

# Using LEAN Methodology to Decrease Door to Device (ELVO) Treatment Time in a Comprehensive Stroke Center

Renee Potter MBA, BSN, RN, SCR, CCRN  
Maggie Shatzel MSPH, BS, RN, SCR

## Background

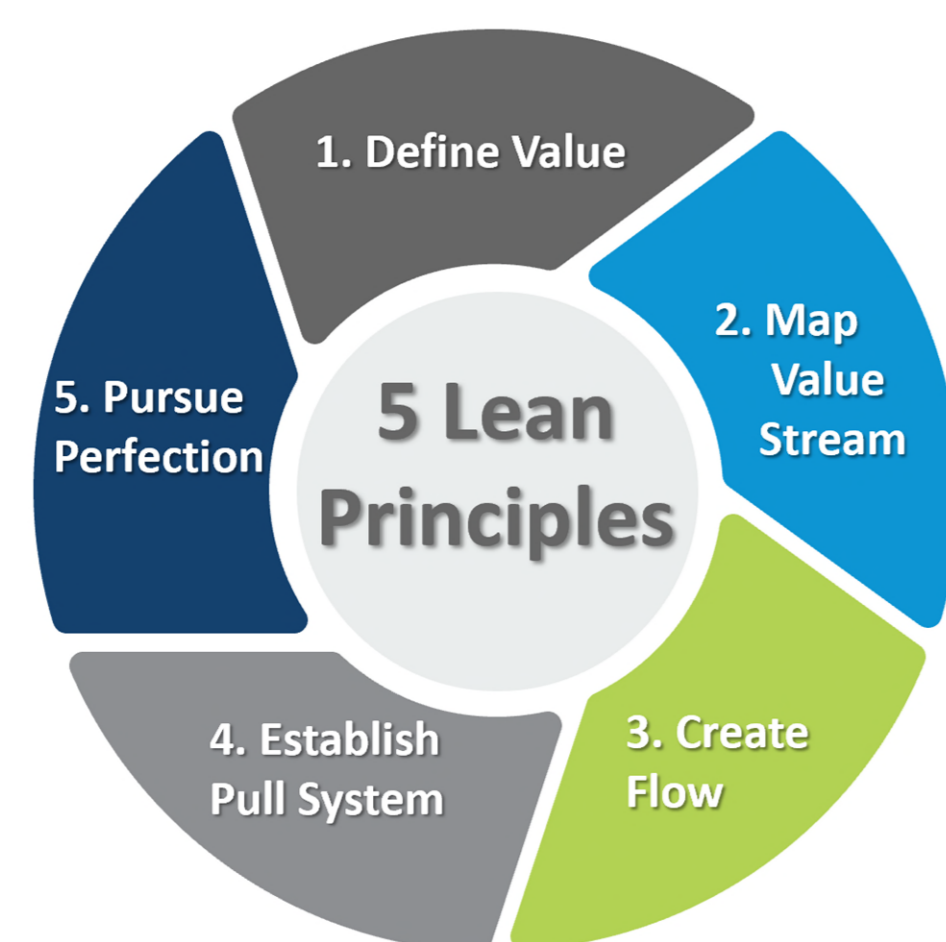
PeaceHealth Sacred Heart Medical Center at RiverBend Comprehensive Stroke Program identified patients arriving to the Emergency Department with large vessel occlusion (ELVO) were not consistently meeting the 90 minutes door to device time goal for emergent mechanical thrombectomy. In Q1 2020 mean door to device time was 108 minutes. This concern was escalated to hospital leadership for assistance

## Objective

Large vessel occlusion (ELVO) patients eligible for emergent mechanical thrombectomy will routinely meet the time goal of door to device in less than or equal to 90 minutes.

