

## BACKGROUND

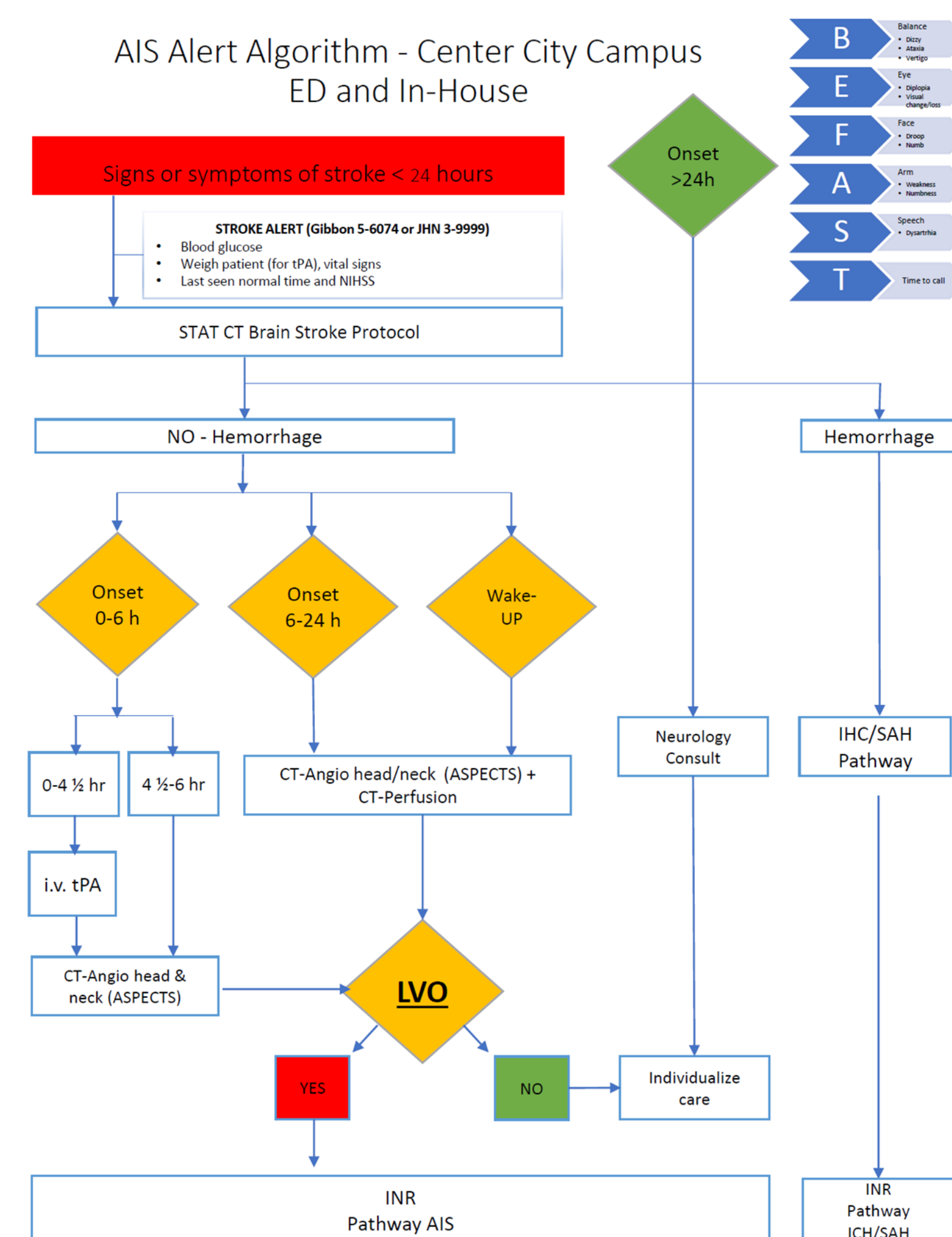
- Endovascular thrombectomy (ET) improves outcomes for patients with acute ischemic stroke (AIS) when given in addition to standard of care (i.e. IV tPA), up to 24 hours after symptom onset.
- Shorter door-to-puncture (DTP) times for ET are associated with improved patient outcomes.
- JCAHO guidelines recommend a target of 90 minutes for DTP, with an ultimate goal of 60 minutes.

## OBJECTIVES

- Optimize the management of patients presenting to TJUH with AIS who are candidates for ET.
- Enable continued process improvement through improved data collection methods and identification of new process metrics.

## METHODS

- A multi-disciplinary committee was created and monthly meetings were held starting December 2017.
- Based off preliminary data– the TJUH ED was targeted for intervention, given comparatively high DTP times to direct transfers to Jefferson Hospital for Neuroscience (JHN).
- A preliminary process revision was proposed in January 2018 and new data points and process metrics were introduced to track for improvement.
- The new ED AIS management protocol (below) was formally implemented May 1st, 2018. Key improvement interventions and timeline are also listed.



