring for these patients is lower at least during the first year (Kalra, 1994; Eason et al, 1995). It is now quite clear that organised stroke rehabilitation services is beneficial and justifies the cost (Wade,1993).

#### **4.6 Rehabilitation Facilities**

Community services by way of domiciliary care have better outcomes in patient household and leisure activity. Day hospital care has better outcomes in prevention of death or institutionalisation of discharged elderly patients. Hospital based services however has been found to be cheaper than domiciliary services. Stroke patients require a range of services that include hospital-based services and community services. It has also been found that stroke patients have poor influence on the assistive devices needed, but utilise the devices being provided to them (Huss et al, 1996).



#### **4.7 Cost Implications of Stroke**

No cost benefit analysis of stroke units has been carried out and neither have the published trials provided enough detailed information to allow a formal analysis. There are also varying situations - for example, the setting up of a stroke rehabilitation team in one hospital may be achieved merely by the redeployment of existing resources, but in other hospitals, considerable additional resources may be needed. In addition, a good service may reduce the use of resources in some patients and increase it in others. For example, in the Scottish Stroke Unit Study, the stroke unit patients used more resources after discharge (health visitors, physiotherapists and day care hospital services) than the medical ward patients (Cochrane Library, 1998).

#### **Components of costs include the following:**

- i) *Direct cost of rehabilitation.*
  - Recurrence and complications of treatment
  - Cost of long term care
  
- ii) *Indirect cost*
  - Impact on caregivers
  - Loss of economic productivity of patients and caregivers over the entire period of recovery, which could be quite prolonged

Figures from other countries showed that the overall cost (direct and indirect) ranges from USD 30-40 billion, while cost per patient varies from about USD 12 000 – 40 000, in which about 93% of the cost was for in-patient care (Wolf et al, 1995).

Since the management of stroke involves a multidisciplinary team, the duration of treatment varies depending on the neurological recovery that may take months to years. Studies from several developed countries showed that fixed costs (particularly nursing staff salaries) accounted for over 90% of spending on patients with acute stroke. Remedial therapy represented only a small proportion of total cost of hospitalization.

#### **5. CONCLUSIONS**

- All stroke survivors will benefit from organised rehabilitation services regardless of the severity of the stroke, age and the timing of rehabilitation.
  
- Rehabilitation should be an integral part of stroke care and should begin as soon as the condition of the patient permits based on the assumed pathophysiology of the stroke.
  
- Organised rehabilitation services are associated with a significant reduction in mortality and morbidity. The management includes monitoring of physiological parameters, specialised care by nurses, as well as physiotherapy, occupational and dietary therapies. Those patients with residual impairments

should then progress to a systematic programme of rehabilitation services. Stroke patients benefit most from expert care when it is task-specific. Coordinated multi-disciplinary rehabilitation is important in prevention of complications, enhancing recovery, reducing hospital stay, and improving functional activity and self-care.

- Social support is important for both patients and carers. The rehabilitation team, stroke support groups and other community members may give this support.

## **6. RECOMMENDATIONS**

- Organised multi-disciplinary stroke rehabilitation services should be established since it is associated with a reduction in mortality, improvement in functional disability, reduction in length of hospital stay and in long term institutionalised care, and thus saves health care costs in the long term.
- Specialised personnel from various professional groups are required for stroke care.
- Local data on the prevalence, incidence and other epidemiological data of stroke for this country is needed.

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## *Appendix*

### **LEVELS OF EVIDENCE SCALE**

<b>Level</b>	<b>Strength of Evidence</b>	<b>Study Design</b>
1	Good	Meta-analysis of RCT, Systematic reviews.
2	Good	Large sample of RCT
3	Good to fair	Small sample of RCT
4		Non-randomised controlled prospective trial
5	Fair	Non-randomised controlled prospective trial with historical control
6	Fair	Cohort studies
7	Poor	Case-control studies
8	Poor	Non-controlled clinical series, descriptive studies multi-centre
9	Poor	Expert committees, consensus, case reports, anecdotes

**SOURCE: ADAPTED FROM CATALONIAN AGENCY FOR HEALTH TECHNOLOGY ASSESSMENT (CAHTA), SPAIN**

**THE FOLLOWING HTA REPORTS ARE AVAILABLE ON REQUEST:**

<b><i>REPORT</i></b>	<b>YEAR</b>
1. LOW TEMPERATURE STERILISATION	1998
2. DRY CHEMISTRY	1998
3. DRY LASER IMAGE PROCESSING	1998
4. ROUTINE SKULL RADIOGRAPHS IN HEAD INJURY PATIENTS	2002
5. STROKE REHABILITATION	2002