Variables Associated With 7-Day, 30-Day, and 1-Year Fatality After Ischemic Stroke

Gustavo Saposnik, MD, MSc, FAHA; Michael D. Hill, MD, MSc, FRCPC; Martin O'Donnell, MB, MRCPI; Jiming Fang, PhD; Vladimir Hachinski, MD, DSc, FRCPC; Moira K. Kapral, MD, MSc, FRCPC; on behalf of the investigators of the Registry of the Canadian Stroke Network for the Stroke Outcome Research Canada (SORCan) Working Group

Background and Purpose—Seven-day, 30-day, and 1-year case-fatality indicators have been used to compare stroke care among hospitals, provinces, and countries and to implement quality improvement strategies. However, limited information is available concerning variables associated with stroke case fatality at these different points in time. We sought to identify and compare variables associated with 7-day, 30-day, and 1-year stroke fatality.

Methods—This was a cohort study of consecutive patients with acute ischemic stroke admitted to 11 stroke centers in Ontario, Canada, between July 2003 and March 2005 and captured in the Registry of the Canadian Stroke Network (RCSN). The RCSN database was linked to administrative databases to capture all deaths occurring within 7, 30, and 365 days of hospital admission for ischemic stroke. Logistic regression was used to determine variables associated with stroke fatality at each time point. Outcome measures were all-location mortality within 7 days, 30 days, and 1 year of hospital admission.

Results—Our cohort included 3631 patients admitted with ischemic stroke. Seven-day case fatality was 6.9% (249/3631), 30-day case fatality was 12.6% (457/3631), and 1-year case fatality was 23.6% (856/3631). In the multivariable analyses, stroke severity, neurologic deterioration during hospitalization, nonuse of antithrombotics during hospital admission, and lack of assessment by a stroke team were the most consistent predictors of case fatality at 7 days, 30 days, and 1 year after stroke. Physician experience in stroke management was inversely associated with 7-day and 30-day mortality, whereas age, comorbid illness, and pneumonia during hospital admission were associated with 30-day and 1-year mortality.

Conclusions—Stroke severity and certain processes of care were associated with case fatality at 7days, 30 days, and 1 year after stroke. This information may be useful for comparing risk-adjusted case-fatality rates among hospitals and for implementing strategies to improve the processes and quality of care in the acute phase of stroke. **(*Stroke*. 2008;39:000-000.)**

Key Words: stroke ■ mortality ■ health indicators ■ outcome research ■ organized care ■ health policy

Stroke case fatality has been used as a proxy measure of hospital performance and quality of care to compare hospitals, provinces, and countries.[1–3] For example, the 30-day and 1-year case fatality after stroke and myocardial infarction has been used by the Organization for Economic Co-operation and Development to compare outcomes among different countries. In addition, 7-day case fatality was recently implemented as an indicator to measure early stroke mortality, because most important clinical decisions are made in the first week after hospital admission.[2,4]

If case fatality is to be used as a key indicator of hospital performance for stroke care delivery, an understanding of the variables associated with early and late mortality is essential. Previous studies have found that a wide variety of variables may influence stroke outcomes, including individual factors (age, sex, socioeconomic status, stroke severity, and comorbid illness) and health system factors (hospital volume, organized stroke care, and other interventions).[5–7] However, less is known about which factors are associated with early versus late stroke case fatality. Mortality at 7 days after stroke

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From the Stroke Research Unit (G.S.), Division of Neurology, Department of Medicine, Li Ka Shing Knowledge Institute, St. Michael's Hospital, University of Toronto, Toronto; Stroke Unit (M.D.H.), Departments of Clinical Neurosciences, Medicine, and Community Health Sciences, University of Calgary, Calgary; Department of Medicine (M.O.), McMaster University, Hamilton; Institute for Clinical Evaluative Sciences (J.F., M.K.K.), Toronto; Stroke Program (V.H.), Department of Clinical Neurological Sciences, London Health Sciences Center, University of Western Ontario, London; Division of General Internal Medicine and Clinical Epidemiology, Department of Medicine, University Health Network, and University Health Network Women's Health Program (M.K.K.), Toronto; and Department of Health Policy, Management and Evaluation (G.S., M.K.K.), University of Toronto, Toronto, Ontario, Canada.

