

March 2015

Building a Stroke System in Louisiana

Purpose

U.S. Centers for Disease Control and Prevention ranks Louisiana as the ninth highest state for stroke deaths (2009). Stroke is the fourth highest killer of Louisiana residents,¹ and stroke affects an estimated 700,000 people each year in across the nation. Approximately 80% of strokes are ischemic and the remaining 20% are hemorrhagic. Although most survive, many are burdened with major disabilities.² Today, the optimal care settings to address incidents of stroke are Advanced Comprehensive and Primary Stroke Centers certified by agencies, such as, The Joint Commission, DNV, or Healthcare Facilities Accreditation Program (HFAP). These organizations are responsible for maintaining national standards for health care organizations and programs. Joint Commission certification and HFAP are recognized nationwide as a symbol of quality that

reflects an organization's commitment to meeting certain performance standards.³

Currently, Louisiana is actively developing a system of care to comprehensively treat incidents of stroke. Only two Advanced Comprehensive Stroke Centers and twelve Advanced Primary Stroke Centers exist, many of which are geographically mal-distributed within the State's borders. The Louisiana Emergency Response Network (LERN) is utilizing a framework of best practices and lessons learned from other states to promote and facilitate the development of an ideal stroke system of care.

This paper provides and explains the framework.

Introduction

LERN is an agency of state government, created by the Louisiana Legislature in 2004 and charged with the responsibility of developing and maintaining a statewide system of care coordination for patients

suddenly stricken by serious traumatic injury or time-sensitive illness.

Funding for the establishment of LERN operations began in July 2006. Since then, the LERN Board of Directors (hereafter referred to as “the board”) has established nine regional commissions populated with stakeholder volunteers that live and work within the region they represent. Recognizing the lack of access to stroke treatment across the state, LERN formed a work group of subject matter experts and invested community leaders from throughout the state to head the Louisiana Stroke Initiative in an effort to develop a system that could provide high level stroke care to all Louisiana residents.

Per Louisiana legislation RS 40:2845, the board works with the Louisiana Department of Health and Hospitals to develop a stroke system that is designed to promote rapid identification of and access to appropriate stroke resources statewide. For the board to fulfill this duty, an effective plan for public education plus an integration plan for pre-hospital (EMS) and hospital processes was developed. LERN utilizes the following framework to build the ideal stroke system of care in Louisiana.

I. Access to Definitive Care

Whenever a stroke occurs, the time between the onset of symptoms and access to definitive care is critical. The term “window of opportunity” is often used to describe the first three hours after the onset of symptoms. Stroke patients receiving definitive care within this three-hour “window” have an increased chance of independence, but it is important to understand that with every minute that passes,

millions of brain cells die and the effectiveness of the treatment is reduced. Tissue plasminogen activator (tPA) is the only FDA approved intervention for the treatment of an occlusive stroke within the first few hours. In the setting of ischemic stroke, tPA causes the components of a clot to break apart, restoring blood flow to the brain, but it must be administered within the first few hours of onset to be effective.⁴

Multiple published studies indicate a decrease in patient mortality for patients treated in designated stroke centers, including a Duke University study of more than 30,000 patients treated in the New York hospital system. The study found that admission to a designated stroke center was associated with a 2.5 percent absolute reduction in 30-day all-cause mortality. The study further demonstrated that admission to a designated stroke center was associated with increased use of thrombolytic (tPA) therapy by 2.2 percent.⁵

Access to definitive care no longer means the delivery of a patient directly to a Comprehensive or Primary Stroke Center. Using the “hub and spoke” model, where a hub Comprehensive or Primary Stroke Center links to spoke hospitals via telemedicine or telephone consultation, all patients can receive life-saving access to care and treatment with tPA as assisted by a physician with stroke expertise. Thrombolytic can be “dripped” at the spoke hospital and the patient then “shipped” to a hub hospital for subsequent treatment, if the spoke hospital does not have the necessary resources to complete stroke management given the risks of tPA or severity of disease. This “drip and ship” approach to delivering thrombolysis for acute ischemic stroke has been proven safe and is faster than transfer before tPA in the “ship then drip” model.^{6 7} In fact, a

study published in *Stroke*, “Telemedic Pilot Project for Integrative Stroke Care (TEMPiS)”, concluded patients treated with tPA by spoke hospitals produced virtually the same outcomes as hub hospitals.⁸ In addition, the randomized “Stroke DOC trial” in the United States showed that hospitals with access to telemedicine for stroke care resulted in more accurate diagnosis and less variation from protocols.⁸

