

Stroke Audit

R Y T Chen, MRCP*, J K H Lim, MRCP, A M L Chuo, MRCP****

*Department of Medicine, Changi General Hospital, **Department of Geriatric Medicine, Changi General Hospital, 2, Simei St 3, Singapore 529889

Summary

Medical audit is vital to ensure continuous quality assurance and quality improvements. We did a retrospective study to ascertain the adequacy of clinical documentation and the factors hindering early discharge after an acute stroke in a restructured hospital. The medical records of all patients with acute stroke who died or were discharged from a restructured hospital in Singapore in January and February 1999 were reviewed retrospectively. Demographic data and the presence or absence of clinical documentation were noted. Factors hindering the discharge of patients at Day 5, Day 10 of stroke and at final discharge were noted and classified into: stroke-related, complications of stroke, medical-related and social factors. There were 101 patients in the study cohort, 55 males (54.5%) and 46 females (45.5%). The mean age was 67.9 years (SD 12.3). Documentation in Barthel scores (0%), presence of depression (0%), mental scores (1.0%), visual problems (10.0%), bladder continence (39.6%), admission functional status (37.6%) and dysphagia (52.5%) were deficient. The mean length of stay (LOS) was 13.0 (SD 14.2) days. The main factor hindering discharge at Day 5 (90.4%), Day 10 (95.2%) and at final discharge (82.1%) was stroke-related problems. Poor function (60.3%) and dysphagia (15.8%) were the 2 most common stroke-related problems hindering final discharge. Complications of stroke, medical-related problems and social reasons hindered final discharge in 10.8%, 17.8% and 2.9% of patients respectively. This audit revealed inadequacy in clinical documentation in patients with acute stroke. The main hindrance to final discharge of patients was stroke-related problems. The 2 most important stroke-related problems were poor function and dysphagia.

Key Words: Documentation, Dysphagia, Function, Hinder discharge, Mental score

Introduction

Medical audit is vital to ensure continuous quality assurance and quality improvements. So far, very few stroke audits have been done locally. Therefore, we did a retrospective study to ascertain the adequacy of clinical documentation and the factors hindering early discharge after an acute stroke in a restructured hospital.

Materials and Methods

The medical records of all patients with acute stroke who died or were discharged from a restructured hospital in Singapore in January and February 1999 were reviewed retrospectively. Patients who had old stroke or developed stroke during hospitalization were excluded from the study. Besides demographic data, the presence or

This article was accepted: 30 November 2002

Corresponding Author: Adeline Chuo, Department of Geriatric Medicine, Changi General Hospital, 2, Simei St 3, Singapore 529889

absence of documentation of the following were noted: timing of presentation, level of consciousness, Glasgow Coma Scale (GCS) scores, mental scores, visual problems, speech problems, dysphagia, power, sensation, continence of bladder and bowel, functional ability on admission, presence of depression, usage of radio-imaging, type of stroke, risk factors for stroke and length of stay. Factors hindering the discharge of patients at Day 5, Day 10 of stroke and at final discharge were noted and classified into: stroke-related, complications of stroke, medical-related and social factors.

Timing of presentation was defined as the time of onset of symptom to presentation at the hospital. A variable was considered "documented" if there was evidence indicating that an attempt had been made to do so.

Unpaired t-test was used to compare means. Cross-tabulation was used to determine association between two parameters.

Results

There were 101 patients in the study cohort, 55 males (54.5%) and 46 females (45.5%). Sixty-nine (68.3%) were Chinese, 22 were Malays (21.8%), 6 were Indians (5.9%) and 4 were of other races (4.0%). The mean age was 67.9 years (SD 12.3).

Twenty-four (23.8%), 13 (12.8%), 23 (22.8%) and 41 (40.6%) patients arrived at the hospital within 3 hours, within 6 hours, within 24 hours and after 24 hours of onset of stroke symptoms respectively. Cross tabulating time of presentation (< or > 3 hours) against age (< 60 or \geq 60 years), sex, race and level of consciousness (alert or drowsy) did not reveal any association (chi-square, $p > 0.05$).

Risk factors for stroke were documented in all patients. The frequency of each risk factor is listed

on Table I. The number of risk factors per patient is listed on Table II.

The adequacy of clinical documentation is as charted on Table III.

