

1 **PREFACE**

2 The Stroke Work Group was co-convened by the American Heart Association/American
3 Stroke Association and the California Heart Disease and Stroke Prevention Program,
4 California Department of Public Health, under a provision of *California’s Master Plan for*
5 *Heart Disease and Stroke Prevention and Treatment*, adopted in 2007.

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7
8 **MISSION**

9 The mission of the Stroke Work Group is to reduce stroke morbidity and mortality in
10 California by:

- 11
12 • Establishing strategies for the development of a statewide system of care for acute
13 stroke, including: (1) standards for pre-hospital patient assessment and preferential
14 transport of eligible stroke patients; (2) criteria for certification of receiving hospitals;
15 (3) standards for appropriate acute stroke treatment; and (4) continuity of care through
16 linkages between medical facilities.

- 17
18 • Providing oversight and guidance as the stroke system of care is implemented in
19 California.

- 20
21 • Promoting recovery from stroke, including access to stroke rehabilitation services.

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24 **BACKGROUND**

25 Stroke is the third leading cause of death in California and a leading cause of long-term
26 disability. Stroke, sometimes called a “brain attack,” is injury to the brain, spinal cord, or
27 retina caused by blockage or rupture of a blood vessel and/or a reduction in oxygenated
28 blood flow. There are two major types of stroke, ischemic stroke and hemorrhagic stroke.

1 In ischemic stroke an occlusion in a blood vessel blocks blood flow to the brain, oxygen
2 does not reach the brain, and tissue dies rapidly. In hemorrhagic stroke, a blood vessel
3 ruptures, causing bleeding into or around the brain. Both types of stroke often result in
4 disability or death.

5
6 In California, stroke accounts for approximately 17,000 deaths each year, 50 deaths per
7 100,000 population.¹ In 2004, almost 9 percent of adults over age 65 reported that they
8 had been given a stroke diagnosis by a doctor.¹ In California, the annual cost of stroke
9 exceeds \$7 billion (\$4.6 billion in medical care and \$2.6 billion in lost productivity).²

10
11 Advances in stroke care, including the introduction of time-dependent therapies, have
12 emphasized the critical need for optimal stroke treatment pathways.

13 14 15 **POSITION STATEMENTS**

16 Systemic changes in health care have been promoted by a number of advocates for
17 improved clinical outcomes for stroke. Position statements published by these groups
18 have shaped acute stroke care across the nation.

19 20 ***Brain Attack Coalition***

21 In 2000, the Brain Attack Coalition (BAC), a multidisciplinary group of health
22 professionals, conducted a comprehensive review of the medical literature and
23 concluded that the establishment of stroke centers would improve the care of
24 stroke patients.³ Component organizations in the BAC include the American
25 College of Emergency Physicians (ACEP), the American Academy of Neurology,
26 the American Association of Neuroscience Nursing, the National Institutes of
27 Health, American Heart Association/American Stroke Association (AHA/ASA), and
28 the National Stroke Association. Specifically, the BAC recommended that all

1 Primary Stroke Centers include the following key elements: (1) acute stroke
2 teams; (2) written care protocols; (3) Emergency Medical Services (EMS);
3 (4) emergency department (ED); (5) stroke unit; (6) neurosurgical services;
4 (7) commitment and support of medical organization, including a stroke center
5 director; (8) neuroimaging services; (9) laboratory services; (10) outcome and
6 quality improvement activities; and (11) continuing medical education.

7
8 In 2005, the BAC recommended the establishment of Comprehensive Stroke
9 Centers for the delivery of specialized care for patients with complicated
10 cerebrovascular disease.⁴ Specialized care in these centers would include:
11 (1) health care personnel with specific expertise in multiple disciplines, including
12 neurosurgery and vascular neurology; (2) advanced neuroimaging capabilities;
13 (3) surgical and endovascular therapeutic capabilities; and (4) a comprehensive
14 stroke infrastructure (e.g., stroke registry, intensive care unit).

15
16 ***National Institute of Neurological Disorders and Stroke***

17 In 2002, the National Institute of Neurological Disorders and Stroke (NINDS)
18 recommended: (1) development of stroke center networks, (2) improved
19 databases for stroke, and (3) expanded education and training in stroke for both
20 neurologists and non-neurologists.⁵

21
22 ***American College of Emergency Physicians***

23 In 2002, the American College of Emergency Physicians recommended that EDs
24 and hospitals work with EMS and the community, so that all parties are aware of a
25 hospital's capabilities regarding acute stroke care. ACEP also asserted that the
26 decision by an ED physician to use intravenous thrombolytic therapy for acute
27 stroke should be supported by hospital systems that assure its safe use.⁶
28

1 **American Heart Association/American Stroke Association**

2 In 2005, the American Heart Association/American Stroke Association (AHA/ASA)
3 issued a position statement urging the development of stroke care systems that
4 coordinate and promote patient access to the services associated with prevention,
5 treatment, and rehabilitation of stroke.⁷ This policy paper describes component-
6 specific recommendations for the implementation and establishment of stroke
7 systems of care, including: (1) primordial and primary prevention strategies;
8 (2) community education; (3) notification and response of EMS; (4) acute
9 treatment; (5) subacute care and secondary prevention; (6) rehabilitation; and
10 (7) continuous quality improvement.

11
12 In 2007, the AHA/ASA released a policy statement titled *Implementation Strategies*
13 *for Emergency Medical Services within Stroke Systems of Care.*⁸ This document
14 provides recommendations to improve and advance pre-hospital care for stroke,
15 including use of protocols, tools, and training necessary to deliver the highest
16 quality of stroke care.

17
18 **National Association of Emergency Medical Service Physicians**

19 In 2007, the National Association of Emergency Medical Service Physicians
20 released a position statement that addresses the role of EMS in the management
21 of acute stroke, including triage, treatment, and stroke systems.⁹ This position
22 paper includes the following recommendations: (1) expeditious EMS dispatch and
23 response; (2) pre-hospital stroke screening and patient assessment;
24 (3) communication with receiving facilities; (4) local/regional strategies for stroke
25 patient destination; and (5) alternative forms of medical transport (e.g., air).

1 **CERTIFICATION**

2 In 2003, the Joint Commission (formerly the Joint Commission for the Accreditation
3 of Healthcare Organizations, JCAHO) developed a certification process that would
4 allow hospitals to achieve Primary Stroke Center status. The Joint Commission set
5 forth criteria that matched the recommendations of the BAC.

6
7 The Joint Commission has not developed a certification process for
8 Comprehensive Stroke Centers, although there is movement in that direction.

9
10
11 **ACTION** *National*

12 The availability of Primary Stroke Center certification initiated the development of
13 acute stroke systems of care across the nation. Many hospitals sought Primary
14 Stroke Center certification not only to provide enhanced service to patients, but
15 also to remain competitive in their markets. With the advent of certified Primary
16 Stroke Centers, EMS responders could readily identify sites for “the most
17 appropriate patient care,” as required by their protocols. Hospitals realized that
18 without Primary Stroke Center certification, EMS responders transporting stroke
19 patients were likely to bypass them. What emerged was a stroke care model that
20 paralleled the trauma system.

21
22 Recognizing an opportunity for the development of statewide systems of acute
23 stroke care, state governments across the nation took action. In many states
24 stroke systems have been created either through legislation or an edict from a
25 State Health Commissioner. Some states (e.g., Texas) have opted to use the Joint
26 Commission and its certification process to identify Primary Stroke Centers. Other
27 states (New York and Massachusetts) have made the decision to use an internal
28 certification process, with criteria for certification that are at least as stringent as

1 the Joint Commission's. Florida's approach to stroke systems of care is unique; it
2 allows hospitals to "attest" to compliance with criteria that match the Joint
3 Commission's. Currently, there is no oversight body to assure that compliance is
4 met.

5
6 **California**

7 California hospitals, most notably in Santa Clara County, were among the first to
8 seek The Joint Commission's Primary Stroke Center certification. Recognizing its
9 role in building a stroke system, the Local EMS Agency (LEMSA) developed
10 protocols for triaging and transporting stroke patients preferentially to these
11 certified Primary Stroke Centers.

12
13 This process was repeated in several other areas of California, so that by mid-2008
14 counties with established or developing stroke systems included: Alameda,
15 Orange, Santa Clara, San Francisco, San Mateo, San Diego, and portions of
16 Northern California, including Modoc, Lassen, Sierra, Alpine, Mono, Inyo, and
17 eastern Nevada, Placer, and El Dorado Counties (served by the Northern Nevada
18 Stroke Network). In most cases, the development of the stroke system was driven
19 by the policies of the LEMSAs.

