

# Case Study 1

## Improving tPA Rates to Enhance Quality of Life for Stroke Patients

Presenters:

Dr. Jeffrey Sternlicht MD, *Chairman, Emergency Department*

Aaliyah Franks, MSN RN *Stroke Program Coordinator*

Amanda Icenroad, BSN RN CEN *Quality Improvement Specialist*

*“To every patient, every time, we will provide the care  
that we would want for our own loved ones.”*

**GBMC**

# Local Problem

Time is brain- treating patients with the clot busting drug, tPA within recommended timeframes can prevent loss of brain function and help maximize the opportunity for recovery and quality of life.

During Greater Baltimore Medical Center's 2016 "Get with the Guidelines" Stroke survey, GBMC's tPA administration rate was lower than national and state benchmarks.

*"To every patient, every time, we will provide the care that we would want for our own loved ones."*

**GBMC**

# Why focus on tPA Treatment?

## Aligns with GBMC's:

- Mission- Health, Healing and Hope
- Vision- “To every patient, every time, we will provide the care we would want for our own loved ones”
- Four Aims-
  - Better Health
  - Better Care
  - Least Waste
  - More Joy

*“To every patient, every time, we will provide the care that we would want for our own loved ones.”*

**GBMC**

# Baseline Data:

## 2016 tPA Administration Rates

• 5.5%

GBMC Baseline  
tPA Administration  
Rate



• 10%

State tPA  
Administration  
Rate



• 11%

National tPA  
Administration  
Rate



*“To every patient, every time, we will provide the care  
that we would want for our own loved ones.”*

**GBMC**

# GBMC Set Goals to:

1. To improve recognition of qualified patients for tPA treatment.
2. To administer tPA more efficiently, safely, and exceed national and state benchmarks inline with American Heart Association's "Get with the Guidelines" standards (> 11% administration rate)
  - a. Improve Door to CT time
  - b. Improve Door to needle time
3. Leverage information system functionalities to meet these goals.

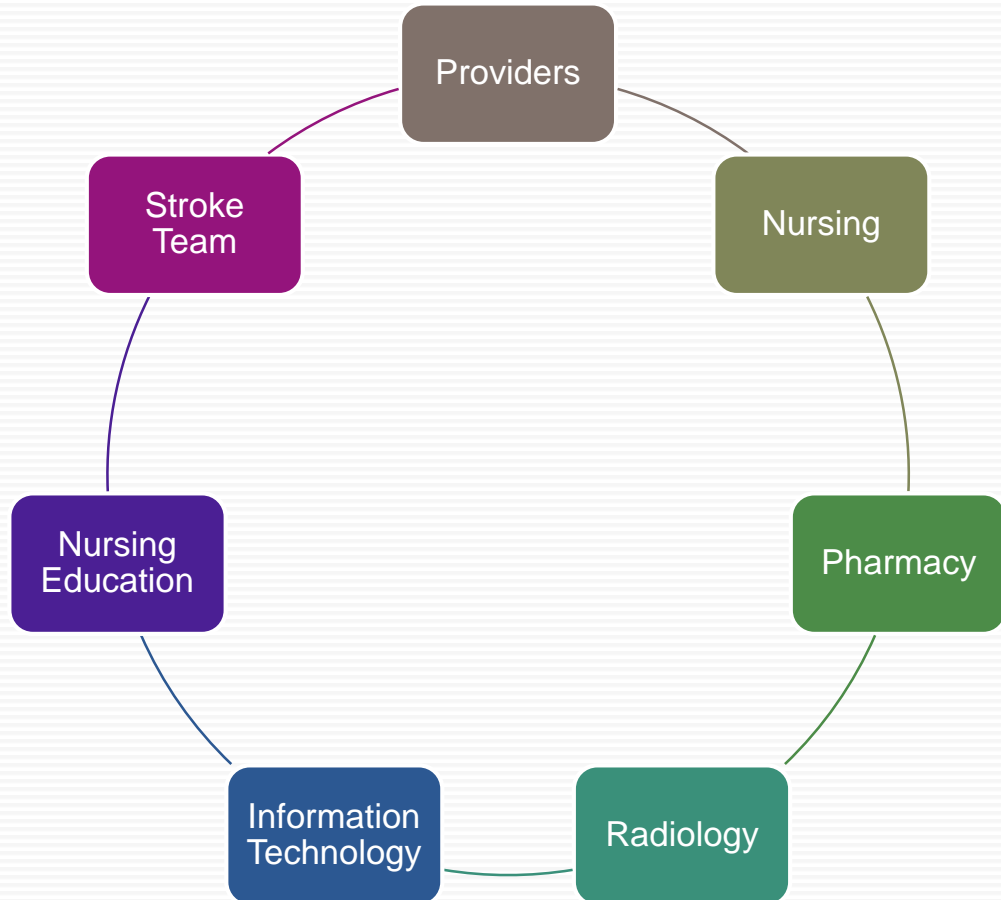


*"To every patient, every time, we will provide the care that we would want for our own loved ones."*

**GBMC**

# Design and Implementation: Governance Strategy

- Collaborative effort between multiple disciplines
- Lead by Stroke Coordinator
- Kaizen Team Lead Facilitation

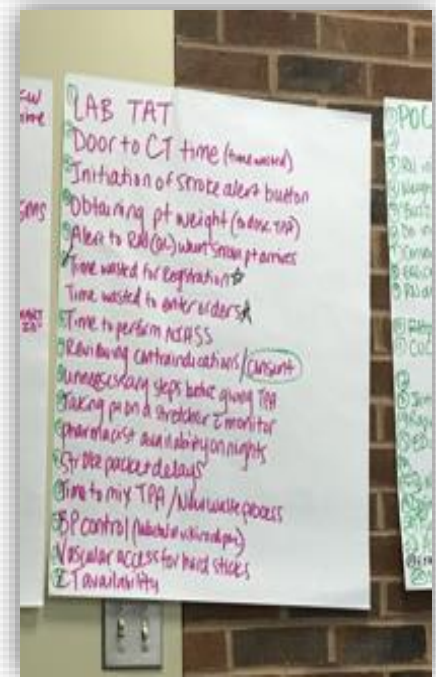


*“To every patient, every time, we will provide the care that we would want for our own loved ones.”*

**GBMC**

# Design and Implementation: Kaizen event focused on tPA Workflow

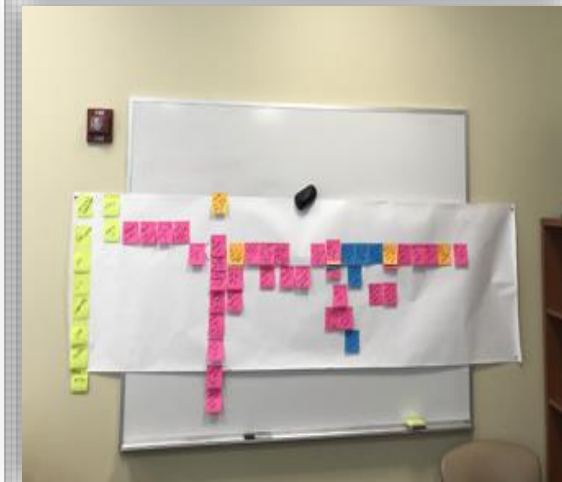
- Targeted redesign initiative (Kaizen) to evaluate current workflow and develop more efficient, standard workflow.



