Emergency Cardiac and Stroke Care in Washington

September 2008

Emergency Cardiac and Stroke Work Group
Washington State Emergency Medical Services
and Trauma Steering Commitee

Washington State Department of Health

Emergency Cardiac and Stroke Care in Washington

September 2008

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Executive Summary

'Global Heart Efforts Pay Off'

'Lessons of Heart Disease, Learned and Ignored'

"Global Heart Efforts Pay Off," was the headline for a *USA Today* article published May 2, 2007. The article cited an international study[1] showing a sharp drop in heart attack deaths that "coincides with global efforts to make sure patients received proven treatments." Less than a month before, the *New York Times* reported many Americans still don't receive optimal care for heart attacks in its article, "Lessons of Heart Disease, Learned and Ignored."

Which is it? Have the lessons been learned, as suggested by the *USA Today* story, or have they been ignored? What about stroke? Are people getting the treatments proven to save lives and reduce disability? Apparently they are not. Several studies show that only about 4 percent of people admitted to the hospital for stroke receive the one medication shown to be effective in treating it.[2]

To answer these questions in Washington, an Emergency Cardiac and Stroke (ECS) Work Group began meeting in 2006. The work group was formed by the state Emergency Medical Services (EMS) and Trauma Care Steering Committee, with support from the Washington State Department of Health. Members of the work group included representatives of 9-1-1 agencies, emergency medical services, hospital emergency departments, neurology and cardiology, professional and industry associations, and the American Heart Association/American Stroke Association.

To get a complete picture of emergency cardiac and stroke care in Washington, the work group examined disability and deaths from cardiac and stroke emergencies, surveyed all parts of the emergency response system to identify strengths and weaknesses, reviewed professional literature, and learned about the experiences of other states working to improve emergency cardiac and stroke care (see Appendix G). This report details the work group's findings and offers recommendations to improve emergency response for Washingtonians experiencing stroke and acute cardiac events such as heart attack and sudden cardiac arrest.

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[1] Fox KAA, Steg PG, Eagle KA, et al. Decline in rates of death and heart failure in acute coronary syndromes, 1999-2006. *JAMA* 2007; 297:1892-1900.
[2] The Paul Coverdell Prototype Registries Writing Group. *Stroke* 2005. 36: 1232-1240.

Findings

The ECS Work Group found that global heart efforts might indeed be paying off in Washington. The age-adjusted mortality rate for coronary heart disease fell from 291 deaths per 100,000 in 1980 to 125 deaths per 100,000 in 2005.[3] Stroke mortality rates have also fallen from 94 deaths per 100,000 in 1980 to 52 deaths per 100,000 in 2005.[4]

34 percent of all deaths caused by cardiovascular diseases

Despite falling death rates, heart disease and stroke were still the second and third leading causes of death in 2005, after all cancers.[5] There were 7,734 deaths due to coronary heart disease, 2,515 of which were heart attacks. Stroke caused 3,167 deaths. All cardiovascular diseases accounted for 34 percent of deaths, surpassing all other causes of death.[6]

Social and Economic Impact

Many survive heart disease or stroke with significant disability

Heart disease and stroke have a substantial social and economic impact on individuals and families, as well as the state's health and long-term care systems. Many people who survive acute heart disease or stroke have significant physical and cognitive disability, resulting in lost productivity, decreased quality of life and, often, significant burden on their families. Many need long-term care services. In 2007, two-thirds of people in nursing homes and one-third of people who received paid care at home had heart disease or had a stroke.

Costs of $4 billion for hospital and long-term care

The economic impact is staggering. Heart disease and stroke are among the most costly medical conditions at nearly $4 billion per year for hospitalization and long-term care.[7] Costs for primary care, outpatient procedures, rehabilitation, and medication are not included in this figure.

Aging Population Nearly Doubles by 2030

The age group at highest risk for heart disease and stroke—people 65 and older—is projected to nearly double by 2030,[8] potentially doubling the social and economic impact of heart disease and stroke in Washington.

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[3] Washington State Department of Health. Health of Washington State, Chronic Disease, Coronary Heart Disease. Olympia, WA, 2007. Available from http://www.doh.wa.gov/HWS/CD2007.shtm

[4] Washington State Department of Health. Health of Washington State, Chronic Disease, Stroke. Olympia, WA, 2007. Available from http://www.doh.wa.gov/HWS/CD2007.shtm

[5] Washington State Department of Health. Health of Washington State, General Health Status, Mortality and Life Expectancy. Olympia, WA, 2007. Available from http://www.doh.wa.gov/HWS/GHS2007.shtm

[6] Washington State Department of Health Death Files, 2003-2005; Center for Heath Statistics Annual Summary Tables, Washington State Department of Health, 12/2005.

[7] Total $3.96 billion: Comprehensive Hospital Abstract Reporting System: $2.3 billion for hospitalizations including a diagnosis of coronary heart disease at discharge, $707 million for stroke-related hospitalizations; long-term care costs estimated from Aging and Disability Services data: $953 million estimated for nursing home care and Medicaid-paid home care.

[8] Washington State Office of Financial Management, Forecasting Division, 2005.

Many Not Getting Proven Treatments

The work group found that too many people are not getting the treatments proven to save lives and reduce disability.

Too much time passes between onset of stroke or heart attack and treatment

- Only 2.4 percent[9] of ischemic strokes in 2003-2005 were treated with tissue plasminogen activator (t-PA), the most beneficial treatment for this type of stroke.[10]
- This rate increased to 4.3 percent in hospitals certified as primary stroke centers by the Joint Commission.
- Only 43 percent of 95 hospitals administered t-PA for stroke from 2003-2005; of these 43 hospitals, 28 of them administered t-PA for stroke less than ten times.[11]
- It is estimated that primary percutaneous coronary intervention (PCI),[12] the most effective treatment for most heart attacks,[13] is performed in 39 percent of cases.[14]
- Only 42 percent of hospitals had a catheterization lab enabling them to do primary PCI.

These low treatment rates are due to many factors. One of the most significant is too much time passing between the onset of stroke or heart attack and treatment. Both t-PA and PCI are most effective within a short window of time. Death and disability may be significantly reduced if treatment for stroke begins within three hours of onset of symptoms, and treatment for heart attack within one hour of symptom onset.[15] But patients often delay seeking treatment for heart attack and stroke, anywhere from 90 minutes to six hours.[16] When they do seek treatment, many of them don't call 9-1-1, opting to get to the hospital on their own. By doing so, they forgo the benefits of emergency medical services: speed, basic medical care, and priority attention at the emergency department.

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[9] Derived from procedure code 99.10 for any first hospitalization for each unique patient, Comprehensive Hospital Abstract Reporting System (CHARS), 2003-2005.
[10] Harold Adams, Robert Adams, Gregory Del Zoppo and Larry B. Goldstein. Guidelines for the Early Management of Adults With Ischemic Stroke. *Stroke* 2005; 36: 916-923.
[11] Comprehensive Abstract Reporting System, 2003-2005.
[12] Primary PCI, also called angioplasty, is a procedure where a balloon-tipped tube is inserted into an artery of the heart and inflated, widening the artery so that blood can flow more easily. It is often accompanied by insertion of an expandable metal stent.
[13] Keeley EC, Boura JA, Grines CL. Primary angioplasty versus intravenous thrombolytic therapy for acute myocardial infarction: a quantitative review of 23 randomized trials. Lancet 2003; 361:13-20.
[14] A crude but indicative measure derived from the total number of hospitalizations for acute myocardial infarction reported to CHARS (all WA hospitals are required to report) in 2005 and the total number of primary PCIs reported to the Clinical Outcomes Assessment Program registry (all WA hospitals that perform PCI are required to report) in 2005: 3786 PCI's performed in 2005/9737 AMI hospitalizations in 2005=38.9%.
[15] Moser, DK, et al. Reducing Delay in Seeking Treatment by Patients With Acute Coronary Syndrome and Stroke: A Scientific Statement From the American Heart Association Council on Cardiovascular Nursing and Stroke Council. *Circulation* 2006; 114; 168-182. http://circ.ahajournals.org/cgi/content/full/114/2/168.
[16] Ibid.

There are additional delays along the "chain of survival"—from dispatch of emergency medical services, to transport, to the emergency room —that increase the critical time to treatment. For example, if patients arrive at a hospital that does not have the resources or expertise to diagnose and treat a heart attack or stroke, they are often transferred to another hospital. In the survey conducted for this report, 78 percent of hospitals reported transferring stroke patients to another acute hospital. For acute myocardial infarction (AMI), 33 percent of patients admitted to hospitals without a cardiologist were transferred to another hospital, compared with 7 percent of patients admitted to hospitals with a cardiologist.

Care, Resources, and Outcomes Vary Widely

The ECS Work Group also found that care, resources, and outcomes vary significantly across the state. Specific findings include:

Hospital

Outcomes for Heart Attack

The following findings were statistically significant:

Heart attack patients more likely to die in hospitals with no cardiologist available

- Heart attack patients were more likely to die in hospitals without a cardiologist available than in hospitals with a cardiologist available, 9 percent versus 7 percent, respectively. If hospitals without cardiologists had the same case-fatality rate* as the hospitals with cardiologists, only 83 deaths would have occurred versus the 109 experienced.
- In hospitals that did not perform open heart surgeries, patients were less likely to die of a heart attack if a cardiac team was present - 10 percent versus 8 percent for hospitals without cardiac teams. If hospitals without a cardiac team had the same case-fatality rate as the hospitals with a cardiac team, only 281 deaths would have occurred versus the 355 experienced.
- Fewer heart attack patients die in hospitals that treat a large number of heart attack patients - 6 percent compared with 10 percent in hospitals with lower numbers of heart attack patients. If low-volume hospitals had the same case-fatality rate as the high volume hospitals, only 348 deaths would have occurred versus the 565 experienced.
- Heart attack patients younger than 65 who used Medicaid or charity as a primary payer, or were self-pay, were more likely to die than similar patients using other forms of insurance or payment.

*Case-fatality rate is the proportion of people who die from a disease or condition among all the people who have that disease or condition. For example, in 2005, 500 people were admitted to Hospital A for a heart attack; 80 of them died from the heart attack. The case-fatality rate would be 80 out of 500 or 16 percent.

Outcomes for Stroke

- The case-fatality rate for hospitals with or without a neurologist was similar – 11 percent and 9 percent, respectively. This finding may be surprising because we would expect that expertise in treating a certain condition would result in better outcomes. It is likely due to the fact that 78 percent of hospitals transfer stroke patients to another hospital, usually a larger hospital with a neurologist.

The following findings were statistically significant:

- Patients in hospitals without a neurologist were less likely to be discharged to rehabilitation than hospitals with a neurologist, 2 percent and 10 percent, respectively.
- Stroke patients younger than 65 who used Medicaid or charity as a primary payer or were self-pay were more likely to die than similar patients using other forms of insurance or payment.

Stroke patients in hospitals without a neurologist were less likely to be discharged to rehabilitation

Treatment Protocols and Resources

A survey of hospital showed:

- 20 percent of hospitals had a cardiac team.
- 2 percent had a cardiologist on staff, 24 hours a day, seven days a week (24/7).
- 44 percent had a cardiologist on call, 24/7.
- 59 percent had cardiac protocols.
- 1 percent had a neurologist on staff, 24/7.
- 37 percent had a neurologist on call, 24/7.
- 21 percent of hospitals had a stroke team.
- 62 percent had stroke protocols for ischemic stroke (most common type).
- 26 percent had protocols for hemorrhagic stroke.
- 29 percent of hospitals had the ability to perform and read CT-scan images to diagnose stroke in-house, 24/7.
- 24 percent had on call ability to perform and read CT scans.

2 percent of hospitals had a cardiologist on staff, 24/7

1 percent of hospitals had a neurologist on staff, 24/7

Patient Admissions

- Among the 36 hospitals without a neurologist, 77 percent admitted stroke patients.
- Among the 35 hospitals without a cardiologist, 57 percent admitted patients with acute coronary syndrome (ACS).[17]

Transfers

- Most hospitals (78 percent) transferred patients with acute stroke to another hospital. This rate increased to 97 percent for hospitals without a neurologist.
- Among hospitals without a cardiologist, 33 percent of AMI (heart attack) patients were admitted and later transferred to another hospital. Only 7 percent of AMI patients at hospitals with a cardiologist were transferred to another hospital.

[17] Acute coronary syndrome is an umbrella term used to cover any group of clinical symptoms compatible with acute myocardial ischemia (heart attack), which is chest pain due to insufficient blood supply to the heart muscle that results from coronary artery disease (also called coronary heart disease).

Emergency Medical Services

There are three levels of emergency medical services (EMS) in Washington: basic life support (BLS), intermediate life support (ILS), and advanced life support (ALS). Only ALS can perform an electrocardiogram (ECG), which can help EMS personnel determine, while in transport, whether a person is having a heart attack, and then notify the hospital in advance. Advanced life support (ALS) [18] is not available everywhere in the state.

Alerting the hospital about incoming stroke or heart attack is not a protocol in most areas

The assessment of emergency medical services (EMS) indicated that at least one-third of EMS protocols did not include specific stroke and cardiac protocols.[19] Well over half did not include stroke assessment or a high-risk checklist for acute coronary syndrome in their protocols, and most did not include pre-arrival notification of incoming stroke or heart attack. Alerting the hospital before an ambulance arrives gives staff time to prepare, which can get a patient to treatment faster.

Less than half of the protocols for BLS included giving patients aspirin or the patient's own nitroglycerin, despite changes in policy and guidelines that allow these treatments. Some medical program directors (MPD) reported that their ALS treatment protocols also did not include giving patients aspirin or nitroglycerin.

One-third of MPDs reported not having *local* operating procedures directing ambulances to the nearest hospital with the appropriate level of care for emergency cardiac and stroke care. Less than half reported having *regional* procedures, which can be critical in situations where the only qualified hospital is in another county.

EMS response could be improved by:

- Establishing uniform protocols for heart attack and stroke assessment
- Requiring prehospital notification
- Establishing local and regional EMS procedures to transport patients to hospitals that are able to provide advanced treatments

Dispatch (9-1-1)

The ECS Work Group surveyed dispatch services to learn more about existing protocols and training for cardiac and stroke care. In Washington, there are 39 independently operated dispatch centers. Three-quarters of dispatch coordinators responded to the survey. Standards are not uniform for training, continuing education, protocols, or quality improvement for emergency medical dispatch services. Nor is there a single agency responsible for oversight. It should be noted that Washington is no different than most of the country in this regard.

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[18] ALS gives the highest level of emergency care. Ambulances are staffed by paramedics, who are trained to provide more sophisticated services to diagnose and treat patients than emergency medical technicians (EMT) and volunteers who staff intermediate life support (ILS) or basic life support (BLS).

[19] Anecdotal information reported subsequent to the survey indicated that all 37 medical program directors currently have protocols addressing cardiac and stroke care. This was not verified but worthy of noting. It may be that at the time of the survey in late 2006, some MPDs did not have these protocols.

Summary of Findings

In summary, the assessment of emergency cardiac and stroke care found:

- Many people are not getting evidence-based treatments.
- Access to diagnostic and treatment resources varies greatly, especially for rural parts of the state.
- Training, protocols, procedures, and resources in dispatch services, emergency medical services, and hospitals vary significantly.
- Care and outcomes vary widely.
- Advances in technology and new approaches to care have been made in recent years that can significantly improve emergency cardiac and stroke care.

Time is critical for heart attack and stroke

The more delays, the more brain or heart tissue dies

Time is critical all along the chain of survival for heart attack and stroke patients. The more delays, the more brain or heart tissue dies. Timely treatment can mean the difference between returning to work or becoming permanently disabled, living at home or living in a nursing home. It can be the difference between life and death.

Getting "the right patient to the right place in time" is key to saving lives and reducing disability from heart disease and stroke, just as it is for trauma. It can save money too – fewer days in the hospital, shorter rehabilitation time, and fewer people in need of long-term care in nursing homes or at home. Indeed, "time is brain" for stroke and "time is muscle" for heart, but "time is money" is equally true.

Many other states have improved systems of care to respond to and treat acute cardiac and stroke events, similar to improvements in trauma care in Washington (see Appendix G). Strategies include the use of telehealth to connect rural emergency staff to specialists at larger, urban hospitals who can help diagnose and recommend treatments; uniform training and treatment protocols specifically for stroke and cardiac care for EMS and hospitals; and authorizing EMS to transport patients to hospitals with the resources to provide evidence-based care.

Several national organizations, such as the American Heart Association, American Stroke Association, and the American College of Cardiology, have published recommendations for improving cardiac and stroke systems of care. These organizations have also developed initiatives to reduce time to treatment, increase the use of evidence-based treatments, and educate the public on the importance of calling 9-1-1 immediately upon experiencing symptoms (see Appendix H).

Here in Washington, some hospitals are taking the lead in improving emergency stroke care. As of January 2008, 12 hospitals had voluntarily undergone the rigorous Joint Commission certification process to become Primary Stroke Centers. Some are exploring roles to support and consult with rural hospitals, and some have quality improvement programs in place.

However, as the report shows, there is significant room for improvement. The ECS Work Group proposed the following recommendations to improve emergency care to reduce death and disability from heart disease and stroke in Washington.

Recommendations*

A systems approach to improve emergency cardiac and stroke care

The ECS Work Group recognized that equipping and staffing every Washington hospital to treat acute heart disease and stroke is not feasible. Instead, they recommended a systems approach to improve emergency cardiac and stroke care, much like the state's excellent trauma-care system.

To develop the recommendations, the ECS Work Group studied data from several sources:

- Analyses of dispatch, medical program director, and hospital surveys
- State hospitalization and death data.
- National emergency care guidelines.
- Recommendations developed by the American Heart Association, American College of Cardiology, the American Stroke Association, and the Brain Attack Coalition.
- Models from other states.

Department of Health staff from the Heart Disease and Stroke Prevention Program and the Office of Emergency Services and Trauma System convened meetings, conducted surveys, analyzed and presented data, and drafted documents, including this report.

Guiding Principles

All Washington residents have a right to optimal care

The following principles guided the work group in developing recommendations:

- Prevention is the first line of defense against heart disease and stroke.
- Care is provided based on what is in the best interest of the patient.
- All Washington residents have a right to optimal care: timely identification, transport, treatment, and rehabilitation by emergency response and health care professionals trained according to best practice standards.
- Racial, ethnic, geographic, age, and socioeconomic disparities are addressed. Market share is balanced by policies and strategies such as telemedicine that promote broad provider participation.
- Regional differences are recognized, but basic standards are met statewide.
- All components of the system participate in planning and quality improvement.
- Patient outcomes are valued, and data collection, analysis, and quality improvement practices demonstrate the quality that the system claims to provide.
- Cost-savings are achieved where possible.

* This is a summary of the recommendations. For details, see the "Recommendations" section of the report.

The overarching recommendations of ECS Work Group endorsed by EMS and Trauma Care Steering Committee:

- Adopt the American Heart Association's Guidelines for Emergency Cardiovascular Care.
- Establish a statewide comprehensive and coordinated system of cardiac and stroke care that includes prevention and public education, data collection, standards for prehospital, hospital and rehabilitative care, and verification of hospital capabilities.
- Form a Technical Advisory Committee under the state EMS and Trauma Care Steering Committee to oversee implementation of these recommendations.

Prevention

Prevention – first line of defense against heart disease and stroke

- Educate the public on heart disease and stroke risk factors and behavior modifications that to reduce the risk of heart disease and stroke. Education should be provided in collaboration with emergency medical services, hospitals, physicians, nurses, regional councils, the Department of Health, the American Heart Association/American Stroke Association, worksites, schools, senior services, and other organizations involved in prevention and health education, or that have access to high-risk and priority populations.

Early Recognition and Treatment

- Develop and implement educational strategies to improve early recognition of heart attack and stroke, the importance of calling 9-1-1, and getting immediate treatment.
- Develop and implement strategies to increase the number of people who are able to provide high quality cardiopulmonary resuscitation (CPR).

Data and Quality Improvement

- Develop a comprehensive data system to demonstrate effectiveness and improve performance through quality improvement. Data collection should include dispatch, EMS and hospitals, and should maximize and integrate existing data systems to avoid duplicate data entry and analysis. Outcome data should be shared between hospital and prehospital providers.
- Monitor disease-specific incidence, morbidity, long-term care trends, and mortality.

Prehospital – Dispatch and EMS

- Implement the American Heart Association's guidelines for prehospital cardiovascular care as the state standard to facilitate rapid patient assessment, early hospital notification, pre-arrival activation of specialty teams, and transport to the appropriate hospital. Prehospital response time goals, training, protocols, and patient care procedures should be standardized (regionally, where necessary).

Hospital

Acute Coronary Syndrome

- Implement the American Heart Association and American College of Cardiology guidelines for hospital emergency care as the state standard, including fibrinolytic (clot-busting) therapy within 30 minutes of arrival, when appropriate, and balloon inflation within 90 minutes of arrival, when appropriate.
- Develop and implement chest pain protocols, including activation of specialized teams, as appropriate. These protocols should assure rapid assessment of chest pain patients with no ST-segment elevation.[20]

Acute Stroke

- Implement the American Stroke Association/Brain Attack Coalition guidelines for acute stroke as the state standard.
- Develop and implement stroke protocols, including activation of specialized teams, as appropriate. These protocols should assure rapid assessment of all stroke patients and expedite decisions about treatment and administration of thrombolytic (clot-busting) or other proven therapies within the necessary time frames.
- Explore telemedicine as a means to increase hospital capability to provide care according to the guidelines. (Telemedicine, or telehealth, is a method of providing real-time healthcare from a distance, using telephones, videoconferencing, digital imaging and other technology.)

Through a voluntary, inclusive program, verify that hospitals meet state standards for cardiac and stroke facilities. These standards would be based on the American Heart Association's 2005 Guidelines for Emergency Cardiovascular Care, American Stroke Association, and Brain Attack Coalition recommendations, or the most current, scientific standards that exist at the time.

Hospital verification program for cardiac and stroke care

Verified facilities should not be required to maintain minimum caseloads. Regions would be able to develop patient care procedures that direct certain patients to hospitals with higher levels of verification in order to assure care is provided in the best interest of the patient, and that all Washington residents have access to optimal care.

Rehabilitation

- Assure access to accredited rehabilitation services for cardiac and stroke patients.
- Develop guidelines or standards for rehabilitation care of cardiac and stroke patients. These standards should include requirements to modify risk factors.
- Advocate for insurance coverage for cardiac and stroke rehabilitation.

[20] ST-segment elevated myocardial infarction is a heart attack indicated by a particular result of an electrocardiogram that usually indicates artery blockage.

Introduction

Focus on emergency care – from onset of heart attack or stroke to hospital

This report examines who experiences acute heart disease and stroke in Washington, what happens when they do, and what resources are available to respond to and treat them. The focus of the report is emergency care, meaning care given from the onset of heart attack or stroke to the hospital emergency room and admission or transfer. This report also addresses elements that are outside of emergency care. Prevention, education, rehabilitation, and quality improvement all play roles in reducing death and disability from heart disease and stroke.

Heart disease and stroke – devastating social, emotional, economic costs

Heart disease and stroke have a tremendous social and economic impact in Washington. They are the second and third leading causes of death after all cancers.[21] When cancers are considered separately, heart disease is the number one killer for all ages combined. Many who survive a stroke or heart attack experience significant disability and diminished quality of life. Stroke and heart attack survivors often need assistance with normal daily activities like bathing, dressing and eating, and are dependent on caregivers, or live out their remaining years in a nursing home. Heart disease and stroke can cause many losses—income, productivity, independence, a lifetime partner, a mother, a father, a child.

If the social and emotional costs are devastating, the economic costs of heart disease and stroke are staggering: nearly $4 billion[22] annually for hospitalization and long-term care alone in Washington. This figure does not include primary care, outpatient procedures, home health, rehabilitation, or medication. Nor does it include the thousands upon thousands of unpaid hours of care provided by family caregivers and friends.

The burden of heart disease and stroke will only increase as Washington's population ages, which it is doing rapidly. The number of people 65 and older is expected to nearly double by 2030, from an estimated 711,810 (11 percent of the population) in 2005 to 1.7 million (20 percent of the population) by 2030. [23] The Office of Financial Management forecasts the number of people 75 and older will grow fastest after 2015 when most of the Baby Boom generation will reach advanced age. Those 85 and older were estimated at 104,420 in 2005. By 2030, more than 200,000 people in Washington will be 85 or older.

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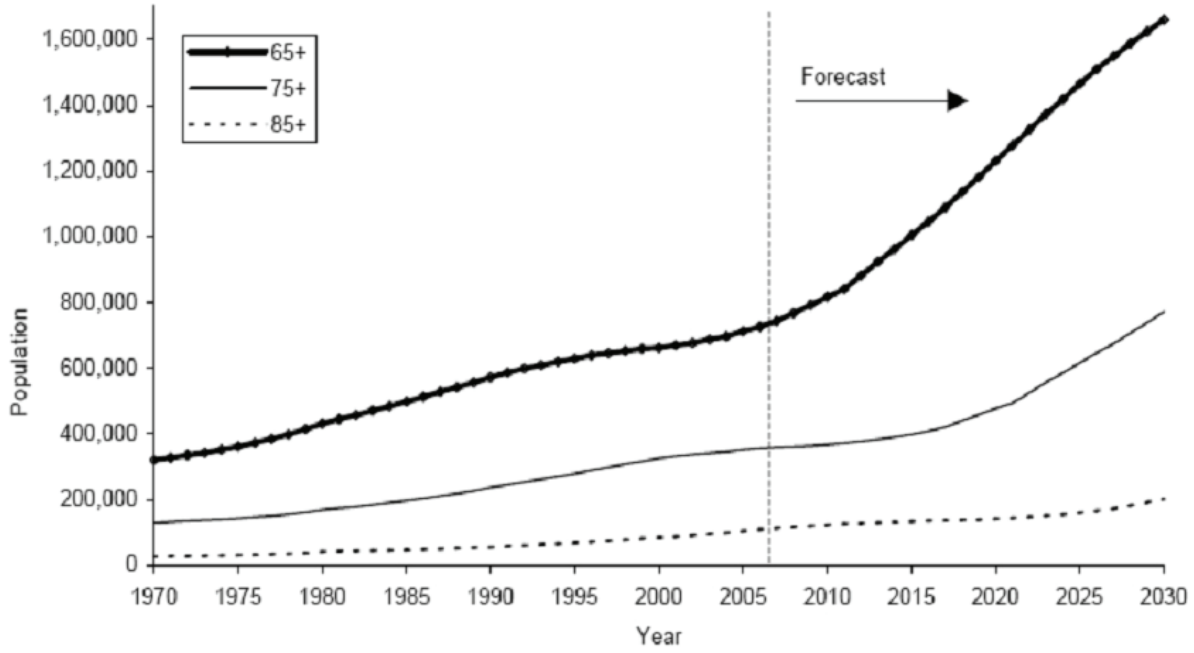
[21] Washington State Department of Health. Health of Washington State. Olympia, WA, 2007. Available from http://www.doh.wa.gov/HWS/HWS2007.htm

[22] Total $3.96 billion: Comprehensive Hospital Abstract Reporting System: $2.3 billion for hospitalization charges in 2005, including a diagnosis of coronary heart disease at discharge, $707 million for stroke-related hospitalizations; estimated from Aging and Disability Services data: $953 million estimated for nursing home care and Medicaid-paid home care.

