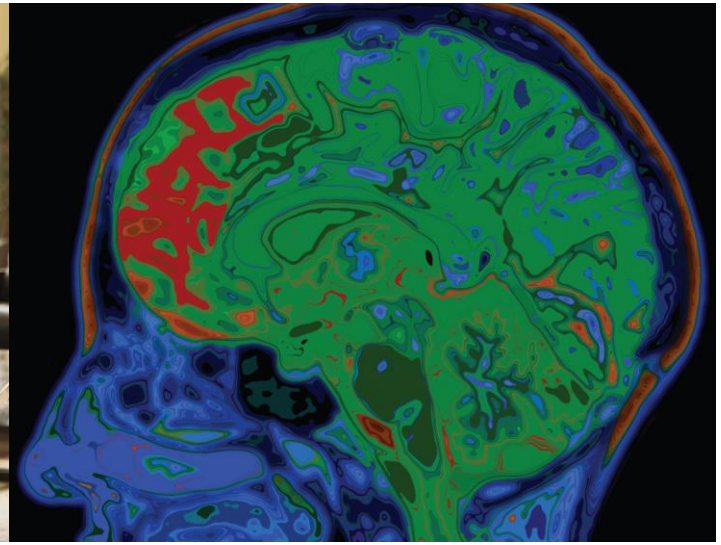
Mind Your Risks℠ to Preserve Brain Health



Walter J. Koroshetz, MD

Director, National Institute of Neurological Disorders and Stroke

National Institutes of Health

National Institute of Neurological Disorders and Stroke

U.S. Department of Health and Human Services
Centers for Disease Control and Prevention

Cerebrovascular Disease is on the Run: Let's Keep It That Way!

- **Stroke is the most evident consequence of cerebrovascular disease**
- **Annual stroke risks declined 70% over last 50 years**
  - Stroke dropped from the third to the fifth leading cause of mortality
  - Decline in stroke is attributed to control of known vascular risk factors

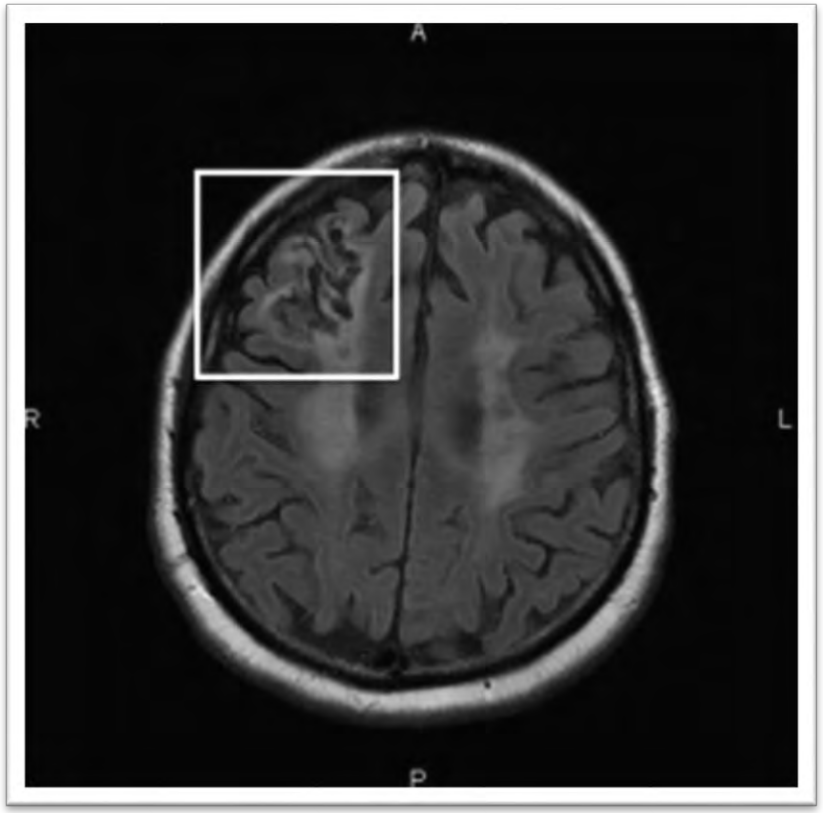
Stroke at a glance

- **Stroke is the 5th leading cause of death in the US**
- **795,000 people in the US experience a new or recurrent stroke each year**
- **1 out of every 3 stroke deaths could be prevented**
- **50 million stroke survivors world-wide cope with significant physical, cognitive and emotional deficits**
- **NIH spent $300 million on stroke research in 2014, with NINDS grants accounting for 2/3 of that total**

MMWR August 6, 1999.

Cerebrovascular Disease is on the Run: Let's Keep It That Way!

- **Hypertension is overwhelmingly the greatest cerebrovascular disease risk factor**
  - 1/3 of the US population over age 18 has hypertension
  - Only half of those with hypertension have BP controlled
  - Desired BP to prevent stroke is likely lower than 120/80
  - SPRINT, SPS3 and ACCORD studies all show decreased risk with BP lowering below 140/90
- **Increase in obesity rates threaten to erode the decline in stroke risk**



BP: Blood pressure
SPRINT: Systolic Blood Pressure Intervention Trial
SPS3: Secondary Prevention of Small Subcortical Strokes Trial
ACCORD: Action to Control Cardiovascular Risk in Diabetes

clinicaltrials.gov/ct2/show/NCT01206062
clinicaltrials.gov/ct2/show/NCT00059306
clinicaltrials.gov/ct2/show/NCT00000620

Tragic Disparities in Stroke in African Americans

- **Stroke risk in African Americans is coming down in parallel with Caucasians**
- **But … stroke and stroke mortality are still dramatically elevated in blacks, especially in middle aged black males**

wonder.cdc.gov/ucd-icd10.html

Mozzaffarian D, Benjamin EJ, Go AS, et al. *Circulation*. 2016.

Tragic Disparities in Stroke in African Americans

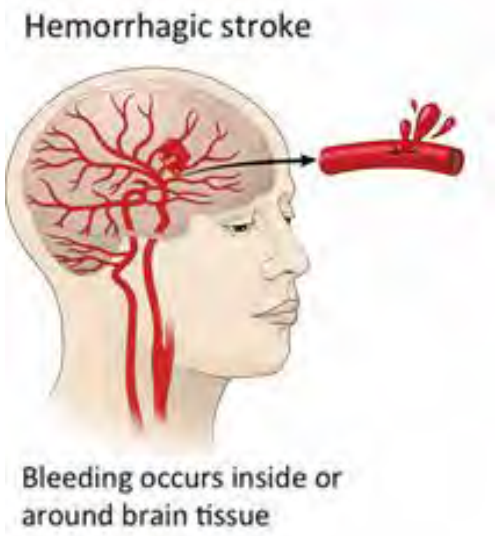
- **The Reasons for Geographic and Racial Disparities in Stroke (REGARDS) is a 30,000 person study**
  - 40% of the increased stroke risk in blacks can be explained by known risk factors
    - Half due to uncontrolled high blood pressure
  - The rest is unexplained
  - African Americans may have many fold higher stroke risk for every 10mm Hg elevation in BP as compared to Caucasians (24% vs. 8%)

BP: Blood pressure
regardsstudy.org/

The Disease Is CerebroVascular: Stroke and Impaired Brain Function Are the Consequences

➢ Clinical stroke

- Ischemic/Infarction
  - ❑ Embolism from cardiac or atherosclerotic source
  - ❑ Hypertensive small vessel disease in deep brain
  - ❑ Low flow stroke due to atherosclerotic cerebral vessel narrowing
- Hemorrhagic
  - ❑ Hypertensive arteriolar rupture and deep brain hemorrhage
  - ❑ Lobar hemorrhage due to amyloid angiopathy
  - ❑ Vascular malformations - Arteriovenous malformation (AVM), aneurysm, angioma, etc.



Scientific Community and NINDS Need to Mount Tripartite Effort to Decrease Burden of Illness Due to Stroke

- **Prevention**
  - Greatest impact on public health
- **Timely Treatment**
  - Timely reperfusion can avert tragic outcome in ischemic stroke
  - Timely treatment in some hemorrhagic strokes can save lives
- **Recovery**
  - Recovery is the rule
  - How to enhance recovery is the question

NINDS: National Institute of Neurological Disorders and Stroke
stroke.nih.gov/documents/Post-Stroke_Rehabilitation_english_brochure.pdf

Major NINDS Research Initiatives in Stroke

NIH StrokeNet

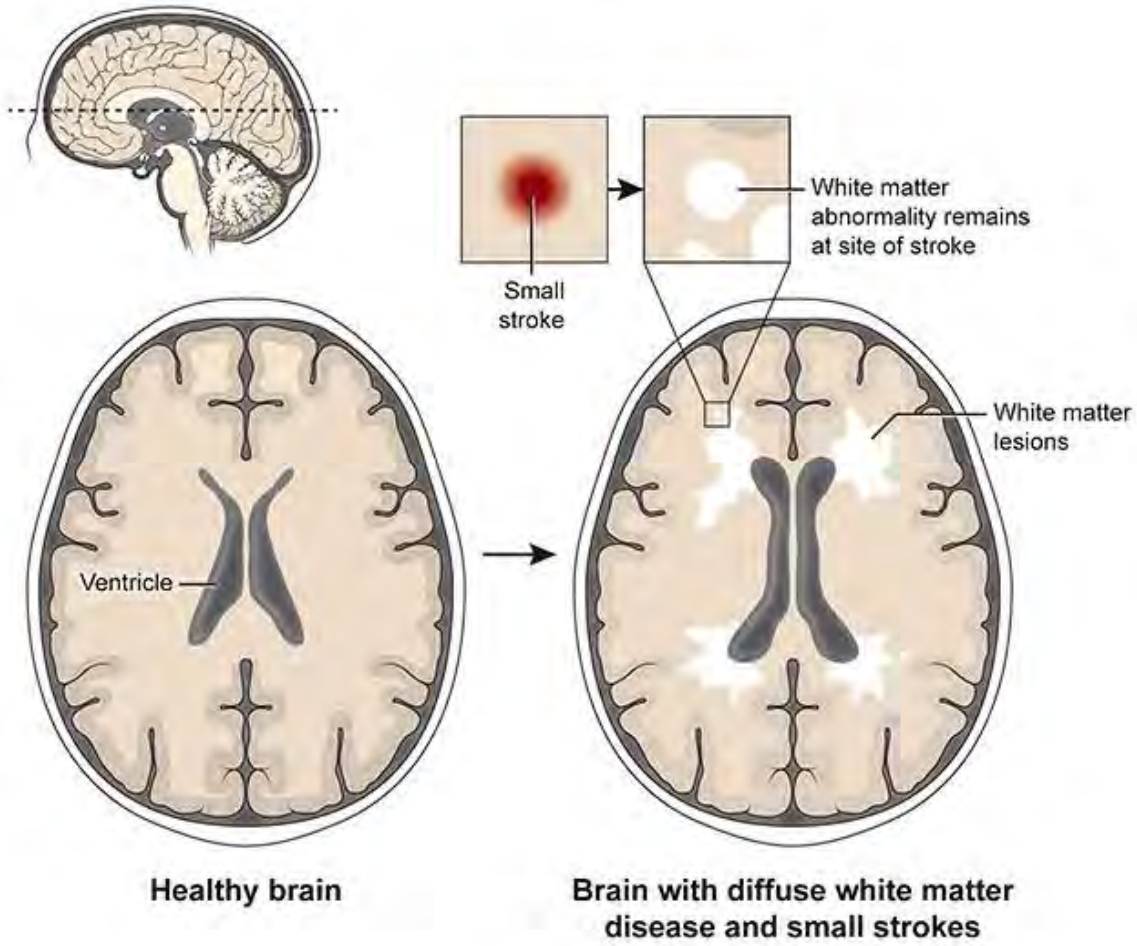
National and Regional Coordinating Centers

National network to execute quality prevention, treatment, and recovery clinical trials

NINDS: National Institute of Neurological Disorders and Stroke
NIH: National Institutes of Health