## Typical Kaizen Week

GBMC

Day 1	Day 2	Day 3	Day 4	Day 5
Lean tool training	Identification of waste	Implementation of process changes	Train associates on process changes	"Go-live" with new process
Document current state map	Future state brainstorming of changes to eliminate waste	Document new work visuals, standards	Trial new process	Observe and support associates in work area
	Try-storming new ideas	Report-out on progress	Troubleshoot issues	Present summary to leadership
	Document future state map		Establish visual process dashboard	Report-out on progress
	Report-out on progress		Report-out on progress	



*"To every patient, every time, we will provide the care that we would want for our own loved ones."*

GBMC

# Design and Implementation: tPA Treatment Strategies

**Target 1** - Leverage EHR to identify more patients that could potentially be experiencing a stroke in both the ED and inpatient areas.

**Target 2** –Develop and implement triage protocols and order sets to standardize care to improve safety, and make ordering more efficient

- ❖ Intended Outcome: Recognize more patients who could be experiencing a Stroke and expedite tPA treatments of qualified patients, to a goal of > 11%



# Design and Implementation

- Redesign processes, workflows to improve recognition and update protocols and order sets
- Focused on ED Provider and Nurse Education (including Mock Brain Attack Drills)
- Hospital-wide Stroke Education
  - Recognizing symptoms, initiating Brain Attack protocol, and following standard work
- Communication with Stroke Coordinator and Quality Team throughout the process



*“To every patient, every time, we will provide the care that we would want for our own loved ones.”*

**GBMC**

# Workflow and How Health Information Technology is Utilized

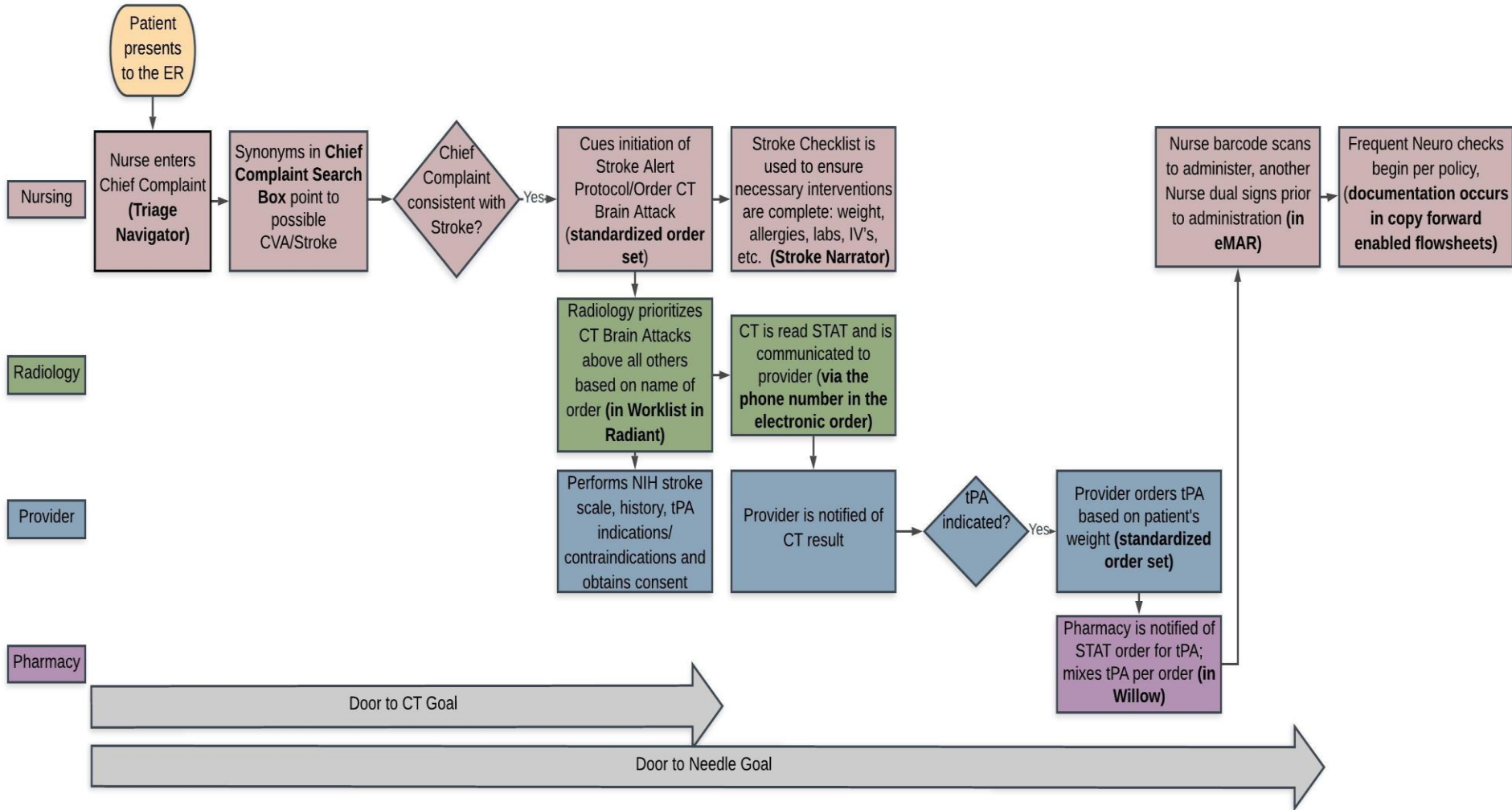


*“To every patient, every time, we will provide the care that we would want for our own loved ones.”*