LERN is promoting a system of transporting stroke patients to tPA capable centers. Primary and secondary destination protocols were developed by the LERN Stroke Workgroup and LERN EMS Stroke Workgroup. Transportation to the two Comprehensive Stroke Centers and twelve Primary Stroke Centers, five of which are located in Greater New Orleans Area (Region 1), could only provide access to timely care to a minority of Louisiana citizens.

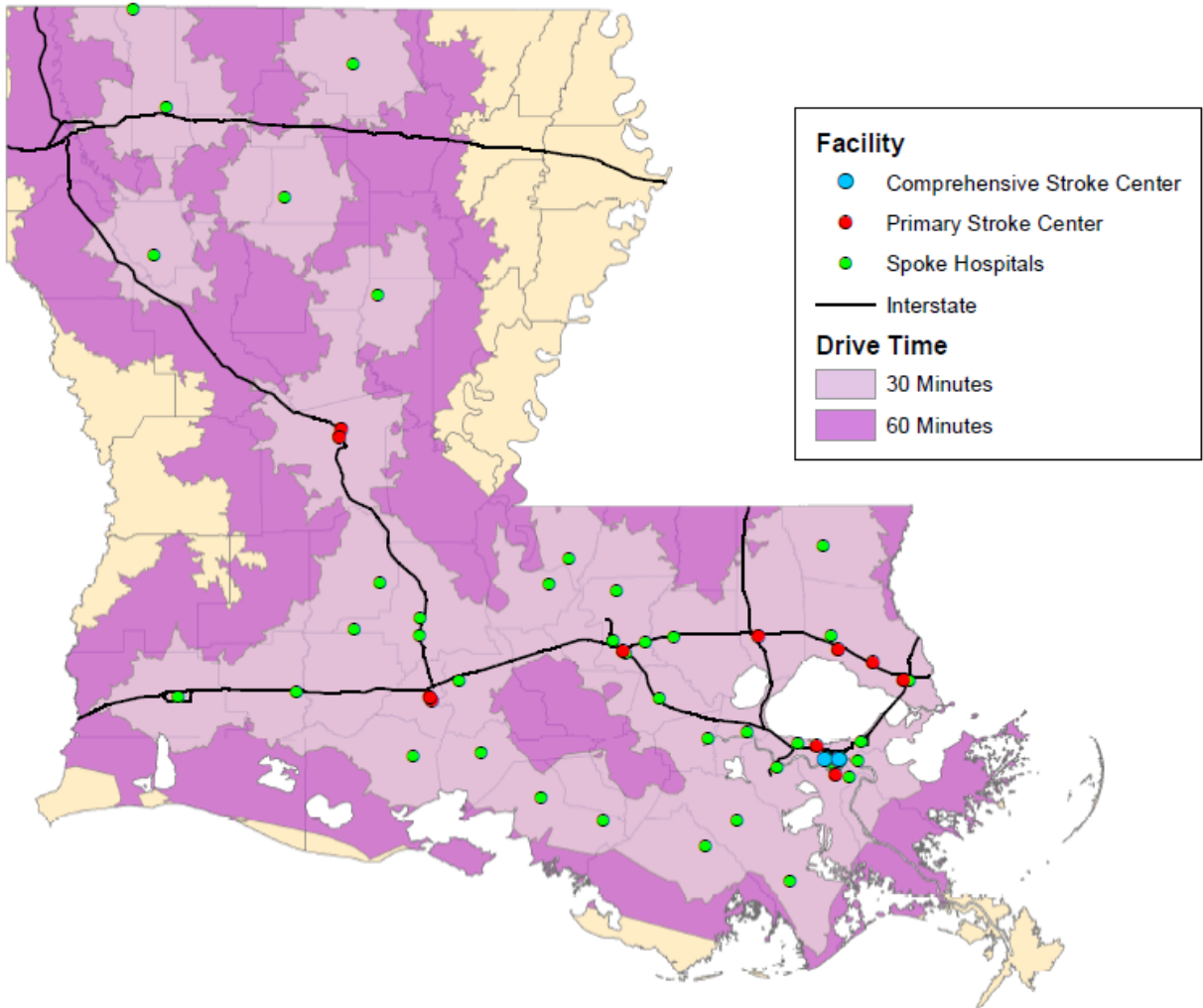
With establishment of criteria for and attestation of Acute Stroke Ready Hospitals and broad implementation of formalized stroke telemedicine services, access to stroke expertise has been greatly expanded and patients suspected of acute stroke are transported to the closest Comprehensive (Level I), Primary (Level II) or Acute Stroke Ready Hospital (Level III). However, there is much more work to be done.

