Stroke: Vascular and Interventional Neurology

ORIGINAL RESEARCH

Transferring Patients From a Primary Stroke Center to Higher Levels of Care: A Qualitative Study of Stroke Coordinators' Experiences

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BACKGROUND: Transfer times from primary stroke centers and acute stroke–ready hospitals to higher levels of care are often excessive, prompting some to suggest ambulance bypass regulations. Since barriers to rapid transfer have never been fully explored, we sought to understand stroke coordinators' experiences with transfer of patients with hyperacute stroke from lower to higher levels of stroke centers.

METHODS: We conducted a national focus group study with primary stroke center stroke coordinators who had recent experience overseeing transfer of a patient with hyperacute stroke to a higher-level stroke center. Interviews were conducted using prescripted open-ended questions; information was recorded and data were transcribed for theme identification.

RESULTS: A total of 23 stroke coordinators participated representing the Northeast, Mid-Atlantic, Southeast, Midwest, and Western United States. Findings were grouped into 3 main categories: Internal Primary Stroke Center Factors, Transport Factors, and External Comprehensive Stroke Center Factors. Within the primary stroke center group, themes slowing transfer were exclusively physician based, whereas themes emerging from the transport category were associated with poor transport company processes. Within the comprehensive stroke center category, themes were all associated with complex hospital processes and communication.

CONCLUSION: Important contributors to efficient transfer of patients with hyperacute stroke are beyond the control of stroke coordinators, requiring cross-system collaboration and improved administrative management to resolve. Quantification of these factors is warranted to support transfer system redesign for rapid access to care for patients with stroke.

Key Words: large vessel occlusion ■ patient transfer ■ stroke systems of care ■ transfer delay

Stroke is a leading cause of preventable adult disability worldwide,[1] yet is a treatable disease if patients act quickly and are taken to hospitals with diagnostic and treatment capabilities that are well matched to their specific condition.[2–4] However, inconsistency with ambulance personnel training in stroke identification and severity,[5,6] along with varying emergency medical services' commitment to use of severity routing protocols,[7,8] results in many patients with needs suitable to thrombectomy stroke centers or comprehensive stroke centers (CSCs) being transported to lower-level-of-care hospitals such as primary stroke centers (PSCs).[9–12] Ultimately, transfer to a thrombectomy stroke center or CSC is necessary for advanced

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diagnostics and treatment, yet multiple barriers to immediate transfer may significantly delay the process.[13,14]

Early work in the setting of time metrics for stroke treatment was centered around the safe and appropriate use of intravenous thrombolytics to patients with ischemic stroke.[3,15] The National Institute of Neurological Disorders and Stroke Recombinant Tissue Plasminogen Activator Stroke Study group was the first to describe the negative impact of delayed reperfusion treatment on the fate of ischemic brain tissue.[16] Treatment of ischemic stroke has evolved to include treatment with mechanical thrombectomy and tissue plasminogen activator at later time points,[17–22] while both ischemic and hemorrhagic stroke remain time-sensitive emergencies.

The STRATIS (Systematic Evaluation of Patients Treated With Neurothrombectomy Devices for Acute Ischemic Stroke) registry evaluated patient outcomes in relation to direct presentation to a CSC compared with transfer to a CSC from a lower-level-of-care hospital, finding that transfer patients had worse outcomes than direct CSC admission patients.[23] These findings speak to the need to understand barriers to door-in–door-out times so that patients may rapidly access the correct level of service to reduce disability from stroke.

Designation as a stroke center is tied to an expectation of evidence-based services and internal process mastery, which is shown to facilitate treatment for eligible patients and improve clinical outcomes.[24,25] In 2021, the American Heart Association published guideline revisions challenging stroke centers to improve overall systems of care, including provision of emergency care and arranging rapid transport when endovascular treatment is warranted.[4] Despite this challenge, transfer times remain lengthy, often in excess of 2 to 3 hours.[26,27] Additionally, to date, contributors to transfer delays have not been formally explored, although assumptions include a belief that substandard PSC processes are a major contributor.[28] Therefore, we aimed to understand the experience of PSC stroke coordinators in transferring patients with emergent acute stroke needs, from lower to higher levels of care.