**GBMC**

# How Health IT is Utilized:

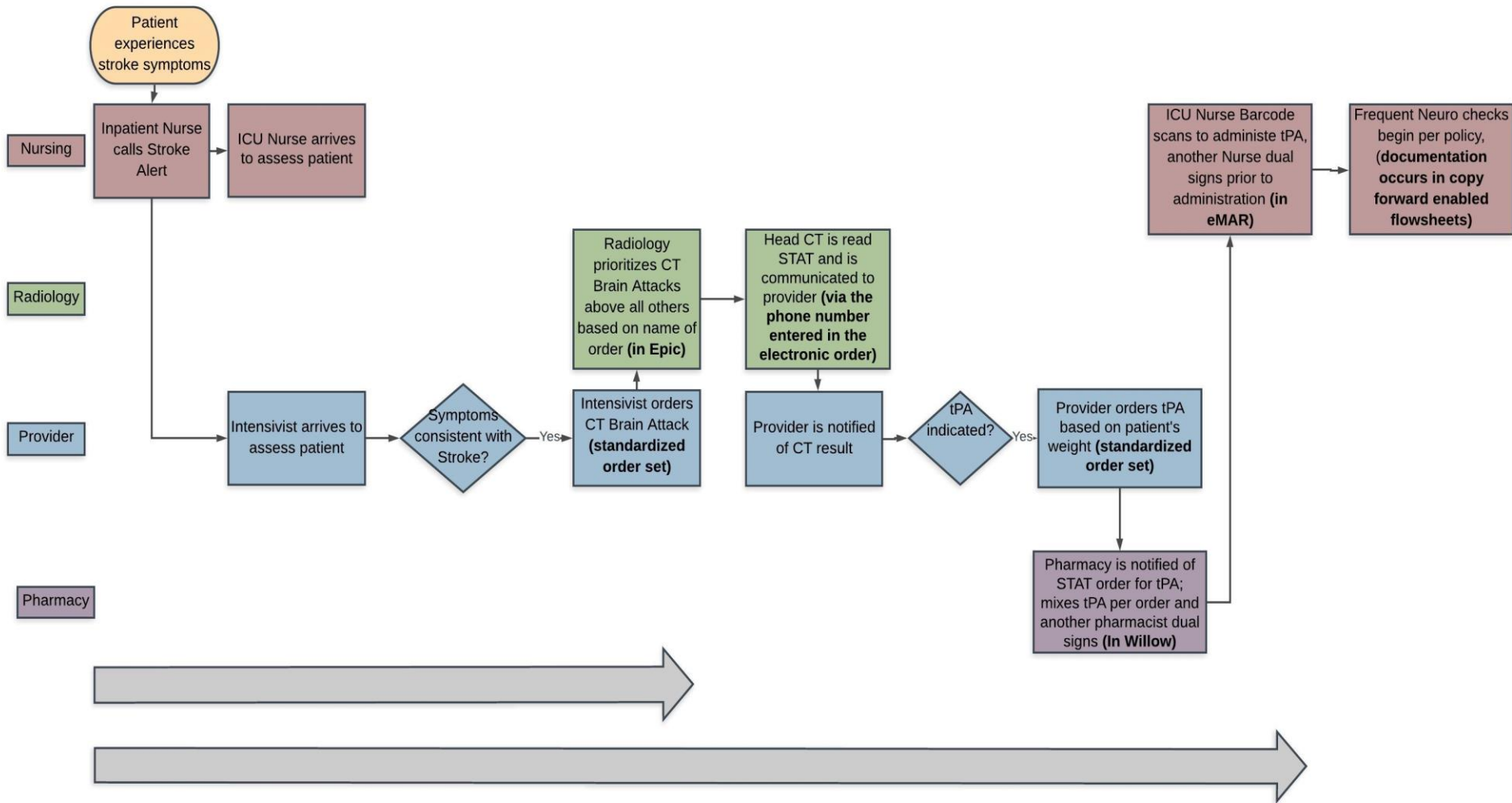
## Emergency Department Stroke Alert Workflow



*"To every patient, every time, we will provide the care that we would want for our own loved ones."*

**GBMC**

# How Health IT is Utilized: Inpatient Stroke Alert Workflow

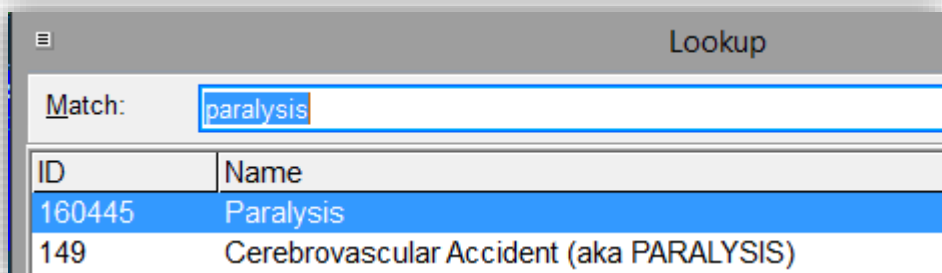


*"To every patient, every time, we will provide the care that we would want for our own loved ones."*

**GBMC**

# Target 1: Cast a Wider Net

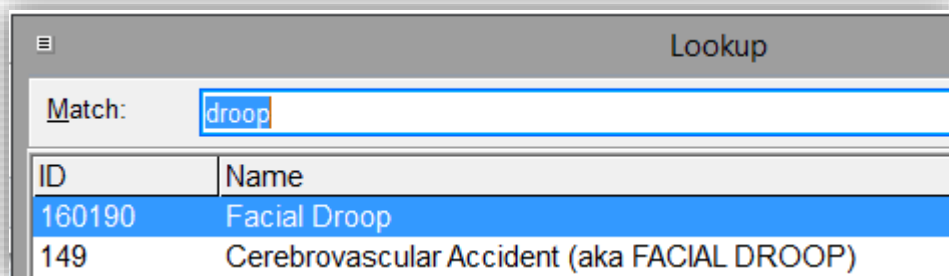
- Use Epic to remind clinicians of the possible chief complaints that could potentially be a CVA/Stroke



Lookup

Match:

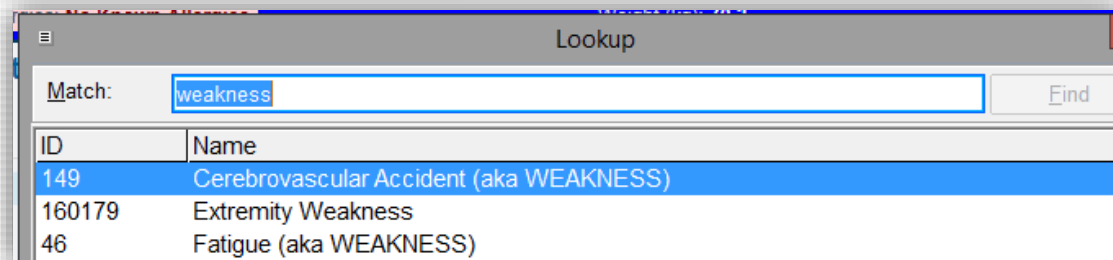
ID	Name
160445	Paralysis
149	Cerebrovascular Accident (aka PARALYSIS)



