



STROKE CRITICAL CARE SYSTEM

Effective: January 1, 2021
Replaces: February 17, 2014

I. Purpose

The purpose of this policy is to reduce the morbidity and mortality of stroke patients by organizing a Stroke Critical Care System that serves our residents and visitors through preventative education, emergency care, hospitalization, rehabilitation, and research. This critical care system links prehospital and hospital care to deliver optimal treatment to the population of stroke patients.

II. Definitions

Board-certified - a physician who has fulfilled all the Accreditation Council for Graduate Medical Education (ACGME) requirements in a specialty field of practice and has been awarded a certification by an American Board of Medical Specialties (ABMS) approved program.

Board-eligible - a physician who has applied to a specialty board examination and has completed the requirements and is approved to take the examination by ABMS. Board certification must be obtained within the allowed time by ABMS from the first appointment.

Quality Improvement - methods of evaluation that are composed of a structure, process, and outcome evaluations which focus on improvement efforts to identify causes of problems, intervene to reduce or eliminate these causes, and take steps to correct the process and recognize excellence in performance and delivery of care.

Stroke - a condition of impaired blood flow to a patient's brain resulting in brain dysfunction, most commonly through vascular occlusion or hemorrhage.

Stroke Medical Director - a board-certified physician in neurology or neurosurgery or another board with sufficient experience and expertise dealing with cerebrovascular disease as determined by the hospital credentialing committee that is responsible for the stroke service, performance improvement, and patient safety programs related to a stroke critical care system.

Stroke Program Manager - a registered nurse or qualified individual designated by the hospital with the responsibility for monitoring and evaluating the care of stroke patients and the coordination of performance improvement and patient safety programs for the stroke center in conjunction with the stroke medical director.

Stroke Team - the personnel, support personnel, and administrative staff that function together as part of the hospital's stroke program.

Telehealth - the mode of delivering health care services and public health via information and communication technologies to facilitate the diagnosis, consultation, treatment, education, care management, and self-management of a patient's health care while the patient is at the originating site and the health care provider is at a distant site.



III. General Designation Requirements

- A. Initial Designation as a Stroke Center in the Santa Clara County Emergency Medical Services (SCC EMS) System requires an application, satisfactory site survey and verification of the following:
1. Currently serving in the EMS system as a Prehospital Receiving Center (PRC) or a Base Hospital (BH).
 2. Compliance with all standards and requirements listed in this policy.
 3. Participation in the Stroke System Advisory Committee.
 4. Enrollment and participation in the stroke data management system and commitment to provide additional data as required by SCC EMS Agency and/or the Stroke System Advisory Committee.
 5. Current written agreement with SCC EMS Agency for designation as a Stroke Center to provide services in Santa Clara County.
 6. Stroke Center designation may be granted following satisfactory review of a completed application, supporting written documentation, and initial site survey by SCC EMS Agency personnel/designees.
 7. Maintenance of The Joint Commission certification and adherence to standards.
- B. Designation Renewal
1. The Stroke Center may be re-designated after satisfactory review of written documentation and a site survey by SCC EMS Agency personnel/designees.
 2. Re-designation shall occur every three (3) years.
 3. Failure to comply with the criteria outlined in this policy at any time will result in disciplinary action up to and including suspension or rescission of EMS Stroke Center designation.

IV. Designation Requirements for an Acute Stroke Ready Hospitals

- A. Hospitals designated by the SCC EMS Agency as an acute stroke ready hospital shall meet all the following minimum criteria:
1. A clinical stroke team available to see, in person or via telehealth, a patient identified as a potential acute stroke patient within twenty (20) minutes following the patient's arrival at the hospital's emergency department.
 2. Written policies and procedures for emergency department stroke services that are reviewed, revised as needed, and implemented at least every three (3) years.



