

9-2009

# Pilot study of the characteristics of acute stroke events in patients discharged from the Carolina University Hospital, Puerto Rico in 2007

Juan Carlos Zevallos  
*University of Puerto Rico*

Juan Gonzalez  
*University of Puerto Rico*

Fernando Santiago  
*University of Puerto Rico*

*See next page for additional authors*

Follow this and additional works at: [http://escholarship.umassmed.edu/qhs\\_pp](http://escholarship.umassmed.edu/qhs_pp)

 Part of the [Biostatistics Commons](#), [Epidemiology Commons](#), and the [Health Services Research Commons](#)

## Repository Citation

Zevallos, Juan Carlos; Gonzalez, Juan; Santiago, Fernando; Rodriguez, Rafael; Rivera, Ada; Garcia, Ana Michelle; Flecha, Felixa; Colon, Marielys; and Yarzebski, Jorge L., "Pilot study of the characteristics of acute stroke events in patients discharged from the Carolina University Hospital, Puerto Rico in 2007" (2009). *Quantitative Health Sciences Publications and Presentations*. Paper 769. [http://escholarship.umassmed.edu/qhs\\_pp/769](http://escholarship.umassmed.edu/qhs_pp/769)

---

# Pilot study of the characteristics of acute stroke events in patients discharged from the Carolina University Hospital, Puerto Rico in 2007

## **Authors**

Juan Carlos Zevallos, Juan Gonzalez, Fernando Santiago, Rafael Rodriguez, Ada Rivera, Ana Michelle Garcia, Felix Flecha, Marielys Colon, and Jorge L. Yarzebski

## **Rights and Permissions**

Citation: Bol Asoc Med P R. 2009 Jul-Sep;101(3):11-3. [Link to article on publisher's site](#)

# Pilot Study Of The Characteristics Of Acute Stroke Events In Patients Discharged From The Carolina University Hospital, Puerto Rico In 2007

Juan Carlos Zevallos MD\*  
Juan Gonzalez MD\*\*  
Fernando Santiago MD‡  
Rafael Rodríguez MD£  
Ada Rivera MD\*  
Ana Michelle García MD\*  
Felixa Flecha MPH\*  
Marielys Colón BS\*  
Jorge Yarzebski MD, MPH §

From the \* Office of Clinical Research, Endowed Health Services Research Center , \*\*Department of Emergency Medicine, ‡ Department of Neurology, £ Department of Neurosurgery, University of Puerto Rico, Medical Science Campus, School of Medicine, San Juan, PR, and § University of Massachusetts Medical School, Worcester, MA, USA  
Address reprints requests to: Juan Carlos Zevallos MD, Office of Clinical Research, Endowed Health Services Research Center, Floor 8, Office 829 P.O. Box 365067, San Juan, PR 00936-5067. Email: juan.zevallos@upr.edu

## INTRODUCTION

According to the World Health Organization, around 15 million people suffer stroke worldwide each year (1). Stroke is the third leading cause of death in Puerto Rico (2) and is the leading cause of serious disability in the United States (3). The outrageous prevalence and neurological and functional deficits associated with acute stroke impose significant burden on patients, their families, and the health care system (4-6). Despite the awareness of the significant population and individual impact of stroke, and the importance of monitoring changing patterns of care and trends in stroke magnitude, hospital, and long-term outcomes to provide health policy makers and advocates the evidence for enhanced stroke prevention, the epidemiology of acute stroke and related consequences are not well described. In the other hand, the evidence-based interventions aimed to reduce the devastating consequences of an acute stroke event after the onset of symptoms are highly time sensitive.

## ABSTRACT

*Background: Stroke is the third leading cause of death in Puerto Rico. We examined the pre-hospital phase, management and case-fatality-rates (CFR) of patients discharged with acute stroke from the Carolina University of Puerto Rico Hospital during 2007. Methods: Trained personnel collected information on demographics, delay-time, mode-of-transportation, management, and mortality from all medical records. STATA<sup>®</sup> was utilized to conduct univariate comparison of demographics, mode-of-transportation, therapeutics and diagnostic characteristics. Logistic regression analysis assessed cohort effect and controlled for confounders. Results: The average age was 69.1 years, and 53% were males. The average delay between onset of symptoms suggestive of stroke and arrival at the emergency department was 4.5 hours. Only 62% of patients utilized Emergency Medical Services (EMS). Intravenous thrombolysis was not administered. Stroke mortality increased with age. Ischemic vs. hemorrhagic CFR was significantly higher (63.9% vs. 36.1%;  $p=0.034$ ). Conclusions: These findings highlight the potential benefit of evidence-based therapeutics and EMS use among stroke patients.*

