Outline

• How much are we affected?
  • Where do we stand compared to others?
    • Stroke & Stroke-related Risk Factors

• What has been done and achieved?

• Areas for improvement
Types of Stroke, GCASR Admissions, 2017

- Ischemic Stroke: 71%
- Transient Ischemic Attack: 14%
- Subarachnoid Hemorrhage: 3%
- Intracerebral Hemorrhage: 11%
- Non-Specific Stroke: 1%
Major Modifiable Risk Factors

- Uncontrolled hypertension
- High blood cholesterol level
- Diabetes mellitus
- Atrial fibrillation
- Obesity
- Smoking
- Lack of physical activity

Definition of Ideal Cardiovascular Health

<table>
<thead>
<tr>
<th>Metric</th>
<th>Goal: Ideal Cardiovascular Health Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Smoking</td>
<td>Never or quit &gt; 12 month ago</td>
</tr>
<tr>
<td>Body mass index</td>
<td>&lt; 25 kg/m²</td>
</tr>
<tr>
<td>Physical activity</td>
<td>&gt; 150 min/week moderate intensity, or</td>
</tr>
<tr>
<td></td>
<td>&gt; 75 min/week vigorous intensity, or</td>
</tr>
<tr>
<td></td>
<td>Combination</td>
</tr>
<tr>
<td>Total cholesterol</td>
<td>&lt; 200 mg/dL†</td>
</tr>
<tr>
<td>Blood pressure</td>
<td>&lt; 120/80 mm Hg†</td>
</tr>
<tr>
<td>Fasting plasma glucose</td>
<td>&lt; 100 mg/dL†</td>
</tr>
<tr>
<td>Healthy diet score</td>
<td>4–5 Components*</td>
</tr>
</tbody>
</table>

MORATLITY
Stroke Belt

Stroke Death Rates, 2014 - 2016
Adults, Ages 35+, by County

Rates are spatially smoothed to enhance the stability of rates in counties with small populations.

Data Source:
National Vital Statistics System
National Center for Health Statistics
Mortality

• ~ 4,400 died from stroke in 2017

• the 5th leading cause of death among adults >45 years

• Georgia ranks 7th in AAMR among the 50 states
Age-adjusted Mortality Rate among Adults 45 years and Older by Calendar year, Georgia 1999–2017

Source: wonder.cdc.gov
Age-adjusted Mortality Rate among Adults 45 years and Older by Calendar year

Source: wonder.cdc.gov
Age-adjusted Mortality Rate among Adults 45 years and Older by Calendar year

Source: wonder.cdc.gov
Population Distribution by Age and Sex, 2017

Georgia

New York

Source: census.gov
# Demographic Distribution of the Population

## Demographic Group New York Georgia

<table>
<thead>
<tr>
<th>Demographic Group</th>
<th>New York</th>
<th>Georgia</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>48.6%</td>
<td>48.7%</td>
</tr>
<tr>
<td>Female</td>
<td>51.4%</td>
<td>51.3%</td>
</tr>
<tr>
<td>White</td>
<td>55.28%</td>
<td>52.80%</td>
</tr>
<tr>
<td>Black</td>
<td>14.56%</td>
<td>31.33%</td>
</tr>
<tr>
<td>American Indian Alaskan Native</td>
<td>0.29%</td>
<td>0.23%</td>
</tr>
<tr>
<td>Asian</td>
<td>8.89%</td>
<td>4.13%</td>
</tr>
<tr>
<td>Native Hawaiian and Other Pacific Islander</td>
<td>0.04%</td>
<td>0.06%</td>
</tr>
<tr>
<td>Hispanic</td>
<td>19.20%</td>
<td>9.65%</td>
</tr>
<tr>
<td>Multiracial</td>
<td>1.74%</td>
<td>1.80%</td>
</tr>
</tbody>
</table>

Source: census.gov

---

## Age-adjusted Stroke Mortality* in Georgia and New York States in 2017

<table>
<thead>
<tr>
<th>Group</th>
<th>Georgia</th>
<th>New York</th>
</tr>
</thead>
<tbody>
<tr>
<td>NH Blacks</td>
<td>145.1</td>
<td>78.6</td>
</tr>
<tr>
<td>NH Whites</td>
<td>116.6</td>
<td>68.1</td>
</tr>
<tr>
<td>Hispanics</td>
<td>55.5</td>
<td>59.4</td>
</tr>
</tbody>
</table>

*: per 100,000 population
Trend in Age-adjusted Stroke Mortality Rate by Race and Gender group, Georgia 2000–2016
Age-adjusted Annual Stroke Mortality Rates by Race, Sex and Geographic Location, Georgia 2012–2016

<table>
<thead>
<tr>
<th>Gender</th>
<th>Race-Ethnicity</th>
<th>Non-Rural</th>
<th>Rural</th>
</tr>
</thead>
<tbody>
<tr>
<td>MALE</td>
<td>Non-Hispanic Blacks</td>
<td>157.5</td>
<td>174.6</td>
</tr>
<tr>
<td></td>
<td>Non-Hispanic Whites</td>
<td>102.9</td>
<td>109.0</td>
</tr>
<tr>
<td>FEMALE</td>
<td>Non-Hispanic Blacks</td>
<td>126.9</td>
<td>140.9</td>
</tr>
<tr>
<td></td>
<td>Non-Hispanic Whites</td>
<td>105.4</td>
<td>116.4</td>
</tr>
</tbody>
</table>
MORBIDITY
Age-adjusted Hospitalization Rate Among Adults 45 Years and Older by Year, Georgia 2007-2016