Nonstandard Abbreviations and Acronyms

CSC	comprehensive stroke center
CTA	computed tomography angiography
PSC	primary stroke center
STRATIS	Systematic Evaluation of Patients Treated With Neurothrombectomy Devices for Acute Ischemic Stroke

CLINICAL PERSPECTIVES

What Is New?

- Identifying contributors to delays in the transfer of patients with hyperacute stroke from the perspective of the primary stroke centers' stroke coordinator.

What Are the Clinical Implications?

- Understanding the contributing factors to delays in patients with hyperacute stroke will aid in removing barriers and increasing the likelihood of treatment eligibility for patients who may benefit from acute stroke treatment once transferred to a higher level of care.

METHODS

Because of the sensitive nature of the data collected for this study, requests to access to the qualitative data set from qualified researchers trained in human subject confidentiality protocols may be sent to Dr Anne Alexandrov at annealex@uthsc.edu. Ethics approval was obtained to conduct a national qualitative focus group study with PSC stroke coordinators exploring the barriers associated with transferring patients from lower to higher levels of stroke care. A mailing list was assembled from publicly available PSC addresses on the Joint Commission and Det Norske Veritas websites,[29,30] and invitations were sent to a random group of stroke center hospitals representing the Northeast, Mid-Atlantic Southeast, Midwest, and Western United States. National focus groups were arranged by webinar to interview stroke coordinators with experience arranging acute stroke transfers in the previous 3 months. Potentially identifiable stroke coordinator, stroke center, transport system, and provider demographics were excluded from data collection to ensure anonymity, enhance ease of participation, and facilitate an honest exchange of information. Study methods complied with Consolidated Criteria for Reporting Qualitative Studies checklist.

Seventy-five-minute web-based interviews were conducted without cameras to ensure anonymity, using the same prescripted open-ended questions for each session. The same focus group facilitator was used for each session along with the same 2 note takers; each session was also recorded to ensure accuracy. A

standardized opening script was used by the facilitator for each session to advise participants not use their names, titles, or names of individuals, patients, coworkers, hospitals, states, or regions where they worked. Consent was implied by continued participation in the process, but participants were also told in the opening script that they could stop participating/disconnect at any time without penalty. Deidentified data were transcribed from recordings and supplemental notes. Data were subsequently coded and inductively analyzed for theme identification to ensure emergence of a detailed account of the acute stroke transfer experience; this entailed a thorough reading with identification of key units of relevant text, followed by grouping of text with similar focus into analytic categories. Definitions were provisionally developed for each category and then systematically analyzed by investigators J.P., W.D., and A.W.A. to ensure exhaustive coverage. Descriptive names for each of the emerging themes were then developed by the investigators.

RESULTS

A total of 23 stroke coordinators and stroke navigators from PSC hospitals representing the Northeast (n=4), Mid-Atlantic (n=4), Southeast (n=5), Midwest (n=5), and Western (n=5) United States regions participated in 1 of 5 focus group sessions held between August 2019 and January 2020. All participants stayed actively engaged for the full duration of each focus group session. Saturation was achieved by session 4 and reaffirmed by the conclusion of session 5, with consistent repetitive findings presented by participants who had no knowledge of previous focus group content and no relation to each other. Three main categories were assembled representing where transfer barriers were reported: Internal PSC Factors, Transport System Factors, and External CSC Factors. Each of the 3 categories was analyzed, and emergent themes were identified.

Internal PSC Factors

Two key themes emerged from the Internal PSC Factors category: (1) *Provider Fear of Error* and (2) *Stroke-Resistant Attitudes*. Provider Fear of Error was represented by hesitation in making medical decisions and was identified in PSC emergency physicians and telemedicine physician responders. Emergency physicians were concerned that their patient management would be criticized by a more knowledgeable stroke provider at a thrombectomy stroke center/CSC or by the telemedicine provider; this fear resulted in failure to immediately notify telemedicine of a patient with potential stroke until certainty arose in the workup, as well as delays in ordering a noncontrast computed tomography (CT) and failure to consider ordering CT angiography (CTA).

> Exemplar: "Our emergency doctors think they should fully evaluate the patient before they call telemedicine and this slows us down. They say it's because they don't want to make a mistake contacting telemedicine unnecessarily. But every time, we've ended up calling them [telemedicine], the nurses knew it was needed well before the emergency physician even saw the patient."