The northeast, northwest, and southwest regions of the state continue to have major gaps in coverage of even Acute Stroke Ready Hospitals (LERN Level III) within a timely distance. At the time of this publication, 40 of the 58 Acute Stroke Ready Hospitals have partnered with a Comprehensive or Primary Stroke Center for telemedicine coverage, or have outsourced telemedicine services from national companies. Furthermore, statewide education is needed to improve stroke recognition, time to access of care, and experience of spoke and non-spoke hospitals in administering tPA safely and efficiently.

Part of the LERN education initiative is accomplished by the distribution of Stroke Toolkits and Reference Cards to Acute Stroke Ready Hospitals which provide resources for care of stroke patients. Education also includes information on how to reach out to the LERN Communication Center for assistance with direction to the closest LERN Level I, II, or III stroke facility, or for when secondary transfer is indicated and a formal relationship has yet to be established with a higher level center.

Figure 1 provides a general picture of the coverage areas available through Louisiana’s two existing Comprehensive Stroke Centers and twelve Primary Stroke Centers and (tele-stroke) spoke hospitals.

Figure 1 – Drive Times to Comprehensive and Primary Stroke Care and Tele-Stroke Spoke Hospitals



To capitalize on the decreased rate of mortality seen in patients receiving care in a timely fashion, Louisiana must continue to build a system of designated stroke centers and tele-stroke enabled hospitals that can provide all Louisiana residents with access to definitive care. To aid in designation and classification, LERN will use nationally recognized criteria for participating hospitals to distinguish stroke treatment hospitals by their capabilities – LERN Level I, II, III, or IV – establishing treatment and transfer guidelines for each level.

While adequate treatment facilities are imperative, they are only one piece of the stroke system of care. Professionals, both pre-hospital (EMS) and emergency department staff, must be trained to recognize the signs of stroke and utilize guidelines for treatment. LERN has conducted state stakeholder meetings and continues to support the development of programming to ensure proper identification of stroke symptoms and utilization of guidelines for patient delivery and treatment.

II. Patient Volume and Care

Health care quality research has produced an extensive amount of literature that documents superior patient outcomes for hospitals and physicians with higher patient volumes. This literature suggests that substantial reductions in mortality rate can be achieved through regionalized treatment models for certain high-risk conditions, including stroke.⁹ In fact, according to a recent study published by the *Journal of NeuroInterventional Surgery*, higher volume endovascular stroke centers have faster times to treatment, higher reperfusion rates, and higher rates of good clinical outcomes.¹⁰

The Joint Commission acknowledges this greater rate of effectiveness among high volume hospitals in its *Comprehensive Stroke Center Certification Requirements* and calls for a diagnosis of at least 1) 20 patients with subarachnoid hemorrhage, 2) 15 endovascular coiling and 10 surgical clipping procedures performed for aneurysms per year and 3) for the administration of tPA to 25 patients per year on average, including administration through telemedicine and transferred patients.¹¹ Hospitals in Louisiana seeking LERN Level I stroke center designation must achieve The Joint Commission's Comprehensive Stroke Center certification.