3. Emergency department policies and procedures shall include written protocols and standardized orders for the emergency care of stroke patients.
4. Data-driven, continuous quality improvement process including collection and monitoring of standardized performance measures.
5. Neuro-imaging services capability that is available twenty-four (24) hours a day, seven (7) days a week, three hundred and sixty-five (365) days per year, such that imaging shall be performed and reviewed by a physician within forty-five (45) minutes following emergency department arrival.
6. Neuro-imaging services shall, at a minimum, include CT or MRI, or both.
7. Interpretation of the imaging.
 - a. If teleradiology is used in image interpretation, all staffing and staff qualification requirements contained in this section shall remain in effect and shall be documented by the hospital.
 - b. Neuro-imaging studies shall be reviewed by a physician with appropriate expertise, such as a board-certified radiologist, board-certified neurologist, a board-certified neurosurgeon, or residents who interpret such studies as part of their training in ACGME-approved radiology, neurology, or neurosurgery training program within forty-five (45) minutes of emergency department arrival.
 - i. For this subsection, a qualified radiologist shall be board-certified by the American Board of Radiology or the American Osteopathic Board of Radiology.
 - ii. For this subsection, a qualified neurologist shall be board-certified by the American Board of Psychiatry and Neurology or the American Osteopathic Board of Neurology and Psychiatry.
 - iii. For this subsection, a qualified neurosurgeon shall be board-certified by the American Board of Neurological Surgery.
8. Laboratory services shall, at a minimum, include blood testing, electrocardiography and x-ray services, and be available twenty-four (24) hours a day, seven (7) days a week, three hundred and sixty-five (365) days per year, and able to be completed and reviewed within sixty (60) minutes following emergency department arrival.
9. Neurosurgical services shall be available, including operating room availability, either directly or under an agreement with a thrombectomy-capable, primary or comprehensive stroke center, within three (3) hours following the arrival of acute stroke patients to an acute stroke-ready hospital.



10. Provide IV thrombolytic treatment and have transfer arrangements with one or more thrombectomy-capable, primary, or comprehensive stroke center(s) that facilitate the transfer of patients with strokes to the stroke center(s) for care when clinically warranted.
11. There shall be a medical director of an acute stroke-ready hospital, who may also serve as a member of a stroke team, who is a physician or advanced practice nurse who maintains at least four (4) hours per year of educational time in cerebrovascular disease.
12. Clinical stroke team for an acute stroke-ready hospital at a minimum shall consist of a nurse and a physician with training and expertise in acute stroke care.
13. Additional requirements may be stipulated by the Santa Clara County EMS Agency Medical Director.

V. Designation requirements for a Primary Stroke Center

- A. Hospitals designated by the SCC EMS Agency as a primary stroke center shall meet all the following minimum criteria:
 1. Adequate staff, equipment, and training to perform rapid evaluation, triage, and treatment for the stroke patient in the emergency department.
 2. Standardized stroke care protocol/order set.
 3. Stroke diagnosis and treatment capacity twenty-four (24) hours a day, seven (7) days a week, three hundred and sixty-five (365) days per year.
 4. Data-driven, continuous quality improvement process including collection and monitoring of standardized performance measures.
 5. Continuing education in stroke care provided for staff physicians, staff nurses, staff allied health personnel, and EMS personnel.
 6. Public education on stroke and illness prevention.
 7. A clinical stroke team, available to see in person or via telehealth, a patient identified as a potential acute stroke patient within 15 minutes following the patient's arrival at the hospital's emergency department or within 15 minutes following a diagnosis of a patient's potential acute stroke.
 - a. At a minimum, a clinical stroke team shall consist of:
 - i. A neurologist, neurosurgeon, interventional neuro-radiologist, or emergency physician who is board certified or board eligible in neurology, neurosurgery, endovascular neurosurgical radiology, or other board-certified physician with sufficient experience and



expertise in managing patients with acute cerebral vascular disease as determined by the hospital credentials committee.

- ii. A registered nurse, physician assistant or nurse practitioner capable of caring for acute stroke patients that has been designated by the hospital who may serve as a stroke program manager.
8. Written policies and procedures for stroke services which shall include written protocols and standardized orders for the emergency care of stroke patients. These policies and procedures shall be reviewed at least every three (3) years, revised as needed, and implemented.
9. Data-driven, continuous quality improvement process including collection and monitoring of standardized performance measures.
10. Neuro-imaging services capability that is available twenty-four (24) hours a day, seven (7) days a week, three hundred sixty-five (365) days per year, such that imaging shall be initiated within twenty-five (25) minutes following emergency department arrival.
11. CT scanning or equivalent neuroimaging shall be initiated within twenty-five (25) minutes following emergency department arrival.
12. Other imaging shall be available within a clinically appropriate timeframe and shall, at a minimum, include:
 - a. MRI
 - b. CTA and / or Magnetic resonance angiography (MRA)
 - c. TEE or TTE
13. Interpretation of the imaging.
 - a. If teleradiology is used in image interpretation, all staffing and staff qualification requirements contained in this section shall remain in effect and shall be documented by the hospital.
 - b. Neuro-imaging studies shall be reviewed by a physician with appropriate expertise, such as a board-certified radiologist, board-certified neurologist, a board-certified neurosurgeon, or residents who interpret such studies as part of their training in ACGME-approved radiology, neurology, or neurosurgery training program within forty-five (45) minutes of emergency department arrival.
 - i. For this subsection, a qualified radiologist shall be board certified by the American Board of Radiology or the American Osteopathic Board of Radiology.