20
21 There are 31 LEMSAs covering California. Some have single-county jurisdictions,
22 and others have jurisdiction over multiple counties. LEMSAs are subject to the
23 guidance of the California Emergency Medical Services Authority (EMSA), but they
24 also have the benefit of a significant amount of autonomy. While the progress
25 made by the LEMSAs toward improved stroke care in California has been
26 encouraging, public health officials and clinicians realized that unless the
27 development of stroke care systems was coordinated at the outset, there would be
28 service gaps that would become progressively more difficult to overcome. A

1 fragmented system of care is a significant obstacle to reducing morbidity and
2 mortality from stroke. Furthermore, there would be a need for strategic planning
3 for Comprehensive Stroke Centers, in addition to immediate implementation of
4 Primary Stroke Centers.

5
6 This position was held by the California Heart Disease and Stroke Prevention and
7 Treatment Task Force (Task Force), an advisory group that was convened in 2006
8 under a law (AB 1220) passed in 2003. The Task Force was charged with writing
9 *California's Master Plan for Heart Disease and Stroke Prevention and Treatment*
10 (Master Plan). The Master Plan was adopted in 2007.

11
12 The stroke system of care proposed by the Master Plan is consistent with the
13 position statements of the BAC and other expert groups, as well as with the vision
14 being realized by other states across the nation. The Master Plan's proposed
15 system requires identification of eligible stroke patients in the field and direct
16 transport to certified stroke centers. To provide maximum access to California
17 residents, the stroke centers would form partnerships with hospitals that could not
18 achieve stroke center status. These partnerships would be formalized by written
19 agreements and protocols.

20
21 The Task Force members recognized the many technical and policy issues
22 inherent in the development of an acute stroke care system and recommended the
23 establishment of a Stroke Systems Work Group (Work Group). In 2007, the
24 AHA/ASA and the California Department of Public Health (CDPH) convened a
25 Work Group, composed of statewide stakeholders. The Work Group was charged
26 with establishing implementation strategies and providing continuing guidance as
27 the system is developed in California. This document reports the findings and
28 recommendations of the Stroke Work Group.

1

2 **TELEMEDICINE**

3 In recent years, telemedicine, the transfer of medical information using real-time, two-way
4 audio and video technology, has successfully brought neurological expertise to remote
5 areas. Research supports the superiority of telemedicine over simple telephone
6 consultations, demonstrating that stroke telemedicine consultations result in more
7 accurate decision-making.¹⁰ Telemedicine has enabled the development of “spoke and
8 hub” stroke care systems that link hospitals that lack 24/7 stroke expertise to hospitals
9 with this resource. This has increased the likelihood that all Californians, regardless of
10 place of residency, will receive the same high standard of acute stroke care.

11

12

13 **CHALLENGES**

14 California’s size and diversity (population distribution and resources) have an important
15 impact on stroke care policy. There are significant differences in dispatch capabilities,
16 EMS response, and hospital services across the State.

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18 **STROKE SYSTEM DEVELOPMENT**

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- Rural areas often have 911 dispatchers who are not specifically trained in emergency medical dispatching. They are often volunteers, and there can be considerable turnover. This makes sustaining a trained workforce difficult.
 - EMS responders in rural areas face distance and sometimes weather challenges. These conditions contribute to delay in patient transport.
 - Some hospitals in rural areas lack the necessary personnel, equipment, and protocols required to treat stroke patients rapidly and well. At a minimum, a facility must have an emergency department, scanning capabilities to distinguish

1 between ischemic and hemorrhagic stroke, and the capacity to administer
2 intravenous thrombolytic therapy to eligible patients. This may require
3 consultation with a neurologist, but neurological expertise is often lacking in rural
4 areas.

- 5
- 6 • Approximately, one-half of the people who have a stroke are driven to the
7 nearest hospital by family members or friends. This means that the patient
8 misses the opportunity to be triaged and transported to a stroke center by EMS
9 responders.
- 10
- 11 • The key responsibilities for EMS in the continuum of acute stroke care are: early
12 recognition of signs and symptoms of stroke, rapid determination of blood
13 glucose level, oxygenation, establishment of IV access, and rapid transport to the
14 most appropriate care facility. However, not all EMS responders can perform all
15 these responsibilities under their permitted scope of practice. For example,
16 Emergency Medical Technicians (EMTs) are not permitted to perform blood
17 glucose level determinations. This limitation hampers accurate triage of possible
18 stroke patients in the field and increases the chance that non-stroke patients will
19 be transported to stroke centers.
- 20
- 21 • In some areas of the State, 911 calls made from cell phones are routed to a
22 central location, usually the California Highway Patrol, instead of the closest
23 Public Safety Answering Point (PSAP). The result is a delay in response and
24 unnecessary expense. Efforts to direct all wireless 911 calls directly to the
25 nearest PSAP should be encouraged.
- 26
- 27 • When thrombolytic therapy is started at a spoke hospital and a patient is then
28 transferred to a hub hospital (“drip and ship” model of care), neither hospital is

1 eligible for the higher rate of reimbursement that Medicare provides for the
2 delivery of this beneficial therapy. The removal of economic disincentives to the
3 best practices that Medicare established for thrombolytic stroke care at a single
4 hospital should be generalized to provide both the spoke and hub facilities with
5 prorated payments that reflect the costs of care for severe stroke patients. The
6 AHA/ASA is working with the Centers for Medicare and Medicaid Services (CMS)
7 to collect data that would permit consideration of such a change in policy.
8

- 9 • The costs associated with implementing a stroke system of care, including data
10 monitoring, will be absorbed by the LEMSA. This may require that LEMSAs seek
11 funding from external sources.

12 13 USE OF TELEMEDICINE

- 14 • When telemedicine enables a “hub and spoke system,” neurologists in the hub
15 facility need to be credentialed by the spoke facilities so they may practice as
16 consultants. Multiple credentialing is a time-consuming and expensive activity.

17
18 Other states have established a uniform, single credentialing process for rural
19 hospital networks and telemedicine hospital networks. The Nevada rural
20 telemedicine system is an example. Neurologists in this network provide
21 telestroke support to more than 20 hospitals in Northern Nevada and more than
22 10 hospitals in California (eastern Sierras). The physicians complete a single
23 credentialing form, accepted at all participating Nevada hospitals, but must
24 complete separate, duplicative forms for each participating California hospital.
25

- 26 • The cost associated with buying and maintaining telemedicine equipment may be
27 challenging for small rural hospitals.
28

- Telemedicine requires robust cooperative agreements between the Satellite and the Hub Hospitals. The stroke system must monitor these agreements and verify that such arrangements are actually accomplishing their stated goals.
- Many Satellite Hospitals may not have the patient volume to gain adequate experience with acute stroke management and there may be inadequate support at these facilities to provide good stroke care, even with telemedicine.

WORK GROUP

The Stroke Work Group is composed of major stakeholders in stroke care, including: neurologists, emergency physicians, specialty nurses (neurology and emergency medicine), EMS providers, local EMS administrators and medical directors, hospital representatives, public health professionals, and voluntary health association representatives.

As part of their effort, the Work Group has developed *Recommended Guidelines for Establishing a Statewide System of Optimal Stroke Care* (Guidelines). The Guidelines follow in this document. The intent of these Guidelines is to develop a system of care that expands the safe use of effective therapies for stroke, and assures that every Californian, regardless of place of residence, will receive the highest level stroke care available.

The Guidelines are consistent with position statements offered by major stroke care advocates, including the Brain Attack Coalition, the National Institute of Neurological Disorders and Stroke, the American College of Emergency Physicians, the American Heart Association/American Stroke Association, and the National Association of EMS Physicians.

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RECOMMENDED GUIDELINES FOR ESTABLISHING A STATEWIDE SYSTEM OF OPTIMAL ACUTE STROKE CARE

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1 **I. COMPONENTS OF THE ACUTE SYSTEM OF CARE FOR STROKE**

2
3 **A. PRE-HOSPITAL**

4 **Goal:** *Development of a pre-hospital system that provides rapid identification and transport of*
5 *suspected acute stroke patients to the most appropriate care center.*

6
7 Since stroke treatment is time-sensitive, recommendations for pre-hospital care include:

8 (1) dispatch of Emergency Medical System (EMS) responders at the “highest priority level”
9 (i.e., EMS resources should be dispatched with the same urgency customary for trauma or
10 acute myocardial infarction); and (2) limited on–scene time and expeditious transportation to
11 the closest appropriate medical facility.

