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Managing the Stroke Rehabilitation Triage Process

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Abstract

The challenge of constructing an exemplary stroke rehabilitation system is balancing the attempt to maximize patient outcomes while controlling costs. This review, using findings from Modules 5 through 7 and from evidence based on consensus opinions, presents research on the stroke rehabilitation triage process. Evidence on patient screening, establishing assessment criteria, stroke severity, and unit location is reported. As well, a potential stroke rehabilitation triage system is proposed.
Key Points

- There is consensus opinion that the screening assessment for rehabilitation should be performed as soon as possible.

- Stroke patients eligible for rehabilitation must be able to learn and have sufficient endurance to participate.

- Eligible stroke patients should be admitted to rehabilitation as soon as they are able.

- The two most powerful predictors of rehabilitation outcomes are initial stroke severity and age.

- Patients with moderate to severe strokes should receive rehabilitation on stroke specific rehabilitation units.

- Patients with severe strokes may be better managed on long-term, less-intensive rehabilitation units.

- Mild stroke patients can be rehabilitated in an outpatient setting.

- Younger patients with moderate to severe strokes should always be admitted to an inpatient intensive rehabilitation program.

- Very elderly stroke patients may be candidates for a less intensive rehabilitation approach, regardless of stroke severity.

- Clinically, age in but the impact inversely related to recovery is small.
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4. Managing the Stroke Rehabilitation Triage Process

Determining which stroke patients require rehabilitation and for those who do whether they need inpatient or outpatient stroke rehabilitation is an important first step.

4.1 Determining Stroke Rehabilitation Admission

4.1.1 Screening Assessment
A screening examination for rehabilitation should be performed as soon as the patient’s medical and neurological condition permits, by a person experienced in rehabilitation (Gresham et al. 1995). The screening examination should incorporate medical information, neurological examination, use of a well-standardized disability (e.g., activities of daily living) instrument and a mental status screening test. Asberg and Nydevik (1991) felt that the optimal timing for stroke rehab assessment was 5-7 days post-stroke onset, although recent trends have been towards decreasing that time, since onset.

**Conclusions Regarding Screening Assessment**

*There is consensus (Level 3) opinion that screening for possible admission to a rehabilitation program should be as soon as the patient’s neurological and medical condition permits. The individual performing the screening assessment should be experienced in stroke rehabilitation.*

*There is consensus opinion that a screening assessment for rehabilitation should be performed as soon as possible.*

4.1.2 Threshold Admission Criteria

Threshold criteria for admission to a comprehensive rehabilitation program include medical stability, the presence of a functional deficit, the ability to learn, and enough physical endurance to sit unsupported for at least one hour and to participate actively in rehabilitation (Gresham et al. 1995). Admission to an interdisciplinary program should be limited to patients who have more than one type of disability and who therefore require the services of two or more rehabilitation disciplines. Patients with a single disability can benefit from individual services, but generally, do not require an interdisciplinary program (Gresham et al. 1995).

**Conclusions Regarding Determinants of the Need for Rehabilitation**

*There is consensus (Level 3) opinion that the most important determinants of the need for a rehabilitation program are the patient’s type/types and severity/severities of impairments and functional disabilities, the ability to learn, and physical activity endurance.*

*There is consensus (Level 3) opinion that admission to an interdisciplinary rehabilitation program should be limited to patients with disabilities in two or more of the following areas of function: mobility, performance of the basic activities of daily living, bowel or bladder control, cognition, emotional functioning, pain management, swallowing and communication.*
4. Managing the Stroke Rehabilitation Triage Process

4.1.3 Timing of Admission to Stroke Rehabilitation
There is a growing literature on the benefits of early admission to rehabilitation. Bernaskie et al. (2004) performed a randomized controlled trial (RCT) using a rat model to establish the effect of timing of rehabilitation post stroke on outcomes. A small focal lesion was inflicted on the rats’ brains, which were then exposed to an enriched environment with rehabilitative training for five weeks beginning at days 5, 14 or 30 post stroke induction or to social housing (control). Animals who received enriched training at day five demonstrated a marked improvement in recovery which was accompanied by an increased complexity of dendritic branching in the unaffected areas when compared to those who began rehabilitation at day 30. The differences in cortical reorganization and functional recovery between animals in the social housing group and those who began rehabilitation at day 30 were similar. The authors noted that previous research (Barbay et al. 2001) also demonstrated a time dependent rehabilitation induced map reorganization following ischemic injury. The remaining preserved cortical regions were the most responsive to rehabilitation training earlier rather than later post stroke. Scallert et al. (2003) noted that the brain appears to be “primed” to recover early following stroke and it is at this point rehabilitation therapies will be the most effective.