Computerized tomographic scan (CT scan) of the brain was the preferred choice of radio-imaging in most patients (86.1%). Only 1 patient had magnetic resonance imaging (MRI) alone. Eleven (10.9%) patients had both CT scan and MRI done. Radio-imaging was not done for 2 patients. Twenty-eight (27.7%) patients had radio-imaging done within the same day of admission, 68 (67.3%) patients had it done by the next day whilst 85 (84.2%) patients had it done within 48 hours of admission.

Seventy-four (73.3%) patients suffered a cerebral infarction, 12 (11.9%) had an intracerebral bleed, 1 (1.0%) had both hemorrhage and infarction, 1 (1.0%) had infarct with hemorrhagic conversion, whilst 11 (10.9%) had no infarct or hemorrhage. In 2 (2.0%) patients, the CT scan finding was unknown as it was not done.

The mean length of stay (LOS) was 13.0 (SD 14.2) days. The LOS for male and female patients were 15.6 (SD 15.8) and 9.96 (SD 11.5) days respectively (unpaired t-test, $p < 0.04$). The mean LOS of patients below 60 years and those 60 and above were 9.54 (SD 10.5) and 14.4 (SD 15.3) days respectively (unpaired t-test, $p > 0.05$). The mean LOS of those with and without drowsiness were 18.2 (SD 11.4) and 13.9 (SD 17.0) days respectively (t-test, $p > 0.05$).

Factors hindering the discharge of patients at Day 5, Day 10 and at discharge / death are shown on Table IV. A more specific breakdown of the causes hindering discharge at the time of discharge / death is shown on Table V.

Eight (7.9%) patients died in hospital.

Table I: Risk factors for stroke

Risk Factor	Frequency n=101 (%)
Hypertension	69 (68.3%)
Diabetes Mellitus	52 (51.5%)
Hyperlipidemia	48 (47.5%)
Smoking	26 (25.7%)
History of Stroke	18 (17.8%)
Atrial Fibrillation	11 (10.9%)

Table II: Number of risk factors per patient

Number of risk factors	Frequency (%)
Nil	7 (6.9%)
One	22 (21.8%)
Two	25 (24.8%)
Three	37 (36.6%)
Four	8 (7.9%)
Five	2 (2.0%)

Table III: Adequacy of clinical documentation

Parameters documented	Frequency documented (%)
GCS scores on admission	60 (59.4%)
Premorbid function	66 (65.3%)
Barthel scores	0 (0%)
Mental scores	1 (1.0%)
Presence of depression	0 (0%)
Living arrangement - on admission* / on discharge**	72 (71.3%) / 68 (67.3%)
Functional status - on admission* / on discharge**	38 (37.6%) / 35 (34.6%)
Visual problems - on admission* / on discharge**	10 (10.0%) / 7 (6.9%)
Speech problems - on admission* / on discharge**	81 (80.2%) / 42 (41.6%)
Swallowing problems - on admission* / on discharge**	53 (52.5%) / 40 (39.6%)
Power assessment - on admission* / on discharge**	101 (100%) / 46 (45.5%)
Sensory assessment - on admission* / on discharge**	71 (70.3%) / 19 (18.8%)
Cerebellar assessment - on admission* / on discharge**	74 (73.3%) / 21 (20.8%)
Bladder continence - on admission* / on discharge**	40 (39.6%) / 23 (22.8%)
Bowel continence - on admission* / on discharge**	36 (35.6%) / 21 (20.8%)

* Within 72 hours of admission

** Within 72 hours of discharge

Table IV: Factors hindering discharge on Day 5, Day 10 and at discharge / death

	Factors Hindering Discharge		
	At Day 5 (n=73)	At Day 10 (n=42)	At Discharge /Death (n=101)
Stroke-related	66 (90.4%)	40 (95.2%)	83 (82.1%)
Complications of stroke	13 (17.8%)	5 (4.9%)	11 (10.8%)
Medical-related	19 (26.0%)	8 (19.0%)	18 (17.8%)
Social reasons	0	0	3 (2.9%)