Correspondence to Dr Gustavo Saposnik, 55 Queen St East, Suite 931, St Michael's Hospital, University of Toronto, Toronto, M5C 1R6 Canada. E-mail saposnikg@smh.toronto.on.ca

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is an easily measurable parameter with high case ascertainment because the hospital length of stay generally exceeds 7 days. This constitutes an advantage when comparing stroke case fatality between different regions, provinces, or countries, particularly when limited follow-up is available after discharge or when death outside the hospital cannot be captured. Our aim was to identify and compare clinical and health system variables associated with 7-day, 30-day, and 1-year stroke case fatality. We hypothesized that (1) variables associated with case fatality at 7 days are similar to those associated with 30-day and 1-year fatality indicators and (2) demographic factors and comorbid conditions are less likely to influence early stroke case fatality.

Patients and Methods

Patients and Data Source: Registry of the Canadian Stroke Network

We identified all patients with ischemic stroke admitted to acute-care hospitals between July 1, 2003, and March 31, 2005 through the Registry of the Canadian Stroke Network (RCSN). Patients with incomplete or missing clinical data, nonstroke diagnoses, hemorrhagic strokes, and transient ischemic attacks were excluded. When a patient had >1 stroke admission during the study period, only the first event was included in this analysis. The RCSN phase 3 collects data on all consecutive patients with acute stroke seen in the Emergency Department or admitted to any of 11 stroke centers in Ontario, Canada. Data are collected through retrospective chart abstraction by trained neurology research nurses. Chart validation studies have shown excellent agreement with the RCSN phase 3 database, with κ scores of >0.8 for key variables (age, sex, stroke type, thrombolysis use, and comorbid conditions). Further details regarding the RCSN have been published elsewhere.[8,9]

Definition of Variables

Patients included in the RCSN were coded as having an ischemic stroke on the basis of their clinical presentation and the results of neuroimaging. Patients without neuroimaging data were excluded from the study. We used the Charlson-Deyo index to quantify patients' comorbidities.[10] This index is a summary score based on the presence or absence of 17 medical conditions. A score of zero indicates that no comorbidities are present, and higher scores indicate a greater burden of comorbidity. On the basis of their Charlson-Deyo index score, patients were categorized as having 0, 1, 2, or 3 or more comorbid illnesses.[6,11] Stroke severity was assessed with the Canadian Neurological Scale (CNS), which is a simple, reliable, and validated scale whereby lower scores indicate greater stroke severity.[12,13] Patients were recorded as "unconscious" when the clinical notes indicated that they were unresponsive or in coma at presentation. Neurologic deterioration was determined by the local attending physician on the basis of a worsening neurologic deficit or deterioration in the level of consciousness from the time of admission. Physiotherapy, occupational therapy, and speech pathology were defined as any assessment by the respective allied health professional during the hospital admission. The number of consultations and time to assessment from stroke onset were not available. A stroke team was defined as a multidisciplinary group of stroke specialists including physicians, nurses, occupational therapists, physiotherapists, and speech language pathologists. Stroke unit care was defined as admission to a stroke unit at any point during the hospitalization.

The RCSN was linked to the Discharge Abstract Database maintained by the Canadian Institute for Health Information (which contains patient-level information on all hospital admissions across Canada) to identify the most responsible physician for each patient. The Discharge Abstract Database was then used to determine the yearly average of stroke patients for whom this physician was considered the most responsible provider in fiscal years 2003/2004 and 2004/2005, and this was used as a proxy of physician clinical experience in stroke management. Use of antithrombotic drugs was defined as exposure to any antiplatelet or anticoagulant agents during hospitalization. Pneumonia was included as a medical complication if it occurred within the first 30 days of the hospital stay and was confirmed on chest x-ray. Length of stay was defined as the number of days in the acute-care facility from admission to discharge or death.

Outcome Measures

Stroke case fatality was chosen as the primary outcome because it is clinically relevant, can be objectively measured, and can be reliably coded. Case fatality was determined from the Ontario Registered Person Database (RPDB), which contains vital statistics and cause of death in the province. This database was developed and is maintained by the Ontario Ministry of Health. The RPDB was used to confirm deaths recorded in the RCSN and to capture out-of-hospital deaths up to 1 year after discharge.