The results from several studies have suggested that stroke rehabilitation is most effective when initiated early (Feigenson et al. 1977, Hayes and Carroll 1986, Salter et al. in press). Reviews by Cifu and Stewart (1999) and Ottenbacher and Jannell (1993) reported a positive correlation between early rehabilitation interventions and improved functional outcomes. However, it is not evident whether the relationship is causal. One prospective comparative trial by Paolucci et al. (2000) looked at the outcomes of stroke patients admitted to rehabilitation at differing times following stroke. They found that those stroke patients who received rehabilitation early did better functionally than those whose rehabilitation was delayed.

The AVERT Trial (A Very Early Rehabilitation Trial) is a large multi-centre study on the importance of early timing in stroke rehabilitation is the AVERT Trial. Patients who underwent earlier and more intensive mobilization after stroke achieve earlier return to unassisted walking and improve functional recovery compared to those receiving standard care (Bernhardt et al. 2008, Sorbello et al. 2009, Cumming et al. 2011). The Phase III trial is currently ongoing in the UK, Australia, Canada, New Zealand and South East Asia.

**Conclusions Regarding the Timing of Admission**

*There is limited (Level 2) evidence that early admission to stroke rehabilitation directly results in improved functional outcomes. Unless the result of an RCT indicates otherwise, stroke rehabilitation patients should be admitted as soon as they are medically stable.*

*Eligible stroke patients should be admitted to rehabilitation as soon as they are able.*

4.2 Triaging Stroke Patients
An effective triage system allows stroke patients to be quickly matched with the appropriate intensity of resources or easily moved to different levels of rehabilitation intensity according to their needs and is...
critical to any well-functioning stroke rehabilitation system. Before an objective and transparent triage system can be set up there must be consistent objective measures of functional abilities and outcomes.

<table>
<thead>
<tr>
<th>Table 4.1 Most Powerful Predictors of Functional Recovery</th>
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<td>- Initial Stroke Severity</td>
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<td>- Age</td>
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</table>

All stroke survivors need caring, support, and education, but only some need formal rehabilitation. Approximately 20% of stroke survivors recover full functional independence by 2 weeks stroke (Kelley-Hayes et al. 1988). It is estimated that another 20% have such severe functional deficits that they are expected to remain nonambulatory and continue to require assistance with ADLs irrespective of rehabilitation efforts (Pfeffer and Reding 1998). Between these extremes are individuals with varying degrees of disability. For these individuals, the goal should be to identify the best possible match between their needs and the capabilities of available rehabilitation facilities. Alexander (1994) notes that the most powerful predictors of functional recovery are initial stroke severity and the patient’s age. This finding has been confirmed by Stineman et al. (1998a) and Stineman and Granger (1998b) although the effect of age falls out for patients with less initial disability (FIM >60-65), leaving stroke severity the most powerful predictor.

**Conclusions Regarding Predictors of Functional Outcome**

*The two most powerful predictors of functional recovery and eventual discharge status home are initial stroke severity and the patient’s age, with initial stroke severity being by far the most important. These two alone can be used to determine appropriate stroke rehabilitation triage, although it does not preclude the use of additional factors.*

4.3 Levels of Stroke Severity

4.3.1 Levels of Severity of Stroke Rehabilitation Patients

**Animal Studies**

As noted in module 3, animals with small strokes will experience functional and structural recovery occurring spontaneously (without rehabilitation therapy) for weeks to months post stroke. The underlying neural changes appear to be related to remaining surrounding brain regions taking over the lost function. Animals with larger lesions show much less return of function and function that does return may take weeks or months to stabilize. Compensatory movements play an important role with cortical activation and reorganization occurring in more distant cortical areas.

**The Three Levels: Mild, Moderate and Severe**

A paradigm for classifying early stroke-related disability was developed by Garraway in 1981. It is presented in Table 4.2.

<table>
<thead>
<tr>
<th>Table 4.2 Levels of Severity of Stroke Rehabilitation Patients</th>
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<tr>
<td>Level of Severity (Garraway et al. 1981, 1985)</td>
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<tr>
<td>Referred to as:</td>
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<tr>
<td>Early FIM Score (Ween et al. 1996)</td>
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<tr>
<td>Early Motor FIM (Stineman 1998)</td>
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<tr>
<td>Mild Strokes “Upper band”</td>
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<tr>
<td>Moderate Strokes “Middle-Band”</td>
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<tr>
<td>Severe Strokes “Lower Band”</td>
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<tr>
<td>Early FIM Score &gt; 80</td>
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<tr>
<td>40-80</td>
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<tr>
<td>38-62</td>
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<tr>
<td>&lt; 40</td>
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<td>&lt; 38</td>
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The most powerful predictor of functional recovery is stroke severity. Garraway et al. (1981, 1985) first proposed the concept of three bands of stroke patients based upon stroke severity during the acute phase.