Participants discussed how this hesitant approach to patient management challenges efficiency and creates a negative work atmosphere where even suggesting to the physician that a more rapid approach be taken was dealt an angry reaction.

> Exemplar: "The emergency physicians really don't know what scans to order. Sure, they know they are supposed to get a plain CT, but beyond that, they seem to have no idea who needs a CTA, CTP [CT perfusion], or maybe even an MRI [magnetic resonance imaging]. This really slows us down because they seem afraid they'll be criticized if they get other scans, so we sit, sometimes as long as an hour, for someone to tell us to get a CTA."

Surprisingly, participants also reported that telemedicine physician responders often refused to interpret neuroimaging themselves, instead waiting on a local general radiologist to officially file a written report, and producing beliefs among staff, such as, "… I mean can't neurologists read CTs and CTAs?" This fear of error was associated with significant delays in treatment and transfer decision making, especially when a CTA was ordered, since CTA interpretation has not been officially included in time to interpretation quality standards.

> Exemplar: "The problem is that no one [guidelines, stroke center certification agencies] has said that CTAs need to be read within a short time period like the noncontrast CT scans, so the hospital doesn't push the radiologists to respond quickly to them. If the telemedicine stroke doctor refuses to read the CTA, it could be 1 to 2 hours before our radiologist writes up a report, so we are in a holding pattern trying to figure out if we should call for transfer."

The Stroke-Resistant Attitudes theme was typified by PSC emergency physicians deliberately not responding to stroke as an emergency, and participants felt that this attitude was most common among their tenured emergency physicians. Working with a physician who is nonresponsive to a stroke emergency was

described as uncomfortable, creating tension in the work environment because of differing physician–nurse values and nurse–patient advocacy.

> Exemplar: "It's our 'old school' emergency physicians who don't think stroke is a 'real' emergency; I don't understand why they are allowed to practice this way. I mean a nurse wouldn't be allowed to get away with such behavior, so why can physicians get away with it?"

Collectively, participants felt that administrators needed to take responsibility for managing these stroke-resistant physician attitudes and associated behaviors. Participants also believed that working with these stroke-resistant physicians created significant friction among team members and negatively impacted the work culture, with one stating, "I look to see when he is scheduled to work and then deliberately pick shifts when he is not on. Working with him is a horrible experience, and I feel so badly for the patients with stroke who come in on his shifts."

Transport System Factors

Two themes emerged within the Transport Factors category: (1) *Desperate for Help* and (2) *High-Cost Care*. The Desperate for Help theme was exemplified by participants "feeling helpless" while waiting for transport to arrive. Weather or simultaneous activations were cited as the biggest factors affecting transport delays for both aeromedical and ground transport programs. However, overall, ground transport ambulances were seen as difficult to arrange in a timely manner, with competing private ambulance companies holding numerous service contracts with nursing homes, rehabilitation facilities, hospitals, and sports events, and failing to triage transport requests to complete the most urgent transfers first.

> Exemplar: "We called right away for transport, but the weather was bad so there was a huge delay, and there were no other options." …"You wait and wait, and there's nothing you can do. It feels so wrong."

Nonstandard stroke assessment and management knowledge and skills among contract private ambulance providers was also identified as problematic, and participants cited problems with crew protocols that either restrict or specifically challenge evidence-based management. Examples included private ambulance crews abruptly discontinuing antihypertensive intravenous infusion agents en route to the CSC because of unfamiliarity with the medication, as well as positioning a patient undergoing large-vessel occlusion thrombectomy upright at 45° to accommodate the transport cardiac monitor. In the words of 1 participant, "God forbid you've given tPA or started a nicardipine drip because that complicates everything!" Transports involving complex drug management are further complicated by a shortage of registered nurses who could ride on board to manage infusions and perform critical patient assessments. Participants were also frustrated by the shortage of critical-care and advanced life support ambulance services, as well as policies prohibiting the use of many city-operated ambulances to transfer patients from PSCs to higher-level-of-care hospitals because of intercity ambulance shortages.