*Index words: pilot, study, acute, stroke, Carolina, University, Hospital, 2007*

Intravenous administration of recombinant tissue plasminogen activator (r-TPA) has clinical benefits for patients with acute ischemic stroke if begins within 3 hours of symptom onset. For hemorrhagic stroke, immediate surgery is crucial to avoid re-bleeding that result in serious disability or death (7). A Healthy People 2010 objective is to increase to 83% the proportion of persons who are aware of the warning symptoms of stroke and the need to telephone 9-1-1 immediately if someone appears to be having a stroke.

## OBJECTIVES

To examine the demographic characteristics of patients discharged with diagnosis of acute stroke, and to assess the pre-hospital, in-hospitals and discharge status of patients admitted with acute strokes at the Carolina University Hospital (CUH), a University of Puerto Rico Hospital located in Carolina, Puerto Rico, during a full calendar year.

## METHODS

### Pre-hospital phase

Trained study personnel utilized a validated data abstraction form to collect information from medical records of men and women of all ages discharged from CUH with an independently confirmed principal diagnosis of acute stroke (ICD-9 codes 430-438) from January 1 to December 31, 2007.

Information was obtained on the delivered quality of care by characterizing and describing differences in, and relationships between, patient demographics, treatment practices, and status at discharge. The data abstraction form was originally developed by researchers at the University of Massachusetts Medical School and adapted locally. We also assessed the duration of pre-hospital delay after the onset of acute stroke related symptoms, the relationship between extent of pre-

hospital delay to the receipt of various medical therapies and cerebral reperfusion strategies, Emergency Medical Services (EMS) data (including mode of transportation).

#### In-hospital phase

During hospitalization, we collected information about Emergency Department (ED) admission findings, first Glasgow Coma Scale Score assessment (a neurological scale basically used to assess level of consciousness after brain injury), the use of evidence-based practices, including selected oral medication and the administration of intravenous thrombolytic therapy (r-TPA). We also collected information on the utilization of various hospital diagnostic procedures and on the initiation of risk factor/behavioral interventions (secondary prevention measures).

#### Mortality

Case-fatality-rate was defined as the percentage of fatalities occurring from the time of admission to the time of discharge. The statistical software package STATA v. 10 (9) was utilized to calculate descriptive statistics and univariate comparison of demographics, health insurance coverage, mode-of-transportation, management and therapeutics and diagnostic characteristics of the study population. The probability of dying (adjusted Odds Ratio) during the hospitalization based on the type of stroke (ischemic or hemorrhagic) was calculated utilizing a logistic regression model adjusted by age, sex, marital status, and health insurance coverage.

## RESULTS

Demographics are presented on Table I. From January 1, 2007 to December 31, 2007, there were 249 validated cases of acute stroke (ICD-9 codes 430 – 438) discharged from the CUH. The proportion of males suffering from an acute stroke event (53.4%) was slightly higher than females. Although the overall average age was close to 70 years, it varied from 21 years to 93 years with males being older than females (71.4 years old vs. 53.9 years old). Stroke cases increased with age (from 21.1% in the age group younger than 59 years old to 39.5% in those >60 years old). The vast majority of the study population was Hispanic and only four out of ten were married. Almost half of the population was covered by a private health insurance plan and approximately one fifth of the patients discharged with a diagnosis of acute stroke were uninsured. We were unable to ascertain the type of health insurance plan on 16/249 of the patients. Approximately 40% of patients did not use the EMS.

Stroke Characteristics are presented in table II. Most of the patients (23/26) were transferred to the Puerto Rico Medical Center, which is a supra-tertiary referral hospital located at approximately 12 miles from the CUH, and had a hemorrhagic stroke (21/25). The most commonly estimated times of stroke occurrence were: overnight 48%, and from 6:00 AM – noon 25%. Ischemic stroke was the most common stroke type (79%) and patients with ischemic stroke were 3 times more likely to die during hospitalization in comparison with those patients with an hemorrhagic stroke (adjusted OR = 3.0 (.95 CI= 1.29 – 7.0)). CT-scanning was the most common diagnosis procedure utilized in 98% of the patients. The majority of patients were assessed for rehabilitation services. The overall CFR was 15.2%, and females showed a slightly higher (57.9 %) in-hospital mortality rate than males (42.1%),

although this difference was not statistically significant ( $p=0.104$ ).