The upper band was those patients who had milder strokes, with fewer deficits. These patients generally have an early (5-7 days post onset) FIM score >80. These patients can generally be managed in the community if outpatient resources are available and there are no specific issues to be addressed on an inpatient stroke unit. Stineman et al. (1998a) have defined these patients as having a motor FIM > 62 at the time of rehab admission. Their ability to benefit from rehab is limited by a “ceiling” effect.

The middle band of patients was those who had suffered moderately severe strokes; they were conscious acutely and had a clinically significant hemiplegia/hemiparesis. Such patients have been defined as having an early FIM score of 40-80 and more specifically a motor FIM between 38-62 (Stineman et al. 1998a). These patients frequently demonstrate marked improvements in all areas although they are often partially dependent in most areas by discharge. Over 85% are discharged to the community (Stineman et al. 1998a) and it is these patients who appear to improve the most with rehabilitation.

The lower band of patients was the most severe strokes, unconscious at onset with severe unilateral or bilateral paresis. Alternatively, such patients may have serious medical co-morbidity which adds to the stroke disability. Such patients have an early FIM score <40 according to Ween et al. (1996) or according to Stineman (1998a). Motor FIM scores <38 have been associated with the lower band. These patients are unlikely to achieve functional independence, regardless of treatment, unless they are younger (see below), and they have the longest rehab stays as well as a lesser likelihood of community discharge (Stineman et al. 1998a). However, although the stroke is so severe they may not progress sufficiently to be discharged home, these patients do make significant gains and with strong family supports they can potentially go home. Although these patients do not improve to the extent the middle band do, improvement in this group appears to be more dependent on the availability of stroke rehabilitation.

4.3.2 Severity of Stroke and Intensity of Rehabilitation
Carey et al. (1988), Asberg and Nydevik (1991), Alexander (1994) and Jorgenson et al. (2000) reported those in the middle band or middle severity range made the most functional gains while those at the extremes, the very disabled or the mildly-disabled, made significantly fewer gains.

<table>
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<th>Table 4.3 Severity of Stroke and Improvement on Rehabilitation</th>
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<tr>
<td><strong>Author, Year Country</strong></td>
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<tr>
<td>Ween et al. 1996 USA</td>
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Ween et al. (1996) prospectively analyzed 536 consecutive stroke rehabilitation admissions to try and identify the influence of preselected factors on functional improvement and discharge destination. Patients with an admission FIM above 80 almost always went home after rehabilitation and so it was recommended that patients with early functional independence measure (FIM) scores greater than 80 (the mildly disabled) are best managed at home as long as appropriate supports are in place. Conversely, patients admitted to rehabilitation with a FIM score of less than 40 almost always required long-term care in a nursing home facility. It was recommended that those with FIM scores less than 40 (the more severely disabled) should likely go to a slower paced or less intensive rehab facility or a decision not made at the time of initial assessment. An admission score of 60 or more was associated with a larger FIM improvement, but the absence of a committed caregiver at home increased the risk of nursing home discharge. Therefore, it was recommended that intensive rehabilitation units are most likely to be effective with moderately severe stroke patients with early FIM scores between 40-80. These patients are generally able to participate fully, show substantial improvement during rehabilitation and have a high probability of discharge home (Alexander 1994).

Oczkowski and Barreca (1993) explored the usefulness of the FIM as a prognostic indicator of outcome in 113 stroke survivors admitted to a Canadian rehabilitation unit. Rehabilitation was by a multidisciplinary team. After initial assessment, rehabilitation goals were set and reviewed and revised every 2 weeks for each patient. Admission to rehabilitation unit occurred a median of 52 days after stroke onset. Rehabilitation was given on average of 64 days. Patients discharged home were younger than those who were institutionalized. Chedoke-McMaster Stroke Assessment and bladder and bowel incontinence on admission were predictive of discharge location. Patients discharged home had significantly higher FIM scores on admission and discharge. Patients discharged to await chronic care had the least change in FIM scores and those awaiting discharge to nursing home placement had similar change as home discharged patients. Patients with any degree of hemianopsia, sensory loss, parietal neglect, aphasia or cognitive impairment had significantly lower FIM scores than those patients without these impairments. Best predictor of location of discharge was FIM scores at admission, admission postural staging and age. FIM scores of 36 or less never get home, scores of 97 or more inevitably go home.
between 36 and 96 exhibited the greatest overall FIM gains, but discharge destination was difficult to predict because of others factors such as comorbidities, cognitive and perceptual impairments, and the presence or absence of a supportive caregiver. This study was limited by the almost 2 months median time to admission.