- ii. For this subsection, a qualified neurologist shall be board certified by the American Board of Psychiatry and Neurology or the American Osteopathic Board of Neurology and Psychiatry.
 - iii. For this subsection, a qualified neurosurgeon shall be board certified by the American Board of Neurological Surgery.
14. Laboratory services capability that is available twenty-four (24) hours a day, seven (7) days a week, three hundred and sixty-five (365) days per year, such that services may be performed within forty-five (45) minutes following emergency department arrival.
15. Neurosurgical services shall be available, including operating room availability, either directly or under an agreement with a thrombectomy-capable, comprehensive or other stroke center with neurosurgical services, within two (2) hours following the arrival of acute stroke patients to the primary stroke center.
16. Inpatient acute care rehabilitation services.
17. Transfer arrangements with one or more higher level of care centers when clinically warranted or for neurosurgical emergencies.
18. There shall be a stroke medical director of a primary stroke center, who may also serve as a physician member of a stroke team, who is board-certified in neurology or neurosurgery or another board-certified physician with sufficient experience and expertise dealing with cerebral vascular disease as determined by the hospital credentials committee.
19. Additional requirements may be stipulated by the Santa Clara County EMS Agency Medical Director.

VI. Designation requirements for a Thrombectomy-Capable Stroke Center

- A. Hospitals designated as a thrombectomy-capable stroke center by the SCC EMS Agency shall meet all the requirements of a primary stroke center plus the following minimum criteria:
 1. The ability to perform mechanical thrombectomy for the treatment of ischemic stroke twenty-four (24) hours a day, seven (7) days a week, three hundred and sixty-five (365) days per year.
 2. Dedicated neuro-intensive care unit beds to care for acute ischemic stroke patients twenty-four (24) hours a day, seven (7) days a week, three hundred and sixty-five (365) days per year.
 3. Satisfy all the following staff qualifications:
 - a. A qualified physician, board certified by the American Board of Radiology, American osteopathic Board of Radiology, American Board of Psychiatry and



Neurology, or the American osteopathic Board of Neurology and Psychiatry, with neuro-interventional angiographic training and skills on staff as deemed by the hospital's credentialing committee.

- b. A qualified neuro-radiologist, board-certified by the American Board of Radiology or the American Osteopathic Board of Radiology.
 - c. A qualified vascular neurologist, board-certified by the American Board of Psychiatry and Neurology or the American Osteopathic Board of Neurology and Psychiatry, or with appropriate education and experience as defined by the hospital credentials committee.
 - d. If teleradiology is used in image interpretation, all staffing and staff qualification requirements contained in this section shall remain in effect and shall be documented by the hospital.
4. The ability to perform advanced imaging twenty-four (24) hours a day, seven (7) days a week, three hundred and sixty-five (365) days per year, which shall include, but not be limited to, the following:
- a. Computed tomography angiography (CTA)
 - b. Diffusion-weighted MRI or CT Perfusion
 - c. Catheter angiography
 - d. Magnetic resonance angiography (MRA)
 - e. And the following modalities available when clinically necessary:
 - i. Carotid duplex ultrasound
 - ii. Transesophageal echocardiography (TEE)
 - iii. Transthoracic Echocardiography (TTE)
5. A process to collect and review data regarding adverse patient outcomes following mechanical thrombectomy.
6. Written transfer agreement with at least one comprehensive stroke center.
7. Additional requirements may be stipulated by the Santa Clara County EMS Agency Medical Director.

VII. Designation requirements for a Comprehensive Stroke Center

- A. Hospitals designated as a comprehensive stroke center by the SCC EMS Agency shall meet all the requirements of a thrombectomy-capable and primary stroke center plus the following minimum criteria:



1. Neuro-endovascular diagnostic and therapeutic procedures available twenty-four (24) hours a day, seven (7) days a week.
2. Advanced imaging, available twenty-four (24) hours a day, seven (7) days a week, three hundred and sixty-five (365) days per year, which shall include but not be limited to:
 - a. All imaging requirements for thrombectomy-capable centers.
 - b. Diffusion-weighted magnetic resonance imaging (MRI) and computed tomography (CT) perfusion imaging.
3. Laboratory tests, electrocardiogram (ECG), and chest x-ray are completed within 45 minutes of patient presentation with stroke symptoms, if ordered by the practitioner.
4. Transcranial Doppler (TCD) shall be available in a timeframe that is clinically appropriate.
5. Intensive care unit (ICU) beds with licensed independent practitioners with the expertise and experience to provide neuro-critical care twenty-four (24) hours a day, seven (7) days a week, three hundred and sixty-five days (365) days per year.
6. Data-driven, continuous quality improvement process including collection and monitoring of standardized performance measures.
7. A stroke patient research program.
8. Satisfy all the following staff qualifications:
 - a. A neurosurgical team capable of assessing and treating complex stroke and stroke- like syndromes.
 - b. A qualified neuro-radiologist, board-certified by the American Board of Radiology or the American Osteopathic Board of Radiology.
 - c. If teleradiology is used in image interpretation, all staffing and staff qualification requirements contained in this section shall remain in effect and shall be documented by the hospital.
 - d. Written call schedule for attending neuro-interventionalist, neurologist, neurosurgeon providing availability twenty-four (24) hours a day seven (7) days a week.
9. Provide comprehensive rehabilitation services either on-site or by written transfer agreement with another health care facility licensed to provide such services.



