欧米のデータではtPAを行っている方が再開率は高い。ただしtPA投与群で死亡率がやや高い（15.2% v.s. 7.5%）

昨年夏に薬事承認されたPenumbraは頭蓋内出血がMerciより少ない(Pivotal study)。今後の課題としては、治療施行者の育成と分布の適正化。Merciシステムの地域分布などは把握されていない。施設経験別に予後を比較すると、多く行っている施設ほど予後が良い傾向がある。Solitaireなど次世代デバイスによる治療効果向上も見込める。

話が変わるが、外科医の限界のパターンにはいくつかあり、A. 身体的限界　B. 精神的限界　C. 治療機会の剥奪　　D. 治療しなくてもよい（委譲）があるが、一番問題なのは、40~45歳の早期定年（みずから開業する）ではないかと考える。自主退職の理由は必ずしもburnoutではないのではないか。

⑥　（松田晋哉）

今回は熊本のデータを示す。2次医療圏を示す。修正ハフモデルにより各病院の診療圏域をグリッド毎に求めた。ハフモデルとは、デパートで消費者が買い物をする確率（集客能力）は、売り場面積に比例し、到達距離の2乗に反比例するという仮説である。

診療実績との比較、実際に来た患者さんの地区と数をプロットして、gapを調べている。熊本ではハフモデルから予測される圏域と、実際の分布がほぼ合致していると考えられた。

まとめ：DPCデータの活用により、脳血管障害の救急入院に関するaccessibilityの数量化・可視化が可能となった。推定と実際のgapを数量化することで脳卒中センターの計画的配置の議論が可能になると考えられる。

⑦　（永田 泉）

まず治療機会の均等が達成できていないのが長崎の現状。昼間はみんなとりたがるが、夜間週末はpayしないので大学にという流れがある。そういうわけで24時間の脳卒中診療についてはどこもやりたがらないので、長崎大学にSCUを作った。設立にあたり苦労した点は、①3：1看護（看護師の確保が問題であった）、②24時間のMRI稼働、③リハビリ常駐（大学では雇用枠を簡単に増やせないので専属スタッフの確保が大変であった）。

SCU設立により、脳梗塞の診療数が徐々に増えた。SCUでは急性期脳卒中に特化しないといけない（8割以上）が、ICUを術後管理に使い、救命救急センターを外傷に特化することで、これを達成している。ICUや救命センターとの役割分担が重要と考えている。SCU常駐は1人いればよいが、実際には1人では足りないので、基本2人常駐するようにしている。脳外科から2人とも出すことが多く、ときに救命センターの当直にも脳外科のDoctorが入ることがあるので、日によっては3人出すことになり、正直きついのが現状。

そこに初期臨床研修制度で2年間脳外科医の育成が遅れ、地方大学にとっては実質の人員減となっていて、追い打ちをかけている。今後検討していただきたいところである。

連携パスの17日以内の制限などもネックになっている。緊急入院についてもある程度のコントロールが可能な都市部とは違い、地方では重症が続くと平均在院日数の調節などは難しいというところがあることを分っていただきたい。

IV. ナショナルレセプトデータベース(NDB)について（松田晋哉）

厚労省保健局総務課が法に基づき、全保険者、生活保護のレセプト、特定健診データを匿名化後に収集したデータベースである。患者連結が可能な匿名化がなされている。実際にはデータベースの体はなしておらず、レセプトのアーカイブである。また収集段階で匿名化され、一部削除される。提供段階で再匿名化する。NDB は都道府県の医療行政にも公開が始まったということで今関心を集めている。

レセプトとは、医療機関が提出する、医療行為に対する支払いの請求書である。医療機関が審査機関にレセプトを出したのちに、査定が行われるが、査定が終わるのを待つと 1 年かかるので、1 次審査を経た時点のレセプトデータが NDB に送られる。医療費の分析ではなく、医療行為の分析なので、1 次審査後の（査定前の）データでよいと考えている。

医療内容が詳細にわかるが、未コード化病名は NDB では文字列が削除されている。また、不必要な保険病名が大量についているという問題がある。たとえば終了した病名が整理されていない、病名開始日が不適切、主傷病フラグが適切に運用されていないなど、疑い病名を適切に処理する必要がある。肝がんの疑いや胃がんの疑いは検査の際によく用いられる。

NDB 匿名化原則について。二次医療圏単位の分析の場合、レセプト数が 10 未満はすべて空白にせよ、医療機関数が 3 未満はすべて空白にせよという原則がある。これらは診療情報の特定が行われないことを保証するためのルールである。

レセプト電子化の推移について。医科は 99.7%とかなり進んでいる一方、歯科はカルテの電子化はすすんでいるものの、電子レセプト化はまだ 3 割に達していない（増加傾向ではある）。

「NDB を用いた医療計画策定のための基盤資料の作成に関する研究」について。NDB からデータを抜き出すときに再匿名化が行われ、北大病院でデータベース化してもらい、自治医大で分析した。福岡県における脳梗塞患者の受療圏について、どこに住んでいる人がどこの病院にかかるかがわかる。急性期病院、回復期病院、療養病床のそれぞれについてみることで、バランスの偏りが分かる（例：飯塚病院には回復期病院が欠けている）。また、地域連携に関する管理料、指導料、在宅療養に関する指導料のレセプト出現率をみることで、地域連携や在宅医療に関する指標として利用できる。tPA の実施率も同様に求まる。

また、年齢調整標準化レセプト出現比（SCR）を調査した。年齢階級を 5 歳刻みとし、100 を全国平均としている。この概念により、都道府県間で前述の指標を比較できる。北海道で地域連携の項目の出現が少なく、北海道は急性期から慢性期まで同じ病院で医療が完結する傾向があるということを反映していると思われる。

まずは政策に反映させるという公共的利益のために利用したいと考えている。

まとめ：NDB を用いて医療の現状を可視化することができる。出来高情報なので治療に関する詳細な情報が入っており、日付も入っている。疫学的な研究の資源としては非常に重要なものである。個人情報保護に関する体制は現在検討中であり、広くデータが活用できるようになるためにはまだ時間がかかる。データ使用のためには保健局に研究計画を提出し、有識者会議での審査が必要。データ切り出しに多大な労力が必要となるので、今のところ提供は年に数回程度。これにかかわる厚

労省の人的負担は相当なもので、西と東にデータベースの拠点をおいて、それぞれに、専門的な管理者をおいて行う方が良い、と考えている。

V. 平成24年度の研究計画および論文化について

データが出そろってきており、基本的な骨格がまとまってきたので、今年度は論文化に集中したいと考えている。

配布資料に記載の通り、Study design, Burnout, 院内死亡率の予測についてはすでに論文作成中である。Weekendについても結果がそろったので作成する予定。コイルのデータから動脈瘤の径を推定するというプロジェクトについては単一施設（国循）ではまとまっているので、J-ASPECTの退院患者調査に協力していただいた病院のなかで、塞栓に用いたコイルの詳細が記載されていた病院を中心に、多施設研究（破裂動脈瘤の病名で使用コイルから破裂動脈瘤径を推定する）を予定している。

DPCレセプト情報の提供に関して、今年度も同様の調査を行う予定である。本年度は脳梗塞、脳出血、くも膜下出血に加えて、一過性脳虚血発作ともやもや病を加えたいと考えている。

レセプト情報のデータのvalidationと、リスク分析の目的をかねて、GCSやNIHSSスコアといった、レセプトに入っていない最低限の必要項目について、班員施設を中心に調査したいと考えている。まずはレポートカードの案を作成し、試行していただいて、なるべく負担をかけない形で運用できればと考えている。

たくさんの分担研究者の先生方から、地域ごとの現状に関する貴重な発表をいただいたが、これらの内容に関しても、当データベースを利用しつつ論文化していただきたいと考えています。解析に関してもお手伝いさせていただきたいと考えていますので、適宜ご相談ください。

本日はありがとうございました。

週末、時間外と包括的脳卒中センターにおける予後との関係

西村　邦宏、中井陸運、嘉田晃子、
飯原弘二

Weekends: A Dangerous Time for Having a Stroke?

Gustavo Saposnik, MD, MSc; Akerke Baibergenova, MD, MPH; Neville Bayer, MD, FRCPC; Vladimir Hachinski, MD, DSc, FRCPC

Background and Purpose—Weekend admissions are associated with higher in-hospital mortality. However, limited information is available concerning the "weekend effect" on stroke mortality. Our aim was to evaluate the impact of weekend admissions on stroke mortality in different settings.

Methods—We analyzed all hospital admissions for ischemic stroke from April 2003 to March 2004 through the Hospital Morbidity Database. The Hospital Morbidity Database is a national database that contains patient-level sociodemographic, diagnostic, procedural, and administrative information including all acute care facilities across Canada. The major inclusion criterion was admission to an acute care facility with a principal diagnosis of ischemic stroke. Clinical variables and facility characteristics were included in the analysis.

Results—Overall, 26 676 patients were admitted to 606 hospitals for ischemic stroke. Weekend admissions comprised 6629 (24.8%) of all admissions. Seven-day stroke mortality was 7.6%. Weekend admissions were associated with a higher stroke mortality than weekday admissions (8.5% vs 7.4%; odds ratio, 1.17; 95% CI, 1.06 to 1.29). Mortality was similarly affected among patients admitted to rural versus urban hospitals or when the most responsible physician was a general practitioner versus specialist. In the multivariable analysis, weekend admissions were associated with higher early mortality (odds ratio, 1.14; 95% CI, 1.02 to 1.26) after adjusting for age, sex, comorbidities, and medical complications.