Seven-day, 30-day, and 1-year case fatality was defined as the proportion of strokes for which death (regardless of cause) occurred within 7 days, 30 days, and 1 year of stroke admission, respectively. Several population-based studies and randomized clinical trials have previously used 30-day or 1-year stroke-fatality indicators.[14–21]

Statistical Analysis

χ^2 tests were used to compare categorical variables; Student's *t* tests and median 2-sample tests were used for continuous variables. For the purpose of descriptive analysis, age was categorized as <59, 60 to 79, and >80 years, and stroke severity was categorized a priori as mild (CNS >8) and severe stroke (CNS ≤7) on the basis of previous studies.[22,23] Logistic regression without selection models was developed to determine the relation of age, sex, stroke severity, clinical manifestations, comorbid conditions, major medical complications, place and process of care, most responsible physician (general practitioner/neurologist), and average yearly number of cases per physician with mortality after stroke. Variables were selected on the basis of stepwise regression and comparison of the −2 log likelihoods of the logistic-regression model.

Because our goal was to adjust the multivariable model for known factors associated with stroke fatality, age and baseline stroke severity were included and retained in all models. Other variables were considered for inclusion in the multivariable model if they were significant at the $P<0.20$ level in the univariate analysis. Statistical analysis was performed with a commercially available software package (SAS statistical software, 1999, version 9.1.3; SAS Institute Inc, Cary, NC). All tests were 2 tailed, and probability values <0.05 were considered significant.

Role of the Funding Source

The sponsor of the study had no role in study design, data collection, data analysis, data interpretation, or writing of the report. The investigators had access to the data in the study and had final decision to submit for publication. Approval for the RCSN was obtained from the Research Ethics Board at each participating institution. The current study was approved by the ethics review boards at St. Michael's Hospital, the RCSN publications committee, and the Sunnybrook Hospital Research Ethics Board.

Results

During the study period (July 2003 to March 2005), 3756 patients were admitted with acute ischemic stroke. One hundred twenty-five patients (3%) were excluded from the analysis for not having valid unique identifiers. Therefore, 3631 patients met the inclusion criteria for this study. Baseline characteristics of stroke patients and facilities are presented in Tables 1 and 2. The mean age was 72 years, and 52.2% were men. The median (interquartile range [IQR])

Table 1. Population Characteristics

Characteristics	All N=3631	7-Day Stroke Fatality n=249	30-Day Stroke Fatality n=457	1-Year Stroke Fatality n=856
Demographics				
Age, y, mean±SE	72.0±0.2	75.1±0.9	77.8±0.6	78.0±0.4
Age group				
<59	18	13.6	9.6	7.9
60–79	48.4	41.4	36.5	39.1
>80	33.6	45.0	53.8	53.0
Sex				
Female	47.8	48.2	50.1	53.2
Charlson group				
0–1	65.8	59.0	51.4	49.3
2	16.4	19.7	21.2	20.1
≥3	17.8	21.3	27.4	30.6
Stroke severity				
CNS score				
Median [IQR]	8.5 [6–10.5]	4.5 [3–7]	5 [3–7]	6 [4–9]
CNS >8	55.7	14.5	17.4	28.2
Clinical presentation				
Level of consciousness				
Alert	86.7	46.8	55.7	67.6
Drowsy	10.5	28.6	28.7	22.6
Unconscious	2.8	24.6	15.6	9.9
Dysphagia	11.5	13.3	15.5	16.7
Weakness	82.5	85.1	88.8	88.0
Aphasia	32.9	43.8	45.7	44.2
Visual field defect	18.4	31.5	26.2	23.5
Neglect	19.8	37.5	36.8	31.6
Use of antithrombotic therapy	93.0	59.4	71.3	81.9

Patients were recorded as "unconscious" if they were unresponsive or in coma according to the clinical notes. Numbers in columns indicate percentages, unless otherwise specified. The Charlson index is a summary score based on the presence or absence of 17 medical conditions. A score of 9 indicates that no comorbidities are present, and higher scores indicate a greater burden of comorbidity. Patients were categorized as having 0, 1, 2, or 3 or more comorbidities. The CNS is a validated score to assess stroke severity that ranges from 1.5 (severe) to 11.5 (mild). Clinical presentation includes neurologic findings on admission. The presence of dysphagia could not be determined in 343 (9.4%) patients. Use of antithrombotics includes antiplatelet or anticoagulant therapy.