Lookup

Match:

ID	Name
160190	Facial Droop
149	Cerebrovascular Accident (aka FACIAL DROOP)



Lookup

Match:

ID	Name
149	Cerebrovascular Accident (aka WEAKNESS)
160179	Extremity Weakness
46	Fatigue (aka WEAKNESS)

*“To every patient, every time, we will provide the care that we would want for our own loved ones.”*

GBMC

# Target 2a: Nurse-Driven Triage Protocol

- Nurse-entered order set custom built for GBMC's needs
- Includes orders, all required assessments and interventions
  - CT Brain order
  - Neurologic status assessment
  - 2 peripheral IV's
  - POCT glucose
  - Lab work
  - Swallow Screenings

Stroke/AMS Triage Protocol	
Stroke/TIA/AMS Protocol	
<input checked="" type="checkbox"/>	Stroke Swallow Screening STAT, Once, First occurrence today at 1126
<input checked="" type="checkbox"/>	Neurovascular checks STAT, Every 15 min, First occurrence today at 1126, Until Specified
<input checked="" type="checkbox"/>	CT Brain Attack head without contrast STAT, Once, First occurrence today at 1126 Reason for Exam: Dizziness
<input checked="" type="checkbox"/>	Insert peripheral IV x 2 STAT, Once, First occurrence today at 1126
<input type="checkbox"/>	Rainbow Tubes Hold
<input checked="" type="checkbox"/>	CBC with Automated Differential Once, First occurrence today at 1126
<input checked="" type="checkbox"/>	Comprehensive Metabolic Panel Once, First occurrence today at 1126
<input checked="" type="checkbox"/>	Troponin I Once, First occurrence today at 1126
<input checked="" type="checkbox"/>	Creatine Kinase, MB Once, First occurrence today at 1126
<input checked="" type="checkbox"/>	Creatine Kinase, Total STAT, First occurrence today at 1126
<input checked="" type="checkbox"/>	Prothrombin Time and Activated Partial Thromboplastin Time STAT, First occurrence today at 1126 If patient is on coumadin, send PT/PTT.
<input checked="" type="checkbox"/>	Alcohol-Ethyl Once, First occurrence today at 1126
<input checked="" type="checkbox"/>	Type and Screen Once, First occurrence today at 1126
<input checked="" type="checkbox"/>	Urinalysis, Routine with Reflex to Microscopic Evaluation Once, First occurrence today at 1126
<input checked="" type="checkbox"/>	POCT Glucose STAT, Once, First occurrence today at 1126
<input type="checkbox"/>	Creatinine POCT STAT, Once
<input type="checkbox"/>	POCT Pregnancy, Urine STAT, Once

*"To every patient, every time, we will provide the care that we would want for our own loved ones."*

**GBMC**

# Target 2b: tPA Order Set

- Ensures care standardization, increases efficiency
- Improves safety of high risk medication dosing
  - tPA dose is calculated based on recorded weight
  - Pharmacy mixes the tPA per order

## Order Sets

### Intravenous t-PA for Ischemic Stroke Personalize

#### Ordering Provider

Must HOLD all anticoagulant or antiplatelet orders for 24 hours (e.g. Aspirin, Heparin, Warfarin, Enoxaparin, Fondaparinux, Dipyridamole, Clopidogrel, Ticlopidine, Dabigatran, Rivaroxan)  
- GBMC Inclusion & Exclusion Criteria  
- GBMC TPA Consent  
- GBMC Extended Criteria Consent  
- GBMC Stroke Page

#### Interventions and Assessments

##### Nursing

Consider POCT Glucose (fingerstick) Q6H

Notify: Stroke Coordinator at 8177

Routine, Until discontinued, starting today at 1541, Until Specified

Provide Stroke Education

Nurse to provide ongoing education to patient and family for the following: -Activation of Emergency Medical System (EMS) -For stay and at discharge -Warning signs and symptoms of stroke -Personal modifiable risk factors, lifestyle, family history -Provide

Bleeding Precautions

Routine, Continuous, starting today at 1541, Until Specified  
For 24 hours from the start of the t-PA

No Straight Stick Blood Draws

Routine, Continuous, starting today at 1541, Until Specified  
No arterial, peripheral or phlebotomy sticks for 24 hours from the start of the t-PA infusion

No Injections

Routine, Continuous, starting today at 1541, Until Specified  
For 24 hours from the start of t-PA infusion

Cardiac monitoring

Routine, starting today at 1540, Until Specified  
! Continuous bedside monitoring is only for ICU, IMC, ED, PEDS

Pulse oximetry, continuous

! Routine, starting today at 1540, Until Specified

Keep SaO<sub>2</sub> greater than/equal to 94%

Routine, Continuous, starting today at 1541, Until Specified  
Place 2-6 L O<sub>2</sub> via Nasal Cannula if needed

### alteplase (ACTIVASE) injection 6.1 mg

Dose: 0.09 mg/kg 100 mg

Weight Type: Recorded Ideal Adjusted Dosing Order-Specific

Weight: 68 kg 77.6 kg 68 kg

Recorded weight: 68 kg (recorded in the last hour)

Administer Dose: 6.1 mg

Administer Amount: 6.1 mL

Route: intravenous intravenous

Frequency: Once

Starting: 7/12/2019 Today Tomorrow At: 1545

First Dose: Today 1545 Number of doses: 1

Scheduled Times

07/12/19 1545

Indications: acute thromboembolic stroke

Admin. Inst.: abc ? ? + Insert SmartText

! Max bolus dose 9 mg.  
Initial Bolus = 10 % of Total Dose (0.09 mg/kg) administer over 1 minute

Flush IV line with 20 ml NS after infusing t-PA.  
\*Door to needle goal LESS than or equal to 60 minutes

Prod. Admin. (none)

Inst.:

Priority: Routine Routine STAT

GBMC

# Success & Change Management Strategy for Workflow Improvements

- Coordinated Stroke Task Force Meetings
  - Multidisciplinary representation including nurses and providers from ED, Stroke Units and Critical Care areas
- Data report out and analysis
- Review of all tPA cases for potential learning opportunities
- Acknowledgement of successes
- Conduct continuous performance improvement cycles with implementation of new enhancements