Conclusions—Stroke patients admitted on weekends had a higher risk-adjusted mortality than did patients admitted on weekdays. Disparities in resources, expertise, and healthcare providers working during weekends may explain the observed differences in weekend mortality. (***Stroke.*** **2007;38:1211-1215.)**

TABLE 2. Outcome Measures and Weekend Effect

Outcomes	Weekday Admissions, n=20 047 (%)	Weekend Admissions, n=6629 (%)	Weekend Effect OR (95% CI)
Discharge to place of residence	9777 (48.7)	2972 (44.8)	0.85 (0.80–0.90)
Mortality at 7 days	1476 (7.4)	563 (8.5)	1.17 (1.06–1.29)
Mortality at discharge	3077 (15.3)	1088 (16.4)	1.08 (1.004–1.17)

- Weekend admission　は一週間以内の死亡率で1.17倍（多変量調整後は1.14倍）

施設の要因

TABLE 3. Weekend Effect for Early Stroke Mortality by Facility Characteristics

Variables	Admissions	Mortality, n (%) Weekday Admissions	Weekend Admissions	Weekend Effect OR (95% CI)
Facility type				
Nonteaching	21 497 (80.6)	1731 (7.6)	464 (8.7)	1.15 (1.03–1.29)
Teaching	5179 (19.4)	345 (6.3)	99 (7.7)	1.24 (0.98–1.6)
Hospital location				
Rural	6347 (10.6)	363 (7.5)	141 (9.3)	1.26 (1.02–1.54)
Urban	20 329 (89.5)	1713 (7.3)	422 (8.3)	1.14 (1.02–1.28)
Most responsible provider				
General practitioner	4511 (16.9)	236 (6.5)	34 (8.6)	1.27 (1.03–1.53)
Specialist	22 165 (83.1)	1248 (7.5)	469 (8.5)	1.14 (1.02–1.28)
Admission to ICU				
Yes	3004 (12.4)	337 (13.4)	149 (19)	1.52 (1.23–1.88)
No	23 372 (87.6)	1139 (6.5)	414 (7.1)	1.10 (0.98–1.23)

- Urban　vs rural
- Teaching　vs　Non－Teaching
- 専門医　vs　一般内科医
- などで週末効果に差が

その他

- 日本—In a total of 1,134 patients, Cox proportional hazards regression analyses demonstrated that the weekday admission was significantly associated with mRS01 at discharge (hazard ratio, HR: 1.385, 95% CI: 1.087-1.764) and case fatality (HR: 0.477, 95% CI: 0.285-0.798 （Cerebrovasc Dis. 2005;20(5):325-31.)
- 台湾—weekday admissions were associated with decreased 30-day mortality, after adjusting for patient gender and age, comorbidities, surgery, physician age and specialty, hospital ownership, accreditation level, teaching status, geographic location, regional resources, and competition. Med Care. 2009;47:1018 –1025.
- GTW- (among 187 669), Off-hour presentation was associated with an increased risk of dying in-hospital, although the absoluteeffect was small for ischemic stroke admissions (0.6% difference; number needed to harm　166) and moderate forhemorrhagic stroke (3.1% difference; number needed to harm 32). (Stroke. 2009;40:569-576.)
- There were 599 087 emergency room admissions for ischemic stroke: 159 906 weekend admissions and 439 181weekday admissions.　There was no difference in in-hospital mortality or discharge disposition(Stroke. 2010;41:2323-2328.)

Stroke Care Unitの場合の時間内と時間外の差（t-PA）

Impact of Hospital Admission During Nonworking Hours on Patient Outcomes After Thrombolysis for Stroke

Karl Georg Haeusler, MD; Lea M. Gerlicher, Bijan Yatsushah, MD; Heinrich J. Audebert, MD; Christian H. Nolte, MD

Background and Purpose—Whether the time of hospital admission is relevant for short-term outcome after stroke is under debate and may depend on care facilities.

Methods—We retrospectively analyzed medical records from patients who received thrombolytic therapy within 4.5 hours of stroke onset in a stroke unit of the Charité–University Hospital Berlin (Charité; n=2981) or within the stroke telemedicine (TEMPiS) network, comprising 12 community hospitals with telestroke units in Bavaria (n=428).

Results—Thrombolytic therapy was administered during nonworking hours in 39.5% (Charité) and 35.0% (TEMPiS) of patients. A trend toward a lower rate of symptomatic intracranial hemorrhage (3.4% versus 6.2%; P=0.027), clinical worsening (14.9% versus 19.7%, P=0.039), and 7-day mortality (3.4% versus 8.7%; P<0.001) after admission during nonworking hours was seen at Charité. However, multivariable analysis did not show a significant impact of the time of admission on clinical worsening, symptomatic intracranial hemorrhage, or 7-day mortality in both cohorts. Thrombolysis based on brain computed tomographic instead of magnetic resonance imaging (odds ratio=4.98; 95% CI, 1.09 to 22.73) and more severe National Institutes of Health Stroke Scale score on admission (odds ratio=1.13 per point; 95% CI, 1.07 to 1.21) were associated with 7-day mortality at Charité. National Institutes of Health Stroke Scale score on admission (odds ratio=1.13 per point; 95% CI, 1.06 to 1.19) and older age (odds ratio=1.05 per year; 95% CI, 1.004 to 1.09) were correlated with 7-day mortality in TEMPiS. National Institutes of Health Stroke Scale on admission was the only independent predictor of symptomatic intracranial hemorrhage or clinical worsening in both cohorts.

Conclusions—The majority of stroke patients received thrombolysis during nonworking hours. The time of hospital admission did not significantly influence the short-term outcome after thrombolysis. (***Stroke.*** **2011;42:2753-2758.)**

Key Words: thrombolysis ■ ischemic stroke ■ working hours ■ nonworking hours ■ 7-day mortality ■ clinical worsening ■ level of medical care

Table 1. Characteristics of Stroke Patients Receiving Thrombolysis at the Charité

	During Working Hours, n = 318	During Nonworking Hours, n = 373	P
Baseline characteristics and past medical history			
Female sex, n (%)	62 (52.5)	87 (50.3)	0.71
Age, mean (SD) (range), y	73.5 (12.8) [26–96]	73.9 (13.5) [32–102]	0.38
Age >=80 y, n (%)	36 (30.5)	62 (35.8)	0.32
Arterial hypertension, n (%)	100 (84.7)	147 (85.0)	0.99
Diabetes mellitus, n (%)	27 (22.9)	49 (28.3)	0.26
Hypercholesterolemia, n (%)	49 (41.5)	70 (40.5)	0.73
Atrial fibrillation, n (%)	49 (36.4)	73 (42.2)	0.31
Coronary artery disease, n (%)	14 (11.9)	38 (22.0)	0.027
Ischemic stroke or TIA, n (%)	23 (19.5)	29 (16.8)	0.56
Characteristics of stroke and thrombolysis			
NIHSS score, mean (SD) [range]	10.6 (6.7) [1–25]	12.0 (7.4) [2–36]	0.24
mRS on admission, mean (SD)	3.6 (1.2)	3.9 (1.2)	0.32
Blood glucose, mean (SD), mg/dL	130 (57)	125 (52)	0.59
CRP, mean (SD), mg/dL	3.2 (2.3)	4.2 (2.8)	0.65
Onset-to-needle time, mean (SD), min	129 (46)	138 (50)	0.21
MRI-based thrombolysis, n (%)	94 (79.7)	31 (17.9)	<0.0001
Outcome			
sICH, n (%)	6 (5.1)	15 (9.2)	0.083
Clinical worsening, n (%)	14 (11.9)	34 (19.7)	0.079
Death at d 7, n (%)	4 (3.4)	15 (8.7)	0.073
Hospital stay, mean (SD), d	8.3 (4.4)	7.9 (4.1)	0.70

TIA indicates transient ischemic attack; NIHSS, National Institutes of Health Stroke Scale; mRS, modified Rankin Scale score; CRP, C-reactive protein; MRI, magnetic resonance imaging; sICH, symptomatic intracranial hemorrhage.

