# New Stroke Treatments and Inter-facility Transport

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# Ischemic Stroke Treatment Toolbox

#### **IV Therapy Alone**



#### **Combination Therapy**





#### IA Therapy Alone





### Results of Recent Interventional Treatment Trials: Better Functional Outcomes at 90 Days

		IV tPA	treatment	advanced			
	# patients	(%)	initiation (h)	imaging	mRS <= 2 (%)	sICH (%)	Mortality (%)
MR CLEAN	500	89	6	no	32.6 vs. 19.1 *	7.7 vs. 6.4	18.9 vs. 19.4
ESCAPE	315	76	12	yes	53.0 vs. 29.3, p<0.001	3.6 vs. 2.7	10.4 vs. 19.0, p= 0.04
EXTEND-IA	70	100	6	yes	71 vs. 40, p=0.01	20 vs. 9	0 vs. 6
SWIFT PRIME	196	100	6	yes*	60 vs. 35, p<0.001	0 vs. 3	9 vs. 12
REVASCAT	206	73	8	no	43.7 vs. 28.2 *	1.9 vs. 1.9	18.4 vs. 15.5
THRACE	414	100	5	no	53 vs. 42, p=0.28	2 vs. 2	12 vs. 13



### Time to Reperfusion Impacts the Likelihood of Functional Independence in SWIFT PRIME



Time from onset to reperfusion (min)







# **DAWN in Full Daylight**

<u>D</u>WI or CTP <u>Assessment with Clinical Mismatch</u> in the Triage of <u>Wake-Up and Late Presenting Strokes</u> Undergoing <u>Neurointervention with Trevo</u>

Tudor G. Jovin MD & Raul G. Nogueira MD on behalf of the DAWN investigators

### Study Methods: Workflow



### **Primary outcome**





73% relative risk reduction of dependency in ADL's NNT for any lower disability 2.0

### 90 Day mRS 0-2 by TLSW to Randomization





## DAWN: Implications for Interventional Centers

- Heretofore, there has been no acute treatment for such patients, and the majority of these patients are never referred to an interventional center
- Selection requires imaging that most hospitals are not capable of doing at this time
- Moreover, most interventional centers currently do not have the imaging software needed to determine eligibility, so patients may only be able to get this intervention at a subset of current interventional centers
- The study has not been published, but we suspect that groin puncture must be done within 60-90 minutes of the selection imaging, so we will not know if a patient is eligible until AFTER he/she is transferred to a capable interventional center
- We have no idea of how many people need to be screened to have one eligible patient
  - Increased transfer volumes will tax an already overloaded system





### Stroke Systems: Hubs and Spokes in the Era of IV Alteplase



![](_page_9_Picture_3.jpeg)

### Stroke Systems in the New Age of Interventional Therapies: Greater dependence on interventional hubs and inter-hospital transport

![](_page_10_Figure_1.jpeg)

![](_page_10_Picture_2.jpeg)

### Intervention-Capable Stroke Centers in NC (2017)

![](_page_11_Picture_1.jpeg)

#### Legend

![](_page_11_Picture_3.jpeg)

![](_page_11_Picture_4.jpeg)

County with a NCSCC hospital

County with no hospital

Note: Data are from NC Stroke Care Collaborative. \*Data from 6/35/2012

- ★ Interventional capable PSC (2017)
- ★ AHA/TJC CSC pending (2017)
- ★ AHA/TJC CSC (2017)

![](_page_11_Picture_11.jpeg)

Department of Neurology

# UNC IA Protocols: Metrics Developed & Goals Set

![](_page_12_Picture_1.jpeg)

#### **Activation/Pre-Arrival**

- Patient Origin OSH, ED, Inpatient
- Transfer Center call time
- Transport Method
- Code IA Activation "auto-launch"

![](_page_12_Picture_7.jpeg)

#### Arrival

- Door Time
- CTA Order, Read
- Decision

![](_page_12_Picture_12.jpeg)