Low volume centers are a reality across the state and in rural locales. Understanding this, LERN established patient care guidelines for the four levels of LERN stroke center designation to balance the best care possible with available resources. The full list of requirements for each LERN level is included in Section IV. Resources.

III. Population Density and Rate of Stroke

Currently, only two Comprehensive Stroke Centers exist, both located in New Orleans. The twelve existing Primary Stroke Centers are mal-distributed – located in New Orleans, Covington, Slidell, Hammond, Lafayette, Baton Rouge, and Alexandria only. This, however, represents substantial progress, compared with just 2012, when only the New Orleans, Baton Rouge, Lafayette, and Alexandria areas had access to Primary Stroke Centers. Densely populated areas in Louisiana without direct access to Primary Stroke Centers include Lake Charles, Shreveport, and Monroe. While some of these areas do have access to tele-stroke enabled hospitals, the ideal network would be comprised of hubs of Comprehensive and/or Primary Stroke Centers (LERN Level I and Level II) in every densely populated area with access to tele-stroke enabled spoke hospitals (LERN Level III) in rural areas.

Development of additional Comprehensive and Primary Stroke Centers, along with LERN Level III centers, will aid in providing greater access to care throughout the state. Notoriously underserved, rural populations that are tele-stroke enabled or participate in transfer guidelines will no longer be hindered by a lack of resources such as an on-staff neurologist or stroke expert.¹² With formalization of Louisiana's stroke system, 2 CSCs were certified in 2013 and many gaps have been filled by 4 additional PSCs and 7 Level III Acute Stroke Ready Hospitals.

Figure 2 is a Louisiana population density map noting the current Primary and Comprehensive Stroke Centers. **Figure 3** depicts the rates of stroke mortality and current location of Primary and Comprehensive Stroke Centers. Together these

figures show that many high population and high stroke mortality areas are not within driving distance of a CSC or PSC.

Figure 2 – Louisiana Population Density Map with Primary and Comprehensive Stroke Centers

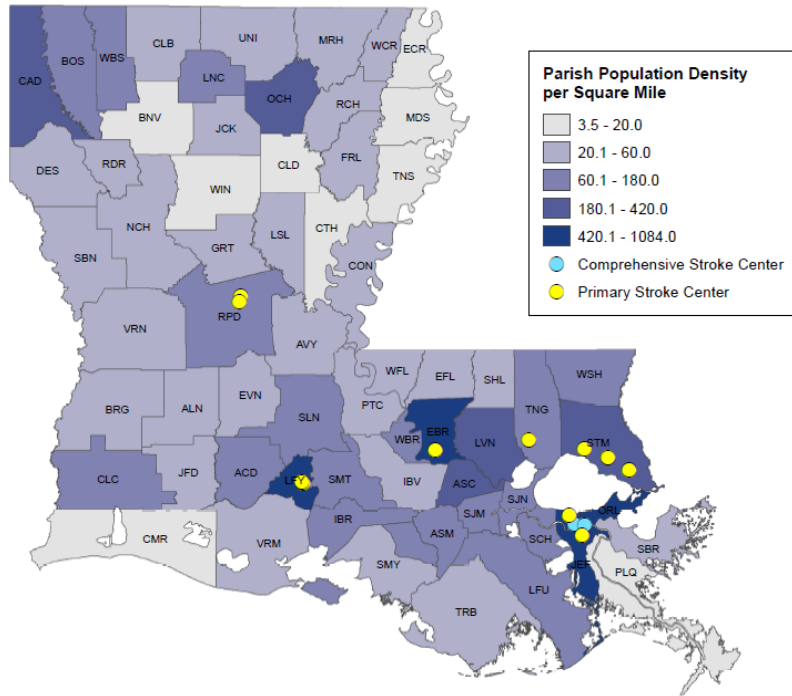
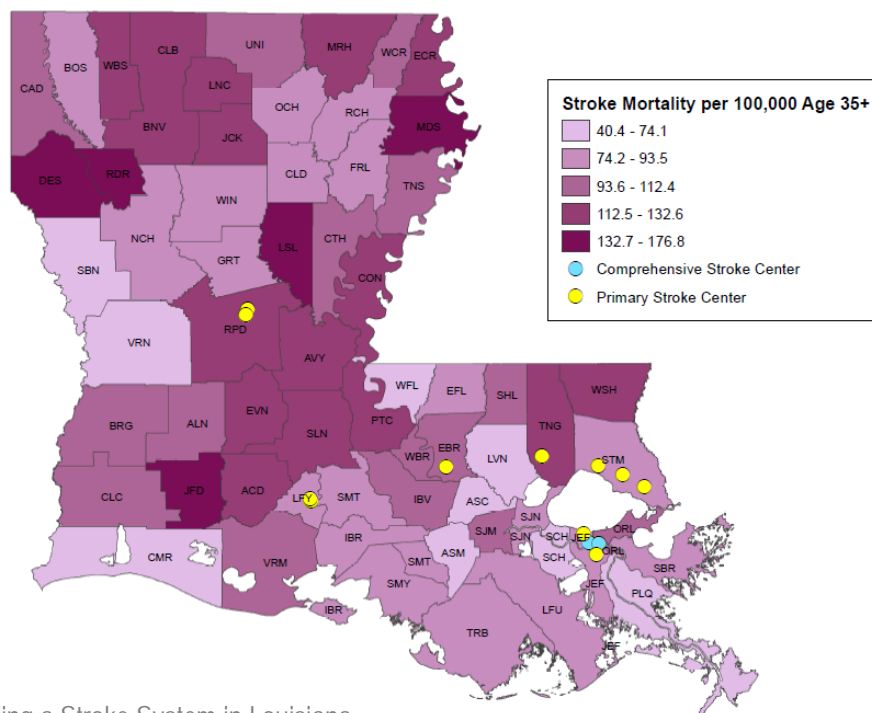


