

Medical University of South Carolina (MUSC) Telestroke Program

Overview

The Medical University of South Carolina (MUSC) in Charleston has over 15 years of experience providing telehealth services through its Center for Telehealth (CFT). MUSC's telestroke program provides remote consultations and treatment recommendations for patients with suspected strokes who present in rural and community hospitals. The network operates as a "hub-and-spoke" model where MUSC, with comprehensive stroke resources (hub site), provides stroke consultations to smaller, often rural hospitals lacking such resources (spoke sites). MUSC's telestroke network consists of 37 rural and community hospitals throughout South Carolina.

Spoke sites have access to MUSC's vascular neurology physicians via live synchronous interactive audiovisual technology 24 hours a day. When a telestroke consultation is requested, MUSC physicians partner with spoke sites to quickly gather information about the stroke patient, administer the NIH Stroke Scale, review CT scans, and provide treatment recommendations. MUSC monitors and shares performance trends with spoke sites to support continuous quality improvement.

Program Components

MUSC CFT empowers "everyone, even on-call nurses," to launch a telestroke consultation, as time to treatment is the most critical factor in stroke care. The table below describes the program components.

	Hub Site (MUSC)	Spoke Sites
Staff	<ul style="list-style-type: none"> Two neurovascular physicians scheduled 24 hours a day Three or four additional physicians on call 	<ul style="list-style-type: none"> Emergency department providers Nurses Emergency medical services
Activities	<ul style="list-style-type: none"> Admission transfer center pages MUSC telestroke physician on call Care coordinator speaks to patient to get a family medical history, typically while the patient is in the computerized tomography (CT) machine Physician receives immediate access to imaging, reviews it, and discusses it with the spoke site physician to make a recommendation 	<ul style="list-style-type: none"> Patient presents with suspected stroke Calls the telestroke program (through the admission transfer center) Registers the patient in the telestroke system Conducts diagnostic tests (e.g., NIH Stroke Scale, CT scan) Patient receives treatment

Intended Participants

The telestroke program provides virtual consultations in emergency departments, inpatient units, and ambulances. Consultations from South Carolina-based physicians who are familiar with regional experiences of stroke presentation and the patient population also result in education and mentorship to spoke site physicians, nurses, and emergency medical technicians.

Problem

South Carolina is in the US "stroke belt," a region with high stroke illness and deaths. Researchers have described disparities in stroke admission rates and outcomes between African American and White patients in South Carolina.¹ Thrombolytics such as tissue plasminogen activator (tPA) can reduce the long-term impact of acute ischemic stroke if given to the patient within 4.5 hours of symptom onset. Many small, rural hospitals in South Carolina have limited expertise needed to treat stroke patients with tPA.²

Strategy

The telestroke program operates as a "hub-and-spoke" model where MUSC, with comprehensive stroke resources, provides 24/7 remote stroke consultation to hospital and emergency medical services (EMS) providers in smaller, often rural communities that lack local stroke expertise.

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Goals and Expected Outcomes

Before the implementation of MUSC's telestroke program in 2008, only 38% of South Carolinians lived within 60 minutes of expert stroke care.^{2,3} Following implementation, about 77% of South Carolina residents live within 60 minutes of expert stroke care.⁴ Access to telestroke improves stroke outcomes and reduces unnecessary transfers, allowing patients to stay in their local hospitals.

Progress Toward Implementation

MUSC maintains a registry of all patients evaluated in the telestroke network. MUSC reviews trends in stroke quality measures, such as treatment times, monthly. MUSC also sends report cards to each site quarterly with recommendations to improve patient treatment.

MUSC employs physicians and structures contracts so that telehealth is part of their daily routines and compensation. All telestroke physicians are credentialed at all spoke sites. MUSC's telestroke team includes site coordinators, success coordinators (technical assistance), transfer center staff, grant administrators, staff for data collection, contracts, credentialing, and development. There is strong buy-in and continuous feedback collected from staff and leadership across the telestroke network.


The telestroke program started in 2008 through funding from a Duke Endowment grant to MUSC's Department of Neurology. Since 2014, legislative funds have supported infrastructure costs to expand the program statewide. Consulting telestroke providers bill professional fees for their consultation, and the program is sustained through contracts with spoke sites.

Health Equity


South Carolina has a high prevalence of heart disease.⁵ Over one-third of residents live in a rural area. Barriers to care include geographic distances, limited transportation, poverty, and a lack of community-based providers.⁶ MUSC creates social determinants of health "heat maps" using public data sources to assess health equity. MUSC uses state funding for telehealth initiatives to address gaps in care, especially for rural communities.

Reach and Impact


 **Over 30,000 telestroke consultations** from 2008 to 2022


 **85% of telestroke patients remained** in their community for treatment⁷

 **\$870,000 in cost savings to payers and patients** due to averted transfers⁸

 **18% tPA rate** versus 6% tPA rate nationally

 **25% percent higher likelihood of receiving tPA** in telestroke counties⁹

 **Decreased mortality rates**⁹

 **9% greater chance of survival** in telestroke counties⁹

 **Less disability**

This document does not constitute an endorsement of any organization or program by CDC or the federal government, and none should be inferred.

¹ Howard G, Kleindorfer DO, Cushman M, et al. Contributors to the excess stroke mortality in rural areas in the United States. *Stroke*. 2017;48(7):1773-1778. doi:10.1161/STROKEAHA.117.017089

² Kazley AS, Wilkerson RC, Jauch E, Adams RJ. Access to expert stroke care with telemedicine: REACH MUSC. *Front Neurol*. 2012;3:44. doi:10.3389/fneur.2012.00044

³ South Carolina Telehealth Alliance. *South Carolina Telehealth Alliance 2019 Annual Report*. 2020. <https://sctelehealth.org/-/sm/sctelehealth/f/reports/scta-2019-annual-report.ashx>

⁴ Adeoye O, Albright KC, Carr BG, et al. Geographic access to acute stroke care in the United States. *Stroke*. 2014;45(10):3019-3024. doi:10.1161/STROKEAHA.114.006293

⁵ Mandelbaum J, Myers KG, Brightharp CL, Hicks SP. Assessment of chronic disease management strategies among health care practices in medically underserved South Carolina counties. *Health Educ Behav*. Published online December 28, 2021;109019812110575. doi:10.1177/10901981211057538

⁶ Agency for Healthcare Research and Quality. 2018 *National Healthcare Quality and Disparities Report*. 2019. <https://www.ahrq.gov/research/findings/nhqrdr/nhqrdr18/index.html>

⁷ South Carolina Telehealth Alliance. *South Carolina Telehealth Alliance 2017 Annual Report*. 2017. <https://sctelehealth.org/-/sm/sctelehealth/f/reports/2017-scta-annual-report.ashx>

⁸ Al Kasab S, Almallouhi E, Debenham E, Turner N, Simpson KN, Holmstedt CA. Beyond acute stroke: rate of stroke transfers to a tertiary centre following the implementation of a dedicated inpatient teleneurology network. *J Telemed Telecare*. 2021;27(4):239-243. doi:10.1177/1357633X19868097

⁹ Simpson AN, Harvey JB, DiLembo SM, et al. Population health indicators associated with a statewide telestroke program. *Telemed J E Health*. 2020;26(9):1126-1133. doi:10.1089/tmj.2019.0204