**Jorgenson et al. (2000)** conducted the Copenhagen Stroke Study, a prospective analysis of 1,197 consecutive patients admitted to a stroke unit. The initial stroke severity was measured by the Scandinavian Neurological Stroke Scale (SSS) at the time of acute admission (Scandinavian Stroke Study Group 1985). The scale’s score ranges from 0-58 points with very severe (0-14), severe (15-29), moderate (30-44) and mild (45-58) classification. At the time of acute admission 41% of the patients were of mild severity, 26% moderate, 14% severe and 19% of very severe severity. Almost all patients with a mild stroke were discharged to their own home. The proportion of patients discharge to their homes occurred in 75% of patients with a moderate stroke, 33% of severe strokes while only 14% of the most severe strokes returned to their home at discharge. For those patients who had suffered a severe stroke, one third died, one third were discharged back to their own homes and one-third had to be discharged to a nursing home despite rehabilitation (Jorgenson et al. 2000).

Interestingly, Jorgensen et al. (2000) noted that the mean gain in Barthel Index (BI) score from admission to discharge was 16 points. However, the gain in BI score varied widely and was related to the level of initial disability. In patients with very severe initial stroke disability, the average gain was 24 points; 41 points for patients with severe stroke; 27 points for those with moderate stroke and 8 points for those with mild stroke. The small gain in points seen in the patients with mild strokes likely reflects a “ceiling” effect.

**Conclusions Regarding the Levels of Severity of Stroke Rehab Patients**

*Severity of stroke is the most powerful predictor of ability to participate and benefit from stroke rehabilitation. Mild strokes benefit the least because of a “ceiling effect”. Moderate to severe stroke improve the most on stroke rehab although the most severe strokes appear to benefit the most when compared to controls.*

### 4.4 Age as a Modifier in Rehabilitation Triage

The second predictor of functional outcome following stroke is age, although it is a lesser factor and considerably more controversial than stroke severity.

#### 4.4.1 Impact of Age on Recovery/Rehabilitation

**Animal Studies**

As noted in Module 3, the impact of stroke and recovery with age in animals is not entirely clear. Older animals do exhibit recovery post stroke, although generally recovery is more rapid and extensive, the younger the animal. This observation correlates with a decline in the rate of formation of new neuronal connections or synaptogenesis. Therefore, older animals do improve post stroke but the process takes longer and is less complete. For this reason age may not be a consistent predictor of functional recovery after stroke.

**Clinical Studies**
Studies support the concept that age is a critical prognostic factor with an established association between increasing age and poorer outcomes.

**Table 4.4 Age as a Modifier in Rehabilitation Triage**

<table>
<thead>
<tr>
<th>Author, Year Country</th>
<th>Methods</th>
<th>Outcomes</th>
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<tbody>
<tr>
<td>Kotila et al. 1984 Finland</td>
<td>Analyzed the profile of recovery of 154 stroke survivors on discharge from hospital, ADL and return to work. Patients were evaluated at time of admission and then 3 and 12 months post stroke onset. Previous medical, social and occupational history and neurological signs and symptoms were registered.</td>
<td>Patients under 65 had significantly better outcomes than those over 65 years and were more often at home, more independent in ADL after 3 months and this difference increased at 1 year.</td>
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<tr>
<td>Bogousslavsky &amp; Pierre 1992 Switzerland</td>
<td>From the Lausanne Stroke Registry, young stroke patients that made up 12.3% of first ever ischemic strokes were divided into two group: group 1 encompassing patients aged 16 to 30 years of age and group 2 encompassing patients aged 31 to 45 years old. Computed tomography, ECG, standard hematologic and other blood tests and extracranial and transcranial Doppler ultrasounds were performed on each patient.</td>
<td>Early mortality was not negligible. No disability of minor sequelae was present in 60% of group 1 and 52% of group 2 patients. Severe sequelae were found in 7% and 14% of group 1 and 2 respectively. Prognosis was better for younger patients with at least 75% of patients improving markedly or completely and able to return to previous activities. The annual incidence of recurrent stroke seems to be less than 1%.</td>
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<tr>
<td>Borucki et al. 1992 USA</td>
<td>Inpatients on a stroke rehabilitation unit with no prior history of stroke and who were admitted directly from acute care hospital were randomly assigned for serial follow up and then were divided into 2 age groups: 69 years or less and 70 years or more.</td>
<td>Greater proportion of older patients were discharged to a skilled nursing facility or were placed in one between discharge and 24 months. Albeit non-significant, survival tended to be worse for older patients. While age was related to death and skilled nursing facility placement, it had no clinically significant effect on maintenance of rehabilitation gains following ischemic stroke.</td>
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<tr>
<td>Kalra 1994 UK</td>
<td>245 stroke survivors who remained in hospital on general or geriatric wards 2 weeks after stroke were randomized to a stroke unit or to a general medical ward and then were divided into an older (75 years and over) and younger (under 75 years) age group. Younger and older stroke patients were comparable for neurological and functional deficits and were distributed equally between the stroke unit and the general wards.</td>
<td>Older patients received more occupational therapy in both settings and more physiotherapy. Younger patients on the stroke unit showed better outcome on discharge to home, median Barthel score, median length of hospital stay, compared with those on the general wards. Older patients on stroke unit had better outcome on discharge to home and median Barthel score than those on general wards. Outcomes in older stroke patients were similar in both settings except for a shorter median length of hospital stay on the stroke unit. Outcomes in younger patients managed on general ward were worse than that in older patients with similar prognosis.</td>
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<tr>
<td>Nakayama et al. 1994 Denmark</td>
<td>363 consecutive acute stroke patients were prospectively followed. Upper extremity function and paresis were assessed weekly using the Barthel Index subscores for feeding and grooming and the Scandinavian Stroke Scale (SSS) subscore for arm and hand. Rehabilitation was performed according to the Bobath technique.</td>
<td>Patients who gained upper extremity function by compensation were younger, had less severe stroke, smaller and subcortically located lesions and less affection of higher cortical function.</td>
</tr>
<tr>
<td>Kammersgaard et al.</td>
<td>1,197 patients were studied in the community- 191 patients were 85 years or older. Very old age was</td>
<td></td>
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2004