CNS score was 8.5 (6.0 to 10.5). Overall, 66% of patients were treated in academic facilities. The most responsible provider for 46.6% of hospital admissions was a neurologist. In addition, 41.8% (1518/3631) of patients were admitted to a stroke unit, whereas 6.4% (234/3631) were admitted to an intensive care unit. The median (IQR) hospital stay was 9 (5 to 19) days.

Stroke Case Fatality

Overall, stroke case fatality was 6.9% (249/3631), 12.6% (457/3631), and 23.6% (856/3631) at 7 days, 30 days, and 1 year, respectively. Unadjusted analyses showed that age, stroke severity, level of consciousness on arrival, presence of weakness, dysphagia, neglect, neurologic deterioration, most responsible provider (neurologist vs nonneurologist), admission to a stroke unit, occupational therapy, physiotherapy, and stroke team assessment, use of antithrombotic therapy, and pneumonia were associated with 7-day, 30-day, and 1-year stroke case fatality. There were no significant differences between academic and nonacademic stroke centers (Table 3).

Table 2. Facility and Physician Characteristics

Characteristic	All N=3631	7-Day Case Fatality n=249	30-Day Case Fatality n=457	1-Year Case Fatality n=856
Facility type				
Academic	66.2	61.8	64.1	63.9
Place of admission				
ICU	6.4	24.9	18.2	12.9
Internal medicine ward	25.9	18.1	26.0	26.8
Neuro-ICU	2.3	6.4	4.6	3.6
Neurology	15.2	8.4	9.2	11.2
Step down	4.5	3.6	3.5	4.1
Stroke unit	41.8	30.5	32.8	36.6
Other	3.8	8.0	5.7	4.9
Most responsible physician				
General practice	12.1	6.4	9.4	12.9
Internal medicine	38.4	34.9	41.4	42.2
Neurology	46.6	51.4	44.2	41.2
Neurosurgery	0.9	2.0	1.1	1.1
Other	1.9	5.2	3.9	2.7
Rehabilitation assessment				
Occupational therapy	77.8	23.0	42.8	63.6
Physiotherapy	82.5	31.9	53.1	70.6
Speech therapy	57.9	21.8	41.7	55.4

ICU indicates intensive care unit. Numbers in columns indicate percentages, unless otherwise specified Information on occupational therapy, physiotherapy, and speech therapy was unavailable in 7 patients. Therefore, denominators for 7-day, 30-day, and 1-year stroke fatality are 248, 456, and 854, respectively.

After adjustment, stroke severity, neurologic deterioration, lack of antiplatelet use, and lack of stroke team assessment were common factors associated with stroke case fatality at 7 days, 30 days, and 1 year. Lower physician experience in stroke management was associated with higher case fatality at 7 and 30 days, whereas patient age, number of comorbid conditions, and in-hospital pneumonia were associated with 30-day and 1-year case fatality (Table 4). Because neurologic deterioration during the hospital course was a powerful determinant of death, we repeated our analyses and found that results were similar whether or not this variable was excluded from the model (supplemental Table I, available online at http://stroke.ahajournals.org). The addition of a quadratic term for age into the models did not lead to any significant differences in the odds ratios or 95% CIs of the other variables included in the models. Risk-adjusted case fatality stratified by stroke severity is shown in the Figure.