Most Strokes Are Silent: Consequences Are Cognitive Impairment and Dementia

- **Infarction**
  - Usually small and multiple seen on MRI or at autopsy
  - Associated with cognitive impairment and dementia
- **Micro hemorrhages**
  - Hypertensive - deep
  - Amyloid angiopathy - cortically located associated with Alzheimer's Disease in half



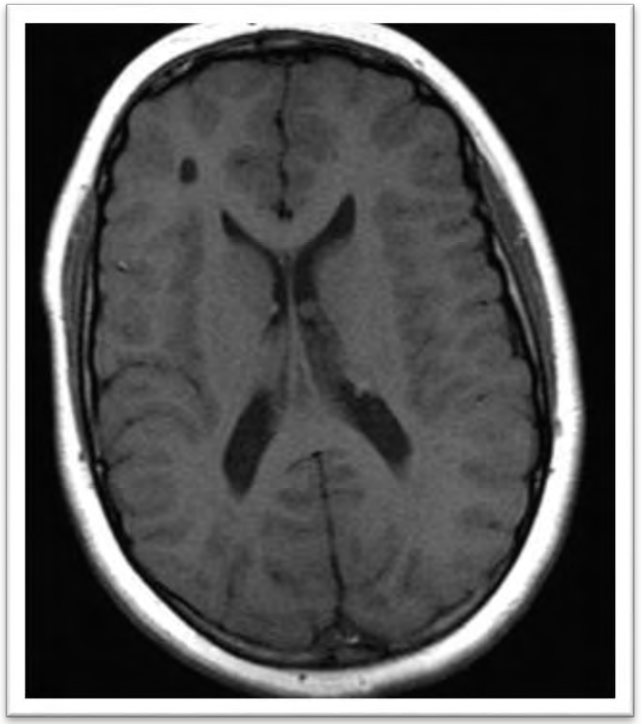
MRI: Magnetic resonance imaging

Silent Strokes Can Lead to Dementia

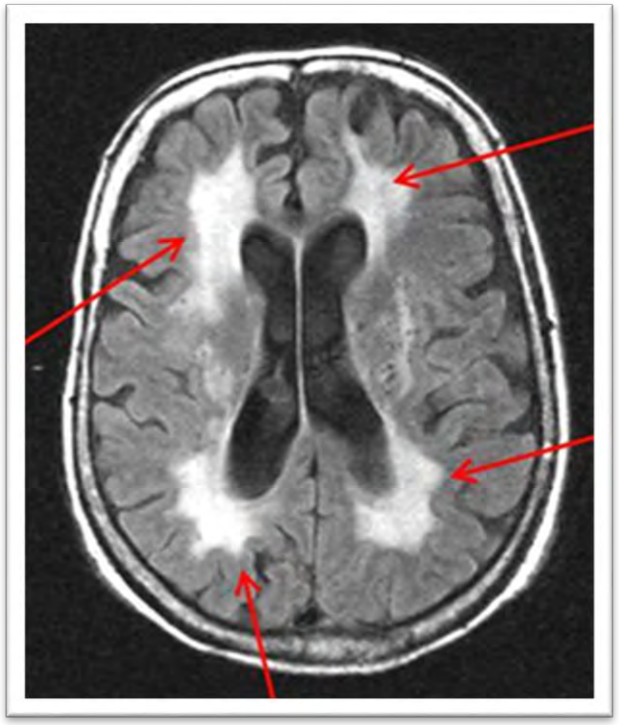
Diffuse white matter disease

- Extremely common
- Associated with cognitive impairment

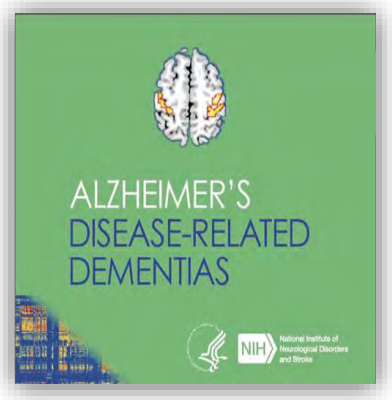
Healthy brain



Diffuse white matter disease



Major NINDS Research Initiatives in Stroke



- **CREST2 trial**
  - To determine if carotid endarterectomy or stenting are superior to aggressive modern, medical management of vascular risk factors in asymptomatic carotid stenosis
- **Alzheimer's Disease-Related Dementia Initiatives**
  - To understand how small vessel cerebrovascular disease contributes to cognitive decline and dementia
- **Stroke Prevention-Intervention Research Program**
  - Testing multi-level interventions in minority communities, major emphasis on hypertension control

NINDS: National Institute of Neurological Disorders and Stroke
CREST-2: Carotid Revascularization and Medical Management for Asymptomatic Carotid Stenosis Trial
clinicaltrials.gov/ct2/show/NCT02089217

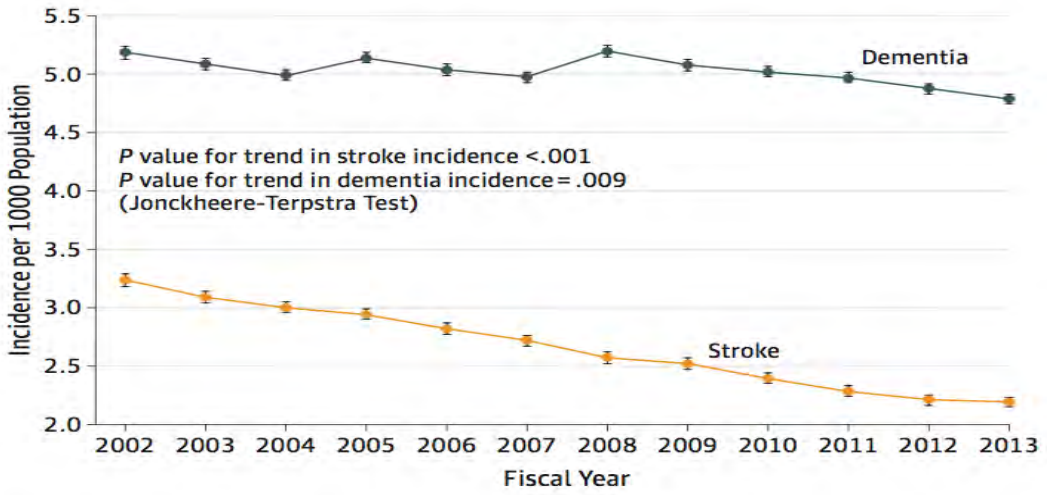
Concordant With, But Not Causally Linked, Dementia Risk Is Dropping In Countries With Dropping Stroke Rates

Declining Incidence of Stroke and Dementia: Coincidence or Prevention Opportunity?

Luciano A. Sposato, MD, MBA[1]; Moira K. Kapral, MD, MSc[2,3,4]; Jiming Fang, PhD[4]; Sudeep S. Gill, MD, MSc[5,6,7]
Daniel G. Hackam, MD, PhD, FRCPC[8]; Lauren E. Cipriano, PhD[9]; Vladimir Hachinski, CM, MD, FRCPC, DSc[1]

JAMA Neurol. 2015;72(12):1529-1531. doi:10.1001/jamaneurol.2015.2816.

Figure. Trends in Stroke and Dementia Incidence Rates, Ontario 2002-2013



The error bars represent 95% CIs.

Incidence of Dementia over Three Decades in the Framingham Heart Study

Claudia L. Satizabal, Ph.D., Alexa S. Beiser, Ph.D., Vincent Chouraki, M.D., Ph.D., Geneviève Chêne, M.D., Ph.D., Carole Dufouil, Ph.D., and Sudha Seshadri, M.D.

N Engl J Med 2016; 374:523-532 | February 11, 2016 | DOI: 10.1056/NEJMoa1504327

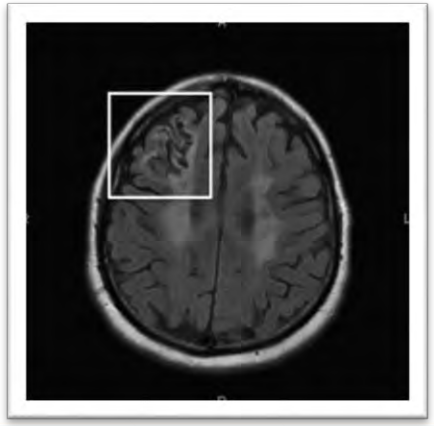
CONCLUSIONS

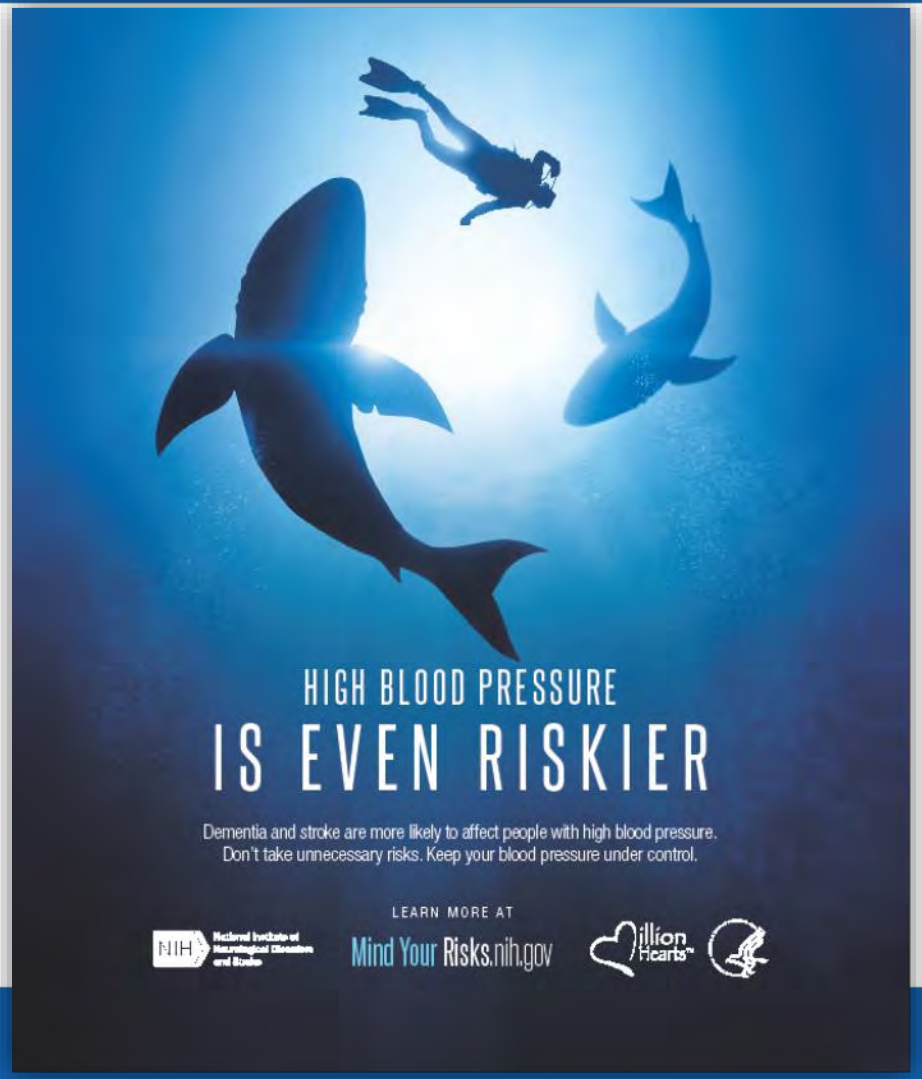
Among participants in the Framingham Heart Study, the **incidence of dementia has declined over the course of three decades**. The factors contributing to this decline have not been completely identified.

Sposato LA, Kapral MK, Fang J, et al. *JAMA Neurol*. 2015.
Satizabal CL, Beiser AS, Chouraki V, et al. *N Engl J Med*. 2016.