Table V: Specific factors hindering discharge at the time of discharge/death

Factors hindering discharge	Frequency (%)
Stroke-related:	
Poor function (ADL/mobility)	61 (60.3%)
Visual	0
Dysphagia	16 (15.8%)
Speech	0
Surgery	3 (2.9%)
Investigations	13 (12.8%)
Complications of stroke:	
Aspiration pneumonia	8 (7.9%)
Urinary retention / incontinence	0
Urinary tract infection	2 (2.0%)
Constipation / impacted faeces	0
Deep venous thrombosis	0
Bedsore	0
Depression	0
Cognitive impairment	1 (1.0%)
Seizure	0
Medical-related:	
Uncontrolled hypertension	6 (5.9%)
Uncontrolled diabetes	3 (3.0%)
Other medical conditions	9 (8.9%)
Social factors:	
Relatives unwilling to bring home	0
Awaiting nursing home or community hospital	2 (2.0%)
Awaiting maid	1 (1.0%)

Discussion

Documentation was totally deficient with respect to Barthel scores, assessment of mental state and assessment for presence of depression. This may be contributed by multiple factors. There may be a lack of awareness in many doctors of the value of these assessments in the prognostication and rehabilitation of stroke patients. Barthel scores and mental test scores are associated with poor functional outcome and institutionalization^{1, 2}. Depression is closely related to stroke and mood symptoms has been reported to be associated with 12- and 24-month mortality in stroke patients^{3, 4}. Unless the importance of these areas are emphasized, assessment of these areas may be deemed to be too tedious, time-consuming and hence conveniently omitted.

Assessment of visual problems (10%) also fared poorly. Poor results were also obtained by McNaughton et al (33%) in a New Zealand audit⁵ and by Rudd et al (44%) in a British audit⁶. Again, this may be attributed to a general lack of awareness as well as the fact that it is a time-consuming, albeit important, act. Assessment of admission functional status (37.6%), incontinence (39.6%), dysphagia (52.5%) and GCS scores (59.4%) were also inadequate. McNaughton et al reported that level of consciousness was documented in 68% while that for dysphagia was only 2%! Rudd et al reported that there was screening for swallowing disorders in only 55% of patients.

Documentation of basic neurological findings were fairly respectable (more than 70%), with power assessment being the cornerstone (100%) in every case. However, a marked decline in documentation across the board was noted nearer the discharge of patients. Whether this was due to the fact that patients had remained stable, or due to a progressive lack of interest on the doctors' part is debatable.

Davenport, in a study of 244 consecutive stroke patients, concluded that stroke clerking pro forma

improved the completeness of the recording of the assessment of hospitalized stroke patients⁷. Whether a set format of clerking sheets for stroke patients will improve documentation is yet to be confirmed.

Smith et al reported that half of patients with acute stroke arrived within 3 hours of symptom onset⁸. In our study, less than 25% of patients arrived within 3 hours of onset of symptoms. This suggests that most patients arrive too late to receive maximum benefit from emerging stroke therapies. It would be useful if we know the risk factors associated with delayed presentation so that strategies could be targeted on this group. Some characteristics associated with delay in presentation noted by Smith et al included Asian/Pacific Islander ethnicity, dependence in any activities of daily living before stroke and several symptoms at stroke onset. In our study, we could not find any association between delay in presentation with age, sex, race and presence of drowsiness. Another study is required to explore the reasons for delayed presentation.

The top 4 risk factors for stroke were found to be hypertension (68.3%), diabetes mellitus (51.5%), hyperlipidemia (47.5%) and smoking (25.7%). Majority (36.6%) of patients had at least 3 risk factors. All these factors are modifiable. Active diagnoses and treatment of these risk factors in the population are, therefore, urgently required.

A study at a university teaching hospital in Canada reported that 60.4% of patients with acute stroke had CT scan brain done within 24 hours⁹. In our study, 68 (67.3%) patients had radio-imaging done by the next day. This indicates the efficient functioning of the Radiology Department in coping with heavy patient load.

In our study, females had a significantly shorter LOS compared to males. Whether this could be due to females having less severe stroke or lesser co-morbidities could not be ascertained from our study because of small sample size and the fact that Barthel scores were inadequate. Interestingly,

our findings contrasted strongly with other studies which showed that males actually had a shorter LOS. Most studies showed that age worsened functional abilities and was associated with longer LOS^{10, 11, 12}. However, our study did not show an association between LOS and age. This was probably because of the small sample size.

Not surprisingly, the main factor hindering discharge at Day 5, Day 10 and at discharge or death was stroke-related. Poor function (60.3%) and dysphagia (15.8%) were the main stroke-related factors hindering final discharge. This suggests the importance of early and active functional and dysphagia assessment and intervention to promote earlier recovery and therefore earlier discharge from hospital. In a 3-year audit, Collins et al reported that an acute stroke service may reduce mortality and morbidity without increasing the length of stay or disability¹³.

