



# **A Statewide System of Care For Time Sensitive Emergencies**

**The Integration of Stroke and STEMI Care  
into the Regional Trauma System**

**A Whitepaper**

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## Executive Summary

Emergency Medical Services Systems continue to mature and adapt, incorporating new science and technology. Research and peer reviewed literature propose that time sensitive emergencies requiring rapid assessment and access to appropriate treatments would be best served utilizing the precepts that successfully operationalized the trauma system. Hospitals have demonstrated improved patient outcomes for stroke patients if they receive; thrombolytic treatment in less than 60 minutes, endovascular treatment of large vessel occlusion strokes in less than 90 minutes and interventional treatment of ST elevation myocardial infarction (STEMI) in less than 90 minutes. These life-threatening conditions require early symptom recognition, rapid diagnosis, stabilization, and transport to an appropriate facility. As with trauma patients, stroke/STEMI patients have better survival rates when taken to an appropriate facility.<sup>1</sup>

In 2018, the Michigan Department of Health and Human Services, Bureau of EMS, Trauma and Preparedness, convened two separate panels of experts in stroke and cardiovascular disease to explore the benefits of integrating these time sensitive emergencies into the framework of the existing trauma system. This current initiative continues and builds upon discussions begun with stroke and cardiovascular stakeholders in 2011. These prior discussions led to some initial recommendations about levels of care, data collection and field triage. This paper furthers those recommendations by proposing a comprehensive system of care for the time sensitive emergencies of trauma, stroke, and STEMI. Ultimately, the goal is to provide optimal care to victims of trauma, stroke, and STEMI through the coordinated and organized efforts of the system participants.

The system of care recommendations included in this paper are comprised of an organized system of interacting processes associated with trauma, stroke and heart attack that are designed to identify and treat these specific time-sensitive medical conditions in a manner organized to result in better patient outcomes. The strategy for integrating stroke, STEMI, and trauma into a broader system of care is to leverage the existing Regional Trauma Network structure for coordination. The integration of regionalized stroke and STEMI care with the currently functional regional trauma system will provide efficiencies in resource utilization and system coordination.<sup>2</sup> Systems of care organized on a regional basis can utilize available resources to match patients to the appropriate facilities for care. Regionalization facilitates system quality and performance improvement activities and is designed to ensure and support coordination of care.<sup>3</sup>

A well-designed regional system of care requires that many different agencies and institutions work together at a broad overarching “systems level” to methodically develop policy and procedure decisions

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<sup>1</sup> Ward, B.T., Patrick, C. B., Dickson, R.L., Crocker, K., Gleisberg, R. (2016). Improving systems of care in time-sensitive emergencies. Journal of Emergency medical Services. Retrieved from, <https://www.jems.com/2016/12/31/improving-systems-of-care-in-time-sensitive-emergencies/>.

<sup>2</sup> Poyer, P., Ornato, J.P., Brady Jr. W. J., Davis, L.L., Ghaemmaghami, C.A., Gibler, B.W., Mears, G., Mosesso Jr., V.N. Zane, R.D. (2007). Development of systems of care for ST-elevation myocardial infarction patients: The EMS and emergency department perspective. Circulation (2)116. Retrieved from, <https://www.ahajournals.org/doi/full/10.1161/circulationaha.107.184047>.

<sup>3</sup> Regionalizing Emergency Care Workshop Summary Institute of Medicine (US). Washington (DC): National Academies Press (US); 2010. ISBN-13: 978-0-309-15151-1/ISBN-10: 0-309-15151-1 <https://www.ncbi.nlm.nih.gov/books/NBK220329/>

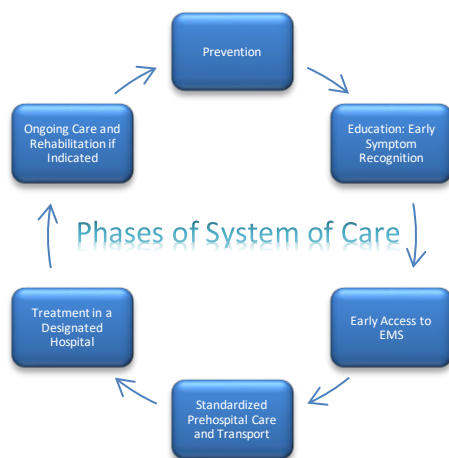
at a higher degree than the decisions commonly made at an individual agency or institution level. A key principle in systems design is that the performance of a system is more than the sum of its individual parts, that system performance is the product of the interactions of system components.

Stroke, STEMI, and trauma patients require timely EMS triage, informed diagnosis, and definitive treatment by a multidisciplinary team of health care providers, supported by appropriate resources, in order to reduce the risk of death or serious disability. A regional system of care for time-sensitive emergencies ensures an organized, coordinated effort within a geographic area to deliver a comprehensive range of patient care integrated within the local medical and public health systems.<sup>4</sup> These systems of care incorporate a variety of disparate healthcare components into a formal structure that is established, supported and supervised within statutes, administrative rules and policy.

An effective system of care includes specialized, independently verified, state designated treatment centers that support an integrated approach to increasing public awareness of initial symptom recognition, reduce the impact of stroke and STEMI occurrence through evidence based standard treatment regimens and ongoing quality improvement. As of November 1, 2019, there were fifty-three (53) independently certified Stroke Centers that provide varying levels of stroke care resources within the state ([Attachment C](#)). Nine (9) chest pain centers in Michigan have received independent accreditation as of November 2019 ([Attachment D](#)).

The value of a time-sensitive emergency system of care is derived from the coordinated transition between each phase of an incident including: prevention measures, Education- early symptom recognition , early access to EMS, standardized pre-hospital response and transport, care in a designated hospital and rehabilitation to achieve improved patient outcomes (Figure 1).

*Figure 1 Phases of System of Care for Time Sensitive Emergencies*

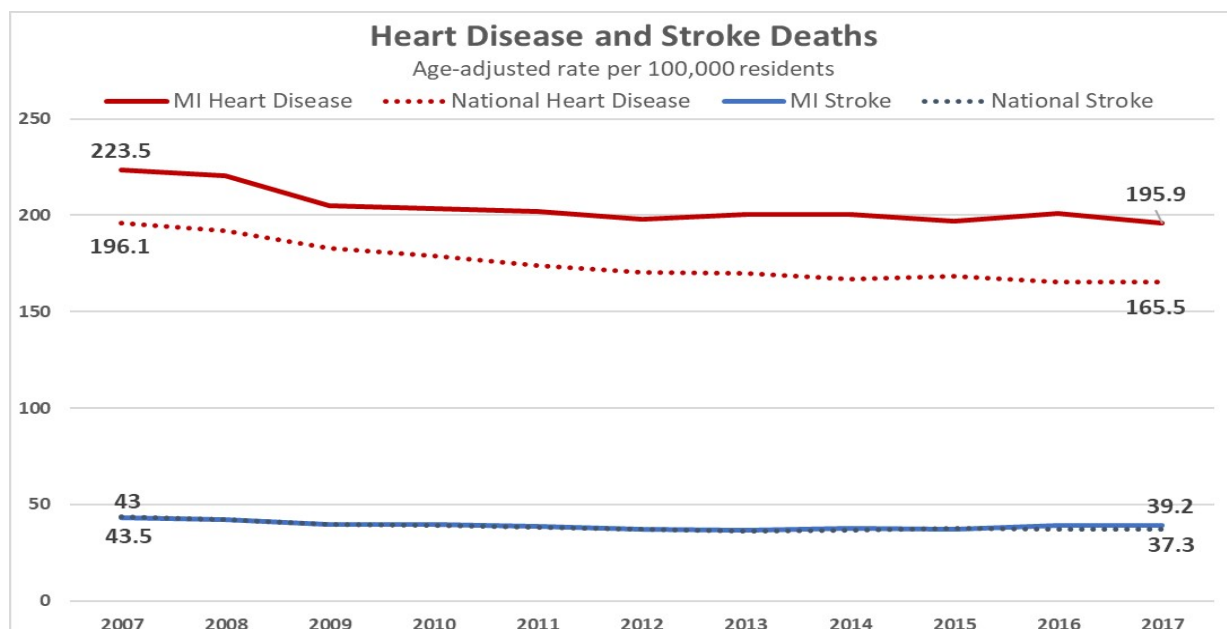


<sup>4</sup> Eastman, A.B., Mackenzie, E.J., Nathens, A.B. (2013). Sustaining a coordinated, regional approach to trauma and emergency care is critical to patient healthcare needs. Health Affairs. (12) 32. Retrieved from, <https://www.healthaffairs.org/doi/10.1377/hlthaff.2013.0716>.