10. Written transfer agreements with primary stroke centers in the region to accept the transfer of patients with complex strokes when clinically warranted.
11. A comprehensive stroke center shall at a minimum, provide guidance and continuing stroke-specific medical education to hospitals designated as a primary stroke center with which they have transfer agreements.
12. Additional requirements may be stipulated by the Santa Clara County EMS Agency Medical Director.

VIII. EMS Receiving Hospitals (Non-designated for Stroke Critical Care Services)

- A. An EMS receiving hospital that is not designated for stroke critical care services shall do the following, at a minimum and in cooperation with stroke receiving centers and the SCC EMS Agency:
 1. Participate in the SCC EMS Agency's quality improvement system, including data submission as determined by the SCC EMS Agency Medical Director.
 2. Participate in the inter-facility transfer agreements to ensure access to a stroke critical care system for a potential stroke patient.

IX. Performance Standards

- A. Written EMS policies and procedures shall be reviewed at a minimum of every two (2) years but may be updated sooner based upon identified Quality Improvement needs.
- B. No health care facility located in the SCC EMS jurisdictional region shall advertise in any manner or otherwise hold itself out to be affiliated with a stroke critical care system or a stroke center unless they have been designated as such by the SCC EMS Agency in accordance with this policy and California Code of Regulations, Title 22, Division 9, Chapter 7.2.
- C. The following shall be met for a hospital to be designated as a stroke receiving center by the SCC EMS Agency:
 1. Be licensed by the California Department of Public Health Services as a general acute care hospital.
 2. Have a special permit for basic or comprehensive emergency medical service pursuant to the provisions of California Code of Regulations Title 22, Division 5.
 3. Be accredited by a Centers for Medicare and Medicaid Services approved deeming authority.
 4. Have a communication system for notification of an EMS suspected stroke patient.



5. Have established protocols for triage and diagnosis following notification of an EMS suspected acute stroke patient.
 6. Agree to accept all EMS suspected acute stroke patients according to applicable SCC EMS policies/protocols.
 7. Agree to accept the transfer of all acute stroke patients whose clinical condition requires a higher level of care than can be provided at the sending facility, unless the stroke receiving center is on diversion or internal disaster.
 8. Submit all required stroke patient data to the SCC EMS selected stroke registry. The hospital stroke patient care elements shall be consistent with the U.S. Centers for Disease Control and Prevention, Paul Coverdell National Acute Stroke Program Resource Guide.
 9. Actively participate in the SCC EMS regional stroke critical care system quality improvement (QI) process which shall include, at a minimum:
 - a. Evaluation of program structure, process, and outcome.
 - b. Review of stroke-related deaths, major complications, and transfers.
 - c. A multidisciplinary Stroke Quality Improvement Committee, including both prehospital and hospital members.
 - d. Participation in the QI process by all designated stroke centers and prehospital providers involved in the stroke critical care system.
 - e. Evaluation of regional integration of stroke patient movement.
 - f. Participation in the stroke data management system.
 - g. Compliance with the California Evidence Code, Section 1157.7 to ensure confidentiality, and a disclosure-protected review of selected stroke cases.
 10. Provide CE opportunities, minimum of four (4) hours per year, for EMS personnel in areas of assessment and management of acute stroke patients.
 11. Provide public education about stroke warning signs and the importance of early utilization of the 9-1-1 system.
- D. SCC EMS Agency Duty Chief notification
1. Notification shall be made to the SCC EMS Agency Duty Chief at least 24 hours prior to any planned event resulting in the CT scanner or neurointerventionalist being unavailable.



2. Notification shall be made to the SCC EMS Agency Duty Chief as soon as possible in the case of an unplanned event causing the CT scanner or neurointerventionalist to be unavailable as well as when the issue is resolved.

X. Reporting Requirements

- A. Stroke Center shall notify the SCC EMS Agency in writing of any failure to meet these EMS Stroke Center Standards within 10 (ten) business days.
- B. Changes to key Stroke Center personnel shall be reported to the SCC EMS Agency within 10 (ten) business days to include:
 1. Stroke Medical Director
 2. Stroke Program Manager