Complications after stroke are common and may hinder discharge. Davenport et al reported complications in 59% after acute stroke and the most common complications were falls, skin breaks, urinary and chest infections¹⁴. In our study, we looked into complications hindering discharge rather than complications per se. We found that complications of stroke had less important role in hindering discharge compared to stroke-related problems. It had more importance in delaying discharge at Day 5 (17.8%) than on Day 10 (4.9%) or at final discharge (10.8%). Aspiration pneumonia (7.9%) and urinary tract infection (2.0%) were the two most common complications of stroke hindering final discharge. This highlights

the importance of early diagnosis and management of dysphagia to reduce risk of aspiration pneumonia and assessing for retention of urine which may predispose to urinary tract infection.

Medical-related problems were important hindrances to discharge on Day 5 (26.0%) and remained significant prior to final discharge (17.8%). Uncontrolled hypertension and diabetes mellitus hindered final discharge in 5.9% and 3.0% patients respectively. Concurrent management of stroke and other active medical problems cannot be overemphasized.

Surprisingly, social factors did not hinder discharge on Day 5 and Day 10, and only affected 2.9% of patients at final discharge.

Conclusion

This audit revealed inadequacy in clinical documentation in patients with acute stroke. The areas particularly deficient were documentation of Barthel scores, presence of depression, mental scores, visual problems, bladder continence, admission functional status and dysphagia. The main hindrance to final discharge of patients was stroke-related problems. The two most important stroke-related problems were poor function and dysphagia. Complications of stroke and medical-related problems also significantly contributed to the delay of discharge. Social factors only played a small role in hindering discharge.

References

1. Woo J, Kay R, Yuen YK, Nicholls MG. Factors influencing long-term survival and disability among three-month stroke survivors. *Neuroepidemiology* 1992; 11: 143-50.
2. Stone SP, Ali B, Auberleek I, Thompsell A, Young A. The Barthel index in clinical practice: use on a rehabilitation ward for elderly people. *J R Coll Physicians Lond* 1994; 28: 419-23.
3. Roa R, Jackson S, Howard R. Depression in older people with mild stroke, carotid stenosis and peripheral vascular disease: a comparison with healthy controls. *Int J Geriatr Psychiatry* 2001; 16: 175-83.
4. House A, Knapp P, Bamford J, Vail A. Mortality at 12 and 24 months after stroke may be associated with depressive symptoms at 1 month. *Stroke* 2001; 32: 696-701.
5. McNaughton H. Stroke audit in a New Zealand hospital. *NZ Med J* 1996; 109: 257-60.
6. Rudd AG et al. The national sentinel audit for stroke: a tool for raising standards of care. *J R Coll Physicians Lond* 1999; 33: 460-4.
7. Davenport RJ, Dennis MS, Warlow CP. Improving the recording of the clinical assessment of stroke patients using a clerking pro forma. *Age Ageing* 1995; 24: 43-8.
8. Smith MA, Doliszny KM, Shahar E, McGovern PG, Arnett DK, Luepker RV. Delayed hospital arrival for acute stroke: the Minnesota Stroke Survey. *Ann Intern Med* 1998; 129: 190-6.
9. McAlister FA, Fisher BW, Houston SC. The timing of computed tomography in acute stroke: a practice audit. *Can Assoc Radiol J* 1997; 48: 123-9.
10. Granger CV, Hamilton BB, Fiedler RC. Discharge outcome after stroke rehabilitation. *Stroke* 1992; 23: 978-82.
11. Jongbloed L. Prediction of function after stroke: a critical review. *Stroke* 1986; 17: 765-76.
12. Mayo NE, Korner-Bitensky, Becker R. Recovery time of independent function post-stroke. *Am J Phys Med Rehabil* 1991; 70: 5-11.
13. Collins D, McConaghy D, McMahan A, Howard d, O'Neill D, McCormack PM. An acute stroke service: potential to improve patient outcome without increasing length of stay. *Ir Med J* 2000; 93: 84-6.
14. Davenport RJ, Dennis MS, Wellwood I, Warlow CP. Complications after acute stroke. *Stroke* 1996; 27: 415-20.