[23] Washington State Office of Financial Management, Forecasting Division, 2005. Available from http://www.ofm.wa.gov/pop/stfc/stfc2005/stfc2005.pdf

Figure 1. Growth of the population over age 65



Source: Washington State Office of Financial Management, Forecasting Division, "Forecast of the State Population" November 2005

The high rates of death and disability from heart disease and stroke, along with astronomical costs and an aging population, present challenges for the future. However, we can meet these challenges if we use the knowledge and the tools we have to:

- Prevent and manage risk factors.
- Teach people to recognize heart attack and stroke early and to call 9-1-1.
- Treat heart attack and stroke patients with interventions proven to reduce death and disability.
- Strengthen the emergency response system, as Washington did for trauma patients in the 1990s, and get the "right patient to the right care at the right time."
- Establish an effective, coordinated, statewide cardiac and stroke system of care that addresses heart disease and stroke from prevention through treatment and rehabilitation.

This report shows why it's critical that Washington addresses acute heart disease and stroke through improving emergency response. The report provides a road map to success in the recommendations made by the members of the Emergency Cardiac and Stroke Work Group.

Background

In 1999, the state's Emergency Medical Services (EMS) and Trauma Care Steering Committee formally recognized the need to examine emergency cardiac and stroke care. A technical advisory committee was convened to assess cardiac and stroke care and recommend ways to address problems. The advisory committee completed its work in 2001 and made recommendations to the EMS and Trauma Care Steering Committee. At that time, resources were not available to act on many of the recommendations.

Improving emergency response – a national priority

In 2003, the U.S. Centers for Disease Control and Prevention (CDC) awarded funds to the Department of Health to create a Heart Disease and Stroke Prevention Program (HDSP). This is part of CDC's national initiative to address two of the leading and largely preventable, causes of death in the nation. Improving emergency response is one of the six priorities of the initiative.

The HDSP partnered with the Department's Office of Emergency Medical Services and Trauma System (OEMSTS) to revisit efforts to improve emergency cardiac and stroke care attempted in 1999. The EMS and Trauma Care Steering Committee, appointed by Washington's Governor, convened the Emergency Cardiac and Stroke (ECS) Work Group to take a fresh look at the issues and opportunities in emergency cardiac and stroke care in Washington. Their work was not intended to address all cardiac and stroke care issues, but rather those of an emergency or time-critical nature.

Methodology

The Emergency Cardiac and Stroke (ECS) Work Group set out to address the following questions:

1. Where do emergency cardiac and stroke cases occur?
2. Who are the emergency cardiac and stroke patients?
3. What prehospital care do emergency cardiac and stroke patients receive?
4. What hospital care do these patients receive?
5. How much does it cost to care for these patients?
6. Where do patients go following hospitalization?
7. How consistent is the prehospital care across the state?
8. How consistent is hospital care across the state?

These questions were answered through a comprehensive assessment of emergency cardiac and stroke care in Washington. The assessment consisted of:

1. **Surveys:** Surveys sent in September 2006 to licensed, non-federal acute-stay hospitals, county medical program directors, and county 9-1-1 coordinators to collect information on resources, protocols, and procedures related to emergency cardiac and stroke care. The surveys were completed on-line or on paper and mailed to the Department of Health.

Surveys:

Hospitals

Medical program directors

County 9-1-1 coordinators

Four contacts were made: 1) a notification letter, 2) a questionnaire, cover letter, and return envelope, 3) a reminder postcard, and 4) a replacement questionnaire sent to all non-respondents. The full survey protocol is in Appendix A; each of the surveys with aggregate results is in Appendices B, C, and D.

- The hospital survey was mailed to 95 licensed acute-care hospitals in Washington. Surveys were sent to the emergency department medical director, the emergency department nursing director, and the hospital administrator. The majority (86 percent) of the hospitals responded, with good representation from eastern and western Washington and a mix of urban and rural hospitals.
- The survey to assess prehospital emergency care was mailed to the medical program directors (MPD) for each county, of which there are 37. MPDs develop the protocols and procedures for prehospital emergency medical services. Twenty-one (57 percent) MPDs responded.
- The dispatch survey was mailed to the 39 county dispatch agency coordinators; 28 (72 percent) responded.

2. **Descriptive analysis:** The report describes analyses of data on death, disability, hospitalization, and costs related to acute heart disease and stroke. While diseases of the heart include many types and variations, much of the data review focused on acute myocardial infarction (AMI) as an area of special concern because time is critical and special resources are needed. Data on other heart disease diagnoses were included in the analysis of nursing home patients and people receiving home care because AMI is not tracked in the data sources.

   - Hospitalization data on AMI and stroke are from the Comprehensive Hospital Abstract Reporting System (CHARS), Washington State Department of Health (DOH) for the years 2003-2005. AMI hospitalizations were defined as discharges with a primary ICD9-CM diagnosis of 410.0-410.9. Stroke hospitalizations were defined as discharges with a primary ICD9-CM diagnosis of 430-438.9.
   - Death data are from death records maintained by the Center for Health Statistics, Vital Statistics, DOH for the years 2003-2005. The underlying cause of death was used for the analysis. Deaths due to AMI were defined as deaths with an underlying cause of death listed as ICD-10 I21-I22.9. Stroke deaths had an underlying cause of death of ICD-10 I60-I69.8, F01-F01.9.
   - Data on nursing home residents is from the Minimum Data Set Active Resident Information Report of the Centers for Medicare and Medicaid Services, 2007.
   - Data on people receiving Medicaid-paid home care are from the Comprehensive Assessment Reporting Evaluation (CARE) system, 2007, of the Washington State Department of Social and Health Services Aging and Disability Services Administration.

3. **Logistic regression:** More in-depth analysis was done to determine whether certain characteristics reported in the survey were associated with outcomes such as death, transfer to another hospital, receipt of treatment, and discharge to rehabilitation. Characteristics analyzed included cardiac and stroke patient volumes; cardiology and neurology specialists on staff; existence of cardiac and stroke specialty teams; specific cardiac and stroke protocols; availability of diagnostic equipment; and capability to perform evidence-based interventions, particularly primary percutaneous coronary intervention (PCI), and thrombolytic therapy using tissue plasminogen activator (t-PA). This analysis was possible only for factors related to hospital care; there were no sources of data to assess outcomes related to prehospital emergency care.

Also limiting outcomes-analysis was the lack of data available on outcomes other than death. Many people who experience acute cardiac and stroke events live, but are significantly disabled. Unfortunately, data on disability resulting from heart disease or stroke are not collected. In an attempt to portray the impact of disability due to stroke and heart attack, data on the number of people who have related diagnoses and are receiving long-term care services in nursing homes and at home were included in the assessment.

For details regarding specific statistics used, their definitions, and illustrative examples, refer to the Statistical Terms section of the Glossary on page 53.

In addition to examining state-specific information, the ECS Work Group reviewed the literature on emergency cardiovascular care, including national guidelines published by the American Heart Association, the American Stroke Association, and the Brain Attack Coalition. They were also presented information on the activities of other states to improve emergency cardiovascular care.

Taking into consideration all of the data gathered and presented, as well as their own knowledge, experience, and expertise, the ECS Work Group made the recommendations presented in this report.

Department of Health staff from the Heart Disease and Stroke Program and the Office of Emergency Services and Trauma System coordinated meetings, conducted the surveys, analyzed and presented data, and prepared documents, including this report. The Work Group reviewed all materials developed by staff.

Limitations of Data

The data used for this report may be limited for the following reasons:

- The data presented in this report came from several sources, as noted above. While every attempt was made to obtain data from the same time periods, and to use consistent definitions of terms, some variation was unavoidable.
- The survey data was self-reported and was not validated by reviewing documents, observation, or otherwise.
- While the survey response rates were generally acceptable – 28 (72 percent) of dispatch coordinators; 21 (57 percent) of medical program directors; and 82 (86 percent) of hospitals – the survey respondents may not represent the entire group.
- It was often necessary to estimate numbers and costs because exact figures were either not available, or not available within the scope of the assessment.

Findings

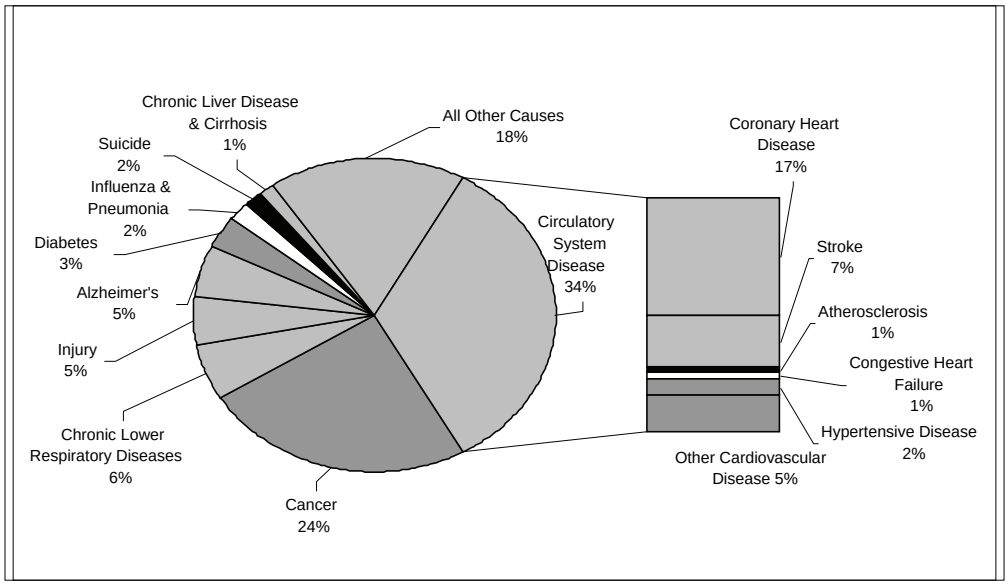
The findings presented include:

- Numbers and characteristics of people affected by acute myocardial infarction (AMI) and stroke.
- Hospitalization and death rates for AMI and stroke.
- Hospitalization charges for heart disease in general, AMI specifically, and stroke.
- Costs of disability are represented by utilization and estimated costs of nursing home and Medicaid home care services for people with a diagnosis of stroke, heart diseases related to AMI, or both.
- Protocols and resources available to respond to and treat cardiac and stroke emergencies at the prehospital and hospital level.
- Estimated percentages of strokes and AMIs treated with recommended interventions.
- Outcomes analyses relating mortality to certain characteristics reported in the hospital survey.

Deaths

The pie chart shows that heart disease and stroke together (circulatory system disease) surpass other causes of death, including cancer, respiratory diseases, injury, diabetes, and Alzheimer's disease. Heart disease, alone, is the leading underlying cause of death for all ages combined.

Figure 2. Leading causes of death, Washington, 2003-2005



Sources: Washington State Department of Health Death Files, 2003-2005; Center for Heath Statistics Annual Summary Tables, Washington State Department of Health, 12/2005. Due to rounding, percentages may not equal 100 when added.

In 2005, there were 7,734 deaths due to coronary heart disease in Washington, 2,515 of which were due to AMI. There were 3,167 deaths due to stroke. Washington was ranked 13th highest of all states for stroke age-adjusted death rates, and 32nd for coronary heart disease age-adjusted death rates.[24]

[24] American Heart Association Web site http://www.americanheart.org/downloadable/heart/1168614926024StateDeathRates_2007.pdf

Table 1. Distribution of myocardial infarction and stroke deaths by selected characteristics, Washington, 2005

Individual Characteristics	Myocardial Infarction† (N=2,515)	Percent*	Stroke‡ (N=3,167)	Percent*
Age				
0-44	35	1.4	44	1.4
45-54	158	6.3	107	3.4
55-64	315	12.5	158	5.0
65-74	424	16.9	375	11.8
75-84	778	30.9	1,057	33.4
85+	805	32.0	1,426	45.0
Gender				
Male	1,411	56.1	1,224	38.7
Female	1,104	43.9	1,943	61.3
Place of death				
Home	636	25.3	470	14.9
Other place	92	3.7	34	1.1
In transport	10	0.4	2	0.1
Emergency room	267	10.6	72	2.3
Hospital	913	36.3	1,087	34.3
Nursing home	534	21.2	1,347	42.5
Hospice	32	1.3	128	4.0
Unknown	31	1.2	27	0.9
Geographic location of death				
Eastern Washington	527	21.0	648	20.5
Western Washington	1,930	76.7	2,458	77.6
Out-of-state	58	2.3	61	1.9

Source: Center for Health Statistics, Washington State Vital Statistics, Death Records, 2005 www.doh.wa.gov/ehsphl/chs/chs-data/death/dea_VD.htm

†Acute myocardial infarction deaths had an underlying cause of death listed on the death certificate as ICD-10 I21-I22.9.

‡ Cerebrovascular disease (stroke) deaths had an underlying cause of death of ICD-10 I60-I69.8, F01-F01.9.

*Due to rounding, percentages when added may not equal 100.

Deaths

Acute Myocardial Infarction – Heart Attack

68 percent of heart attack deaths were in an emergency room, hospital or nursing home

- **Age:** AMI deaths occurred primarily in people age 45 years and older, with most deaths occurring in people 75 and older.
- **Gender:** More men than women died from AMI. Deaths due to AMI among men younger than 65 years outnumbered women by a ratio of 3:1; there were 385 male deaths and 118 female deaths in this age group in 2005. In people 65 years and older, deaths were more evenly distributed across genders, with 1,015 deaths among males and 978 deaths among females.

- **Place of Death:** The majority (68 percent) of AMI deaths occurred in the emergency room, hospital or a nursing home. Those younger than 65 years of age appeared more likely to die out of hospital (41 percent) compared to those 65 years and older (27 percent). About 25 percent of deaths from AMI occurred at home; almost 4 percent occurred at another non-health care setting. This was consistent in both eastern and western

  Washington with no significant difference in the case-fatality rate occurring out of hospital. For death rates by county for heart disease, see Appendix E.

Deaths

Cerebrovascular Disease – Stroke

- **Age:** Stroke deaths occurred primarily in people age 45 years and older, with the majority occurring in people 75 and older.
- **Gender:** More women than men overall died from stroke, but more men died from stroke among people younger than age 65 (179 men, 142 women in 2005). For people ages 65-84 years, there were 729 deaths among women (55 percent) compared to 609 male deaths (46 percent). In the very old (85 years and older), female deaths outnumbered male deaths by a ratio of 2.5:1 (910 female deaths and 361 male deaths in 2005).
- **Place of death:** About 15 percent of stroke deaths occurred at home; another 1 percent occurred at another non-health care location. This was consistent in both eastern and western Washington with no significant difference in the percentage of deaths occurring out of hospital. The majority (79 percent) of stroke deaths occur in hospitals and nursing homes. Unlike deaths from AMI, younger people were not more likely to die from stroke out of hospital than older people. For stroke death rates by county, see Appendix E.

15 percent of stroke deaths were at home

79 percent of stroke deaths occurred in hospitals and nursing homes

Hospitalizations

In 2005, heart disease and stroke were the first and seventh leading causes of hospitalization in Washington after childbirth.[25] There were 79,310 hospitalizations that included any diagnosis of coronary heart disease (CHD) at discharge.[26] For 25,463 (32 percent) of these hospitalizations, CHD was the primary diagnosis. AMI[27] (a subset of CHD) was the primary diagnosis for 9,737 hospitalizations, or 12 percent of the total hospitalizations with any CHD diagnosis.

In the same year, 27,253 Washington hospitalizations included a diagnosis of stroke at discharge. For 13, 315 (49 percent) of these hospitalizations, stroke was the primary diagnosis.

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[25] Includes ICD9 codes 391-392.0, 393-398, 402, 404, 410-416, 420-429. CHARS, Washington State Department of Health. Health of Washington State. Olympia, WA 2007.
[26] Includes ICD9 codes 410-414. CHARS, Washington State Department of Health.
[27] Includes ICD9 codes 410-410.9. CHARS. Washington State Department of Health.

Table 2. Distribution of myocardial infarction and stroke hospitalizations by selected patient characteristics Washington State, 2005†

Patient Characteristics	Myocardial Infarction† (N=9,737)	percent*	Stroke‡ (N=13,315)	percent*
Age				
0-44	520	5.3	624	4.7
45-54	1,400	14.4	1,173	8.8
55-64	2,192	22.5	2,079	15.6
65-74	2,013	20.7	2,807	21.1
75-84	2,282	23.4	4,134	31.1
85+	1,330	13.6	2,498	18.8
Gender				
Male	6,084	62.5	6,345	47.7
Female	3,653	37.5	6,970	52.4
Discharge Disposition				
Home (routine)	6,478	66.5	6,386	47.6
Home with home health agency	598	6.1	952	7.2
Transfer to another hospital	811	8.3	329	2.5
Transfer to Skilled Nursing Facility	941	9.7	2,599	19.5
Transfer to Intermediate Care Facility	31	0.3	47	0.4
Transfer to other institution type	61	0.6	204	1.5
Left against medical advice	42	0.4	45	0.3
Died	576	5.9	1,008	7.6
Other	111	1.1	306	2.3
Rehabilitation	88	0.9	1,439	10.8
Residence				
Eastern Washington	1,619	16.6	2,495	18.7
Western Washington	7,516	77.2	10,256	77.0
Out-of-State	588	6.0	556	4.2
Unknown	14	0.1	8	0.1

Source: Comprehensive Hospital Abstract Reporting System (CHARS), Washington State Department of Health, 2005
† Acute myocardial infarction hospitalizations were defined as discharges with a primary ICD9-CM diagnosis of 410.0-410.9 (cardiac infarction; coronary artery embolism, occlusion, rupture, thrombosis; infarction of heart, myocardium, or ventricle; rupture of heart, myocardium, or ventricle; ST elevation (STEMI) and non-ST elevation (NSTEMI) myocardial infarction.
‡ Cerebrovascular disease (stroke) hospitalizations were defined as discharges with a primary ICD9-CM diagnosis of 430-438.9.
*Due to rounding, percentages when added may not equal 100.

Hospitalizations

Patient Characteristics

Hospitalization rates rose with increasing age, then decreased after age 84

As shown in Table 2, hospitalization rates for heart disease and stroke generally rose with increasing age, and then decreased after age 84. Hospitalizations for AMI were higher among men compared to women, while stroke hospitalizations were higher for women than they were for men. Most AMI patients were discharged to home, with less than 10 percent being transferred to a skilled nursing facility. Just over half of stroke patients were discharged to home, with about 20 percent being transferred to a skilled nursing or other type of facility.

Stroke patients were far more likely than cardiac patients to be discharged to rehabilitation, but this is most likely due to stroke rehabilitation often being done on an inpatient basis, while cardiac rehabilitation is on an outpatient basis.

Hospitalizations

Cost Estimates for Hospitalizations

Heart disease accounted for 17.3 percent of the total hospital charges in 2005, making it the most expensive type of hospitalization.[28] In 2005, charges for hospitalizations which included any diagnosis of CHD totaled $2.3 billion. Where CHD was the primary diagnosis, charges were over $1 billion. AMI, a subset of CHD, comprised 12 percent of the CHD-related hospitalizations, with charges over $430 million.[29]

Hospital charges for any diagnosis of coronary heart disease totaled $2.3 billion

Total charges for stroke-related hospitalizations were $707 million, with $321 million for stroke as the primary diagnosis.[30]

Total charges for stroke-related hospitalizations were $707 million

These costs are estimates based on hospital reports of what they charge payers at the time of discharge, not necessarily what they receive from payers. They did not include physician fees, which are billed separately.

Medicare was the primary payer for 54 percent of AMI hospitalizations and 64 percent for stroke hospitalizations.

Disability and Long-Term Care

Measuring the impact of disability due to stroke and heart disease is less straightforward than measuring mortality and hospitalizations. However, there are data available on the number of people with diagnoses of stroke or heart diseases related to AMI[31] receiving care in nursing homes and in their own homes. This gives us a picture, albeit incomplete, of the number of people disabled by heart disease and stroke and the costs of disability. It significantly underestimates both measures, as it does not include people cared for by family or those who pay out-of-pocket for care.

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[28] Includes ICD9 codes 391-392.0, 393-398, 402, 404, 410-416, 420-429. CHARS, Washington State Department of Health. Health of Washington State. Olympia, WA 2007.

[29] CHARS, ischemic heart diseases, ICD-9 410-414.9.

[30] Cerebrovascular disease (stroke) hospitalizations were defined as discharges with a primary ICD9-CM diagnosis of 430-438.9 (CHARS).

[31] Heart diseases related to AMI were used in the analysis because AMI is not specifically tracked in the data sources. Diseases considered related were heart disease, congestive heart failure, peripheral vascular disease, other cardiovascular disease.

More than half in nursing homes diagnosed with heart disease or stroke

In April 2007, almost 60 percent (11,095 of 18,928) of people in nursing homes had a diagnosis of heart disease or stroke.[32] The average annual cost of care in a nursing home in Washington is $76,833.[33] Annually, the cost of caring for 11,095 residents is approximately $852 million.

$852 million for nursing home care

In February, 2007, 6,486 (26 percent) of the 25,066 people receiving assistance with activities of daily living (bathing, dressing, toileting, eating, etc.) in their own homes through the Medicaid program reported having been diagnosed with stroke, congestive heart failure (CHF), or both.[34] There were 3,040 who reported having a stroke diagnosis, 2,787 who reported CHF, and 659 who reported both stroke and CHF.

The average monthly cost of Medicaid home care is $1,300.[35] If all 6,486 people with diagnoses of stroke and CHF received services for one month, estimated Medicaid expenditures of providing home care to these stroke and CHF patients would be $8.4 million per month, or $101 million per year.

Prehospital Care

Dispatch Services

Dispatch services were assessed primarily to learn more about existing protocols and training for cardiac and stroke calls. A total of 28 (72 percent) of the 39 county dispatch coordinators responded to the survey. The following are highlights from the dispatch coordinator survey. For the survey questions and aggregate results, see Appendix B.

- Dispatch services are provided under a variety of local authorities: 32 percent operate under county authority, 39 percent operate under interlocal or other agreements, 18 percent under law enforcement or county and law enforcement, and 4 percent each under city, fire department, or city and fire department combined. There is no statewide agency or local entity responsible for emergency medical dispatch, and no uniform oversight or guidance at the regional, state, or even federal level. Some coordination and general training are provided by the E9-1-1 Unit in the Emergency Management Division of the Washington Military Department.
- All dispatch coordinators reported using an emergency medical dispatch program: 48 percent use Medical Priority Dispatch System, 37 percent use King County's Criteria-Based Dispatch, 11 percent use Powerphone, and 4 percent "other."

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[32] Centers for Medicare and Medicaid Minimum Data Set Active Resident Information Report. Included diagnoses of arteriosclerotic heart disease, congestive heart failure, peripheral vascular disease, other cardiovascular disease, and stroke.
[33] An average derived from Seattle and Spokane nursing home costs reported in "The MetLife Market Survey of Nursing Home & Home Care Costs" by MetLife Mature Market Institute.
[34] Washington State Department of Social and Health Services, Aging and Disability Services Administration, Comprehensive Assessment Reporting Evaluation System.
[35] Washington State Department of Health Services, Aging and Disability Services Administration, April 2007.

- Medical program directors, in some areas, review or approve emergency medical protocols for dispatch, select emergency medical dispatch programs, and work to improve quality.
- Sixty-seven percent conduct quality improvement for emergency medical dispatch.
- Eighty-five percent have protocols for suspected cardiac emergency calls; 89 percent have them for suspected stroke calls.
- Fifty-nine percent reported that all dispatchers receive chest pain-specific training or continuing education; 63 percent reported that all dispatchers receive stroke-specific training or continuing education.
- Fifty-eight percent of dispatch coordinators indicated that advanced life support (ALS) is dispatched every time for emergency calls for chest pain/discomfort; 31 percent indicated that ALS is sometimes dispatched.
- Eighty-five percent of dispatch coordinators indicated that the severity of chest pain/discomfort does not influence the level of EMS service dispatched.
- The following factors were reported as influencing the level of EMS service dispatched for chest pain or discomfort:
  - Level of consciousness: 71 percent reported this factor as an influence.
  - Age: 61 percent reported this factor as an influence.
  - Medical/surgical history: 46 percent reported this factor as an influence.
  - Pertinent and related symptoms such as chest pain, shortness of breath, dizziness: 70 percent reported this factor as an influence.
- Half of the dispatch coordinators indicated that ALS was dispatched to a potential stroke emergency call every time, and 39 percent indicated that ALS is sometimes dispatched. Fifty-seven percent indicated that Basic Life Support (BLS) is dispatched every time, and 33 percent indicated BLS is sometimes dispatched.
  - Twenty-two percent of dispatch coordinators indicated that the severity of stroke influences the level of EMS service dispatched.
- The following factors are reported as influencing the level of EMS service dispatched for stroke:
  - Level of consciousness: 68 percent reported this factor as an influence.
  - Medical history: 36 percent reported this factor as an influence.
  - Pertinent and related symptoms such as chest pain, shortness of breath, dizziness: 64 percent reported this factor as an influence.
  - Known diabetic: 36 percent reported this factor as an influence.

Emergency Medical Services

The survey assessing emergency medical services was sent to the 37 medical program directors (MPDs) who oversee the care given by certified emergency medical services (EMS) personnel. The survey assessed training, protocols, and patient care procedures. Of the 37 MPDs, 21 (57 percent) responded to the survey. The following are highlights from the medical program director survey. For the survey questions and aggregate results, see Appendix C.