Table 3. Variables Associated With 7-Day, 30-Day, and 1-Year Stroke Fatality

Variables	7-Day Stroke Fatality OR (95% CI)	30-Day Stroke Fatality OR (95% CI)	1-Year Stroke Fatality OR (95% CI)
Demographic			
Age	1.02 (1.01–1.03)	1.04 (1.03–1.05)	1.05 (1.05–1.06)
Age group			
<59	1.0	1.0	1.0
60–79	1.14 (0.77–1.70)	1.46 (1.03–2.06)	2.03 (1.54–2.68)
>80	1.85 (1.24–2.75)	3.51 (2.51–4.92)	5.10 (3.87–6.73)
Sex, female	1.02 (0.79–1.32)	1.11 (0.92–1.35)	1.33 (1.14–1.55)
Charlson index	1.05 (0.99–1.12)	1.15 (1.10–1.20)	1.25 (1.20–1.30)
Charlson=0–1	1.0	1.0	1.0
Charlson=2	1.36 (0.97–1.91)	1.77 (1.38–2.30)	1.89 (1.53–2.31)
Charlson≥3	1.36 (0.98–1.89)	2.20 (1.73–2.79)	3.18 (2.63–3.84)
Clinical presentation			
Level of consciousness, alert	1.0	1.0	1.0
Drowsy	6.01 (4.30–8.27)	6.00 (4.70–7.69)	4.58 (3.68–5.72)
Unconscious	39.8 (25.6–61.8)	26.9 (17.2–42.1)	22.1 (13.0–37.4)
Dysphagia	1.85 (1.24–2.75)	2.06 (1.55–2.74)	2.25 (1.80–2.81)
Weakness	2.47 (1.49–4.08)	3.40 (2.25–5.15)	2.39 (1.83–3.11)
Neglect	4.61 (3.35–6.34)	4.29 (3.39–5.46)	3.21 (2.65–3.88)
Stroke severity (CNS score)	0.69 (0.65–0.73)	0.69 (0.66–0.72)	0.75 (0.72–0.77)
Neurologic deterioration	14.1 (11.1–19.2)	16.7 (13.4–20.8)	7.8 (6.5–9.5)
Setting			
Nonacademic vs academic institution	1.23 (0.94–1.60)	1.11 (0.91–1.36)	1.14 (0.97–1.34)
Physician experience (cases per year), every 10-case increase	0.94 (0.90–0.97)	0.95 (0.93–0.98)	0.98 (0.97–1.00)
Consults			
Stroke team	0.38 (0.29–0.50)	0.52 (0.43–0.63)	0.70 (0.60–0.82)
Occupational therapy	0.07 (0.05–0.09)	0.15 (0.13–0.19)	0.38 (0.32–0.45)
Physiotherapy	0.08 (0.06–0.10)	0.17 (0.14–0.21)	0.39 (0.32–0.46)
Speech therapy	0.18 (0.13–0.25)	0.47 (0.39–0.57)	0.87 (0.75–1.02)
Place of admission			
ICU vs stroke unit	6.84 (4.72–9.91)	5.01 (3.74–6.88)	3.42 (2.57–4.54)
Medical ward vs stroke unit	0.95 (0.65–1.39)	1.32 (1.02–1.70)	1.24 (1.02–1.50)
Neurosurgery ward vs stroke unit	4.40 (2.43–7.94)	2.99 (1.78–5.04)	2.20 (1.40–3.50)
Neurology ward vs stroke unit	0.75 (0.46–1.23)	0.75 (0.53–1.07)	0.81 (0.63–1.04)
Other vs stroke unit	3.22 (1.90–5.44)	2.11 (1.33–3.35)	1.68 (1.15–2.47)
Step down vs stroke unit	1.12 (0.55–2.72)	0.99 (0.58–1.72)	1.06 (0.71–1.57)
Medical complications			
Pneumonia	3.27 (2.86–4.70)	5.18 (3.91–6.87)	5.70 (3.34–7.48)
Pulmonary embolism	1.57 (0.47–5.23)	1.82 (0.74–4.50)	2.30 (1.01–4.86)
Glucose on admission per mmol/L	1.06 (1.03–1.09)	1.04 (1.02–1.07)	1.04 (1.02–1.07)
Use of antithrombotic therapy	0.07 (0.05–0.09)	0.10 (0.08–0.13)	0.17 (0.13–0.22)

References:

OR indicates odds ratio. The Charlson index is a summary score based on the presence or absence of 17 medical conditions. A score of 0 indicates that no comorbidities are present, and higher scores indicate a greater burden of comorbidity. Patients were categorized as having 0, 1, 2, or 3 or more comorbidities. The CNS is a validated score to assess stroke severity that range from 1.5 (severe) to 11.5 (mild). Clinical presentation includes neurologic findings on admission. Patients were recorded as "unconscious" if they were unresponsive or in coma according to the clinical notes. The presence of dysphagia could not be determined in 344 (9.3%) patients. Use of antithrombotics includes either antiplatelet or anticoagulant therapy.

