Pregnancy-Associated Stroke: Patient Characteristics, Risk Factors and Short-Term Outcomes

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Disclosures

Get With The Guidelines® - Stroke Registry:

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Outline: Pregnancy-Related Stroke

- Background

- Prior Research

- GWTG-Stroke
  - Overview
    - Stroke subtype analysis
    - Ischemic stroke therapy
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Stroke is a catastrophic event in pregnancy and postpartum period, associated with significant morbidity and mortality.

Residual deficits can impact quality of life and decisions about future pregnancies.

Pregnant women are generally healthy, which can obscure timely stroke diagnosis.

Pregnant women are excluded from studies related to stroke therapy.
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## Prior Research: Major Case Series

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Prior Research: Nationwide Inpatient Sample

- Largest inpatient payer-based patient database; 20% of nonfederal community hospitals
- N=2,850 pregnancy-related discharges
  - Stroke rate: 34.2/10,000 deliveries (2000-01)
- African American women and women > 35 years were at ↑ risk
- Stroke-associated medical conditions:
  - Migraine: OR = 16.9 (95% CI: 9.7-29.5)
  - Thrombophilia: OR =16.0 (9.4-27.2)
  - Heart disease: OR = 13.2 (10.2-17.0)
  - Hypertension: OR = 6.1 (4.5-8.1)
- Complications of pregnancy are significant risk factors for stroke:
  - Postpartum infection: OR = 25.0 (95% CI: 18.3-34.0)
  - Transfusion: OR = 10.3 (7.1-15.1)
  - Gestational hypertension: OR = 4.4 (3.6-5.4)
  - Postpartum hemorrhage: OR = 1.8 (1.2-2.8)

Prior Research: UK Obstetric Surveillance System

- 30 cases antenatal stroke in 1,958,203 delivering women (2007-2010)
  - Incidence: 1.5 cases per 100,000 delivering women
- Poor outcomes are more frequent than previously thought:
  - 30% of survivors discharged to another facility
  - 45% survivors had significant disability at discharge
- Significant variation in the use of pharmacologic, surgical and organized stroke unit care:
  - 20% admitted to acute stroke unit
  - 67% received aspirin
  - 42% received anticoagulant
  - 0% received thrombolysis
Prior Research: Confidential Enquiries into Maternal Deaths

- Retrospective study (1979-2008)
  - 347 stroke deaths/
    21,514,457 total
    maternities
  - 1.6 stroke deaths /100,000
    maternities
- 1 in 7 maternal deaths due to
  stroke
- Within ICH, many are associated
  with preeclampsia/ eclampsia
- Sub-standard care with poor
  management of dangerously
  high systolic BP

- Retrospective review of 28 patients
  - 92% were HS; >50% antepartum

- Emphasis on the association between stroke and severe SBP (155-160 mmHg) rather than severe DBP in preeclampsia/eclampsia
  - Pre-stroke BP:
    - SBP > 155 mmHg in 100% of patients
    - DBP >110 mmHg in 12.5% of patients

- Post-stroke mean BP were significantly higher than pre-stroke values

- Maternal mortality was 53.6%
N=10,378 delivery hospitalizations

Incidence of pregnancy-related stroke is low, but the prevalence is ↑:
- 47% for antenatal hospitalizations: 0.15 to 0.22 per 1,000 deliveries
- 83% for postpartum hospitalizations: 0.12 to 0.22 per 1,000 deliveries
- No change for delivery hospitalizations: 0.27 per 1,000 deliveries

These trends are largely driven by the concomitant prevalence changes in hypertensive disorders of pregnancy and heart disease.