- May 18 - Formal protocol introduced - includes automated CTA (+/- perfusion) for all stroke alerts
- June 18 - Direct JeffSTAT contact and INR fellow communication instituted with neurosurgery consult
- Aug 18 - Improved documentation with service contact times
- Sept 18 - "INR Alert" page instituted - Simultaneous activation of JeffSTAT/INR/JHN staff for ET candidates
- Oct 18 - Formalized neurosurgery consult workflow
- Nov 18 - Mar 19 - Initial data collection reviewed - new process metrics and followup metrics added
- Apr 19 - Improved transport protocol
- May 19 - Interim 1 year analysis

## RESULTS

We present the 1-year follow-up data following implementation of the revised TJUH AIS Management Protocol. Data is compared between Pre- and Post-intervention patients.

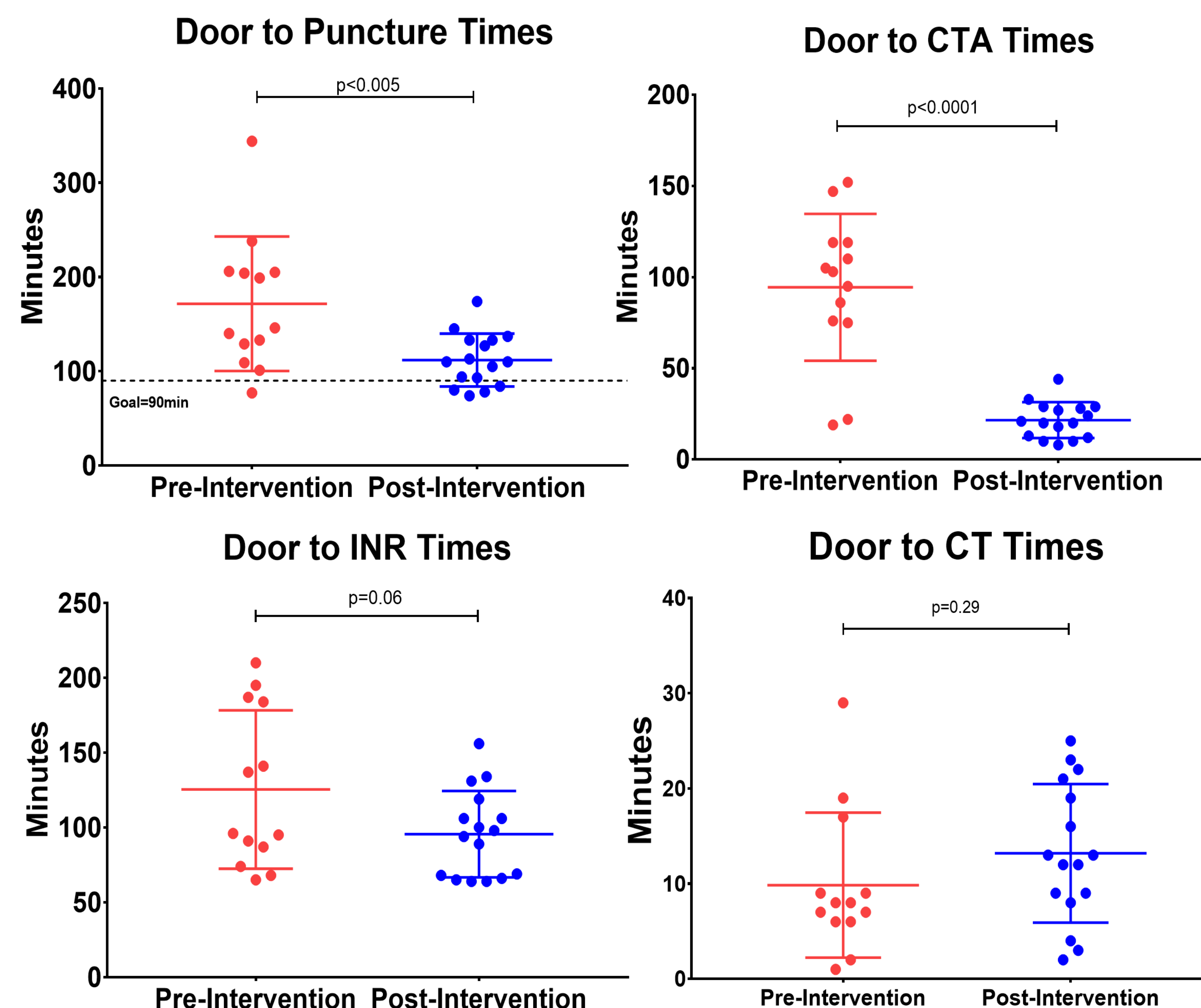


Figure 1: Differences in process metrics (Mean±SD) during the pre-intervention (n=13) and post-intervention (n=16) phases. There were significant improvements in DTP and Door-to-CTA times (t-test, 171±20 vs 112±7 min, and 94±11 vs 22±2 min, respectively). There was a non-significant trend toward improved Door-to-INR times (125±15 vs 96±7) and no difference in Door-to-CT Times (9±2 vs 13±2 min)