- Thirty-three percent of the MPDs reported having no specific stroke or cardiac protocols.[36]
- Forty-eight percent did not include stroke assessment in treatment protocols for ALS, 81percent did not include this assessment for Intermediate Life Support (ILS), and 71percent did not include this assessment for Basic Life Support (BLS).
- Seventy percent did not complete a high-risk checklist on at least 80 percent of their patients presenting with acute coronary syndrome.
- Sixty-two percent did not include a fibrinolytic checklist in treatment protocols to help determine whether the patient is a candidate for fibrinolytic therapy. This therapy involves giving medication to break down clots.
- For ST-elevated myocardial infarction (STEMI): 29 percent of ALS did not include pre-arrival notification to the receiving hospital of incoming STEMI patients in their treatment protocols. For ILS and BLS: 91 percent and 95 percent, respectively, did not include pre-arrival notification for STEMI. STEMI means a heart attack described by a particular result of an electrocardiogram that usually indicates blockage in an artery.
- For stroke, 10 percent did not include pre-arrival notification for ALS, and 67 percent and 52 percent, respectively, did not include pre-arrival notification for ILS and BLS.
- Twenty-nine percent did not have local county operating procedures that identify the location of the nearest hospital that can provide the appropriate level of care for treating acute coronary syndrome; 33 percent did not have them for stroke.
- Thirty-eight percent did not have *regional* operating procedures that identify the location of the nearest hospital that can provide the appropriate level of care for treating acute coronary syndrome; 43 percent did not have them for stroke.

[36] Anecdotal information reported subsequent to the survey indicated that all MPDs currently have protocols addressing cardiac and stroke care. This was not verified but worth noting. It may be that at the time of the survey in late 2006, some MPDs did not have these protocols. However, even if all MPDs had or have protocols specific to cardiac and stroke care, the consistency of the protocols with the recommended guidelines from the American Heart Association was not assessed.

- Seventy-seven percent of MPDs reported that people in their county always (48 percent) or usually (29 percent) have timely access to ALS prehospital care.
- Less than half of MPDs' protocols for BLS included giving aspirin or the patient's own nitroglycerin, despite changes in policy to allow it. Some MPDs reported that even their ALS treatment protocols did not include administration of aspirin or nitroglycerin.

Comments

Comments on the survey indicated concern about the evidence base of thrombolytic stroke therapy, distance to cardiac and stroke specialty hospitals, communication between EMS and hospitals, and lack of neurology and cardiac specialists in rural areas. One commenter suggested a statewide comprehensive system modeled on the principles of the state trauma system would reduce death and disability from heart disease and stroke. Another suggested allowing hospitals without cardiovascular surgery backup to do interventional cardiology.

Hospital Care

The survey assessing hospital resources, treatment protocols, and procedures was sent to the 95 licensed acute care hospitals in the state. Of these, 82 (86 percent) responded to the survey. For the survey questions and aggregate results, see Appendix D.

Emergency Department Staffing

- Seventy (88 percent) of the 80 hospitals that reported on physician staffing had an emergency department staffed with full-time physicians. Of the 70 hospitals, 48 (69 percent) had physicians board-certified in emergency medicine, 20 (29 percent) had physicians board-certified in other specialties, and two (3 percent) had physicians not board- certified. (Note: percentages do not add up to 100 due to rounding).
- Ten percent (13) of the 80 hospitals that reported on physician staffing did not have physician-staffed emergency departments. These hospitals relied on physician assistants (22 percent), a combination of nurses, nurse practitioners, and physician's assistants (67 percent), or other (11 percent).

Cardiac Care

Table 3 indicates the percentage of hospitals that responded 'yes' to survey questions about capability, protocols, and resources to provide emergency cardiac care. The narrative following the table elaborates on the data and presents findings of analyses conducted to determine whether certain variables were related to mortality, transfers, or treatment received.

Table 3. Cardiac care capabilities & resources by hospital and by hospital size, Washington, 2006†

Capability/Resource	# of hospitals that responded to question (n=82)	Total % "yes"	Hospital size‡ (n=81)* 1-19 (*n* = 13)	20-49 (*n* = 29)	50-99 (*n* = 10)	100-199 (*n* = 14)	200+ (*n* = 15)
Physician-staffed in emergency department	80	85.4%	76.9%	69.0%	100.0%	100.0%	100.0%
Cardiologist on staff or on call	82	57.3%	7.7%	31.0%	70.0%	100.0%	100.0%
Admits acute coronary patients	82	74.4%	69.2%	51.7%	80.0%	92.9%	100.0%
Cardiac team in place	82	19.5%	0.0%	3.5%	0.0%	42.9%	53.3%
Acute coronary protocol in place	82	58.5%	38.5%	48.3%	60.05%	78.6%	73.3%
Catheterization lab on premises	82	41.5%	0.0%	0.0%	50.0%	92.9%	100.0%
Performs open heart surgery	82	22.0%	0.0%	0.0%	10.0%	21.43%	86.7%
Lytics is primary reperfusion strategy	81	48.9%	84.6%	72.4%	40.0%	21.4%	6.7%
Angioplasty is primary reperfusion strategy	81	41.5%	7.7%	10.3%	50.0%	78.6%	86.7%
Provides post-acute cardiac rehabilitation	82	54.9%	23.1%	37.9%	60.0%	85.7%	80.0%
Avg time by ground to open heart surgery hosp. (minutes)	60	51.5**	78.5	57.3	37.8	23.0	5.0
Avg time by air to open heart surgery (min.)	44	29.3***	39.2	30.3	23.8	16.3	0.0

†Derived from survey responded to by 82 hospitals (Appendix D). The "total % yes" column reflects the percentage that responded yes to the specific question about a resource or capability, and includes all responses available from the survey, including the one hospital for which the number of staffed beds was not known.
‡Defined by number of staffed beds as reported in the survey or the trauma designation applications submitted throughout 2005-2007.
*The data exclude one hospital for which the number of staffed beds was not known.
**The average time in minutes (*SD* = 45.0)
***The average time in minutes (*SD* = 22.8)

Cardiologist Availability

As Table 3 reflects, all 29 hospitals with 100 or more beds indicated having a cardiologist either on-staff or on call. Of the smallest hospitals (<20 beds), one (7.7 percent) of 13 reported having a cardiologist available. Of the 35 hospitals that don't have a cardiologist available, 20 (57 percent) indicated that they admit patients with acute coronary syndrome.

Heart attack patients were more likely to die in hospitals without a cardiologist

- There were significantly more AMI deaths at hospitals without a cardiologist than at hospitals with a cardiologist, 9 percent and 7 percent respectively ($p < .005$).[37] That is, patients admitted for AMI were more likely to die in hospitals without a cardiologist. If hospitals without cardiologists had the same case-fatality rate as the hospitals with cardiologists, only 83 deaths would have occurred versus the 109 observed.

  Limiting this analysis to patients 65 years or older yielded similar rates for hospitals with and without a cardiologist [10 percent and 10 percent, respectively ($p = .439$)].

[37] Analysis was limited to AMI patients defined as ICD-9 410-410.9 from 2003-2005 CHARS data and excluding: 1) transfers to other acute care facilities (status = 02) and 2) hospitals that did not participate in the survey.

Limiting the analysis to patients 64 years or younger yielded significantly different death rates. That is, patients 64 years or younger were less likely to die in hospitals with a cardiologist than in hospitals without a cardiologist, approximately 3 percent and 5 percent respectively ($p < .05$).

- Thirty-three percent of AMI patients admitted to hospitals without a cardiologist were transferred to another hospital, compared with 7 percent of patients admitted to hospitals with a cardiologist.

One-third of heart attack patients, admitted to hospitals without a cardiologist, were later transferred to other hospitals

Hospital Cardiac Team

A hospital cardiac team specializes in cardiac care and follows specific procedures. Depending on the hospital, such teams might include the emergency physician, a cardiologist, radiology, laboratory services, patient care services, pharmacists, and others.

- Sixteen (20 percent) hospitals reported having a cardiac team; all but one of them have 100 or more beds.
- In hospitals that do not perform open-heart surgery, patients were less likely to die of a heart attack if there was a cardiac team, 10 percent versus 8 percent ($p < .005$).[38] If hospitals without a cardiac team had the same case-fatality rate as the hospitals with a cardiac team, for the period 2003 through 2005, only 281 deaths would have occurred versus the 355 observed.

Acute Coronary Protocol

Of the 82 hospitals that responded to the survey, 59 percent reported having acute coronary protocols in place. The larger hospitals were more likely to have protocols, but even among the hospitals with 200-plus beds, only 73 percent reported having them. Hospitals with cardiologists on staff or on call were more likely to have acute coronary protocols than hospitals without cardiologists on staff or on call, 73 percent and 27 percent respectively.

Availability of Cardiac Interventions

Nineteen (20 percent) of the 95 hospitals in Washington perform open heart surgery.[39] The map on page 29 shows the location of these hospitals by state EMS and Trauma Region at the time of the survey. The ability to perform open heart surgery is not necessary to treat most AMIs. It is, however, necessary to have a catheterization laboratory and the professionals to perform percutaneous coronary intervention (PCI), one of the most effective interventions for AMI.[40] There are 30 Washington hospitals that perform emergency PCI (see map on page 30). About half of the state's hospitals rely on lytics (clot-busting medications) rather than PCI to treat AMIs.

Out of 95 Washington hospitals, 19 perform open heart surgery, 30 perform PCI

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[38] Analysis was limited to AMI patients defined as ICD-9 410-410.9 from 2003-2005 CHARS data and excluding: 1) transfers to other acute care facilities (status = 02) and 2) hospitals that did not participate in the survey.
[39] Data obtained from the Department of Health Certificate of Need Program, not the hospital survey.
[40] American College of Cardiology/American Heart Association Guidelines for the Management of Patients With ST-Elevation Myocardial Infarction—Executive Summary. Antman EM et.al. *Circulation* 2004; 110;588-636.

Hospital Cardiac Volume[41]

Volume represents the number of patients a hospital admitted for a particular condition, in this case AMI. It indicates a hospital's level of experience treating a condition and, as such, it can influence outcomes.

- High volume hospitals had a significantly lower case-fatality (death) rate (6 percent) for AMI than low volume hospitals (10 percent) from 2003 to 2005 ($p < .001$). That is, patients were more likely to die in low volume hospitals than high volume hospitals. If low volume hospitals had the same case-fatality rate as the high volume hospitals, for the period 2003 through 2005, only 348 deaths would have occurred versus the 565 observed.
- In 2005, the top ten volume hospitals for AMI accounted for 37 percent of all cardiac admissions in Washington.

[41] For this analysis, hospital volume is determined by the number of patients a hospital admitted for AMI in 2003-2005 divided by 3 (CHARS). After computation, low volume is defined as having 199 or less AMI patients and high volume by 200 or more AMI patients. AMI is defined as ICD-9 410-410.9.

Figure 3. Hospitals That Perform Open Heart Surgery

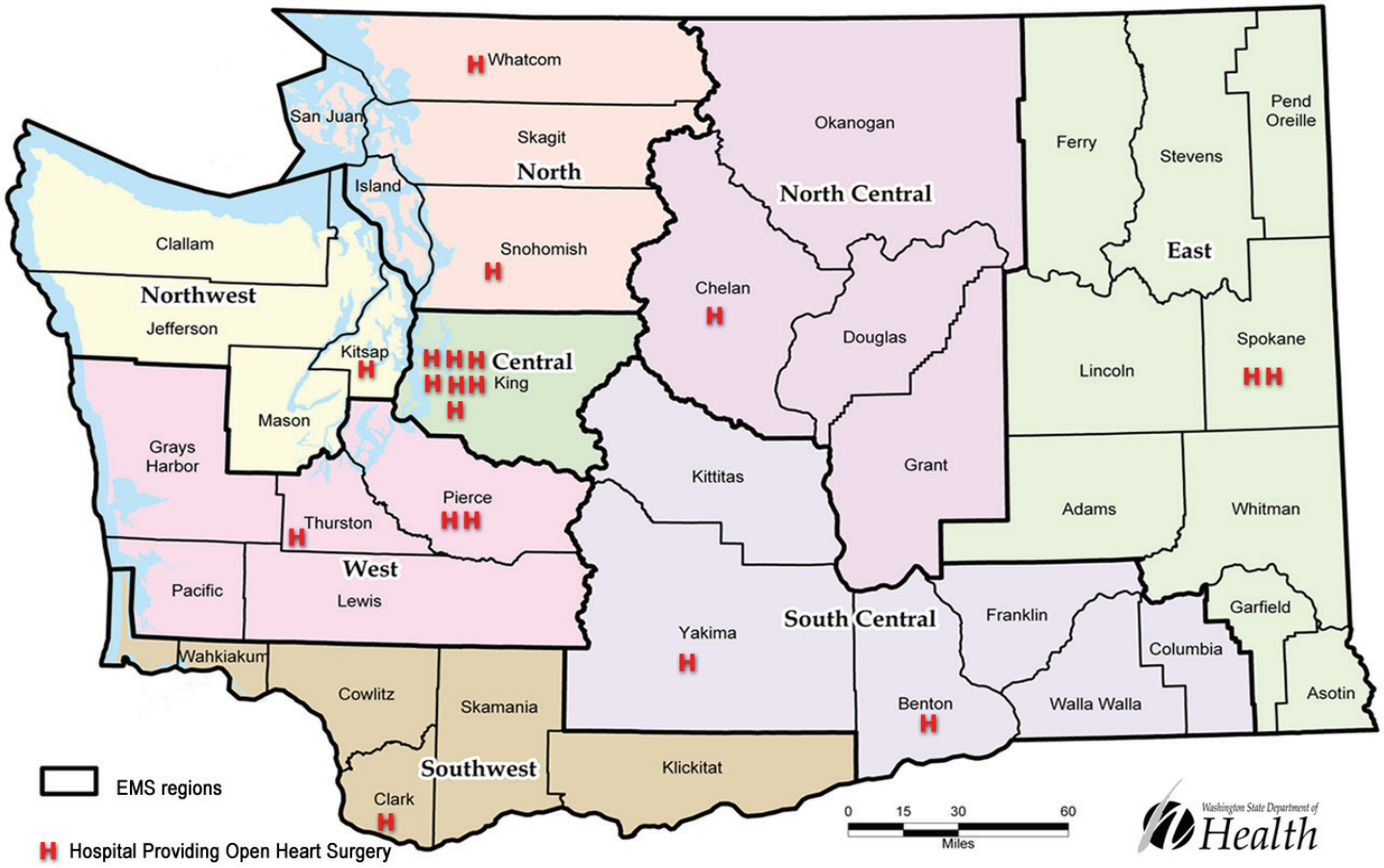

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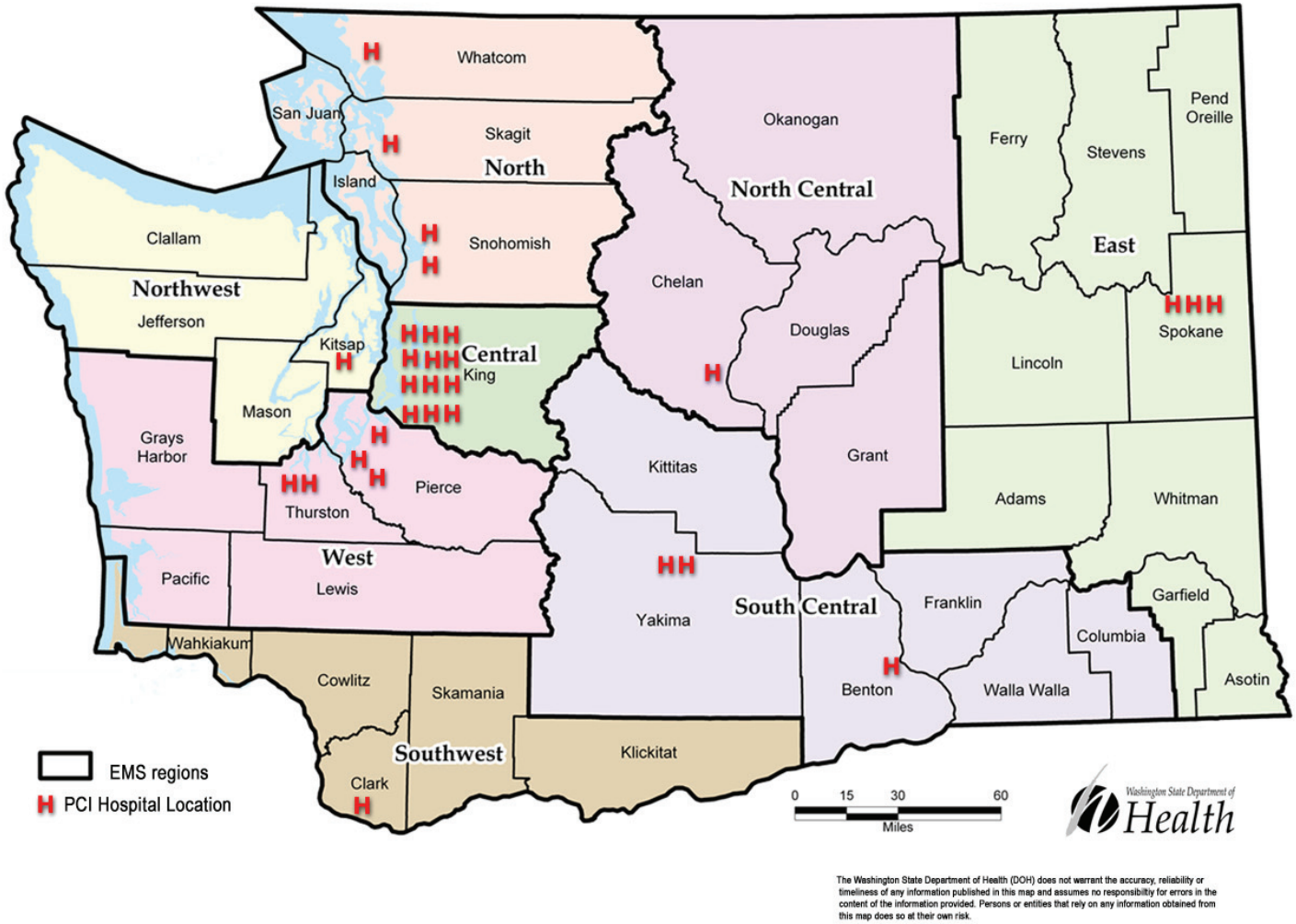
Figure 4. Hospitals That Perform Percutaneous Coronary Intervention (PCI)



Stroke Care

Table 4 indicates the percentage of hospitals responding 'yes' to questions on the hospital survey (Appendix D) about capability, protocols, and resources to provide emergency stroke care. The narrative following the table elaborates on the data and presents findings of analyses conducted to determine whether certain variables were related to mortality, transfers, treatment received and discharge to rehabilitation.

Table 4. Stroke care capabilities and resources by hospital size, Washington 2006†

			Hospital Size‡ (n=81)*				
Capability/Resource	# of hospitals that responded to question (n=82)	Total % "yes"	1-19 (*n* = 13)	20-49 (*n* = 29)	50-99 (*n* = 10)	100-199 (*n* = 14)	200+ (*n* = 15)
Neurologist on staff or on call	82	47.6%	0.0%	20.7%	50.0%	85.7%	100.0%
CT available	82	90.2%	69.2%	89.7%	100.0%	100.0%	93.3%
MRI available	82	43.9%	0.0%	13.8%	60.0%	92.8%	80.0%
Protocol in place for intracerebral hemorrhage	74	25.6%	7.7%	20.7%	10.0%	35.7%	46.7%
Protocol in place for acute ischemic stroke	79	62.2%	30.8%	51.7%	60.0%	92.8%	80.0%
Protocol in place for subarachnoid hemorrhage	74	23.2%	7.7%	17.2%	10.0%	35.7%	46.7%
Stroke team in place	82	20.7%	0.0%	6.9%	0.0%	35.7%	60.0%
Admits stroke patients	82	84.2%	69.2%	75.9%	90.0%	92.9%	100.0%
Provides post-acute stroke rehabilitation	82	59.8%	46.2%	55.2%	50.0%	64.3%	80.0%
Transfers some or all stroke patients	82	78.1%	100.0%	96.6%	80.0%	71.4%	33.3%
JCAHO certified primary stroke center	82	8.5%	0.0%	0.0%	0.0%	7.1%	33.3%
Average ground time to closest hospital (minutes)	60	60.0**	71.5	62.6	65.6	40.8	43.0
Average air time to closest facility (minutes)	51	34.6***	36.9	33.9	34.4	43.5	18.8

†Derived from survey responses from the 82 participating hospitals (Appendix D). The "total % yes" column reflects the percentage that responded yes to the specific question about resources or capability, and includes all responses available from the survey, including the one hospital for which the number of staffed beds was not known.
‡Defined by number of staffed beds as reported in the survey or the trauma designation applications submitted throughout 2005-2007.
*The data presented in these columns by hospital size excludes one hospital for which the number of staffed beds was not known.
**The average time in minutes (*SD* = 53.5)
***The average time in minutes (*SD* = 30.1)

Neurologist Availability

Thirty-one (38 percent) of hospitals reported having a neurologist available 24 hours a day, seven days a week (24/7), either on staff or on call. Of these 31 hospitals, only one reported having a neurologist on staff available, 24/7; the remaining 30 reported having a neurologist available on call, 24/7. Eight (10 percent) hospitals reported having a neurologist on call less than 24/7.

Thirty-six hospitals (44 percent) reported having no neurologist on staff, and seven (9 percent) reported "other," such as consults by telephone. In the 29 hospitals with 100 or more beds, 27 (93 percent) reported having a neurologist available on staff or on call. None of the 13 hospitals under 20 beds reported having a neurologist available.

Of the 36 hospitals without neurology support, 28 (77 percent) reported that they admit patients with acute stroke.

- The number of stroke deaths in 2005 was similar for hospitals with or without a neurologist available, 11 percent and 9 percent respectively ($p = .116$).[42]
- Extending this analysis to include 2003 and 2004 data, the number of deaths was significantly greater at hospitals with a neurologist than hospitals without a neurologist, 11 percent and 8 percent respectively ($p < .001$).[43] These findings may be surprising because we would expect that expertise in treating a certain condition would result in better outcomes. It is likely due to the fact that 78 percent of hospitals transfer stroke patients to another hospital, usually a larger hospital with a neurologist.
- Patients were more likely to receive t-PA when receiving care in hospitals with a neurologist available. Hospitals that reported having a neurologist available administered t-PA significantly more frequently than hospitals without a neurologist, 0.7 percent and 0.2 percent respectively ($p < .01$).[44]
- Patients in hospitals without neurologists were significantly less likely to be discharged to rehabilitation compared to patients in hospitals with neurologists, 2 percent and 10 percent respectively ($p < .001$).[45]

Diagnostic Equipment and Protocols

Most hospitals – 90 percent – can perform and read CT scans 24/7

As reflected in Table 4 on page 31, 74 (90 percent) of the 82 hospitals surveyed reported having the ability to perform and read CT scans, 24/7. Of these 74, only 24 (29 percent) indicated that CT was available in-house, 24/7; 20 (24 percent) indicated that CT was available on call, 24/7; and 30 (37 percent) indicated in-house and on call. The remaining eight hospitals reported either not having CT available, 24/7, or not at all.

Only 44 percent have the ability to perform and read MRI images 24/7

Only 36 (44 percent) hospitals reported having the ability to perform and read MRI images, 24/7. Of these 36, only 11 (13 percent) indicate that their ability to perform and read MRI images is in-house, 24/7; 11 (13 percent) indicated that their MRI availability is on call, 24/7; and 14 (17 percent) on call or on staff. Of the 11 reporting MRI availability on call, 24/7, 9 (82 percent) require a response time of 30 minutes or less.

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[42] Analysis was limited to stroke patients defined as ICD-9 430-434.9 & 436-438.9 from 2005 CHARS data and excluding: 1) transfers to other acute care facilities (status = 02) and 2) hospitals that did not participate in the survey.

[43] Analysis was limited to stroke patients defined as ICD-9 430-434.9 & 436-438.9 from 2003-2005 CHARS data and excluding: 1) transfers to other acute care facilities (status = 02) and 2) hospitals that did not participate in the survey.

[44] Analysis was limited to stroke patients defined as ICD-9 430-434.9 & 436-438.9 from 2003-2005 CHARS data and excluding: 1) transfers to other acute care facilities (status = 02) and 2) hospitals that did not participate in the survey; t-PA is defined as the primary procedure code 99.10.

[45] Analysis was limited to stroke patients defined as ICD-9 430-434.9 & 436-438.9 from 2003-2005 CHARS data and excluding: 1) deaths (status = 20) and 2) hospitals that did not participate in the survey.

Only 51 (62 percent) hospitals indicate that they have written protocols for ischemic stroke. These are strokes caused by a clot or other mass blocking a blood vessel in the brain. The majority – 83 percent – of strokes are ischemic. Only 21 (26 percent) indicate that they have written protocols for intracerebral hemorrhagic stroke, and only 19 (23 percent) have written protocols for subarachnoid hemorrhagic stroke. Hemorrhagic strokes are caused by rupture of a blood vessel in the brain. Intracerebral and subarachnoid refer to the part of the brain where the stroke occurred.

Stroke Team

Seventeen (21 percent) of the 82 responding hospitals reported having a stroke team in place to respond to patients with acute stroke. Fourteen (82 percent) out of 17 hospitals with stroke teams were large facilities (100 or more beds). One hospital was of unknown size. Only two hospitals with stroke teams had fewer than 100 beds. There was no statistically significant difference in deaths between hospitals with stroke teams and similar-sized hospitals without stroke teams.

Hospital Stroke Volume

Sixty-nine (84 percent) of hospitals reported admitting stroke patients. In 2005, the top ten volume hospitals for stroke accounted for 45 percent of all stroke admissions in Washington. In contrast, the 38 low-volume hospitals (fewer than 100 stroke admissions per year) accounted for only 1 percent of stroke admissions.

Most hospitals – 84 percent – admitted stroke patients

Stroke Transfers

Sixty-four (78 percent) of hospitals reported transferring patients with acute stroke to another acute-care facility. Of the hospitals without a neurologist on staff or on call, 97 percent reported transferring stroke patients to another hospital. Patients with hemorrhagic strokes — those caused by rupture rather than blockage — were transferred most frequently. Ischemic stroke patients were transferred less frequently (13 percent *always*, 26 percent *mostly*, 36 percent *sometimes*, and 26 percent *rarely or never*).