## Introduction to the Michigan Stroke and STEMI System of Care Recommendations

According to the American Heart Association (AHA), every 40 seconds somebody in the United States has a stroke and there is a death caused by stroke every four minutes. A majority, (87%) of strokes are caused by ischemic strokes in which blood flow to the brain is blocked. In addition to deaths, stroke is a leading cause of long-term disability. Similarly, an American suffers a heart attack every 40 seconds. Cardiovascular disease, which includes heart disease and strokes, is the leading cause of death in the United States.<sup>5</sup> Stroke mortality rates in Michigan are above the national average. There are comparably grim statistics for Michigan death rates resulting from heart disease, with rates well above the national average (Figure 2). The Michigan resident death file (2017) demonstrates that in certain geographic areas, such as the City of Detroit, the death rate for heart disease far exceeds both state and national averages. In Michigan, cardiovascular disease was responsible for the death of 25,324 Michigan residents in 2016.<sup>6</sup>

Figure 2 Comparison of Michigan and National Mortality rates for Heart Disease and Stroke



Source: Michigan Resident Death Files, Division for Vital Records & Health Statistics, Michigan Department of Health and Human Services

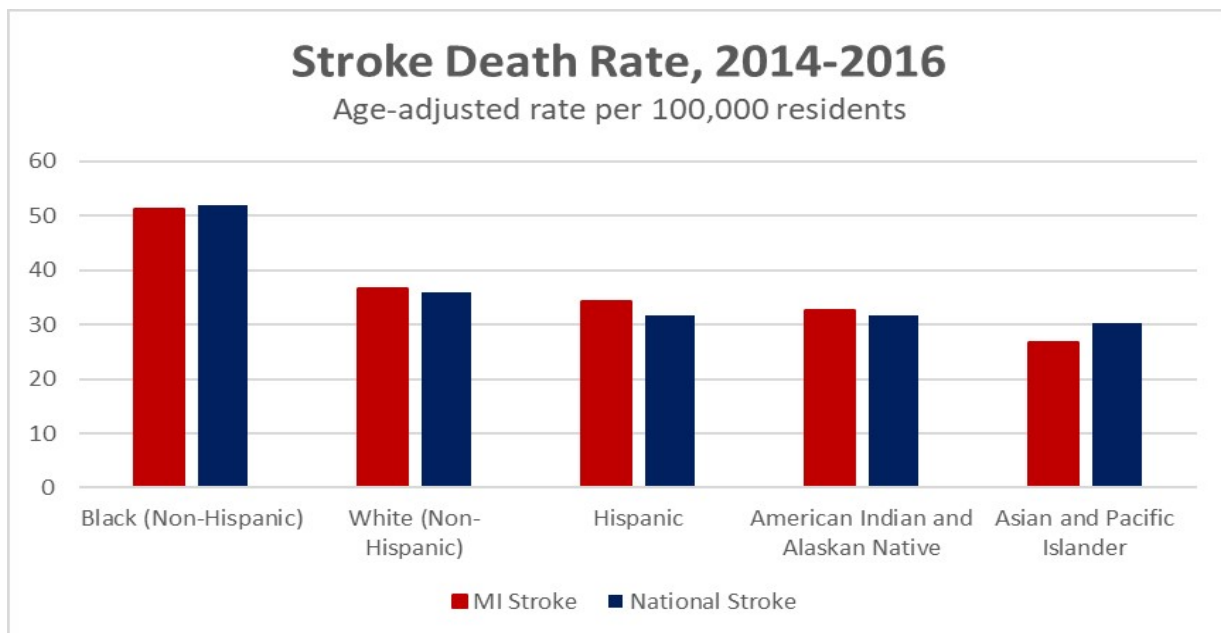
<sup>5</sup> American Heart Association Council on Epidemiology and Prevention Statistics Committee and Stroke Statistics Subcommittee. Heart Disease and Stroke Statistics-2018 Update: A Report from the American Heart Association. *Circulation*. 2018 Mar 20;137(12): e67-e492. doi: 10.1161/CIR.0000000000000558. Epub 2018 Jan 31. Erratum in: *Circulation*. 2018 Mar 20;137(12): e493. PMID: 29386200 retrieved from <https://healthmetrics.heart.org/wp-content/uploads/2018/02/At-A-Glance-Heart-Disease-and-Stroke-Statistics-2018.pdf>

<sup>6</sup> Michigan Department of Health and Human Services. (2017). Number of deaths and age-adjusted mortality rates for the ten leading causes of death, Michigan 2017, and United States residents, 2016. Retrieved from <https://www.mdch.state.mi.us/pha/osr/deaths/causrankcnty.asp>

Stroke is a cardiovascular disease that is the result of decreased blood supply to the brain. A stroke occurs when a blood vessel in the brain is blocked by a clot or a vessel rupture. Stroke is the fifth leading cause of death in the United States and in Michigan, killing 5,003 Michigan residents in 2017 (Figure 3). 2017 statistics illustrate that Michigan's age adjusted mortality rate for stroke (39.2/100,000) is above the US average (37.6/100,000). Further, the rate in Detroit of 46.2 strokes per 100,000 residents is also higher than both state and national averages.<sup>7</sup>

Stroke treatment for blocked vessels includes the timely infusion of a thrombolytic ("clot busting") medication or a surgical intervention called thrombectomy for strokes caused by clots that obstruct large blood vessels in the brain. For strokes caused by a ruptured or leaking blood vessel in the brain, rapid surgical treatment at a specialized Stroke Center is required to stop the bleeding and reduce pressure on the brain. The amount of delay between the onset of stroke symptoms and stroke treatment correlates to higher risk for death or long-term disability. The paradigm for stroke treatment is "time is brain".

*Figure 3 Stroke Death Rates by Ethnicity*



**Source: Centers for Disease Control and Prevention Interactive Atlas of Heart Disease and Stroke Tables**

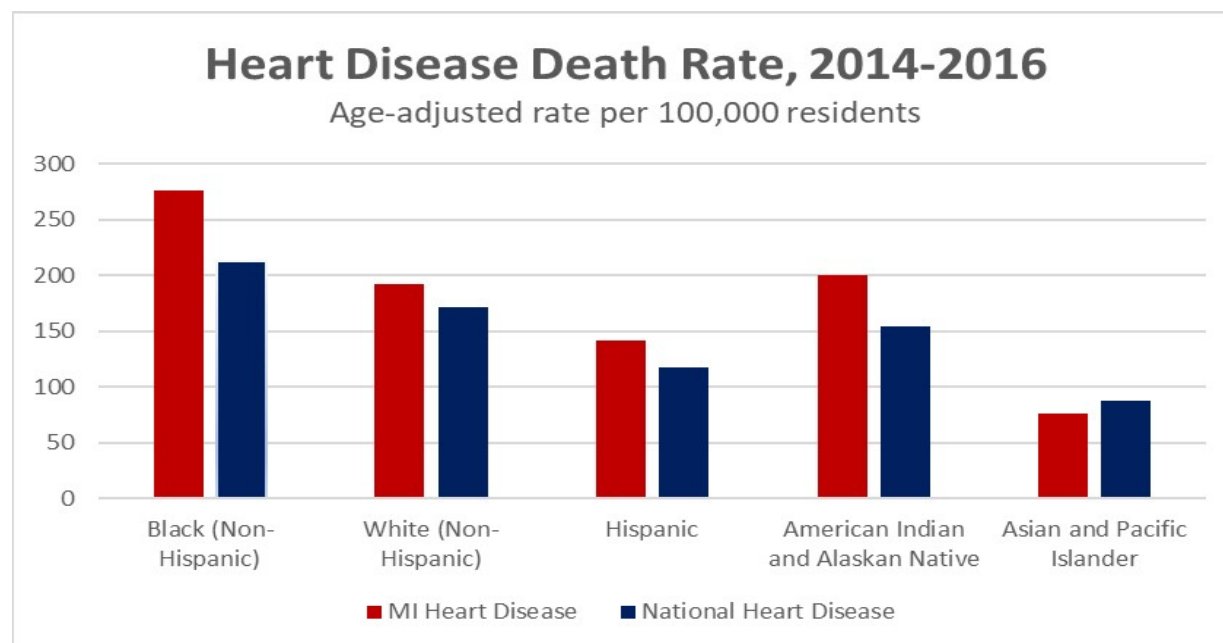
<sup>7</sup> Michigan Resident Death Files. Division for Vital Records & Health Statistics, Michigan Department of Health & Human Services. (2017) retrieved from <http://www.mdch.state.mi.us/pha/osr/chi/CRI/CriticalInd/Crilhd.asp?TableType=Stroke&CoName=City%20Of%20Detroit%20Health%20Department&CoCode=09>

ST segment elevation myocardial infarction (STEMI) is the deadliest type of heart attack and a profoundly life-threatening medical emergency (Figure 4). STEMI occurs when one of the heart's major arteries is blocked. A patient experiencing a STEMI event is at considerable risk for sudden cardiac arrest, often resulting in sudden death. STEMI can be treated with fibrinolytic medications or a procedure called percutaneous coronary intervention (PCI) in specialized hospital centers. There is a direct relationship between the amount of time a heart artery is blocked and the severity of the heart attack. For heart attack, the mantra is "time is muscle".

Many states, cities, and regions throughout the United States and around the world are developing multi-tiered systems of care for patients suffering from time-sensitive emergencies such as trauma, stroke, and STEMI events. Michigan has already established one such regionalized system of care for the traumatically injured patient. Michigan's voluntary, all-inclusive regional trauma system has been operational since 2013 and currently functions to assure that trauma patients receive the optimal care for their injuries through formal processes dedicated to get the right patient to the right trauma facility at the right time.

Just as trauma systems focus on the "golden hour" for trauma victims, the integration of stroke and STEMI will focus on "time is brain" for stroke and "time is muscle" for STEMI care.

*Figure 4 Heart Disease Death Rates by Ethnicity*



Source: Centers for Disease Control and Prevention Interactive Atlas of Heart Disease and Stroke Tables

For Michigan residents, heart disease is the number one killer, trauma is third, and stroke is the fifth leading cause of death (Figure 5).