12
13 The EMS system is the central component in a system of care for acute disease. The EMS
14 system is responsible for the entry of an acute stroke patient into the health care system and
15 may facilitate the transport of stroke patients between facilities; thus, it is appropriate that the
16 Local Emergency Medical Agencies (LEMSAs) develop acute stroke systems of care. This
17 approach is consistent with the current systems of stroke care that have been developed in
18 California and allows LEMSAs, the entities in California that have the authority to develop
19 systems of care, the opportunity to implement region-appropriate plans.

20
21 All LEMSAs will be encouraged to develop a system of care for stroke so that optimal care will
22 be accessible to all California residents, regardless of place of residence. This will assure a
23 uniformly high standard of stroke care across the State. The proposed system will be
24 restrictive (promulgation of specific protocols at the State level) in those measures that every
25 paramedic/EMT can meet, and will be less restrictive in measures that are county-specific or
26 resource-specific. (“Less restrictive” is defined as the establishment of goals and standards at
27 the state level, while giving flexibility to LEMSAs to meet these goals and standards using
28 whatever strategies local resources and geography dictate.) The actions of LEMSAs in

1 developing stroke systems of care will be consistent with these Guidelines developed by the
2 Stroke Work Group, California's recognized expert panel on stroke care.

3
4 The California Department of Public Health (California Heart Disease and Stroke Prevention
5 Program) will annually issue a report describing the stroke systems of care in each California
6 county.

7 8 **1. EMERGENCY MEDICAL DISPATCH**

9
10 Stroke care begins with receipt of the 911 call. Call centers in most urban areas include
11 Emergency Medical Dispatchers (EMDs), who are specifically trained and certified to field
12 calls of a medical nature. EMDs typically operate in a "prioritized dispatch system," which
13 allows EMDs discretion in assigning a level of urgency and resources for each medical call. In
14 contrast, 911 calls made to rural call centers are often received by dispatchers whose role is
15 limited to deciding whether a call requires a law enforcement, fire, and medical response. If a
16 medical response is needed, it is sent at the highest priority level.

17
18 A LEMSA's stroke system will have standardized written protocols for EMDs that will require
19 EMDs to perform a stroke screen over the telephone, alert EMS about the need for rapid
20 triage and transport, and provide pre-arrival instructions for bystanders. EMDs will receive
21 education to support use of these protocols.

22
23 At all 911 call centers, dispatch for stroke will be at the highest priority level possible, so that
24 patients are ensured rapid access to treatment. Interfacility transfer for acute stroke should be
25 an equally high priority to avoid delays in treatment.

26
27 The stroke system will also include quality improvement measures to ensure that dispatchers
28 consistently and correctly follow written protocols.

1 **Procedures**

2 The dispatch response to stroke will include appropriate processes that ensure rapid access
3 to treatment.

4
5 **1. Training of dispatchers**

- 6 a. In counties that use prioritized dispatch, dispatchers will be instructed by LEMSA
7 protocols and policies to receive training (e.g., stroke portion of BLS training) on
8 the signs and symptoms of stroke, as well as the use of a caller interrogation
9 protocol. LEMSA directors will recommend that EMDs receive stroke training as
10 part of their continuing education requirements.

11
12 **2. Use of a formal caller interrogation protocol**

- 13 a. In counties that use prioritized dispatch, dispatchers will use a caller interrogation
14 protocol with formal tools and algorithms (see Appendix A) to effectively and
15 consistently identify suspected stroke patients in the field. These protocols will be
16 approved and authorized by the LEMSA EMS Medical Director.
- 17 b. LEMSAs will validate their caller interrogation protocol and tools as part of their
18 overall quality improvement program.

19
20 **3. Dispatch**

- 21 a. In counties that use prioritized dispatch, dispatchers will provide instructions for
22 bystanders as they wait for EMS.
- 23 b. EMS responders will be dispatched at the highest priority and highest available
24 care level for suspected acute stroke patients.
- 25 c. The time-from-call-to-dispatch of EMS response will meet or exceed the goal
26 established by the LEMSA.
- 27 d. LEMSAs are encouraged to provide language resources (e.g., interpreters) in
28 areas where a large part of the population have limited English-speaking skills.

2. EMS RESPONDERS

In California, EMS emergency vehicles are staffed by paramedics, emergency medical technicians, and nurses. The vehicles are fully equipped for basic life support, including ventilation and oxygenation capabilities for advanced airway maintenance.

The key responsibilities for EMS in the continuum of acute stroke care are:

- Early recognition of signs and symptoms of stroke.
- Rapid determination of blood glucose level.
- Establishment of IV access.
- Oxygenation.
- Rapid transport to the most appropriate care facility with early notification to the receiving facility.

For appropriate and time-sensitive triage, first responders must be trained to recognize the signs and symptoms of stroke. To assure competency in this area, all EMS responders will be required to participate in periodic pre-hospital stroke recognition and treatment education that coincides with certification and license renewal cycles. First responders will be required to use a validated pre-hospital stroke screening tool. The screening instruments should have both low false-positive rates (to avoid redirection of non-stroke patients) and low false-negative rates (to ensure routing of true stroke patients to capable centers).

Procedures

The EMS response to stroke will include appropriate processes that ensure rapid access to treatment. The pre-hospital system of care will include the following:

1. Training of all EMS responders in recognition of stroke.

- a. EMS responders will be required by LEMSA protocols and policies to receive continuing education on the use of a validated stroke screening tool (e.g., CPSS,

1 LAPSS; see Appendix B) to accurately and consistently identify, triage, and treat
2 stroke patients in the field. This training will coincide with certification and license
3 renewal cycles. The goal will be to train 100 percent of EMS responders in the
4 recognition of stroke signs and symptoms.

- 5 b. LEMSAs will require providers of ambulance services to train EMS responders in
6 stroke recognition and use of a validated screening tool as part of their contractual
7 agreement.

8
9 **2. Training of all EMS responders in emergency stroke treatment.**

10 LEMSAs will include training in the pre-hospital management of stroke as a requirement
11 for certification and re-licensure of EMS responders. This training will include:

- 12 a. Accurate documentation of the time of onset of symptoms (time “last seen without
13 stroke symptoms”) in suspected stroke cases.
- 14 b. Disease management (e.g., oxygen if hypoxemic, avoidance of fluids containing
15 dextrose unless hypoglycemic, rapid assessment and transport).

16
17 **3. TRANSPORT**

18 Stroke patients will be transported to designated facilities based on the level of care that is
19 appropriate for that patient. LEMSAs will establish policies and protocols for rapid transport of
20 stroke patients to the most appropriate care center. Protocols will take into account the
21 Guideline definition of a stroke patient (i.e., eligibility for treatment). Transport protocols will
22 emphasize direct transport of patients to minimize the need for interfacility transfer.

23
24 In all cases, EMS responders will notify the receiving Emergency Department (ED) in advance
25 of an inbound suspected stroke patient. This enables early preparation of brain imaging
26 scanners and hospital team personnel.

1 Hospital diversion practices may impede optimum stroke care. A system that provides
2 information for EMS on the availability of hospitals and hospital beds, in a rapid time frame, is
3 a feasible option to counter such impediments and has been tested in other states.
4

5 ***Procedures***

6 Patients will undergo transport to the nearest hospital that provides appropriate services for
7 stroke treatment. This determination needs to include assessments of regional issues and
8 transport times.
9

10 **1. LEMSA destination protocols**

11 Each LEMSA will develop prearranged destination protocols. Stroke patients will be
12 transported directly to the hospital that is most appropriate for their condition.

- 13 • All suspected stroke patients who may be eligible for conventional intravenous
14 thrombolytic therapy should be transferred directly to a facility offering such therapy
15 (Primary Stroke Centers), whenever possible.
- 16 • All suspected stroke patients whose time “last seen without stroke symptoms” exceeds
17 the therapeutic window for conventional intravenous thrombolytic therapy identified by
18 the LEMSA, may optimally be transported to a Primary Stroke Center for supportive
19 acute stroke care if so doing would not place an undue burden on LEMSA resources.
- 20 • In LEMSAs that have additionally adopted Comprehensive Stroke Center Systems, all
21 patients who are within a time frame for Guideline (intra-arterial thrombolysis) or FDA-
22 approved (mechanical embolectomy or mechanical aspiration) interventions should be
23 transferred directly to a facility offering such therapy, whenever possible.
- 24 • LEMSAs will establish policies regarding appropriate stroke patient diversion and will
25 establish a method that EMS can use to determine which, if any, hospitals are
26 diverting stroke patients.
27
28

1 a. Eligible for treatment with intravenous thrombolysis

- 2
- 3 • Age 18 years or older.
 - 4 • Symptoms consistent with stroke causing a measurable neurological deficit.
 - 5 • Stroke screening algorithm positive for likely stroke.
 - 6 • Time “last seen without stroke symptoms” well-established to be within the
7 therapeutic window for intravenous thrombolysis identified by the LEMSA. The
8 LEMSA will take the newest national guidelines under consideration when
9 setting the therapeutic window. Currently, various LEMSAs have established
10 that window to be less than 2 hours, less than 2.5 hours, or less than 3 hours
11 from the time “last seen without stroke symptoms.”