Of hospitals without a neurologist, 97 percent transferred stroke patients to another hospital

Thrombolytic Stroke Treatment Rates

Administrative hospital discharge data (CHARS) indicated that only 2.4 percent of ischemic stroke patients received thrombolytic stroke therapy (t-PA) in Washington from 2003 through 2005. The rate increased to 4.3 percent in hospitals that are certified by the Joint Commission as primary stroke centers. Receipt of t-PA varied according to age, gender, geographical location, and presence of a stroke team. People older than 85, women, and people in eastern Washington were less likely to receive t-PA.

Patients in hospitals with a stroke team or certified as a primary stroke center were more likely to receive t-PA.

Specialty Stroke Care

As of January 2008, 12 hospitals in the state were certified as primary stroke centers by the Joint Commission under a program developed in collaboration with the American Stroke Association. Certification means that the hospital meets national standards and performance measurement expectations based on the Brain Attack Coalition's "Recommendations for the Establishment of Primary Stroke Centers" (see Attachment F). The map on page 35 shows the locations of the Primary Stroke Centers by EMS and Trauma regions.

Certified Primary Stroke Centers in Washington

Bellevue

Overlake Hospital

Everett

Providence Everett Medical Center

Kent

Valley Medical Center

Olympia

Providence St. Peter Hospital

Seattle

Harborview Medical Center
Northwest Hospital
Swedish Medical Center
Swedish Medical Center Providence
Virginia Mason Medical Center

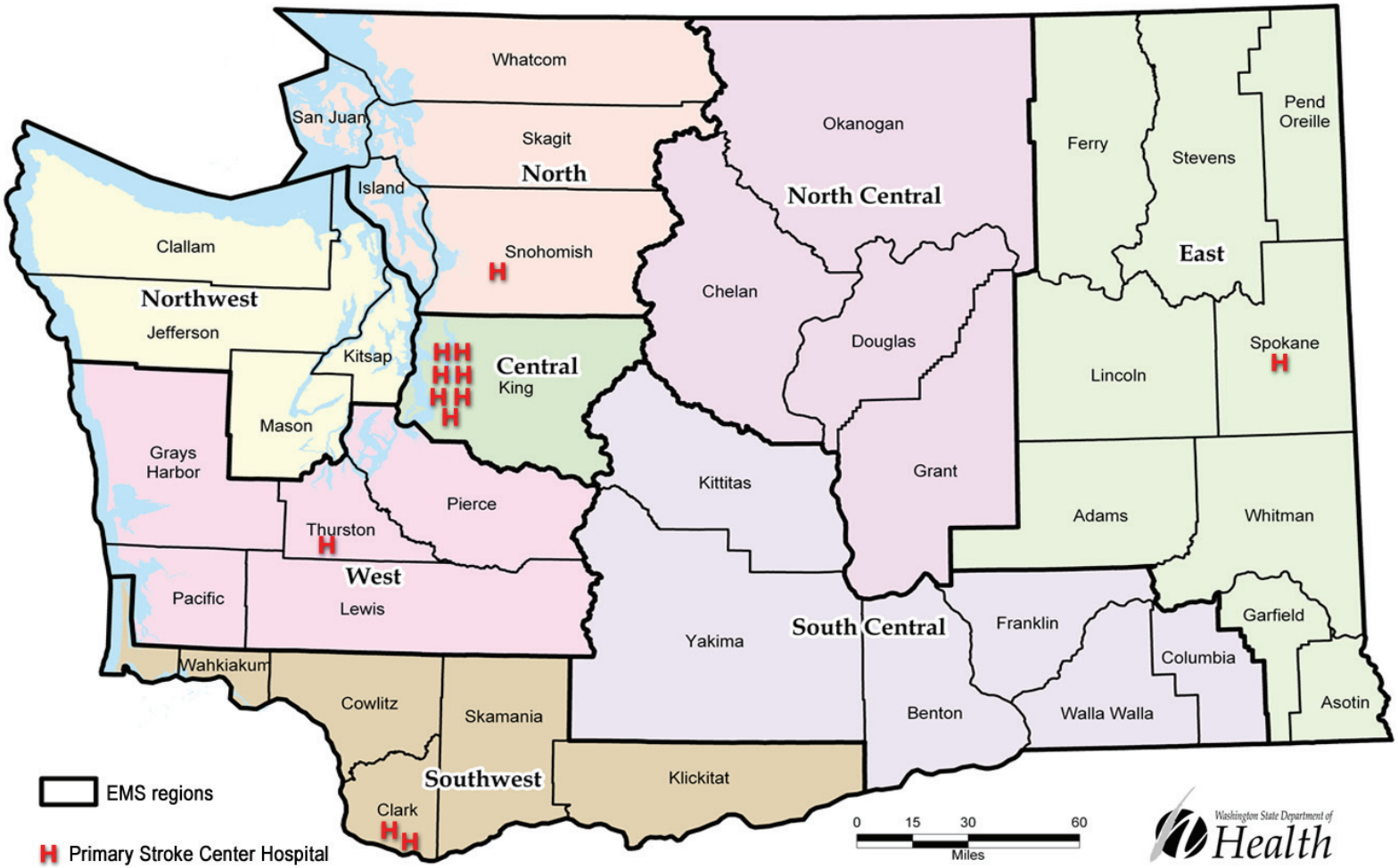
Spokane

Sacred Heart Medical Center

Vancouver

Legacy Salmon Creek
Southwest Washington Medical Center

Figure 5. Joint Commission Certified Primary Stroke Centers



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Comments from Hospital Survey Respondents

Hospital respondents had many suggestions for system improvements including:

- Using telemedicine to transfer CT images to consulting neurologists.
- Making standard treatment for acute ischemic stroke independent of the availability or opinions of specialists.
- Increasing access to prehospital information.
- Sharing data on door-to-balloon time and outcomes from receiving hospitals to determine if the transferring hospital's thrombolytic use was appropriate and effective.
- Establishing protocols for acute coronary syndrome and stroke care in emergency departments.
- Increasing public education on the importance of getting to the hospital soon after the onset of stroke symptoms.
- Eliminating the rule requiring open heart surgery as a back up for performing non-emergency PCI (angioplasty).

Concerns expressed included:

- The lack of neurosurgeons, cardiologists and catheterization labs, and the inability to provide these resources, 24/7.
- Neurologist bias toward thrombolytic therapy for acute ischemic stroke.
- Lack of consensus on acute stroke care and the efficacy of thrombolytic therapy.
- Limited or non-existent physical, occupational, and speech therapy in some areas.
- Insurance denials, forcing patients to nursing facilities or home.

One comment in particular got to the heart of improving stroke care:

"We would benefit greatly from a telemedicine program…. Ideally this would be used to prevent unnecessary transfers for non-surgical patients."

> "We would benefit greatly from a telemedicine program that allows us to consult on acute ischemic stroke and intracerebral hemorrhage patients. Ideally this would be used to prevent unnecessary transfers for non-surgical patients. It would require our hospitalists and administration to agree that a telemedicine neurosurgical consult would be adequate.
>
> However, our barriers to providing thrombolytic therapy for acute ischemic stroke are twofold. First, not all our neurologists or emergency physicians believe in its efficacy – better data and education are required before this will become accepted. Second, we do not have full time neurosurgical coverage, and patients are very resistant to being transferred to Seattle. So they will opt out of receiving thrombolytics solely because they will have to be transferred to a facility with neurosurgery coverage just in case of hemorrhage. Cardiac care is a great model of how well-proven interventions can work. However, with the shortage of neurosurgeons and the dissension among neurologists, acute stroke care will likely never reach that level of successful widespread intervention."

Rehabilitation

According to the hospital survey, 64 percent of hospitals that admit cardiac and stroke patients provide post-acute cardiac and stroke rehabilitation. However, cardiac and stroke rehabilitation were not defined in the survey, so the scope and types of therapy provided (e.g., physical, speech, occupational, etc.) are not known. Given this limitation, the survey indicated smaller, rural hospitals were much less likely to provide post-acute cardiac and stroke rehabilitation. People over age 85 and women were less likely to be discharged to rehabilitation, and people in eastern Washington and those treated in a hospital with a stroke team were more likely to be discharged to rehabilitation.[46]

18 percent of Washington residents reported getting outpatient rehabilitation

Overall, it appears that most people did not participate in cardiac or stroke rehabilitation, at least on an outpatient basis—only 18 percent of Washington residents reported receiving outpatient rehabilitation after heart attack or stroke in the 2005 Behavioral Risk Factor Surveillance survey.

[46] Comprehensive Hospital Abstract Reporting System, 2005.

Discussion of Findings

There are effective interventions available that save lives, reduce disability

The assessment of the current system of emergency cardiac and stroke care in Washington found significant variability across the state on several measures:

- Level of emergency response dispatched (advanced, intermediate, or basic life support).
- Timeliness of emergency response.
- Access to interventions and standards of care proven to reduce death and disability.
- Patient outcomes.
- Protocols, patient care procedures, and resources available for the rapid assessment, triage, and treatment essential for optimal outcomes.

For both acute cardiac and stroke events, there are effective, evidence-based therapies and interventions available that save lives and significantly reduce disability. For ischemic stroke (83 percent of all strokes), thrombolytic therapy has been shown to significantly decrease disability by breaking up clots before they do widespread damage in the brain.[47] For acute myocardial infarction (AMI or heart attack), there is primary percutaneous coronary intervention (PCI), as well as medication to dissolve clots.[48] These therapies must be delivered within critical time-frames to be effective—within three hours of onset of symptoms for thrombolytic stroke therapy, and within 90 minutes for PCI.

Too few people get life-saving treatments

Coordinated systems of care are recommended

The assessment found that too few people in Washington are getting these life-saving treatments: only 2.4 percent[49] of ischemic strokes were treated with tissue plasminogen activator (t-PA, a type of thrombolytic therapy), the most effective proven treatment for this type of stroke; PCI, the most effective treatment for AMI, is estimated to be performed in less than half the cases.[50]

Coordinated systems of care, similar to trauma systems, are the recommended solution to this serious problem. Support for a coordinated system of care for AMI , particularly ST-elevation myocardial infarction or STEMI, was presented in the October 2006 *American Heart Journal*:

> Recent developments have provided a unique opportunity for the organization of regional ST-elevation myocardial infarction (STEMI)

[47] Harold Adams, Robert Adams, Gregory Del Zoppo and Larry B. Goldstein. Guidelines for the Early Management of Adults With Ischemic Stroke. *Stroke* 2005;36: 916-923.
[48] Keeley EC, Boura JA, Grines CL. Primary angioplasty versus intravenous thrombolytic therapy for acute myocardial infarction: a quantitative review of 23 randomized trials. Lancet 2003;361:13-20.
[49] Derived from procedure code 99.10 for any first hospitalization for each unique patient, Comprehensive Hospital Abstract Reporting System (CHARS), 2003-2005.
[50] Derived from the total number of hospitalizations for acute myocardial infarction reported to CHARS (all WA hospitals are required to report) in 2005 and the total number of primary PCIs reported to the Clinical Outcomes Assessment Program registry (all WA hospitals that perform PCI are required to report) in 2005.

receiving center (SRC) networks. Because cumulative evidence has demonstrated that rapid primary percutaneous coronary intervention (PCI) is the most effective reperfusion method (strategy for acute STEMI to restore blood flow after a blockage), the development of integrated SRC networks could extend the benefits of primary PCI to a much larger segment of the U.S. population. Factors that favor the development of regional SRC networks include results from recently published clinical trials, insight into contemporary STEMI treatment patterns from observational registries, experience with the nation's current trauma system, and technological advances. The 2004 American College of Cardiology/American Heart Association STEMI guidelines have specified that optimal "first medical contact-to-balloon" times should be less than 90 minutes, so a clear benchmark for timely reperfusion has been established. To achieve this, the current process of care must improve and more cooperation is needed between emergency medical services, emergency medicine physicians, and cardiologists.[51]

For stroke, the Institute of Medicine (IOM), the American Stroke Association (ASA), and the Brain Attack Coalition recommend a coordinated system of stroke care that integrates prevention, treatment, and rehabilitation. The IOM also recommends a coordinated system for emergency care in general in its 2006 report brief, "The Future of Emergency Care in the United States Health System." It further recommends that the system be regionalized and accountable.

In its "Recommendations for Stroke Systems of Care,"[52] the ASA suggests that the guiding principles of trauma systems are applicable to stroke systems, with the caveat that stroke centers can and should be much more numerous than Level I trauma centers.

Principles of trauma care apply to emergency stroke and cardiac care

The principles of trauma care applicable to emergency stroke and cardiac care include:

- Better communication among dispatch, EMS, and hospitals.
- Clear transport protocols to ensure that patients are taken only to facilities with appropriate resources and staff expertise.
- Strategies for treating and transporting patients who live in rural and remote areas.
- Integration of rehabilitation services.
- The use of evidence-based treatment protocols.

According to a report published by the Centers for Disease Control and Prevention, "shorter prehospital and hospital delays will increase the proportion of patients with ischemic stroke who can receive brain imaging, t-PA therapy,

[51] Rokos, Ivan C., et al. Rationale for establishing regional ST-elevation myocardial infarction receiving center networks. American Heart Journal 2006; 152:661-7.
[52] American Stroke Association's Task Force on the Development of Stroke Systems. "Recommendations for the Establishment of Stroke Systems of Care." *Stroke* 2005;36;690-703. Online version available http://stroke.ahajournals.org/cgi/content/full/36/3/690

and early secondary prevention therapies and reduce their risk for severe disability from stroke."[53]

Significant factor for timely treatment: patients themselves

Some or all of these principles are applied to emergency stroke and cardiac care in some local systems in Washington, primarily urban areas and in association with certified primary stroke centers, but there are many other areas where this is not the case.

Many wait too long to seek medical attention

There is another significant factor contributing to the low numbers of people getting the recommended treatments: the patients themselves. Many people wait too long to seek medical attention for heart attack and stroke symptoms.[54] Also, instead of calling 9-1-1, they drive or are driven to the hospital. Once they finally arrive at the hospital, it is past the "golden hours" for treatments to be effective. Getting patients to recognize symptoms and call 9-1-1 immediately is as important as the system changes proposed to get the right patient to the right place in time. The ECS Work Group recommends educating the public on heart attack and stroke symptoms, why getting treatment right away is critical, and to call 9-1-1.

Dispatch

The assessment of dispatch found the following varied significantly:

- Governing bodies
- Training requirements
- Protocols
- Quality improvement

There is no medical oversight of emergency dispatch like there is with EMS. For EMS, a physician (medical program director) develops protocols and procedures that all EMS providers must follow. Finally, there is no single state or national agency or other entity with centralized responsibility for emergency medical dispatch.

We know very little about how well emergency medical dispatch works in Washington. We do know that a decentralized system with limited coordination can be vulnerable to inconsistencies and lack of accountability.

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[53] "Prehospital and Hospital Delays After Stroke Onset --- United States, 2005-2006. Morbidity and Mortality Weekly Report, Centers for Disease Control and Prevention; May 18, 2007/56/19; 474-478.

[54] Moser, DK, et al. Reducing Delay in Seeking Treatment by Patients With Acute Coronary Syndrome and Stroke: A Scientific Statement From the American Heart Association Council on Cardiovascular Nursing and Stroke Council. *Circulation* 2006; 114; 168-182. http://circ.ahajournals.org/cgi/content/full/114/2/168.

Emergency Medical Services

The assessment of EMS indicated that at least one-third of EMS protocols did not include specific stroke and cardiac protocols. Well over half did not include assessment for stroke or completion of a high-risk checklist for acute coronary syndrome in their standard protocols.

Notifying hospitals of incoming stroke or heart attack prior to arrival is not protocol in most areas. This could significantly reduce the time to treatment by giving the hospital time to prepare for treating the patient: calling in specialty staff, preparing the catheterization lab, freeing up a CT scan, etc.

One-third of medical program directors (MPDs) reported not having *local* operating procedures directing ambulances to the nearest hospital with the appropriate level of care for emergency cardiac and stroke care. Less than half reported having *regional* procedures, which can be critical in situations where the only qualified hospital is in another county.

More than half the time, people did not have timely access to advanced life support (paramedics), which is the only level of EMS that can perform electrocardiograms (ECG). An ECG is a diagnostic tool that helps paramedics determine whether a patient is having a heart attack.

More than half the time, people do not have timely access to paramedics

This does not mean that EMS in Washington is deficient. But it is clear that there are ways to reduce time to treatment in the EMS phase of emergency response. The American Heart Association/American Stroke Association Emergency Cardiovascular guidelines for EMS include:

- Evidence-based training and protocols that ensure rapid identification and triage for stroke and chest pain using validated identification scales and chest pain checklists.
- Response-time goals.
- Transport to the nearest hospital capable of providing treatment according to evidence-based guidelines.
- Prehospital notification to activate cardiac and stroke teams.

The ECS Work Group recommends adopting these guidelines for EMS in Washington.

Hospital

The critical factor in acute-care for stroke and heart attack, specifically ischemic stroke and STEMI, is the ability to perform the recommended interventions—thrombolytic stroke therapy (clot-busting medication) for ischemic stroke, and PCI for STEMI—in time for them to be effective.

Other factors that have been shown to improve outcomes for heart attack and stroke at the hospital level are cardiac/stroke teams on-site or on call, 24/7; cardiac- and stroke-specific protocols; and diagnostic and interventional capabilities such as CT scans, MRIs, intravenous t-PA, and catheterization laboratories. The findings for Washington indicate significant variability in all of these factors, often dependent on the size of the hospital. Because most small hospitals are in rural areas, variability is also dependent on geographic location.

Many rural hospitals lack the resources to provide optimal care for acute cardiac and stroke. They do, however, play an important role by rapidly assessing and transferring patients to hospitals with more resources.

Only 21 percent of surveyed hospitals have stroke team

Stroke: While most hospitals at least have CT scans, the hospital survey indicated that only 29 percent have the ability to perform and read CT images in-house, 24/7. Only 21 percent of the 82 responding hospitals reported having a stroke team. A neurologist is a critical part of the stroke team; however, only 1 percent of reporting hospitals have a neurologist on staff, 24/7, and only 37 percent have a neurologist on call, 24/7. The recommended time from the emergency room to the administration of thrombolytics (clot busting medication), or "door-to-lytic" time, is 60 minutes (National Institutes of Health).

For those Washington hospitals that administer thrombolytic therapy, 20 percent report door-to-lytic times of 60-89 minutes; 28 percent report 90 minutes or longer. This is too long when the window of opportunity is just three hours, and, more than likely, precious minutes or hours have passed in transit, either from home or from another hospital. Seventy-eight percent of hospitals reported transferring acute stroke patients to another hospital. This percentage increases to 97 percent for hospitals that reported not having a neurologist on staff or on call.

Very few stroke patients are treated with t-PA, one of the only effective treatments for stroke

One of the biggest issues that came to light through the assessment is how few stroke patients in our state are treated with t-PA, one of the only effective interventions for stroke. According to CHARS data, only 2.4 percent of ischemic stroke patients received t-PA from 2003-2005. This is less than the national estimate of three to 4 percent. The data also showed that only 32 out of 95 hospitals in the state administered t-PA from 2003-2005.

According to discussions among the Emergency Cardiac and Stroke Work Group members, comments on the survey, and articles on the topic, factors contributing to the low rate of t-PA usage are:

- Patient delay in seeking treatment.
- Lack of resources to accurately diagnose and treat stroke, such as neurologists, CT scans, and MRIs.
- Reluctance on the part of emergency physicians to administer t-PA because 1) they lack the resources to accurately diagnose stroke or distinguish between an ischemic or hemorrhagic stroke; and 2) concern about liability from administering t-PA to a patient experiencing a hemorrhagic versus an ischemic stroke (t-PA could increase bleeding in a hemorrhagic stroke, worsening the effects of the stroke and possibly causing death).
- Lack of confidence on the part of some emergency physicians and neurologists in the scientific evidence for t-PA, and lack of consensus among neurologists.
- Reluctance on the part of patients to be transferred, far from home, to a hospital capable of administering t-PA and providing the follow up care.

A surprising finding was the number of hospitals that admit stroke patients but don't have neurologists available, either on staff or on call. Of the 36 hospitals without neurology support, 28 (77 percent) reported they admit patients with acute stroke.

Of the 36 hospitals without neurology support, 77 percent admit stroke patients

A formalized, systems approach to cardiac and stroke care will increase the chances of a good outcome by assuring that patients in need of time-critical interventions receive rapid diagnosis and transfer to a hospital capable of providing definitive care.

The map identifying certified primary stroke centers in Washington (Figure 5, page 35) shows geographic gaps in *known* resources for stroke care that can treat stroke and meet national recommendations. There are undoubtedly hospitals without formal certification providing evidence-based care in some of the gap areas, but there is no system to identify which hospitals can provide optimal care for stroke.

Cardiac care: 37 percent of hospitals reported having no cardiologist on call or on staff. Only 20 percent of the hospitals responding reported having a cardiac team, and only 42 percent reported having a catheterization lab. Outcome differences based on 2005 hospital data (CHARS) showed higher in-hospital case-fatality rates for hospitals without a cardiologist and without cardiac teams.

In summary, all along the chain of survival there are opportunities to reduce the time it takes to get patients to optimal treatment for acute cardiac and stroke events. Reducing this critical time interval will save lives and reduce disability. Less disability means cost savings—fewer days in the hospital, shorter rehabilitation time, fewer people in need of long-term care in nursing homes or at home. Indeed, "time is brain," as they say in stroke circles, but "time is money" is equally true.

Fortunately, national guidelines exist to improve emergency cardiac and stroke care, and there are some local and regional prehospital providers and hospitals leading the way in Washington by voluntarily implementing these guidelines. We can also look to the literature, as well as other states' models (Appendix G) and studies substantiating that cardiac and stroke systems of care reduce disability and death from heart attack and stroke.

Recommendations

A systems approach to improve emergency cardiac and stroke care

The ECS Work Group recognized that equipping and staffing every Washington hospital to treat acute heart disease and stroke is not feasible. Instead, they recommended a systems approach to improve emergency cardiac and stroke care, much like the state's excellent trauma-care system.

To develop the recommendations, the ECS Work Group studied data from several sources:

- Analyses of dispatch, medical program director, and hospital surveys
- State hospitalization and death data.
- National emergency care guidelines.
- Recommendations developed by the American Heart Association, American College of Cardiology, the American Stroke Association, and the Brain Attack Coalition.
- Models from other states.

Department of Health staff from the Heart Disease and Stroke Prevention Program and the Office of Emergency Services and Trauma System convened meetings, conducted surveys, analyzed and presented data, and drafted documents, including this report.

Guiding Principles

All Washington residents have the right to optimal care

The following principles guided the work group in developing recommendations:

- Prevention is the first line of defense against heart disease and stroke.
- Care is provided based on what is in the best interest of the patient.
- All Washington residents have a right to optimal care: timely identification, transport, treatment, and rehabilitation by emergency response and health care professionals trained according to best practice standards.
- Racial, ethnic, geographic, age, and socioeconomic disparities are addressed.
- Market-share is balanced by policies and strategies such as telemedicine that promote broad provider participation.
- Regional differences are recognized, but basic elements exist statewide.
- All components of the system participate in planning and quality improvement.
- Patient outcomes are valued, and data collection, analysis and quality improvement practices demonstrate the quality that the system claims to provide.
- Cost-savings are achieved where possible.

The overarching recommendations of the Emergency Cardiac and Stroke Work Group endorsed by EMS and Trauma Care Steering Committee:

- Adopt the American Heart Association's Guidelines for Emergency Cardiovascular Care.
- Establish a statewide comprehensive and coordinated system of cardiac and stroke care that includes prevention and public education, data collection, standards for prehospital, hospital and rehabilitative care, and verification of hospital capabilities.
- Form a Technical Advisory Committee under the state EMS and Trauma Care Steering Committee to oversee the implementation of these recommendations.

Prevention

Prevention – first line of defense against heart disease and stroke

- Educate the public on heart disease and stroke risk factors and behavior modifications needed to reduce the risk of heart disease and stroke.
- Focus education and outreach on high-risk populations, particularly those that experience disparities in health and access to care.
- Conduct education in collaboration with emergency medical services, hospitals, physicians, nurses, regional councils, the Department of Health, the American Heart Association/American Stroke Association, worksites, schools, senior services, and other organizations involved in prevention and health education, or that have access to high-risk and priority populations.
- Assure that Washington's public schools include heart-health education, signs and symptoms of heart attack and stroke, and when to call 9-1-1 in health education classes or other appropriate curricula.

Early Recognition and Treatment

- Develop model screening programs and share innovative approaches with providers across the state.
- Expand insurance coverage to include screening for cardiac and stroke risk.
- Develop and implement educational strategies to improve early recognition of heart attack and stroke and the importance of calling 9-1-1 and getting treatment within the necessary timeframe for optimal outcomes.
- Develop and implement strategies to increase the number of people who are able to provide high quality cardiopulmonary resuscitation (CPR), such as worksite programs and requiring CPR training to graduate from high school.
- Promote public access to automated external defibrillators (AED).

Data Collection and Quality Improvement

- Develop a comprehensive data system to demonstrate effectiveness and improve performance through quality improvement. Data collection should include dispatch, EMS and hospitals, and should maximize and integrate existing data systems to avoid duplicate data entry and analysis.

- Support efforts to develop quality collaboratives[55] at hospitals and participation in patient registries.[56]
- Facilitate sharing outcomes and quality improvement data between hospital and prehospital providers.
- Support implementing the Washington Emergency Medical Services Information System (WEMSIS) to inform field care and treatment. Explore adding data fields specific to cardiac and stroke and evaluate regularly.
- Monitor trends in disease-specific incidence and mortality, morbidity and long-term care.
- Develop regional quality improvement programs that provide a protected environment to discuss stroke and cardiac system and care issues.

Prehospital

The American Heart Association's guidelines for prehospital cardiovascular and stroke care should be implemented as the state standard for rapid patient assessment, early hospital notification, and transport to the appropriate hospital.

- Develop statewide treatment protocols and regional patient care procedures (PCPs) specific to cardiac and stroke patients. Prehospital notification should be included in all cases.

Cardiac recommendations

- Cardiac recommendations include:
  - Primary ABCD (airway, breathing, circulation, defibrillation) and ALS for suspected sudden cardiac arrest.
  - Twelve-lead electrocardiograms in the field.
  - Prehospital chest pain checklist to screen for acute coronary syndrome.
  - Initial treatments of MONA (morphine, oxygen, nitroglycerin, and aspirin) in the field.
  - Alert destination hospital of incoming sudden cardiac arrest or STEMI patient.