Denmark

Based Copenhagen Stroke Study and stratified according to age. Age was evaluated as a predictor of both short-term and long-term outcomes. The very old were classified as being ≥ 85 years.

Associated with more severe strokes, being female, having atrial fibrillation and pre-existing disability. Very old age predicted short-term mortality (OR 2.5; 95% CI 1.5-4.2), and discharge to nursing home or in-hospital mortality (OR 2.7; 95% CI 1.7-4.4). Five years after stroke very old age predicted mortality or nursing home placement (OR 3.9; 95% CI 2.1-7.3), and long-term mortality (HR 2.0; 95% CI 1.6-2.5). However, other factors such as onset stroke severity, pre-existing disability and atrial fibrillation were also significant independent predictors of prognosis after stroke.

Although age has been associated with poorer outcomes, its impact can be overestimated. In a cohort study of 2,219 patients, Kugler et al. (2003) studied the effect of patient age on early stroke recovery. The authors found that relative improvement decreased with increasing age: patients younger than 55 years achieved 67% of the maximum possible improvement compared with only 50% for patients above 55 years (p< 0.001). They also found that age had a significant but relatively small impact on the speed of recovery with younger patients demonstrating a slightly faster functional recovery (p< 0.001). The authors concluded that although age had a significant impact it nevertheless was a poor predictor of individual functional recovery after stroke and could not be regarded as a limiting factor in the rehabilitation of stroke patients. However, younger patients did demonstrate a more complete recovery.

Bagg et al. (2002) in a prospective study of 561 patients admitted to an inpatient stroke rehabilitation program found that age alone was a significant predictor of total FIM score and Motor FIM score at discharge, but not of FIM change. For both total FIM score and Motor FIM score at discharge, age alone accounted for only 3% of the variance in outcome. The results from this study suggest that advanced age alone is not a justifiable reason to deny patients access to rehabilitation given the questionable clinical relevance of that factor (Bagg et al. 2002).

Conclusions: In humans, age has a small but significant effect on the speed and completeness of recovery. However, because older stroke patients do recover, albeit at a slower rate, and the overall impact of age is relatively small, age in and of itself is a poor predictor of functional recovery after stroke.

Clinically, age in inversely related to recovery but the impact is small.

4.4.2 Younger Stroke Patients

The odds of discharge home are 18 times greater if the stroke patient is under 65 than if they are over 85 (Herman et al. 1984). Kotila et al. (1984) compared 77 stroke patients 65 or older versus 77 patients younger than 65. Younger stroke patients had a better outcome in return to home and ADLs. Bogousslavsky and Pierre (1992) found 202 or 1638 (12.3%) of patients from the Lausanne stroke registry with first ever ischemic stroke were 45 years or younger. They were divided into two groups: 1) Group 1 – age 16-30, n=56 (28%); 2) Group 2 – age 21-45, n=146 (72%). Prognosis was better for the Group 1 patients.

Alexander (1994) reported that all patients under 55 years old in his study group were discharged home. More importantly there was a significant greater FIM change in those patients aged <55 years than for
patients >55 years and even a significantly greater FIM change for groups aged 55 to 74 years than for
the group >75 years (Alexander 1994). Nakayama et al. (1994) reported that older stroke patients made
the same degree of neurological recovery than younger patients but had a much lower functional gain.
It was suggested that the more elderly patients had less compensatory abilities than younger stroke
patients with comparable neurologic impairments. Kalra (1994) also reported that younger patients
enjoyed greater functional recovery and higher rates of home discharge than elderly stroke survivors.
Younger patients often do well no matter how impaired they are initially and even with severe strokes
(FIM <40) should be considered appropriate for a comprehensive intensive rehab unit (Alexander 1994).

Conclusions Regarding Age

There is limited (Level 2) evidence that younger stroke patients (less than 55 years of age) should be
admitted to an inpatient intensive rehabilitation programs even if the stroke is severe.