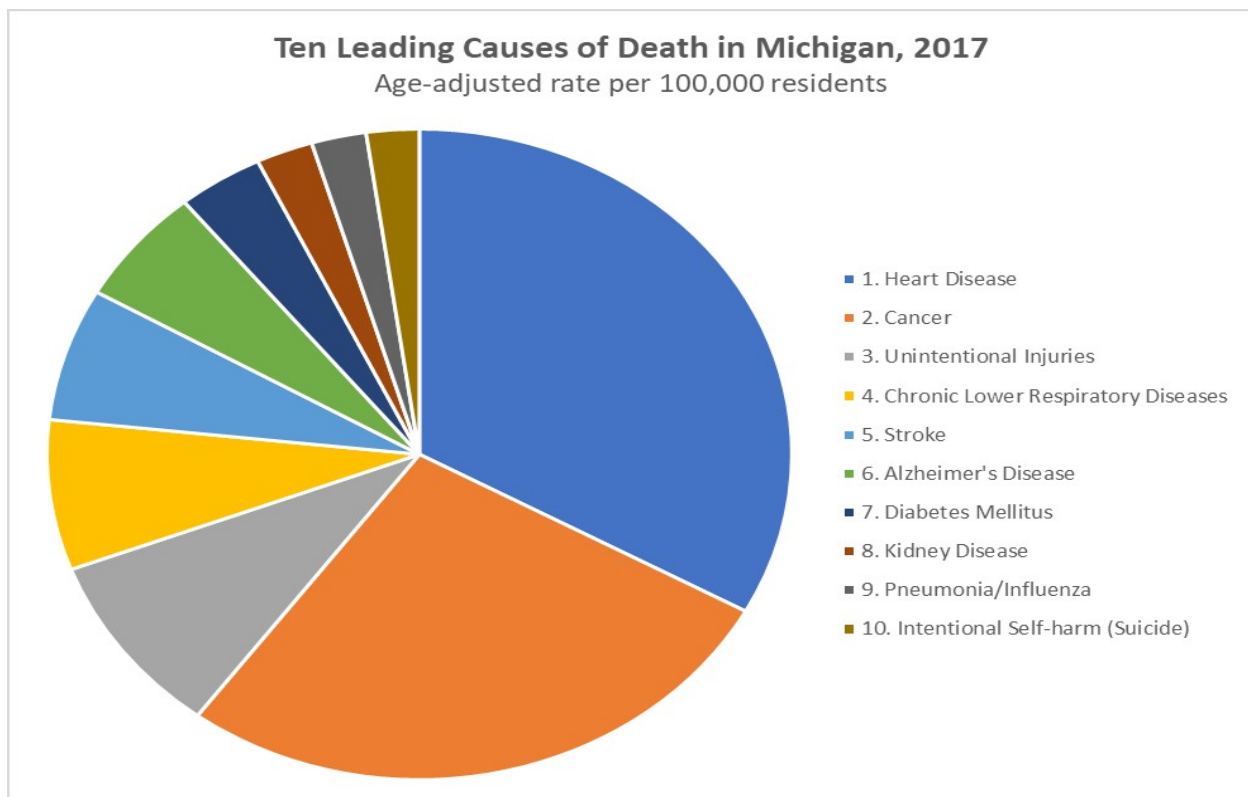
In 2017 a Technical Assistance Team from National Highway Traffic Safety Administration (NHTSA) performed a ten-year reassessment of emergency medical services and trauma in Michigan. The

Michigan Department of Health and Human Service (MDHHS) Bureau of EMS, Trauma and Preparedness (BETP) is the lead agency responsible for the development, coordination, and administration of the statewide emergency medical services system. The NHTSA Reassessment report mentions the active engagement of regionalization for trauma care in Michigan, and further noted that “hospitals self-identify as stroke and STEMI verified centers” using various entities as certifying bodies. The report suggests that statewide programs for time-sensitive emergencies, such as stroke and STEMI “be modeled upon the successful trauma system plan.”<sup>8</sup>

The following are among the NHTSA recommendations included in the reassessment report. The BETP should:

- Adopt rules to establish standards for the care of patients suffering from a time sensitive condition other than trauma.
- Pursue cardiac and stroke systems of care using the trauma system as a model.
- Develop a stroke and STEMI designation process, including reporting and accountability requirements to ensure appropriate services are provided to patients.

*Figure 5 Top Ten Leading Causes of Death*



<sup>8</sup> [https://www.michigan.gov/documents/mdhhs/2017\\_Michigan\\_EMS\\_NHTSA\\_Reassessment\\_Final\\_Report\\_573033\\_7.pdf](https://www.michigan.gov/documents/mdhhs/2017_Michigan_EMS_NHTSA_Reassessment_Final_Report_573033_7.pdf)

**Source:** 2017 Geocoded Michigan Death Certificate Registry. Division for Vital Records & Health Statistics, Michigan Department of Health & Human Services; Population Estimate (latest update 6/2018), National Center for Health Statistics

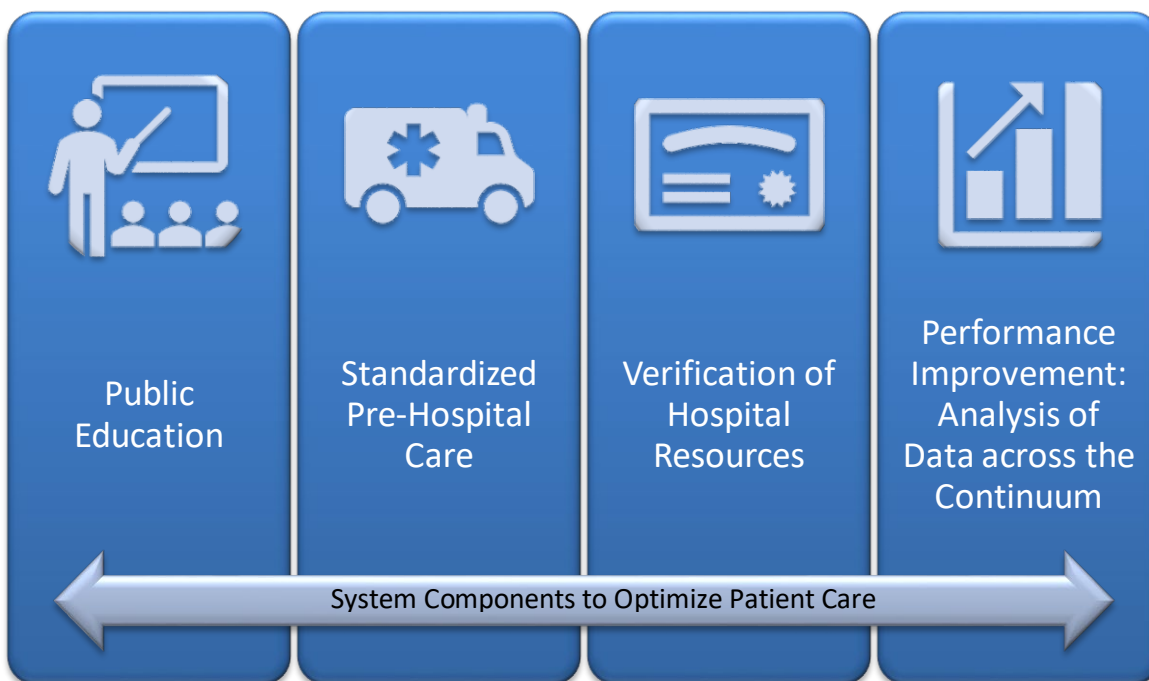


## Recommendations

The goal of the Michigan Systems of Care initiative is to incorporate and integrate the time-sensitive emergencies of stroke and STEMI into the existing and maturing regional trauma system. In this concept, each currently approved Regional Trauma Network will become a Regional System of Care Network, with three branches: regional trauma system, regional stroke system and regional STEMI system. Each region's trauma, stroke and STEMI system will function independently within the Regional System of Care, each responsible for organizing and maintaining their individual advisory committee, professional standards review organization and subcommittees.

In order to improve patient outcomes, the following recommendations will present the concepts and elements necessary to optimize patient care through 1) public education on risk factors, symptom recognition and EMS access, 2) standardized pre-hospital patient triage and care, 3) verification of in-hospital resources to provide stroke or STEMI care and 4) the analysis of patient data from symptom recognition through post-hospital rehabilitation to improve the quality of care. The recommendations are practical, are supported by clinical data, were agreed upon by the expert consensus opinion of stakeholders and based on experience with trauma, can be implemented successfully (Figure 6).

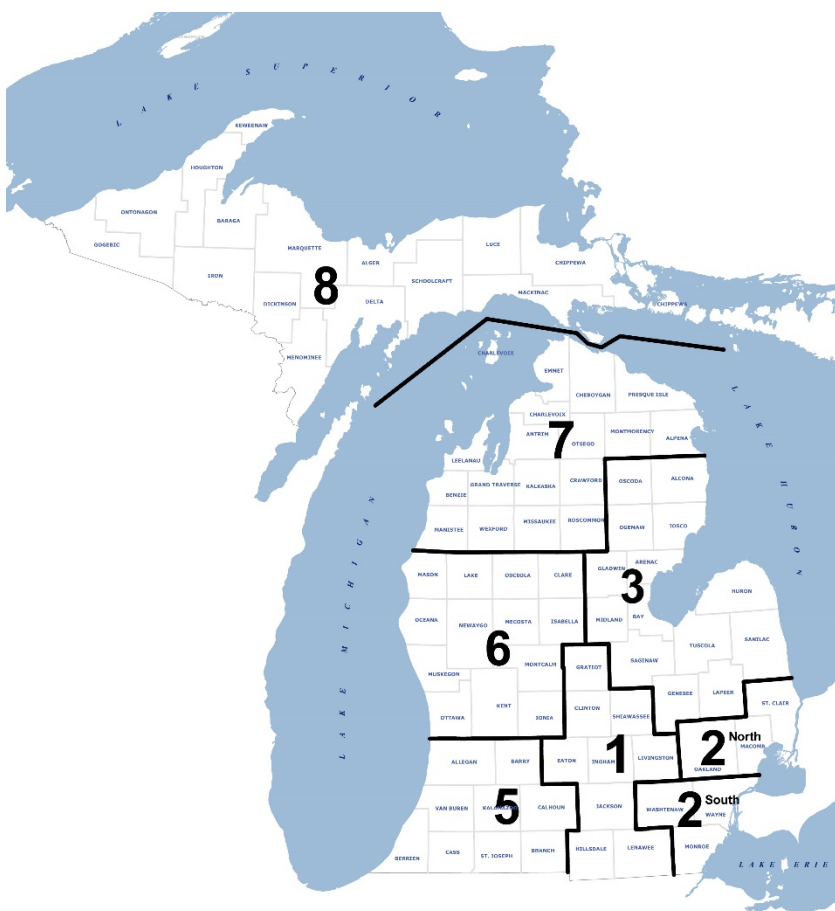
*Figure 6 Essential Elements of Systems of Care*



The Michigan Systems of Care Recommendations are outlined in two sections: The Michigan Stroke System Recommendations and the Michigan STEMI System Recommendations. These recommendations consist of similar components for a regionalized system of care that are shared with the existing trauma system, including: **Governance and Leadership**; **Pre-hospital Care and Destination Guidelines**; **Verification** of hospital resources to provide appropriate care, state **Designation**; **Data** collection and **System Evaluation**. Although some system components and recommendations are similar, the stroke and STEMI each require different technical resources and specific system structures within the hospitals to be verified, and then designated, as either a Stroke Center or a STEMI Center. The overarching goal of the Michigan Systems of Care recommendations is the implementation of a regionalized, inclusive, coordinated, and accountable system of care for the most time sensitive emergencies affecting the citizens and visitors of Michigan (Figure 7 and Figure 8).