*“To every patient, every time, we will provide the care that we would want for our own loved ones.”*

**GBMC**



# Other System Improvements

NIH Stroke Scale incorporated into Epic

Implementation of Stroke Narrator

Nurse Stroke Checklist (coming soon)

Los Angeles Motor Scale

Neuro Check flowsheets have  
Copy Forward allowed

*“To every patient, every time, we will provide the care  
that we would want for our own loved ones.”*

GBMC

# NIH Stroke Scale

- Performed at baseline, 24 hours post tPA, and at discharge
- All assessments visible for data trending

NIH Stroke Scale

Interval  Baseline  24 Hours Post TPA  Discharge  Other (Comment)

Level of Consciousness (1a.)  0  1  2  3

LOC Questions (1b.)  0  1  2

LOC Commands (1c.)  0  1  2

Best Gaze (2.)  0  1  2

Visual (3.)  0  1  2  3

Facial Palsy (4.)  0  1  2  3

Motor Arm, Left (5a.)  0  1  2  3  4  Amputation or joint fusion

Motor Arm, Right (5b.)  0  1  2  3  4  Amputation or joint fusion

Motor Leg, Left (6a.)  0  1  2  3  4  Amputation or joint fusion

Motor Leg, Right (6b.)  0  1  2  3  4  Amputation or joint fusion

Limb Ataxia (7.)  0  1  2  Amputation or joint fusion

Sensory (8.)  0  1  2

Best Language (9.)  0  1  2  3

Dysarthria (10.)  0  1  2  Intubated or other physical barrier

Extinction and Inattention (11.) (Formerly Neglect)  0  1  2

Total

*“To every patient, every time, we will provide the care that we would want for our own loved ones.”*

GBMC

# Stroke Narrator

Stroke Narrator Refresh Validate Data by Device

Expand All Collapse All

Not Scanned

Favorites

Alerts (1)

Overdue

Reassess Vitals 44:39h 49m

Vitals

Essential Flowsheets

Previously Filed

MAR

Specimen Collection/Tasks (0)

POCT Results (0)

Event Log Patient Summary Orders

Load Past Stroke

Show: Deleted Status Changes Orders Flowsheet Filed LDA Flowsheets/Assessments

Date	Full Time	Event	Details	User
Aug 9	14:38:11	Stroke Alert Checklist	Stroke Alert Checklist - Brain Attack Head CT - STAT: Completed Obtain/Confirm Actual Weight: Completed Update/Verify Allergies: Completed Insert/Confirm working IV lines X2: Completed Place on Cardiac Monitor: Completed Vital Signs & Neuro Checks Q15 minutes per protocol: Completed EKG STAT (after CT): Completed Keep Patient NPO: Completed	NE
Aug 9	14:37:09	Dysphagia Assessment	Observation Screening - History of Swallowing Difficulty: 0-No Altered Level of Consciousness: 0-No Drooling, Gurgly, Wet Voice: 0-No Slurred Speech: 0-No Observation Screening Result: PASS Screening Stopped and Patient NPO including medications: No MD Notified of Failed Screening: No Test Screening - Difficulty Sipping From Cup: 0-No Leakage From Mouth: 0-No Delayed or Absent Swallow: 0-No Coughing, Choking, or Clearing Throat: 0-No Gurgly or Wet Voice: 0-No Test Screening Result: PASS Screening Stopped and Patient NPO including medications: No MD Notified of Failed Screening: No	NE
Aug 9	14:35:43	Neurological	Neurological - Neuro (WDL): Within Defined Limits Neuro Pertinent Negatives: Alert and oriented x 4 Motor Strength - Right Arm Drift: Present Left Arm Drift: Absent Facial Symmetry: Right facial drooping Extremities: All Right upper extremity - Voluntary Movement: Follows commands RUE Motor Strength: Normal power	NE
Aug 9	14:35:34	GCS Assessment	Glasgow Coma Scale - Eye Opening: Spontaneous Best Verbal Response: Oriented Best Motor Response: Obeys commands Glasgow Coma Scale Score: 15	NE
Aug 9	14:35:13	Peripheral IV 08/09/19 Left Forearm Assessment	Site Assessment: Clean; Dry; Intact Line Status: Blood return noted	NE
Aug 9	14:34:28	Data Record		NE
Aug 9	14:34:28	Orders Acknowledged	New - CT Brain Attack ANGIOGRAM brain with contrast	NE
Aug 9	14:34:28	Orders Placed	CT Brain Attack ANGIOGRAM brain with contrast	PI
Aug 9	14:34:00	Peripheral IV 08/09/19 Left Forearm Placed	Placement Date/Time: 08/09/19 1434 Pre-existing line?: No (Placed at GBMC) Size (Gauge): 18 G Orientation: Left Location: Forearm Patient Tolerance: Tolerated well	NE
Aug 9	14:27:09	Stroke Documentation Start		NE

Expand All Collapse All

Stroke Events

- Stroke Documentation Start
- Stroke Documentation End

Stroke Alert Checklist

- Stroke Alert Checklist

Stroke Assessments

- TPA VS/NEURO CHECK
- NIH Stroke Scale - Nursing
- Dysphagia Assessment

Existing LDAs/Wounds (2)

- Peripheral IV 02/05/19 Right Antecubital
- Peripheral IV 08/09/19 Left Forearm

IVs

- Peripheral IV
- CVC Single Lumen
- CVC Double Lumen

Find IVs Add

Tubes

Drains

Airways

Wounds

Notes

Assessments

- GCS Assessment
- Neurological
- Cardiac
- Gastrointestinal

- Customized build to increase efficiency
- All required assessments located here to increase compliance
- Combined IVs and Neuro Checks since done together
- tPA can be administered from this screen

*"To every patient, every time, we will provide the care that we would want for our own loved ones."*

GBMC

# Nurse Stroke Alert Checklist

- Improves compliance with obtaining timely POC Glucose, weight, allergies, labs, etc.
- Paper form converted to electronic