Mind Your Risks℠ for Healthy Brain Aging

- Persons with stroke (clinical or silent) have increased risk of dementia
- Persons with diffuse white matter disease have increased risk of cognitive impairment

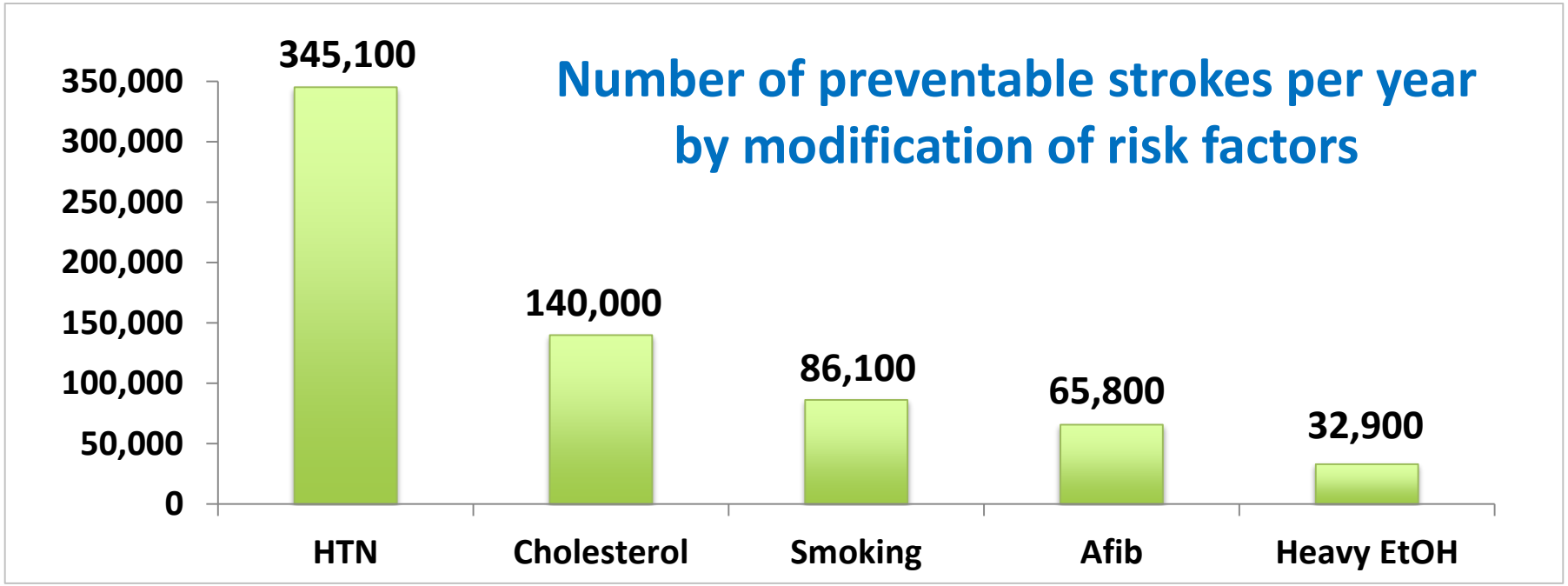




Mind Your Risks℠ Campaign

Stroke Is Preventable, May Decrease Dementia Risk

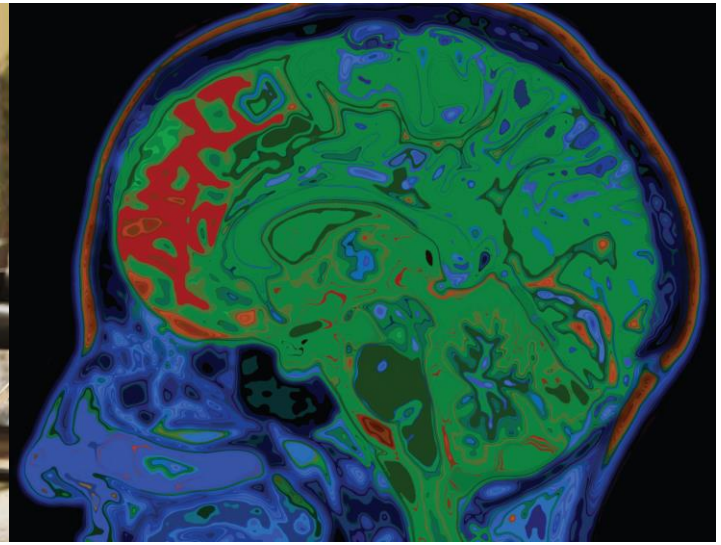
- Blood pressure control is a powerful means of preventing stroke
- Increased use of anti-platelet treatment (aspirin), and HMG CoA reductase inhibitors (statins) is associated with decrease in stroke



Afib: Atrial fibrillation
EtOH: Ethanol

Gorelick PB. *Arch Neurol*. 1995.
Gorelick PB. *Stroke*. 2002.

Stroke Prevention in Women
Knowing the Difference Can Make A Difference



Cheryl Bushnell, MD, MHS

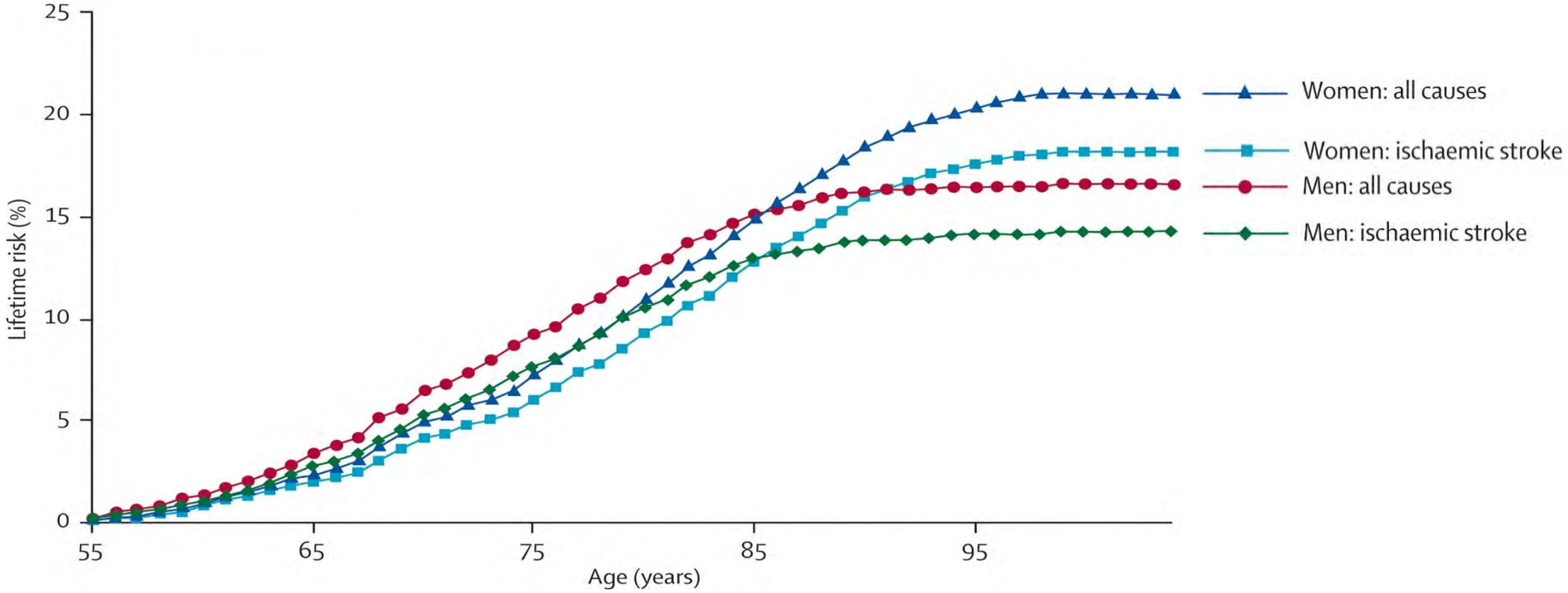
Professor of Neurology and Director, Comprehensive Stroke Center
Department of Neurology, Wake Forest Baptist Medical Center
Chair, AHA/ASA Guideline on the Prevention of Stroke in Women

Wake Forest® School of Medicine

U.S. Department of Health and Human Services
Centers for Disease Control and Prevention

Women Live Longer Resulting in A Higher Lifetime Risk of Stroke

Women have a higher lifetime risk of stroke than men (18% vs 14%)



Seshadri S, Wolf PA. *Lancet Neurol*. 2007.

Stroke is More Common in Women and Women Have Poorer Outcomes – Prevention is Essential

- **Of those who die from stroke, 60% are women**
- **Higher prevalence of stroke among women**
  - There are at least 200,000 more disabled women from stroke than men
- **Women have worse outcomes after stroke in terms of functional status and quality of life**
- **Stroke prevention for women is key**

Mozaffarian D, Benjamin EJ, Go AS, et al. *Circulation*. 2016.
Bushnell C, McCullough LD, Awad IA, et al. *Stroke*. 2014.

Women Have Different Stroke Risk Factors

Risk Factor	Women-specific	Stronger or More Prevalent in Women	Similar Prevalence in Men and Women But Unknown Difference in Impact
Pregnancy	X		
Preeclampsia/eclampsia, gestational diabetes	X		
Hormonal contraception	X		
Postmenopausal hormone use	X		
Changes in hormonal status	X		

Bushnell C, McCullough LD, Awad IA, et al. *Stroke*. 2014.

Some Stroke Risk Factors Are Stronger in Women

Risk Factor	Women-specific	Stronger or More Prevalent in Women	Similar Prevalence in Men and Women But Unknown Difference in Impact
Migraine with aura		X	
Atrial fibrillation		X	
Diabetes mellitus		X	
Hypertension		X	
Depression		X	
Psychosocial stress		X	

Bushnell C, McCullough LD, Awad IA, et al. *Stroke*. 2014.

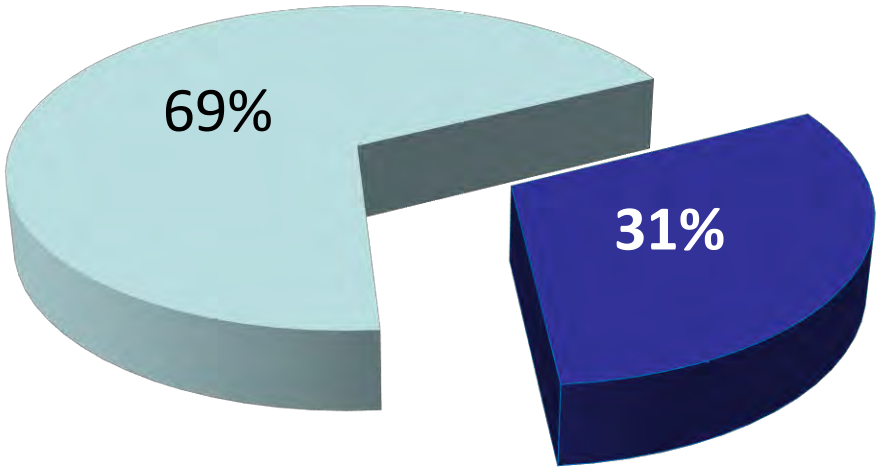
Some Stroke Risk Factors Are Similar To Men's Level of Risk But Difference in Impact Unclear

Risk Factor	Women-specific	Stronger or More Prevalent in Women	Similar Prevalence in Men and Women But Unknown Difference in Impact
Physical inactivity/ Obesity/Diet			X
Age			X
Prior cardiovascular disease			X
Tobacco smoking			X
Metabolic syndrome			X

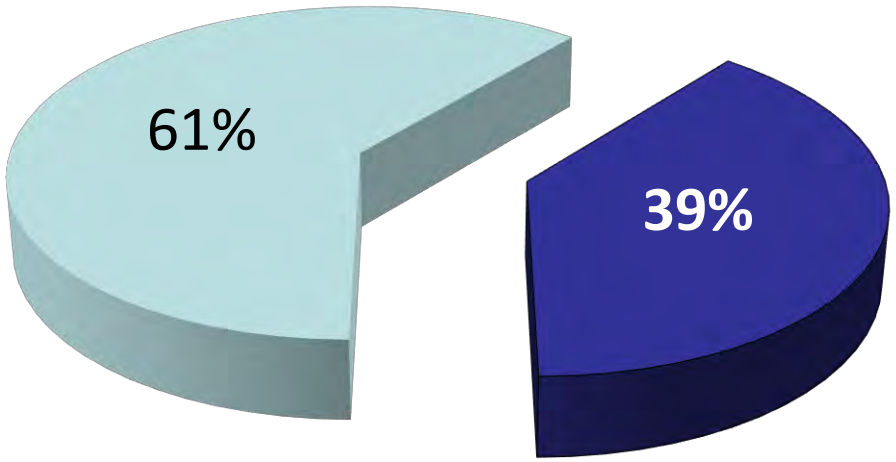
Bushnell C, McCullough LD, Awad IA, et al. *Stroke*. 2014.