- t-PA後の7日以内死亡、症状を有するICH、臨床的悪化に関しては時間内であれば減少の傾向だが有意差なし

時間内と時間外の影響

Table 3. Multivariable Analysis for 7-Day Mortality, Symptomatic Intracranial Hemorrhage (sICH), or Any Clinical Worsening After Thrombolysis for Charité (n=291) and TEMPiS (n=616) Patients

	Mortality at ≤7 Days, OR (95% CI)		sICH, OR (95% CI)		Any Clinical Worsening, OR (95% CI)	
	Charité	TEMPiS	Charité	TEMPiS	Charité	TEMPiS
Female sex	0.62 (0.22–1.72)	1.19 (0.55–2.56)	0.55 (0.23–1.43)	0.86 (0.43–1.72)	1.31 (0.66–2.60)	0.83 (0.52–1.32)
Age, per y	1.21 (0.82–1.26)	1.03 (1.004–1.059)	1.06 (0.96–1.04)	1.02 (0.99–1.06)	1.01 (0.98–1.04)	1.02 (0.99–1.04)
NIHSS score, per point	1.15 (1.02–1.24)	1.13 (1.06–1.19)	1.07 (1.01–1.14)	1.07 (1.01–1.13)	1.10 (1.05–1.14)	1.05 (1.00–1.09)
Admission during working h	0.89 (0.22–3.53)	1.30 (0.73–2.47)	0.39 (0.12–1.13)	1.01 (0.48–2.08)	0.63 (0.31–1.25)	1.32 (0.85–1.98)
Coronary artery disease	1.32 (0.37–4.70)	*	0.38 (0.08–1.74)	*	0.76 (0.31–1.84)	*
MRI-based thrombolysis	0.20 (0.04–0.92)	*	0.92 (0.22–2.99)	*	0.96 (0.40–2.22)	*

OR indicates odds ratio; NIHSS, National Institutes of Health Stroke Scale; MRI, magnetic resonance imaging; CI, confidence interval; sICH, symptomatic intracranial hemorrhage.
*Not available.

- t-pa後の7日以内死亡、症状を有するICH、臨床的悪化には影響しない
- しかし少数サンプルのため有意差がない可能性あり一傾向はすべて時間内が減少の方向

J-ASPECTにおける研究計画

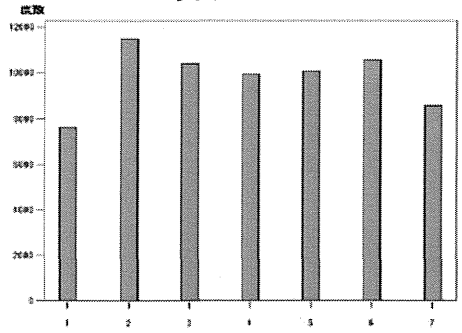
- 検討課題

1.週末における入院と平日の入院での総死亡率、7日以内死亡に差があるか否か
2.平日の場合も時間外と時間外の差があるか
3.包括的脳卒中センターの基準を満たす施設は死亡率に差がない（施設基準各各項目ごとの検討含む）
4．病型別、血管内治療、t-PAなどのサブ解析

進捗状況

- DPC個人データと施設調査の結果によるCSC scoreの突合終了
- 日付から、週末、平日に関するデータ作成終了
- 平日の時間内、時間外に関する情報をもとデータから抽出中(時間外加算等)
- 高島町レジストリーでは他院からの搬送を経ることの影響が示唆

発症日



1,7は日曜日、土曜日

総死亡

weekday	Method	Mean	95% CL Mean		Std Dev	95% CL Std Dev	
0		0.1176	0.1126	0.1225	0.3221	0.3186	0.3256
1		0.1020	0.0994	0.1046	0.3027	0.3009	0.3045
Diff (1-2)	Pooled	0.0155	0.0101	0.0210	0.3074	0.3057	0.3090
Diff (1-2)	Satterthwaite	0.0155	0.00994	0.0211			

- Weekday 1, Weekend 0で死亡率に1.55%の差（p<0.00994)

入院7日目までの死亡、30日までの死亡

weekday	Method	Mean	95% CL Mean		Std Dev	95% CL Std Dev	
0		0.0959	0.0913	0.1004	0.2944	0.2913	0.2977
1		0.0812	0.0789	0.0836	0.2732	0.2715	0.2748
Diff (1-2)	Pooled	0.0147	0.00975	0.0196	0.2783	0.2769	0.2798
Diff (1-2)	Satterthwaite	0.0147	0.00956	0.0198			

- Weekday 1, Weekend 0で死亡率に1.47%の差（p<0.001） 30日までも同様に有意差あり
- 24時間死亡には有意差なし

J-ASPECT study

患者受療圏とアウトカム

2012/6/29

目的

脳卒中の患者データ・病院データの地理的分析

⇓

脳卒中センターの適正な配備、救急医療体制の構築へ

まず搬送時間が死亡率と関係するかを検討

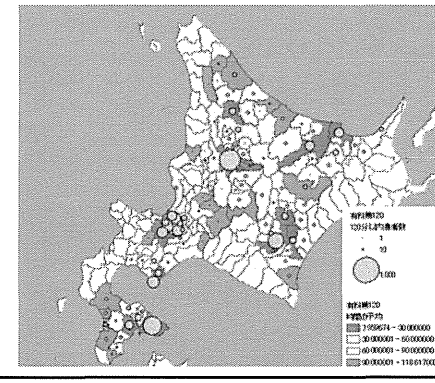
計測方法

病院までの搬送時間、距離の把握

- 患者住所の郵便番号と病院の間の距離、時間を測定
  - ・患者データ数：68718件
  - ・対応する病院数：266件
- 条件：搬送は120分以内、隣接県まで
  有料道路使用無
  （ただし北海道、中国、四国：使用有）

現在計測中

市区町村別平均アクセス時間と120分以内でアクセスの患者数：
15病院処理結果

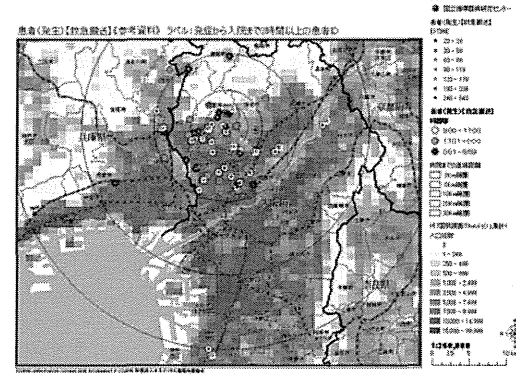


分析方法

- 調整死亡率と搬送時間
  死亡率を搬送時間、施設でモデル化
  地図上の表示
- 調整死亡率とその他変数の関係
  - – 包括的脳卒中センターのスコア
  - – 病院の規模、設備等の特徴
  - – 都市区分、医療圏
  - – 疾患別

  モデル化と地図上の表示

発症から3時間以内の患者分布



脳卒中診療医の疲弊度,燃え尽き症候群に関する全国調査
(J-ASPECT Study—Part2)
The nationwide survey of burnout among Japanese surgeons and neurologists of stroke care, J-ASPECT Study

西村 邦宏 1、竹上 美紗 2、宮本 恵宏 1、有賀 徹 2、宮地 茂 3、永田 泉 4、豊田 一則 1
松田 晋哉 5、飯原 弘二 1、J-ASPECT Study 研究班

1 国立循環器病研究センター予防医学・疫学情報部、2 昭和大学救急医学、3 名古屋大学脳神経外科
4 長崎大学脳神経外科、5 産業医科大学公衆衛生学

脳卒中診療医の疲弊度全国調査による燃え尽き症候群

・燃え尽き症候群は、Maslach の定義によれば、極度の疲労（Exhaustion）感情の枯渇, シニスム、離人症的症状（Cynicism, Depersonalization）を 特徴とする病態である

・対人サービスでおこりやすいことが知られている。(J Occup Behav 1981; 2: 99-113)

・近年、医師の燃え尽き症候群がアメリカ人研修医の集団などで多く報告されている

・ アメリカ外科学会:の会員の40% はburnout, 30%がうつ病のスクリーニング陽性, 28% がlow mental QOL を示している(Ann Surg. 2009;250:463– 471.)

・医師の燃え尽き症候群、ストレスは医療過誤との関連も指摘されている
(JAMA. 2009;302(12):1294-1300, Ann Surg. 2010 Jun;251(6):995-1000.)

・日本人医師における燃え尽き症候群に関して、大規模調査は行われていない。

・本研究では、脳卒中診療に携わる専門医資格を持つ医師を対象として、職場環境と燃え尽き症候群、QOL、うつ症状の関連を検討した。

対象と方法

・厚生労働科学研究飯原班(包括的脳卒中センターの整備に向けた脳卒中の救急医療に関する研究—J-ASPECT研究)の一環として行った。

・対象は日本脳神経外科学会、日本神経学会の認定専門医を対象に無記名、横断的アンケート調査を2011年3月に行った。(配布総数10,741人)

・今回は震災の影響を考慮して東北3県居住医師は対象から除いた。

・年齢、性別、経験年数、診療内容、労働時間、受け持ち患者数、当直回数、オンコール回数、収入、専門医種別、などを診療従事者側の背景要因として調査した。

・仕事に対する満足度、燃え尽き症候群の頻度、QOLの測定を行った. 燃え尽き症候群はMaslash Burnout Inventory の日本語版(北岡らによる)日本版MBI-GSを用いた。16問の質問により疲労感、シニスム、職場効力感を測定した。

・QOL の測定にはSF-36中のメンタルヘルススコア(MH5)を尺度として用いた。

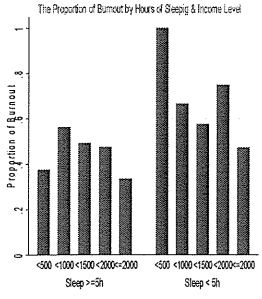
・疲弊感スコア3.4以上,シニシズムスコア2.6以上または職場効力感スコア1.7を満たす場合を燃え尽き症候群として, Wilcoxon Ranksum test, Logistic regressionにより関連するリスクファクターの検索を行った。多変量モデルではステップワイズ法による変数選択を行った。