Prior Research: Nationwide Inpatient Sample

Trends in Pregnancy Hospitalizations That Included a Stroke in the United States From 1994 to 2007: Reasons for Concern?
Elena V. Kuklina, Xin Tong, Pooja Bansil, Mary G. George and William M. Callaghan

*Stroke* 2011, 42:2564-2570: originally published online July 28, 2011
doi: 10.1161/STROKEAHA.110.610592
## Hypertension in Pregnancy: ACOG Guidelines

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<th>Modification</th>
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<tr>
<td>Early recognition?</td>
<td>Yes</td>
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<tr>
<td>Definition of severe PE: Proteinuria?</td>
<td>Not necessary</td>
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<tr>
<td>Definition: Mild preeclampsia?</td>
<td>N/A</td>
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<tr>
<td>Treatment of moderate hypertension (&lt;160/110 mmHg)?</td>
<td>No</td>
</tr>
<tr>
<td>BP monitoring postpartum?</td>
<td>PPD# 1, 3, 7-10</td>
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Severe Hypertension should be treated in pregnancy (Class 1 recommendation; level of evidence: A)

“The goal of BP management in pregnancy is to maintain systolic BP between 130 and 155 mm Hg and diastolic BP between 80 and 105 mm Hg, with lower target ranges in the context of co-morbidity”
Nationwide Inpatient Sample - Pregnancy Related Stroke: Aims

- To evaluate trends and associated stroke risk and complications of stroke in pregnant women with and without hypertensive disorders of pregnancy
Nationwide Inpatient Sample: Methods

- Cross-sectional study
- 81,983,216 pregnancy hospitalizations from 1994-2011
- Rates of stroke hospitalizations with and without these hypertensive disorders of pregnancy per 10,000 pregnancy hospitalizations
- Adjusted odds ratios (aOR) with 95% confidence intervals (95% CI) were obtained using logistic regression
Study Population:
- Stroke with HDP (n = 9,890)
- Stroke without HDP (n = 21,783)
- HDP without stroke (n = 6,176,848)
- No HDP and no stroke (n = 75,774,695)
Trends in stroke hospitalizations in pregnancy, with and without HDP, in the United States, 1994–2011 (N=31,673). Stroke includes ICH, SAH, IS, TIA, iatrogenic stroke, and unspecified PRS.
Nationwide Inpatient Sample: Results

62% rate of PRS overall

102% rate of PRS with HDP

Hypertensive Disorders of Pregnancy and Stroke Risk Factors

PPH
1.3 (1.04 - 1.7)*

SCA
1.6 (1.1 - 2.3)*

Valve disorders
2.8 (2.1 - 3.6)*

Migraine
4.5 (3.4 - 5.9)*

Congenital coagulation defects
2.7 (1.8 - 3.9)*

SLE
2.9 (1.9 - 4.3)*

AF
8.1 (4.4 - 14.9)*

CHD
13.1 (9.1 - 18.9)*

* aOR (95% CI)

Hypertensive Disorders of Pregnancy and Complications

aOR (95% CI):

- Mechanical ventilation: 1.9 (1.6-2.2)
- Pneumonia: 1.8 (1.3 -2.5)
- Seizure: 1.3 (1.1 -1.6)
- Died during hospitalization: 1.3 (1.02-1.6)
- Prolonged hospital stay: 1.2 (1.1 -1.4)
- Non-routine discharge: 1.2 (1.1 -1.4)
- Percutaneous gastrostomy tube: 1.1 (0.6-1.7)
- Temporary tracheostomy: 0.8 (0.4-1.3)
Nationwide Inpatient Sample: Conclusions

- **↑** HDP stroke rate **103%** (0.8 to 1.6 per 10,000 pregnancy hospitalizations) vs. **47%** (2.2 to 3.2 per 10,000 pregnancy hospitalizations) without this disorder.
  - Only partially explained by changing trends in common risk factors (e.g. advanced maternal age, heart disease, HDP, other comorbid maternal conditions)

- Women with HDP were **5X** more likely to have a stroke than those without

- Having traditional stroke risk factors substantially **↑** the stroke risk among HDP hospitalizations

- Stroke related complications were increased in stroke with HDP compared with those without

Nationwide Inpatient Sample: Limitations

- Inherent to this administrative database:
  - ICD-9 billing codes
  - Missing information: HELLP and race
  - Lack of clinical detail

- Unmeasured effects of improved diagnostics for stroke

- Study design does not permit causality; hypothesis generating
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GWTG-Stroke Analysis
Questions