12 *This patient should be transported to a facility capable of reliably offering*
13 *approved intravenous thrombolytic therapy with high rates of adherence to*
14 *protocols and a well-organized acute supportive stroke care structure (i.e.,*
15 *Certified Primary Stroke Center).*

16

17 b. Possible eligibility for treatment with intravenous thrombolysis

- 18
- 19 • Age 18 years or older.
 - 20 • Symptoms consistent with stroke causing a measurable neurological deficit.
 - 21 • Stroke screening algorithm positive for likely stroke.
 - 22 • Time “last seen without stroke symptoms” not well-established to be within the
23 therapeutic window for intravenous thrombolysis identified by the LEMSA. The
24 LEMSA will take newest national guidelines under consideration when setting
25 the therapeutic window. Currently, various LEMSAs have established that
26 window to be less than 2 hours, less than 2.5 hours, or less than 3 hours from
27 the time “last seen without stroke symptoms.”
- 28

1 *This patient should be transported to a facility capable of reliably offering*
2 *approved intravenous thrombolytic therapy with high rates of adherence to*
3 *protocols and a well-organized acute supportive stroke care structure (i.e.,*
4 *Certified Primary Stroke Center).*

5
6 c. Not eligible for treatment with intravenous thrombolysis

- 7
- 8 • Symptoms consistent with stroke causing a measurable neurological deficit.
 - 9 • Stroke screening algorithm positive for likely stroke.
 - 10 • Time “last seen without stroke symptoms” well-established to be outside the
11 therapeutic window for intravenous thrombolysis established by the LEMSA.
12 The LEMSA will take newest national guidelines under consideration when
13 setting the therapeutic window. Currently, various LEMSAs have established
14 that window to be less than 2 hours, less than 2.5 hours, or less than 3 hours
15 from the time “last seen without stroke symptoms.”

16 *This patient may optimally be transported to a facility capable of reliably offering*
17 *a well-organized acute supportive stroke care structure (i.e., Certified Primary*
18 *Stroke Center). Stroke patients within the identified therapeutic window can be*
19 *expected to experience the maximum benefit from routing directly to Primary*
20 *Stroke Centers and should always be so routed, when possible. Stroke patients*
21 *beyond the identified therapeutic window can be expected to experience lesser*
22 *benefit. Consideration should be given to routing these patients directly to*
23 *Primary Stroke Centers, if so doing would not place an undue burden on LEMSA*
24 *resources.*

25

26 d. Not eligible for treatment with intravenous thrombolysis, but eligible for treatment
27 with endovascular mechanical embolectomy, endovascular aspiration, intra-arterial
28 thrombolysis, or other interventions acceptable under Guidelines or FDA-approval
 beyond the 3-hour therapeutic window.

- Age 18 years or older.
- Symptoms consistent with stroke causing measurable neurological deficit.
- Stroke screening algorithm positive for likely stroke.
- Time “last seen without stroke symptoms” well-established to be within the therapeutic window for treatment with endovascular mechanical embolectomy, endovascular aspiration, or intra-arterial thrombolysis identified by the LEMSA. The LEMSA will take the newest national guidelines under consideration when setting the therapeutic window. Currently, various LEMSAs have identified that window to be more than 2.5 hours but less than 7.5 hours from the time “last seen without stroke symptoms.”

In LEMSAs that have created a Comprehensive Stroke Center System, in addition to a Primary Stroke Center System, this patient should be transported to a facility capable of offering endovascular recanalization therapy with high rates of adherence to protocols and a well-organized acute supportive stroke care structure (i.e., Certified Comprehensive Stroke Center). This may be accomplished by direct routing from the field to a Comprehensive Stroke Center, or by initial routing to a Primary Stroke Center with secondary interfacility transfer to a Comprehensive Stroke Center, depending on which approach is most efficient in the particular LEMSA region.

Triage by EMS to on-site Primary Stroke Centers or Comprehensive Stroke Centers should fully take into account neurosurgical or interventional neuroradiology capabilities. Neurosurgeons and interventional neuroradiologists play important roles for treating intracerebral hemorrhage and subarachnoid hemorrhage. In addition, brain tumors and subdural hematomas are common stroke mimics. Patients who will likely benefit from neurosurgical consultation should be directly diverted to facilities with this service.

2. Mode of transportation

1 Stroke patients will undergo rapid transport to the closest facility that provides the appropriate
2 level of stroke care. In most circumstances, this will involve ground transport; however, if
3 indicated, air transport (helicopter or fixed-wing aircraft) may be considered to shorten time to
4 treatment.

7 **4. TARGET TIMES**

8 National guidelines for EMS dispatch, on-scene, and transport times⁸ have been set as listed
9 below. These guidelines were established for urban EMS systems and may not be realistic
10 for LEMSAs that serve rural and frontier areas. However, in all cases the EMS response to
11 acute stroke should be equivalent to the response for acute myocardial infarction.

13 **1. Protocols that seek to reduce EMS dispatch times**

- 14 a. The goal for time from 911 call to dispatch of EMS is less than 90 seconds.

16 **2. Protocols that seek to reduce the EMS response and on-scene times for stroke**

17 Response time goals for stroke include:

- 18 a. Except where adverse weather and remote location are extenuating circumstances,
19 EMS response time (time from 911 call to arrival on the scene) less than 9 minutes. In
20 all cases EMS must make its best effort to reach the patient rapidly. Once the
21 ambulance or helicopter or fixed-wing aircraft is dispatched, travel time to the patient
22 should be equivalent to trauma or myocardial infarction calls.
- 23 b. On-scene time less than 15 minutes (unless there are extenuating circumstances).
24 This on-scene time should also apply to emergent interfacility transport of stroke
25 patients. To reduce on-scene time, protocols will encourage paramedics to conduct
26 glucose tests and start IVs en route, rather than performing these procedures on-
27 scene.

1 **3. Protocols that seek to reduce transport times for stroke patients**

- 2 a. EMS travel time from the scene to the ED will be equivalent to travel time for trauma or
3 myocardial infarction calls.

4
5
6 **EVALUATION AND OUTCOMES**

7 Improvements in stroke outcomes require an ongoing commitment from every member of the
8 health care team. These efforts are intended to inform the process and to improve disease
9 outcomes. Evaluation of pre-hospital stroke care can occur at many levels and with varying
10 degrees of complexity; however, ensuring that appropriate measurement tools are
11 implemented will facilitate this process.

12
13 LEMSAs will establish the most ambitious benchmarks possible for each of these measures,
14 given local constraints.

15
16 ***Procedures***

17 **1. Engage in Continuous Quality Improvement.**

18 The success of the pre-hospital component of the stroke system of care will depend on
19 objective data to assess and improve the process. The overall goal of a stroke system of care
20 is to improve quality of care, thereby improving health outcomes.

- 21 a. **Structure:** Evaluation of the pre-hospital component of the stroke system will include
22 assessment of the following structural components. Goals drawn from national
23 guidelines⁸ for specific data points are shown. LEMSAs may determine that other goals
24 are more appropriate for local conditions as long as goals recognize the emergent nature
25 of stroke.

- 26
27
 - Dispatch protocols requiring the highest level of response for suspected stroke.
 - Adequate staff and equipment to transport patients.

- 1 • Ongoing written and in-person education of EMDs on stroke. (Goal: 100 percent of
- 2 EMDs receive education on the signs and symptoms of stroke.)
- 3 • Ongoing written and in-person education of EMS responders on stroke. (Goal:
- 4 100 percent of EMS responders complete a minimum of two hours of stroke
- 5 assessment and care as part of their required continuing medical education for
- 6 certification and re-licensure.)
- 7 • Validated pre-hospital stroke screening tools.
- 8 • Prearranged destination protocols.
- 9 • Local Stroke Oversight Committee.