Table 4. Multivariable Analysis for 7-Day, 30-Day, and 1-Year Stroke Case Fatality

	7-Day Case Fatality		30-Day Case Fatality		1-Year Case Fatality	
Variables	OR	95% CI	OR	95% CI	OR	95% CI
Stroke severity (mild)	0.78	0.71–0.85	0.76	0.71–0.81	0.80	0.77–0.84
Neurologic deterioration	13.3	8.77–20.09	14.29	10.44–19.57	5.44	4.21–7.03
Physician experience (stroke cases per year)	0.94	0.88–0.99	0.95	0.91–0.99	0.99	0.97–1.02
Stroke team	0.40	0.26–0.63	0.54	0.38–0.76	0.78	0.68–1.00
Use of antithrombotic therapy	0.12	0.07–0.19	0.13	0.08–0.21	0.29	0.20–0.43
Age, y	1.01	0.99–1.03	1.04	1.03–1.06	1.05	1.04–1.06
Charlson index=0–1 (reference)	1.0	...	1.0	...	1.0	...
Charlson index=2	1.05	0.62–1.78	1.52	1.02–2.27	1.74	1.31–2.30
Charlson index≥3	1.00	0.59–1.68	1.73	1.19–2.51	2.96	2.29–3.84
Pneumonia	1.53	0.88–2.66	1.91	1.23–2.95	2.21	1.53–3.19

OR indicates odds ratio.

Discussion

Our study shows that initial stroke severity, neurologic deterioration after admission, assessment by a stroke team, and lack of use of antithrombotics are all associated with stroke case fatality at 7 days, 30 days, and 1 year. Physician experience was associated with 7-day and 30-day case fatality, whereas age, comorbid conditions, and pneumonia were associated with 30-day and 1-year case fatality.

The finding that early (7-day) case fatality was related to neurologic death (rather than death due to complications or other medical conditions) and was therefore primarily influenced by factors such as initial stroke severity and early neurologic deterioration is consistent with other studies.[5,24] However, in contrast to previous studies, we did not find that age or sex was associated with early death after stroke. This may be because some previous studies were unable to account for stroke severity in their analyses.[25–28] It is possible that variables such as stroke severity and neurologic deterioration are stronger predictors of short- and long-term case fatality, thereby diminishing the effect of age and sex in multivariable analyses.[5,27,29,30]

We found an inverse association between physician experience in stroke management and early mortality. In a study of >44 000 Medicare beneficiaries >65 years of age in 11 US metropolitan regions, the authors found a lower 30-day stroke-fatality for patients cared for by neurologists versus generalists (hazard ratio=0.90; 95% CI, 0.82 to 0.998) after adjusting for covariables.[16] Similar findings were reported in another study including >10 000 Emergency Department admissions for ischemic stroke to academic centers in the United States (adjusted odds ratio=0.49; 95% CI, 0.35 to 0.68).[31] Other authors have reported better outcomes, lower mortality, and lower length of stay when stroke care was provided by a specialist (neurologist or vascular neurologist).[32,33] Nevertheless, the impact of physicians' experience on stroke case fatality is not usually captured in clinical databases, as reflected by the limited number of studies reporting this variable. Our study found that physician experience rather than physician specialty (neurologist vs nonneurologist) was associated with mortality after stroke.

Interestingly, we found a significant reduction in mortality with antithrombotic use during hospitalization. This finding is consistent with the modest but significant reduction in death and disability shown in 2 randomized clinical trials (IST and CAST) when treatment with aspirin was initiated within 48 hours of stroke onset. However, the magnitude of the effect in our study was higher than reported in those clinical trials, suggesting the possibility of confounding factors.[34,35] For example, it is likely that those patients who did not receive antithrombotic therapy were those with contraindications to therapy (such as active bleeding) or those with such severe strokes that they were treated with supportive rather than

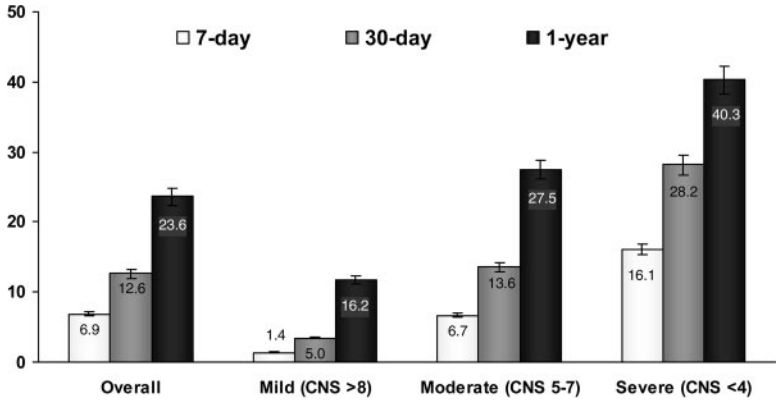

Figure. Risk-adjusted case fatality by stroke severity. Case fatality stratified by stroke severity adjusted for age, sex, and Charlson index. Bars represent the 95% CI.

active clinical care, both factors that would be associated with a higher case fatality in this group of patients.

