Supplementary Online Content

McTaggart RA, Yaghi S, Cutting SM, et al. Association of a primary stroke center protocol for suspected stroke by large-vessel occlusion with efficiency of care and patient outcomes. *JAMA Neurol*. Published online May 8, 2017. doi:10.1001/jamaneurol.2017.0477

This supplementary material has been provided by the authors to give readers additional information about their work.

eAppendix

Methods: PSC ELVO Protocol

Critical aspects of the PSC ELVO protocol are elaborated in detail below:

Call CSC Transfer Center is patients LAMS score is ≥4

Emergency department physicians at the collaborating PSCs were educated to call the CSC transfer center based on their clinical suspicion of a severe stroke using the LAMS score threshold. The yield of the LAMS score in screening for ELVO has been validated in prior studies[1]. Physicians were specifically told that CTA confirmation of an ELVO was not necessary to initiate the transfer process and the transfer could be aborted/deferred if the CTA excluded a large vessel occlusion.

Dispatch transport team prior to CTA confirmation of ELVO

Our CSC has a critical care transport service which operates 24 hours a day, 7 days a week and is often staffed by a physician on board. In cases where our critical care transport was unavailable or distance to the PSC was too long, alternate transportation with local ambulance was arranged by the PSC. Regardless of the transport mechanism chosen, early CSC pre-notification facilitates the identification of a specific transport mechanism for the patient, *prior to CTA confirmation of ELVO*.

If the LAMS score is ≥4 obtain CTA at time of initial NCCT

Since repeat trips to the CT scanner can potentially cause significant treatment delay in patients with ELVO, PSC ED physicians were asked to obtain a CTA of the head and neck as part of initial imaging on all patients with LAMS ≥4 (or clinical suspicion for ELVO) along with their non-contrast head CT. We also suggested that the PSCs do not wait for serum creatinine value prior to the CTA in suspected stroke patients based on prior studies showing low rates of renal injury and that the benefit outweighs risks [2-8].

Implement LifeIMAGE for remote viewing of the imaging

LifeIMAGE (LifeIMAGE Inc., Newton, MA) is a HIPAA-compliant, cloud-based software platform that allows physicians and hospitals to share imaging from any DICOM compliant modality, allowing effective communication and leading to improved patient care. All PSCs in our region were encouraged to install the LifeIMAGE sending application (LISA) so images could be transferred directly from the PSC CT scanner to the LifeIMAGE cloud. Images in the LifeIMAGE cloud can then be accessed by our stroke team on a mobile device or LifeIMAGE local application (a server that sits behind the CSC firewall). If the ELVO transfer patient is accepted, the images from LifeIMAGE cloud can be downloaded for permanent storage within the CSC PACS system. At the start of the study period, only 3 of the 14 PSCs had LifeIMAGE installed, and over the study period, this was installed at all 14 PSCs. It is also possible to configure the CT scanners at the PSC to “auto-send” CTAs on stroke patients directly to LifeIMAGE, to reduce manual steps and potential for delay. Implementation of “auto-send” has been more variable.

Direct transportation to angiography suite

Since the necessary imaging had been obtained prior to arrival at the CSC, there was no need to stop in the Emergency Department prior to the procedure. All patients were transported by either our critical care transport team or a local ambulance directly to our angiography suite. Repeat imaging was not performed routinely, but was done in cases where there had been neurologic deterioration, long delay between initial imaging at the PSC and arrival to the CSC, or instances where vessel imaging could not be performed at the PSC. Activation of the Neuro-Interventional team (nurses, technologists, fellow and attending) occurred after CTA confirmation of the ELVO using the LifeIMAGE mobile application, while the patient was still at the PSC. In cases where LifeIMAGE was not installed or if there was a delay in image availability, the team was activated based on the report of the outside interpretation.

Methods: Case Acceptance

PSC ELVO case acceptance for mechanical thrombectomy was based on the following criteria:

- CTA showing occlusion of the internal carotid artery (ICA) or M1 segment of the middle cerebral artery (MCA)
- Non-contrast CT Alberta Stroke Program Early CT Score (ASPECTS) of 6 or higher
- National Institute of Health Stroke Scale (NIHSS) of 6 or higher (or equivalent estimation of clinical deficit)
- Groin puncture can occur within 6 hours from symptom onset
- CTA collateral score greater than 0 (when sinus opacification allowed reasonable assessment)

eTable 1: PSC ELVO Protocol Breakdown

Group n=70	Patient number (%)
Full Execution	22 (31%)
Partial Execution	48 (69%)
a) PSC CTA in 30' and LifeIMAGE	16 (23%)
b) LifeIMAGE only	14 (20%)
c) CSC Called in 30' and LifeIMAGE	7 (10%)
d) No component execution	6 (8.6%)
e) PSC CTA in 30'	3 (4.3%)
f) CSC Called in 30' only	1 (1.4%)
g) CSC Called and CTA in 30'	1 (1.4%)

eTable 2: Performance by Center*

	PSC DOOR IN DOOR OUT (DIDO)			
	Partial Execution		Full execution	
	median (minutes)	Count	median (minutes)	Count
Hospital #1spital	81	3	55	3
Hospital #2	96	5	50	6
Hospital #3	90	4	78	3
Hospital #4	110	5	95	2
Hospital #5	118	5	64	1
Hospital #6	133	10	75	6
Hospital #7	145	4	60	1
Overall (p<0.001)	**114**	**36**	**66**	**22**

*Centers ranked #1-#7 by overall efficiency. The association of full implementation of the PSC ELVO protocol with a reduction in DIDO time can be seen at every PSC

eReferences

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