Women Are Underrepresented In Stroke Prevention Clinical Trials

Average Distribution of Participation in Carotid Intervention Trials



Average Distribution of Participation in Antiplatelet Trials



Men

Women

Bushnell C, McCullough LD, Awad IA, et al. *Stroke*. 2014

Preeclampsia and Gestational Hypertension Double A Woman's Lifetime Risk of Stroke

Study Year	CV Outcome	Pregnancy Outcome	HR or OR	Follow-up
2013	Ischemic CV disease	Gestational hypertension	1.7	40 yrs
2009	Stroke	Gestational hypertension Mild preeclampsia Severe preeclampsia	1.6 1.5 1.7	13-15 yrs
2005	CV disease	Maternal placental syndrome	1.9	
2005	Stroke	Preeclampsia	3.1	
2003	Stroke mortality	Preeclampsia	3.6	32 yrs
2003	CV disease	Preeclampsia	2.5	
2001	Stroke mortality	Term preeclampsia Preterm preeclampsia	0.98 5.1	

CV: Cerebrovascular
HR: Hazards Ratio
OR: Odds Ratio

Bushnell C, McCullough LD, Awad IA, et al. *Stroke*. 2014.

Women With History of Preeclampsia or Eclampsia Require More Aggressive Follow-up

- **Prevention of Stroke in Women with a History of Preeclampsia**
- **Class IIa Recommendations**
  - Because of the increased risk of future hypertension and stroke 1 to 30 years after delivery, in women with a history of preeclampsia (Level of Evidence B) it is reasonable to:
  - **(1) consider evaluating all women starting 6 months to the 1 year postpartum, as well as those who are past childbearing age, for a history of preeclampsia/eclampsia, and document their history of preeclampsia/eclampsia as a risk factor, and**
  - **(2) evaluate and treat for cardiovascular risk factors including hypertension, obesity, smoking, and dyslipidemia**

Bushnell C, McCullough LD, Awad IA, et al. *Stroke*. 2014.

Women-specific Risk Factors
Hormonal Contraception Doubles Risk and Risk Increases with Age

- **Meta-analyses of stroke risk with oral contraceptives (OC) use**
  - Two-fold increased (OR 2.12–2.75)
  - No risk with progestogen only pills
- **Population-based analysis**
  - Increased risk with 30–40 microgram doses of ethinyl estradiol
- **The absolute risk of stroke is low**
  - 10/100,000 person-years in non-OC user vs. 20/100,000 person-years in an OC user
- **Risk increases dramatically with age and if other risk factors of stroke present**

Gillum LA, Mamidipudi SK, Johnston SC. *JAMA*. 2000.
Baillargeon JP, McClish DK, Essah PA, et al. *J Clin Endocrinol Metab*. 2005.
Lidegaard Ø, Løkkegaard E, Jensen A, et al. *N Engl J Med*. 2012.
Chan WS, Ray J, Wai EK, et al. *Arch Intern Med*. 2004.
Chakhtoura Z, Canonico M, Gompel A, et al. *Stroke*. 2009.

Oral Contraceptives (OC) and Risk of Stroke: RATIO Study

Odds Ratio of Ischemic Stroke in Relation to Current OC Use According to Other Risk Factors for Stroke		
	Current OC Use Odds Ratio	Noncurrent OC Use Odds Ratio
High Cholesterol	**10.8**	**1.1**
Obesity	**4.6**	**1.2**
Smoking	**4.4**	**2.3**
High Blood Pressure	**7.6**	**6.8**
Diabetes	**5.3**	**5.6**

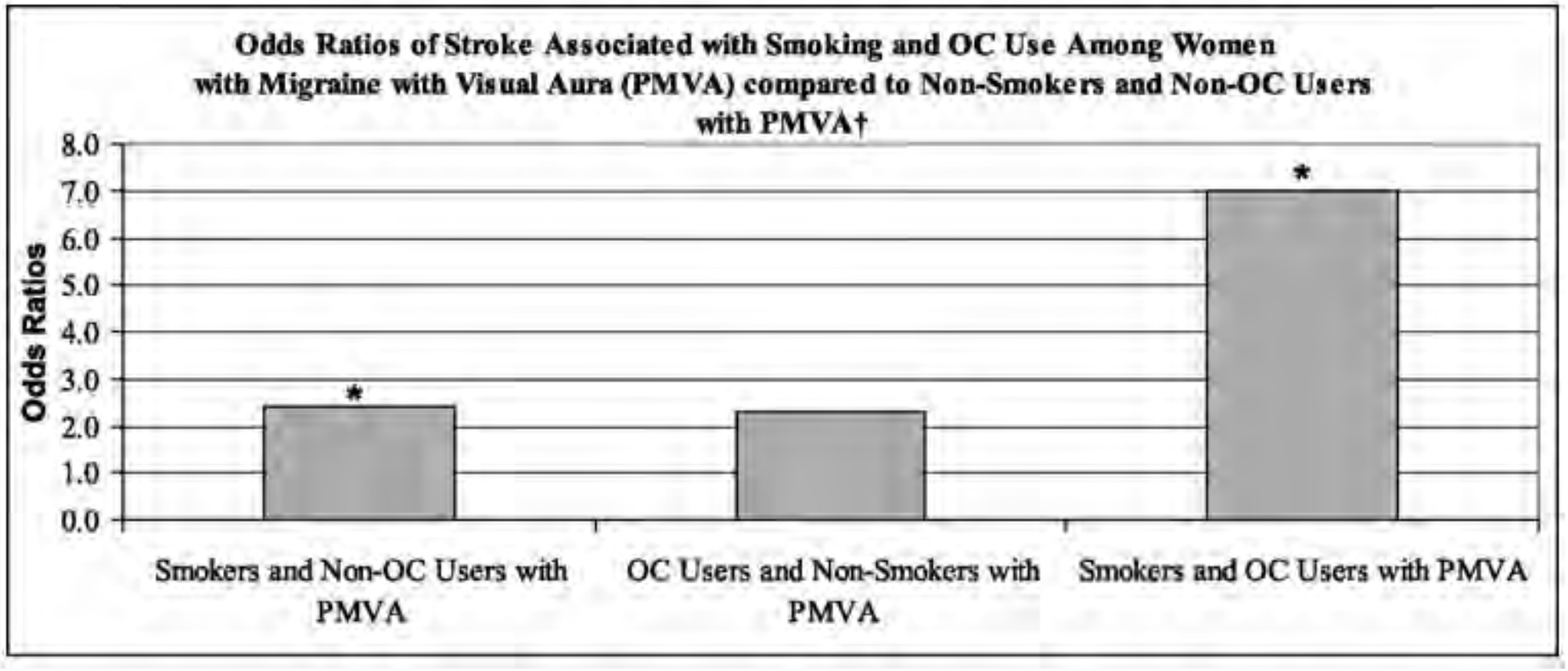
RATIO: Risk of Arterial Thrombosis in Relation to Oral Contraceptives
Kemmeren JM, Tanis BC, van den Bosch MA, et al. *Stroke*. 2002.

Risk Factors More Prevalent in Women
Migraines with Aura

- **Migraines with aura are about 3 times more prevalent in women than men**
- **Women with migraines with aura have about a 2-fold increased risk compared to those without migraines**
  - Treatment to decrease frequency of migraines may decrease risk of stroke
- **Absolute risk: 4 additional ischemic stroke cases per 10,000 women per year when migraine with aura was assumed as underlying cause of stroke**

Kurth T, Chabriat H, Bousser MG. *Lancet Neurol*. 2012.
Kurth T, Diener HC. *Stroke*. 2012.

For Women with Migraines with Visual Auras, Oral Contraceptives and Smoking Further Increases Risk of Stroke



$p < 0.05$
OC: Oral contraceptive

MacClellan LR, Giles W, Cole J, et al. *Stroke*. 2007.

Risk Factors More Prevalent in Women
Depression and Psychosocial Stress

- For men and women, depression and psychosocial stress increased the risk for stroke by 30%
- From Nurses' Health Study, women with history of depression had 29% increased risk of incident total stroke
- Men and women with stable high depressive symptoms had similarly increased risks for stroke
- Women with resolving symptoms of depression had higher risk of stroke than men

O'Donnell MJ, Xavier D, Liu L, et al. O'Donnell, et al. *Lancet.* 2010.
Gilsanz P, Walter S, Tchetgen Tchetgen EJ, et al. *J Am Heart Assoc*. 2015.
Pan A, Okereke OI, Sun Q, et al. *Stroke*. 2011.
Pan A, Sun Q, Okereke OI, Rexrode KM, *JAMA*. 2011.

Risk Factors More Prevalent in Women
Atrial Fibrillation

- **More common in women than men**
- **When treated with anticoagulants, women more likely to have**
  - Thromboembolic complications
  - Bleeding with anticoagulant use
- **Uncertain risk of complications with novel oral anticoagulants (NOACs) in elderly women who are frail and have borderline renal function**

Atrial fibrillation is a problem with the rate or rhythm of the heartbeat. The heart beats too fast, too slow, or with an irregular rhythm. This lets blood stay in the heart longer than normal and clots can form. If the clots reach the brain, they can cause a stroke.

Anticoagulants prevent clots from forming.

Risk Calculator for Atherosclerotic Cardiovascular Disease (ASCVD): 2013 Cholesterol Guidelines

Risk Factor	Acceptable Range of Values and Units	Optimal values	Patient values
Sex	M or F		
Age	20–79 Years		
Race	AA or WH		
Total cholesterol	130–320 mg/dL	170	
HDL-Cholesterol	20–100 mg/dL	50	
Systolic BP	90–200 mm Hg	110	
Treatment for high BP	Y or N	N	
Diabetes	Y or N	N	
Smoker	Y or N	N	

Patient Calculated Risk
10-yr ASCVD Risk = (Optimal 0.3%)
Lifetime ASCVD Risk =
Lifetime ASCVD Risk with optimum risk =

tools.acc.org/ASCVD-Risk-Estimator/

Risk Calculator for Atherosclerotic Cardiovascular Disease (ASCVD): 2013 Cholesterol Guidelines

Risk Factor	Acceptable Range of Values and Units	Optimal values	Patient values
Sex	M or F		F
Age	20–79 Years		40
Race	AA or WH		AA
Total cholesterol	130–320 mg/dL	170	250
HDL-Cholesterol	20–100 mg/dL	50	30
Systolic BP	90–200 mm Hg	110	150
Treatment for high BP	Y or N	N	N
Diabetes	Y or N	N	N
Smoker	Y or N	N	N

Patient Calculated Risk
10-yr ASCVD Risk = 6.8% (Optimal 0.3%)
Lifetime ASCVD Risk = 39%
Lifetime ASCVD Risk with optimum risk = 8%

tools.acc.org/ASCVD-Risk-Estimator/

Risk Calculator for Atherosclerotic Cardiovascular Disease (ASCVD): 2013 Cholesterol Guidelines

Risk Factor	Acceptable Range of Values and Units	Optimal values	Patient values
Sex	M or F		F
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HDL-Cholesterol	20–100 mg/dL	50	30
Systolic BP	90–200 mm Hg	110	150
Treatment for high BP	Y or N	N	N
Diabetes	Y or N	N	N
Smoker	Y or N	N	N

Output: 10-year ASCVD Risk (%) only available for ages 40–79

Patient Calculated Risk
10-yr ASCVD Risk = **6.8%** (Optimal 0.3%)
Lifetime ASCVD Risk = **39%**
Lifetime ASCVD Risk with optimum risk = **8%**

tools.acc.org/ASCVD-Risk-Estimator/

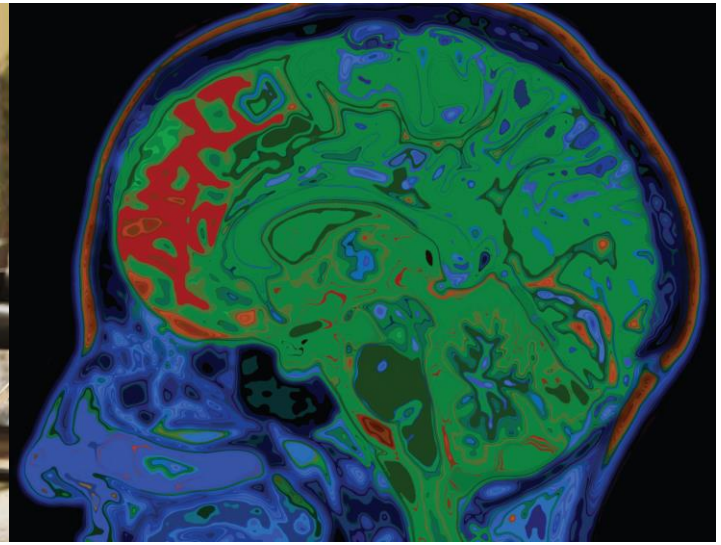
Is It Time for a Risk Score That Incorporates Unique Risk Factors?