Stroke recommendations

- Stroke recommendations include:
  - Perform a prehospital **FAST** stroke evaluation to screen for stroke and eligibility for time-dependent interventions (Cincinnati Prehospital Stroke Screen plus time last normal):

[55] A collaborative is an approach to improving health care, where teams of staff from health-care organizations work together to improve care.
[56] A patient registry is a collection of information about patients that is kept in a central location, usually in a privacy-protected computer database, so that medical staff can quickly review a patient's medical history and health-care needs. Information about many patients can be analyzed to improve care.

Face: ask the patient to smile, observe for asymmetry

Arm: have patient hold up both arms straight in front of them, observe for drifting down or inability to raise to horizontal position

Speech: have patient repeat the phrase – *firefighters are your friends* – and note any slurring of speech or inability to speak

Time: Establishing the time patient was last known to be normal (prior to stroke onset)

- Check finger-stick blood-glucose level, if possible.
- Alert destination hospital of incoming acute stroke.

- Work with dispatch operators to develop uniform protocols for timely dispatch of prehospital cardiac and stroke resources.
- Assure a system of rendezvous with advanced life support, as appropriate for timely response, for patients with acute myocardial infarction or sudden cardiac arrest, who are initially treated by basic life support (BLS) personnel. For stroke patients who are hemodynamically and respiratory stable, rapid transport by closest/fastest transport to closest, highest-level verified stroke hospital is appropriate.
- Develop prehospital triage and destination plans to transport patients with:
  - Acute coronary syndrome with ST-segment elevation to the closest Level I or II cardiac hospital capable of performing acute coronary intervention, taking into account transport time, symptom duration, and hemodynamic stability.
  - Stroke of less than two hours duration to a Level I, II or III stroke hospital available within 30 minutes.
  - Stroke of two-to-four hours duration to a Level I stroke hospital.
- Adopt a statewide standard for time-on-scene of 15 minutes for cardiac and stroke patients.
- Require American Heart Association (or equivalent) advanced cardiac life support (ACLS) training for paramedics.
- Assure that appropriate cardiac and stroke training and continuing education is available for prehospital personnel.
- Participate in regional system planning for cardiac and stroke care.
- Use telehealth where available and appropriate to expedite and improve assessment and treatment, such as transmitting ECG results to hospital physicians.

Hospital

Acute Coronary Syndrome

American Heart Association and American College of Cardiology guidelines

- The American Heart Association and American College of Cardiology guidelines for hospital emergency care should be implemented as the state standard, including the following:
  - Fibrinolytic therapy within 30 minutes of arrival, when appropriate.
  - Balloon inflation within 90 minutes of arrival, when appropriate.
- Hospitals with interventional capability should participate in clinical data registries such as the ACTION Registry of the American College of Cardiology, and practice quality improvement.
  - Hospitals should develop and implement chest pain protocols, including activating specialized teams, as appropriate. These protocols should assure rapid assessment of chest-pain patients with no ST-segment elevation.
  - Cardiac teams and catheterization labs should be activated based on EMS notification of positive ECG for STEMI.

Acute Stroke

American Stroke Association guidelines

- The American Stroke Association guidelines for acute stroke should be implemented as the state standard, including the following:
  - First 10 minutes in emergency department (ED)
    - ABCs
    - IV access, blood testing sent, check glucose (treat if indicated)
    - Neurological screening assessment
    - Activate stroke team (do prior to arrival if pre-notified by EMS)
    - Order emergent CT of head
    - 12-lead ECG
  - Within 25 minutes of ED arrival
    - Assessment by stroke team where possible, including possible use of telemedicine.
  - Within 45 minutes of ED arrival
    - CT completed and interpreted.
    - Consider IV t-PA, intra-arterial interventions and implementing standing order sets as appropriate for time since patient last normal and hospital capabilities.
- Hospitals with interventional (IV or IA) capabilities (Levels I, II, III) should participate in a clinical data registry and practice quality improvement.

- Hospitals should develop and implement stroke protocols, including activation of specialized teams, based on prehospital notification, as appropriate to capabilities and possibly via the use of telemedicine. These protocols should assure rapid assessment of all stroke patients and expeditious decisions about treatment.
- Stroke teams should be activated and CT scanner cleared based on EMS notification of incoming stroke.
- Use telehealth where available and appropriate to expedite and improve assessment and treatment.
- Participate in regional cardiac and stroke system planning and regional quality improvement programs that provide a protected environment to discuss stroke and cardiac system and care issues.
- Provide patient outcome information to prehospital providers.
- Assist with training EMS, particularly in reading ECG for STEMI patients to enable earlier activation of the cardiac team.

State Verification Program for Cardiac and Stroke Care

Through a voluntary, inclusive program, verify that hospitals meet state standards for cardiac and stroke facilities. These standards would be based on the American Heart Association Guidelines for Emergency Cardiovascular Care and the American Stroke Association and Brain Attack Coalition recommendations, or the most current scientific standards.

Verified facilities should not be required to maintain minimum caseloads. Regions would be able to develop patient-care procedures directing certain patients to hospitals with higher levels of verification.

Verification would likely require authorizing legislation with assignment of a lead agency. Details of cardiac and stroke facility verification would be developed during the administrative rule-making process. Preliminary examples of cardiac and stroke verification levels are described below.

Cardiac Facility Verification

Requirements for All Cardiac Levels: All levels should have a cardiac team and a policy for activating the team based on prehospital information. Data collection and quality improvement should be integral. All emergency department physicians, nurses, and physician-extenders should be trained in advanced cardiac life support (ACLS). All levels are required to have a protocol to begin therapeutic hypothermia for patients with cardiopulmonary arrest. Transfer agreements are in place for rapid transfer of patients in need of specialized care including electrophysiology. All levels are required to have cardiovascular prevention/public education programs. All levels support prehospital education and training. All levels have cardiovascular quality-improvement programs in place including benchmarks and performance indicators.

Level I cardiac care facilities should have the equipment and staff necessary to provide intensive care, open-heart surgery, cardiac catheterization, coronary angiography, coronary angioplasty, and emergency coronary angioplasty/stenting for STEMI patients – around-the-clock. Physician, nurse, and technical staffing should be sufficient to provide rapid and quality care, utilizing a cardiac-team response. Emergency-department physicians should be board-certified or board-eligible. A cardiologist and cardiac-catheterization lab staff should be available within 30 minutes of identification of STEMI by EMS or by emergency department staff. "Door-to-balloon" goal should be within 90 minutes. The presence of appropriate sub-specialists is mandatory. Level I facilities should also have a phase 1 (inpatient) cardiac rehabilitation program, with access to a phase 2 (outpatient) rehabilitation program.

Level II cardiac-care facilities should have the equipment and staff necessary to provide intensive care, cardiac catheterization, coronary angioplasty, and emergency coronary angioplasty/stenting for STEMI patients. Physician, nurse, and technical staffing should be sufficient to provide rapid and quality care. Emergency department physicians should be board-certified or board-eligible. A cardiologist should be available within 30 minutes. Level II facilities should also have a phase 1 cardiac rehabilitation program, with access to a phase 2 rehabilitation program.

Level III cardiac-care facilities should have the equipment and staff necessary to provide resuscitation and stabilization of cardiac patients, including an emergency department staffed 24 hours a day by physicians and nurses. Level III facilities should have capability to perform fibrinolysis and should have an intensive-care unit (ICU). A cardiologist or internal medicine physician, with special competence in cardiac medicine, should be available within 30 minutes. Level III facilities should also have a phase 1 cardiac rehabilitation program, with access to a phase 2 rehabilitation program.

Level IV cardiac-care facilities should have equipment and staff necessary to provide resuscitation and stabilization of cardiac patients, prior to transfer to a higher level of care. Level IV facilities should have an emergency department staffed by physicians and be able to provide fibrinolysis.

Stroke Facility Verification

Requirements for All Stroke Levels: All levels should utilize a team response with stroke patients based on prehospital information and written stroke protocols. Data collection and quality improvement should be integral. All emergency department physicians, nurses, and physician-extenders should be trained in Advanced Cardiac Life Support. Transfer agreements must be in place for rapid transfer of patients in need of specialized care. All levels are required to have stroke prevention/public education programs. All levels have quality-improvement programs in place including benchmarks and performance indicators.

Level I stroke-care facility standards should be developed to focus on outcomes and will be based on the Brain Attack Coalition (BAC) standards for a comprehensive stroke center (Appendix F). Level I facilities should have vascular neurology and vascular surgery, and the equipment and staff necessary to perform the full range of diagnostic techniques, and surgical and interventional therapies (e.g., IV and IA reperfusion therapies) according to

BAC guidelines, around-the-clock. Physician, nurse, and technical staffing should be sufficient to provide rapid and quality care, utilizing a stroke team response according to written stroke protocols. Emergency-department physicians should be board-certified or board-eligible. EMS and emergency department personnel should be fully integrated. There should be an ICU and a stroke unit (can be the same) and comprehensive rehabilitation services.

Participation in quality improvement (QI) and a stroke registry would be essential. Education and training of hospital staff, prehospital personnel, and community health care providers on stroke care should be part of the comprehensive services. Consultation services to hospitals without verification or lower level verification should be provided. Level I facilities would participate in patient and community education on stroke prevention, signs and symptoms and 9-1-1 activation.

Level II stroke-care facility standards would be similar to Level I but without the requirement to provide intra-arterial reperfusion therapies or the same level of surgical capability. Standards would be more in line with the BAC guidelines for a primary stroke center versus a comprehensive stroke center.

Level III stroke-care facilities should have the equipment and staff necessary to provide diagnostic evaluation (CT scanner, 24/7) and IV t-PA for appropriately selected ischemic stroke patients. The emergency department must be staffed 24 hours by physicians and nurses. A board eligible/certified neurologist should be available within 30 minutes (could possibly be via telemedicine). An agreement must be in place with a higher-level stroke center for immediate transport of any stroke patients post treatment with IV t-PA or as appropriate on a patient-by-patient basis.

Level IV stroke-care facilities should have equipment and staff necessary to provide resuscitation and stabilization of stroke patients, prior to transfer to a higher level of care. In general, if a patient is thought to have a stroke in the prehospital setting, and has stable hemodynamics, EMS should bypass Level IV facilities to get the patient to a higher-level facility.

Rehabilitation

- Assure access to appropriately accredited rehabilitation services for cardiac and stroke patients.
- Guidance or standards should be developed for rehabilitation care for acute myocardial infarction and stroke patients. These standards should include requirements for risk-factor modification.
- Advocate for policy to assure insurance coverage for cardiac and stroke rehabilitation.

Glossary of Terms and Abbreviations

Medical Terms

Definitions for most of the terms are from the American Heart Association's Cardiac Glossary (http://www.americanheart.org/presenter.jhtml?identifier=3038158)

Acute coronary syndrome (ACS) – An umbrella term used to cover any group of clinical symptoms compatible with acute myocardial ischemia, which is chest pain due to insufficient blood supply to the heart muscle that results from coronary artery disease (also called coronary heart disease).

Acute myocardial infarction (AMI) – Heart attack (see definition for heart attack).

Advanced life support (ALS) – The most advanced level of emergency medical services. ALS ambulances are staffed by paramedics, who have the highest level of emergency medical training and are qualified to provide more sophisticated diagnostic and treatment services than basic or intermediate life support.

Angioplasty – A medical procedure in which a balloon is used to open narrowed or blocked blood vessels of the heart (coronary arteries). It is not considered to be a type of surgery. A catheter with a deflated balloon on its tip is passed into the narrowed artery segment, the balloon is inflated and the narrowed segment widened. Then the balloon is deflated and the catheter is removed. Also called percutaneous coronary intervention.

Automated External Defibrillator (AED) – A portable electronic device that automatically diagnoses the potentially life threatening cardiac arrhythmias of ventricular fibrillation and ventricular tachycardia in a patient, and is able to treat them through defibrillation, the application of electrical therapy which stops the arrhythmia, allowing the heart to reestablish an effective rhythm. AEDs are designed to be simple to use and training is part of many cardiopulmonary resuscitation (CPR) classes.

Basic life support (BLS) – The most basic level of emergency medical services, staffed by emergency medical technicians or trained volunteers.

Cardiovascular – Pertaining to the heart and blood vessels. ("Cardio" means heart; "vascular" means blood vessels.) The circulatory system of the heart and blood vessels is the cardiovascular system.

Cardiovascular disease – Diseases pertaining to the heart and blood vessels.

Cardiac arrest – Cardiac arrest is the sudden, abrupt loss of heart function. It's also called sudden cardiac arrest or unexpected cardiac arrest. Most cardiac arrests occur when the electrical impulses in the diseased heart become rapid (ventricular tachycardia) or chaotic (ventricular fibrillation) or both. This irregular heart rhythm (arrhythmia) causes the heart to suddenly stop beating. Cardiac arrest can be reversed if it's treated within a few minutes with cardiopulmonary resuscitation (CPR) and an electric shock (defibrillation) to the heart to restore a normal heartbeat.

Case-fatality – The number of people who die from a disease.

Case-fatality rate – The proportion of people who die from a disease or condition among all the people who have that disease or condition. For example, in 2005, 500 people were admitted to Hospital A for a heart attack; 80 of them died from the heart attack. The case-fatality rate would be 80 out of 500 or 16 percent.

Catheterization – The process of examining the heart by guiding a thin tube (catheter) into a vein or artery and passing it into the heart and into the coronary arteries. Coronary Arteriography

(angiography) and angioplasty (PTCA, Balloon Angioplasty) are done during a cardiac catheterization.

Cerebrovascular – Pertaining to the brain and its major blood vessels.

Cerebrovascular accident (CVA) – The medical term for a stroke (apoplexy). Strokes can be either ischemic (loss of blood supply) or hemorrhagic (bleeding into the brain).

Computed tomography (CT Scan) – An X-ray imaging technique that uses a computer to produce tomographic, or cross-sectional, images of the chest (including the heart and great vessels) or the brain. It's used to diagnose and evaluate heart diseases such as aortic diseases, cardiac masses and pericardial disease and to define the areas in the brain affected by stroke.

Coronary heart disease (CHD) – Disease of the heart caused by atherosclerotic narrowing of the coronary arteries likely to produce chest pain (angina pectoris) or heart attack. Also called coronary artery disease.

Electrocardiogram (ECG or EKG) – A quick, painless test that records the electrical activity of the heart. It may be taken at rest or during exercise. It is the standard clinical tool for diagnosing arrhythmias (abnormal rhythms) and to check if the heart is getting enough blood or if areas of the heart are abnormally thick.

Emergency medical services (EMS) – Emergency response services provided in a community for medical emergencies.

Emergency medical services and trauma region – Regional coordinating bodies of the Washington State Emergency Medical Services and Trauma Care System, which is the system in place to provide personnel, facilities, and equipment for effective and coordinated medical treatment of patients with a medical emergency or injury requiring immediate medical or surgical interventions to prevent death or disability.

Fibrinolysis – The process of breaking down blood clots. It occurs normally in the body and can be speeded up by medications such as t-PA, streptokinase (fibrinolytic therapy).

Heart Attack (Myocardial Infarction) – Death of, or damage to, part of the heart muscle due to an insufficient blood supply. Heart attacks occur when one of the coronary arteries that supply blood to the heart muscle is blocked. Blockage is usually caused from a buildup of plaque (deposits of fat-like substances) due to atherosclerosis. If a plaque deposit tears or ruptures, a blood clot may form and block the artery, causing a heart attack. Heart attack is also called a coronary thrombosis or coronary occlusion.

Hemorrhagic stroke – Cerebral hemorrhage occurs when a blood vessel or an aneurysm bursts in the brain, causing bleeding inside the brain. Subarachnoid hemorrhages occur when a blood vessel on the brain's surface ruptures and bleeds into the space between the brain and the skull.

Intermediate life support (ILS) – An intermediate level of emergency medical services between advanced and basic life support, usually staffed by emergency medical technicians.

Ischemic stroke – The death of, or injury to, brain cells caused when a blood clot or other particle blocks an artery in the brain (cerebral artery) or leading to it, such as the carotid (neck) artery. Cerebral thrombosis and cerebral embolism are ischemic strokes.

Lytics – A term used to refer to medications that break up blood clots (short for fibrinolytic or thrombolytic).

Medical program director (MPD) – A physician contracted by the Washington State Department of Health to oversee emergency medical services provided at the county level.

Myocardial infarction – See heart attack.

Percutaneous coronary intervention (PCI) – A medical procedure in which a balloon is used to open narrowed or blocked blood vessels of the heart (coronary arteries). It is not considered to be a type of surgery. A catheter with a deflated balloon on its tip is passed into the narrowed artery segment, the balloon is inflated and the narrowed segment widened. Then the balloon is deflated and the catheter is removed. Also called angioplasty.

Reperfusion – A type of therapy during which one or more techniques is used to restore blood flow to part of the heart muscle damaged during a heart attack, or part of the brain injured during a stroke. It may include clot-dissolving drugs (thrombolysis), balloon angioplasty or surgery.

ST-segment elevated myocardial infarction (STEMI) – A heart attack described by a particular result of an electrocardiogram that usually indicates blockage in an artery.

Stroke – An interruption of blood flow to the brain causing paralysis, slurred speech and/or altered brain function. It may be caused by a blood clot blocking circulation or by bleeding into brain tissue causing tissue damage. Also called Apoplexy, Cerebrovascular Accident.

Thrombolysis – The breaking up of a blood clot.

Thrombolytic therapy – A type of therapy during which one or more techniques is used to break up a blood clot.

Tissue plasminogen activator (tPA) – One of several clot-dissolving (thrombolytic) drugs used during a heart attack or stroke to restore blood flow in a blocked artery. To be effective, it must be given within a few hours after symptoms begin.

Statistical Terms

Frequencies – Frequencies reflect the precise number of observations for particular phenomena under discussion. For instance, in reporting the number of hospitals that participated in the survey, a value, 82, reflects the frequency or the observed number.

Ratio – The relationship between two numbers typically expressed as a fraction. For example, if for every three men younger than age 65 who died from a heart attack, one woman younger than age 65 died of a heart attack, the ratio of dying from a heart attack at an age younger than 65 for men to women is 3:1.

Proportion or Percentage – A specific type of ratio in which the numerator is included in the denominator and the resultant value is expressed as a percentage. For example, if 82 hospitals responded to a survey out of 95 hospitals that were invited to participate, we can say that about 86 percent ((82/95)*100) of hospitals participated.

Rate – Is a special form of proportion that includes specification of time. For example: (Number of events in a specified period/population at risk of these events in a specified period)*100 – to express rate as a percent.

Odds Ratio – The odds ratio is a way of comparing whether the probability of a certain event is the same for two groups. The odds ratio expresses the odds of disease in a first group with risk factor present versus odds of disease in a second group with risk factor absent. An odds ratio of 1.00 implies that the event is equally likely in both groups. An odds ratio greater than 1.00 implies that the event is more likely in the first group. An odds ratio less than 1.00 implies that the event is less likely in the first group. For example, patients were less likely to die in hospitals with cardiac teams than hospitals without cardiac teams [Odds Ratio = 0.76, 95 percent CI = 0.64 - 0.90].

Ninety-five percent Confidence Interval (CI) for Odds Ratio – Confidence intervals provide a measure of how much an odds ratio might vary due to random factors or chance. If the 95 percent CI

includes 1.00, then the odds ratio is not statistically significant, i.e., there is no difference between the two groups compared. If the 95 percent CI does not include 1.00, such as in the example above, then the odds ratio is statistically significant, i.e., there is a statistically significant difference between the two groups compared.

Logistic Regression – A statistical analysis that produces odds ratios while adjusting for various factors that may confound the relationship between a specific factor and a disease under study. For example, after adjusting for patients' age and hospital volume, stroke patients younger than 65 with Medicaid, self-pay or charity as the primary payer were ***more*** likely to die during their hospitalization than similar individuals with other insurance [Odds Ratio = 1.46, 95 percent CI = 1.21, 1.75]. Note that the odds ratio here is greater than 1.00 implying that death was more likely in the first group, i.e., patients on Medicaid, self-pay or charity. Also note that the 95 percent CI does not include 1.00, thus the difference between both groups is statistically significant.

P-Value – A p-value is a measure of how much evidence we have that two groups are different. The p-value is a probability, with a value ranging from zero to one. If p-value is <0.05, then the two groups are statistically significantly different. If p-value is ≥ 0.05, then the two groups are similar. For example, when we report that patients are less likely to die in hospitals with cardiac teams than hospitals without cardiac teams ($p < .05$), this means that the difference between both groups is statistically significant.

Abbreviations

ACS – acute coronary syndrome

AMI – acute myocardial infarction

ALS – advanced life support

CHD – coronary heart disease

CT – computed tomography

CVA – cerebrovascular accident

CVD – cardiovascular disease

ECG/EKG – electrocardiogram

EMS – emergency medical services

MPD – medical program director

PCI – percutaneous coronary intervention

STEMI – ST-elevated myocardial infarction

t-PA – tissue plasminogen activator

Appendices

A Survey Protocol

B Emergency Stroke and Cardiac Care Survey Results for Dispatch Coordinators

C Emergency Stroke and Cardiac Care Survey Results for Medical Program Directors

D Emergency Stroke and Cardiac Care Survey Results for Hospitals

E Mortality Table C7. Diseases of the Heart, Ischemic Heart Diseases, and Cerebrovascular Diseases by County of Residence, 2005

F Brain Attack Coalition Guidelines

G Stroke and Cardiac Systems in Other States

H Current Efforts to Improve Heart Attack and Stroke Care

Appendix A

Survey Protocol

Overview: The Heart Disease and Stroke Prevention Program (HDSPP) at the Washington State Department of Health (DOH) worked with the Office of Emergency Medical Services (EMS) and Trauma System and a multidisciplinary workgroup consisting of prehospital and hospital personnel to assess and enhance the response to and outcomes of acute cardiac and stroke events in Washington.

Questionnaires were used as a measurement tool to assess the current capacity and the existing standards of prehospital and hospital acute cardiac and stroke care. Three different questionnaires regarding Acute Coronary Syndrome and Acute Stroke Care were sent to stakeholders listed in Table 1.

Table 1. List of Survey Recipients and Length of Survey

Stakeholder Group	Survey Recipient (number)	Estimated time for completion
Medical Program Director	County MPD (37)	15-20 min.
Dispatch	County 9-1-1 coordinator (39)	15-20 min.
Hospital	Emergency department medical director* Emergency department nursing director* Hospital administrator* (95 total hospitals)	30-35 min.

* Although hospital questionnaires were mailed to the emergency department medical director, emergency department nursing director, and the hospital administrator, only one response was requested. The request to submit a single response was indicated in the pre-notification letter, in the cover letter that accompanied the questionnaire, and the replacement questionnaire sent to all non-responders. If more than one response was received, the first-received response was accepted.

Distribution and Follow-up: Besides paper questionnaires, all three questionnaires were available for completion online. The online link was provided on the top of each mail-in questionnaire. Respondents were given the option of completing the survey in the format of their choice. All responses to survey questions were mandatory; however, respondents were given the the ability to select an option such as ‘not-applicable’ if a questions did not apply to them. Responses to open-ended questions did have a word limit.

Four contacts were made: 1) a prior notification letter, 2) a questionnaire, cover letter, and return envelope, 3) a reminder postcard, and 4) a replacement questionnaire sent to all non-respondents. The mailings were timed to obtain the maximum response rate. The initial questionnaire mailing took place two weeks after the prior letter. The postcard reminder was sent to all respondents one week after the initial questionnaire mailing. The replacement questionnaire to non-respondents occurred two weeks after the postcard mailing. The cut off date for receipt of completed

questionnaires was three weeks after the second questionnaire mailing. Questionnaires received after the cutoff date were added to the dataset at the discretion of the program manager.

Table 2. Timeline for Distribution

Activity	**Timeline**
Pre-notification letter	Week 1
Mail-in/online questionnaire	Week 3
Reminder/thank you postcard	Week 4
Replacement questionnaire to non-responders	Week 6
Close online access	Week 8

Pre-notification letters were sent August 18, 2006; initial questionnaire mailings were sent September 7, with a cut off date of October 13, 2006. Each survey recipient was assigned a unique identifier on the top right corner of the paper questionnaire in order to identify non-responders for repeat mailing. This identifier was necessary to access and complete the questionnaire online.

The cardiac/stroke systems coordinator was the lead person for the distribution of the paper questionnaire and the four above-mentioned contacts. We enlisted the help of the Emergency Stroke and Cardiac Work Group to follow-up with non-respondents. The work group chair — the emergency department medical director at University of Washington — and DOH EMS and Trauma office staff followed up with Hospital and MPD questionnaire non-respondents, respectively.

Data Tracking and Entry: Participants were instructed to complete the questionnaire, place it in the self-addressed stamped envelope, and seal the envelope to protect confidentiality. Completed paper responses were entered into the electronic database by the cardiac and stroke systems coordinator and an assistant. The electronic database and the online portion of the questionnaire were developed by the Community and Family Health Office of the Assistant Secretary (CFH OAS). They used the software *Opinio* to develop the on-line survey. All paper and online data are stored safely with access limited to the CFH OAS online survey supervisor, the epidemiologist and his manager, the cardiac and stroke systems coordinator, the research investigator, and one data entry staff person.

As mentioned earlier, a unique identifier was a required field for the online survey. The weekly report generated by the OAS provided a list of respondents with their unique identifier to the cardiac/stroke systems coordinator. The coordinator entered the information into a separate Excel database that contained agency information to match the identifier to the responding agency. A list of non-responders was then generated for follow-up to increase the response rate.

Quality Control: A number of measures were taken to maintain the quality of the activities related to survey distribution, data collection, data entry, and data analysis. To ensure that

surveys were readable, pilot tests were done with both the paper and online versions at DOH before mailing the surveys. Problems identified were resolved by the cardiac and stroke systems coordinator and the online survey supervisor. Data received through the mail was entered into the *Opinio* database by the cardiac/stroke systems coordinator. The entries were verified on a weekly basis by the CFH OAS, and the EMS and Trauma Systems staff by reviewing the weekly reports generated by the OAS. Approximately 5 percent of completed surveys were re-administered by telephone to verify data.

Confidentiality of the respondents was ensured by storing data in a locked cabinet for paper surveys and on a secure DOH server for online surveys, and limiting access to authorized staff.