Table I. Demographics: Patients Discharged with Stroke Diagnoses, Carolina University Hospital, 2007

Characteristic	N (%)
Males	132 (53.0)
Age (years)	
Mean (+/- SD)	69.1 (15.5)
< 35	6 (2.4)
35-44	11 (4.5)
45-54	33 (13.4)
55-64	40 (16.2)
65-74	48 (19.4)
75-84	66 (26.7)
85+	43 (17.4)
Ethnicity	
Hispanic/Latino	220 (88.4)
Marital Status	
Married	97 (39.0)
Health Insurance Plan	
'Reforma'*	59 (23.7)
Medicare	10 (4.0)
Private Plan	119 (47.8)
Uninsured	45 (18.1)
Unknown/Not mentioned	16 (6.4)

\*Reforma is the state government-sponsored health insurance plan

Table II. Stroke Characteristics: Patients Discharged with Stroke Diagnoses, Carolina University Hospital, 2007

Characteristic	N/Total (%)
<b>Transfer Status</b>	
From another hospital	37/249 (14.9)
To another hospital	27/249 (10.9)
To PR Medical Center	24/27 (85.7)
<b>Principal Diagnosis at Discharge (ICD-9)</b>	
430.00 Subarachnoid hemorrhage	8 (3.2)
431.00 Intracerebral hemorrhage	45 (18.2)
432.00 – 432.90 Other Intracerebral hemorrhage	2 (0.8)
434.00 – 434.90 Occlusion of cerebral arteries	190 (76.9)
436.00 Acute, but ill-defined cerebrovascular disease	2 (0.8)
437.00 – 437.90 Other, but ill-defined cerebrovascular disease	2 (0.8)
<b>Mode-of-transportation</b>	
EMS/helicopter	135/217 (62.2)
<b>Estimated Time of occurrence</b>	
6:00 AM – 11:59 AM	48/192 (25.0)
Noon – 5:59 PM	20/192 (10.4)
6:00 PM – 11:59 PM	14/192 (7.3)
Overnight (awoke with deficits)	92/192 (48.0)
<b>Glasgow Comma Scale</b>	
Mean score and range	13.2 (3 – 15)
<b>Stroke Type (Final Diagnosis)</b>	
Ischemic	188 (79.0)
Hemorrhagic	48 (20.2)
Subdural hematoma	2 (0.8)

## LIMITATIONS

This study has at least the following limitations: 1) the data was collected by mean of a retrospective review of medical records; 2) information on medical records relies on the type of information recorded during hospitalizations; 3) missing (not recorded) information may affect study results. For example, 6.4% of records did not have information on health insurance coverage.

This initial pilot study phase will serve as the foundation for developing long-term surveillance (The Puerto Rico Stroke Surveillance System) to examine changing trends in stroke magnitude management, and short and long outcomes in patients hospitalized in all fourteen hospitals that provide emergency care within the SJMA.

## DISCUSSION

The proportion of cases defined as uninsured (18.1%) was higher than the average statewide figure reported by the Behavioral Risk Factor Surveillance System (BRFSS) (10) for Puerto Rico (91.7%, .95CI = 90.5 – 92.9).

Our findings emphasize the importance to improve at least three crucial factors related to the prognosis of patients suffering an acute stroke event, a) early recognition of acute stroke symptoms; b) prompt call to EMS and immediate transportation to a health care facility; and c) administration of evidence-based treatment, including r-TPA or surgery. However, none of the evidence-treatment options were available at CUH during the study period. The high proportion of ischemic stroke events may be explained by the fact that hemorrhagic strokes are transported directly to the supratertiary facility (PR Medical Center). Unfortunately, the CUH did not offer intravenous thrombolysis or surgery during the study period. Secondary preventive measures such as anti-tobacco counseling or reducing weight and increasing physical activity were extremely limited, and offer a great opportunity for education enhancement to health providers.