- **Available sex-specific scores do *not* include**
  - Women's unique risk factors
  - Lifetime risk for those under age 40
- **While younger women's risks are lower, risk stratification would help illustrate importance of prevention strategies**
- **Knowing their risk could motivate younger women to change lifestyle earlier**
- **This strategy could decrease the risk of stroke, as well as dementia (which is more common in women)**

We Need To Better Understand Women's Unique Risk Factors

- **Women may have prevention strategies that differ from men's**
  - Clinical trials need to inform these differences and to change practice
- **Future research should target prevention AND improved outcomes for women after stroke**
- **Women live longer — We need to focus on the quality of that extended lifespan**

Closing the Gap: Quality Improvement and Stroke Systems of Care



Michael R. Frankel, MD

Professor & Director of Vascular Neurology, Emory University School of Medicine
Chief of Neurology and *Director,* Marcus Stroke & Neuroscience Center for the Grady Health System
Lead Neurologist, Georgia Coverdell Stroke Registry

MARCUS STROKE & NEUROSCIENCE CENTER

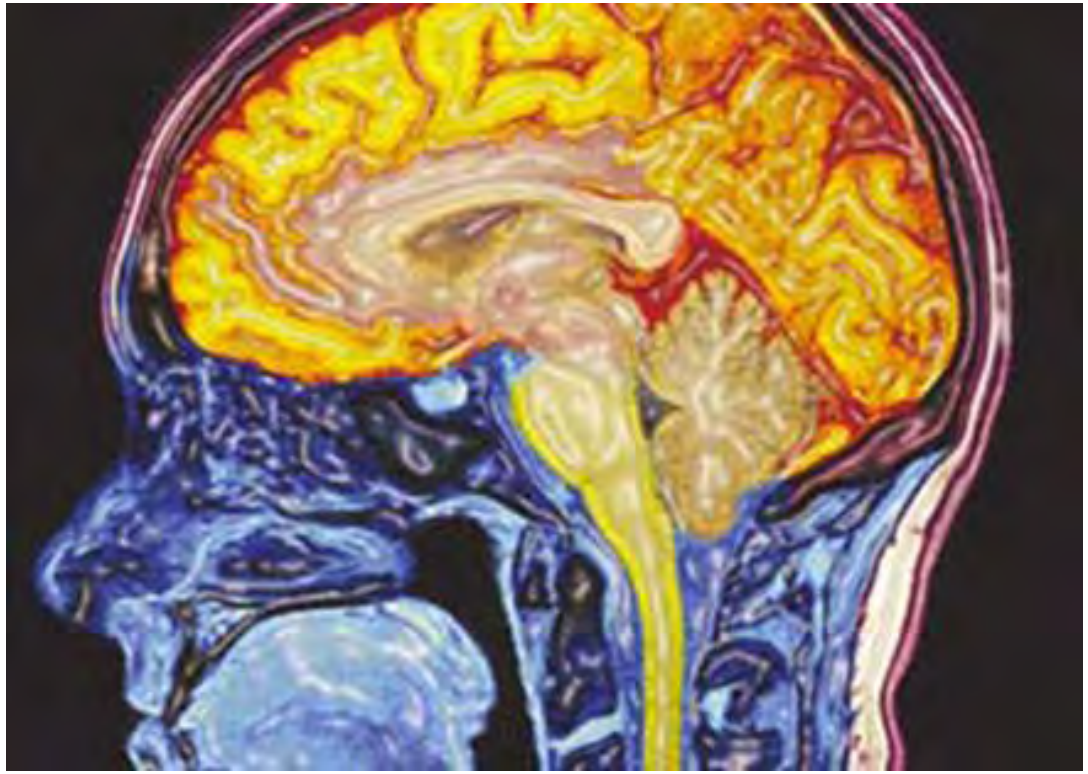
Grady

EMORY UNIVERSITY SCHOOL OF MEDICINE

U.S. Department of Health and Human Services
Centers for Disease Control and Prevention

The Good News – Major Advances in Past 20 Years

- **Prevention**
- **Treatment**
- **Rehabilitation**
- **Clinical Trials**
- **Consensus**
  - Remote Treatment Stroke Centers
  - Primary Stroke Centers
  - Comprehensive Stroke Centers
  - Joint Commission
  - American Heart Association and American Stroke Association



The Bad News – Translating Advances into Practice Has Lagged

- **Why the practice gap between translating what we know into what we do?**
- **Changing processes is challenging**
  - Lack of leadership, coordination of care, cooperation, and resources (people and time) → inertia
- **Fragmentation of care within the system of care**
  - Lack of integration of facilities, agencies and professionals → inhibits collaboration
- **How do we bridge the gap?**
- **How do we integrate the components?**

Bridging The Gap by Improving The Quality of Stroke Care

- **Paul Coverdell Acute Stroke Registry**
  - Data specifically collected to improve process and outcome
  - Established quality indicators that track progress toward defect-free care
  - Evaluate effectiveness of Quality Improvement (QI) measures
- **Get With The Guidelines**
  - American Heart Association and American Stroke Association

Defect-Free Care means all quality indicators that are appropriate for a patient meet an established guideline.

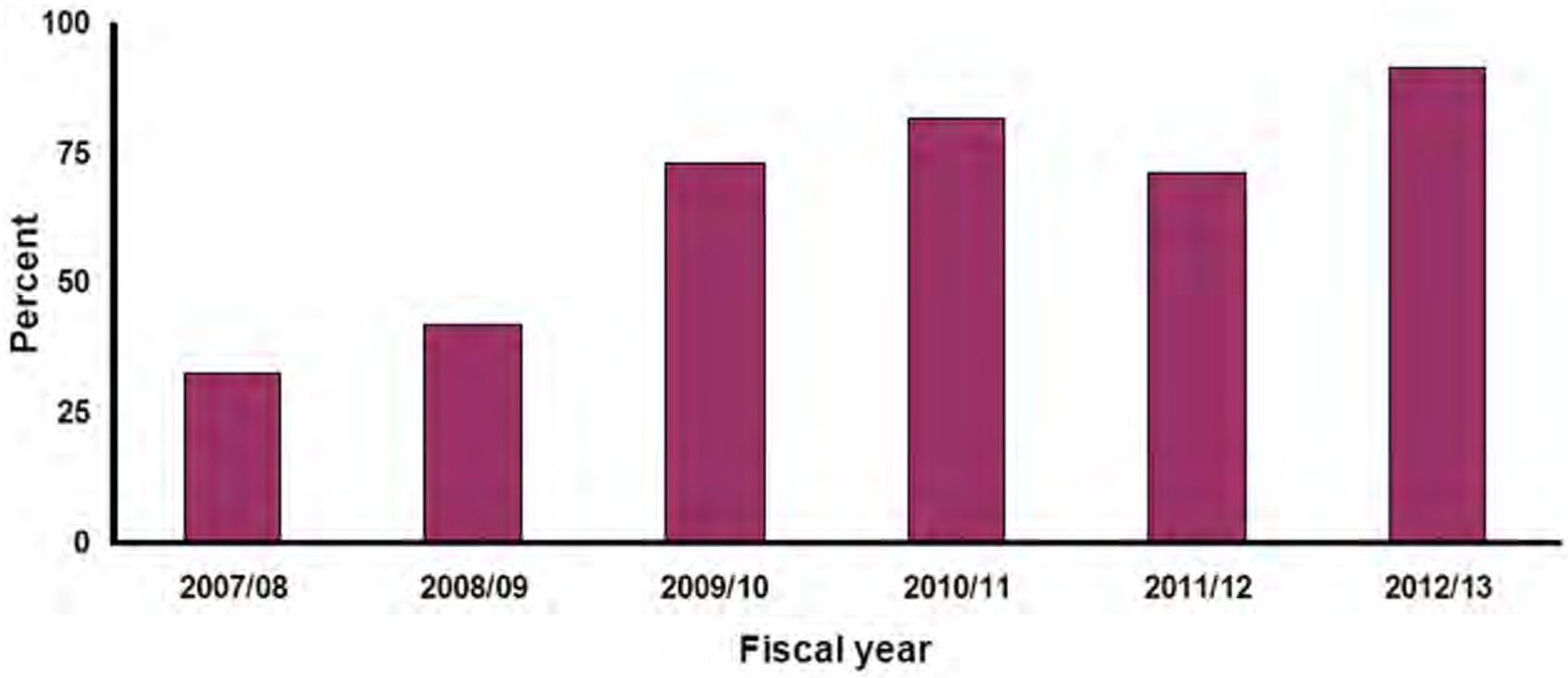
Coverdell Stroke Care Quality Indicators