Figure 7 Time Sensitive Systems of Care Regions

Figure 8 Time Sensitive Systems of Care Networks






*The Regional Networks consist of:*

- Regional Board- MCAs in the region
- The Advisory Councils- subject matter experts
- The RPSRO- subject matter experts charged with system performance improvement (PI)
- Each region's unique needs are reflected in the structure of their advisory bodies and committees

## Michigan Stroke System Recommendations

The Michigan Stroke System recommendations are based on a statewide, regionalized, all-inclusive system of healthcare providers and hospitals that voluntarily participate in the provision of stroke care at a level commensurate with the independently verified resources to be provided to the stroke patient.

In Michigan, and nationally, stroke is the fifth leading cause of death and is a major cause of long-term disability. High blood pressure and previous heart attack or stroke are considered risk factors for subsequent events. According to results from the Michigan Behavioral Risk Factor Survey; in 2017, an estimated 34.8% of Michigan adults reported ever being told by a doctor that they had high blood pressure. In 2017, the prevalence of high blood pressure in Michigan (34.8%) was higher than the U.S. median prevalence (32.3%) In 2017, the prevalence of heart attack (5.4%), coronary heart disease (5.2%), and stroke (3.7%) among Michigan adults were all higher than the U.S. median prevalence (heart attack: 4.2%; coronary heart disease: 3.9%; and stroke: 3.0%).<sup>9</sup> Organized and coordinated stroke systems of care can help to ensure that stroke patients receive the proper treatment and prompt care at hospitals possessing the necessary resources. The Michigan Stroke System recommendations were developed with the goal of ensuring that all Michigan residents and visitors receive timely and safe access to stroke care regardless of geographical area. The recommendations include:

-  Verification of hospital stroke resources by nationally recognized certifying authorities prior to designation as a Stroke Center by the Department. Any hospital may voluntarily participate in Stroke Center designation at a level of care for which they are able to provide resources. The designation of differing levels of Stroke Center, based on the verification of stroke resources available, will enhance stroke care throughout the state including rural, critical access hospitals, community hospitals and academic medical centers.
-  Regionalization ensures that the various levels of stroke care providers cooperate in system development with local medical control authorities, hospitals, EMS providers and rehabilitation providers. Regionalization also assures Stroke Center participation in EMS protocol development and evaluation of patient care.
-  EMS protocols will be required to address assessment, triage, treatment, transport, and destination of stroke patients based upon regional stroke care resources.

## Leadership and Governance Discussion

A comprehensive system of care for stroke should be assimilated into the existing regionalized, coordinated, and accountable trauma system. The stroke system will ideally use the existing EMS resources as well as the current trauma system model, in order to prevent duplication of efforts, services and resources while maximizing efficiency and reducing overall costs. The current regional trauma networks have enhanced cooperation between regions, recognizing borders are porous and strong partnerships improve patient care and outcomes

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<sup>9</sup> Michigan Behavioral Risk Factor Survey Standard Tables, 2017  
[https://www.michigan.gov/documents/mdhhs/2017\\_MiBRFS\\_Standard\\_Tables\\_667122\\_7.pdf](https://www.michigan.gov/documents/mdhhs/2017_MiBRFS_Standard_Tables_667122_7.pdf)

A stroke system of care is comprised of the EMS system, hospitals, public health agencies, rehabilitation facilities and partners focused on prevention. These partners employ a preplanned and organized response for stroke prevention and patient care and integrated rehabilitative support to return the patient back to a productive life. An effective system includes coordinated and preplanned communication processes, accurate identification, and level of stroke care centers, rapid, protocol directed, ambulance transportation to the appropriate Stroke Center, and performance improvement at the agency and regional level.

The stroke system recommendations are flexible and inclusive and are designed to incorporate the unique needs of each region's resources. A lead agency is required to ensure that a system of care for stroke is integrated with all of the components of the EMS system, and that the stroke system of care is integrated with other systems including the regional trauma and medical control authority networks, and when possible, systems of care in contiguous states. The lead agency must establish, implement, and maintain policies, procedures, and protocols for stroke care within the EMS system. In this regard, the National Highway Traffic Safety Administration has recommended that Michigan pursue stroke systems of care based upon the regional trauma system model. These recommendations integrate the stroke system of care into the governance process of the Regional Trauma Networks to link and coordinate EMS, local medical control authorities and regional medical control authorities to address systems of care for time sensitive emergencies.

**Recommendation: Authorize Michigan's Lead Agency for Stroke**

In Michigan, the lead agency for the statewide Stroke System shall be the Michigan Department of Health and Human Services (MDHHS). The Department will:

1. Implement and maintain a statewide plan for a regionalized Stroke System that is based upon the structure of the current eight Regional Trauma Networks, comprised of the local medical control authorities within the region that will serve as the Regional System of Care Network.
2. Develop a process for the verification of hospital resources for stroke patients.
3. Develop a process for the designation of stroke hospitals.
4. Develop a statewide stroke data collection and performance improvement process.
5. Establish evidence based statewide stroke care guidelines.
6. Approve regional stroke triage and destination protocols for EMS.

**Recommendation: Establish a State Stroke Advisory Committee**

The Director of MDHHS shall appoint a multidisciplinary Stroke Advisory Committee to advise the Department on all matters concerning the statewide stroke system and the Regional Stroke Systems. At a minimum, the Committee shall be comprised of a neurologist, a vascular neurologist, an endovascular interventionalist, a stroke coordinator, a stroke data abstractor/registrar, an emergency physician, a hospital representative, an EMS agency representative and a medical control authority medical director. The best interests of the stroke patient shall be the primary concern of the committee's advice to the Department.

**Recommendation: Establish Regional Stroke Systems**

The Department shall establish eight Regional Stroke Systems integrated into the existing structure and governance of the current eight Regional Trauma Networks serving as the Regional System of

Care Network, to provide clinical oversight for the stroke care provided in each respective region of the state. Regional Stroke Systems shall be comprised of the approved Medical Control Authorities within the applicable region as defined in the trauma statute and administrative rules. Each Regional Stroke System shall appoint a Regional Stroke Advisory Council and a Regional Professional Standards Review Organization for Stroke.

## Pre-hospital Discussion

The Pre-hospital care provided to stroke patients is crucial to the success of the stroke system of care and reducing the morbidity and mortality of stroke. In addition, it is essential that the Pre-hospital care is coordinated with the stroke care provided in the definitive Stroke Centers. The Pre-hospital components of stroke care include appropriate dispatch, identification of reported stroke symptoms, early notification and communication with receiving healthcare facilities, EMS medical direction, tiered triage and destination protocols, and transportation to the appropriate Stroke Center.

The existing Regional Trauma Networks have experience in developing tiered triage and destination protocols for trauma patients and these will serve as a model for the development of stroke protocols. Tiered triage protocols are regionally monitored to reduce both over-triage and under-triage in order to ensure the goal of getting the “right patient to the right place at the right time”. As the regional governance bodies, comprised of the local medical control authorities, the Regional System of Care Network will be responsible for the respective Regional Stroke System’s development and adoption of destination protocols that link tiered stroke triage to the ambulance transportation to the appropriate level of Stroke Center.

The expert writing group recommends that Michigan develop a statewide, regionalized, voluntary, all-inclusive stroke system of care. It also supports the participation of hospitals to the extent, or level, that they are able to commit the necessary resources for the appropriate management of the stroke patient. It also ensures that all stroke patients are part of a system of coordinated care based on standardized triage criteria and regional destination protocols.

Some hospitals may choose not to participate in the stroke system of care. Regional Stroke Systems will identify hospital capability in the development of EMS stroke destination protocols.

### **Recommendation: Implement Tiered Stroke Triage and Destination Pre-hospital Protocols**

Stroke patients requiring the resources of a Stroke Center will be identified by stroke field triage protocols established by the Regional Stroke Systems. Triage protocols enable prehospital providers to identify and assess known or suspected stroke patients using validated stroke screening tools that are approved by the Lead Agency, with the advice of the State Stroke Advisory Committee and the Quality Assurance Task Force (QATF). Stroke field triage protocols will be based upon available published peer-reviewed evidence, use of validated stroke screening tools, and American Heart Association/American Stroke Association guidelines.

These protocols will ensure that patients are transported to the most appropriate Stroke Center, and that Pre-hospital EMS notifies the destination Stroke Center that a stroke patient is enroute.

Tiered stroke triage protocols will enable the stroke system providers to identify those patients who require the resources of a Level I (Comprehensive) Level II (Thrombectomy Capable) or Level III (Primary) Stroke Center, as well as those patients who are appropriately transported to a Level IV (Acute Stroke Ready) Stroke Center for initial assessment and therapy, necessary stabilization and prompt transfer to the appropriate Level I, II or III Stroke Center.