The chart shows the age-adjusted hospitalization rate per 100,000 adults 45 years and older in Georgia from 2007 to 2016. The rate starts at 566 in 2007 and decreases to 485 in 2016.
Age-adjusted Hospitalization and Mortality Rate Among Adult Georgians 45 Years and Older
Trend in Age-adjusted Stroke Hospitalization Rate by Race and Gender group, Georgia 2000–2016

- **NH White Female**
- **NH Black Female**

- **NH White Male**
- **NH Black Male**
Age-adjusted Annual Stroke Hospitalization Rate Among Adults 45 Years and Older by Demographic Characteristics, Georgia 2012-2016
Age-adjusted Annual Stroke Hospitalization Rate Among Adults 45 Years and Older by Geographic Location, Race, and Gender, Georgia Hospital Discharge data, 2012-2016
DISABILITY
Disability

• 70% of stroke patients develop some form of disability\textsuperscript{1}
• ~3.4% adult Georgians (N=259,246) are Stroke survivors
• Based on 2016 Georgia BRFSS, among stroke survivors
  • 49.7% have limitation of activity due to health problems
  • 38.7% use special equipment to conduct their daily life

\textit{Stroke} 2005, 36:e100-e143
Prevalence of Stroke Survivors and Activity Limitation due to Health Problems among Georgia Stroke Survivors, BRFSS 2012-2016

Limitation of Activity

Stroke Survivors
MAJOR MODIFIABLE RISK FACTORS
Prevalence of Risk Factors Among Adult Georgians, Georgia Stroke Survivors, and U.S., BRFSS 2016*§

- Overall Adult Georgians have a high prevalence of Stroke risk factors

*: Prevalence of Hypertension and high cholesterol level were determined based on the 2015 Georgia BRFSS data
§: a person is physical inactive if he or she didn’t do any physical activity or exercise during the past 30 days other than their regular job
Obese: Body mass index 30 or greater

- Overall Adult Georgians have a high prevalence of Stroke risk factors
- Stroke patients in Georgia have much higher risk factors than the average adult Georgian and U.S. Adult.

<table>
<thead>
<tr>
<th>Risk Factor</th>
<th>GA Stroke Survivors</th>
<th>Georgia</th>
<th>U.S.A.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hypertension</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High cholesterol</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diabetes mellitus</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Obesity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physical inactivity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Smoking</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*: Prevalence of Hypertension and high cholesterol level were determined based on the 2015 Georgia BRFSS data
§: a person is physical inactive if he or she didn’t do any physical activity or exercise during the past 30 days other than their regular job
Obese: Body mass index 30 or greater
**Estimated Number of Georgians Affected by Stroke and Stroke-related Chronic Conditions and Risk Factors**

<table>
<thead>
<tr>
<th>Disease/Risk Factor</th>
<th>Prevalence</th>
<th>Estimated Population</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Percent</td>
<td>95% CI</td>
</tr>
<tr>
<td>Stroke</td>
<td>3.4</td>
<td>(3.2, 3.7)</td>
</tr>
<tr>
<td>Hypertension</td>
<td>34.2</td>
<td>(33.4, 34.9)</td>
</tr>
<tr>
<td>Diabetes</td>
<td>11.1</td>
<td>(10.7, 11.6)</td>
</tr>
<tr>
<td>CHD or MI</td>
<td>6.5</td>
<td>(6.2, 6.9)</td>
</tr>
<tr>
<td>Obesity</td>
<td>30.4</td>
<td>(29.7, 31.2)</td>
</tr>
<tr>
<td>High Cholesterol</td>
<td>35.5</td>
<td>(34.7, 36.3)</td>
</tr>
<tr>
<td>Smoking</td>
<td>18.4</td>
<td>(17.8, 19.1)</td>
</tr>
<tr>
<td>Physical Inactivity</td>
<td>26.2</td>
<td>(25.5, 26.9)</td>
</tr>
</tbody>
</table>
**Prevalence of Risk Factors among Adult Georgians, BRFSS 2016**

**Diabetes mellitus**

**Obesity**

- **HP2020 target (30.5%)**
Prevalence of Risk Factors among Adult Georgians, BRFSS 2015

Hypertension

High Cholesterol

HP2020 target (26.9%)
Prevalence of Cigarette Smoking among Adult Georgians, BRFSS 2016

Smoking

Prevalence (%)

Male Female 18-<45 Yrs 45-<65 Yrs 65+ Yrs Non-Hispanic White Non-Hispanic Black Other Less than $15,000 $15,000-$24,999 $25,000-$49,999 $50,000-$74,999 Less than High School High School Graduate Some College