- **Timeliness of treatment**
  - tPA administration
  - Antithrombotic therapy started by end of hospital day 2
- **Prophylactic treatment during stay**
  - DVT Prophylaxis
  - Anticoagulation for Atrial Fibrillation
- **Screening for other risk factors**
  - Dysphagia screening
  - Smoking cessation advice/counseling
- **Stroke education**
- **Assessed for rehabilitation**
- **Discharged on**
  - Antithrombotic therapy
  - Cholesterol reducing medication

tPA: Tissue plasminogen activator
DVT: Deep vein thrombosis

Improvements in tPA Administration in Georgia

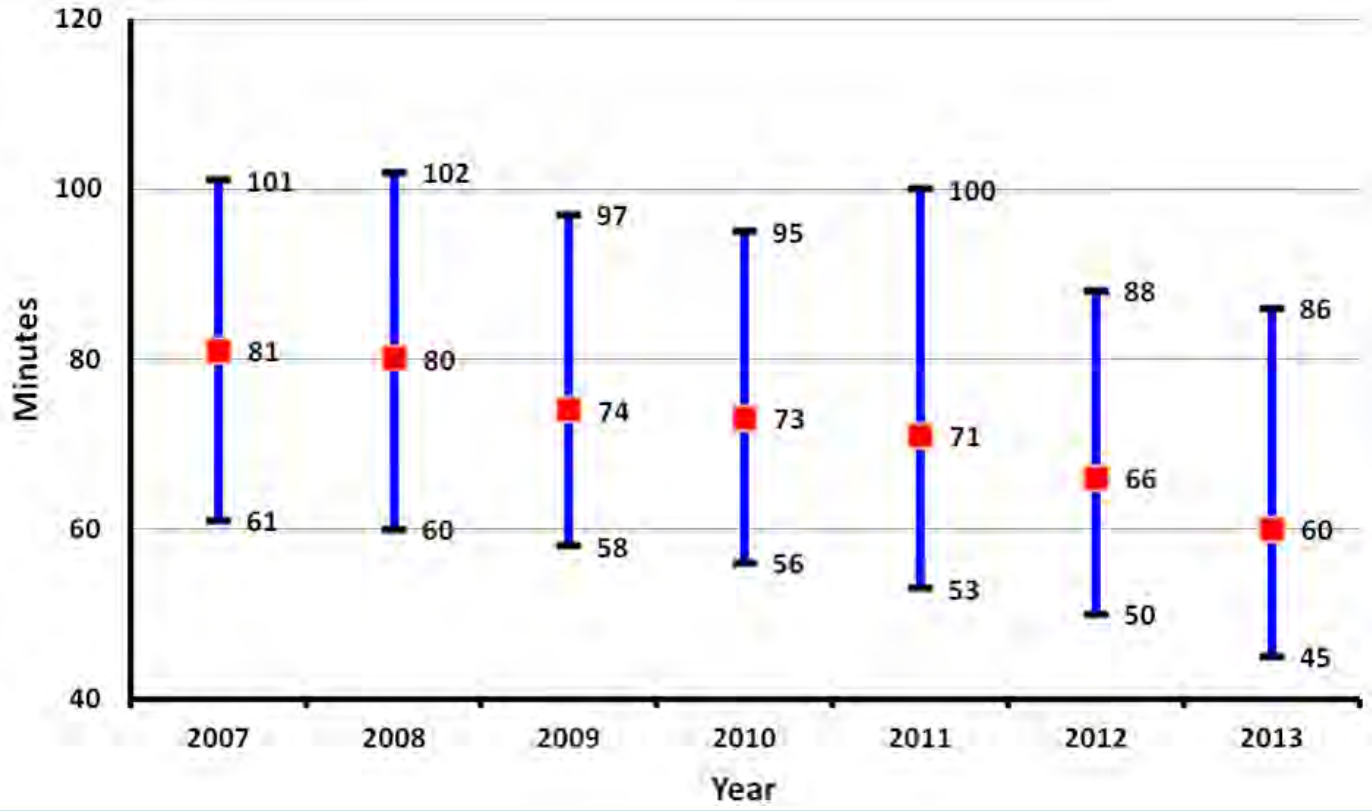
Intravenous tPA Administration within 3 hours of "Last Known Well" among Eligible Ischemic Stroke Patients, GCASR, 2007-2013



tPA: Tissue plasminogen activator
GCASR: Georgia Coverdell Acute Stroke Registry

Earlier Treatment Leads to Less Disability and Lower Mortality

Median Door-to-needle Time among Patients Included in the Analysis, GCASR, 2007–2013



During a stroke, every minute counts.

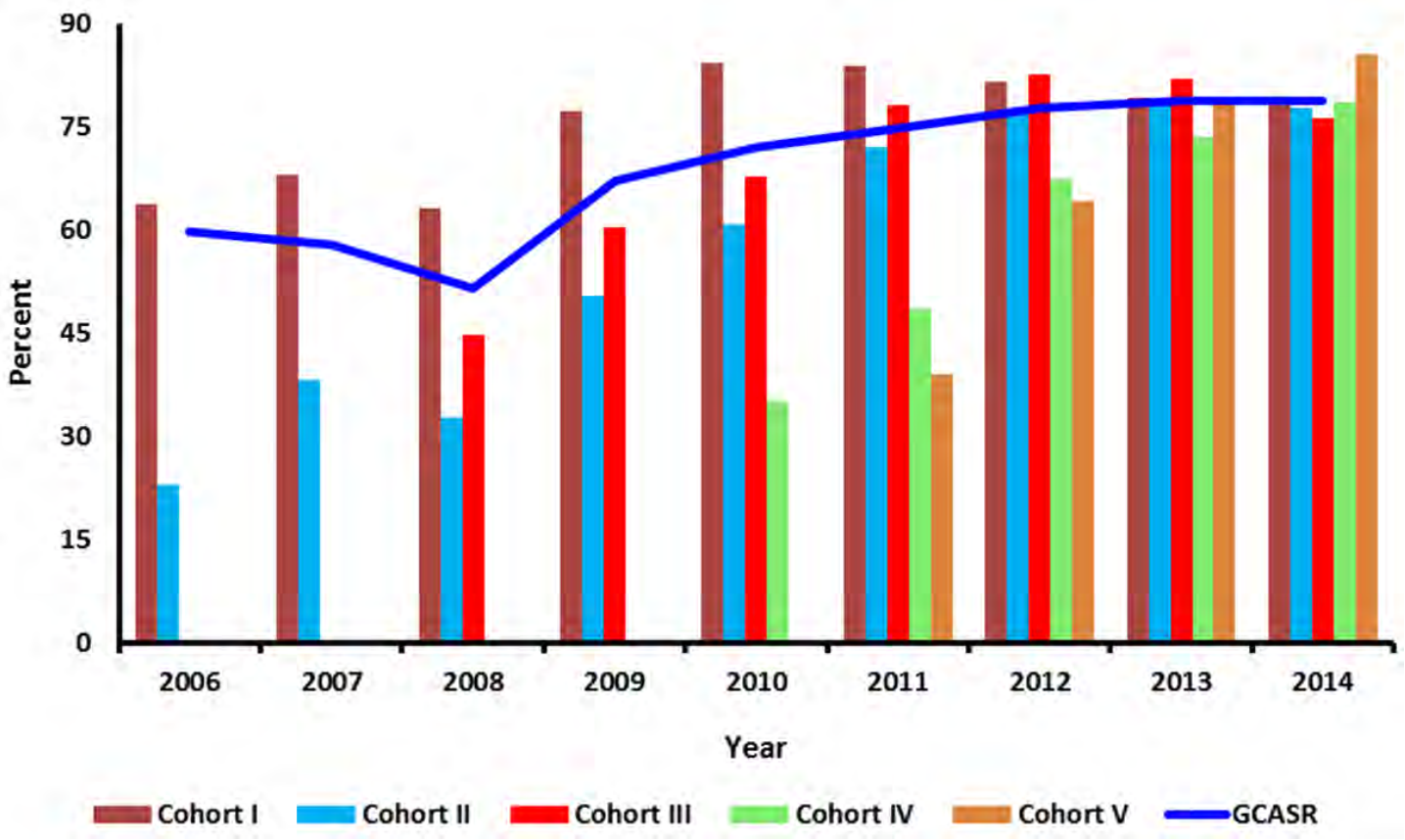
2

million neurons die for every minute a stroke continues.

GCASR: Georgia Coverdell Acute Stroke Registry
Saver, JL. *Stroke*. 2006

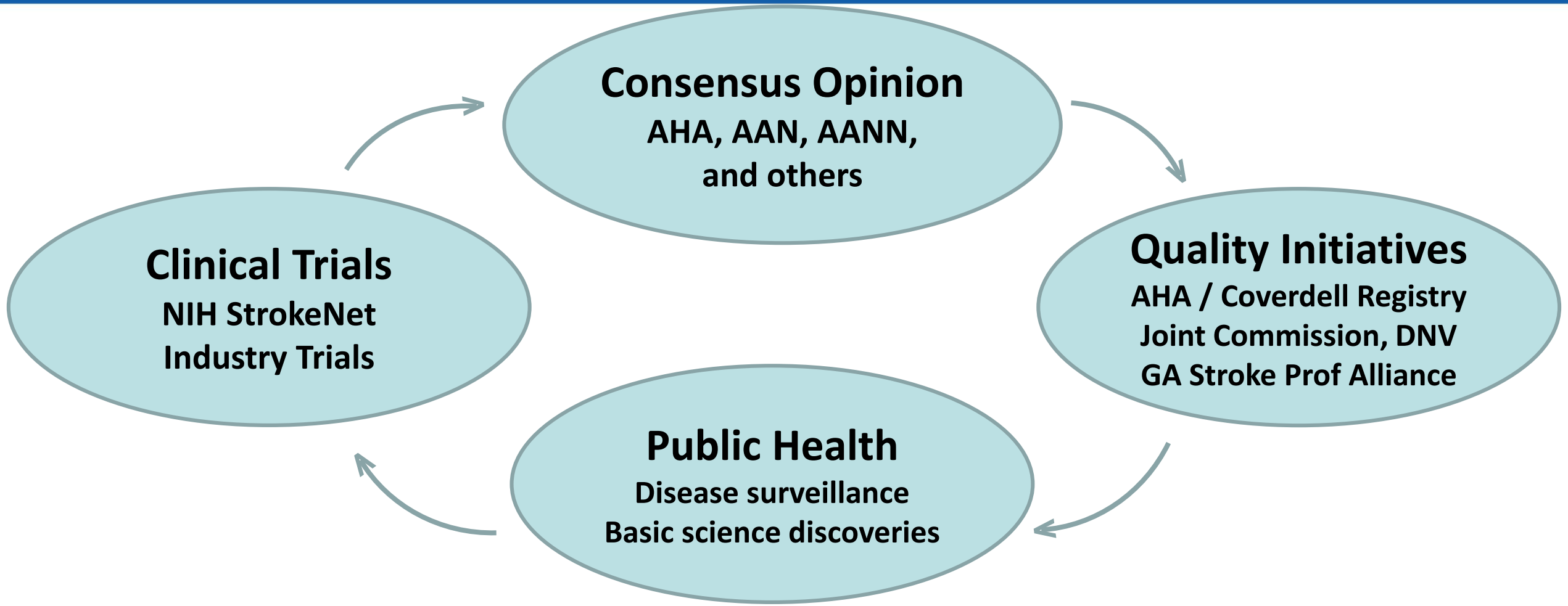
Increases in Defect-free Care

Defect-free Care by Hospital Cohort, GCASR, 2006–2014



GCASR: Georgia Coverdell Acute Stroke Registry

A Connected View of Improving Public Health In Stroke In Georgia



AHA: American Hospital Association
AAN: American Academy for Neurology
AANN: American Association of Neuroscience Nurses

DNV: Det Norske Veritas

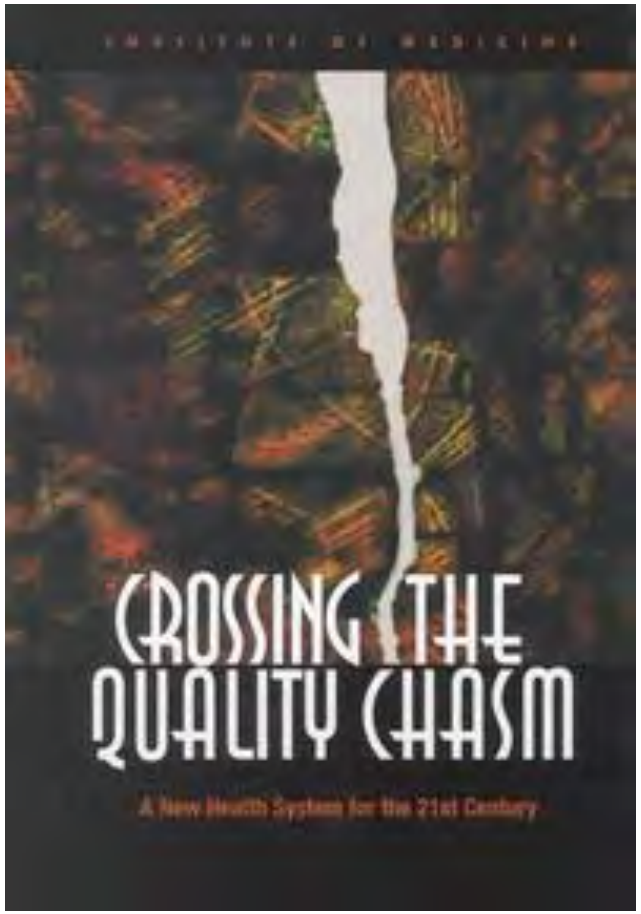
How Do We Integrate System Components?