A final validation step occurred at the data management level and consisted primarily of accounting for all respondents, ensuring that a data record existed for every completed questionnaire received, and a review of individual responses for discrepancies. All discrepancies were reviewed and appropriate actions taken to ensure quality and accuracy of data collected.

Preparing Data for Analysis: Reports were generated weekly, exported to Excel and Word software, and shared with the epidemiologist and the cardiac/stroke systems coordinator for follow-up and analysis. A final report was generated by the OAS one week after the close of online survey for data analysis.

Emergency Stroke and Cardiac Care Survey Results for Dispatch Coordinators

December 2006

28 (71.8 percent) of 39 dispatch agencies responded. All EMS and Trauma regions except Central (King) are represented.

NOTES: 1) Some percentages may not add up to 100 due to rounding. 2) Identifying information has been replaced by "X".

General Systems of Care Questions

Q1. Do you use an Emergency Medical Dispatch program?

100%	Yes
0%	No → **Skip to Q5**
0%	Don't know/Not applicable → **Skip to Q6**

Q2. Which Emergency Medical Dispatch (EMD) program do you use:

48.2%	MPDS (Medical Priority Dispatch System)
11.1%	Powerphone
37.0%	Criteria Based Dispatch – King Co
0%	APCO (Associated Public-Safety Commissions Officers, Inc)
3.7%	Other

Q3. Is your EMD program revised periodically?

88.9%	Yes
7.4%	No → **Skip to Q6**
3.7%	Don't know/Not applicable → **Skip to Q6**

Q4. How often do you implement or purchase those revisions?

- Bi-annually.
- So far we have had one revision in the last two years and we are getting ready to revise again by 2007.
- Whenever releases from MPDS are available.
- As soon as a new release is available.
- Yearly.
- When medical priority updates.
- When the MPD approves them.
- Been trying for over two years.

- As needed based on QI review.
- When new revisions come out, or clarifications are needed.
- We pay an annual maintenance fee so we get updates as they are created.
- As often as Priority Dispatch issues updates.
- Currently using latest Version 11.3.
- As needed based on QI review.
- When new revisions come out, or clarifications are needed.
- We pay an annual maintenance fee so we get updates as they are created.

Q5. If no, please describe the method you use to dispatch EMS calls.

- We use the Cardset from Medical Priorities and send the EMS out using the code given.
- We stick to the cards for our questions.
- 911 Call answered at Main PSAP(X) then sent to Secondary PSAP(Prospect)Fire/Ambulance where call is prioritzed using MPDS and Engines/Medic Units Dispatched.
- Get chief complaint, prioritize the call (ABCDE), then tone the call, keep caller on the line.
- MPDS.

Q6. In 2005, how many full-time equivalent (FTE) dispatchers did you have?

Mean: 19.3 FTE dispatchers (range: 5 to 47)

Q7. How many dispatchers are EMD certified?

Mean: 19.6 EMD certified dispatchers (range: 5 to 47)
(Note: this question does not ask for FTEs.)

Q8. In 2005, what was the total number of EMS calls received in your county?

Mean: 11,445 EMS calls Median: 7307 Range: 185 to 42,000

Q9. How many hours of <u>initial</u> training are required for EMS dispatchers?

14.3%	<25 hours of initial training
25.0%	25-49 hours
3.6%	50-99 hours
14.3%	100-199 hours
3.6%	200-499 hours
7.1%	500 or more hours
32.1%	Missing/no response

Q10. How often is <u>ongoing</u> training conducted for the EMS dispatchers (EMD & non-EMD)?

44.4%	Annually
22.2%	Every two years
33.3%	Other

Q11. How many continuing education (CE) hours are required for the EMS dispatchers annually?

28.6% <10 hours annually
14.3% 10-19 hours
21.4% 20 or more hours
35.7% Missing/no response

Q12. Do you conduct Quality Improvement (QI) for Emergency Medical Dispatch?

66.7% Yes
29.6% No → **Skip to Q14**
3.7% Don't know/Not applicable/Missing → **Skip to Q14**

Q13. Which quality improvement methods do you use? (Check all activities that apply)

57.1% Medical call review procedure
46.4% Mandatory continuing education
28.6% Frequent staff training
42.9% Re-certification
10.7% Cardiac specific QI
7.1% Stroke specific QI
3.6% Other (quality assurance team)

Q14. Under what authority does your department operate?

3.6% City
32.1% County
7.1% Law enforcement
3.6% Fire department
0% Public health department
0% Private
39.3% Other/interlocal agreement
3.6% City & Fire Department
10.7% County and law enforcement

Q15. Please describe the role the county EMS Medical Program Director (MPD) plays in dispatch.

- We have not gotten that far yet.
- Approved, CBD Program.
- EMS medical program director does not wish to accept the liability.
- Advisory only.
- Authorizes/approves MPDS protocols/upgrades.
- Recommends automatic upgrades to determinant call codes (i.e. upgrading a bravo response to a charlie). Receives monthly QI compliance reports for case reviews.

- Participates on Medial Dispatch Review Committee as needed for discussions on MPDS changes, CPR changes or related changes or standards.
- Approves protocols.
- Has participated in some QI.
- He is on our County Trauma Council and a member of our quality assurance team that reviews calls quarterly. This agency is in the process to contract with hospital X and Emergency Medical Services.
- Any contact training in November 2006.
- The program has been approved by EMS Director for hospital X and we will mimic the program.
- No role has been taken.
- That is currently being reviewed.
- Up to this point, they have approved all instructions given.
- Involved in selection of Powerphone.
- MPD is responsible for EMD Program;
- Oversight of program - For cards (protocols) with variables, he decides which are selected.
- Authorizes use of EMD.
- They have to approve the cardsets we use.
- Reviews quarterly run reviews.
- The MPD advises the EMS council who makes recommendations to the fire chiefs who govern Fire/EMS dispatch through a policy board.
- Sets EMD program.
- With dispatch. Has reviewed and approved all Cards Helps make responders aware that 911 is part of the EMS system!
- He is totally in charge of our EMD/EMS programs.
- Approval of protocols.
- Participates in QI process.
- Approves all changes.
- I have not had any direct contact.
- All of the EMD protocols are reviewed and approved by the MPD.
- Directly involved with dispatch.
- Has reviewed and approved all Cards in the MPDS.
- MPD frequently meets with the communications division chief to review how specific medical calls dispatched. Reviews protocols and authorizes any changes.

Cardiac Care-Specific Questions

Q16. Do you have Emergency Medical Dispatch (EMD) protocols for suspected *cardiac* calls?

85.2% Yes
11.1% No → **Skip to Q21**

3.7% Don't know/Not applicable/Missing → **Skip to Q21**

Q17. Is your department willing to share a copy of your EMD cardiac protocol?

65.2% Yes
34.8% No

Q18. Who *developed* the cardiac protocol?

MPDS; MPDS; Powerphone; They are part of our EMD card set; EMD cardsets from NAEMD; King Co for Criteria Based Dispatch; X (individual's name).

Q19. Was the cardiac protocol *reviewed* by the county EMS Medical Program Director?

82.6% Yes
4.4% No
13.0% Don't know/Not applicable

Q20. Does your cardiac protocol include standard pre-arrival instructions for chest pain/discomfort calls?

85.2% Yes
0% No
14.8% Don't know/Not applicable

Q21. How often are each of the following dispatched to a chest pain/discomfort emergency call? (Check all that apply.)

	Always ▼	Sometimes ▼	Never ▼
ALS/Paramedic	57.7%	30.8%	11.5%
ILS	6.7%	20.0%	73.3%
BLS/EMT	57.1%	28.6%	14.3%

Q22. Which of the following factors does the level of service dispatched depend on? (Check all that apply)

60.7% Age
71.4% Level of consciousness
67.9% Pertinent related symptoms (such as chest pain, shortness of breath, dizziness etc)
46.4% Previous medical/surgical history
35.7% Other

Q23. Does the level of EMS service dispatched depend on the severity of the chest pain/discomfort?

0% Yes
85.2% No
14.8% Don't Know/Not applicable/Missing

Q24. Do dispatchers receive specific training and/or continuing education for chest pain/discomfort?

59.26% Yes, all dispatchers receive chest pain specific training and/or continuing education
3.7% Yes, only EMDs receive chest pain specific training and/or continuing education
22.2% No, dispatchers do not receive chest pain specific training and/or continuing education
14.8% Don't know/Not applicable

Stroke Care – Specific Questions

Q25. Do you have EMD protocols for suspected *stroke* calls?

88.9% Yes
7.4% No → **Skip to Q30**
3.7% Don't know/Not applicable → **Skip to Q30**

Q26. Is your department willing to share a copy of your EMD stroke protocol?

67.0% Yes → **Please include a copy in the return envelope with this questionnaire.**
33.0% No

Q27. Who *developed* the stroke protocol?
One comment: mirrors cardiac protocol

Q28. Was the stroke protocol *reviewed* by the county EMS Medical Program Director?

70.4% Yes
3.7% No
25.9% Don't Know/Not applicable/Missing

Q29. Does the stroke protocol include standard pre-arrival instructions for stroke calls?

88.9% Yes
0% No
11.1% Don't know/Not applicable

Q30. How often are each of the following dispatched to a potential stroke emergency call? (Check all that apply.)

	Always ▼	Sometimes ▼	Never ▼
ALS/Paramedic	50.0%	38.5%	11.5%
ILS	7.1%	21.4%	71.4%
BLS/EMT	57.1%	33.3%	9.5%

Q31. Which of the following factors does the level of dispatch depend on? (Check all that apply.)

67.9% Level of consciousness/breathing
64.3% Related pertinent symptoms (such as dizziness, numbness, weakness etc)

35.7% Previous medical history
35.7% Known diabetic
39.3% Other

Q32. Does the level of EMS service dispatched depend on the severity of the stroke?

22.2% Yes
66.7% No
11.1% Don't know/Not applicable/Missing

Q33. Do your dispatchers receive stroke specific training and/or continuing education?

63.0% Yes, all dispatchers receive stroke specific training and/or continued education
7.4% Yes, only EMDs receive stroke specific training and/or continued education
18.5% No, dispatchers do not receive stroke specific training and/or continued education
11.1% Don't know/ Not applicable/Missing

Thank you for taking the time to complete the survey. If you have any further comments or questions, please note them here.

Comments:

- We are brand new to EMD and are not using it as our dispatch until we get policy in place. Thank you, X.
- FYI- We will have a QI Program after the 1st of the year 2007.
- Currently, we have been unable to get the medical program director to sign-off on our EMD system. We have attempted to have them approved.
- WE DO NOT DETERMINE LEVEL OF RESPONSE. WE BROADCAST LOCATION AND NATURE OF CALL WHEN UNITS ACKNOWLEDGE, THEY ARE GIVEN ADDITIONAL DETAILS. IT WORKS WELL FOR ALL OF US.
- X has not had any EMD Training. Only CPR/AED American Fire AD. At this time, we are going into contract with X and the program will mimic X.
- We currently have more emphasis on EMD in that we are making it mandatory to review protocols and test on the computer at least four times a year plus their recertification attending class ever other certification. They have been required to also take the previous years' protocol refresher test via disc and computer. Not being a large agency with calls occurring sometimes infrequently, on-going education and mock scenarios play an important role in their expertise of handling medical emergencies.
- Medical Priority has a computer software interface with our Spillman CAD system. We would like state assistance in funding the 'Pro QA' software to dispatch EMS calls through CAD, rather than having to spend response time using the cumbersome cards.
- Our agency was under the impression that the local MPD's insurance covered the instructions given by our agency. I've recently found out that is not true and in researching I find no RCW that depicts the need for their concurrence on the instructions we use. As I'm having a difficult time in getting approved I'm researching to be able to move to another system that will allow my agency to stay current with instructions. We've been trying for over two years to get changes approved- to no avail. I'd like to implement a quality assurance program but feel we need to get out instructions tuned up first. We were originally certified by X, but the MPD didn't like some of the instruction so we quit using them. That was in X and I now know differently. But change is hard to come by sometimes so we are currently reviewing our options.

- I am very concerned about our out-dated material. X CBD is a version of X CBD. I'm actively petitioning my local EMS contact to allow us to use PowerPhone EMD instead.
- Regarding Q14. I think it's telling that the DOH isn't even aware there are many 911 centers in Washington State which are stand alone units of government formed by interlocal agreement. EMD is part of the EMS system, and it is time for the DOH to step up to the plate and assist with funding.
- All ALS & BLS respond to all calls
- We use the NAEMD Medical Cardsets for all medical cards. We do not write out any other specific policies for medical cards. Our policy says that we will stick to our training we were given and utilize the Cardsets.
- Q24: Dispatchers are trained in cardiac emergencies yearly.
- When offering on line surveys please make sure they are functional after completing ¾ of the survey. The survey entered a loop preventing completion and/or submission. So here is the hard copy after 30 minutes work as opposed to the 15 minutes indicated on your cover sheet.
- All our EMS personnel are volunteers and we only have three paramedics living locally. We dispatch what we know and follow the EMD procedures, but we don't 'code' our calls. We give all the information and EMD does what they think is appropriate. They may call for ALS or cancel ALS- it is up to them.
- Just to clarify: The local EMS protocols require that we dual dispatch for all EMS calls outside the X. All FPD's have EMT units that make up the second responding unit. In the city, there is a dual response only on specific cases, such as those listed above, in which case a pumper truck (for staffing needs) is sent as the second unit.
- We are in process of purchasing Aqua which is the MPDS quality improvement program and hope to incorporate it into an extensive quality assurance program which will involve reviews of critical calls with our dispatchers, firefighters and paramedics.
- We have 23 dispatch/call taker. Eleven of which are the call takers that answer the phone and provide EMD. So we are 100 percent EMD to call takers.

Appendix C

Emergency Stroke and Cardiac Care Survey Results for Medical Program Directors

December 2006

21 (56.8 Percent) of 37 medical program directors (MPD's) responding.

All 8 EMS and Trauma regions represented.

NOTES: 1) Some percentages may not add up to 100 due to rounding. 2) Identifying information has been replaced by "X".

Section I: Acute Cardiac Care

Q1. Have you integrated the American Heart Association (AHA) 2005 Emergency Cardiovascular Care (ECC) guidelines into your prehospital protocols?

76.2% Yes
9.5% No → **Skip to Q3**
14.3% Don't know/Not applicable/Missing → **Skip to Q3**

Q2. If yes, which specific treatment protocols have you included by <u>level</u> of service for immediate general treatment/management of <u>ischemic chest pain</u>? (Check all that apply.)

Treatment	ALS* ▼	ILS* ▼	BLS* ▼
Oxygen	66.7%	42.9%	71.4%
Aspirin	71.4%	38.1%	47.6%
Nitroglycerin	71.4%	33.3%	38.1%
Morphine (or other narcotics)	71.4%	4.8%	0%
12-lead ECG	71.4%	9.5%	4.8%
Fibrinolytic checklist	38.1%	4.8%	4.8%
Fibrinolytic therapy	0%	0%	4.8%
Blood draw for glucose	61.9%	28.6%	23.8%
Other labs drawn in the field (CBC with diff, chemistries, coags)	57.1%	14.3%	0%
Alert hospital for STEMI	71.4%	9.5%	4.8%

*Advanced Life Support; Intermediate Life Support; Basic Life Support

Q3. Do your protocols permit prehospital fibrinolysis in special circumstances (e.g. >60 minutes in transport; online medical control; physician review of 12-lead ECG or physician available on-site)?

4.8% Yes
76.2% No
19.1% Don't know/Not applicable/Missing

Q4. Do your local county patient operating procedures identify the location of the nearest hospital with the appropriate level of care for the treatment of Acute Coronary Syndrome (ACS)*?

66.7% Yes
28.6% No
4.8% Don't know/Not applicable/Missing

Q5. Do your regional patient care procedures identify the location of the nearest hospital with the appropriate level of care for the treatment of Acute Coronary Syndrome?

47.6% Yes
38.1% No
14.3% Don't know/Not applicable

Q6. How often do people within your county have timely access to ALS? (For this survey, 'timely access' is defined as: Capacity to provide ALS care as soon as a need is recognized)

47.6% Always
28.6% Usually
19.1% Sometimes
4.8% Rarely
0% Never

Q7. How often do people within your county have access to EMS personnel capable of triaging patients with chest pain?

71.4% Always
14.3% Usually
9.5% Sometimes
0% Rarely
4.8% Never

*For this survey, Acute Coronary Syndrome is described as: All patients presenting with acute myocardial infarction, non-ST/elevated myocardial infarction, or accelerated angina.

Q8. How often do people within your county have access to EMS personnel capable of determining the need to rapidly alert the receiving hospital of a probable Acute Coronary Syndrome patient?

66.7% Always
23.8% Usually
9.5% Sometimes
0% Rarely
0% Never

Q9. Do you have an Acute Coronary Syndrome (ACS) protocol for use by your prehospital personnel?

66.7% Yes
33.3% No → **Skip to Q11**
0% Don't know/Not applicable → **Skip to Q11**

Q10. Are you willing to share a copy of your Acute Coronary Syndrome protocol?

57.1% Yes
42.9% No

Q11. Do your prehospital providers complete a high-risk checklist on at least 80% of their patients presenting with ACS?

28.6% Yes
61.9% No
9.5% Don't know/Not applicable/Missing

Q12. Do your <u>EMS personnel</u> receive <u>chest pain/discomfort</u> specific training and/or continuing education?

100% Yes
0% No → **Skip to Q14**
0% Don't know/Not applicable → **Skip to Q14**

Q13. If yes, how often do your EMS personnel receive this training and/or education?

66.7% Annually
14.3% Every two years
19.0% Other

Q14. As the county MPD, please describe the role you play in dispatch protocols for patients with chest pain/discomfort?

- Must approve them.
- At this time I am not involved in dispatch. As an MPD I have no liability protection to cross over into dispatch. Furthermore, our dispatch center has not been willing to pay for my services to provide medical direction; Sometimes dispatch asks my opinion when they get a new dispatch protocol (commercial product); Review protocol every 3-5 years make updates as called for in between; I developed the protocols along with a 'protocol committee'.
- I typically use the X protocols, with yearly updates.
- I make minor changes to them where necessary to work within X county.
- An advisory role through X QI committee to local dispatch.
- Review the dispatch protocols.
- On line support, occasionally ride with ambulance.
- I review and approve dispatch protocols.
- I review and approve our criteria-based dispatch protocols in the county.
- I review the dispatch cards every 2 years. Random QA of calls at the comm center.
- Dispatch follow CBD Guidelines and I have approved on-line CME X.
- EMD training for dispatch centers; Medical advisor for emergency medical dispatch protocol (criteria based). Review/approve use of X Protocols and oversee QA/application of same.
- If asked, I give input re dispatch protocols. I encourage adherence to AHA guidelines. Oversight of all dispatch protocols (MPDS) with revision as appropriate.
- Approval of all prehospital dispatch pre-arrival instructions.
- Oversight of quality improvement.
- Write them in accordance with current AHA recommendations.
- Help develop and approve.
- Ensuring compliance of dispatch protocols by review of run reports of our EMS crews.

Section II: Acute Stroke Care

Q15. Do your prehospital ALS, ILS, or BLS protocols include the following for immediate general treatment/management of potential stroke? (Check all that apply.)

Treatment	ALS ▼	ILS ▼	BLS ▼
Oxygen	90.5%	47.6%	90.5%
Initial 12-lead ECG	61.9%	4.8%	0%
Start IV	90.5%	52.4%	0%
Blood draw for Glucose	85.7%	38.1%	28.6%
Other stroke labs drawn in the field (CBC with diff, chemistries, coags)	76.2%	9.5%	0%
Determine time when patient last known normal	90.5%	28.6%	42.9%
Perform prehospital stroke assessment*	52.4%	19.1%	28.6%
Alert hospital	90.5%	33.3%	47.6%

*If prehospital stroke assessment scale used, please indicate the name: 6 Cinncinati, 1 NIHSS, 1 secondary survey

Q16. Do your <u>local</u> county patient operating procedures identify the location of the nearest hospital with the appropriate level of care for the treatment of stroke?

66.7% Yes
33.3% No
0% Don't know/Not applicable

Q17. Do your <u>regional</u> patient care procedures identify the location of the nearest hospital with the appropriate level of care for the treatment of stroke?

42.9% Yes
42.9% No
14.3% Don't know/Not applicable/Missing

Q18. In your county, is the usual destination for potential stroke patients a hospital with: (Check the ONE answer that matches your hospital situation.)

4.8% No CT scanner
38.1% CT scanner

47.6% CT scanner and neurologist
4.8% CT scanner and neurologist and stroke team
4.8% CT scanner and neurologist and stroke team and JCAHO primary stroke center
0% Don't know/Not applicable

Q19. Do you have a stroke protocol for use by your prehospital personnel?

66.7% Yes
33.3% No → **Skip to Q21**
0% Don't know/Not applicable → **Skip to Q21**

Q20. Are you willing to share a copy of your stoke protocol?

57.1% Yes
42.9% No

Q21. Do your EMS personnel receive <u>stroke</u> specific training and/or continuing education?

95.2% Yes
0% No → **Skip to Q23**
4.8% Don't know/Not applicable/Missing → **Skip to Q23**

Q22. If yes, how often do your EMS personnel receive this training and/or education?

61.9% Annually
23.8% Every two years
14.3% Other

Q23. As the county MPD, please describe the role you play in dispatch protocols for patients with <u>stroke</u>?

- Must approve them.
- Sometimes dispatch asks my opinion when they get a new dispatch protocol (commercial product).
- EMS round often review neurological emergencies with BLS ILS ALS.
- An advisory role through X committee.
- Review dispatch protocols annually.
- Review dispatch protocols.
- On-line support.
- I review and approve dispatch protocols.

- I approve the criteria based dispatch protocols in the county.
- I review the dispatch cards every two years and am involved in monthly random QA.
- Medical advisor for emergency medical dispatch protocol (criteria based).
- Review/approve use of X protocols and oversee QA/application of same.
- Approval of MPDS dispatch and pre-arrival instructions.
- Oversight of QI.
- Current AHA recommendations incorporated.
- We currently do not have a stroke specific protocol.
- Review run reports for compliance.

Section III: Barriers to Emergency Cardiac and Stroke Care

Q24. Please indicate if any of the following barriers exist that, if eliminated, would improve care provided to patients with Acute Coronary Syndrome or acute stroke.

Acute Coronary Syndrome

Barriers	No Problems ▼	Slight Problems ▼	Significant Problems ▼	Don't know/did not respond ▼
Communication between dispatch and EMS	76.2%	19.1%	4.8%	0% missing*
Communication between EMS and hospital	52.4%	19.1%	23.8%	4.8% missing
Insufficient resources such as medical staff, technology	57.1%	19.1%	23.8%	0% missing
Travel time due to distance	28.6%	38.1%	28.6%	4.8% missing
Lack of standardized protocols	81.0%	19.1%	0%	0% missing
Other	23.8%	4.8%	9.5%	61.9% missing

[Specify: Telehealth; Very rural, no ALS; Medicare limits choice of transfer]

*Missing values were removed from the denominator when calculating % ages

Acute Stroke

Barriers	No Problems ▼	Slight Problems ▼	Significant Problem ▼	Please describe what would improve care to patients ▼
Communication between dispatch and EMS	52.4%	19.1%	23.8%	4.8% missing
Communication between EMS and hospital	81.0%	19.1%	0%	0% missing
Insufficient resources such as medical staff, technology	52.4%	23.8%	23.8%	0% missing
Travel time due to distance	28.6%	38.1%	28.6%	4.8% missing
Lack of standardized protocols	76.2%	23.8%	0%	0% missing
Other	19.1%	14.3%	4.8%	61.9% missing

[Specify: physician resistance to stroke protocols, very rural settings, time constraints, Telehealth]

Q25. Please describe in detail any additional barriers that if eliminated, would improve the care provided to patients with ACS and Stroke in your county?

- No stroke or cardiac specialty hospital for at least 60-80 miles, and chest pain and neuro cases go to the nearest community hospital. EMS only goes to specialty hospital if X locate or if transferring hospital-hospital.
- The data supporting emergent IV thrombolytics is weak. There is much more data which shows it is not of benefit than which shows it is. It is a mystery to me why the American Heart Association has pushed this issue the way it has been pushed on such weak data. I do not feel the State of Washington should be focusing so many resources to acute stroke care until there is a larger body of compelling data.
- Given the huge human and financial costs of heart attacks and strokes the development of a state-wide comprehensive system model after the principles of our state trauma system would largely reduce death and disability from the diseases. The system should integrate programs of prevention, prehospital care as well as rehab - and be linked together with an outcome based system of QI.
- As an internist, I find at times I need to shop for a stroke team. At times, the answers from Olympia are not consistent with my training, regarding fibrinolysis.
- Allow hospitals without cardiovascular surgery backup at that hospital to do interventional cardiology. Our closest interventional hospital is 50 minutes away without traffic. We transfer two to three ACS per day.
- Lack centralized dispatch, GPS on all ambulances.
- Resources limited by topography and economics, very rural county with two hospitals, no in-house neurology/cardiology (cath labs). In process to regionalize cardiac response to STEMI patients with regional cardiac services.
- Being an X community, we utilize the local hospital for initial diagnosis & Rx and coordinate immediate referral to higher level center by helicopter or ground transport as indicated.
- Decision on use of fibrinolytics for stroke still controversial. Hospital commitment uncertain - physicians committed.

Emergency Stroke and Cardiac Care Survey Results for Hospitals

December 2006

82 (86.3 percent) of 95 hospitals reporting.

All EMS and Trauma regions represented.

NOTES: 1) Some % ages may not add up to 100 due to rounding. 2) Identifying information has been replaced by "X".

SECTION I - HOSPITAL DEMOGRAPHICS

Q1. What is your average daily census in the …?

a. Emergency department
mean: 47; median: 21; (range: 2 to 267)

b. Hospital
mean: 92; median: 41; (range 1 to 450)

Q2. In the last 12 months, what percentage of emergency department patients are admitted?

Mean 15.3% of emergency patients admitted, median 13%, (range 4% to 56%)

Q3. In the last 12 months, what is the average percentage of hospital beds that are occupied?

Mean 59.7% of hospital beds occupied, median: 62.0, (range: 1% to 96%)

Q4. What is the number of staffed beds in the …?

a. Emergency department
Mean 15 beds, median 11
(Range: 0 beds to 58 beds)

b. Hospital
Mean 96 beds, median 32
(Range: 3 beds to 400 beds)

SECTION II - ACUTE CORONARY SYNDROME – ACS*

SECTION IIA Triage and Therapeutic Interventions

Q5. Do you have full-time (24/7) physician staff in your emergency department?