## Method

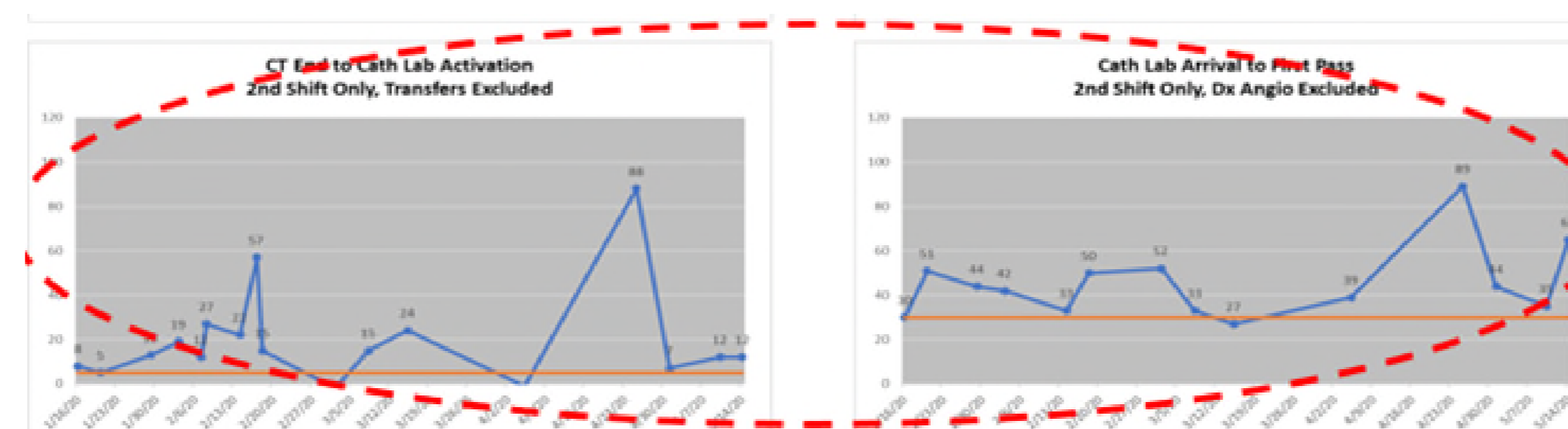
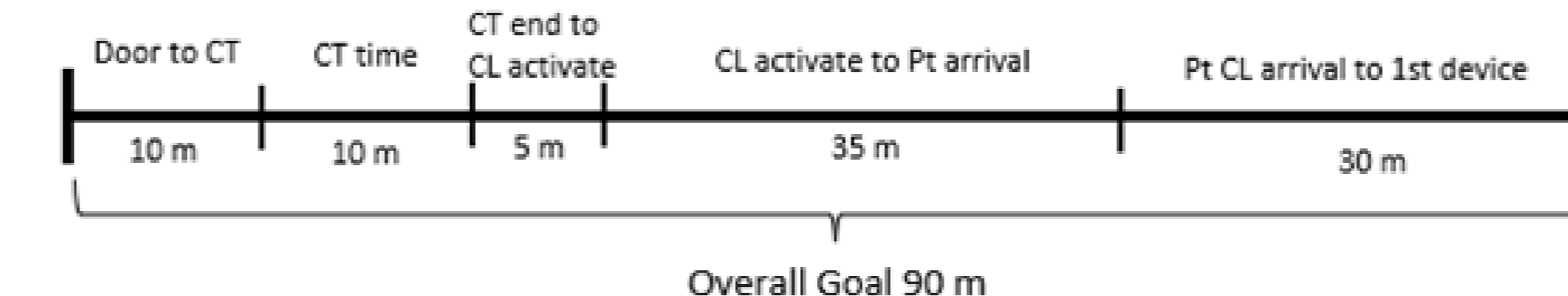
The Stroke Program utilized the LEAN Methodology.



<https://www.planettogether.com/hubfs/image-png-Mar-09-2021-07-05-08-82-PM.png>

**Define Value:** Stroke patients lose 1.1 million brain cells for every minute of stroke. Evidence-based practice has identified faster treatment times improves patient outcomes, thereby decreasing long-term death and disability from stroke.