Each Regional Stroke System will establish destination guidelines for transporting stroke patients with the medical control authorities within the respective region.

**Recommendation: Implement an All-Inclusive Stroke System**

The Department will implement a voluntary “all-inclusive” system of care for stroke throughout the state, which provides for the treatment of all stroke patients throughout a continuum of pre-hospital, hospital, and rehabilitative care. This system allows for hospitals to participate at the level of care at which they are able to commit, and are able to provide the resources required, for the appropriate management of the stroke patient. An all-inclusive stroke system ensures that stroke patients are treated in a system of coordinated care based upon the stroke acuity and the level of intervention and care required for optimal patient outcome.

## Verification and Designation of Definitive Stroke Care Facilities Discussion

Stroke systems of care are being developed based upon changing paradigms and emerging technologies. The development of multiple levels of Stroke Centers, expanding use of technology, advanced surgical interventions and comprehensive rehabilitation programs are focusing stroke care strategies on the efficient triage and transport of patients to a designated Stroke Center, and the subsequent transfer of patients who require additional resources and treatments to a higher level of Stroke Center.

The resources of hospitals applying for designation as a Level I, Level II, Level III or Level IV Stroke Center shall be verified by a department approved national certification organization. Hospitals wishing to become Michigan designated Stroke Centers will be responsible for the cost of the verification of resources and formal certification by a nationally recognized certifying organization that is approved by the department.

Stroke Center verification will differ from trauma center verification in that there is a single nationally recognized organization that verifies trauma center resources, the American College of Surgeons. Stroke Center certification is currently offered by three nationally recognized organizations (The Joint Commission (TJC); the Health Care Facilities Accreditation Program (HFAP); Det Norske Veritas and Germanischer Lloyd (DNV-GL) which use similar, but not identical processes. The expert writing group has reviewed the guidelines of these three organizations and recommends that certification from all three organizations should be recognized as verification of resources at the respective levels of this recommendation.

The ideal strategy is to get the stroke patient to appropriate level of stroke care immediately. Level I Stroke Centers provide a comprehensive set of neuro and endovascular therapies, and these centers have the resources to care for the most complex and challenging stroke patients. Level I Stroke Centers can provide 24 hour per day, seven days per week care for all ischemic strokes, all types of hemorrhagic

stroke, stroke with multi-system involvement, and stroke patients who require surgical or endovascular intervention and neuro ICU care.

Nevertheless, geography and local resources often impede patients from reaching a Level I Stroke Center in a reasonable time (Attachment C). Moreover, not all stroke patients require the extensive resources of a Level I Stroke Center. A Level II Stroke Center, capable of providing thrombectomy, has the resources to provide care for many ischemic stroke patients, including those more complicated patients who require endovascular intervention. To be designated as a Level II Stroke Center, a hospital must be, at a minimum, capable of providing mechanical thrombectomy and neuro ICU beds on a 24 hour per day, seven days per week basis.

Patients with an acute ischemic stroke can be cared for at a Level III Stroke Center. A Level III Stroke Center is not capable of providing mechanical thrombectomy on a 24/7 basis, although this intervention may be available on a limited schedule. Therefore, regional stroke system triage and destination protocols may reflect that patients who require endovascular intervention should be preferentially transported to a Level I or Level II Stroke Center if the additional transportation time is limited. Thoughtful triage and transport protocols will reduce the chance of a higher level of care facility becoming overwhelmed with patients who could be appropriately cared for at another level of care. The Regional Stroke Systems will be responsible for the development of department approved triage and destination protocols for EMS within their respective regions.

All hospitals in Michigan can participate in the stroke system of care, and to provide some level of stroke care to the residents of their communities, thus resulting in a truly inclusive system of stroke care. Some hospitals may choose not to participate in the stroke system of care. The Regional Stroke Systems will identify hospital capability in the development of EMS stroke destination protocols.

#### **Recommendation: Verification of Stroke Centers**

In order to be designated by the department, each participating hospital must submit evidence of current certification, by a nationally recognized and department approved certifying organization, that the hospital has the resources to operate at the specific level of stroke care requested in an application for designation from the Department. The written certification shall serve as verification to the department that the hospital will comply with the standards and resources for the requested level of stroke care designation throughout the current certification period. A hospital may apply to the department for temporary status as a Stroke Center by submitting an application that includes evidence that the hospital meets the Department approved criteria for a Provisional Stroke Center. A hospital applying for Provisional Stroke Center status will require the recommendation of the Regional Stroke System and a recommendation for approval from the Stroke Advisory Committee. Hospitals that are unable to maintain the standards and resources for the verified level of stroke care during the certification period shall be required to promptly self-report their change of status of non-compliance to the Department and appropriate Regional Stroke System(s). Department designation shall be concurrent with certification.

- 1). Level I Stroke Center: evidence of current certification by a department approved nationally recognized certifying organization<sup>10</sup> that the hospital has the resources required to be verified as meeting the criteria equivalent of a certified Comprehensive Stroke Center (CSC).
- 2). Level II Stroke Center: evidence of current certification by a department approved nationally recognized certifying organization that the hospital has the resources required to be verified as meeting the criteria for a certified Thrombectomy Capable Stroke Center (TSC). Level II Thrombectomy Stroke Centers are specifically required to demonstrate the resources to provide mechanical thrombectomy on a 24 hour per day, 7 day per week, 365 days per year basis.
- 3). Level III Primary Stroke Center: evidence of current certification by a department approved nationally recognized certifying organization that the hospital has the resources required to be verified as meeting the criteria for a certified Primary Stroke Center (PSC).
- 4). Level IV Acute Stroke Ready Hospital: evidence of current certification by a department approved nationally recognized certifying organization that the hospital has the resources required to be verified as meeting the criteria for an Acute Stroke Ready Hospital (ASRH).

**Recommendation: Time Frame for Verification**

A hospital submitting evidence of verification as a Level I through IV Stroke Center will submit documentation of current certification as established by a schedule created in the Department.

**Recommendation: Designation of Stroke Centers**

The Department will designate Stroke Center capability based on the Department's established verification process and the recommendations and advice of the State Stroke Advisory Committee and the respective Regional Stroke System Network. The Department will maintain a list of all currently designated Stroke Centers including their respective location and designation status.

**Recommendation: Periodic Re-designation of Stroke Centers**

The Department will establish a mechanism for the re-designation of Stroke Centers based upon the verification time frame established. Re-designation shall run concurrent with evidence of verification.

## Data Collection, Performance Improvement and Education Discussion

The purpose of statewide stroke performance improvement recommendations is to ensure that stroke patients receive the highest quality of stroke care throughout the continuum. This requires the collection of uniform and consistent data in order to monitor patient care processes and outcomes. Certifying bodies confirm data collection as part of the certification process. Many performance improvement measures are included in the evaluation process used by nationally recognized certifying bodies during the certification and/or recertification process for a hospital to become a Stroke Center. In addition, performance evaluation priorities such as EMS response times, in hospital "door to needle" times, patient functional outcomes or arrival-to-transfer times may be identified by regional stroke systems as important measures of performance.

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<sup>10</sup> Currently recognized national accrediting organizations are The Joint Commission, the Health Care Facilities Accreditation Program or Det Norske Veritas and Germanischer Lloyd (DNV-GL).



The data are then used to identify areas for improvement, development, and implementation of corrective action plans, monitoring of compliance with corrective actions, and verification that corrective actions were effective.

Stroke system evaluation and performance improvement are functions of the Department's effort to evaluate system effectiveness, accessibility, cost, and the quality of stroke services. The Department will also assist the regional stroke systems by developing uniform statewide assessment measures and regional performance metrics. The Department will be responsible for receiving state stroke registry data and reporting back to the region(s) to assist in identifying deficiencies that need to be addressed and determining how the system can improve. These data will be used to evaluate system and regional processes regarding each significant element of the stroke system. Basic outcome measures such as mortality, morbidity and timeliness of procedures will be assessed, as well as an analysis of process measures such as response times, protocol compliance and transfer times which will be used to improve overall patient care. Functional outcome and impact of long-term disability is important to measure as proxy for the potential to return to a productive life post the event. The system will endeavor to collect data in order to monitor this important metric.

The time elapsed between onset of stroke symptoms and arrival at an appropriate Stroke Center emergency department is correlated to morbidity, mortality and long-term disability related to stroke. The main causes of delayed stroke treatment include the lack of public awareness of stroke signs and symptoms, the importance of calling 911 and the need for immediate specialized care. Ongoing public education programs about stroke symptoms and the need for immediate care can reduce the time delays and thereby improve outcomes for stroke patients.

**Recommendation: Data Collection and Confidentiality**

All designated hospitals that receive stroke patients are required to participate in data collection established by the Department.

Protection of patient data collected for regional stroke system performance improvement shall be provided and maintained through existing state legislation included in the Public Health Code.

**Recommendation: Data Collection System**

A statewide stroke data registry shall be established by the Department, including the establishment a minimum data set, a data dictionary, and the stroke data upload and data verification process. The submission of data to the stroke registry shall be phased-in in order to support the efficient and orderly establishment of designated stroke facilities.

Stroke Centers will submit the required stroke data to the state stroke registry according to a schedule established by the department. The stroke registry will utilize a standardized data set recommended by the State Stroke Advisory Committee and approved by the department. The stroke data set will be uploaded to the state stroke data registry by each Stroke Center.

Additional stroke data elements that are not a part of the standardized stroke data set may be required based upon the recommendation of the Stroke Advisory Committee and approved by the Department.

**Recommendation: Stroke Care Performance Improvement**

Each medical control authority will adopt and implement regional stroke care protocols that include triage and destination guidelines, and a performance improvement plan as developed by the Regional Stroke System and approved by the Department. Performance Improvement will be supported by the Bureau of EMS, Trauma and Preparedness, Bureau of Health and Wellness and the Bureau of Epidemiology and Population Health.