- **System = Network**
- **Task Force for Stroke Systems of Care**
  - Describes the current fragmentation of stroke care
  - Describes components of a stroke system
  - Recommends methods for encouraging the implementation of stroke systems

Schwamm LH, Pancioli A, Acker JE 3rd, et al. *Circulation*. 2005.

Institute of Medicine

- Recommended creating coordinated systems of care that integrate preventive and treatment services and promote patient access to evidence-based care



Institute of Medicine. Crossing the Quality Chasm: A New Health System for the 21st Century. Washington DC: National Academies Press; 2001.

Creating Stroke Systems of Care

The Goal

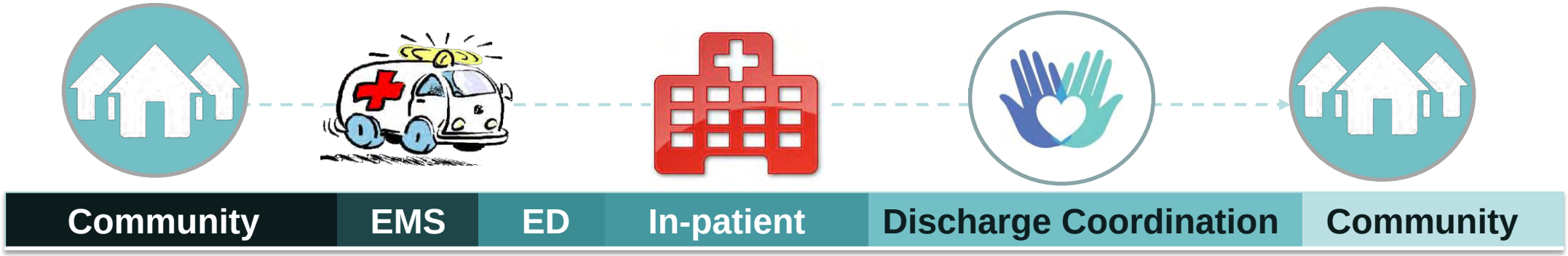
- Develop an effective integrated system for stroke prevention, acute treatment, and rehabilitation

The Challenge

- Although individual components of a stroke system may be well developed, these components often operate in isolation

First Critical Function of a Stroke System

1. **Ensure <u>effective interaction and collaboration</u>**
   - Among agencies, services, and people involved
   - In the prevention, timely identification, transport, treatment, and rehabilitation of individual stroke patients
   - In a locality or region



EMS: Emergency Medical Service
ED: Emergency department
Schwamm LH, Pancioli A, Acker JE 3rd, et al. *Circulation*. 2005.

Second and Third Critical Functions of a Stroke System

2. **Promote use of an <u>organized, standardized approach</u>**
   - In each facility and component of the system

3. **Identify <u>performance measures</u>**
   - Include both process and outcomes measures
   - Include a mechanism for evaluating effectiveness throughout
   - Ensure entire system and its individual components continue to evolve and improve

Schwamm LH, Pancioli A, Acker JE 3rd, et al. *Circulation*. 2005.

Stroke Systems Should Be Flexible and Improve Care

- Stroke systems should be <u>customized</u> for each state, region, or locality
- Track, monitor and improve care
- Follow clinical pathways based on evidence and consensus opinion
- Ensure smooth transition and continuum of care after hospital discharge

Quality Initiatives

- **Evaluations of the system should examine**
  - Overall patient outcomes
  - Linkages among essential stroke system components
  - Linkages to other systems and entities
  - Obstacles to care
  - Potential gaps

Challenges Remain

- Stroke is a common and devastating disease
- Stroke care in most regions of the United States remains fragmented with inadequate coordination among key stakeholders

Building Stroke Systems Is Critical Next Step

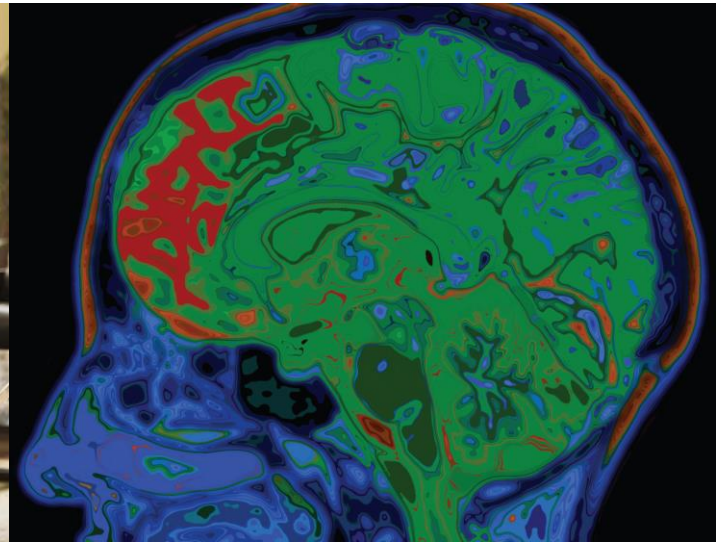
- State-based strategies like the Georgia Coverdell Acute Stroke Registry have had a major impact on improving public health
- An excellent example of the intersection and integration between clinical care and community-based public health
- Currently integrating pre-hospital, hospital, and post-hospital phases by engaging key stakeholders interested in improving care transitions and patient outcomes

Building Stroke Systems Is Critical Next Step

- **Building and enhancing stroke systems throughout the United States is the critical next step in improving patient outcomes**

- **Providers and policymakers at the local, state, and national levels can promote coordinated systems that improve patient care and public health**

Stroke Prevention: Improving Outcomes Across Systems



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Director, Paul Coverdell National Acute Stroke Program

Senior Medical Officer, Division for Heart Disease and Stroke Prevention

U.S. Department of Health and Human Services
Centers for Disease Control and Prevention

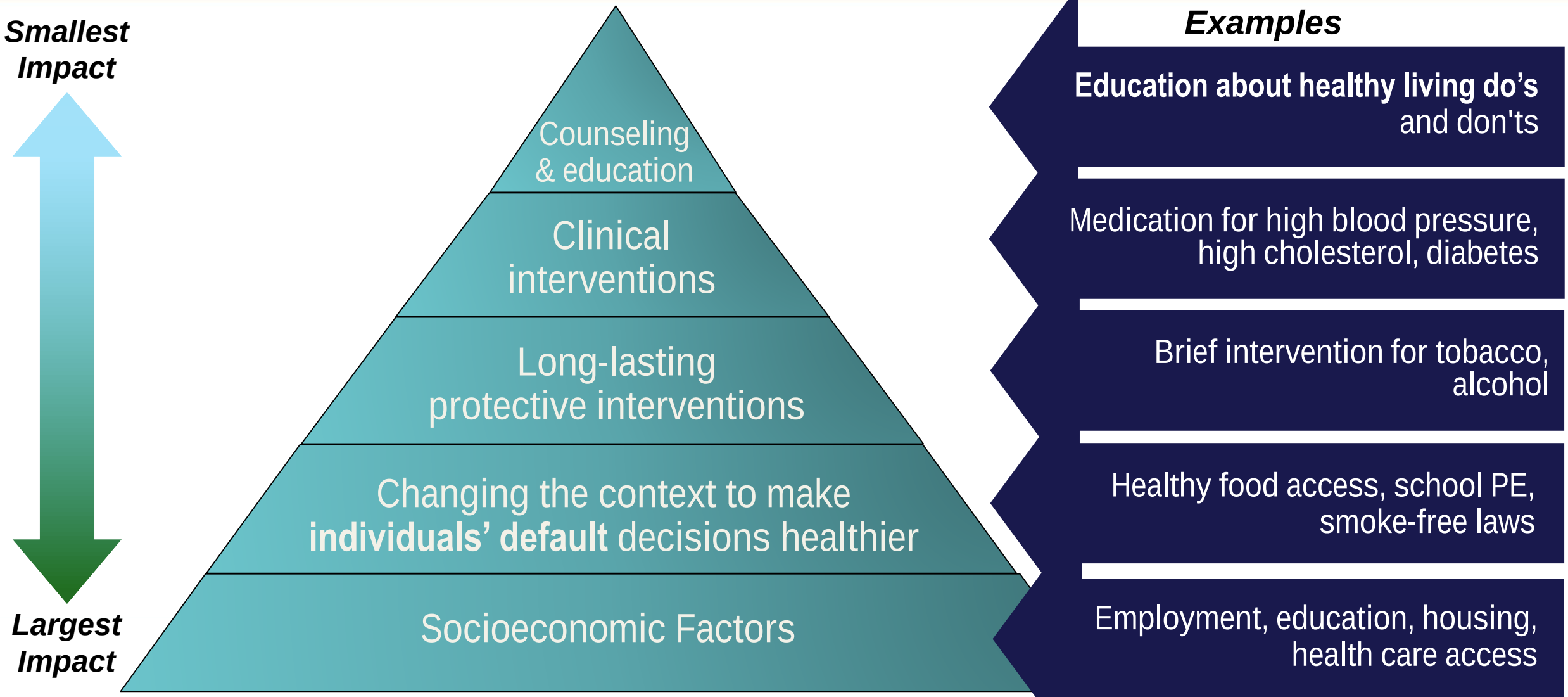
Epidemiology of Stroke

millionhearts.hhs.gov/learn-prevent/risks.html

- **5th leading cause of death in the US**
  - Risk increases with age
  - 75% of stroke victims survive
  - ~$33 billion annually
- **2nd leading cause of death in the world**
  - 6.5 million deaths annually
  - Highest rates in Asia
  - 69% of strokes occur in developing countries

CDC, NCHS. Underlying Cause of Death 1999–2013 on CDC WONDER Online Database, released 2015.
Mozaffarian et al. *Circulation.* 2015.
Hall MJ, Levant S, DeFrances CJ. NCHS data brief, No. 95. 2012