結果

Variable	Burnout(+) (N=1170)	Burnout(-) (n=1282)	P-value
Male (%)	92.1	91.8	0.8429
Number of On-call Nights/Month	3.3	2.6	<0.0001
Number of calls after hours	2.4	1.7	<0.0001
Working Hours/week	69.3	64.1	<0.0001
Hours of Sleeping <5h	11.0%	5.9%	0.0001
Stroke Care >25%	74.5%	70.0%	0.0123
Experience (10 Years	8.3%	6.2%	0.0032
Number of t-PA Cases/year	2.48	1.99	0.0009
Income(¥Million)	1419.218	1484.5	<0.0001
Married	79.2%	83.8%	0.0029

- 対象となる脳神経外科医、神経内科医のうち2724(25.3%) の解答を得た。疲弊度に関しての有効回答率は90.1%であった。
- 解答者は平均経験年数で21.9年, 週65.9 時間労働、月2.95 回の当直と週2.02回のオンコール勤務を行っていた.(Table 1)
- 疲弊感またシニシズムのどちらかを満たすことを基準とした場合、48.1%の解答者が燃え尽き症候群の可能性があった

結果



- 疲弊感スコア3.4以上かつシニシズムスコア2.6以上または職場効力感スコア1.7を満たす場合と定義した場合でも23.4%がバーンアウトと診断された。
- 睡眠時間、収入によるバーンアウトの割合は大きく異なることが示された。
- ・SF－36のメンタルスコアを用いた場合、58%が軽度のうつ症状を示し, 27.1%は重度のうつ症状を示した

Table2. Risk factors of developing burnout

Outcomes	OR	P-value	95%CI
Working Hrs/week	1.02	<0.001	(1.01-1.03)
Number of Calls after hours	1.09	<0.001	(1.06-1.12)
Hours of Sleeping <5h	1.66	<0.001	(1.33-2.06)
Years of Experience <10 years	1.37	0.002	(1.12-1.67)
Number of t-PA Cases/year	1.04	<0.001	(1.02-1.07)
Stroke Care >25%	1.25	0.012	(1.05-1.49)
Married	0.73	0.002	(0.60-0.89)
Number of On-call nights	1.05	<0.001	(1.03-1.07)
Income(¥10Million)	0.93	<0.001	(0.90-0.96)

Table3. Final models for predicting burnout

Outcomes	OR	P-value	95%CI
Number of Patients	1.02	0.042	(1.00-1.03)
Hours of Sleeping <5h	1.72	0.003	(1.21-2.45)
Stroke Care >25%	1.27	0.03	(1.02-1.58)
Number of On-call Nights	1.06	0.007	(1.02-1.10)
Income/¥10Million	0.92	0.007	(0.88-0.97)
Married	0.71	0.018	(0.54-0.94)

- 単変量回帰で燃え尽き症候群の増加と有意に相関したのは,

  労働時間,時間外コール数
  睡眠時間6時間以下
  t-PA 治療数
  当直日数
  経験年数10年以下
  患者数
  脳卒中治療に携わる時間が25%以上であること
- 燃え尽き症候群の低下と有意に相関したのは,

  既婚、収入
- ステップワイズ法では,最終的に 睡眠時間, 労働時間,当直数,高収入, が予測因子として選択された

結果

脳外科医

	Odds Ratio	P-value	95% CI	
緊急手術	1.13	0.033	1.01	1.27
開頭術	1.03	0.472	0.96	1.10
脳卒中手術	1.04	0.344	0.96	1.12
TPA件数	1.24	<0.001	1.11	1.38

施設要因

	Odds Ratio	P-value	95% CI	
総病床数	1.17	0.006	1.05	1.30
血除去術	1.04	0.003	1.01	1.07
開頭術	1.03	0.057	1.00	1.06
SCUを備える	1.11	0.351	0.89	1.40
救急指定	1.70	0.031	1.05	2.76

脳外科医に関しては、緊急手術、TPA件数が有意なリスク要因であった。
施設調査による施設側の要因のpreliminaryな解析では、総病床数、血除去術、救急指定などとの関連が示唆された

結論

- ・燃え尽き症候群、うつ症状及びQOL低下は脳卒中診療に携わる医師でしばしば認められた。
- ・睡眠時間の増加、収入の増加が燃え尽き症候群の予防に有効であることが示唆された。しかし収入については経験年数の増加に伴う職位の上昇と実労働時間の減少と相関している可能性がある。
- ・t-PAの件数は緊急度の高い処置であり、疲弊につながっている可能性がある。
- ・脳卒中の診療時間が長いことが燃えつき症候群リスクとなっており、今後当直回数の減少、一人当たり受け持ち患者数の減少などを通じた脳卒中診療医の負担の軽減が必要と思われる。
- 今後1施設あたりの疲弊させない人員配置の閾値の検討が必要
- ・今後は地域性、地理的条件(過疎地域)、所属施設の性格(特定機能病院等)、包括的脳卒中センターの要件などの要因による詳細な検討が必要である。

J-ASPECT study
Results of CSC score and mortality

2012/6/29
Akiko Kada
National Cerebral and Cardiovascular Center

Methods

- Hospital research (n=256)
  death from DPC data (n=64650)
- Create comprehensive stroke center(CSC) score according with components of a CSC (Alberts MJ, et.al. 2005)
- Hierarchical logistic regression analyses with hospital and patient level for mortality

Background, CSC score, death

脳梗塞　非外傷性脳内血腫　クモ膜下出血

	Cerebral infarction	Intracerebral hemorrhage	Subarachnoid hemorrhage
Patients	42057	17475	5269
Female	17448 (41.5%)	7251 (41.5%)	3533 (67.1%)
Age	73.9 ± 12.2	70.7 ± 13.5	64.2 ± 14.8
MRS : 1 - 3	18892 (44.9%)	4870 (27.9%)	1400 (26.6%)
4	10901 (25.9%)	4309 (24.7%)	802 (15.2%)
5	9114 (21.7%)	7398(42.3%)	2632 (50.0%)
Hospital CSC total score	16.4 ± 3.6	16.6 ± 3.4	16.9 ± 3.2
CSC components:			
Personnel with expertise	3.7 ± 1.2	3.7 ± 1.2	3.8 ± 1.2
Diagnostic techniques	4.4 ± 1.1	4.5 ± 1.1	4.5 ± 1.0
Surgical/interventional therapies	4.4 ± 1.1	4.4 ± 1.0	4.5 ± 1.0
Infrastructure	2.6 ± 1.2	2.6 ± 1.1	2.7 ± 1.1
Education/research	1.4 ± 0.8	1.4 ± 0.8	1.4 ± 0.8
Death	**2765 (6.6%)**	**2655 (15.2%)**	**1405 (26.7%)**

N (%), mean ± SD

Mortality by gender

All	N	Death n (%)
Male	36478	3407(9.3%)
Female	28172	3396(12.1%)
Total	64650	6803(10.5%)

Cerebral infarction	N	Death n (%)
Male	24609	1394(5.7%)
Female	17448	1371(7.9%)

Intracerebral hemorrhage	N	Death n (%)
Male	10224	1575(15.4%)
Female	7251	1080(14.9%)

Subarachnoid hemorrhage	N	Death n (%)
Male	1736	447(25.7%)
Female	3533	958(27.1%)

Analyses of mortality : cerebral infarction

Factor	β	SE	OR	95%CI	P value
Male	-0.003	0.04	0.997	0.92 – 1.08	0.938
Age	**0.57**	**0.02**	**1.77**	**1.70 – 1.85**	**<0.001**
CSC total score	**-0.02**	**0.01**	**0.98**	**0.96 – 0.99**	**0.002**

Hierarchical logistic regression model

Factor	β	SE	OR	95%CI	P value
Personnel with expertise	**-0.07**	**0.03**	**0.93**	**0.89 – 0.98**	**0.005**
Diagnostic techniques	-0.01	0.03	0.99	0.93 – 1.04	0.598
Surgical/interventional therapies	-0.02	0.03	0.98	0.93 - 1.03	0.470
Infrastructure	**-0.07**	**0.03**	**0.93**	**0.89 – 0.98**	**0.009**
Education/research	**-0.15**	**0.04**	**0.86**	**0.80 – 0.92**	**<0.001**

Adjusted by gender and age

Analyses of mortality : Intracerebral hemorrhage

Factor	β	SE	OR	95%CI	P value
Male	**0.18**	**0.05**	**1.19**	**1.09 – 1.30**	**<0.001**
Age	**0.22**	**0.02**	**1.25**	**1.21 – 1.29**	**<0.001**
CSC total score	-0.02	0.01	0.98	0.96 – 1.00	0.055

Factor	β	SE	OR	95%CI	P value
Personnel with expertise	-0.01	0.03	0.99	0.93 – 1.05	0.698
Diagnostic techniques	-0.05	0.03	0.95	0.90 – 1.01	0.126
Surgical/interventional therapies	-0.05	0.03	0.95	0.90 – 1.01	0.102
Infrastructure	-0.03	0.03	0.98	0.92 – 1.04	0.411
Education/research	**-0.10**	**0.04**	**0.91**	**0.84 – 0.99**	**0.023**