Event Log Patient Summary Orders

Load Past Stroke

Show:  Deleted  Status Change

### Stroke Alert Checklist

Time taken: 13:57:10 9/3/2019

Show:  Row Info  Last Filed  All Choices

+ Add Row + Add Group Values By + Create Note

Stroke Alert Checklist

Brain Attack Head CT - STAT	<input type="checkbox"/> Completed
POC Glucose STAT	<input type="checkbox"/> Completed
Obtain/Confirm Actual Weight	<input type="checkbox"/> Completed
Update/Verify Allergies	<input type="checkbox"/> Completed
Insert/Confirm working IV lines X2	<input type="checkbox"/> Completed
Lab Work STAT (PT/PTT/INR, CMP, CBC, Troponin)	<input type="checkbox"/> Completed
Place on Cardiac Monitor	<input type="checkbox"/> Completed
Vital Signs & Neuro Checks Q15 minutes per protocol.	<input type="checkbox"/> Completed
Pull red t-PA box from Accudose and have at the bedside	<input type="checkbox"/> Completed
EKG STAT (after CT)	<input type="checkbox"/> Completed
Keep Patient NPO	<input type="checkbox"/> Completed
Ask MD if Alteplase (t-PA) is to be administered	<input type="checkbox"/> Yes - Proceed to Pre-TPA Checklist <input type="checkbox"/> No - Do Not Give t-PA

Accept Cancel

*“To every patient, every time, we will provide the care that we would want for our own loved ones.”*

GBMC

# Los Angeles Motor Scale (LAMS)

- Assists triage nurses in the identification of acute cerebral ischemia because of large vessel occlusion

1/23/2019 visit with Fred T Chan, MD for Hospital Encounter

QUICK LOOK

- Chief Complaint
- Travel Screening
- Vitals
- Pain
- Quick Look Comp

PRIMARY TRIAGE

- With Triage
- Allergies
- Triage Details
- Primary Assess
- LAMS**
- Sepsis
- Suicide
- Abuse
- Violence
- SOGI

LAMS - LAMS (Los Angeles Motor Scale)

Time taken: 1428 7/17/2019

Values By + Create Note

▼ LAMS

Facial Droop	0=Absent	1=Present	
Arm Drift	0=Absent	1=Drifts Down	2=Falls Rapidly
Grip Strength	0=Normal	1=Weak grip	2=No grip

LAMS Score 2

Restore Close Cancel

*“To every patient, every time, we will provide the care that we would want for our own loved ones.”*

GBMC

# Neuro Checks: Copy Forward Allowed

- Quickly/easily see changes in neuro assessments
- Supports efficient documentation of patient condition over time

CU RN Handoff Restraints (NV) Non-Stroke Neuro Check **Stroke Neuro Check** Vaccination Screening Stroke Neuro Check

08/09/19 1415

Angioedema present post TPA?

No

Select Single Option: (F5)

Yes

No

Comment (F6)

**Value Information**

No

Taken by:  
Lindsay Adams, RN at 08/09/19 1415 (today)

Recorded by:  
Lindsay Adams, RN at 08/09/19 1423 (today)

**Row Information**

Presence of angioedema should be assessed 2 hours post TPA

**Last Filed Values (24 hours)**

No

by Lindsay Adams, RN at 08/09/19 1415

No

by Lindsay Adams, RN at 08/09/19 1400

**First Filed Value**

No

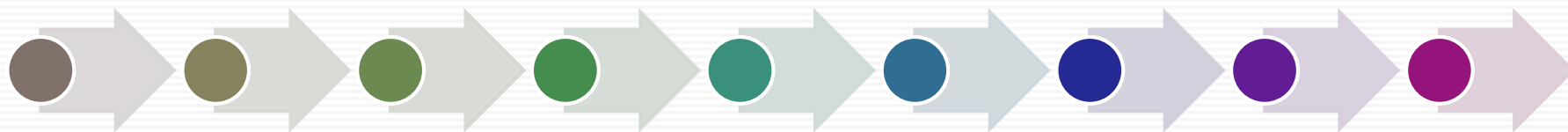
by Lindsay Adams, RN at 08/09/19 1400

	1400	1415
<b>Orientation and Cognition</b>		
Level of Consciousness	Alert	Awake
Orientation Level	Oriented X4	Oriented X4
Cognition	Appropriate judgem...	Appropriate judgem...
Speech	Clear	Clear
Facial Symmetry	Right facial drooping	Right facial drooping
Neuro Symptoms	None	None
Relieved by		
<b>Arm Drift</b>		
Left Arm Drift	Absent	Absent
Right Arm Drift	Present	Present
<b>Vision/Ocular movements</b>		
Visual Field	Intact Visual Field	Intact Visual Field
Acute Visual Changes	No Acute Visual cha...	No Acute Visual cha...
Extraocular Movements	Intact Ocular Move...	Intact Ocular Move...
<b>Neurological Check</b>		
Pupil Assessment	Bilateral	
R Pupil Size (mm)	2	3
R Pupil Shape	Round	Round
R Pupil Reaction	Brisk	Brisk
L Pupil Size (mm)	2	3
L Pupil Shape	Round	Round
L Pupil Reaction	Brisk	Brisk
Motor Function/Strength Assessment	Motor response	Motor response
RUE Motor Response	Responds to comm...	Responds to comm...
RUE Motor Strength	Normal power	Normal power
LUE Motor Response	Responds to comm...	Responds to comm...
LUE Motor Strength	Normal power	Normal power
RLE Motor Response	Responds to comm...	Responds to comm...
LLE Motor Response	Responds to comm...	Responds to comm...

*"To every patient, every time, we will provide the care that we would want for our own loved ones."*