10

11 b. **Process:** Data will be collected and reported on the following EMS process

12 characteristics. It will be the goal of LEMSAs to collect these data on 100 percent of

13 stroke patients. Goals drawn from national guidelines⁸ for some specific data points are

14 shown. LEMSAs may determine that other goals are more appropriate for local

15 conditions as long as goals recognize the emergent nature of stroke.

- 16
- 17 • Time “last seen without stroke symptoms.”
- 18 • Time from “last seen without stroke symptoms” to 911 call.
- 19 • Time from receipt of 911 call to dispatch of EMS. (Goal: Less than 90 seconds for
- 20 90 percent of the calls.)
- 21 • Time from receipt of 911 call by dispatch to ambulance arrival. (Goal: Less than
- 22 9 minutes at least 90 percent of the time for suspected acute stroke patients.)
- 23 • On-scene time or interfacility transport time. (Goal: Less than 15 minutes unless
- 24 there are extenuating circumstances.)
- 25 • Time from scene to ED door. (Goal: Equivalent to travel time for trauma and
- 26 myocardial infarction.)
- 27 • Total EMS contact time (i.e., time from receipt of the 911 call or presentation at a
- 28 non-stroke center hospital to arrival at the stroke center).

- 1 • Use of a documented validated screening tool to identify stroke patients. (Goal:
2 100 percent of EMS systems use a validated stroke screening tool.)
- 3 • Percent of false positives/false negatives dispatched.
- 4 • Percent of false positives/false negatives due to field stroke identification by EMS.
5 (Goal: Less than 30 percent false positives.)
- 6 • Documentation of pre-arrival notification at receiving facility. (Goal: Receiving EDs
7 notified of an incoming suspected stroke 100 percent of the time.)
- 8 • Percent of stroke patients routed to designated Primary Stroke Centers.
- 9 • Documentation of blood glucose by ALS providers.

11 c. Outcomes

- 12 • Dispatch determinate and EMS responder presumptive diagnosis or primary
13 impression should be compared with final patient diagnoses. (Initially EMS should
14 establish a goal of triage of at least 90 percent of target stroke patients to appropriate
15 receiving facilities, with a goal of less than 30 percent of routed patients having final
16 non-stroke diagnoses.)

18 2. Report Quality Improvement Progress

19 On a periodic basis, LEMSAs will analyze data collected on the pre-hospital system and report
20 annually on the results of their stroke system quality improvement process to their Oversight
21 Committee (see Section C below), providers, and the California Department of Public Health.

1 **B. HOSPITAL**

2 **Goal:** *Development of a regional hospital system that provides optimum stroke treatment for*
3 *every stroke patient.*

4
5 California’s health care system includes hospitals that vary considerably in their capacity to
6 care for stroke.

7
8 Hospitals with the capacity needed to be part of a stroke system of care include:

- 9
- 10 1. Comprehensive Stroke Centers (as defined by the multi-organizational BAC)—these
11 facilities are equipped with diagnostic and treatment facilities that are not found in other
12 hospitals. Referrals are made for those patients who require the expertise of specialists
13 and the procedures they perform.
 - 14
15 2. Primary Stroke Center (as defined by The Joint Commission)—these facilities have been
16 recognized as hospitals that meet the minimum desirable level of care for stroke patients
17 in the ED and in inpatient care.
 - 18
19 3. Satellite Stroke Centers (as defined by the multi-organizational BAC)—these facilities are
20 able to provide the minimum desirable level of care for stroke patients in the ED,
21 particularly when paired with another hospital, but are not documented to provide the
22 minimum desirable level of care for admitted inpatients. These facilities should be
23 regarded as stroke partners or “spokes” and should be aligned by formal agreement with a
24 hospital that can provide the missing service. The most common “missing service” is
25 neurological expertise in the ED and inpatient Stroke Unit care for patients treated with
26 recanalization therapies. In these hospitals, the necessary ED neurological expertise may
27 be provided through telemedicine.
- 28

1 In California, there may also be other types of hospitals. LEMSAs should encourage these
2 hospitals, where possible, to acquire the capacity that is needed to participate in the stroke
3 system. These hospitals include:

- 4
5 1. Potential Stroke Centers—these facilities have the physical resources to serve as primary
6 Stroke Centers (e.g., 24-hour ED, on-site computed tomography [CT] or magnetic
7 resonance [MR]), but have not yet made an institutional commitment to reliably provide
8 access to approved therapies. These hospitals often can attain Primary Stroke Center
9 status with local realignment of resources or by pairing with another hospital/telemedicine
10 source of specialist expertise. These hospitals should not communicate to the public that
11 they are a stroke center or use other terminology that implies they are capable of
12 delivering the standard of stroke care.
- 13
14 2. Hospitals that do not have an ED and/or CT or MR—these hospitals are not able to
15 diagnose or treat stroke according to the minimum level of desirable care. These hospitals
16 should be required to communicate to EMS responders that they are not capable of
17 providing the current standard of stroke care. These hospitals should not communicate to
18 the public that they are a stroke center or use other terminology that implies they are
19 capable of delivering the standard of stroke care.

20
21 Appropriate receiving centers for stroke patients include Comprehensive Stroke Centers,
22 Primary Stroke Centers, and Satellite Stroke Center hospitals. Ideally, every stroke patient
23 will be transported by EMS to the appropriate center within the stroke system. However, to
24 prepare for patients arriving by private vehicle and in hospital-occurring strokes, every hospital
25 in California should have a protocol for stroke patients.

26 27 ***Procedures***

28 The hospital system of care for stroke will include the following:

1 **1. Evaluation of hospital capacity within a LEMSA region**

2 LEMSAs will survey or otherwise ascertain the capabilities of hospitals in their regions to
3 identify: (1.) hospitals which have been certified as Primary Stroke Centers by the Joint
4 Commission or another body (e.g., LEMSA, CDPH) with equivalent of higher certification
5 standards; (2.) hospitals that are currently seeking or could reasonably seek Primary
6 Stroke Center certification from the Joint Commission or another body with equivalent of
7 higher certification standards; and (3.) hospitals that are Satellite Stroke Centers, possibly
8 through partnerships with Primary Stroke Centers. LEMSAs will use this baseline
9 information to organize the system of care within each region.
10

11 **2. Certification of hospitals as Primary Stroke Centers**

12 LEMSAs will establish criteria for certification of Primary Stroke Centers; however, these
13 criteria must be at least as rigorous as those used by the Joint Commission in stroke
14 center certification (see Appendix C). LEMSAs will identify an entity that will be
15 empowered to certify Primary Stroke Centers. This entity should be independent of the
16 participating hospitals. This entity will be one of the following: (1.) the Joint Commission;
17 (2.) the California Department of Public Health; (3.) the LEMSA itself; or (4.) an
18 independent third-party certifying body. No health care facility will advertise in any manner
19 or hold itself out to be a Primary Stroke Center unless it has been certified by the process
20 authorized by the LEMSA.
21

22 **3. Identification of Satellite Stroke Centers**

23 LEMSAs may optionally establish criteria for certification of Satellite Stroke Centers.
24 These centers would be modeled on the recommendations of the multi-organizational
25 BAC. LEMSAs that establish a Satellite Stroke Center system should identify an entity that
26 will be empowered to certify the Satellite Stroke Center. This entity should be independent
27 of the participating hospitals. This entity will be one of the following: (1.) the California
28 Department of Public Health; (2.) the LEMSA itself; or (3.) an independent third-party

1 certifying body. No health care facility will advertise in any manner or hold itself out to be
2 a Satellite Stroke Center unless it has been certified by the process authorized by the
3 LEMSA.

4. Identification of Comprehensive Stroke Centers

6 LEMSAs may optionally establish criteria for certification of Comprehensive Stroke
7 Centers. These would be modeled on the recommendations of the multi-organizational
8 BAC. LEMSAs that establish a Comprehensive Stroke Center system should identify an
9 entity that will be empowered to certify these centers. This entity should be independent
10 of the participating hospitals. This entity will be one of the following: (1.) the Joint
11 Commission (after it establishes a certification process for Comprehensive Stroke
12 Centers); (2.) the California Department of Public Health; (3.) the LEMSA itself; or (4.) an
13 independent third-party certifying body. In counties in which the LEMSA has established a
14 Comprehensive Stroke Center system, no health care facility will advertise in any manner
15 or hold itself out to be a Comprehensive Stroke Center unless it has been certified by the
16 process authorized by the LEMSA.