Adjusted by gender and age

Analyses of mortality : Subarachnoid hemorrhage

Factor	β	SE	OR	95%CI	P value
Male	**0.21**	**0.07**	**1.24**	**1.07 – 1.43**	**0.004**
Age	**0.38**	**0.02**	**1.46**	**1.39 – 1.53**	**<0.001**
CSC total score	**-0.06**	**0.01**	**0.95**	**0.92 – 0.97**	**<0.001**

Factor	β	SE	OR	95%CI	P value
Personnel with expertise	-0.07	0.04	0.93	0.87 – 1.00	0.055
Diagnostic techniques	-0.04	0.04	0.96	0.89 – 1.05	0.391
Surgical/interventional therapies	**-0.16**	**0.04**	**0.85**	**0.78 – 0.92**	**0.001**
Infrastructure	**-0.12**	**0.04**	**0.89**	**0.82 – 0.96**	**0.005**
Education/research	**-0.21**	**0.05**	**0.81**	**0.73 – 0.90**	**0.001**

Adjusted by gender and age

Analyses of mortality : All 参考

Factor	β	SE	OR	95%CI	P value
Male	**-0.17**	**0.03**	**0.84**	**0.80 – 0.89**	**<0.001**
Age	**0.22**	**0.01**	**1.25**	**1.22 – 1.27**	**<0.001**
CSC total score	-0.01	0.01	0.99	0.98 – 1.00	0.166

Factor	β	SE	OR	95%CI	P value
Personnel with expertise	-0.02	0.02	0.97	0.93 – 1.02	0.262
Diagnostic techniques	0.01	0.03	1.01	0.97 – 1.07	0.584
Surgical/interventional therapies	-0.02	0.02	0.99	0.94 – 1.03	0.497
Infrastructure	-0.02	0.02	0.98	0.94 – 1.03	0.485
Education/research	**-0.11**	**0.03**	**0.89**	**0.84 – 0.95**	**0.001**

Adjusted by gender and age

Summary

Mortality was influenced by

- Age
- Male in Intracerebral hemorrhage / subarachnoid hemorrhage
- Higher CSC score
  - Education / research
  - Infrastructure

Backup

- Confounding by age in Subarachnoid hemorrhage
- Influence by Modified Rankin Scale(1～4 / 5)

Confounding by age in subarachnoid hemorrhage

Subarachnoid hemorrhage	N	Death n (%)
Male	1736	447(25.7%)
Female	3533	958(27.1%)

Subarachnoid hemorrhage

Age <75	N	Death n (%)
Male	1495	329(22.0%)
Female	2295	444(19.3%)

Age ≧75	N	Death n (%)
Male	241	118(49.0%)
Female	1238	514(41.5%)

Confounding by age
年齢による交絡

Analyses of mortality : cerebral infarction

Factor	β	SE	OR	95%CI	P value
Male	**0.14**	**0.05**	**1.15**	**1.05 – 1.26**	**0.003**
Age	**0.37**	**0.02**	**1.44**	**1.38 – 1.51**	**<0.001**
MRS (5)	**2.04**	**0.05**	**7.69**	**7.00 – 8.44**	**<0.001**
CSC total score	-0.01	0.01	0.99	0.97 – 1.00	0.112
Univariate: male	**-0.35**	**0.04**	**0.71**	**0.65 – 0.76**	**<0.001**

Factor	β	SE	OR	95%CI	P value
Personnel with expertise	**-0.08**	**0.03**	**0.92**	**0.87 – 0.98**	**0.007**
Diagnostic techniques	-0.01	0.03	0.99	0.93 – 1.05	0.653
Surgical/interventional therapies	0.006	0.03	1.01	0.95 - 1.07	0.842
Infrastructure	-0.007	0.03	0.99	0.94 – 1.05	0.818
Education/research	**-0.11**	**0.04**	**0.89**	**0.82 – 0.97**	**0.007**

Adjusted by gender, age, and MRS(5)

Analyses of mortality : Intracerebral hemorrhage

Factor	β	SE	OR	95%CI	P value
Male	0.37	0.05	1.46	1.32 – 1.61	<0.001
Age	0.21	0.02	1.23	1.18 – 1.28	<0.001
MRS (5)	2.88	0.07	17.6	15.4 – 20.2	<0.001
CSC total score	-0.02	0.01	0.99	0.96 – 1.01	0.219
Univariate: male	0.05	0.04	1.05	0.96 – 1.14	0.277

Factor	β	SE	OR	95%CI	P value
Personnel with expertise	-0.04	0.04	0.96	0.89 – 1.03	0.246
Diagnostic techniques	-0.05	0.04	0.95	0.88 – 1.03	0.206
Surgical/interventional therapies	-0.03	0.04	0.97	0.90 – 1.05	0.402
Infrastructure	0.02	0.04	1.02	0.94 – 1.10	0.637
Education/research	-0.08	0.05	0.92	0.83 – 1.03	0.143

Adjusted by gender, age, and MRS(5)

Analyses of mortality : Subarachnoid hemorrhage

Factor	β	SE	OR	95%CI	P value
Male	0.34	0.08	1.40	1.19 – 1.65	<0.001
Age	0.27	0.03	1.32	1.25 – 1.39	<0.001
MRS (5)	2.45	0.10	11.6	9.57 – 14.0	<0.001
CSC total score	-0.05	0.02	0.95	0.92 – 0.98	0.001
Univariate: male	-0.09	0.07	0.92	0.80 – 1.05	0.192

Factor	β	SE	OR	95%CI	P value
Personnel with expertise	-0.11	0.04	0.89	0.82 – 0.98	0.011
Diagnostic techniques	-0.02	0.05	0.98	0.89 – 1.09	0.762
Surgical/interventional therapies	-0.16	0.05	0.85	0.77 - 094	0.002
Infrastructure	-0.08	0.05	0.92	0.84 – 1.02	0.107
Education/research	-0.17	0.07	0.84	0.74 – 0.96	0.009

Adjusted by gender, age, and MRS(5)

Analyses of mortality : All

Factor	β	SE	OR	95%CI	P value
Male	0.08	0.03	1.09	1.02 – 1.15	0.007
Age	0.13	0.01	1.14	1.11 – 1.16	<0.001
MRS (5)	2.62	0.04	13.8	12.8 – 14.7	<0.001
CSC total score	-0.007	0.009	0.99	0.98 – 1.01	0.447
Univariate: male	-0.29	0.03	0.75	0.71 – 0.79	<0.001

Stroke
JOURNAL OF THE AMERICAN HEART ASSOCIATION

Weekends: A Dangerous Time for Having a Stroke?

Gustavo Saposnik, Akerke Baibergenova, Neville Bayer and Vladimir Hachinski

Stroke. 2007;38:1211-1215; originally published online March 8, 2007;
doi: 10.1161/01.STR.0000259622.78616.ea
Stroke is published by the American Heart Association, 7272 Greenville Avenue, Dallas, TX 75231

Print ISSN: 0039-2499. Online ISSN: 1524-4628

Weekends: A Dangerous Time for Having a Stroke?

Gustavo Saposnik, MD, MSc; Akerke Baibergenova, MD, MPH; Neville Bayer, MD, FRCPC; Vladimir Hachinski, MD, DSc, FRCPC

Background and Purpose—Weekend admissions are associated with higher in-hospital mortality. However, limited information is available concerning the "weekend effect" on stroke mortality. Our aim was to evaluate the impact of weekend admissions on stroke mortality in different settings.

Methods—We analyzed all hospital admissions for ischemic stroke from April 2003 to March 2004 through the Hospital Morbidity Database. The Hospital Morbidity Database is a national database that contains patient-level sociodemographic, diagnostic, procedural, and administrative information including all acute care facilities across Canada. The major inclusion criterion was admission to an acute care facility with a principal diagnosis of ischemic stroke. Clinical variables and facility characteristics were included in the analysis.

Results—Overall, 26 676 patients were admitted to 606 hospitals for ischemic stroke. Weekend admissions comprised 6629 (24.8%) of all admissions. Seven-day stroke mortality was 7.6%. Weekend admissions were associated with a higher stroke mortality than weekday admissions (8.5% vs 7.4%; odds ratio, 1.17; 95% CI, 1.06 to 1.29). Mortality was similarly affected among patients admitted to rural versus urban hospitals or when the most responsible physician was a general practitioner versus specialist. In the multivariable analysis, weekend admissions were associated with higher early mortality (odds ratio, 1.14; 95% CI, 1.02 to 1.26) after adjusting for age, sex, comorbidities, and medical complications.

Conclusions—Stroke patients admitted on weekends had a higher risk-adjusted mortality than did patients admitted on weekdays. Disparities in resources, expertise, and healthcare providers working during weekends may explain the observed differences in weekend mortality. (***Stroke.* 2007;38:1211-1215.)**

Key Words: hospital volume ■ mortality ■ outcomes research ■ stroke

The incidence of stroke increases during weekends and some other stressful days.[1–3] However, hospitals face shortages of staff and specialized services during those periods. Previous studies have shown increased mortality for different conditions or procedures such as cancer, aortic aneurysm, duodenal ulcer, epiglottitis, and pulmonary embolism, among others, during weekend admissions.[4,5] This phenomenon was defined by some authors as the "weekend effect."[5] However, limited information is available regarding ischemic stroke. It is possible that stroke care is not homogenous across the week, thus affecting the outcome.