**Recommendation: Stroke Awareness, Prevention and Education**

The Department, with the advice of the State Stroke Advisory Committee, will support coordination among state and regional stroke networks regarding awareness, prevention initiatives and programs. The Department will work with stroke care stakeholders throughout the state to support ongoing stroke care provider and community education efforts.

## Introduction to the Michigan STEMI System Recommendations

The Michigan STEMI System recommendations are based on a statewide, regionalized, all-inclusive system of healthcare providers and hospitals that voluntarily participate in the provision of STEMI care at a level commensurate with the independently verified resources they can provide to the STEMI patient. The Michigan STEMI System recommendations employ time sensitive emergency best practices, lessons learned in regional system development, and the existing components of the regional trauma system in the development of a comprehensive system of STEMI care in Michigan.

A STEMI is caused by the sudden development of a blood clot that completely blocks an artery in the heart. This can lead to damage that covers a large area of the heart muscle. The treatment priority is to open the blocked artery quickly, restoring the blood flow in order to save as much heart muscle as possible. STEMI treatments include percutaneous coronary intervention (PCI) wherein a balloon is inflated within the artery at the blockage to restore blood flow; fibrinolytic medications (“clot busters”) are the next best option; or coronary bypass surgery may be required in the most serious circumstances.

In Michigan, and nationally, heart disease is the leading cause of death and is a major cause of long-term disability. STEMI is a significant public health problem and carries a high risk of death and disability. The American Heart Association (AHA) estimates that as many as 250,000 people will suffer from a STEMI heart attack each year in the United States. Advances in STEMI care have resulted in significant reductions in deaths, attributed to treatments aimed at the rapid reperfusion of the STEMI patient, utilizing either fibrinolytic therapy, or PCI. Evidence demonstrates a mortality and morbidity advantage with primary PCI when this therapy can be delivered in a timely manner. The American College of Cardiology (ACC)/AHA guidelines and the European Society of Cardiology guidelines for STEMI are in agreement that early and complete reperfusion by mechanical PCI is optimal, with the door-to-balloon time of 90 minutes and door-to-needle time of 30 minutes.

According to the AHA, more than 30 percent of STEMI patients fail to receive any form of reperfusion therapy, often due to a lack of public awareness about the need for early access to care and activation of EMS, and the lack of a comprehensive system of cardiovascular care. Of those that receive thrombolytic therapy, fewer than half are treated with a door-to-needle time of less than 30 minutes. Of those that receive primary PCI, only 40 percent are treated with a door-to-balloon time of less than 90

minutes. In those patients who either receive no reperfusion therapy or delayed reperfusion therapy, the short- and long-term outcomes are significantly worse, as compared to patients treated within the timeframe recommendations of the ACC/AHA guidelines.

STEMI patients should be recognized as quickly as possible to identify those eligible for fibrinolytic or primary PCI therapy. Research has shown that both morbidity and mortality can be reduced by the approach of rapid interventional reperfusion within ninety (90) minutes of hospital arrival. Additional research has demonstrated that in-the-field recognition by pre-hospital providers utilizing 12-lead ECG, coupled with pre-hospital notification of the receiving facilities, can further reduce time to reperfusion, resulting in improved outcomes.

The Michigan STEMI System recommendations were developed with the goal of ensuring that all Michigan residents and visitors can receive timely and safe access to STEMI care regardless of geographical area. The plan requires verification of hospital STEMI resources by nationally recognized accrediting organizations or an in-state process prior to designation as a STEMI Center by the Department. Any hospital may voluntarily participate in STEMI Center designation at a level of care for which they are able to provide resources. The designation of differing levels of STEMI Center, based on the verification of the STEMI resources available, will enhance STEMI care throughout the state including rural, critical access hospitals, community hospitals and academic medical centers. Regionalization ensures that the various levels of STEMI care providers cooperate in system development with local medical control authorities, hospitals, EMS providers and rehabilitation providers. Regionalization also assures STEMI Center participation in EMS protocol development and evaluation of patient care. EMS protocols will be required to address assessment, triage, treatment, transport, and destination of STEMI patients based upon regional STEMI care resources.

Current STEMI treatment standards recommend treatment with primary PCI within 90 minutes of medical contact. Access and availability of PCI centers in this 90-minute time frame is limited within the state due to geographic distribution of PCI centers and STEMI support resources (Attachment D). In addition, lack of public awareness about early access to the medical system and EMS activation play a major role in reducing access to primary PCI in the recommended time frame. Although primary PCI is the preferred treatment for STEMI, fibrinolytic therapy within 30 minutes of medical contact, followed by transport to a PCI center is the alternative course of action. Evidence based research in the future may impact the current recommended timelines for treatment. National goal directed timelines or guidelines recommended by the STEMI Advisory Council will direct treatment parameters.

The Michigan STEMI System recommendations were developed by a multidisciplinary team of expert stakeholders including cardiologists, emergency physicians, STEMI coordinators, data registrars, quality improvement staff, hospital representatives, EMS agency representatives, medical control authorities and a regional trauma network representative. The planning process has been transparent and inclusive throughout. The system planning criteria was defined early in the planning cycle and the STEMI systems expert writing groups worked collaboratively to define the required system processes.

Implementation of the Michigan STEMI System recommendations will create a statewide hospital destination policy that clearly defines expectations for STEMI patient transport to the most appropriate STEMI Center, and will provide ongoing data collection and analysis for system improvement. A statewide system of STEMI care is designed to enhance coordination among multiple agencies including EMS dispatch, first responders, ambulance providers, hospitals, and regional networks to better ensure system performance and accountability.

## Leadership and Governance Discussion

A comprehensive system of care for STEMI should be integrated into the existing regionalized, coordinated, and accountable trauma system. The STEMI recommendations employ the existing EMS resources, as well as the current trauma system model, in order to prevent duplication of efforts, services and resources while maximizing efficiency and reducing overall costs. The current regional trauma networks have enhanced cooperation between the regions, as the system disregards geographical boundaries and institutional linkages in order to better serve patients.

The STEMI system of care is composed of EMS providers, hospitals, public health agencies and rehabilitation facilities utilizing a planned and organized response for STEMI patient care. This response includes coordinated and preplanned communication processes, accurate identification and level of STEMI treatment centers, with rapid, protocol-driven EMS treatment and transport to a designated STEMI treatment center, followed by rehabilitative support to return the patient back to a productive life.

These recommendations are flexible and inclusive and are designed to incorporate the unique needs of each region's resources. The goal of the plan is to ensure that STEMI patients are accurately identified, appropriately treated, and receive prompt access to the appropriate resources and optimal care necessary for a favorable recovery and return to their community.

A lead agency is required to ensure that a statewide system of care for STEMI is integrated with all of the components of the EMS system, and that the STEMI system of care is coordinated with other systems including the regional trauma and medical control authority networks, and where possible, STEMI systems of care in contiguous states. The lead agency must establish, implement, and maintain policies, procedures, and protocols for STEMI care within the EMS system. In this regard, the National Highway Traffic Safety Administration has recommended that Michigan pursue STEMI systems of care based upon the regional trauma system model. This plan integrates STEMI care into the governance process of the Regional STEMI Networks as a means to link and coordinate EMS, local medical control authorities, regional medical control authorities and hospitals to address systems of care for time sensitive emergencies.

Each region's unique needs are reflected in the structure of their advisory bodies, professional standards review organizations and subcommittees.

**Recommendation: Authorize Michigan's Lead Agency for a Statewide STEMI System**

In Michigan, the lead agency for STEMI Systems will be the Michigan Department of Health and Human Services (MDHHS). The Department will:

1. Implement and maintain a statewide plan for a regionalized STEMI system that is based upon the structure and governance of the statewide trauma system. The statewide STEMI system shall consist of eight Regional STEMI Systems that are merged into the current eight Regional Networks, serving as the approved Regional System of Care Network, and comprised of the local medical control authorities within the region.
2. Develop a process for the verification of hospital resources for STEMI patients.
3. Develop a process for the designation of STEMI facilities.
4. Develop a statewide STEMI data collection and performance improvement process.
5. Establish evidence based statewide STEMI care and national goal directed timelines approved by the STEMI Advisory Committee.
6. Approve regional STEMI triage and destination protocols for EMS

**Recommendation: Establish a statewide State STEMI Advisory Committee**

The Director of MDHHS will appoint a multidisciplinary STEMI Advisory Committee to advise the Department on all matters concerning the statewide STEMI system and the Regional STEMI Systems. At a minimum, the Committee shall be comprised of a cardiologist, a STEMI coordinator, a STEMI registrar, an emergency physician, a hospital representative, an EMS agency representative, and a medical control authority medical director. The best interests of the STEMI patient will be the primary concern of the committee's advice to the Department.

**Recommendation: Establish Regional STEMI Systems**

The Department will establish eight Regional STEMI Systems, merged into the current eight Regional Trauma Networks, serving as the approved Regional Systems of Care Network, to provide clinical oversight for the STEMI care provided in each respective region of the state. Regional STEMI Systems will be comprised of the approved Medical Control Authorities within the region. Each Regional STEMI System shall appoint a Regional STEMI Advisory Council and a Regional Professional Standards Review Organization for STEMI.

## Pre-hospital Discussion

The Pre-hospital care provided to STEMI patients is an essential component of the STEMI system of care and reducing death due to STEMI. In addition, it is essential that the Pre-hospital care is coordinated with the STEMI care provided in the designated STEMI treatment centers. The Pre-hospital components of STEMI care include communications, EMS medical direction, triage and destination protocols, and transportation to the appropriate STEMI treatment facility.