5. Hospital protocols for acute stroke treatment

19 Hospitals that choose not to participate in the stroke system of care should have plans
20 developed to ensure that stroke patients who arrive by private vehicles or patients who
21 have an in-hospital stroke receive optimal stroke care. This may include protocols for the
22 rapid transport of acute stroke patients to a facility that provides the appropriate level of
23 stroke treatment.

6. Development of ongoing collaboration between hospitals for the acute treatment of stroke

27 Physicians at hub and spoke stroke centers joined by telemedicine must follow the same
28 protocols for treating stroke patients. This is necessary for the clinicians at the hub center

1 to feel confident about accepting the risk of consulting with remote facilities and for the hub
2 hospital to be willing to admit a stroke patient who is treated at the spoke and then
3 transferred.
4

5 **EVALUATIONS AND OUTCOMES**

6 Improvements in stroke outcomes require an ongoing commitment from every member of the
7 health care team. These efforts are intended to inform the process and to improve disease
8 outcomes. Evaluation of stroke care within hospitals can occur at many levels and with
9 varying degrees of complexity; however, ensuring that appropriate measurement tools are
10 implemented will facilitate this process. The structure of the stroke system should facilitate
11 the exchange of relevant clinical data between appropriate providers (e.g., EMS, hospitals).
12

13 ***Procedures***

14 **1. Engage in Continuous Quality Improvement**

15 The success of the hospital component of the stroke system of care will depend on objective
16 data to assess and improve the process. The overall goal of a stroke system of care is to
17 improve quality of care, thereby improving health outcomes.
18

19 **a. Structure:** Evaluation of the hospital component of the stroke system will include
20 assessment of the following structural components.

- 21 • Adequate staff, equipment, and training to perform ED rapid evaluation, triage and
22 treatment.
- 23 • Standardized Stroke care pathway.
- 24 • 24/7 stroke diagnosis and treatment capacity in certified hospitals.
- 25 • Quality assurance system in certified hospitals.

26
27 **b. Process:** Data will be collected and reported on the following hospital process
28 characteristics. It will be the goal to collect these data on 100 percent of stroke patients.

1 Initially, LEMSAs will expect hospitals to collect and evaluate the most critical data elements
2 necessary to permit an assessment of quality of care. These minimum data elements are
3 indicated by a solid bullet (●) in the following list. In more mature stroke care systems,
4 additional data collection indicated below by an open bullet (○) will be encouraged. With the
5 advice of their Stroke Oversight Committees, the LEMSAs will update these data
6 requirements as needed to align with revisions in national guidelines.

7 **Benchmark:** For all of the measures listed below, the goal is for 100 percent of eligible
8 patients to receive the therapy or the intervention described.

- 9
- 10 ● Thrombolytic therapy—Percent of acute ischemic stroke patients who arrive within
11 120 minutes of time “last seen without stroke symptoms” and for whom thrombolytic
12 therapy was initiated with 180 minutes of time “last seen without stroke symptoms.”
- 13 ● Early antithrombotics—Percent of patients with ischemic stroke or transient ischemic
14 attack (TIA) who receive antithrombotic therapy by the end of hospital day two.
- 15 ● DVT prophylaxis—Percent of patients with an ischemic stroke, TIA, or hemorrhagic
16 stroke and who are nonambulatory who receive DVT prophylaxis by the end of hospital
17 day two.
- 18 ● Antithrombotics—Percent of patients with an ischemic stroke or TIA prescribed
19 antithrombotic therapy at discharge.
- 20 ● Anticoagulation for atrial fibrillation—Percent of patients with an ischemic stroke or TIA
21 and atrial fibrillation who are discharged on anticoagulation therapy.
- 22 ● Cholesterol reducing drugs—Percent of ischemic stroke or TIA patients with LDL
23 >100 mg/dL or with LDL not measured or on cholesterol reducer prior to admission
24 who are discharged on cholesterol reducing drugs.
- 25 ● Smoking cessation—Percent of patients with ischemic or hemorrhagic stroke or TIA
26 with a history of smoking cigarettes who are, or whose caregivers are, given smoking
27 cessation advice or counseling during hospital stay.
- 28

- 1 • Dysphagia screening—Percent of patients with ischemic or hemorrhagic stroke or TIA
2 who undergo screening for dysphagia with a simple valid bedside testing protocol
3 before being given any food, fluids, or medication by mouth.
- 4 • Stroke education—Percent of patients with ischemic or hemorrhagic stroke or TIA or
5 their caregivers who are given education or educational materials assessing **all** of the
6 following: personal risk factors for stroke, warning signs of stroke, activation of
7 emergency medical system, need for follow-up after discharge, and medications
8 prescribed.
- 9 • Rehabilitation considered—Percent of all patients with ischemic or hemorrhagic stroke
10 or TIA who were assessed for rehabilitation services.
- 11
- 12 ○ Door to imaging (CT or MR) time for stroke patients arriving within 3 hours of onset of
13 stroke symptoms—Time from ED arrival to initial imaging work-up for acute stroke or
14 TIA patients.
- 15 ○ Door to imaging (CT or MR) time for stroke patients arriving 3 to 6 hours after onset of
16 stroke symptoms—Time from arrival in ED to initial imaging work-up for subacute
17 stroke or TIA patients.
- 18 ○ Door to thrombolytic therapy—Time from ED arrival to administration of intravenous
19 thrombolytic therapy for ischemic stroke patients.
- 20 ○ Time “last seen without stroke symptoms” to administration of thrombolytic therapy—
21 Time from symptom onset to administration of intravenous thrombolytic therapy for
22 ischemic stroke patients.
- 23 ○ Intravenous thrombolytic therapy contraindicated—Percent of eligible acute ischemic
24 stroke patients not treated with intravenous thrombolytic therapy that had reasons for
25 not receiving intravenous thrombolytic therapy.
- 26 ○ Protocol deviations—Percent of acute ischemic stroke patients who received
27 intravenous thrombolytic therapy outside of the treatment window.
- 28

- 1 ○ Reasons for no intravenous thrombolytic therapy—Reason that eligible acute ischemic
- 2 stroke patients were not treated with intravenous thrombolytic therapy.
- 3 ○ Thrombolytic complications—Percent of ischemic stroke patients with complications
- 4 secondary to thrombolytic therapy.
- 5 ○ Complication types—Types of complications seen with thrombolytic therapies received
- 6 by ischemic stroke patients.
- 7 ○ Antihypertensive—Antihypertensive medications (class) prescribed at discharge for
- 8 ischemic stroke or TIA patients.
- 9 ○ Diabetic medications—Percent of patients who have diabetes mellitus or are taking
- 10 diabetic medication prior to admission who are discharged on diabetic medication.
- 11 ○ Weight recommendation—Percent of ischemic stroke or TIA patients with BMI greater
- 12 than or equal to 25 kg/m² who receive recommendations at discharge for reducing
- 13 weight and/or increasing activity.

15 **c. Interface with EMS**

16 In cooperation with EMS, hospitals will collect the following data. It will be the goal of
17 hospitals to collect these data points on 100 percent of stroke patients:

- 18 ● Pre-notification—Percent of cases of pre-arrival notification among all patients
- 19 transported by EMS from scene.
- 20 ● Time “last seen without stroke symptoms” to arrival time.
- 21 ● Accuracy of field triage—Percent of patients whose final stroke diagnosis matched
- 22 EMS identification as possible stroke.
- 23 ● Over-triage—Percent of patients identified by EMS as potential stroke patients who did
- 24 not receive a discharge diagnosis of stroke.
- 25 ● Under-triage—Percent of patients not identified by EMS as stroke patients who receive
- 26 a discharge diagnosis of stroke.

1 **d. Outcomes**

2 Hospitals will collect the following data. It will be the goal of hospitals to collect these data
3 points on 100 percent of stroke patients

- 4 • Modified Rankin Scale (MRS) or National Institute of Health Stroke Scale (NIHSS)—
5 used to assess changes in clinical status during the course of the hospitalization.
- 6 • In-hospital (risk- and stroke severity-adjusted) mortality.
- 7 • 30-day mortality.

8
9 **2. Report Quality Improvement Progress**

10 On a periodic basis, LEMSAs will analyze data collected on the hospital system and report
11 annually on the results of their stroke system quality improvement process to their Oversight
12 Committee (see Section C below), providers, and the California Department of Public Health.