We hypothesized that (1) stroke mortality increases for weekend admissions and (2) this weekend effect varies by facility type, location, and physician specialty. Our aim was to examine the effect of weekend admissions and their impact on in-hospital stroke mortality in a large population-based study across Canada. The identification of factors associated with in-hospital mortality for weekend admissions can contribute to implementation of quality improvement initiatives.

Subjects and Methods

We identified all stroke patients admitted to acute care hospitals between April 1, 2003, and March 31, 2004, through the Hospital Morbidity Database (HMDB) managed by the Canadian Institute for Health Information. HMDB is a national database that contains patient-level sociodemographic, diagnostic, procedural, and administrative information across Canada. Inclusion criteria included admission to an acute care facility due to ischemic stroke as identified through the patient's principal diagnosis recorded according to the International Classification of Diseases, either the ninth (ICD-9) or 10th (ICD-10) revision (ICD-9 codes 433.01, 433.11, 433.21, 433.31, 433.81, 433.91, 434.01, 434.11, 434.91 and ICD-10 codes I63, I64). Validation studies have also established a high accuracy rate for these codes.[6,7] All provinces and territories except Manitoba and Quebec use ICD-10 codes. The first 7 days after admission are crucial for acute stroke management, preventing complications, identifying the stroke mechanism, and discharge planning.[8,9] This was the rationale for using the 7-day case-fatality indicator to analyze the impact of weekend admissions. In addition, this indicator has the advantages of high case ascertainment and limited influence of length of stay when comparing different facilities. Patients with transient ischemic attack and hemorrhagic stroke were excluded owing to major prognostic differences. We also

Received September 3, 2006; final revision received October 7, 2007; accepted October 18, 2006.

From the Stroke Program (G.S., V.H.), Department of Clinical Neurological Sciences, London Health Sciences Center, University of Western Ontario, London; the Department of Clinical Epidemiology and Biostatistics (A.B.), McMaster University, Hamilton; and the Stroke Program (G.S., N.B.), Department of Neurology, St. Michael's Hospital, University of Toronto, Toronto, Canada.

Correspondence to Gustavo Saposnik, MD, 55 Queen St E, Stroke Program, Suite 931, St. Michael's Hospital, University of Toronto, Toronto, ON M5C 1R6, Canada. E-mail gsaposnik@yahoo.com

Stroke **is available at http://www.strokeaha.org** **DOI: 10.1161/01.STR.0000259622.78616.ea**

excluded records containing an invalid health card number or missing discharge disposition.

Canada's healthcare system includes universal government-funded insurance coverage. This study evaluated all stroke admissions from 606 hospitals across Canada, which represent a comprehensive range of facilities, including academic and community hospitals located in metropolitan and rural areas. Similar to other studies, weekend was defined as the period from midnight on Friday to midnight on Sunday. All other times were defined as weekdays.[4]

In this analysis, the influence of the following variables on early stroke outcome was assessed: age (categorized as <65, 65 to 74, 75 to 84, and ≥85 years old), sex, comorbid conditions, major medical complications, socioeconomic status, facility type by location (rural/urban), teaching status, most responsible physician (general practitioner/specialist), length of hospital stay, and discharge disposition (dead, home, residential/nursing home, or other transfer to another hospital). For patients transferred between hospitals, the day of admission was defined as the day they presented to the initial acute care facility.

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 0 means that no comorbid index is present, and higher scores indicate a greater burden of comorbidity. The Charlson-Deyo index was classified as having none, 1, 2, or >3 comorbidities.[11,12]

Socioeconomic status was estimated through an approach developed by Statistics Canada that assigns neighborhoods to 5 equally sized quintiles based on income data reported on the 2001 census.[13] A higher quintile value of a residential area is associated with higher socioeconomic status of residents in that area. Teaching status was defined according to the Association of Canadian Academic Healthcare Organizations.[14]

Each hospital in the HMDB is assigned a unique, encrypted identifier. This identifier was used to determine the annual acute ischemic stroke volume for each hospital that contributed to the database. As expected in administrative-clinical databases, no specific data were available for estimating acute neurological status (National Institutes of Health Stroke Scale) or measures of functional disability such as the Barthel index and modified Rankin scale. We were able, however, to adjust for some other important clinical predictors, including age, sex, comorbid illnesses, and major medical complications in the multivariable analysis.

Statistical Analysis

Descriptive statistics were used to assess the effect of various patient and hospital characteristics on 7-day in-hospital mortality. Multivariable logistic-regression analysis was used to calculate odds ratios (ORs) and the corresponding 95% CIs. Multivariable regression analysis of in-hospital mortality was performed by entering all relevant patient and hospital variables into the model. The estimated weekend effect was adjusted for patient age, sex, Charlson-Deyo index, and complications.

The presence of potential interactions between age and sex, hospital type (teaching status, location), and intensive care unit (ICU) admission were tested by adding interaction terms to the regression model. Except for the interactions between ICU and teaching status and ICU and hospital location (rural/urban), the remaining ones were not statistically significant. A Kaplan-Meier estimated survival function of the time from hospital admission to hospital death was plotted to determine the weekend effect.

Statistical analysis was performed with a commercially available software package (SAS statistical software, version 9; SAS Institute Inc; and STATA version 8.2, Stata Corp LP). All tests were 2 tailed, and probability values <0.05 were considered significant.

Ethics

The design of the study was approved by the ethics review board at the University of Western Ontario, London, Canada. Because the identity of the patients was completely anonymous, no specific informed consent was required. The data pooling center was blinded to hospital identities.

Data Quality

According to a reabstraction study conducted after implementation of ICD-10 by the Canadian Institute for Health Information for quality assurance, diagnosis in the abstract coincides with diagnosis in the chart in 92% of stroke cases. The reliability of the coding of data collected for day of admission was 97% and for death was >99%. Nonmedical and sociodemographic data elements in this study had agreement rates ranging from 96% to 100%.[15]

Other Canadian studies on hospital coding of stroke and vascular risk factors according to ICD-9 and ICD-10 showed a high accuracy rate.[16,17] On the whole, ICD-9 coding was excellent, with 90% (95%

TABLE 1. Comparison of Clinical Characteristics Between Stroke Admissions on Weekends and Weekdays

Variables	Weekday Admissions, n=20 047 (%)	Weekend Admissions, n=6629 (%)	*P* Value
Mean age (SD), y	73.8 (13)	74.7 (13)	<0.001
Age groups, y			<0.001
Age <65, %	4176 (21)	1264 (19)	
Age 65–74, %	4799 (24)	1487 (22)	
Age 75–84, %	7215 (36)	2452 (37)	
Age ≥85, %	3857 (19)	1426 (22)	
Sex, male, %	10 368 (52)	3309 (50)	0.01
Charlson-Deyo comorbidity index			0.1
0	13 793 (69)	4634 (70)	
1	2629 (13)	860 (13)	
2	1872 (9)	607 (9)	
≥3	1753 (9)	528 (8)	
Facility type, %			0.9
Teaching hospitals	3895 (19)	1284 (19)	
Nonteaching hospitals	16 152 (81)	5345 (81)	
Facility location, %			0.8
Rural	4823 (24)	1524 (23)	
Urban	15 224 (76)	5105 (77)	
Cases requiring ICU	650 (3.2)	221 (3.3)	0.1
Physician type			0.7
General practitioner	3378 (17)	1133 (17)	
Specialist	16 669 (83)	5496 (83)	
Neighborhood income, quintiles*			0.3
1	4325 (22)	1427 (21)	
2	4165 (21)	1308 (20)	
3	3960 (20)	1285 (19)	
4	3480 (17)	1179 (18)	
5	3044 (15)	1055 (16)	
Unknown postal code	1073 (5)	375 (6)	
Major medical complications			
Pneumonia	691 (3.4)	223 (3.4)	0.8
Urinary tract infection	650 (3.2)	221 (3.3)	0.7
Pulmonary embolism	102 (0.5)	40 (0.6)	0.4
Mean length of stay (SD), d	16.1 (32)	16.0 (24)	0.7

*Corresponds to 5 equally sized quintiles of neighborhood income based on the 2001 Canadian census data.

TABLE 2. Outcome Measures and Weekend Effect

Outcomes	Weekday Admissions, n=20 047 (%)	Weekend Admissions, n=6629 (%)	Weekend Effect OR (95% CI)
Discharge to place of residence	9777 (48.7)	2972 (44.8)	0.85 (0.80–0.90)
Mortality at 7 days	1476 (7.4)	563 (8.5)	1.17 (1.06–1.29)
Mortality at discharge	3077 (15.3)	1088 (16.4)	1.08 (1.004–1.17)

CI, 86% to 92%), and ICD-10 was similarly good, with 92% (95% CI, 88% to 95%) of strokes correctly coded.[7]

Results

Among 26 676 patients hospitalized for ischemic stroke at 606 centers across Canada, 6609 (24.8%) were admitted during weekends. Patients admitted on weekends were older and more frequently male. There were no statistically significant differences in the remaining baseline characteristics, including major medical complications, between patients admitted on weekends versus weekdays in the univariable analysis (Table 1).