The existing Regional Trauma Networks have experience in developing triage and destination protocols for trauma patients and these will serve as a model for the development of STEMI protocols. Tiered triage protocols are regionally monitored to reduce both over-triage and under-triage in order to ensure the goal of getting the "right patient to the right place at the right time". As the regional governance bodies, comprised of the local medical control authorities, the Regional System of Care Network will be responsible for the respective Regional STEMI System development and adoption of destination protocols that link STEMI triage to ambulance transportation to the appropriate STEMI treatment center.

The expert writing group recommends that Michigan develop a statewide, regionalized, voluntary, all-inclusive STEMI system of care. A systematic approach to STEMI care ensures that STEMI patients are integrated into a system of regional health care providers who are well trained and have the resources to provide optimal care. It also supports the participation of hospitals to the extent, or level, that they are able to commit the necessary resources for the appropriate management of the STEMI patient. It also ensures that all STEMI patients are part of a system of coordinated care based on standardized triage criteria and regional destination protocols.

The Expert Writing Group recognizes that some hospitals may choose not to participate in the STEMI system of care. Regional STEMI Systems will identify hospital capability in the development of EMS STEMI destination protocols.

**Recommendation: Implement Tiered STEMI Triage and Destination Pre-hospital Protocols**

STEMI patients requiring the resources of a STEMI Receiving Center will be identified by 12 lead ECG, where available, and cardiac chest pain triage criteria established by the Regional STEMI System. Cardiac chest pain triage protocols will ensure that known or suspected STEMI patients are identified using 12 lead ECG, where available, and assessed using protocols that are established and approved by the Lead Agency, with the advice of the State STEMI Advisory Committee and the Quality Assurance Task Force. These protocols will ensure that identified STEMI patients are transported to a STEMI Receiving center, or a STEMI Referring Center when appropriate, and that Pre-hospital EMS alerts the destination STEMI Center that a STEMI patient is enroute.

Cardiac chest pain triage protocols will enable the STEMI system providers to identify those patients who require the resources of a STEMI Receiving Center, as well as those patients who are appropriately transported to a STEMI Referring Center for initial assessment and therapy, necessary stabilization and prompt transfer to the appropriate STEMI Receiving Center.

Each Regional STEMI System shall establish destination guidelines for transporting STEMI patients with the respective medical control authorities within the region.

**Recommendation: Implement an All-Inclusive STEMI System**

The Department will implement an “all-inclusive” system of care for STEMI throughout the state, which provides for the treatment of all STEMI patients throughout the continuum of pre-hospital, hospital, and rehabilitative care. This system allows for hospitals to voluntarily participate at the level of care at which they are able to commit, and are able to provide the resources required, for the appropriate management of the STEMI patient. An all-inclusive STEMI system ensures that STEMI patients are treated in a system of coordinated care structured for optimal patient outcome.

## Verification and Designation of STEMI Referring and STEMI Receiving Facilities Discussion

STEMI systems of care are being developed based upon the need to ideally deliver the patient to a designated STEMI Receiving Center for primary PCI treatment within 90 minutes of access to medical care. When that is not possible, the next option is to transport the patient to a designated STEMI Referring Center for fibrinolytic treatment and prompt transfer to a STEMI Receiving Center.

The resources of hospitals applying for designation as a STEMI Receiving Center shall be verified by a department approved national accreditation organization. Hospitals applying for designation as a STEMI Referring Center may have their resources verified either by a department approved national accreditation organization or may seek verification through an in-state process developed and implemented by the Department. Hospitals wishing to become Michigan designated STEMI Centers will be responsible for the process of the verification of resources and formal accreditation by a department approved nationally recognized accrediting organization or through the Michigan process.

The in-state verification process for STEMI Referring Centers will be analogous to that used for verification and subsequent designation of Level IV trauma centers in Michigan. The trauma program uses nationally developed criteria to evaluate the resources and processes of the Level IV trauma centers, the hospital site visits are performed by department trained subject matter experts from the state's Level I and Level II trauma centers. Each hospital verified as either a Level I or Level II trauma center is required to provide staff (subject matter expert) for inclusion in the site reviewer pool in order to implement the in-state verification process. The in-state verification process for STEMI Referring Centers will require the same manpower assistance from STEMI Receiving Centers in order to perform site visits to review and evaluate the resources and processes of hospitals applying to become STEMI Referring Centers.

STEMI Center verification will differ from trauma center verification because as mentioned previously, there is a single nationally recognized organization that verifies trauma center resources, the American College of Surgeons Committee on Trauma. STEMI Center verification and accreditation are currently offered by two nationally recognized organizations, The Joint Commission/American Heart Association and the American College of Cardiology which use similar, but not identical processes. The expert writing group reviewed the guidelines of both organizations and recommends that accreditation from both organizations should be recognized as verification of resources at the respective levels of this recommendation. The goal of the in-state process for verification of STEMI Referring Centers is to maintain the same verification criteria as the Department approved independent nationally recognized accreditation bodies.

As stated earlier, the ideal strategy is to get the STEMI patient to a STEMI Receiving Center within 90 minutes of symptom onset. Although primary PCI is the preferred treatment for STEMI, fibrinolytic therapy within 30 minutes of medical contact, followed by EMS transport to a PCI center is the alternative course of action.

All hospitals in Michigan can participate in the STEMI system of care and can provide some level of STEMI care to the residents of their communities, thus resulting in a truly inclusive system of care. Nevertheless, some hospitals may choose not to participate in the STEMI system of care. The Regional STEMI Systems will identify those non-participating hospitals in the development of EMS STEMI destination protocols.

#### **Recommendation: Verification of STEMI Centers**

In order to be designated by the department, each participating hospital must submit evidence of

current verification, by a nationally recognized accrediting organization, that the hospital has the resources to operate as either a STEMI Receiving or STEMI Referring center in an application for designation from the department. The written accreditation shall serve as verification to the department that the hospital will comply with the standards and resources for the requested level of STEMI designation throughout the current certification period. Hospitals that are unable to maintain the standards and resources for the accredited level of STEMI care during the accreditation period shall be required to promptly self-report their change of status or non-compliance to the Department and appropriate Regional STEMI System(s).

- 1). STEMI Receiving Center, evidence of current accreditation by a department approved nationally recognized accrediting organization that the hospital has the resources required to be verified as meeting the criteria equivalent for an accredited STEMI Receiving Center.
- 2). STEMI Referring Center, evidence of current accreditation by a department approved nationally recognized accreditation organization, or through the Michigan verification process, that the hospital has the resources required to be verified as meeting the criteria for an accredited STEMI Referring Center.

A Provisional STEMI Receiving Center or STEMI Referring Center will be required to submit a continuing compliance report to the Regional STEMI System and the Department every six months or until accredited by a department approved nationally recognized accrediting organization or is verified by the Department.

**Recommendation: Time Frame for Verification**

A hospital submitting evidence of verification as a STEMI Receiving or STEMI Referring center will submit documentation of current accreditation as established by a schedule created by the Department.

**Recommendation: Designation of STEMI Centers**

The Department will designate STEMI Center capability based on the Department's established verification process and the recommendations and advice of the State STEMI Advisory Committee and the STEMI Center's respective Regional STEMI Network. The Department will maintain a list of all currently designated STEMI Centers including their respective location and designation status.

**Recommendation: Periodic Re-designation of STEMI Centers**

The Department shall establish a mechanism for the re-designation of STEMI Centers based upon the verification time frame established in Recommendation 7.

## Data Collection, Performance Improvement and Education Discussion

The purpose of statewide STEMI performance improvement recommendations is to ensure that STEMI patients receive the highest quality of STEMI care throughout the continuum. This requires the collection of uniform and consistent data in order to monitor patient care processes and outcomes. The data is then used to identify areas for improvement, development, and implementation of corrective action plans, monitoring of compliance with corrective actions, and verification that corrective actions were effective.



STEMI system evaluation and performance improvement are functions of the Department's effort to evaluate statewide and regional system effectiveness, accessibility, and the quality and performance improvement of the STEMI system of care. The Department will also assist the regional STEMI systems by developing uniform statewide assessment measures and regional performance metrics for STEMI care. The Department will also be responsible for receiving state STEMI registry data and reporting back to the regions on system improvements and deficiencies that need to be addressed.

The evaluation and assessment of the STEMI system of care requires comprehensive and consistent data submissions for performance analysis and improvement. Designated STEMI Centers will be required to submit STEMI patient data quarterly into the state STEMI registry. This data will be used to evaluate system and regional processes regarding each significant element of the STEMI system. Basic outcome measures such as mortality, morbidity and timeliness of procedures will be assessed, as well as an analysis of process measures such as response times, protocol compliance and transfer times, will be used to improve overall patient care.

Performance improvement measures are included in the evaluation process used by nationally recognized accrediting bodies during the accreditation process for a hospital to become a STEMI treatment center. In addition, performance evaluation priorities such as EMS response times, in hospital "door to needle" times, "door to balloon times", or arrival-to-transfer times may be identified by regional STEMI systems as important measures of performance.

The Regional STEMI Systems will develop performance improvement plans focused externally on regional system improvements using data submitted to the state STEMI registry.

Ongoing public education programs about STEMI symptoms and the need for immediate care can reduce the time delays and improve outcomes for STEMI patients. The time elapsed between onset of symptoms and arrival at an appropriate hospital emergency department is often responsible for the poor outcomes related to STEMI. The lack of public awareness of STEMI signs and symptoms, the need for immediate specialized care and the need to call 911 are the main causes of delayed STEMI treatment.

**Recommendation: Data Collection and Confidentiality**

All designated STEMI Centers that receive STEMI patients are required to participate in the data collection process established by the Department.

Protection of STEMI patient data collected for regional STEMI system performance improvement will be provided and maintained through existing state legislation included in the Public Health Code.

**Recommendation: Data Collection System**

A statewide STEMI data registry will be established by the Department, including the establishment of a minimum data set, data dictionary, and the data upload and data verification process. The submission of data to the STEMI registry shall be phased-in in order to support the efficient and orderly establishment of designated STEMI facilities.