Younger stroke patients with moderate to severe strokes should always be admitted to an
inpatient intensive rehabilitation program.

4.4.3 Elderly Stroke Patients

Very elderly patients tend to be more cognitively impaired and have greater disease comorbidity and
poorer social supports. Elderly patients often don't do as well with more aggressive intensive therapy
approaches and such an approach may not be the best utilization of resources. Alexander (1994) has
shown that elderly patients (defined as greater than 75 years) with FIM scores between 40-60 don’t
appear to be able to benefit as much from intensive rehab and should be considered for less intensive
rehab. However, a word of caution; when the patient is between 75 and 80 years old the patient’s
particular case must be considered. Borucki et al. (1992) showed that those elderly patients with the
ability to function independently outside their homes had a functional outcome not significantly
different than younger patients. Patients over 80 years should be considered for less intensive
rehabilitation.

It is important to recognize that elderly patients do make significant gains in terms of FIM changes
(Borucki et al. 1992, Alexander 1994) but such gains tend to be slower with longer rehabilitation stays
and a greater likelihood of discharge to an institution (Alexander 1994). Dividing rehabilitation into
outpatient, intensive and less-intensive rehabilitation streams allows one to maximize use of resources
without compromising outcomes of rehabilitation.

Conclusions Regarding Elderly Stroke Patients

There is limited (Level 2) evidence that elderly stroke patients older than 75 years of age in the lower
half of the middle severity group (early FIM 40 – 60) should be managed with a less-intensive stroke
rehabilitation approach.

Very elderly stroke patients may be candidates for a less intensive rehabilitation approach,
regardless of stroke severity.
4.5 Where Should Stroke Rehabilitation Be Conducted?

Stroke rehabilitation can be conducted in rehabilitation hospitals or rehabilitation units in acute care or rehabilitation hospitals, in nursing facilities with rehabilitation programs, in outpatient facilities, or in the home.

4.5.1 Hospital Based Inpatient Programs

Hospital programs are usually the most comprehensive, provide the greatest intensity of therapy and generally have optimal medical coverage. Expertise in stroke rehabilitation varies with the greatest concentration in formal hospital-based stroke rehabilitation units. Patients with moderate or severe disabilities and sufficient physical endurance to tolerate intense rehabilitation (at least 3 hours of physically demanding activities per day) are candidates for these more intense hospital programs. The wide variability in the capabilities of programs makes it incumbent on the referring physician or hospital to evaluate the capabilities of the program with specific reference to each patient's needs. Access to an appropriate facility may be an issue. The benefits of such specialized stroke rehabilitation units were discussed in Module 5.

As noted in Module 5, there is strong evidence that specialized interdisciplinary stroke rehabilitation, as provided by an interdisciplinary stroke-specific team, results in improved functional outcomes when compared to “usual” care as provided on a general medical unit. There is also strong evidence that patients with more severe strokes benefit from stroke rehabilitation to a much greater extent. The evidence in this regard is overwhelming that moderate to severe stroke patients should be rehabilitated in stroke-specific inpatients units. There is moderate evidence that enhanced outpatient rehabilitation and discharge services, when provided in conjunction with stroke specific inpatient care, results in improvements in functional outcomes and the number of patients discharged home as well as reduced length of hospital stay. Again, enhanced rehabilitation/discharge services have the greatest impact on moderate to severe strokes.

**Conclusions Regarding the Ideal Location for Stroke Rehabilitation**

*There is strong (Level 1a) evidence that patients with moderate to severe strokes should be rehabilitated on stroke-specific rehabilitation units, at least initially.*

*There is moderate (Level 1b) evidence that for patients with moderate to severe strokes, enhanced rehabilitation outpatient and discharge services improves functional outcomes and increases the number of patients discharged home as well as reducing hospital length of stay.*

**Patients with moderate to severe strokes should receive rehabilitation on stroke specific rehabilitation units.**

4.5.2 Lower Intensity Inpatient Programs

Patients with severe degrees of disability and those who have poor physical endurance or limited attention spans that precludes participation in an intensive rehabilitation program can be managed with lower intensity programs. These programs may offer single or multiple therapies in an interdisciplinary setting 1 to 3 hours a day, 3 to 5 days a week. This is sometimes referred to inaccurately as “subacute rehabilitation”. However, as the results from a recent study demonstrated, patients with severe stroke can achieve impressive rehabilitation goals. A group of 196 non-ambulatory patients, most with FIM...
scores below 40, were admitted to a specialized, enriched multidisciplinary rehabilitation program for a period of close to three months. Upon completion of the program, 43% of patients were able to return home and 28% were no longer wheelchair dependent (Teasell et al. 2005).