Overall, 7-day case fatality was 7.6% (2039/26676), whereas mortality at discharge was 15.6% (4165/26676). Early stroke mortality was higher among patients admitted on weekends (8.5%) compared with weekdays (7.4%) (OR 1.17; 95% CI, 1.06 to 1.29). Similar results were observed for mortality at discharge (16.4% versus 15.3%; OR 1.08; 95% CI, 1.004 to 1.17). Patients admitted on weekends were less likely to be discharged to the same place of residence ($P<0.001$; OR 0.85; 95% CI, 0.80 to 0.90; Table 2).

The analysis of stroke mortality on weekends by facility characteristics is shown in Table 3. The weekend effect was larger in rural hospitals (OR 1.26; 95% CI, 1.02 to 1.54) compared with urban hospitals (OR 1.14; 95% CI, 1.02 to 1.28) and when the most responsible physician was a general practitioner (OR 1.17; 95% CI, 1.06 to 1.29). For weekend admissions, early stroke mortality was significant in nonteaching hospitals (OR 1.15, 95% CI, 1.03 to 1.29) and for ICU hospitalizations (OR 1.52; 95% CI, 1.23 to 1.88). Two interaction terms (ICU admission×nonteaching hospital, $P<0.001$; and ICU admission×rural location, $P<0.001$) were significant, suggesting higher mortality for patients requiring ICU admission in nonteaching and rural hospitals.

Multivariable analysis for 7-day case fatality showed that patients admitted on weekends had 13% higher odds of dying compared with patients admitted during weekdays (OR 1.14; 95% CI, 1.02 to 1.26) after adjusting for age, sex, Charlson-Deyo comorbidity index, and medical complications (pneumonia, respiratory tract infection, and pulmonary embolism; Table 4). Kaplan-Meier curves demonstrated a significantly lower 30-day survival function for patients admitted on weekends than for weekday admissions (log-rank=0.0005; the Figure).

Discussion

Our study shows that stroke patients admitted on weekends had an increased mortality rate and were less likely to be discharged to the same place of residence than those admitted on weekdays. After adjusting for age, sex, comorbidities, and major medical complications, weekend admissions increased the risk of death by 14%. The effect of weekend admissions may be greater in nonteaching hospitals and for patients requiring ICU admission. Although the weekend effect affected patients admitted to both rural and urban hospitals and those treated by general practitioners versus specialists, the effect may be larger in patients admitted to rural hospitals and when the most responsible physician is a general practitioner (Table 3). In agreement with prior studies that examined the weekend effect in other medical conditions,[4,5,18–21] our study demonstrated a significant impact on several stroke outcomes, including visit disposition, 7-day case fatality, and mortality at discharge.

In a large study analyzing the weekend effect in the top 100 causes of hospital death, Bell and Redelmeier[4] found that weekend admissions for any condition were associated with a 4% increase in mortality and that 23% of causes were

TABLE 3. Weekend Effect for Early Stroke Mortality by Facility Characteristics

Variables	Admissions	Mortality, n (%)		Weekend Effect OR (95% CI)
		Weekday Admissions	Weekend Admissions	
Facility type				
Nonteaching	21 497 (80.6)	1231 (7.6)	464 (8.7)	1.15 (1.03–1.29)
Teaching	5179 (19.4)	245 (6.3)	99 (7.7)	1.24 (0.98–1.6)
Hospital location				
Rural	6347 (19.4)	363 (7.5)	141 (9.3)	1.26 (1.02–1.54)
Urban	20 329 (80.6)	1113 (7.3)	422 (8.3)	1.14 (1.02–1.28)
Most responsible provider				
General practitioner	4511 (16.9)	236 (6.9)	34 (8.6)	1.27 (1.00–1.63)
Specialist	22 165 (83.1)	1240 (7.5)	469 (8.5)	1.14 (1.02–1.28)
Admission to ICU				
Yes	3304 (12.4)	337 (13.4)	149 (19)	1.52 (1.23–1.88)
No	23 372 (87.6)	1139 (6.5)	414 (7.1)	1.10 (0.98–1.23)

TABLE 4. Adjusted Risk of Early Stroke Mortality for Weekend Admissions

7-Day Mortality	Adjusted OR	95% CI	
Weekend admission	1.14	1.02	1.26
Age, y	1.04	1.04	1.05
Female sex	1.01	0.92	1.11
Charlson comorbid score=0	Ref	...	...
1 or 2	1.03	0.92	1.15
>3	1.14	0.97	1.33
Major medical complications*	1.07	0.89	1.28

Ref indicates reference group.

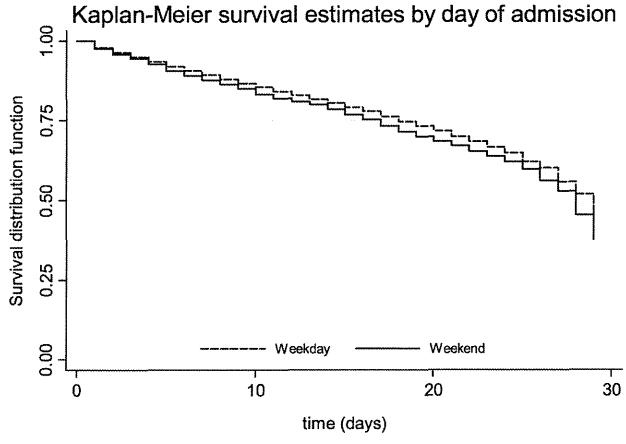
*Major medical complications included pneumonia, urinary tract infection, and pulmonary embolism.

Results were similar if the multivariable model was not adjusted by major medical complications.

associated with a statistically significant weekend effect. This is 1 of the largest and best-conducted studies analyzing the weekend-outcome relation. However, the authors did not analyze the weekend effect on admissions due to ischemic stroke.

Another large study conducted in acute care hospitals in California found that weekend admissions were associated with a 3% higher chance of mortality after adjusting for covariates.[5] Cancer of the ovary/uterus, duodenal ulcer, and cardiovascular symptoms were the conditions associated with a significant weekend effect. They found that the weekend effect was larger in major teaching hospitals compared with nonteaching hospitals (OR=1.13 vs 1.03; P=0.03). Interestingly, they also included 24 565 patients with ischemic stroke but found no significant difference in the mortality rate between weekend and weekday admissions. Differences in the overall proportion of patients admitted on weekends (28%), the length of hospital stay, or resource availability on weekends might explain the discrepancy with our study.

The weekend effect was also observed in a few studies conducted in different settings (pediatric hospitals, ICUs, stroke units).[18–21] As expected, the magnitude of the weekend effect diminished when stroke mortality decreased. Therefore, variations in the definition of hospital mortality (short versus long term), which is highly influenced by the length of stay, may explain differences among studies.



Kaplan-Meier survival curves for stroke mortality by day of admission. Reference: log-rank test=0.0005. This figure shows that stroke survival on weekend admissions is significantly lower than on weekday admissions in a 30-day time period.

Important factors need to be considered to interpret the underlying mechanisms for the weekend effect. In a cohort study including 723 stroke patients, recent alcohol intake (1 to 40 g and >40 g of alcohol consumption during the previous 24 hours) was associated with the onset of brain infarction during weekends and holidays (P<0.01). High alcohol drinking and drug use on weekends may have an impact on stroke mortality.[22] Another potential explanation is that patients admitted on weekends might have more severe strokes or comorbid conditions and consequently worse prognoses than those admitted on weekdays. Although we have no information on stroke severity on admission, the weekend effect remained significant after adjusting for other variables (age, comorbid conditions, and major medical complications) that affect mortality in the same direction as stroke severity.

Interestingly, we found no significant difference in the medical complication rate between weekend and weekday admissions. Although variations in the processes of care may explain our findings, we do not have information on fluctuations in staff level, coverage, differences in expertise, or availability of stroke consultants.

There are some strengths as well as limitations of our study. First, as in most studies that involve administrative-clinical databases, no information was available on stroke severity and the results of brain imaging. Second, the possibility of errors in recording demographic data, mortality date, or diagnostic codes cannot be excluded. However, there is no reason to believe that potential recording errors would be higher for weekend admissions. Third, it is possible that comorbid conditions and medical complications were underreported, thus limiting the adjustment in the multivariable analysis for the weekend effect. On the other hand, our results were consistent among the outcomes measured, and our use of a national database allowed comprehensive coverage of all stroke-related hospitalizations across the country.

In summary, stroke patients admitted on weekends had a higher risk-adjusted mortality than did patients admitted on weekdays. Even in a country with universal health insurance coverage, disparities in resources, expertise, or the number of healthcare providers working during weekends may be present and may explain the observed differences in weekend mortality between facilities. The understanding of factors affecting the processes of care may provide new avenues to implement quality improvement initiatives.

Acknowledgments

We thank the Canadian Institute for Health Information for providing the data. We appreciate the support of the Research Department and the Regional Stroke Center at St. Michael Hospital, Toronto. The authors thank Drs Bob Hyland and Art Slutzky for their support.

Sources of Funding

This research was supported in part by a grant from the Heart Stroke Foundation of Canada (HSFC) and the Canadian Institute for Health Research (CIHR) given to Dr Gustavo Saposnik. The grant was obtained on the basis of competitive applications after publication of

grant advertisements. The investigators acted as sponsors of the study. Neither the HSFC nor the CIHR had input on the design, access to the data, analyses, interpretation, or publication of the study.