STEMI Centers will submit the required data to the state STEMI registry according to a schedule established by the department. The STEMI registry shall utilize a standardized data set

recommended by the State STEMI Advisory Committee and approved by the department. The data set will be uploaded to the state STEMI data registry by each facility.

Additional STEMI data elements not a part of the standardized data set may be required based upon the recommendation of the STEMI Advisory Committee and approved by the Department.

**Recommendation: STEMI Care Performance Improvement**

Each medical control authority will adopt and implement regional STEMI care protocols that include triage and destination guidelines, and a performance improvement plan as developed by the Regional STEMI System and approved by the Department. Performance Improvement will be supported by the Bureau of EMS, Trauma and Preparedness, Bureau of Health and Wellness and the Bureau of Epidemiology and Population Health.

**Recommendation: STEMI Prevention and Education**

The Department, with the advice of the State STEMI Advisory Committee, will support coordination among state and regional STEMI awareness, prevention initiatives and programs. The Department will work with STEMI care stakeholders throughout the state to support ongoing STEMI care provider and community education efforts.

## Michigan Stroke and STEMI Systems of Care Implementation

Legislation will be required in order to implement regionalized Stroke and STEMI Systems for Michigan. A key provision for legislation is to authorize the Michigan Department of Health and Human Services (MDHHS) as the lead agency for developing a Stroke and STEMI Systems implementation plan based on the existing framework of the statewide trauma system. The Stroke and STEMI Systems recommendations will serve as the basis for the development of the Administrative Rules required for implementing the components of the Stroke and STEMI Systems.

## In State Verification and Designation Process

The in-state verification process will require the development of standards, department training of evaluation staff, and support for verification team site visits. This includes the development of policies, process, forms and tools for facilities and others.

## Michigan Stroke and STEMI Systems of Care Finance

Resources will be needed in order to incorporate Stroke and STEMI systems into the existing trauma system. The following are suggested minimum resources that will be needed to operationalize the System of Care for Time Sensitive Emergencies. Additional resources will be necessary beyond this guidance.

**Designation and Verification Coordinator** This position will be responsible for the maintenance, tracking and coordination of credentials and documents that verify hospital resources from the various approved national accrediting organizations. These documents and credentials are used in conjunction with state requirements in the process of facility designation. The position is also responsible for the development and coordination of an appeals process for verification and designation dispute.

**Stroke and STEMI Registries:** The effectiveness and efficiency of stroke and STEMI systems of care requires the collection and analysis of data, including data from treating hospitals as well as from the

EMS system. EMS providers are currently required to submit data regularly to Michigan Emergency Medical Services Information System (MiEMSIS). Designated trauma centers are required to submit data to the Michigan Trauma Registry.

Hospitals designated as Stroke or STEMI Centers will also be required to submit data into the Michigan Stroke Registry and/or Michigan STEMI Registry. The department will be responsible for collating, analyzing, and distributing aggregate data regarding stroke and STEMI care to the regions and across the state.

**Database Coordinator:** This position will coordinate the collection of stroke and STEMI facility data, including technical support for designated center data input into the stroke and STEMI registries.

**Data Analyst:** This position will be responsible for the analysis, surveillance and evaluation of stroke and STEMI data, and the preparation of aggregate reports on system performance, monitoring trends, data integration, and responding to data requests.

**Stroke and STEMI Systems of Care Coordinator:** This position will be responsible for the planning, coordination and evaluation of the stroke and STEMI systems of care. The position will also be responsible for working with the Regional Trauma Coordinators to support and coordinate the activities of the regional stroke and STEMI networks as integrated into the Regional Trauma Networks.

## Summary

Michigan is committed to ensuring that residents and visitors have access to quality, efficient and effective healthcare. That commitment is evident in the fact that for eight years, passionate stakeholders have committed time and energy to carefully planning and considering a System of Care for Time Sensitive Emergencies. That discussion was predicated on the need for a fully functioning trauma system that would be the foundation for stroke and STEMI systems of care. That system is soon to be fully functioning. By the close of 2021 it is anticipated that 124 acute care facilities will have completed the verification/designation process, all of these facilities will have contributed data to the state trauma registry routinely and all eight trauma regions are continuing their work, monitoring and guiding the trauma system. This trauma system experience will inform and guide the implementation of a Systems of Care for Time Sensitive Emergencies. Stakeholders have continually demonstrated their commitment to develop and maintain a regionalized, coordinated, accountable system of care for Michigan residents experiencing a time sensitive emergency due to trauma, stroke or STEMI that will provide the best opportunity for a positive outcome and return to a productive quality of life.

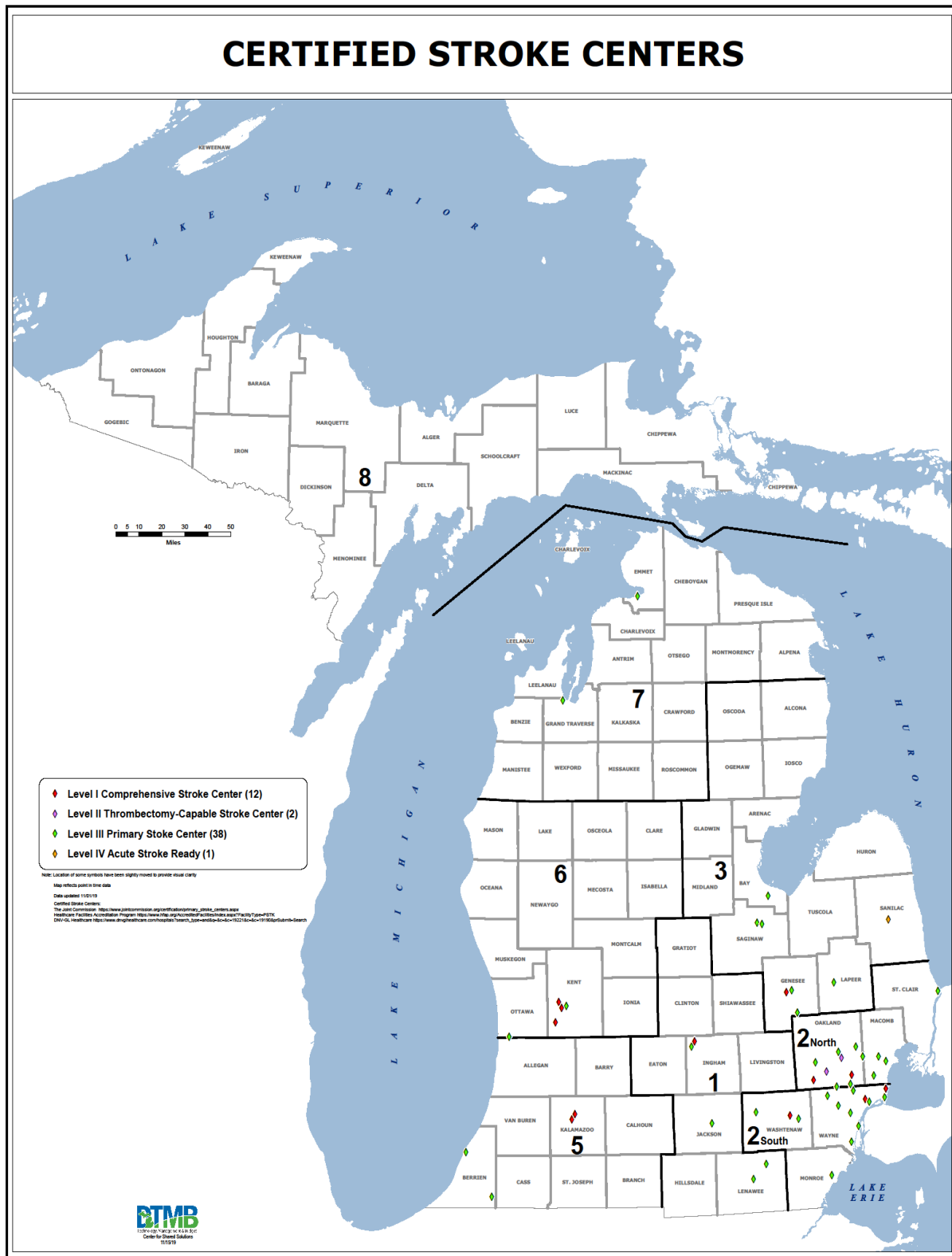
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Tara Lanz, BSN, RN	Sparrow Health System Ionia	Emergency Department Manager
Michael Laurer, MD	Mid-Michigan Health	STEMI Medical Director/Invasive Cardiology
Michele McLean, MD	Covenant Healthcare-Life Net	Emergency Physician-Medical Director
Charles McWherter, EMT-P	Mid-Michigan Health	STEMI Group Leader
Brahmajee Nallamotheu, MD	Michigan Medicine	Interventional Cardiology
Konni Phillips, RN	McKenzie Health System	Trauma Program Manager
Patricia Schafsnitz, RN	McKenzie Health System	Director of Nursing
Wayne Snyder, MPA, EMT-P	MDHHS	Systems of Care Consultant
Kathie Thomas, DHA, MPH	American Heart Association	Senior Director of Quality
Michael Thomas, MD	Michigan Medicine	Interventional Cardiology
Kathy Wahl, MSN, BS, RN	MDHHS	EMS and Trauma Division Director
Marta Wiesen, MSN, RN	Munson Healthcare	STEMI Liaison
Cheryl Wieber, MHA	Munson Healthcare	Executive Director Heart and Vascular Services
Eileen Worden, BSN, RN	MDHHS	Trauma Manager
Alison Zeerip, MSN,	Mercy Health St. Mary's	Clinical Nurse Specialist

## Attachment C – Map of Certified Stroke Centers in Michigan



# Attachment D – Map of Accredited Chest Pain Centers in Michigan