13
14
15 **C. OVERSIGHT COMMITTEE**

16 LEMSAs will establish a Stroke System Committee (Advisory Group) to provide oversight and
17 guidance to EMS and hospitals as the stroke system is implemented. The Oversight
18 Committee will:

- 19 a. Include appropriate representation from key stakeholders.
- 20 b. Assure that as many hospitals as possible in a region are capable of providing the
21 optimum standard of care for stroke patients either independently or through a partnership.
22 In developing hospital partnerships, the Committee will consider the applicability of
23 telemedicine in providing neurological expertise where lacking on-site; they will regard the
24 California Department of Public Health’s Telestroke Work Group as a resource.
- 25 c. Facilitate written agreements among hospitals to formalize partnerships.
- 26 d. Review and analyze quality improvement reports on the pre-hospital and hospital
27 components of stroke system submitted by the LEMSA. Results will be used to revise and
28 improve the system.

1 **II. ADDITIONAL CONSIDERATIONS**

2
3 **A. Telemedicine**

4 Telemedicine is a highly feasible solution to resource gaps at rural hospitals and may also
5 have a role to play in urban areas where traffic delays may force EMS to deliver a stroke
6 patient to a hospital without available neurological or radiologic expertise.

7
8 Systems for remote interpretation of radiologic images are well-established throughout the
9 United States and California. For stroke patients, it is critical that interpretation of the initial
10 brain CT or MR be performed within 45 minutes of hospital arrival (for those patients who
11 arrive in less than 3 hours).

12
13 Systems for remote neurologic audio/video interview and visual examination of the patient and
14 family by a neurologist are now widely employed in several states, and have been deployed
15 successfully at several sites in California.

16
17 ***Procedures***

18 **1. Standard Protocols**

19 Hub and spoke systems that provide expertise via telemedicine must be designed to optimize
20 system compatibility in terms of patient evaluation and treatment protocols. Protocols must
21 be standardized across all participating facilities so that medical staff will be assured that
22 remote patients will receive evaluation and treatment as expected.

23
24 **2. Compatible Telemedicine Systems**

25 Partnering facilities must use compatible technology and assure appropriate training of staff
26 in its use.

1 **3. Private Telemedicine Companies**

2 Private telestroke/telemedicine companies that are not connected with a hospital or medical
3 facility may not have the capacity to provide good stroke care. Agreements between private
4 telemedicine companies and Satellite hospitals are discouraged because of concerns
5 regarding issues of liability, the quality of care provided, and the lack of continuity of care.
6

7 **4. Credentialing for Specialists**

8 The development of a uniform credentialing form and potentially a uniform credentialing
9 process for physicians providing telemedicine services for emergency conditions is desirable
10 for the State of California. Telemedicine physicians need to obtain local hospital credentials
11 permitting them to practice at each facility to which they provide consultative services.

12 Currently, each hospital employs its own credentialing forms and processes. The resulting
13 paperwork burden is a barrier to the availability of specialists to provide access to care in
14 California.
15

16 **5. Standing Telestroke Advisory Committee**

17 A standing Telestroke Advisory Committee will be established at the California Department of
18 Public Health to provide ongoing assistance to LEMSAs as they incorporate telemedicine into
19 their acute stroke systems of care. The Telestroke Advisory Committee will interact and
20 collaborate with other telemedicine committees established by the Governor and the
21 Legislature.
22

23 **B. Community Education**

24 The ability to recognize the signs and symptoms of stroke is vital to receiving timely treatment,
25 which increases the chance of achieving a functionally independent outcome. Information on
26 recognition of acute stroke and appropriate response are the key messages for a public
27 education campaign. Community education should focus on the following critical messages
28 for stroke:

- Signs and symptoms of stroke (e.g., “Give Me 5,” FAST, “Suddens”)
- Time-sensitive window for EMS/treatment response (i.e., in the event of a stroke, call 911 immediately, since “time is brain”); treatment begins with the arrival of EMS (EMS brings the emergency room to the patient).

Educational materials and campaigns should be culturally sensitive, language-appropriate, and presented at the literacy level of the intended audience. Materials should particularly target high-risk racial/ethnic groups (i.e., Hispanics, African Americans, and Native Americans) and women. In addition, public education should be presented in a variety of venues throughout the community and should be communicated using multiple forms of media.

Procedures

1. Community Benefit Requirements

Hospitals will be encouraged to satisfy their community benefit requirements by educating people in their service areas about the signs and symptoms of acute stroke and the need to call 911 immediately.

2. Public Education Campaigns

LEMSAs will encourage certified Primary Stroke Centers to conduct public education about the signs and symptoms of stroke and the need to call 911.

LEMSAs will encourage EMS providers to educate the public about the signs and symptoms of stroke and the need to call 911.

In conducting these public education campaigns, LEMSAs will be encouraged to seek partnerships with other private and public organizations that are also committed to the prevention and optimum treatment of stroke.

1 **C. Policy Recommendations**

2 All LEMSAs will be encouraged to develop a system of care for stroke so that optimal care will
3 be accessible to all California residents. This will assure a uniformly high standard of stroke
4 care across the State. The actions of LEMSAs in developing stroke systems of care will be
5 consistent with Guidelines developed by the Stroke Work Group, California’s recognized
6 expert panel on stroke care.

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15

16

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19 California Department of Public Health

20

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1 **APPENDIX A: SAMPLE CALLER INTERROGATION TOOL FOR DISPATCHERS**

2 **Key Questions:**

3 Is patient alert?

4 Is patient breathing normally?

5 Describe what the patient looks like?

6 What is the patient doing?

7 Can the patient respond to you and follow simple commands?

8 Can the patient answer your questions?

9 How is the patient acting?

10 If acting unusually, what is different?

11 Is the patient able to speak in full sentences?

12 Is the patient complaining of any pain? Where is the pain located? (Consider appropriate card,
13 Back, Chest, Abdomen.)

14 Is the patient diabetic? (Consider diabetic card.)

15 Has the patient had a seizure? (Consider seizure card.)

16 Has the patient had a headache? (Consider headache card.)

17 Had the patient had any recent injury/trauma?

18 Does the patient have any other medical or surgical history? What?

19 Has the patient had a stroke before?

20
21 **Pre-Arrival Instructions:**

22 Keep patient calm.

23 Don't allow patient to move around.

24 If unconscious or having trouble breathing, keep neck straight and remove pillows.

25 Nothing by mouth (to eat or drink).

26 Gather patient medication, if any.

27 If the patient's condition changes, call me back.

28 Lock all pets away because they may interfere with instructions or attack emergency responders.

**APPENDIX B: SAMPLE VALIDATED STROKE SCREENING TOOLS
FOR EMS RESPONDERS**

1. LOS ANGELES PREHOSPITAL STROKE SCREEN (LAPSS)

Screening Criteria	Yes	No
1. Age over 45 years	___	___
2. No prior history of seizure disorder	___	___
3. New onset of neurologic symptoms in last 24 hours	___	___
4. Patient was ambulatory at baseline (prior to event)	___	___
5. Blood glucose between 60 and 400	___	___

Exam: look for obvious asymmetry

	Normal	Right	Left
Facial smile / grimace:	___	___ Droop	___ Droop
Grip:	___	___ Weak Grip ___ No Grip	___ Weak Grip ___ No Grip
Arm weakness:	___	___ Drifts Down ___ Falls Rapidly	___ Drifts Down ___ Falls Rapidly

	Yes	No
6. Based on exam, patient has only unilateral weakness:	___	___

If Yes (or unknown) to all items above LAPSS screening criteria met:

If LAPSS criteria for stroke met, call receiving hospital with "code stroke," if not, then return to the

1 appropriate treatment protocol. (Note: the patient may still be experiencing a stroke if even if
2 LAPSS criteria are not met.)
3

4
5 **Reference**

6
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1 **2. CINCINNATI PREHOSPITAL STROKE SCALE**

2

3 **Facial Droop:**

4 Normal: Both sides of face move equally

5 Abnormal: One side of the face does not move at all

6

7 **Arm Drift:**

8 Normal: Both arms move equally or not at all

9 Abnormal: One arm drifts compared to the other

10

11 **Speech:**

12 Normal: Patient uses correct words with no slurring

13 Abnormal: Slurred or inappropriate words or mute

14

15 **References**

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17 validity." Ann Emerg Med 1999 Apr; 33(4):373-8.