As cited by Flick (1999), in the United States “There is a trend for Medicare managed-care patients to be sent to subacute rehabilitation programs (Retchin et al. 1997). A recent large cooperative study compared stroke rehabilitation outcomes at 3 and 6 months for long-term placement, functional status, and cost in case mix-adjusted populations treated in rehabilitation hospitals, subacute nursing homes, and traditional nursing homes (Kramer et al. 1997). The study found significantly greater functional recovery in the rehabilitation hospital patients compared with the subacute and traditional nursing home patients. The total Medicare cost was 1.5 times greater than subacute and 2 times greater than traditional nursing home rehabilitation, but the odds of returning to the community doubled for rehab hospital patients in comparison with subacute patients. Subacute patients were more likely to return to the community than traditional nursing home patients, but there was no significant difference in function. Patients who are progressing slowly in acute rehabilitation have been shown to benefit from transition to subacute rehabilitation programs (Kosasih et al. 1998).”

Conclusions Regarding Lower Intensity Programs

*There is limited (Level 2) evidence that severe strokes are best managed with a more long-term, less intensive rehabilitation approach.*

Patients with severe strokes may be better managed on long-term, less-intensive stroke rehabilitation units.

4.5.3 Outpatient/Home Care Rehabilitation

There is a trend, as mentioned before, to move rehabilitation out of the hospital and into the community, sooner and to a greater extent than that seen previously. This alternative approach to rehabilitation has been advocated by Edmonds and Peat (1997). The approach is multidisciplinary in nature and takes place where the stroke patient lives. This approach purportedly makes use of existing community resources, including Home Care, with full involvement of family members or caregivers. The disabled stroke patient and their family are therefore more involved in their health care and have a greater say, and more responsibility, for their own rehabilitation. Such an approach would provide a mechanism for providing services required by disabled stroke patients in regions and areas where such services have not been readily available.

The benefits of this devolution are obvious: it is potentially less costly, is arguably more patient-centered and involves the family/caregivers to a greater extent. However, where similar therapy services have been provided to the home, the cost savings have proven elusive. Moreover, discharging patients too soon may have an adverse impact upon outcome. Stineman et al. (1999) studied resource use and outcome differences between Veterans Administration (VA) and private sector rehabilitation facilities and determine if differences remained after controlling for patient characteristics. Data were obtained from 3,056 stroke patients admitted to 60 VA facilities in 1994 and 1995 and 52,382 stroke patients admitted to 467 private sector facilities in 1995. The VA serves a higher proportion of patients who are single, separated or divorced, unemployed or retired due to disability, and who are African Americans (p<0.01). VA patients tended to have less severe disabilities and longer intervals between stroke onset and rehabilitation admission. Even after adjusting for available clinical characteristics, VA patients stayed from 30% to 84% longer than private sector patients, depending on Function Related Group
(FRG) (p<.001). On average, veterans achieved higher levels of functional independence by the time of discharge in 12 of 21 FRGs and lower levels in one FRG (p<.01). Major differences in resource use and outcomes remained after statistical adjustment for population differences in clinical characteristics (Stineman et al. 1999).

The characteristics of the home environment and availability of social support may determine the feasibility of home or outpatient therapy; for outpatient rehabilitation transportation is often an issue. As mentioned in the previous paper, those studies that have looked at conducting rehabilitation in the home have found little difference in functional outcomes for higher level stroke patients when offered organized rehabilitation care at home (Holmqvist et al. 1998) but poorer care for moderate or severe stroke sent back to their communities when compared to in-patient rehabilitation programs (Ronning and Guldvog 1998) (see Section 7). The danger with the moderate to severe stroke group is that the skill set, present in hospital rehabilitation units, will not be as high in the community. In Ronning and Guldvog’s study (1998), fully 30% of stroke patients randomized to rehab in the community did not receive any form of organized rehabilitation. An integrated system, whereby the hospital-based rehab program serves as an educational and clinical resource, is important, both for the community support and the rehab program.

We concluded that there is strong (Level 1a) evidence that mild stroke patients discharged early from an acute hospital unit can successfully be rehabilitated in the community by an interdisciplinary stroke rehabilitation team (see Section 7). Such programs can reduce hospital length of stay by approximately one week but do not appear to reduce overall costs.

There is also strong (Level 1a) that hospital-based outpatient stroke rehabilitation results in improved outcomes when compared to routine or no care over the short-term. There is strong (Level 1a) evidence that addition home-based therapy does not improve functional outcomes as measured by the Barthel Index, when compared to routine care. There is conflicting (Level 4) evidence of the superiority of home-based or hospital-based outpatient stroke rehabilitation.

Conclusions Regarding Home/Outpatient Rehabilitation

*There is strong (Level 1a) evidence that mild strokes can be rehabilitated in an outpatient setting. It does not appear to matter whether it is at home or based out of a hospital, although home appears to be preferable.*

Mild stroke patients can be rehabilitated in an outpatient setting.