No Leisure Time Physical Activity

Percent

Male Female 18-<45 Yrs 45-<65 Yrs 65+ Yrs Non-Hispanic White Non-Hispanic Black Other Less than $15,000 $15,000-$24,999 $25,000-$49,999 $50,000-$74,999 $75,000+ Less than High School High School Graduate Some College

HP2020 target (12%)
Prevalence of Stroke Survivors among Adult Georgians, BRFSS 2016
GEORGIA COVERDELL ACUTE STROKE REGISTRY
Georgia Coverdell Acute Stroke Registry

Objectives
- Prevent stroke death, disability and recurrence
- Reduce stroke morbidity in Georgia

Approach
- Monitor quality of stroke care: pre-hospital, in-hospital and post-hospital
- Data-driven quality improvement through collaborative efforts
## GCASR REACH: Pre-hospital & In-Hospital Care

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of EMS Agency Participating</th>
<th>Georgians Transported with Presumed Stroke</th>
<th>Number of Hospitals Enrolled</th>
<th>Georgians’ Hospital Visit for Acute Stroke</th>
</tr>
</thead>
<tbody>
<tr>
<td>2005</td>
<td></td>
<td></td>
<td>19</td>
<td>35%</td>
</tr>
<tr>
<td>2012</td>
<td>9</td>
<td>20%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2019</td>
<td>31</td>
<td>68%</td>
<td>81</td>
<td>94%</td>
</tr>
</tbody>
</table>
GCASR REACH: Pre-hospital & In-Hospital Care

- By Jan 2019
  - 81 Hospitals
  - 31 EMS Agencies
    - Participate in GCASR
GCASR: Improvements

IV Alteplase Among Ischemic Stroke Patients, GCASR 2008-2018

IV Alteplase Among Eligible Ischemic Stroke Patients Within 3 hours of Last Known Well Time, GCASR 2008-2018
GCASR: Improvements

Median Door-To-IV Alteplase Time Among Eligible Ischemic Stroke Patients, GCASR 2008-2018
Defect-free Care among Acute Stroke Patients, GCASR 2008-2018

Performance measures constituting Defect-free Care:
- A clot busting drug Alteplase intravenously
- Venous thromboembolism prophylaxis
- Dysphagia screening
- Antithrombotic medication in the first 48 hours
- Stroke education
- Smoking cessation counseling or treatment
- Rehabilitation assessment
- Lipid lowering medication
- Antithrombotic medication at discharge
- Anticoagulant medication for those with atrial fibrillation
GCASR: Improvements

NIH Stroke Scale Score Documentation for Ischemic Stroke Patients, GCASR 2008-2018

Last Known Well Time Documentation for Ischemic Stroke Patients, GCASR 2008-2018
AREAS FOR IMPROVEMENT
Areas for Improvement

Percent of Acute Stroke Patients Brought by EMS, GCASR, 2008-2018

Percent of Acute Stroke Patients Brought by EMS With Hospital Prenotification, GCASR 2008-2018
Areas for Improvement

Median Last Known Well to Hospital Arrival and Door-to-IV Alteplase Administration time Among Acute Ischemic Stroke Patients, GCASR 2008-2018
Areas for Improvement

IV Alteplase Administration among All Ischemic Stroke Patients, GCASR 2008-2017

- Non-Hispanic White
- Non-Hispanic Black
Areas Affected the Most

• Stroke morbidity and mortality
• Prevalence of stroke survivors
• Prevalence of stroke-related diseases and risk factors
  • Diabetes, Hypertension, CAD/MI, Obesity, High Cholesterol, Smoking, Physical Inactivity
• Socio-demographic indicators
  • Prevalence of adults
    • With annual household income less than $25,000
    • Who have not completed high school
Age-adjusted Annual Stroke Hospitalization and Mortality Rates among Adults 45 Years and Older by Public Health Districts, Georgia 2012-2016
Prevalence of Stroke and Stroke-related Risk Factors, Georgia BRFSS 2011-2017

Stroke

Hypertension

Diabetes
Prevalence of Stroke and Stroke-related Risk Factors, Georgia BRFSS 2011-2017

High Cholesterol

Obesity

Smoking
Prevalence of Stroke and Stroke-related Risk Factors, Georgia BRFSS 2011-2017

Physical Inactivity

Household Income <$25,000

High School Noncompletion
Public Health Districts Ranked* by Composite Index of Stroke-related Chronic Conditions and Socioeconomic Status, Georgia BRFSS 2011-2017

*Prevalence of stroke, hypertension, coronary artery disease or myocardial infarction, diabetes mellitus, high total cholesterol level, smoking, obesity, physical inactivity, high school non-completion and annual household income less than $25,000 USD are considered for ranking.

Source: Georgia Department of Public Health
Areas Affected the Most & GCASR Coverage
Summary

- Significant reduction in morbidity and mortality in the last 10-20 years but can be reduced further
- The decline in mortality has stopped/reversed?
- Southwest region of Georgia is most affected
- Quality of in-hospital stroke care has improved in GCASR-participating hospitals
- 45% of stroke patients are not using EMS
- Time between symptom onset and hospital arrival is increasing
Questions?

Thank YOU!