**Map Value Stream:** The LEAN team analyzed each individual ELVO case for time metrics and reviewed current ELVO treatment protocol. The team then segmented the overall process into sequential steps, assigned each step a time goal and evaluated the recent performance for each of the steps. Based on this analysis of data, opportunities for improvement were identified, specifically after hours and weekend cases.

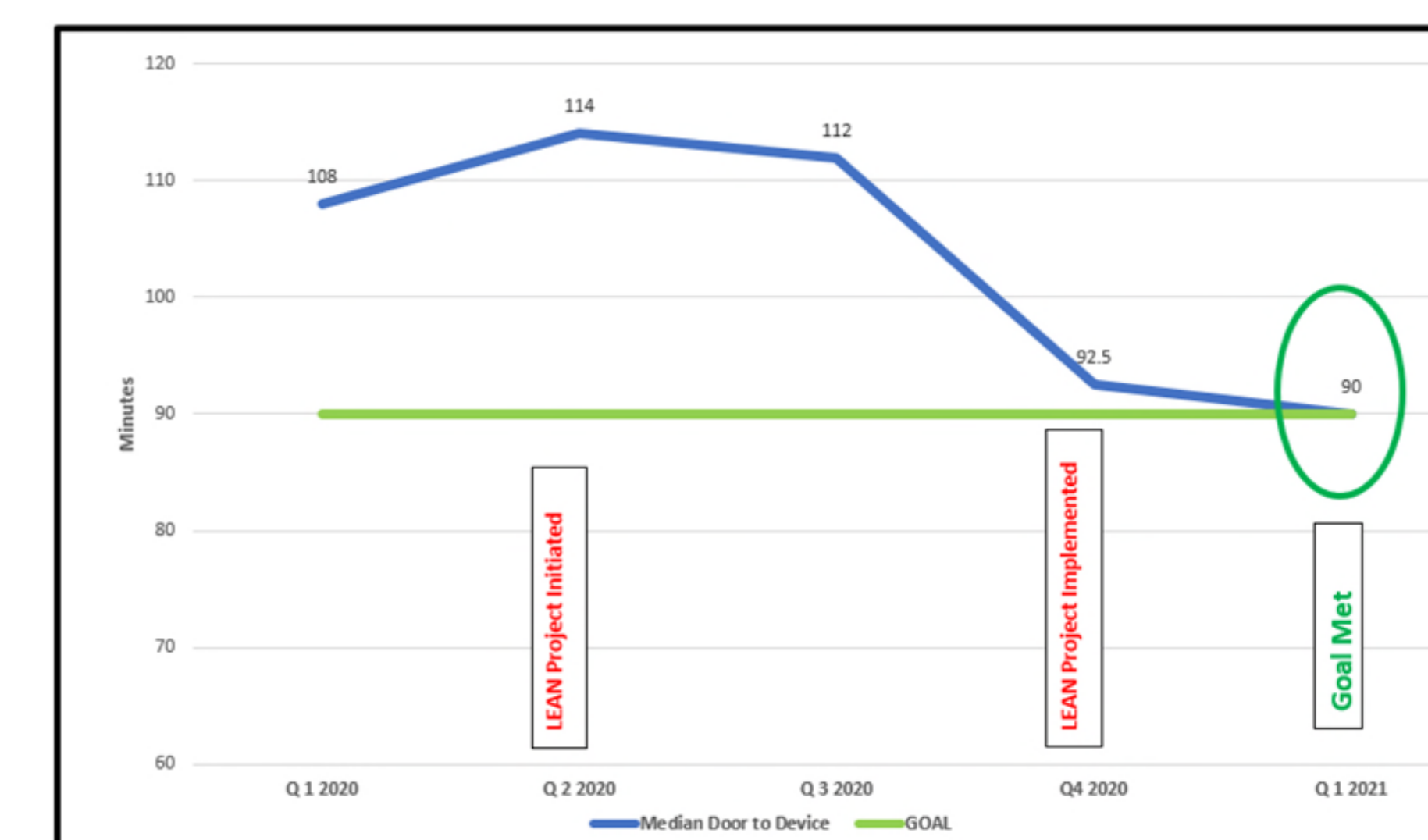


**Create Flow:** Observation of actual cases and staff interviews determined time barriers. Scheduled mock mechanical thrombectomy cases were conducted with Cath Lab staff and interventional radiologists to identify standard work process opportunities.