To our knowledge, this is the first study to show that many of the factors associated with 7-day stroke case fatality are also associated with 1-year stroke case fatality. This suggests that the more easily measurable 7-day mortality may be a suitable indicator for measuring stroke outcomes. The understanding of variables associated with early mortality may permit organizations to use the 7-day stroke case fatality indicator as a proxy measure for more efficient evaluation of potentially modifiable processes of care.

There are some limitations of our study that deserve comment. First, our study included patients admitted to specialized stroke centers, and the results are not necessarily generalizable to those treated in other facilities. However, the RCSN attempts to include all consecutive patients with acute stroke at all participating hospitals to reduce any selection bias. It contains detailed patient-level information, including demographic, clinical, and interventional data, not otherwise available in larger administrative databases. Second, our study did not capture deaths that occurred before admission. Third, the association between mortality and interventions such as occupational therapy, physiotherapy, stroke unit care, and antithrombotic therapy may be confounded and reflect the fact that patients with very severe strokes may die before there is an opportunity to receive such interventions, or they may not be offered these interventions because the severity of the stroke (or the presence of serious comorbid illness) makes a palliative approach most appropriate. Thus, the absence of certain interventions may be a marker for more severe strokes rather than a causal factor in death after stroke. Fourth, variables not included in our analyses (eg, transfers between physicians, time of physical/occupational therapy assessment, other hospital resources) may have influenced the association between "physician experience in stroke management" and case fatality. Despite these limitations, this large study provides novel information on similarities between variables associated with case fatality at different points in times.

In summary, the understanding of factors affecting case fatality may provide a rationale for a more systematic use of the 7-day indicator for comparing risk-adjusted case fatality across hospitals and for developing strategies to improve the processes and quality of care in the acute phase of stroke.

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Disclosures

None.

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Table I. Multivariable Analysis for 7-Day, 30-Day, and 1-Year Stroke Case Fatality, Excluding Neurologic Deterioration

	7-Day Mortality		30-Day Mortality		1-Year Mortality	
Variables	OR	95% CI	OR	95% CI	OR	95% CI
Stroke severity (mild)	0.75	0.69–0.81	0.75	0.71–0.79	0.79	0.76–0.82
Physician experience (stroke cases assisted per year)	0.94	0.89–0.99	0.96	0.92–0.99	0.99	0.97–1.02
Stroke team	0.57	0.38–0.85	0.70	0.52–0.96	0.84	0.66–1.06
Use of antithrombotic therapy	0.08	0.05–0.13	0.10	0.07–0.15	0.21	0.15–0.31
Glucose on admission	1.07	1.02–1.12	1.04	1.00–1.08	1.03	0.99–1.06
Pneumonia	2.46	1.48–4.09	3.17	2.17–4.67	3.09	2.18–4.38
Age, y	1.01	0.99–1.02	1.04	1.03–1.05	1.05	1.04–1.06
Charlson index=0–1 (reference)	1.0	...	1.0	...	1.0	...
Charlson inde =2	1.19	0.74–1.94	1.55	1.09–2.20	1.73	1.32–2.26
Charlson index ≥3	0.84	0.52–1.37	1.44	1.03–2.02	2.66	2.07–3.41

References:

OR indicates odds ratio. The Charlson index is a summary score based on the presence or absence of 17 medical conditions. A score of 0 indicates that no comorbidities are present, and higher scores indicate a greater burden of comorbidity. Patients were categorized as having 0–1, 2, or 3 or more comorbidities. Stroke severity was categorized a priori as mild (CNS >8) and severe (CNS ≤7) on the basis of previous studies.[20,21] Use of antithrombotics includes antiplatelet or anticoagulant therapy. Multivariable analyses for 7-day, 30-day, and 1-year case fatality were adjusted for age, sex, level of consciousness, stroke severity, glucose level on admission, most responsible provider, Charlson index, pneumonia, pulmonary embolism, and antithrombotic use.