**GBMC**

# Value Derived

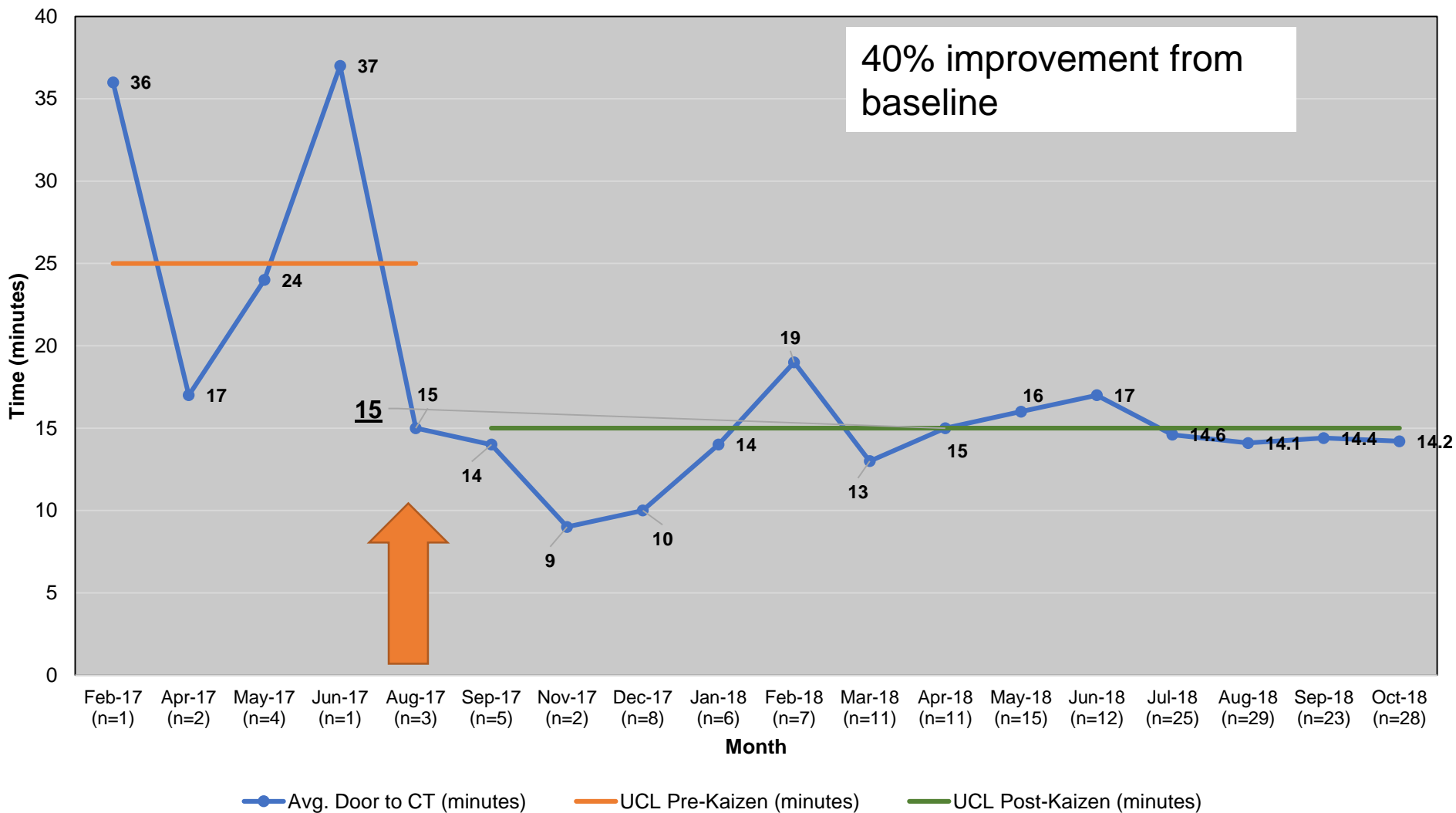


*“To every patient, every time, we will provide the care that we would want for our own loved ones.”*

**GBMC**

# Target 1 -ED Stroke Alert Door to CT Time (through October 21, 2018)

## Improvement with Nurse-Driven Protocol

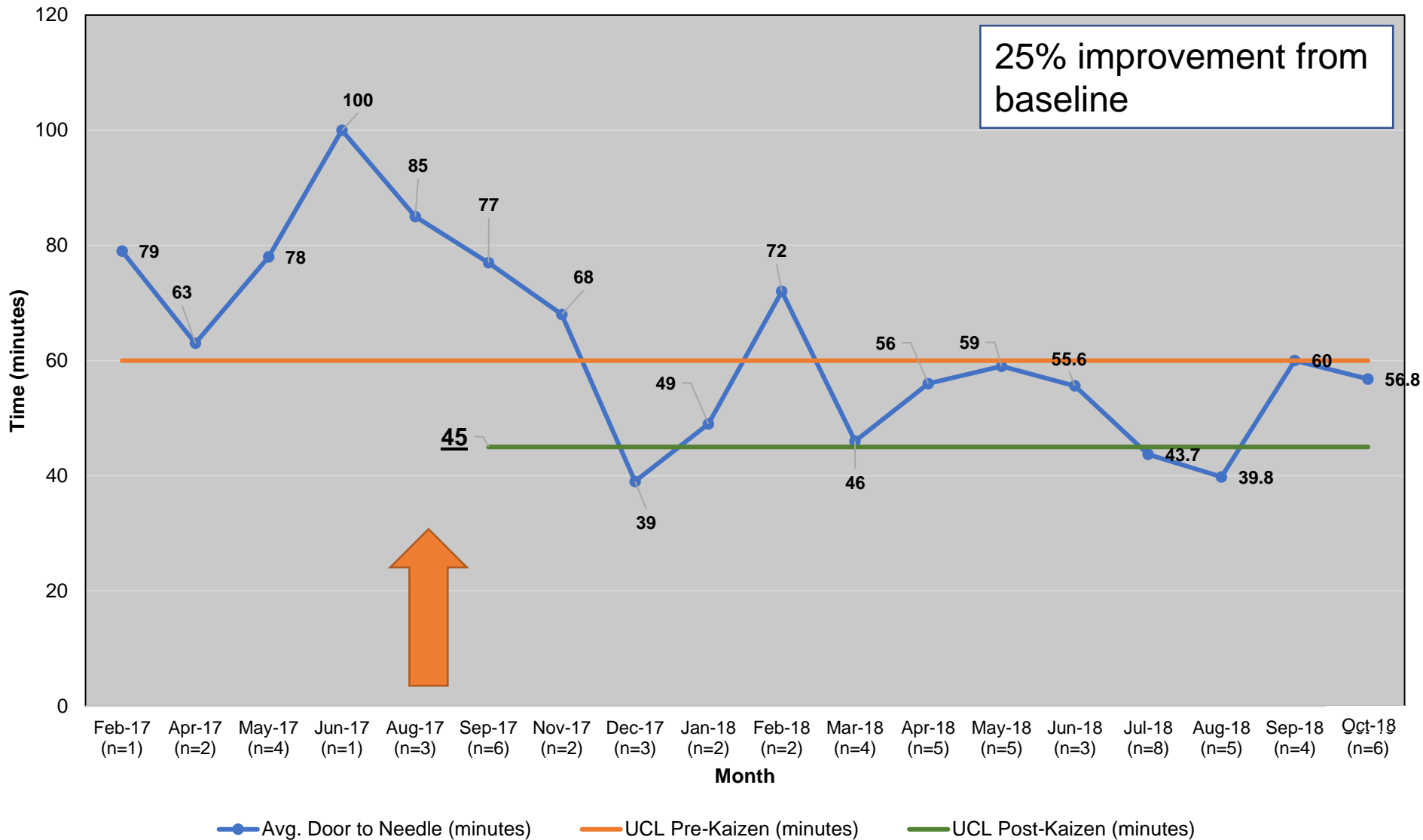


*“To every patient, every time, we will provide the care that we would want for our own loved ones.”*