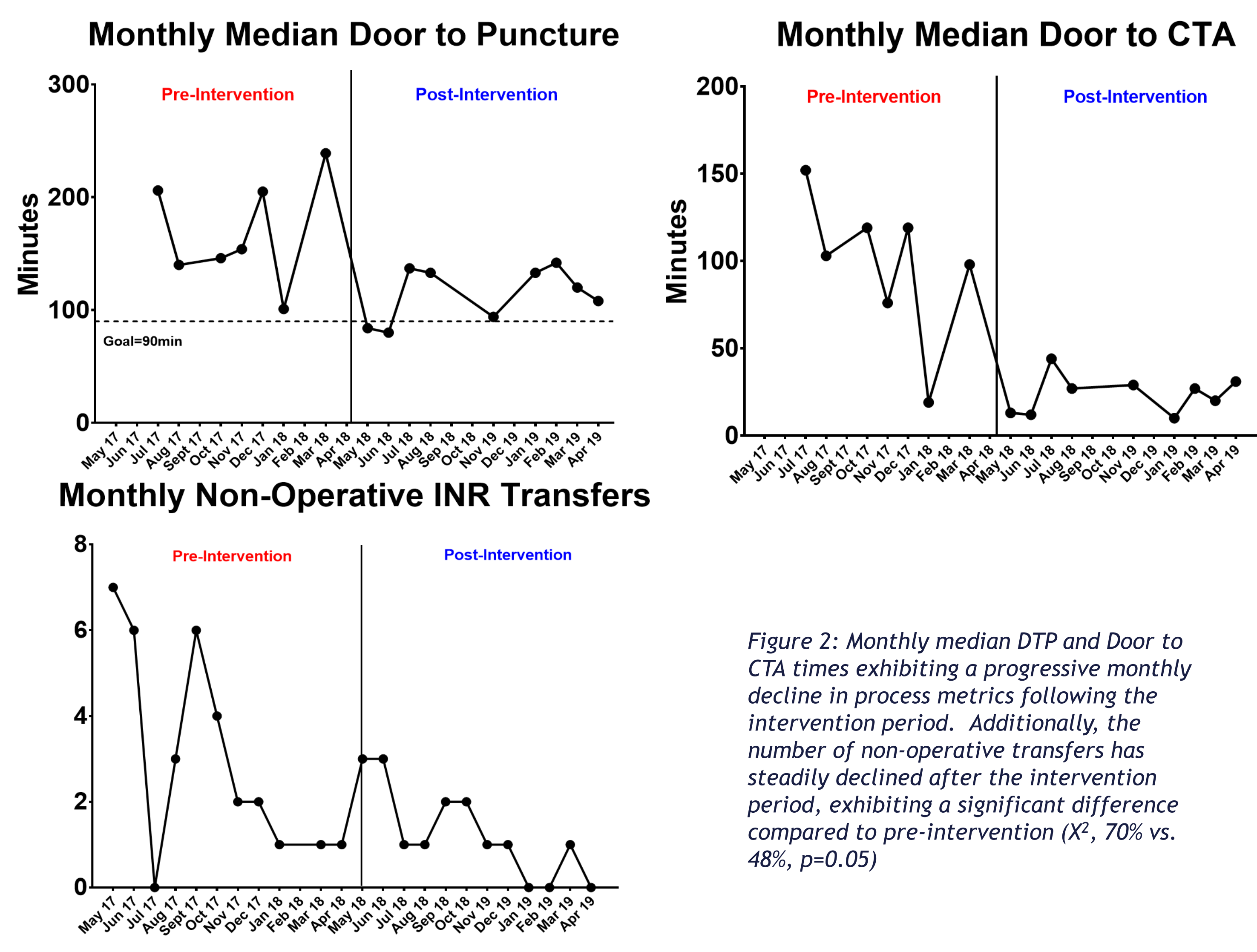


Figure 2: Monthly median DTP and Door to CTA times exhibiting a progressive monthly decline in process metrics following the intervention period. Additionally, the number of non-operative transfers has steadily declined after the intervention period, exhibiting a significant difference compared to pre-intervention ( $\chi^2$ , 70% vs. 48%,  $p=0.05$ )

## DISCUSSION

Successes:

- Significant improvement in DTP times
  - Improved by ~1 hour from pre-intervention
  - Decreased standard deviation = improved consistency
    - Reflects well structured, repeatable protocol
- Significant improvement in Door to CTA times
  - Improved triage, diagnosis, and identification of ET candidates on arrival to ED
- Trend toward improved Door to INR times
  - Improved activation and mobilization of transport
  - Early CTA in ED did not delay mobilization to INR
- Progressive decline in non-operative transfers to INR
  - Successful triage/diagnosis in ED = Improved efficiency and resource utilization

Challenges:

- DTP times are not consistently at/below goal (90min)
  - Continued analysis – new data points, improvement needed
  - Possible targets – Transport, INR to table, Radiology
- Unclear association with outcomes metrics

## Conclusions and Future Directions

Multi-disciplinary committee successfully improved process metrics for patients with AIS undergoing ET. However, need for continued improvement as primary measure (DTP) is not consistently at goal.

Next Steps:

- Improved data collection (see updated list below):
  - Identification of new process metrics (i.e. radiology, transport)
  - Tracking outcome measures (i.e. discharge/6mo NIHSS, mRS)
- Individual case review:
  - Continued monthly meetings for review.
- Targeted interventions

Metrics	Team Owner	Door to TPA decision time	Neurology	JeffStat Dispatch Time	JeffStat
Door to Groin Puncture Time (Goal<90 min)	ER	Time TPA ordered	Pharmacy	INR page time	Neurology
Door to needle time (Goal<60 min)	ER	Time TPA phone call received by pharmacist	Pharmacy	JeffStat Arrival	JeffStat
Date of Arrival	Neurology	Time TPA delivered to neurology resident in ED	Pharmacy	Neurology Notification to JeffStat Arrival	Neurology
Age	Neurology	Time from IPA ordered to delivered	Pharmacy	Time of departure from ED	JeffStat
Pre-hospital stroke alert YES/NO	ER	Location of IPA administration (CT OR ER)	Pharmacy	JeffStat Arrival to INR	JeffStat
ER Arrival time (Door)	ER	Time of IPA bolus administration	Pharmacy	INR Arrival	INR TEAM
Time of ED physician evaluation	ER	Start time of IPA infusion	Pharmacy	End time of IPA infusion	Pharmacy
RACE score	ER	CTP performed? Y/N	Pharmacy	Door to INR (ER arrival to INR arrival)	INR TEAM
Door to ED physician evaluation	ER	Location CTA/P performed (ER/Gibson vs JHN INR)	Pharmacy	Groin Puncture time	INR TEAM
Door to stroke alert activation	ER	Time of CTA/P study performed (scout image)- NSGY	Pharmacy	Time from CTA head last image (above) to groin puncture (<60 min)	Neurology
Time of stroke alert activation	ER	Time of CTA/P study performed (scout image)- RAD	Pharmacy	TICI	INR TEAM
Door to CTA/CTP (1 <sup>st</sup> image)	ER	Time from groin puncture to TICI 2b/3 reperfusion (<60 min)	Pharmacy	Total number of passes with reperfusion device	INR TEAM
Time CTA ordered	Radiology	Time of CTA Last Image	Pharmacy	Time of sheath removal after thrombectomy procedure	INR TEAM
Time CTA/P ordered	Radiology	Time for CTA Processing	Pharmacy	Time of radial sheath removal after thrombectomy procedure	INR TEAM
Time of Neurology evaluation	Neurology	Neurology Arrival Time	Pharmacy	Time patient Last known well	INR TEAM
Time from stroke alert activation to neurology evaluation	Neurology	Door to Neurosurgery Arrival	Pharmacy	Time from order to labs resulted	ER
Initial NIHSS Time	Neurology	Time JeffStat received phone notification from resident	Pharmacy	LVO Location	INR TEAM
Time of discussion with stroke fellow	Neurology	Time CTA head/P read reported by Radiology attending- NSGY	Pharmacy	Length of Stay	INR TEAM
Time CT head performed (Scout image)	Radiology	Time CTA head/P read reported by Radiology attending- RAD	Pharmacy	Admission NIHSS	Neurology
Door to CT performed time	ER	Time from CTA last image (above) to prelim read	Pharmacy	Discharge NIHSS	Neurology
Time CT head interpreted by stroke fellow/stroke attending	Neurology	Time from CTA start (above) to prelim read	Pharmacy	90-day mRS	Neurology
Neurology notification time if concern for LVO	Neurology	CTA first image to INR decision time	Pharmacy		
Door to Neurosurgery Notification	Neurology	CTA last image to INR decision time	Pharmacy		
Time CT head read reported by Radiology attending	Radiology	Time from Neurosurgery notification to INR decision	Pharmacy		
IPA (yes/no)	Neurology	Door to thrombectomy decision/INR activation time	Pharmacy		
IPA decision time	Neurology		Pharmacy		