#### Treatment

- Groin Puncture Time
- Sedation/Anesthesia
- Treatment Type

Goals: Door-to-Groin: <u><</u>60 min Door-to-Device: <90 m

- TICI Score
- Complications

Actual (CY 2017): Avg Door-to-Groin: 30 min Avg Door-to-Device: 57 min

# The UNC Experience: Code IA Stroke Transfers

- 60% of our Code IA Stroke activations are transfers
- Of transferred patients
  - 71% received IV alteplase prior to transfer
  - 22% had a CTA performed before transfer
  - Only 39% of transferred patients were actually eligible for intervention upon arrival
    - 71% of patients with a pre-transfer CTA went to intervention
    - Only 30% of patients without a pre-transfer CTA went to intervention
    - Reasons for exclusion: no proximal occlusion (62%); arrived at UNC outside of treatment window (16%); significantly improved (13%)
  - Referring hospital door-in-door-out (DIDO) in hours, median (IQR)
    - 1.8 (0.4-2.7) intervention
    - 1.7 (0.8-2.6) non-intervention

![](_page_13_Picture_12.jpeg)

### Hurdles to Reducing Onset-to-Intervention Times in New Systems of Stroke Care

- Hubs (CSCs and Interventional-Capable PSCs)
  - 12 hospitals in NC capable of advanced interventions
    - cost prohibitive for most other hospitals
  - Not all Hubs offer 24/7/365 access
  - Limited bed availability force some Hubs to divert
  - Goals
    - improve access
      - streamline referral process
      - help referring hospitals select patients eligible for intervention
      - education for referring hospitals and transport agencies
    - improve notification methods when on divert
      - Important for inter-facility transfers as well as initial transport of patients
    - "autolaunch" capability
    - reduce door-to-device times
    - prepare for the eventuality of DAWN-eligible patients

![](_page_14_Picture_16.jpeg)

## Hurdles to Reducing Onset-to-Intervention Times in New Systems of Stroke Care

### **Referring Hospitals**

### • ASRHs or other stroke capable hospitals

- IV alteplase patients are generally transferred out
- May have limited awareness of potential interventional opportunities
- Most do not have ability to perform emergent CTAs
- PSCs
  - Usually keep uncomplicated IV alteplase patients
  - Many but not all perform emergent CTAs
- Goals
  - Improve door-to-needle times for IV alteplase
  - Improve door-to- transfer request times by developing rapid referral protocols
    - Know your Hubs: who, when, and how
  - Reduce the number of transfers to Hubs who do not require complex care
    - Develop CTA protocols and work with Hubs to upload images for review
  - Improve DIDO make sure patients are ready to go as soon as transport arrives

![](_page_15_Picture_16.jpeg)

## Hurdles to Reducing Onset-to-Intervention Times in New Systems of Stroke Care

### Transport systems

- Air Transport
  - The desired mode of transport for code IA, if available
    - Generally owned and operated by the Hubs' health care systems
    - Mutual aid assistance commonly needed
  - Weather a major factor in availability
- Ground Transport
  - May be faster than air transport if vehicle is already at the referring hospital and distance to Hub is short
    - Most transports are done by units owned and operated by health care systems (both Spokes and Hubs)
    - Mutual aid sometimes needed and is sometimes provided the local government EMS services
  - Heavily affected by traffic delays
- Goals
  - Continue to work collaboratively to provide fastest transports possible
  - Be aware of each Hub's patient protocols (pre-notification, delivery point, etc)
  - Collect and review data on Code IA transport volumes to help determine the current and future resources needed
  - Be proactive in planning for increase stroke transport volumes

![](_page_16_Picture_17.jpeg)

# Proposed Next Steps

- Continue current SAC dialogue: Integrating and Accessing Care
- Encourage each Hub to begin dialogues with their referring hospitals and transport systems
- Provide education government and health care leadership on the current issues and needs
- Organize a meeting (SAC, Hub leadership teams, NCHA, NCCEP, NCOEMS, NCDHHS, Critical Care Transport leadership, others) to continue dialogue on a larger scale

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![](_page_18_Picture_0.jpeg)

![](_page_18_Picture_1.jpeg)

![](_page_18_Picture_2.jpeg)

![](_page_18_Picture_3.jpeg)

American Heart Association American Stroke Association CERTIFICATION

Meets standards for Comprehensive Stroke Center

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![](_page_18_Picture_7.jpeg)

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![](_page_18_Picture_9.jpeg)

![](_page_18_Picture_10.jpeg)