Figure 3 – Louisiana Stroke Mortality Rate with Primary and Comprehensive Stroke Centers



IV. Resources

Comprehensive and Primary Stroke Centers (LERN Level I and Level II, respectively) require the availability of a stroke unit, CT-scanners, laboratory, the ability to administer tPA, and the use of guidelines and quality control mechanisms. Comprehensive Stroke Centers must be willing to commit to 30-minute coverage for vascular neurology and neurosurgery and Primary Stroke Centers must commit to 30-minute coverage for neurological expertise and two-hour coverage for neurosurgery.

Level III centers do not require neurosurgery support, but they are required to demonstrate quality of stroke care by involvement in a quality control program such as American Stroke Association Get with the Guidelines (GWTG), or submission of a board approved data set to LERN. Those hospitals that submit data to LERN or participate with GWTG are

considered “confirmed” LERN level III stroke centers. Data submitted quarterly to LERN is reviewed by the stroke medical director with the intent of providing feedback and education when areas in need of improvement are identified.

Table 1 illustrates all required criteria for each LERN Stroke center designation.

In a survey conducted by the LERN stroke work group, only seven of 71 hospitals indicated a vascular neurologist on staff. LERN recognizes the scarcity of vascular neurologists and neurosurgeons and the challenge it presents to the development of an ideal stroke system of care. Availability and willingness of neurologists to support a designated stroke center is a critical factor that impacts the ongoing viability of existing centers and the spoke hospitals they support, and the establishment of new Comprehensive and Primary Stroke Centers.

Table 1 – LERN Stroke Center Criteria

Criteria	LERN Level IV	LERN Level III	LERN Level II (Primary Stroke Center)	LERN Level I (Comprehensive Stroke Center)
Physician staffed ER 24/7	X	X	X	X
CT scan available <12h	X			
CT scan available 24/7		X	X	X
Lab < 45 minutes		X	X	X
Proficient tPA delivery		X	X	X
Neurological expertise		X	X	X
Vascular neurology <30 min				X
Neurosurgery <2 h			X	
Neurosurgery <30 min				X
Interventional				X
Research				X
Training programs				X
Stroke unit			X	X
ICU			X	X
NICU				X
Quality control		CMS required core measures for stroke	CMS required core measures for stroke/Joint Commission	CMS required core measures for stroke/Joint Commission
Guidelines for stroke		X	X	X

Thus, LERN’s established criteria is designed to build upon the hub and spoke model to make the most of available resources, ensuring all hospitals are stroke ready and have adequate measures in place to treat stroke patients in-house or at other hospitals.