**APPENDIX C: THE JOINT COMMISSION'S STROKE FRAMEWORK
AND STROKE PERFORMANCE MEASURES**

STROKE STANDARDIZED MEASURE SET FRAMEWORK

DOMAINS	KEY MEASUREMENT AREAS		
Urgent Care Assessment	<ul style="list-style-type: none"> • Stroke team • Written care protocols 	<ul style="list-style-type: none"> • Initial Physical Assessment & Neurological evaluation <ul style="list-style-type: none"> ○ Ischemic vs. hemorrhagic stroke ○ Vital signs 	<ul style="list-style-type: none"> • Diagnostics <ul style="list-style-type: none"> ○ Blood counts, coagulation, chemistry ○ EKG ○ Chest X-ray ○ Vascular imaging ○ Brain imaging
Acute Care Hospitalization/Treatment	<ul style="list-style-type: none"> • Airway/ventilatory support • Anticoagulation • Rehab referral 	<ul style="list-style-type: none"> • Anti-platelet therapy • Anti-thrombotic therapy 	<ul style="list-style-type: none"> • Avoidance of nifedipine • DVT prophylaxis
Risk Factor Modification	<ul style="list-style-type: none"> • Smoking • Obesity • Alcohol intake 	<ul style="list-style-type: none"> • Heart disease • Sedentary lifestyle/physical activity 	<ul style="list-style-type: none"> • Diet
Secondary Prevention	<ul style="list-style-type: none"> • Hypertension • Medications • Carotid artery disease 	<ul style="list-style-type: none"> • Smoking cessation • Diabetes 	<ul style="list-style-type: none"> • High cholesterol • History of TIA
Education	<ul style="list-style-type: none"> • Causes of stroke • Adherence to medication use • Resources for social support or services 	<ul style="list-style-type: none"> • Risk factor modification/ healthy lifestyle 	<ul style="list-style-type: none"> • Treatment of stroke • Discharge preparation
Rehabilitation	<ul style="list-style-type: none"> • Instrumental activities of daily living • Multidisciplinary evaluations • Speech therapy <ul style="list-style-type: none"> ○ Dysphagia ○ Speech and oral expression ○ Aphasia 	<ul style="list-style-type: none"> • Activities of daily living • PT • Vocational Therapy • Sensory disturbances 	<ul style="list-style-type: none"> • Bowel/bladder control • OT • Psychological evaluation



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Primary Stroke Centers

Standardized Stroke Measure Set (Harmonized Measures)

Stroke-1

Deep Vein Thrombosis (DVT) Prophylaxis

Stroke-2

Discharged on Antithrombotic Therapy

Stroke-3

Patients with Atrial Fibrillation Receiving Anticoagulation Therapy

Stroke-4

Thrombolytic Therapy Administered

Stroke-5

Antithrombotic Therapy By End of Hospital Day Two

Stroke-6

Discharged on Cholesterol Reducing Medication

Stroke-7

Dysphagia Screening

Stroke-8

Stroke Education

Stroke-9

Smoking Cessation / Advice / Counseling

Stroke-10

Assessed for Rehabilitation

Note: Effective January 1, 2008, all ten measures are required for certification.

1 **APPENDIX D: SAMPLE COUNTY EMS SYSTEM STROKE PLAN TEMPLATE**
2 **(NORTH CAROLINA MODEL)**

3
4 **EMS Stroke Plan Template**

5
6 **Summary:**

7 **Every EMS patient requesting EMS services with a medical presentation of an Acute**
8 **Stroke will be screened to rapidly identify an acute stroke and will be rapidly triaged**
9 **and transported to the appropriate destination for an optimal patient outcome.**

10
11 **Purpose:**

12 The purpose of this policy is to:

- 13 • Rapidly identify patients presenting with symptoms of an acute stroke.
- 14 • Minimize the time from onset of stroke symptoms to the arrival of the patient at a care site
15 where specialized care can be provided.
- 16 • Quickly determine the best destination for each stroke patient (based on the onset of the
17 patient's symptoms and the distance from a stroke center).
- 18 • Provide quality EMS service and patient care to the county's citizens.
- 19 • Provide a means for continuous evaluation to assure this plan's compliance.

20
21 **Procedure:**

22 **The success of an EMS Stroke Plan is based on the completion of the following:**

- 23 • Early recognition of Stroke Symptoms and activation of the EMS System.
- 24 • Rapid Identification of an Acute Stroke Patient through the use of a validated Stroke
25 Screen.
- 26 • Documentation of the Onset of Stroke Symptoms.
- 27 • Completion of a Reperfusion Checklist to determine potential eligibility for thrombolytic
28 therapy.

- 1 • Providing quality EMS care to each Acute Stroke Patient.
- 2 • Based on the elapsed time from the onset of symptoms and thrombolytic eligibility,
- 3 determine the most appropriate destination for the Acute Stroke Patient.
- 4 • Early activation/notification of the receiving Stroke Center.
- 5 • Early activation of EMS Specialty Care Transport Programs if the EMS System is unable
- 6 to transport the Stroke Patient to the appropriate destination within the treatment time
- 7 window.
- 8 • Ongoing evaluation to assure the Stroke Plan is implemented and maintained within the
- 9 EMS System.

11 **Definitions:**

12 1. **Comprehensive Stroke Centers** (as defined by the multi-organizational BAC)—these

13 facilities are equipped with diagnostic and treatment facilities that are not found in other

14 hospitals. Referrals are made for those patients who require the expertise of specialists

15 and the procedures they perform.

16

17 2. **Primary Stroke Center** (as defined by The Joint Commission)—these facilities have

18 been recognized as hospitals that meet the minimum desirable level of care for stroke

19 patients in the ED and in inpatient care.

20

21 3. **Satellite Stroke Centers** (as defined by the multi-organizational BAC)—these facilities

22 are able to provide the minimum desirable level of care for stroke patients in the ED,

23 particularly when paired with another hospital. These facilities should be regarded as stroke

24 partners or “spokes” and should be aligned by formal agreement with a hospital that can

25 provide the missing service. The most common “missing service” is neurological expertise

26 in the ED and inpatient Stroke Unit care for patients treated with recanalization therapies.

27 In these hospitals, the necessary ED neurological expertise may be provided through

28 telemedicine.

1 **The following time parameters should be applied to determine the appropriate**
2 **destination for each Acute Stroke Patient:**

3
4 **(Items bulleted in red font are the EMS System-specific information that should be**
5 **included when developing the EMS Stroke Plan. List the names of the**
6 **Comprehensive Stroke Center, Primary Stroke Center, or Satellite Stroke Centers**
7 **with each item.)**

8
9 **1. Acute Stroke Patients who can be transported directly to a Primary Stroke Center**
10 **in less than 2 hours from the onset of stroke symptoms** should be transported directly
11 to a Primary Stroke Center for care.

12
13 **• Describe how this operationally will occur and list the Primary Stroke Center(s) that**
14 **will be used. Note the importance of early notification to the Primary Stroke Center.**

15
16 **2. If Item 1 above is not possible, but the Acute Stroke Patient can be transported to a**
17 **Satellite Stroke Center in less than 2 hours** from the onset of Stroke Symptoms,
18 transport to the Satellite Stroke Center.

19
20 **• List the Satellite Stroke Center(s) that will be used and any criteria to determine the**
21 **destination.**

22
23 **3. If the Acute Stroke Patient's onset of symptoms is beyond the time required for Items 1 or**
24 **2, but the patient could be delivered to a Stroke Center within 5 hours of symptom**
25 **onset, transport the patient to a Stroke Center.**

26
27 **• If there is a Comprehensive Stroke Center in the system, the EMS System will**
28 **directly transport the patient to a Comprehensive Stroke Center. List Comprehensive**

1 **Stroke Center(s).**

2 • **If there is no Comprehensive Stroke Center in the system, EMS System will directly**
3 **transport the patient to the closest Primary Stroke Center.**

4
5 • **If the EMS System is unable to leave their service area, the patient will be**
6 **transported to the nearest hospital. With early notification, the nearest hospital will**
7 **activate an Air or Ground Specialty Care Transport Program to deliver the patient to**
8 **the Comprehensive Stroke Center within the 5–hour time window.**

9
10 4. If the Acute Stroke Patient’s onset of symptoms is beyond the time required for Items 1,
11 2, or 3, or if the time of onset of symptoms is unknown, the patient should be delivered to a
12 Primary Stroke Center.

13
14 • **If the EMS System is unable to leave their service area, the patient will be**
15 **transported to the nearest hospital. The nearest hospital will activate an Air or**
16 **Ground Specialty Care Transport Program to deliver the patient to the Primary Stroke**
17 **Center as quickly as possible.**