Disclosures

None.

References

1. Pasqualetti P, Natali G, Casale R, Colantonio D. Epidemiological chronorisk of stroke. *Acta Neurol Scand.* 1990;81:71–74.
2. Wang H, Sekine M, Chen X, Kagamimori S. A study of weekly and seasonal variation of stroke onset. *Int J Biometeorol.* 2002;47:13–20.
3. Saposnik G, Baibergenova A, Dang J, Hachinski V. Does a birthday predispose to vascular events? *Neurology.* 2006;67:300–304.
4. Bell CM, Redelmeier DA. Mortality among patients admitted to hospitals on weekends as compared with weekdays. *N Engl J Med.* 2001;345:663–668.
5. Cram P, Hillis SL, Barnett M, Rosenthal GE. Effects of weekend admission and hospital teaching status on in-hospital mortality. *Am J Med.* 2004;117:151–157.
6. Goldstein LB. Accuracy of ICD-9-CM coding for the identification of patients with acute ischemic stroke: effect of modifier codes. *Stroke.* 1998;29:1602–1604.
7. Kokotailo RA, Hill MD. Coding of stroke and stroke risk factors using International Classification of Diseases, Revisions 9 and 10. *Stroke.* 2005;36:1776–1781.
8. Chang KC, Tseng MC, Weng HH, Lin YH, Liou CW, Tan TY. Prediction of length of stay of first-ever ischemic stroke. *Stroke.* 2002;33:2670–2674.
9. Saposnik G, Webster F, O'Callaghan C, Hachinski V. Optimizing discharge planning: clinical predictors of longer stay after recombinant tissue plasminogen activator for acute stroke. *Stroke.* 2005;36:147–150.
10. Deyo RA, Cherkin DC, Ciol MA. Adapting a clinical comorbidity index for use with ICD-9-CM administrative databases. *J Clin Epidemiol.* 1992;45:613–619.
11. Charlson ME, Pompei P, Ales KL, MacKenzie CR. A new method of classifying prognostic comorbidity in longitudinal studies: development and validation. *J Chronic Dis.* 1987;40:373–383.
12. Goldstein LB, Samsa GP, Matchar DB, Horner RD. Charlson index comorbidity adjustment for ischemic stroke outcome studies. *Stroke.* 2004;35:1941–1945.
13. Wilkins R. Automated geographic coding based on the Statistics Canada postal code conversion files. Ottawa, Canada: Health Analysis and Measurement Group; 2004.
14. Lozon JC, Fox RM. Academic health sciences centres laid bare. *Healthcare Pap.* 2002;2:10–36.
15. Data quality of the discharge abstract database following the first-year implementation of ICD-10-CA/CCI: final report. Ottawa, Ontario, Canada: Canadian Institute for Health Information; 2004:1–81.
16. Williams JI, Young W. A summary of studies on the quality of health care administrative databases in Canada. In: Goel V, et al, eds. *Patterns of Health Care in Ontario. The ICES Practice Atlas.* 2nd edition. Ottawa: Canadian Medical Association; 1996. Available at: http://www.ices.on.ca/file/Practice2-appendix.pdf. Accessed on September 1, 2006.
17. Williams JI YW. A summary of studies on the quality of health care administrative databases in Canada. Goel V, et al, eds. Ottawa; 1996:1–22.
18. Gould JB, Qin C, Marks AR, Chavez G. Neonatal mortality in weekend vs weekday births. *JAMA.* 2003;289:2958–2962.
19. Hamilton P, Restrepo E. Weekend birth and higher neonatal mortality: a problem of patient acuity or quality of care? *J Obstet Gynecol Neonatal Nurs.* 2003;32:724–733.
20. Rollins G. Weekend, Monday and Friday ICU admissions have increased risk of mortality. *Rep Med Guidelines Outcomes Res.* 2002;13:7–9.
21. Hasegawa Y, Yoneda Y, Okuda S, Hamada R, Toyota A, Gotoh J, Watanabe M, Okada Y, Ikeda K, Ibayashi S. The effect of weekends and holidays on stroke outcome in acute stroke units. *Cerebrovasc Dis.* 2005;20:325–331.
22. Haapaniemi H, Hillbom M, Juvela S. Weekend and holiday increase in the onset of ischemic stroke in young women. *Stroke.* 1996;27:1023–1027.

Stroke
Journal of the American Heart Association

Effect of Weekend Compared With Weekday Stroke Admission on Thrombolytic Use, In-Hospital Mortality, Discharge Disposition, Hospital Charges, and Length of Stay in the Nationwide Inpatient Sample Database, 2002 to 2007

Brian L. Hoh, Yueh-Yun Chi, Michael F. Waters, J Mocco and Fred G. Barker II

Stroke. 2010;41:2323-2328; originally published online August 19, 2010;
doi: 10.1161/STROKEAHA.110.591081
Stroke is published by the American Heart Association, 7272 Greenville Avenue, Dallas, TX 75231

Print ISSN: 0039-2499. Online ISSN: 1524-4628

Effect of Weekend Compared With Weekday Stroke Admission on Thrombolytic Use, In-Hospital Mortality, Discharge Disposition, Hospital Charges, and Length of Stay in the Nationwide Inpatient Sample Database, 2002 to 2007

Brian L. Hoh, MD; Yueh-Yun Chi, PhD; Michael F. Waters, MD, PhD; J Mocco, MD, MS; Fred G. Barker II, MD

Background and Purpose—A stroke "weekend effect" on mortality has been demonstrated in other countries with a possible slight effect in the United States. We studied patients with stroke in the Nationwide Inpatient Sample database for a weekend effect on thrombolytic use, in-hospital mortality, discharge disposition, hospital charges, and length of stay.

Methods—The Nationwide Inpatient Sample 2002 to 2007 was searched for all emergency room admissions for International Classification of Diseases, 9th Revision codes corresponding to ischemic stroke. Generalized estimated equations for generalized linear models were performed, adjusting for gender, age, race, season, median income level, payer, comorbidity score, hospital region, hospital location, teaching status, bed size, and hospital annual stroke case volume to compare weekend versus weekday stroke admission incidence of thrombolytic use, in-hospital mortality, discharge disposition, hospital charges, and length of stay. The same analysis was performed using the International Classification of Diseases, 9th Revision codes for ischemic stroke AND transient cerebral ischemia to check internal validity for coding irregularities that may occur in differentiating stroke from transient ischemic attack.

Results—There were 599 087 emergency room admissions for ischemic stroke: 159 906 weekend admissions and 439 181 weekday admissions. Generalized estimated equation for generalized linear model analysis was performed and demonstrated weekend compared with weekday patients with stroke were slightly more likely to receive thrombolytics (OR=1.114; 95% CI=1.039 to 1.194; P=0.003); incur slightly higher total hospital charges (effect ratio=1.011; 95% CI=1.006 to 1.017; P<0.001); and have slightly longer lengths of stay (effect ratio=1.021; 95% CI=1.015 to 1.027; P<0.001). There was no difference in in-hospital mortality or discharge disposition.

Conclusions—There is a slight stroke weekend effect on thrombolytic use, total hospital charges, and length of stay, but no difference in in-hospital mortality or discharge disposition. **(*Stroke*. 2010;41:2323-2328.)**

Key Words: hospital charges ■ ischemic stroke ■ length of hospitalization ■ mortality ■ outcome ■ thrombolytic ■ weekend

Hospital admission for ischemic stroke over the weekend compared with a weekday is associated with higher mortality in Canada,[1] Sweden,[2] Japan,[3] and Taiwan.[4] In England, Wales, and Northern Ireland, patients with stroke admitted on weekends wait longer to be admitted into a stroke unit and are less likely to have a brain scan within 24 hours.[5] In the United Kingdom, weekend patients with stroke are less likely to receive thrombolytics,[6] whereas in Germany, they are more likely.[7]

Studies of the stroke "weekend effect" in the United States, however, have been inconsistent. In the Get With the Guidelines–Stroke Program, off-hour ischemic stroke presentation (weekends and weeknights) is associated with slightly higher in-hospital mortality.[8] The difference was small (0.6%), however, with a number of 166 needed to harm.[8] In North Carolina, patients with acute ischemic stroke admitted on weekends wait longer to undergo a CT scan.[9]

In Virginia, weekend patients with stroke are more likely to receive tissue plasminogen activator, albeit with no improvement in mortality.[10] In a study of 2 comprehensive stroke centers, there was no difference in discharge disposition, discharge, or 90-day modified Rankin score or 90-day mortality between patients with stroke admitted on weekends compared with weekdays.[11]

Received May 19, 2010; final revision received June 19, 2010; accepted June 30, 2010.

From the Departments of Neurosurgery (B.L.H., J.M.), Epidemiology and Health Policy Research (Y.-Y.C.), and Neurology and Neuroscience (M.F.W.), University of Florida, Gainesville, Fla; and the Neurosurgical Service (F.G.B.), Massachusetts General Hospital, Boston, Mass.

Correspondence to Brian L. Hoh, MD, Department of Neurological Surgery, University of Florida, PO Box 100265, Gainesville, FL 32610. E-mail brian.hoh@neurosurgery.ufl.edu

Stroke **is available at http://stroke.ahajournals.org** **DOI: 10.1161/STROKEAHA.110.591081**