The High-Cost Care theme focused on complaints related to the cost of transport, especially aeromedical transfers, for which patients were billed at astonishingly high rates that were not disclosed before transport. This resulted in numerous patient complaints, especially when the distance covered was relatively short and could have been managed by ground transfer if ambulances were available.

> Exemplar: "If the system were more efficient, we wouldn't need to use helicopters unless it was an extreme distance."… "It's really unfair to patients when they get these surprise $15 000 flight bills and it makes us [PSC] look bad."

External CSC Factors

The External CSC category of barriers included 2 themes: (1) *Complex Communication Navigation* and (2) *Overwhelmed Systems*. The Complex Communication Navigation theme focused on issues trying to communicate with the correct person at each CSC to accept the transfer. Participants shared frustrations that included (1) needing to make numerous phone calls; (2) having to wait to hear back from physicians who were busy with rounds or surgery; and (3) being told that the case was accepted for transfer but that the CSC wasn't ready to accept the patient at this time. On average, participants stated it took 2 to 3 phone calls to reach the "transfer decision maker."

> Exemplar: "Since the interventionalists don't admit, we have to make on average 3 phone calls to the CSC, beginning first with the emergency physician, then a neurologist, and then an interventionalist; and, if the interventionalist is busy in a case, we have to wait for him to call us back." … "We have to talk with an interventional nurse practitioner who makes the transfer decision. Then if they [CSC interventional team] find the patient doesn't have an occlusion, they call us to give us a slap on the wrist even though their person made the transfer decision. They can be very

condescending, and it makes you not want to call them again."

Participants provided other examples of condescending and intimidating treatment and felt that this CSC behavior worsens the Provider Fear of Error described previously in transferring emergency physicians. Participants also described how the same CSC often changes their acceptance of patients for thrombectomy depending on the treating interventionalist who is on call, and this further confuses emergency physicians about which patients to consider for transfer.

Exemplar: "One doctor will take patients 80 years old or older for thrombectomy, but the next doctor on won't. Some doctors won't take patients with basilar artery occlusions or second middle cerebral artery branch occlusions but others will. Since they all work in the same CSC, it's impossible to know whether a case is going to get accepted for transfer or not. I understand it's not always a black-and-white decision, but no one explains anything to us, and you get yelled at sometimes for bothering to call them for guidance. So, we keep making phone calls, shopping around at other hospitals, just looking for someone who will help." … "At meetings they [CSC neurointerventional surgeons] talk a big game. They say they never refuse patients, but I speak up and say, 'Yes you do!' then I get in trouble for telling the truth."

The *Overwhelmed Systems* theme included having to hold patients at the CSC because of the need to "open a bed" by moving another patient to make room for an admission. Participants also described times when the CSC hospital went on diversion, expressing concern that this was a violation of CSC certification standards. Frustration with CSC hospitals not all having similar capabilities was also voiced, with participants describing leniency in stroke center certification processes that have allowed centers lacking internal resources to be credentialed at the highest level of stroke center.

Exemplar: "Just because it's a CSC doesn't mean that they have enough interventionalists to manage cases. Some CSCs do, others don't. I know one that turfs cases to a competitor because they don't have enough doctors to operate. It also doesn't mean they will even be open for business since they can go on diversion at any time."

DISCUSSION

Our study showed that barriers to timely transfer of patients with acute stroke, from lower levels of care to higher levels of care, are significant, with PSCs, transport systems, and CSCs each contributing to transfer delays. Speculation that PSCs are the main point in the transfer bottleneck appears questionable,[28,31] with the main problem slowing PSC processes tied to fears of error, which may have their origin in complex and sometimes inappropriate CSC communication. This speaks to the need for improved interprofessional relationships among PSC and CSC providers, as well as the need for the appropriate sharing of feedback and communications that enhance provider education about "why" some patients may be eligible and others are not. Clinicians at CSC hospitals could also work with affiliated PSCs to develop protocols that standardize the stroke-emergent workup.

Our findings about telemedicine physician responders not being willing or able to read CT imaging are concerning; this may be attributable to telemedicine companies hiring nonstroke specialist, general neurology physicians to take acute stroke call. Waiting for a general radiologist or an off-site teleradiologist to provide an official interpretation of imaging is shameful and irresponsible for physicians serving as telestroke responders. Administrators of PSC hospitals should report "failure to interpret imaging" to telemedicine company managers as unacceptable in the skill set required to work as a telestroke responder; similarly, telemedicine companies should assess potential physician hires' neuroimaging interpretation skills when making hiring decisions.