85.4% Yes
12.2% No → Skip to Q8
2.4% Don't know/Not applicable → **Skip to Q8**

Q6. If yes, are the majority (greater than 75 percent) of these physicians:

Yes
▼
69.2% Board certified in Emergency Medicine
29.3% Board certified in other specialties
0% Not board certified

Q7. If no, is your Emergency Department staffed by… *(Check all that apply)*

0% Nurse Practitioner
22.2% Physician's Assistant
0% Registered Nurse
66.7% Combination of Nurses, Nurse Practitioners, and Physician's Assistants
11.1% Other (describe): _____

Q8. Do you have a Cardiologist on-staff?

2.4% Yes, in-house 24/7 → **Skip to Q10**
43.9% Yes, on call 24/7
11.0% Yes, on call less than 24/7
6.1% Other (specify) _____
36.6% No Cardiologist on staff or on call → **Skip to Q10**

Q9. If a Cardiologist is available <u>on call</u>, what is the required response time from call to arrival at patient's bedside?

19.4% Less than 20 minutes
3.2% 20-29 minutes
67.7% 30 minutes
9.7% More than 30 minutes

Q10. Do you admit patients with acute coronary syndrome* (ACS)?

74.4% Yes
23.2% No → **Skip to Q12**
2.4% Don't know/Not applicable → **Skip to Q12**

*ACS definition for this survey: All patients presenting with acute myocardial infarction, non-ST elevated myocardial infarction or accelerated angina.

Q11. Typically, acute coronary syndrome (ACS) patients are admitted to which of the following units?(Check **ONE** primary unit)

32.3% CCU
29.0% General ICU
29.0% Other monitored bed
0% Unmonitored bed
9.7% Other (describe) [Combination]

Q12. Do you have an acute coronary syndrome (ACS) or cardiac team?

19.5% Yes
79.3% No → **Skip to Q14**
1.2% Don't know/Not applicable → **Skip to Q14**

Q13. If yes, who are the members of the team? *(Check all that apply.)*

93.8% Emergency physician
93.8% Cardiologist
43.8% Pharmacist
37.5% Radiologist
50% Laboratory Medicine
62.5% Patient Care Services
18.8% Other (specify): [Cath lab, ED RN, ED EKG tech]

Q14. Do you have a protocol for acute coronary syndrome*?

58.5% Yes
35.4% No → **Skip to Q16**
6.1% Don't know/Not applicable → **Skip to Q16**

Q15. Are you willing to share a copy of your acute coronary syndrome protocol?

64.6% Yes
29.2% No
6.3% No response

Q16. Does your hospital have a catheterization lab?

41.5% Yes
57.3% No → **Skip to Q23**
1.2% Don't know/Not applicable → **Skip to Q23**

Q17. If yes, is it dedicated to cardiac catheterization?

73.5% Yes
26.5% No
0% Don't know/Not applicable

Q18. Does your facility have catheterization lab team?

5.9% Yes, in house 24/7 → **Skip to Q20**
82.4% Yes, on call 24/7
2.9% Yes, on call, less than 24/7

2.9% Other (please describe): _____
5.9% No cath lab staff in-house or on call → **Skip to Q20**

Q19. If <u>on call</u>, what is the required response time of the catheterization lab team?

22.2% 20 minutes or less
70.4% 30 minute response
7.4% More than 30 minutes

Q20. What is your hospital's average door-to-balloon time?

11.8% <60 minutes
44.1% 60-90 minutes
8.8% >90 minutes
35.3% Don't know/Not applicable

Q21. Is the catheterization lab activated based on prehospital data received prior to patient arrival?

17.7% Yes, always
23.5% Yes, most of the times
23.5% Yes, sometimes
23.5% No, catheterization lab not activated based on prehospital data → **Skip to Q23**
11.8% Don't know/Not applicable → **Skip to Q23**

Q22. Please indicate the prehospital data that will activate the catheterization lab:

EKG in field showing acute ST elevation, (+)EKG findings called in by medic X, EKG; Chest Pain, SOB, ST Segment; EMS EKG with positive ST; EMS interpretation of rhythm strip alone will activate code STEMI; STEMI; EKG Transmitted by EMS or + EKG as read by EMS; ST Elevation, Unstable Angina Refractory To Meds; EKG Finding of AMI; EKG With ST Elevation; ST segment elevation; Field EKG, EKG from transferring hospital

Q23. How far away from your hospital is the nearest Open-Heart Surgery Program?

Ground	Air	Time to Open-Heart Surgery Program
30%	44.2%	<=20 minutes
33.3%	5%	21-59 minutes
20%	4.7%	60-89 minutes
16.7%	4.7%	>=90 minutes

18 (21.9%) out of 82 hospitals reported having an open-heart surgery program

Q24. What is your primary Reperfusion Strategy?

49.4% Thrombolytics/Fibrinolytics (lytics)
42.0% Angioplasty
8.6% Not applicable – do not provide reperfusion therapy

Q25. If you provide lytic therapy, who usually makes the decision to give lytics?

31.3% Emergency physician
5.0% Cardiologist
48.8% Emergency department physician and cardiologist
3.8% Other
11.3% Do not provide lytic therapy

Q26. If you provide Angioplasty, who triggers the catheterization lab?

18.1% Emergency physician
6.9% Cardiologist
23.6% Emergency department physician and cardiologist
5.6% Other (specify): _____
45.8% Do not provide angioplasty

Q27. If a patient has a negative EKG, do you have a chest pain rule out protocol?

72.0% Yes
18.3% No
9.8% Don't know/Not applicable

Q28. Do you have point-of-service enzyme testing?

32.9% Yes → **Skip to Q30**
62.2% No
4.9% Don't know/Not applicable → **Skip to Q30**

Q29. If no, what is your typical turn-around time for cardiac markers?

35.3% 30 minutes or less
31.4% 31-59 minutes
31.4% 60 minutes or longer
1.96% Don't know/Not applicable

SECTION IIB Transfers

Q30. Do you transfer patients with acute coronary syndrome to another acute care facility?

69.5% Yes
28.1% No → **Skip to Q36**
2.4% Don't know/Not applicable → **Skip to Q36**

Q31. If yes, please indicate how often you transfer each type of patient:

	Transferred?				
Type of patient	Always ▼	Mostly ▼	Sometimes ▼	Rarely ▼	Never ▼
Patient with ACS	25.5%	50.9%	12.7%	9.1%	1.8%
Patient needing open heart surgery	98.2%	0%	1.8%	0%	0%

Patient requiring catheterization.....85.7%	1.8%	7.1%	1.8%	3.6%

Q32. What interventions do you perform prior to transfer?

66.7% Thrombolytic
2.0% Catheterization
5.9% Thrombolytic and Catheterization
25.5% Other (specify): [Other combinations]

Q33. How far is the closest receiving hospital for transfers from your hospital?

Ground	Air	Time to receiving hospital
27.8%	43.6%	<20 minutes
33.3%	48.7%	21-59 minutes
20.4%	2.6%	60-89 minutes
18.5%	5.1%	90 minutes or longer

Q34. Do you believe your transfer arrangements are working well?

91.1% Yes → **Skip to Q36**
5.4% No
3.6% Not sure

Q35. If the answer is no or not sure, please indicate what is not working well or any other concerns:

- We have no data from receiving facility on average door to balloon time. Our medical staff would like this information to determine if our thrombolytic use is appropriate or needs to be increased prior to transfer.
- Difficulty with beds.
- We may need to consider lytics and then shipping patients if they cannot get directly to lab in X.
- Due to Medicare reimbursement rules requiring transfers to the nearest facility that provides care, we are forced to send patients to a facility that has a cumbersome transfer process and a perceived barrier to accepting patients.
- No formal arrangements.
- Variable depending on which cardiologist is taking call.
- I would like to see us get more acute MI to the cath lab emergency. Our out the door time is 145 minutes - need to lower that.

Q36. Is your hospital certified for AMI, ACS, and /or CAD (disease-specific care) by JCAHO?

17.1% Yes → **Skip to Q38**
61.0% No
22.0% Don't know/Not applicable → **Skip to Q38**

Q37. If not, are you working towards certification or considering certification?

4.0% Yes, working towards certification
18.0% Yes, considering certification
78.0% No, not considering certification at this time

SECTION III - ACUTE STROKE CARE

SECTION IIIA Triage and Therapeutic Interventions

Q38. Does your facility have a neurologist on-staff?

1.2% Yes, in-house 24/7 → **Skip to Q40**
36.6% Yes, on call 24/7
9.8% Yes, on call, less than 24/7
8.5% Other (please describe): Consults, available no call, telephone, etc.
43.9% No neurologist on staff or on call → **Skip to Q40**

Q39. If a neurologist is available on call, what is the required response time from call to arrival at patient's bedside?

5.0% 10 minutes
5.0% 15 minutes
55.0% 30 minutes
10.0% 45 minutes
25.0% 60 minutes

Q40. Does your hospital have a written care protocol for acute stroke, specifically for:

Type of stroke	Yes ▼
Acute ischemic stroke	62.2%
Intracerebral hemorrhage	25.6%
Subarachnoid hemorrhage	23.2%

Q41. Does your hospital have the ability to perform and read CT images 24/7?

29.3% Yes, in-house
24.4% Yes, on call
36.6% Yes, both in-house and on call
3.7% Not 24/7, consultant available specific hours only
4.9% No
1.2% Don't know/Not applicable

Q42. Does your hospital have the ability to perform and read MRI images 24/7?

13.4% Yes, in-house → **Skip to Q44**
13.4% Yes, on call
17.1% Yes, both in-house and on call

12.2% Not 24/7, consultant available specific hours only
40.2% No → **Skip to Q44**
3.7% Don't know/Not applicable → **Skip to Q44**

Q43. If a CT/MRI Tech is available on call, what is the <u>required</u> response time?

8.3% <=10 minutes
4.2% 15 minutes
25% 20 minutes
62.5% 30 minutes

Q44. Who usually reads your CT/MRI scans? *(Check all that apply.)*

0.0% Emergency physician only
10.0% Emergency physician and radiologist
1.4% Neurologist
67.1% Radiologist
4.3% Neuroradiologist
7.1% Radiologist and neuroradiologist
5.8% ED physician, radiologist and neurologist
1.4% Radiologist and other
2.9% Other

Q45. Who usually makes the decision to administer lytics such as tPA for acute ischemic stroke? *(Check all that apply.)*

21.0% Emergency physician
8.6% Neurologist or neurosurgeon
39.5% ED Physician and neurologist/neurosurgeon
1.2% Internist & ED physician
0% Hospitalist/Intensivist
1.2% ED physician, neurologist and internist
2.7% Other (specify): (e.g., receiving facility physicians)
16.0% We don't give lytics for stroke
9.8% Don't know/Not applicable

Q46. What is your hospitals average door-to-lytic time?

32% 30 minutes or less
20% 31-59 minutes
20% 60-89 minutes
28% 90 minutes or longer

Q47. Do you have a stroke team that responds to suspected acute stroke?

20.7% Yes
74.4% No → **Skip to Q50**
4.9% Don't know/Not applicable → **Skip to Q50**

Q48. Which of the following are routinely included on the team? *(Check all that apply.)*

94.1% Emergency physician
76.5% Neurologist
52.9% Radiologist
17.7% Neurosurgeon
58.8% CT/MRI Tech
52.9% Nurse Specialist
47.1% Pharmacist
41.2% Other

Q49. What is the required response time for the stroke team?

53.3% 10 minutes or less
13.3% 15 minutes
13.3% 30 minutes
20.0% no required response time

Q50. Does your hospital admit acute stroke patients?

84.2% Yes
12.2% No → **Skip to Q53**
3.7% Don't know/Not applicable → **Skip to Q53**

Q51. Who typically manages inpatient care of stroke patients within the first 48 hours of being admitted?

18.8% Neurologist
1.5% Neurosurgeon
4.4% ICU, specialist/intensivist
37.7% Primary caregiver
18.8% Hospitalist
18.8% Other/combination

Q52. Typically, stroke patients are admitted to which one of the following units? *(Check **ONE** primary unit.)*

31.9% General medical ward
37.7% General ICU
11.6% Neuro unit
18.8% Other and combination

SECTION IIIB Transfers

Q53. Do you transfer patients with acute stroke to another acute care facility?

78.1% Yes
20.7% No → **Skip to Q59**
1.2% Don't know/Not applicable → **Skip to Q59**

Q54. If yes, please indicate how often you transfer patients for each subtype of stroke:

Type of Stroke	Transferred? Always ▼	Mostly ▼	Sometimes ▼	Rarely ▼	Never ▼
Ischemic	12.9%	25.8%	35.5%	22.6%	3.2%
Intracerebral hemorrhage	49.2%	30.2%	14.3%	6.4%	0.0%
Subarachnoid hemorrhage	60.3%	25.4%	7.9%	6.4%	0.0%

Q55. What interventions do you perform prior to transfer? (Check all that apply.)

59.8% Neurological assessment
72.0% CT scan
25.6% Fibrinolytic therapy
39.0% Aspirin
4.9% Other

Q56. How far is the closest receiving hospital for stroke transfers from your hospital?

Ground	Air	Time (minutes)
26.7%	43.1%	20 minutes or less
30.0%	47.1%	21-59 minutes
21.7%	0.0%	60-89 minutes
21.7%	9.8%	90 minutes or longer

Q57. Do you believe your transfer arrangements are working well?

90.6% Yes → **Skip to Q59**
4.7% No
4.7% Not Sure or no response

Q58. If the answer is no or not sure, please indicate what is not working well or any other concerns:

- New Stroke/TIA protocol is forthcoming.
- No good data at this point.
- Time out door too long.
- Absence of clear cut transfer arrangement with receiving facilities.
- We have no formal transfer policy with certified stroke centers.

Q59. Is your hospital certified as a JCAHO Primary Stroke Center?

8.5% Yes → **Skip to Q62**
81.7% No
9.8% Don't know/Not applicable → **Skip to Q62**

Q60. If not a JCAHO certified stroke center, are you working towards certification or considering certification?

12.0% Yes, working towards certification → **Skip to Q62**
10.7% Yes, considering certification → **Skip to Q62**
66.7% No, not considering certification at this time
10.7% No response/missing

Q61. If you are not considering JCAHO certification at this time, does your hospital meet Brain Attack Coalition recommendations for a primary stroke center?

12.0% Yes
36.0% No
52.0% Don't know/Not applicable/Missing

SECTION IV - QUALITY IMPROVEMENT, OTHER QUESTIONS

Q62. Do you provide post-acute cardiac rehabilitation services? [if hospital admits cardiac]

54.9% Yes
37.8% No
7.3% Don't know/Not applicable/Missing

Q63. Do you provide post-acute stroke rehabilitation services? [if hospital admits stroke]

59.8% Yes
36.6% No
3.7% Don't know/Not applicable/Missing

Q64. Do you provide any other cardiac or acute stroke care services not mentioned in this survey?

12.2% Yes
67.9% No → **Skip to Q66**
20.0% Don't know/Not applicable → **Skip to Q66**

Q65. If yes, please describe:

- Mended Hearts Support Group.
- General ICU/CCU care including pacemaker insertions.
- Electrophysiology.
- CHF Clinic.
- Non-invasive cardiac testing.
- Patient Support Groups, Education Classes + Community Screening.
- Outpatient neuro rehab specialty clinics, vision, balance, driving, language, etc.
- Support groups bi-monthly.
- We have an interventional neuroradiologist + will be putting in place our Biplanar in December. Currently doing stenting/coiling/+cong devices.

- Diagnostic cath lab, clinical cardiology including pacemaker insertions, exercise and non-exercise stress testing, Echocardiology including TE echo and cardiac nuclear med services.
- CARF certified inpatient as well as outpatient rehabilitation services, also designated as Level 2 trauma rehab facility.
- Research, cardiac surgery, cardiovascular wellness
- Speech, occupational therapy.
- In-house rehab unit.

Q66. Do barriers exist that, if eliminated, would improve care provided to cardiac or stroke patients?

36.6%	Yes
43.9%	No → **Skip to Q68**
19.5%	Don't know/Not applicable/Missing → **Skip to Q68**

Q67. If yes, please describe:

- Their practice arrangement has been to provide inpatient consultation after admission by another specialty. They are not interested in changing this model to develop a stroke team.
- Lack of neurosurgeons.
- Public education, minimal access to pre hospital data.
- More inpatient ICU beds.
- Neurologist bias to thrombolytic for acute ischemic stroke.
- On-site cardiologist, availability of staffed beds.
- Priority transcript needs to occur by medic. Some strokes are transported by BLS. Transport needs to be considered as high a priority as cathlab MIs.
- External barriers such as insurance denials forcing pts to a sub-acute facility or home.
- No available physical therapists, occupational therapists or speech therapists.
- Limitation of performing primary angioplasty that is non-emergent at a hospital that does not have open heart back up. We could care for more patients without having to transfer them if this rule was eliminated
- We are a small rural hospital. Do not have a CT scanner. Working on trying to get one.
- In-house physician staff, EMS to call from field.
- Financial, education and training.
- We need more cardiologists, neurologists, and at least one neurosurgeon.
- Electronic sharing of CT images between hospitals.
- Radiologist here 24/7, neurologist. However our level hospital could never get them due to number of patients. CT Surgery on-site, neurologist on staff.
- More community specific education about getting to ED/Stroke center early.
- No cath lab, not enough neurologists.
- 24/7 in-house emergency department practitioner.

- Regarding cardiac care, the biggest barrier is recruitment of more cardiologists to allow 24/7 clinical coverage and to develop the cath lab to provide emergent interventional cardiology. We have been recruiting for several years without success.
- Regarding stroke care, as far as the use of lytics and stroke teams recommended by AHA - the medical staff in general are not convinced as to the efficacy of lytics in stroke and that the benefit outweighs the risk in most cases with the mortality rate much higher when using than in acute MI. Secondly, to develop a stroke team we only have partial neurosurgical coverage and the neurologists, although providing 24/7 call most of the time, rarely see patients in the ER.
- No Neurosurgeon on call or on staff, radiology only available in house 18 hours/day.
- Cardiac care in this region is excellent, no changes needed.
- There is no consensus on acute stroke care in this region, administration of thrombolytics is subject to the opinion of the on call neurologist and the availability of neurosurgery. There needs to be standardization of treatment for acute ischemic stroke not dependent on the availability of local resources or specialty opinion.
- Lack of consensus re fibrinolytic therapy.
- We have great O.T./P.T, need more staff on floor.
- Formalized transfer agreement with receiving facilities.
- Would like cardiac cath lab --> being lobbied against by hospital 50 miles away because of business they would lose.
- 24/7 emergent CT angio or MRI/MRA emergently.
- Stroke - community awareness of necessity to come in for treatment with onset of symptoms.
- Education and 'buy-in' from medical staff in community and hospital administration.
- Recognition by physicians that patients can be safely transferred to a long-term acute care hospital for post cardiac/CVA rehabilitation.
- Currently, EMS protocol has ambulances bypassing our hospital for stroke despite the presence of our stroke program. This has kept our volume low. Increased volume will increase quality. Protocols for ACS and stroke care in ED.

Q68. Do you currently use telemedicine for acute cardiac or stroke consultation?

13.4%	Yes
81.7%	No
4.9%	Don’t Know/Not applicable/Missing

Q69. Are you planning to use telemedicine in future?

40.2%	Yes
29.7%	No
30.5%	Don’t know/Not applicable/Missing

Thank you for taking the time to complete the survey. If you have any additional comments or questions about Emergency Cardiac and Stroke Care or about this survey, please write them in the box below.

Comments:

- Some questions required a 'sometimes' answer and that option was not provided.
- We would benefit greatly from a telemedicine program that allows us to consult on acute ischemic stroke and intracerebral hemorrhage patients. Ideally, this would be used to prevent unnecessary transfers for non-surgical patients, but would require our hospitalists and administration to agree that a telemedicine neurosurgical consult would be adequate. However, our barriers to providing thrombolytic therapy for acute ischemic stroke are twofold: first, not all our neurologists or ER physicians believe in its efficacy - better data and education are required before this will become accepted, second, we do not have full time neurosurgical coverage, and patients are very resistant to being transferred to Seattle, so will opt out of receiving thrombolytics solely because they will have to be transferred to a facility with neurosurgery coverage just in case of hemorrhage. Cardiac care is a great model of how well proven interventions can work, however with the shortage of neurosurgeons and the dissention among neurologists, acute stroke care will never reach that level of successful widespread intervention.
- Pediatric Hospital - much of survey involves a patient population we don't see or there are not standard guidelines for.
- Working with the 10 minute mile to assure ASA, EKG, Monitor, Oxygen, Nitro within 10 minutes of arrival to ER door. Now going to add incentive to get them out this door within one degree.
- We are considering becoming a stroke center. They have the capability to use telemedicine for acute cardiac or stroke consultation, just not using it. It is very important to group the results by peer group hospitals. We are small critical access. We have an ongoing program to improve cardiac arrest resuscitation in the field and at ours and other receiving hospitals. This includes interventions that are effective but seldom used elsewhere (hypothermia) as well as research to define future effective therapies (percutaneous cardiopulmonary support for cardiac arrest and ultrafiltration after cardiac arrest). Q - Are you planning to use telemedicine in future? A - As technology becomes available and funding for rural hospitals. Considering the use of telemedicine for acute stroke consultation, as well as working to develop transfer protocols for acute stoke, outside of the 180 minute venous thrombolysis window. X does not see these conditions. Most questions were NA. We are a small critical access hospital. We use X as our resource and transfer center, although we have used X as well, for cardiac and stroke patients. Rarely use telemedicine.
- Please note: Q1 asks for average daily census, but the statement reads 'beds' for the emergency department and hospital entries. The program does not allow for changing to 'patients'. Some questions are left for interpretation by the responder; in the case of ‘considering' certification by JCAHO, for the purpose of this response meant actively involved in discussions. More specific hospital demographics are likely available; I just don't have them.
- We're a long-term acute care hospital; therefore, we have patients referred to us after the initial event. Partnering with X to improve care of AMI patients. Establishing protocols to transport patients within 30 minutes for PCI.. We are developing a comprehensive stroke center at X in X, opening in 2007. In this envisioned system, some stroke patients will be managed at X. We have just approved a stroke coordinator + have developed aggressive thrombolytic and interventional protocols for IV t-PA/IA t-PA/+ metric catheters/for embolism. We completed our purchase of a biplanar angio suite. We completed our on-site review of X.
- Question #1a and 1b are referring to census. Answer should be number of patients, not beds.
- We are searching for answers regarding transfers and stroke. We would like to 'drip & ship' to a stroke center as none exist in X area. I would rather ship to them rather than keep in local hospitals that don't have a stroke team. We are an acute care hospital with med/surg and rehab. We do not have ER nor ICU. We are Medicare approved and CARF-certified. We have telehealth/medicine available, would like to search for opportunities to use it for these situations.

Mortality Table C7. Diseases of the Heart, Ischemic Heart Diseases, and Cerebrovascular Diseases by County of Residence, 2005

	Diseases of the Heart (I00-I09,I11,I13,I20-I51)			Ischemic Heart Disease (I20-I25)			Cerebrovascular Disease (I60-I69)		
County	Number	Crude Rate[1]	Age-Adj Rate[2]	Number	Crude Rate[1]	Age-Adj Rate[2]	Number	Crude Rate[1]	Age-Adj Rate[2]
State Total	**10,913**	**174.4**	**176.4**	**7,734**	**123.6**	**125.3**	**2,883**	**46.1**	**47.0**
Adams	27	158.8	186.1	14	82.3	97.9	4	*	*
Asotin	45	215.3	142.7	26	124.4	81.6	9	43.1	25.8
Benton	273	172.7	202.6	193	122.1	143.2	74	46.8	55.8
Chelan	144	208.1	168.1	109	157.5	128.5	58	83.8	66.3
Clallam	192	287.4	171.4	129	193.1	114.6	81	121.3	69.6
Clark	612	156.3	187.2	416	106.3	127.7	155	39.6	48.7
Columbia	9	219.5	143.9	9	219.5	143.9	0	*	*
Cowlitz	211	220.0	190.8	167	174.1	151.8	62	64.7	57.1
Douglas	66	190.2	183.6	51	147.0	141.7	19	54.8	51.8
Ferry	16	216.2	232.7	8	108.1	111.2	3	*	*
Franklin	84	138.8	200.2	63	104.1	154.0	14	23.1	32.2
Garfield	5	208.3	122.7	4	*	*	2	*	*
Grant	138	174.5	189.3	103	130.2	141.4	32	40.5	44.7
Grays Harbor	186	266.5	212.4	121	173.4	138.3	44	63.0	51.0
Island	134	176.3	161.0	88	115.8	104.3	28	36.8	33.9
Jefferson	68	246.4	155.5	48	173.9	110.3	29	105.1	66.4
King	2,608	144.2	149.5	1,774	98.1	102.0	698	38.6	40.0
Kitsap	404	168.1	178.2	268	111.5	118.2	114	47.4	52.2
Kittitas	63	172.1	173.8	47	128.4	125.4	17	46.4	44.4
Klickitat	56	287.2	245.2	44	225.7	192.6	9	46.2	38.6
Lewis	178	248.6	189.0	140	195.5	149.0	40	55.9	41.6
Lincoln	33	326.7	207.8	21	207.9	128.0	8	79.2	41.9
Mason	154	296.7	240.4	101	194.6	156.8	36	69.4	59.1
Okanogan	69	174.2	148.7	39	98.5	84.3	24	60.6	52.0
Pacific	86	403.7	236.6	68	319.2	188.3	17	79.8	45.6
Pend Oreille	21	172.1	156.8	15	123.0	106.9	8	65.6	68.2
Pierce	1,380	182.6	206.9	1,032	136.5	155.0	334	44.2	51.5
San Juan	23	148.4	98.4	12	77.4	50.7	6	38.7	25.9
Skagit	211	190.3	151.1	137	123.5	97.9	70	63.1	49.8
Skamania	16	155.4	170.2	11	106.8	112.3	6	58.3	73.4
Snohomish	1,036	158.0	193.1	758	115.6	142.1	246	37.5	46.8
Spokane	801	183.6	162.5	577	132.2	117.8	238	54.5	48.8
Stevens	99	240.3	216.8	82	199.0	179.8	32	77.7	72.3
Thurston	395	176.3	175.7	258	115.1	115.2	98	43.7	43.6
Wahkiakum	7	179.6	124.2	5	128.3	88.9	2	*	*
Walla Walla	137	238.3	176.4	87	151.3	111.8	58	100.9	71.8
Whatcom	314	173.7	168.3	223	123.3	120.4	86	47.6	46.0
Whitman	55	129.7	156.4	40	94.3	115.5	13	30.7	36.2
Yakima	557	242.9	242.1	446	194.5	195.0	109	47.5	47.4

[1] Rate per 100,000 population.