**Establish Pull:** Developed standard workflow for each Cath Lab team member role. Created daily Room Ready process for end of the workday and after-hours emergency cases. Interventional radiologists met and agreed to standardize equipment and supplies. Developed and standardized post case debrief for ELVO cases.

**Pursuit of perfection:** Ongoing review of post case debriefs with escalation of any identified barriers to Stroke Program and Cath Lab leadership. Continuous review of metrics to verify compliance and identify additional process improvements needs

## Results



## Conclusions

The LEAN methodology provided the means to implement change. Analyzing data, breaking up each step of the process and assigning adapted time goal allowed us to identify improvement opportunities and standardize the process to consistently meet the treatment time goal. SHMC at RB CSC was conferred the 2021 Endovascular Advanced award from the American Heart Association American Stroke association.



# Stroke & Strangulation

## Medicine is Missing the Connection

### Brain Under Attack

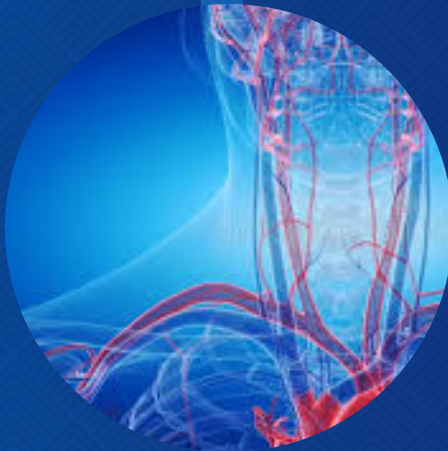
Brain is 2% of the body, yet uses 20% of its oxygen supply

Repeated moments of hypoxia can cause watershed strokes

Strangulation is considered a possible cause of cryptogenic strokes

24 Carotid dissections from strangulation ~ 29% suffered a stroke 3 - 7 months later (Zuberi, 2019)

Latent periods for strokes are common & can be months to decades



### Vessels v. PSI

22 PSI concentric pressure or 5.5 PSI frontal pressure decreases blood flow to brain

Carotid arteries carry 80-85% blood to brain: 11 PSI to compress

Vertebral arteries 15-20% blood to brain: 16-66 PSI to compress

Collapse or obstruct trachea: 33-35 PSI

Jugular veins: 4.5 PSI to compress

Open a can of pop: 14-20 PSI

Adult male handshake: 80-100 PSI

### Manual Strangulation

Application of pressure to the neck using hands, arms, legs

Think anger! rage! gripping & grabbing! Think shutting someone up!!!

Victims of violent crimes, domestic Violence; adult, geriatric, & pediatric victims

Human trafficking, sex trafficking victims

Often used as a means to control or subdue

Some forms of breath play



### No Visible Bruises

Over 50% of all autopsies on people strangled to death, ZERO external markings

Strangulation can kill or cause strokes hours, days later due to vessel injuries, swelling, compromised blood flow to & from brain

No external markings does not mean no internal damage, it's not, "no big deal"

Tears in the intimal lining of the carotids, clots can form, or vessels can rupture

Latent periods for destruction are common

### Ligature Strangulation

Pressure around the neck with some form of ligature or device; rope, scarf, collar...

Often with autoerotic or erotic asphyxiation, breath play, TPE play (total power exchange), BDSM...

Strangulation & suffocation have become normalized as part of sexual encounters

Partakers are often unaware of lingering dangers or negative long-term effects

There is NO safe way to do breath play!



### Next Steps

Gold Standard: CT Angio of Carotid & Vertebral Arteries

CT of neck with Contrast; good, less sensitive

Damage can include the vertebral processes, thyroid, others structures & vessels

Create a medical questionnaire that includes a history of any hands to neck events or participation in breath play

Shame often accompanies strangulation; victims might not reveal anything to you, that is also, diagnostic