Not surprisingly, transport systems produce one of the most challenging problem areas for PSC transferring clinicians.[14,28,32] Although guidelines provide direction for emergency medical services providers,[4] there remains a somewhat nonuniform application of stroke care standards within private ambulance services,[33] with a significant need for ambulance personnel education.[34,35]

Further complicating ground transportation is the relative shortage of ambulances across the country, particularly in certain overburdened or rural regions.[36] This makes use of aeromedical transport necessary,[37] although its cost may not be covered adequately by payers.[38] Additionally, private ambulance contractors should develop and implement transport triage policies to aid in rerouting and prioritization of stroke transports. Ideally, as the most sophisticated stroke hospitals, CSCs could be expected to operate a transfer service—ground, aeromedical, or even mobile stroke unit—that could expedite patient transfers from affiliated PSCs using staff that have the expertise to manage patients with complex stroke.[39–42]

Transfer communications within CSC hospitals must be improved to reduce the number of calls and the frustration felt by transferring hospital personnel. This could

include development of a transfer center[4,43] with dedicated personnel to make connections in a timely way between the transferring parties. Use of the transfer center model can produce efficient, effective results[4,44] but should be followed with quality metrics that include the responsiveness and professionalism exhibited by the CSC personnel to ensure that intimidation and condescending behaviors are avoided. Transfer centers can also play a role in quantifying issues tied to inefficient acceptance times that may be used to better the overall process within the PSC and CSC sites.[43]

An interesting finding that was expressed by all study participants was frustration over what was described as "leniency" in how stroke centers are credentialed, with inconsistencies noted in the resources and capabilities of CSC hospitals. While coronavirus disease has devastated many hospitals' resources and staffing,[45] it should be noted that our interviews were conducted before the coronavirus disease shutdown in the United States, therefore reflecting inequity in resources that existed well before the pandemic. Leniency in credentialing of stroke centers as CSC hospitals does nothing to encourage administrators to invest in resources and manpower that fully reflect the highest level of stroke center services, nor does it accurately portray to the public the capabilities of the hospital. We suggest that stroke center certification agencies embrace rigorous criteria for CSC certification, appropriately reducing those CSCs that are dependent on external resources to a thrombectomy stroke center level. Additionally, time metrics for CTA interpretation should be set similar to those supporting noncontrast CT interpretation.

Finally, we found it discouraging that our participants identified the significant unethical problem of working with "stroke-resistant" emergency physicians. Attitudes are among the most refractory factors to change among personnel and are deeply rooted in history and often dated training experiences.[46] Unfortunately, negative attitudes are significant contributors to unhealthy work environments, which ultimately translate into poor patient care experiences.[47] It is incumbent on hospital administrators to intervene when clinical care is compromised by physicians who question or choose to remain resistant to adoption of an emergent stroke treatment paradigm.

Our study has limitations. First, qualitative studies are hypothesis-generating works,[48] and as such we are unable to provide a quantitative look at how often the barriers cited in this paper actually impact transfer times across the United States. Additionally, we cannot be certain that our study has identified all possible barriers that limit transfer timeliness; however, we did reach a point of saturation that failed to produce any new or additional findings from our national sample of participants. Future work should aim to quantify the frequency of the barriers identified, while also examining additional barriers that may not have been identified in our study. Our study is also limited to findings within the United States; replication in other countries may be important to understand barriers experienced elsewhere. Finally, as is consistent with qualitative focus group designs, we assume that our participants were truthful about factors that impacted their transfer experiences.[49] While we have no way of verifying the information shared, we also were certain not to include any identifiers, and therefore we are assured that what we present in this work is a truthful representation of our participants' experiences.

CONCLUSIONS

Transferring patients with acute stroke from PSCs to higher-level-of-care hospitals is complex. We have identified important barriers to an efficient and effective transfer process that delay access to critical acute stroke services. Stroke center hospitals, stroke center credentialing agencies, and transport systems should assess their performance in relation to our findings, identifying methods to improve stroke services across the hospital continuum.

ARTICLE INFORMATION

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