**GBMC**



# ED Stroke Alert Door to Needle Time (through October 21, 2018) Improvement with Provider Standardized Order Set Use



*“To every patient, every time, we will provide the care that we would want for our own loved ones.”*

**GBMC**

# GBMC tPA Rates 2016, 2017, 2018

Compared to State and National Benchmarks

according to *Get With the Guidelines*

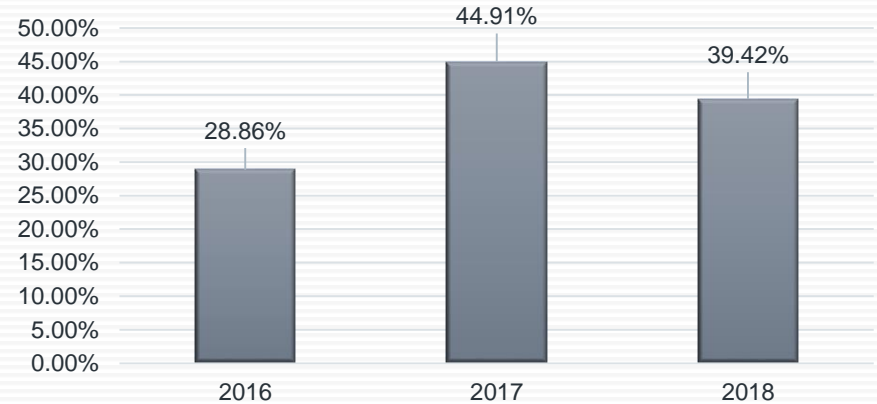


# Lowered Mortality/Morbidity

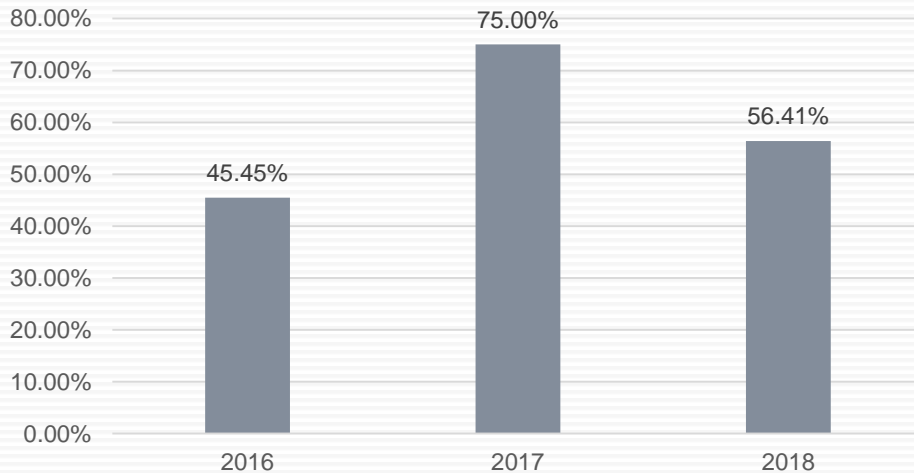
After implementation of the new design for stroke treatment, more patients were discharged to home or acute rehab.

% of patients died or discharged to hospice also decreased.

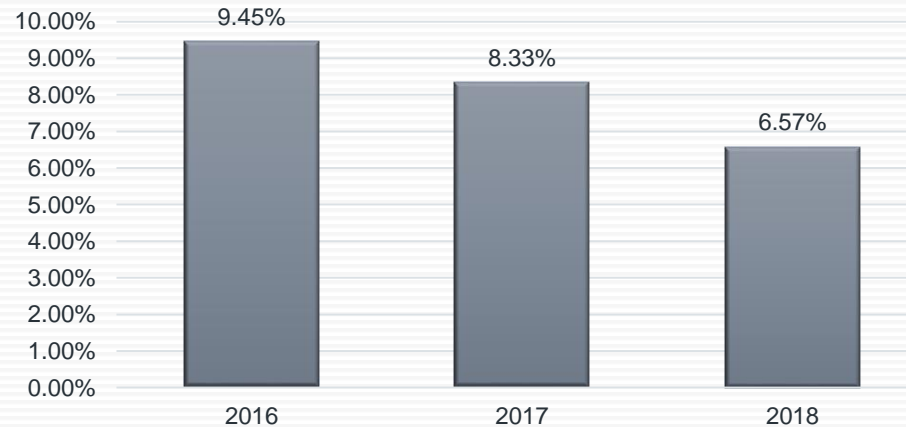
### Ischemic Stroke Outcome Rehabilitation



### tPA Patients Home or Acute Rehab



### Ischemic Stroke Outcome Death/Hospice



*“To every patient, every time, we will provide the care that we would want for our own loved ones.”*

**GBMC**

# Return on Investment

- Initial landmark study in Neurology has shown that qualified patients treated with tPA will produce health care cost savings of approximately \$4,500 per patient<sup>1</sup>
- Using the estimation of \$4,500 dollars cost savings per tPA treated patient:
  - 11 in 2016 = \$49,500
  - 20 in 2017 = \$90,000
  - 39 in 2018 = \$175,500

<sup>1</sup> <https://www.ncbi.nlm.nih.gov/pubmed/9566367/> Cost Effectiveness of Tissue Plasminogen Activator for Acute Ischemic Stroke. Fagan SC, et al. Neurology. 1998.

*“To every patient, every time, we will provide the care that we would want for our own loved ones.”*

**GBMC**

# Stroke Center Recognition

- Given by American Heart Association (AHA) in recognition of hospitals that meet specific quality measures for the diagnosis and treatment of stroke patients with the **goal of speeding recovery and reducing death and disability for stroke patients.**



*“To every patient, every time, we will provide the care that we would want for our own loved ones.”*

**GBMC**

# Keys to Success

- Process must always be re-evaluated based on the data and changing workflows
  - Small workflow change can mean a big change in the data
  - Leverage PDSA and Epic
- Casting a wider net means:
  - Identify more stroke patients
    - Increases pharmacy expenses for tPA medication, which means budget planning
      - **Eventually pharmacy used the amount of medication wasted for central line de-clotting, contributing to savings of \$1000**
    - More false alarms for possible strokes
- Essential that all members of the care team understand the high priority of a Stroke Alert

*“To every patient, every time, we will provide the care that we would want for our own loved ones.”*

**GBMC**