## RESUMEN

**Introducción:** Los ataques cerebrales constituyen la tercera causa de muerte en Puerto Rico. El estudio examina la fase pre-hospitalaria, manejo y mortalidad hospitalaria de pacientes egresados con ataque cerebral del Hospital Universitario de Carolina-Puerto Rico durante el 2007. **Métodos:** Personal entrenado recolectó información demográfica, tiempo de retraso, tipo de transportación, manejo y mortalidad de todos los récords médicos. STATA<sup>®</sup> se utilizó para análisis estadístico de variables demográficas, transportación, terapéuticas y características diagnósticas. El análisis de regresión logística se utilizó para evaluar el efecto de cohorte y para controlar por variables confusas. **Resultados:** La edad promedio fue 69.1 años, y 53% fueron hombres. El promedio de retraso entre el apareamiento de síntomas sugestivos de ataque cerebral y arribo al departamento de emergencia fue de 4.5 horas. Sólo 62% de los pacientes utilizaron el sistema de transporte de emergencia (EMS). No se administró trombolisis endovenosa. La mortalidad aumentó con la edad y fue mayor en ataques isquémicos vs. hemorrágicos, (63.9% vs. 36.1%,  $p=0.034$ ). **Conclusiones:** Estos resultados realzan el beneficio potencial de las terapias basadas en evidencias y el uso de EMS en pacientes con ataque cerebral.

Table III. In-hospital Management, Evidence-based Preventive Measures and Case-fatality-rates: Patients Discharged with Stroke Diagnoses, Carolina University Hospital, 2007

	N (%)
<b>Most Common Hospital Procedures</b>	
Angiography	7/249 (2.9%)
Carotid Doppler	82/249 (33.0%)
CT-scan	2 4 5 / 2 4 9
(98.4%)	
Electroencephalogram	66/249 (26.5%)
Examination of CFS fluid	3/249 (1.2%)
MRI	26/249 (10.5%)
Assessed for rehabilitation services	142/249 (57.1)
<b>Preventive Measures</b>	
Anti-smoking counseling	192/247 (77.8)
Reducing weight/increasing physical activity recommendations	29/247 (11.8)
Stroke education	4/247 (1.7)
<b>Hospital Medication at discharge</b>	
Ace Inhibitor	100/247 (40.5)
Aspirin	49/247 (19.7)
Beta blockers	67/247 (27.2)
Lipid lowering agents	88/247 (35.7)
<b>Mortality</b>	
Case-fatality-rate*	38 (15.3)
Females	22 (57.9)

\*Case-fatality-rate = proportion of fatalities occurring from the time of admission to the time of discharge.

## REFERENCES

1. World Health Report, 2002: <http://www.who.int/whr/2002/en/>. Accessed July, 2009.
2. Puerto Rico Department of Health. <http://www.salud.gov.pr>
3. American Heart Association. Heart Disease and Stroke Statistics-2009 Update. A Report From the American Heart Association Statistics Committee and Stroke Statistics Subcommittee. *Circulation*. 2009;119:e21-e181
4. United States Stroke Statistics. <http://www.strokecenter.org/patients/stats.htm> Accessed July, 2009.
5. Flynn RW, MacWalter RS, Doney AS The cost of cerebral ischemia. *Neuropharmacology*. 2008 Sep;55(3):250-6. Epub 2008 Jun 5. Review.
6. Feigin VL, Lawes CM, Bennett DA, Anderson CS Stroke epidemiology: a review of population-based studies of incidence, prevalence, and case-fatality in the late 20th century *Lancet Neurol*. 2003 Jan;2(1):43-53
7. Hacke W, Donnan G, Fieschi C, et al. Association of outcome with early stroke treatment pooled analysis of ATLANTIS, ECASS, and NINDS rt-PA stroke trials. *Lancet* 2004;363:768-74.
8. Saposnik G, Hill MD, O'Donnell M, Fang J, Hachinski V, Kapral MK, Registry of the Canadian Stroke Network for the Stroke Outcome Research Canada (SORCan) Working Group. Variables associated with 7-day, 30-day, and 1-year fatality after ischemic stroke. *Stroke* 2008 Aug;39(8):2318-24 Epub 2008 Jun 19.
9. STATA: Statistical package version 10. College Station: <http://www.stata.com/>
10. Centers for Disease Control and Prevention (CDC). Behavioral Risk Factor Surveillance System Survey Data. Atlanta, Georgia: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, Puerto Rico, 2008.