4.6 A Potential Triage System

There is a fundamental need for an integrated system of care that spans acute care, in patient rehabilitation, outpatient and home care service and supported living options that permit disabled individuals to move among levels of care in response to changed needs. Continuity of care and efforts to maximize functional independence of both patients and caregivers are essential. The goal is to provide a seamless flow of patients across the continuum of care.

One of the most important elements of systematic approach is an appropriate triage system based on the previous evidence discussed in this section (see Figure 4.1).
The two most important predictors of functional recovery and eventual discharge home are initial stroke severity and the patient's age. Initial stroke severity for purpose of stroke rehabilitation triage is best measured using a functional outcome measure such as FIM. Patients with early FIM scores of >80 can generally be managed in the community if the outpatient rehabilitation therapies are available. Early FIM scores of 40 – 80 are the traditional "middle band" stroke rehabilitation patients, making marked improvement more rapidly and hence benefiting from intensive rehabilitation. Those patients with early FIM scores of < 40 are less likely to achieve functional independence, make a slower recovery and hence require longer less intensive rehabilitation stays.

Hence, early FIM scores allow a rough triaging of stroke patients into 3 groups: 1) FIM > 80 – community care; 2) 40-80 – more intensive short or length of stay stroke rehab; 3) 80 – less intensive longer length of stay stroke rehab. Again, this system speaks to evaluation during the initial week post stroke onset. The number will obviously need to shift upward if the assessment for rehabilitation is made after the first week.

Age is a significant prognostic factor with increasing age leading to poorer outcomes. Younger stroke patients (< 55 years of age) often do well no matter how impaired they are initially and even with severe strokes (FIM < 40). Such patients should be considered appropriate for a more intensive stroke rehabilitation program. Elderly stroke rehab patients (> 75 years of age) in the lower half of the middle severity group (early FIM 40 – 60) should be admitted for a less-intensive stroke rehabilitation program.

The combination of stroke severity and age allows an objective triage system to slot patients into community-based stroke rehab, more intensive, or slower-stream stroke rehabilitation. The triage system can be done within a single stroke rehabilitation unit where the rehabilitation care of stroke patients is individualized. The key message is that a “one size fits all” model does not appear to be appropriate and stroke rehabilitation locale (inpatient vs. outpatient) and intensity (intensive vs. slow stream) must be individualized for each stroke patient. In reality, an optimal stroke rehabilitation program would provide an individualized rehabilitation therapy program based upon the individual stroke patient’s specific needs.
Figure 4.1 Potential Stroke Rehabilitation Triage System Employing Stroke Severity and Age.
Summary

1. There is consensus (Level 3) opinion that screening for possible admission to a rehabilitation program should be performed as soon as the patient’s medical state allows. The individual performing the assessment should be experienced in stroke rehabilitation.

2. There is consensus (Level 3) opinion that the most important determinants are the patients’ types and severity of impairments and functional abilities, the ability to learn and physical activity endurance.

3. There is consensus (Level 3) opinion that admission to an interdisciplinary rehabilitation program should generally be limited to patients with disabilities in two or more areas of function: mobility, performance of the basic activities of daily living, bowel or bladder control, cognition, emotional functioning, pain management, swallowing and communication.

4. There is limited (Level 2) evidence that early admission to stroke rehabilitation directly results in improved functional outcomes. Until the results of an RCT indicates otherwise, stroke rehabilitation patients should be admitted as soon as they are medically stable.

5. The two most powerful predictors of functional recovery initial stroke severity and the patient’s age and these two alone can be used to determine appropriate stroke rehab triage, although it does not preclude the use of additional factors.

6. Severity of stroke is the most powerful predictor of ability to participate and benefit from stroke rehabilitation. Mild strokes benefit the least because of a “ceiling” effect. Moderate to severe strokes improve the most on stroke rehab although the most severe strokes appear to benefit the most when compared to controls.

7. There is strong (Level 1a) evidence that mild stroke patients can be rehabilitated in an outpatient of home setting.

8. There is moderate (Level 1b) evidence that moderate to severe strokes are best managed, at least initially, in comprehensive intensive stroke rehab units.

9. There is limited (Level 2) evidence that severe strokes are best managed with a more long-term, less intensive stroke rehabilitation approach.

10. There is strong (Level 1a) evidence that mild strokes can be rehabilitated in an outpatient setting. It does not appear to matter whether it is at home or based out of a hospital, although home appears to be preferable.

11. There is limited (Level 2) evidence that younger stroke patients < 55 years should be admitted to an inpatient intensive rehab program even if the stroke is severe.
12. There is limited (Level 2) evidence that elderly stroke patients > 75 years in the lower half of the middle severity group (early FIM 40–60) should be managed with a less-intensive stroke rehab approach.

13. Age has a small but significant effect on the speed and completeness of recovery. However, because older stroke patients do recover, albeit at a slower rate, and the overall impact of age is relatively small, age is a poor predictor of functional recovery after stroke.
References


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