[2] Rate per 100,000 age-adjusted to U.S. 2000 population. Does not include deaths where age is unknown.

* Rate not calculated because number of deaths was less than 5.

Note: Codes for International Classification of Diseases, Tenth Revision (ICD-10) are in parentheses after each group heading.

Rates based on fewer than 20 deaths are likely to be unstable and imprecise.

Source: Center for Health Statistics, Washington State Department of Health, 03/2007.

Appendix F

Brain Attack Coalition Guidelines

Recommendations for the
Establishment of Primary Stroke Centers

June 20, 2000 – The Brain Attack Coalition recommends that each Primary Stroke Center should address the following 11 major aspects of acute stroke care:

- **Acute Stroke Teams:** The Acute Stroke Team should include a physician with experience in diagnosing and treating cerebrovascular disease, and one other health care provider as a minimum. Hospital-based stroke teams should be available around-the-clock, seven days a week in order to evaluate within 15 minutes any patient who may have suffered a stroke.

- **Written Care Protocols:** Hospitals should have written procedures to streamline and accelerate the diagnosis and treatment of stroke patients. The availability of such protocols is a key step in reducing time to treatment as well as complications from treatment.

- **Emergency Medical Services:** Emergency medical services (EMS) have a vital role in the rapid transportation and survival of stroke patients. Improved coordination between hospitals and EMS is a cornerstone of a Primary Stroke Center. One element of a well-integrated system would be effective communications between EMS personnel and the stroke center during rapid transport of a patient experiencing a stroke.

- **Emergency Department:** The emergency department staff should have training in diagnosing and treating stroke and have good lines of communications with both EMS and the acute stroke team.

- **Stroke Unit:** A Primary Stroke Center wishing to provide care beyond the initial life-threatening period should have access to a Stroke Unit where patients can receive specialized monitoring and care. Some hospitals may choose to stabilize patients and transfer them to another facility.

- **Neurosurgical Services:** Primary Stroke Centers should be able to provide neurosurgical services to stroke patients within two hours of when the services are deemed necessary.

- **Support of Medical Organization:** The facility and its staff, including administration, should be committed to the Primary Stroke Center. This comprehensive commitment ensures the delivery of high quality and efficient care to acute stroke patients.

- **Neuroimaging:** The ability to perform brain imaging studies on acute stroke patients is vital for physicians to make a fast, accurate diagnosis of stroke patients. Brain imaging studies include CT scans. A Primary Stroke Center must be capable of performing an imaging study within 25 minutes of the physician's order. The image should be evaluated by a physician within 20 minutes of completion.

- **Laboratory Services:** Standard laboratory services should be available around-the-clock, seven days per week at a Primary Stroke Center. Standard laboratory services include rapidly performing and reporting blood counts, blood chemistries and coagulation studies. A Primary Stroke Center also should be able to rapidly obtain ECG and chest x-rays.

- **Outcomes/Quality Improvement:** Primary Stroke Centers should have a database or registry for tracking the number and type of stroke patients seen, their treatments, timeline for treatments and some measurement of patient outcome.

- **Education Programs:** The professional staff of a Primary Stroke Center should receive at least eight hours per year of continuing medical education credit. In addition to professional education, the Primary Stroke Center should plan and implement at least two annual programs to educate the public about stroke prevention, diagnosis and availability for emergency treatment.

The National Institute of Neurological Disorders and Stroke is a component of the National Institutes of Health, U.S. Department of Health and Human Services.

Cardiac And Stroke Systems In Other States

State	Legal Authority	System Model	Administration Requirements	Stroke Center Requirements	
Florida	Legislation enacted in 2004 to promote the development of an emergency treatment system which provides that stroke victims are quickly identified and transported to and treated in facilities that have specialized programs for providing timely and effective treatment for stroke victims. Regulations adopted to carry out legislation.	**Stroke:** Identify and transport suspected stroke patients to designated stroke centers.	Agency for Health Care Administration, Department of Health: Maintain and distribute to all licensed EMS providers a list of primary and comprehensive stroke centers per hospitals self-designating through affidavits; develop a sample stroke triage assessment tool and require EMS to use it or one similar; require EMS to develop and use specified protocols for suspected stroke. Public Health Partnership Council on Stroke: Statewide public education program on stroke prevention; adoption and dissemination of practice guidelines related to screening, risk factors, early signs and treatment strategies for primary care physicians; adoption and dissemination to physicians, EMS providers, and others practice guidelines for the initial treatment of stroke, and long-term treatment and rehabilitation of stroke.	Hospitals self-designate by affidavit to Agency for Health care Administration as Primary Stroke Center (PSC) or Comprehensive Stroke Center (CSC); PSC must be certified by Joint Commission or equivalent; CSC must be certified by Joint Commission and meet additional requirements specified in rule.	
	Dispatch/EMS Requirements	**Outcomes**	**Funding**	**Payment Mechanisms**	**Data Collection**
	Use a stroke-triage assessment tool substantially similar to the sample	Significantly more ischemic stroke patients were treated with			Yes

	developed by the Department of Health. Develop and implement assessment, treatment, and transport-destination protocols for stroke patients with the intent to assess, treat, and transport them to the most appropriate hospital.	intravenous tPA per month after FSA enactment, rising from 3.8 patients per month to 5.2 patients per month. The proportion of patients receiving treatment also rose, from 8.4 percent to 10.5 percent.			

Cardiac And Stroke Systems In Other States

State	Legal Authority	System Model	Administration Requirements	Stroke Center Requirements	
Massachusetts	No legislation; Department of Health promulgated regulations to establish standards for the designation of Primary Stroke Service in hospitals with Emergency Services.	**Stroke:** Requires EMS to transport patients to hospitals designated as Primary Stroke Service; "hub and spoke model"-- hospital with minimal stroke care resources has arrangement with larger hospital which provides neurology consultation via telemedicine on diagnosis and treatment.	Designate hospitals, including application review, one day on-site survey; list of designated hospitals to EMS; manage stroke registry.	Set in regulation, based on Brain Attack Coalition guidelines.	
	Dispatch/EMS Requirements	**Outcomes**	**Funding**	**Payment Mechanisms**	**Data Collection**
	Develop regional point-of-entry plans; use stroke checklist; follow state stroke protocol; transport to PSS if will arrive within two hours of symptom onset.	The use of tPA increased from 40 percent pre-regulation to 63.7 percent post-regulation in eligible patients arriving at hospitals within two hours of symptom onset and jumped from 31.2 percent to 53.3 percent in eligible patients arriving within three hours.			Yes (Coverdell Stroke Registry funding)

State	Legal Authority	System Model	Administration Requirements	Stroke Center Requirements	
New Jersey	2004 Legislation passed providing for the designation of primary and comprehensive stroke centers at acute care hospitals; appropriated $3 million to the Department of Health to be distributed in matching grants to hospitals who need financial assistance to become stroke centers; matching grants distributed equitably by region. Regulations adopted to carry out legislation.	**Stroke:** Combination of "drip and ship" -- begin treatment at a local hospital and then transport to higher level hospital, and "hub and spoke" -- hospital with minimal stroke care resources has arrangement with larger hospital which provides neurology consultation on diagnosis and treatment.	Commissioner of Health designates hospitals based on hospital application and demonstration that it meets requirements (based on Brain Attack Coalition guidelines).	Based on Brain Attack Coalition guidelines. PSCs evaluate, stabilize and provide emergency care to patients with acute stroke and then, depending on the patient's needs and the center's capabilities, either admits the patient or transfers to a CSC. CSCs provide complete and specialized care and education and guidance to affiliated primary stroke centers.	
	Dispatch/EMS Requirements	**Outcomes**	**Funding**	**Payment Mechanisms**	**Data Collection**
			$3 million for matching grants to assist hospitals to meet primary stroke center criteria.		Yes

Cardiac And Stroke Systems In Other States

State	Legal Authority	System Model	Administration Requirements	Stroke Center Requirements	
New York	No legislation; the Department of Health invited hospitals to apply for designation as Stroke Centers	Stroke: Hub and spoke using telemedicine [Remote Evaluation of Acute Ischemic Stroke (REACH) program from Georgia]. • A stroke patient is transported to a spoke hospital by ambulance; • The emergency department of the spoke contacts the hub hospital, which then contacts its on call neurologist who uses a laptop computer with wireless service to go into the REACH system; • An audio and visual link is then established between the patient and his spoke doctor and the neurologist; • After completing a stroke assessment, the hub doctor will then make a treatment recommendation, with the treatment carried out by the spoke doctor.	Department of Health approves applications for Stroke Center designation, which requires a site visit. The Bureau of Emergency Medical Services notifies Regional EMS Council and county EMS coordinators of approved centers and posts them on their website.	Requirements include: Ability to meet the response times for acute stroke treatment established by the Brain Attack Coalition/National Institute of Neurological Disorders and Stroke (NINDS), e.g., door to CT scan 25 minutes, door to t-PA 60 minutes, etc. Acute stroke team available 24 hours/day, seven days per week. Neurologist on staff and immediately available (may be met by telemedicine consult with larger hospital). Informing local EMS agencies of their Stroke Center designation. Assisting with training EMS staff on stroke protocols. Other requirements, per application.	
	Dispatch/EMS Requirements	**Outcomes**	**Funding**	**Payment Mechanisms**	**Data Collection**
	NYS Suspected Stroke Protocol required; includes transporting suspected stroke patients to a designated stroke center under certain conditions, e.g., if patient	Eligible patients arriving at hospitals within two hours of symptom onset and jumped from 31.2 percent to 53.3 percent in eligible patients arriving within three hours.		State Medicaid program provides reimbursement for telemedicine consultation by "hub" specialists to "spoke" hospital treating	

	will arrive within two hours of the onset of symptoms, and notifying stroke center in advance of stroke patient en route.			patient. The specialist must be operating within their scope of practice, be enrolled in the Medicaid program, and meet credentialing requirements of the spoke hospital.	

Cardiac And Stroke Systems In Other States

State	Legal Authority	System Model	Administration Requirements	Stroke Center Requirements
Georgia	State resolution from the Legislature sent to the Governor and the American Stroke Association urging the State of Georgia to establish a stroke system, the main purpose of which would be to establish a systems approach to dealing with stroke patients, including assessing center designations, EMS protocols and field triage, interfacility stroke transfer, and stroke data collection.	**Stroke:** Developed Remote Evaluation of Acute Ischemic Stroke (REACH), a rural hospital telestroke network with a "hub and spoke" organizational model. All consultants have telestroke privileges at rural hospitals. The rural hospital activates the system if a patient with a suspected stroke arrives within four hours of the onset of symptoms. A toll-free call is made to the consulting hospital, which then contacts the stroke specialist on call. The stroke consultant then logs onto the REACH Website via any workstation with broadband Internet access and completes the consult with 2-way audio and 1-way video. A decision to treat or not to treat with t-PA is made and transmitted to the rural facility. In addition, recommendations for diagnostic evaluation and therapy are given as well as recommendations and arrangements for transfer to MCG.		

	Dispatch/EMS Requirements	Outcomes	Funding	Payment Mechanisms	Data Collection
		In a pilot, nearly 1/4 of the t-PA-treated patients were treated within 90 minutes of symptom onset and over half were treated within two hours, compared to an urban stroke system in which only 28 percent of the t-PA-treated patients were treated within two hours.			Yes

Cardiac And Stroke Systems In Other States

State	Legal Authority	System Model	Administration Requirements	Stroke Center Requirements	
North Carolina	RACE (Reperfusion in Acute myocardial infarction in Carolina emergency departments): The project is based on the collaborative efforts of EMS personnel, physicians, nurses, administrators, and payers from five regions and 68 hospitals throughout North Carolina. The recommendations of this project are based upon established guidelines, published data, and the knowledge and experience of numerous individuals specializing acute myocardial infarction care. RACE interventions include educational nursing programs, conducting physician teleconferencing seminars on reperfusion therapies, providing emergency room guideline tools and expanding the use of electrocardiogram (EKG) machines in ambulances, so vital data about patients' hearts can be transmitted ahead to emergency personnel. The program also analyzes health care delivery systems at participating hospitals. While many larger centers have layers of service and personnel that provide round-the-clock care, some smaller hospitals do not treat many heart patients and may not be optimally staffed for emergencies. The program has established a 24-hour hotline administered by senior cardiologists who can consult with emergency room physicians at smaller hospitals lacking an on-site cardiologist available 24/day. Blue Cross Blue Shield of NC supported the initial effort with a $1 million corporate grant.				
	Dispatch/EMS Requirements	**Outcomes**	**Funding**	**Payment Mechanisms**	**Data Collection**
			$1 million grant from Blue Cross Blue Shield		

State	Legal Authority	System Model	Administration Requirements	Stroke Center Requirements	
Minnesota	Minnesota Level 1 Heart Attack Program: The Level 1 Heart Attack Program evolved from the need to connect rural areas with this level of treatment. The program relies upon a high degree of collaboration between community hospitals and Abbott Northwestern Hospital and the Minneapolis Heart Institute®. The process begins when a patient with acute ST-segment elevation MI arrives at a community hospital. After evaluating and stabilizing the patient, the community emergency department declares a Level 1 heart attack. Coordination immediately begins on a number of different fronts. Trained personnel, who understand that a fast response is essential to aid recovery, coordinate emergency transportation and promptly arrange with air or ground crews for the quick transport of the patient. A Level 1 team at Abbott Northwestern Hospital begins work immediately. Before the patient even arrives, admission staff complete registration information based on data submitted by the community hospital to ensure a bed is available. Designated nurses work closely with key hospital departments to share patient information, such as intubation, cardiac arrest, interpreter requirements and changes in patient status. A full cath lab team, including a registered nurse, cardiovascular technician, radiology technician, clinical cardiologist and interventional cardiologist, are prepared to act when the patient arrives. Patients are moved from the helicopter or ambulance directly to the cardiac cath lab, where the Level 1 team is standing-by. The treatment goal is to direct angioplasty/stenting within 90 minutes from the time patients arrive at their local emergency department to balloon inflation at the Abbott Northwestern catheterization lab. It is a program that requires transportation working in harmony with proven medical procedures, but it all begins with quick decision making by emergency room physicians at non-metro hospitals.				
	Dispatch/EMS Requirements	**Outcomes**	**Funding**	**Payment Mechanisms**	**Data Collection**

Current Efforts to Improve Heart Attack and Stroke Care

Washington State

Heart Disease and Stroke Prevention Program

The purpose of the Washington State Heart Disease and Stroke Prevention Program is to reduce death and disability from heart disease and stroke. It is funded by the U.S. Centers for Disease Control and Prevention. The program works with multiple partners in this effort, taking the lead in planning, facilitating, and developing projects to achieve the goals and objectives of the Washington State Public Health Action Plan for Heart Disease and Stroke Prevention and Management. Strategies include:

- Preventing and controlling risk factors, particularly high blood pressure and high blood cholesterol.
- Improving screening, diagnosis, treatment, and rehabilitation.
- Increasing access to evidence-based treatment.
- Improving emergency response to acute cardiac and stroke events.
- Educating the public about risk factors, signs and symptoms, and the importance of calling 9-1-1.
- Educating health care providers on prevention and management.
- Supporting quality improvement initiatives.
- Monitoring health status and patient outcomes through data collection and analysis.

www.doh.wa.gov/cfh/heart_stroke/default.htm

Clinical Outcomes Assessment Program (COAP)

The Clinical Outcomes Assessment Program (COAP) is a Washington State initiative designed to produce clinical information needed to improve quality of care and meet the growing demand for accountability in the health care industry. COAP's physician-led Management Committee, in partnership with state officials and key stakeholders, has created this program as a model of collaboration in which Washington State's cardiac community can work together toward a common goal — improving patient care and health outcomes. COAP's timely reporting mechanism provides hospitals with clinical feedback on a quarterly basis. Through the protection of Washington State law and private contract, COAP is operated under the auspices of the Foundation for Health Care Quality a non-profit 501(c)3 corporation.

www.coap.org

Regional Stroke Network

In 2007, Alaska, Idaho, Montana, Oregon and Washington were funded to form a regional stroke network that will address issues related to stroke in the northwest region of the United States. Washington will be the lead state for the network. A regional stroke burden report and strategic

plan will be developed, and the capacity for distance learning targeted to health care professionals and the use of telestroke within and between states will be explored.

The Joint Commission

Primary Stroke Center Certification

The Joint Commission's Certificate of Distinction for Primary Stroke Centers recognizes centers that make exceptional efforts to foster better outcomes for stroke care and demonstrate compliance with national standards. Achievement of certification signifies that the services the hospitals provide have the critical elements to achieve long-term success in improving outcomes. It signifies that the care provided is effectively managed to meet the unique and specialized needs of stroke patients. The Joint Commission's Primary Stroke Center Certification Program was developed in collaboration with the American Stroke Association. It is based on the Brain Attack Coalition's "Recommendations for the Establishment of Primary Stroke Centers."

www.jointcommission.org/CertificationPrograms/PrimaryStrokeCenters/

American Heart Association/ American Stroke Association

Mission: Lifeline

The American Heart Association launched *Mission: Lifeline* in May 2007. This is a community-based initiative to improve the systems of care for ST-elevation myocardial infarction (STEMI) heart attack patients. The primary goal is to get patients to hospitals that can provide the care needed in time to save lives. To accomplish this, the initiative focuses on educating the public to recognize signs of a heart attack and the importance of calling 911; improving the diagnosis of this type of heart attack by emergency medical services personnel; and transporting or transferring patients to hospitals capable of providing primary percutaneous coronary intervention (PCI), the most effective treatment for this type of heart attack.

www.americanheart.org/presenter.jhtml?identifier=3048034

Go Red For Women

In February 2004, the American Heart Association (AHA) launched *Go Red For Women*. The *Go Red For Women* movement raises women's awareness of their risk for heart disease and helps them learn — and take action to reduce — their personal risk for heart disease. The *Go Red For Women* movement drives home to women the message that heart disease is their leading cause of death…a fact most women still do not take to heart.

www.americanheart.org/presenter.jhtml?identifier=3037771

Power To End Stroke

The *Power To End Stroke* is a campaign targeting African Americans. The objective of the campaign is to create a "movement" around the serious health disparity issue of stroke in African Americans – and to drive the message that stroke is preventable. The campaign works to increase awareness of high blood pressure and diabetes in African Americans and to promote adherence to primary and secondary prevention guidelines.

http://strokeassociation.org/presenter.jhtml?identifier=3030549

Get With The Guidelines[SM] (GWTG)

Get With The Guidelines is the premier hospital-based quality improvement program for the American Heart Association and the American Stroke Association. It empowers health care provider teams to consistently treat heart and stroke patients according to the most up-to-date guidelines. The quality improvement team's primary goal is to ensure 100 percent of patients are treated and discharged according to evidence-based medicine, thereby reducing the likelihood of subsequent, more catastrophic events.

www.americanheart.org/presenter.jhtml?identifier=1165

U.S. Centers for Disease Control and Prevention

A Public Health Action Plan to Prevent Heart Disease and Stroke
The purpose of the Action Plan, released in April 2003, is to chart a course for the Centers for Disease Control and Prevention (CDC) and collaborating public health agencies, with all interested partners and the public at large, to help promote and achieve national goals for preventing heart disease and stroke over the next two decades—through 2020 and beyond. The National Forum for Heart Disease and Stroke Prevention is working to implement the action plan through the efforts of seven implementation groups.

State Heart Disease and Stroke Prevention Program
In 1998, the U.S. Congress provided funding for CDC to initiate a national, state–based heart disease and stroke prevention program with funding for eight states. Currently, 32 states and the District of Columbia are funded, 19 as capacity building programs and 14 as basic implementation programs (Washington State's program is at the basic implementation level).

Paul Coverdell National Acute Stroke Registry
CDC's state–based program to measure, track, and improve the delivery and quality of stroke care is currently operating in four states (Washington is not one of them).

WISEWOMAN
WISEWOMAN's mission is to provide low–income, under– or uninsured 40– to 64–year–old women with the knowledge, skills, and opportunities to improve diet, physical activity, and other lifestyle behaviors to prevent, delay and control cardiovascular and other chronic diseases (Washington is not currently participating in this program).

National Heart Lung and Blood Institute

Heart Truth

To make women more aware of the danger of heart disease, the National Heart, Lung, and Blood Institute (NHLBI) and partner organizations are sponsoring a national campaign called *The Heart Truth*. The campaign's goal is to give women a personal and urgent wakeup call about their risk of heart disease.

The centerpiece of *The Heart Truth* is the Red Dress, which was introduced as the national symbol for women and heart disease awareness in 2002 by NHLBI. The Red Dress reminds women of the need to protect their heart health, and inspires them to take action.

The campaign is especially aimed at women ages 40 to 60, the time when a woman's risk of heart disease starts to rise. But its messages are also important for younger women, since heart disease develops gradually and can start at a young age—even in the teenage years. Older women have an interest too—it's never too late to take action to prevent and control the risk factors for heart disease. Even those who have heart disease can improve their heart health and quality of life.

http://www.nhlbi.nih.gov/health/hearttruth/index.htm

American College of Cardiology

D2B: An Alliance for Quality

D2B (Door to Balloon): An Alliance for Quality is a new Guidelines Applied in Practice (GAP) program launched by the American College of Cardiology (ACC) to save time and save lives by reducing the door-to-balloon times in U.S. hospitals performing primary percutaneous coronary intervention (PCI). A growing list of other organizations, including the American Heart Association (AHA) and the National Heart Lung and Blood Institute, are partners in this effort.

National guidelines developed by the American College of Cardiology (ACC) and the American Heart Association (AHA) state that hospitals treating ST-elevated myocardial infarction (STEMI) patients with emergency PCI should reliably achieve a door-to-balloon time of 90 minutes or less. However, accomplishing this level of performance is an organizational challenge.

The D2B Alliance was developed to make what is current extraordinary performance ordinary by providing hospitals with key evidence-based strategies and supporting tools needed to begin reducing their D2B times. More importantly, it provides an open, vibrant community for hospitals to share their findings and experiences and reward excellence.

www.d2balliance.org

National Cardiovascular Data Registry (NCDR)

NCDR™ is a confidential quality measurement program for cardiac and vascular facilities consisting of four registries: ACTION Registry for acute coronary syndrome patients; Cath PCI Registry for diagnostic cardiac catheterizations and percutaneous coronary interventions; ICD Registry for implantable cardioverter defibrillators; and CARE Registry for carotid artery revascularization and endarterectomy procedures. NCDR™ is an initiative of the American College of Cardiology Foundation, with partnering support from the following organizations: the Society for Cardiovascular Angiography and Interventions; Heart Rhythm Society; the Society for Cardiovascular Angiography and Interventions, the Society of Interventional Radiology, the American Academy of Neurology, the American Association of Neurological Surgeons / Congress of Neurological Surgeons, and the Society for Vascular Medicine and Biology.

www.accncdr.com/WebNCDR/Common/

Take ACTION Campaign

The NCDR™ launched the Take ACTION campaign in June 2007. This is a nationwide quality improvement project that will target hospitals, physicians and patients, with a clinical focus on acute coronary syndrome (ACS) patients. The initial focus of the campaign will be the transition home and 30-day post-discharge period.

Take ACTION is a cohesive strategy that will provide educational and quality improvement tools and resources to increase awareness, improve adherence and enhance compliance with relevant clinical practice guideline recommended therapies. The primary goal of this national campaign focuses on reducing secondary events among patients with acute coronary syndrome by measuring behavioral changes in both physicians and patients.

The Take ACTION campaign will:

- Ensure that cardiologists and primary care physicians are equipped with resources to optimize ACC/AHA clinical guideline compliance in the outpatient setting
- Ensure that patients understand the diagnosis and treatment of acute coronary syndrome
- Monitor the transition of patients from the inpatient facility to the outpatient setting
- Monitor patient compliance with recommended treatments in the routine clinical care setting.

www.accncdr.com/WebNCDR/TakeACTION/default.aspx

Federal Legislation

The American Stroke Association, a division of the American Heart Association, is leading the effort to advance comprehensive stroke legislation, the Stroke Treatment and Ongoing Prevention Act (STOP Stroke Act). The STOP Stroke Act would help ensure that stroke is more

widely recognized by the public and treated more effectively by health care providers by authorizing:

- A grant program to help states ensure that patients have access to quality stroke prevention, treatment and rehabilitation services.
- A national public awareness campaign to educate the public about stroke warning signs and how stroke can be prevented.
- The Coverdell Stroke Registry and Clearinghouse to collect data and share best practices.
- A grant program to educate medical professionals in newly developed diagnostic approaches, technologies and therapies.

For several years, the STOP Stroke Act has had broad bipartisan support in the House of Representatives and Senate. The full House passed the STOP Stroke Act by voice vote on March 27, 2007.In the Senate, the STOP Stroke Act bill was referred to the Senate Health, Education, Labor, and Pensions Committee.

www.americanheart.org/presenter.jhtml?identifier=3010937

Sudden Cardiac Arrest Foundation

The mission of the Sudden Cardiac Arrest (SCA) Foundation is to prevent death and disability from SCA. The SCA Foundation's vision is to increase awareness about SCA and influence attitudinal and behavioral changes that will reduce mortality and morbidity from SCA. Specifically, they envision their efforts will help:

- Increase the rate of bystander cardiopulmonary resuscitation (CPR) from 20 percent to 30 percent within five years.
- Double the use of automated external defibrillators (AEDs) outside the hospital within five years (increase from <5 percent to 10 percent).
- Double the rate of survival to hospital discharge within ten years (increase from 7 percent to 14 percent).

http://www.sca-aware.org/index.php

U.S. Department of Health and Human Services

National Institutes of Health

The National Institute of Neurological Disorders and Stroke (NINDS), a component of the National Institutes of Health (NIH), announced the launch of a new community education program, which broadens the Institute's national stroke education campaign "Know Stroke. Know the Signs. Act in Time" to promote stroke awareness among Hispanics in the United States.

www.ninds.nih.gov/stroke

Washington State Department of Health

DOH Pub 345-241

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