V. Conclusion

Louisiana’s two Comprehensive and twelve Primary Stroke Centers and their spoke hospitals are not adequate to provide timely access to care for all Louisiana residents. Significant geographic holes in Louisiana’s

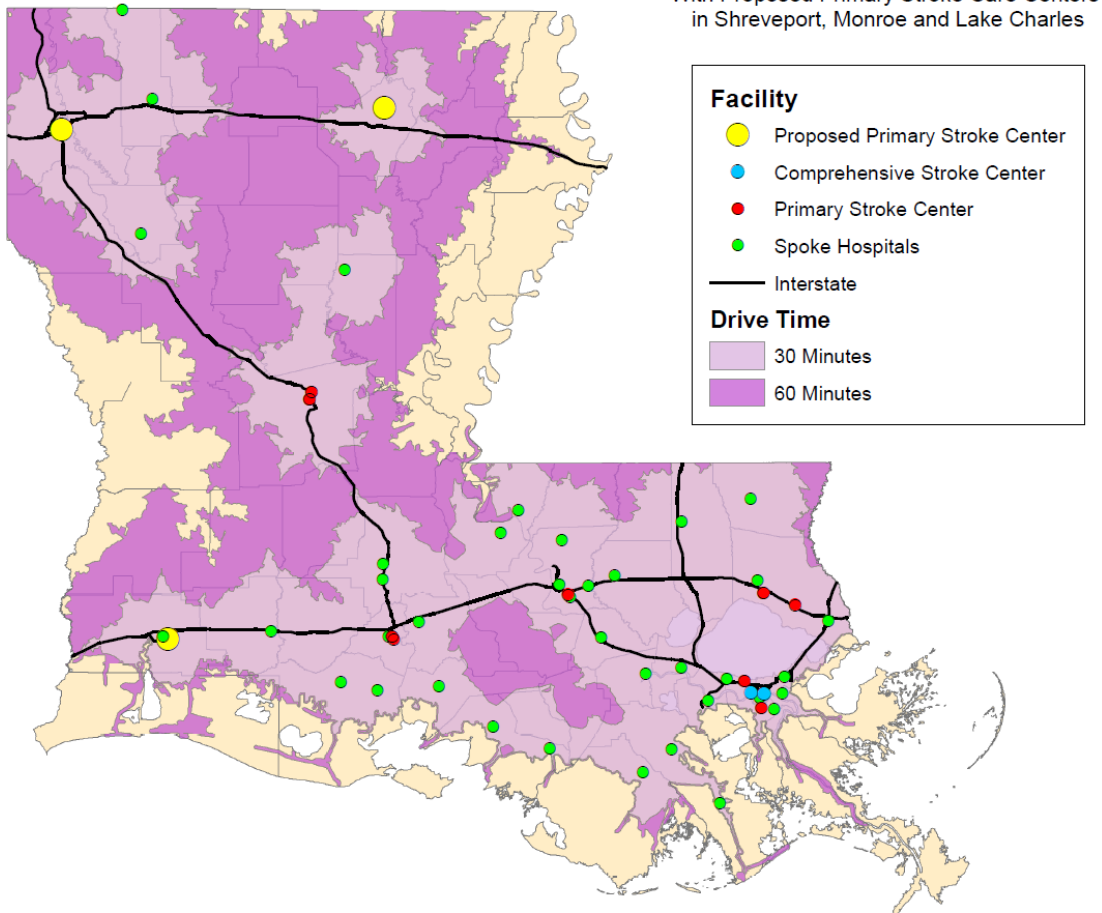
stroke care network exist, leaving many of our citizens at risk.