Factors Affecting Cardiovascular Health and Stroke Outcomes



Adapted from: Frieden, TR. *Am J Public Health*. 2010

Million Hearts®
Prevent One Million Strokes and Heart Attacks by 2017

COMMUNITY PREVENTION
Reduce need for treatment

Tobacco control

Sodium reduction

Trans fat elimination

CLINICAL PREVENTION
Improve treatment

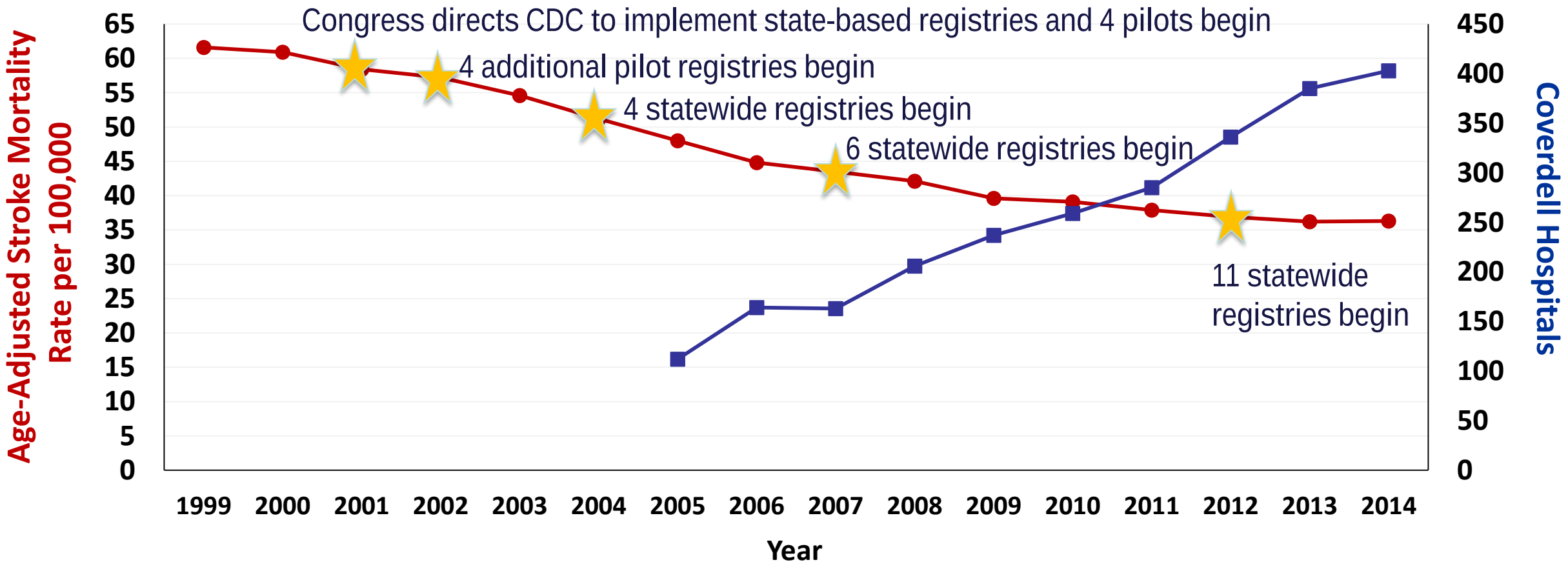
Focus on ABCS

Health information technology

Clinical innovations

millionhearts.hhs.gov

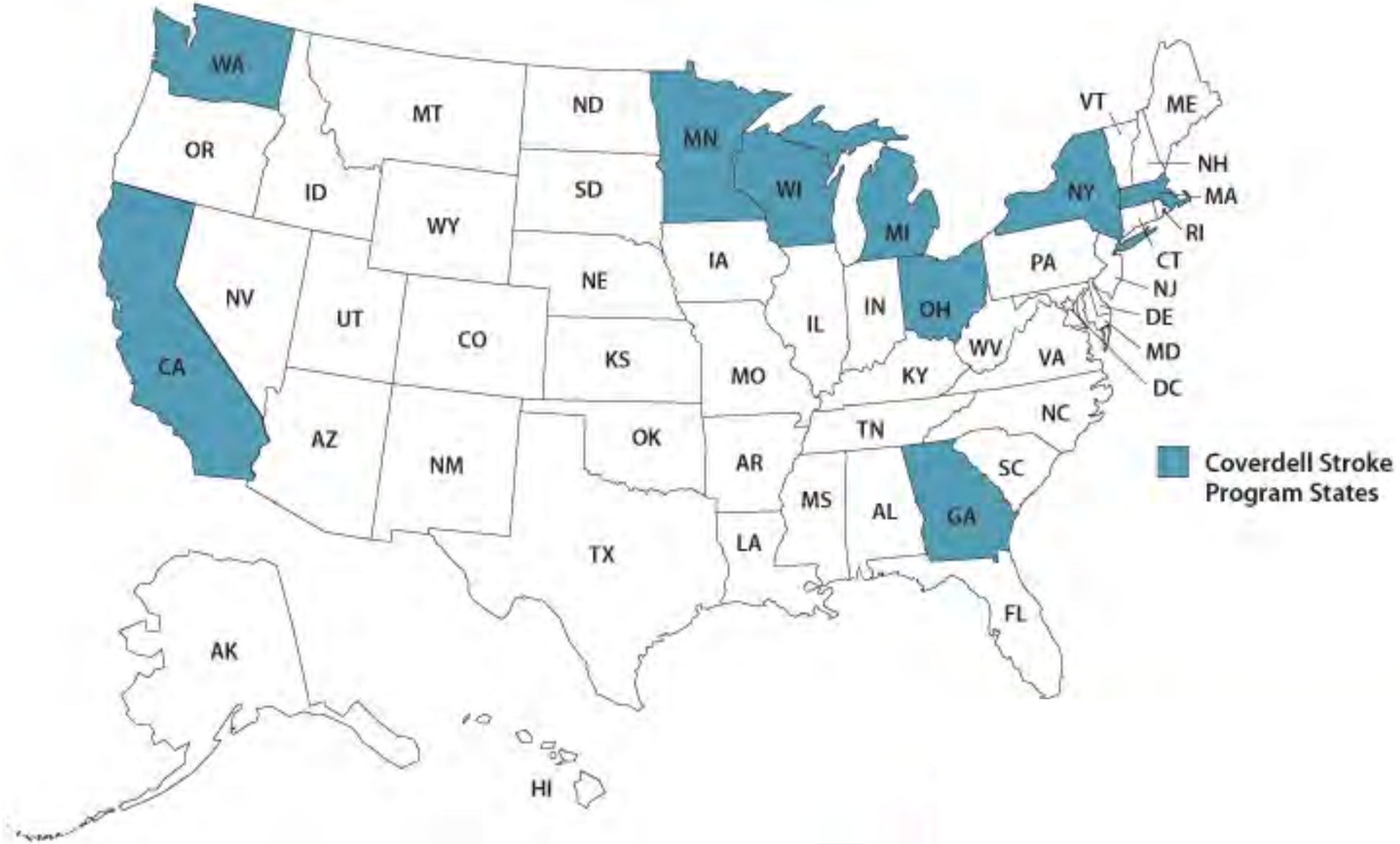
Timeline of Stroke Mortality and Paul Coverdell National Acute Stroke Program's Reach



Enhancing Systems of Care

Statewide, Data-Driven Quality Improvement across the Stroke Care Continuum for Better Patient Outcomes

Paul Coverdell National Acute Stroke Program
Statewide Systems of Care



Coordination of Systems Across the Care Continuum

Pre-hospital

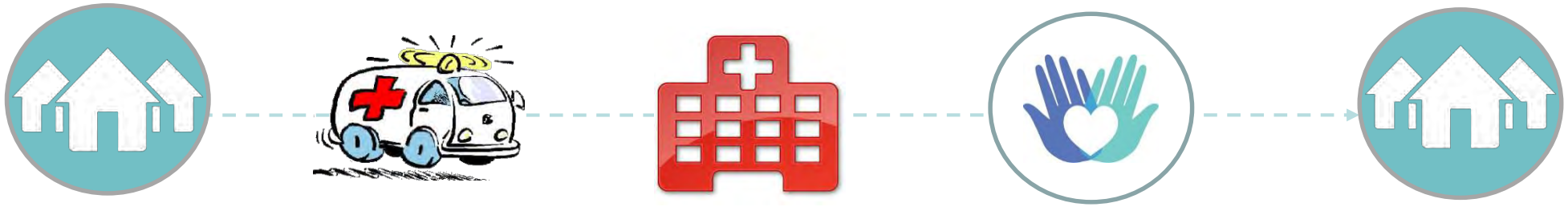
- Promote public prevention messages
- Improve EMS care and transitions

In-hospital

- Improve hospital care

Post-hospital

- Improve post-discharge care transitions
- Educate, facilitate home support systems



Community	EMS	ED	In-patient	Discharge Coordination	Community

EMS: Emergency Medical Service
ED: Emergency department

Collaborations and Linking Systems

Pre-hospital

- Promote public prevention messages
- Improve EMS care and transitions

In-hospital

- Improve hospital care and transitions

Post-hospital

- Improve post-discharge care
- Educate, facilitate home support systems

- Coordinate partnerships, recruitment, engagement
- Integrate, analyze and use data
- Sustain improvements

EMS: Emergency Medical Service

Data Driven Improvements

Collect Data

Utilize EMS and hospital records,
Hospital inventory survey,
Annual performance narratives,
Qualitative interviews and
Surveillance data

Establish Measures

Create Quality Indicators and
Program performance measures

Provide Feedback

Provide data quality
and state progress,
Grantee evaluation,
Annual performance reports,
Cross-site findings

Improve Quality

Improve data quality, Track progress,
Target interventions and improvements,
Inform practice protocols,
Set standards of care

cdc.gov/dhdsp/stroke_registry.htm stroke.ahajournals.org/content/46/Suppl_1

Priority Focus Areas for Stroke Prevention Efforts

- **Inform, develop and deploy effective interventions**
- **Identify and address delivery gaps**
- **Monitor and evaluate progress**
  - Interactive Atlas of Heart Disease and Stroke

Epidemiology and Surveillance

Environmental Approaches

Health System Interventions

Community-Clinical Linkages

Bauer UE, Briss PA, Goodman RA, et al. *Lancet*. 2014
cdc.gov/dhdsp/maps/atlas/

Priority Focus Areas for Prevention Efforts

- **Improve the social and physical environments**
- **Promote healthy behaviors**
- **Make healthy choices easier and more convenient**
  - Million Hearts® sodium reduction

Bauer UE, Briss PA, Goodman RA, et al. *Lancet*. 2014

Priority Focus Areas for Prevention Efforts

- **Improve the delivery and use of services**
  - Coverdell Quality Performance Measures
  - Million Hearts® health information technology

Bauer UE, Briss PA, Goodman RA, et al. *Lancet*. 2014

Priority Focus Areas for Prevention Efforts

- **Improve access to community resources**
- **Support to prevent, delay, manage chronic diseases**
  - Coverdell community interventions and information exchange

Bauer UE, Briss PA, Goodman RA, et al. *Lancet*. 2014

Stroke Across All Ages – May is Stroke Awareness Month

- **Stroke Videos**
  - "Recognize the Signs and Symptoms of Stroke"
  - "Prince Quire's Stroke Story"
  - "Dr. Frankel's Coverdell Story: Improving Stroke Care in Georgia"
  - "Coverdell Stroke Program: Ensuring That All Americans Receive the Highest-Quality Care"
- **"Stroke and You" fact sheet series**
- **Infographics, social media cards, blogs**
- **Twitter and Facebook**

cdc.gov/dhdsp/materials_for_patients.htm

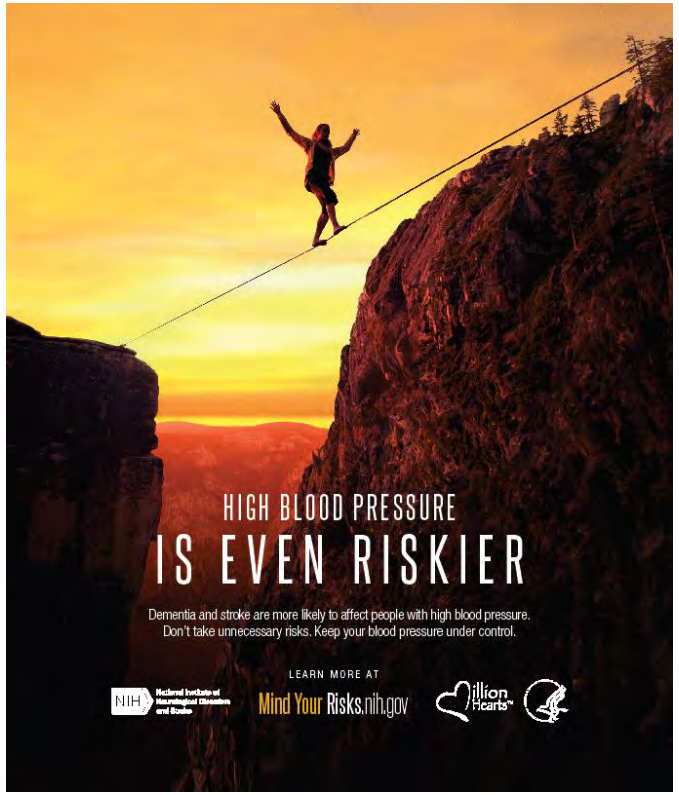
Stroke is Treatable

- **Improve stroke care with integrated efforts across care systems**
  - Quality improvement is helping bridge care gaps, improve treatment and outcomes, and eliminate disparities in care
  - Preventing stroke, morbidity, and mortality

Stroke is Preventable

- **Mind Your Risks℠ and address risk factors**
  - Hypertension remains a treatable risk factor for stroke
  - Women have increased risk of stroke and different risks for stroke
  - Racial and ethnic risk differences need to be understood and addressed

Stroke is Preventable and Treatable

- **Recognize symptoms of a stroke and act FAST!**
  - Call 911 if you think someone is having a stroke
  - Every minute counts!
  - Rapid treatment and rehabilitation are vital to improving outcomes

Mind Your Risks℠ and Act FAST to Prevent and Treat Strokes