LERN is therefore working with the Department of Health and Hospitals to develop a stroke system to ensure adequate coverage in densely populated areas and further expand spoke hospital access that fill geographic holes in the stroke system of care, promoting the rapid identification of and access to appropriate stroke resources statewide. **Figure 4** depicts that future.

LERN’s goal is to meet the stroke care needs of all Louisiana residents while using available resources in the most efficient manner possible.

Figure 4 – Proposed Stroke Center Map (Need New Map)

Drive Times to Comprehensive and Primary Stroke Care and Tele-Stroke Spoke Hospitals



References

- ¹ "Louisiana Fact Sheet." Center for Disease Control. Web. 23 Apr. 2013. <http://www.cdc.gov/nchs/pressroom/states/LA_2011.pdf>.
- ² Derdeyn, Colin D., MD. "Stroke Systems of Care – The benefits of mandatory EMS transport of stroke patients to designated centers." *Endovascular Today*. Sept. 2009. Web. 23 Apr.2013. <http://bmctoday.net/evtoday/2009/09/article.asp?f=0909_05.php>.
- ³ "About the Joint Commission." The Joint Commission. Web. 23 Apr.2013. <http://www.jointcommission.org/about_us/about_the_joint_commission_main.aspx >.
- ⁴ Fonarow et al. Timeliness of tissue-type plasminogen activator therapy in acute ischemic stroke: patient characteristics, hospital factors, and outcomes associated with door-to-needle times within 60 minutes. *American Heart Association*. 2011;123. Web. 23 Apr.2013. <<http://www.ncbi.nlm.nih.gov/pubmed/21311083>>.
- ⁵ Chan et al. Association Between Stroke Center Hospitalization for Acute Ischemic Stroke and Mortality. *The Journal of the American Medical Association*. 2011;305(4):373-80.
- ⁶ *Emerg Med*. 2011 Aug;41(2):135-41. doi: 10.1016/j.jemermed.2008.10.018. Epub 2009 Mar 9.
Is the drip-and-ship approach to delivering thrombolysis for acute ischemic stroke safe?
Martin-Schild S1, Morales MM, Khaja AM, Barreto AD, Halleivi H, Abraham A, Sline MR, Jones E, Grotta JC, Savitz SI.
- ⁷ Saler M, Switzer JA, Hess DC. Use of Telemedicine and Helicopter Transport to Improve Stroke Care in Remote Locations. *Curr Treat Options Cardiovasc Med*. 2011 Jun; 13(3): 215–224.
- ⁸ Audebert et al. "Telemedicine for Safe and Extended Use of Thrombolysis in Stroke : The Telemedic Pilot Project for Integrative Stroke Care (TEMPiS) in Bavaria." *The American Heart Association*. 29 Dec. 2004. Web. 23 Apr.2013 <<http://stroke.ahajournals.org/content/36/2/287.full.pdf>>.
- ⁸ Meyer et al. Efficacy of site-independent telemedicine in the STRoKE DOC trial: a randomised, blinded, prospective study. *The Lancet Neurology*. 2008;1(9):787-95.
- ⁹ "AHA Scientific Statement - Recommendations for the Establishment of Stroke Systems of Care." *American Heart Association*. 2005;36 Web. 23 Apr.2013.< <http://stroke.ahajournals.org/content/36/3/690.full>>.
- ¹⁰ Gupta et al. Higher volume endovascular stroke centers have faster times to treatment, higher reperfusion rates and higher rates of good clinical outcomes. *The Journal of NeuroInterventional Surgery*. 2012.
- ¹¹ "Facts about Advanced Certification for Comprehensive Stroke Centers." The Joint Commission. Aug. 2012. Web. 23 Apr.2013. <http://www.jointcommission.org/assets/1/18/Comprehensive_Stroke_Center_Certification.pdf>.
- ¹² "Telestroke is Cost-effective for Hospitals, Mayo Clinic Researchers Show." *Mayo Clinic*. 4 Dec. 2012. Web. 23 Apr.2013. <<http://www.mayoclinic.org/news2012-sct/7192.html>>.