

# Am I Coming or Going? Door In Door Out for Acute Ischemic Stroke

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# Outline

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- Time is Brain
- EVT for LVO
- Guidelines
- DIDO
- Cases
- Strategies for Improvement

# Time is Brain – Acute Treatment

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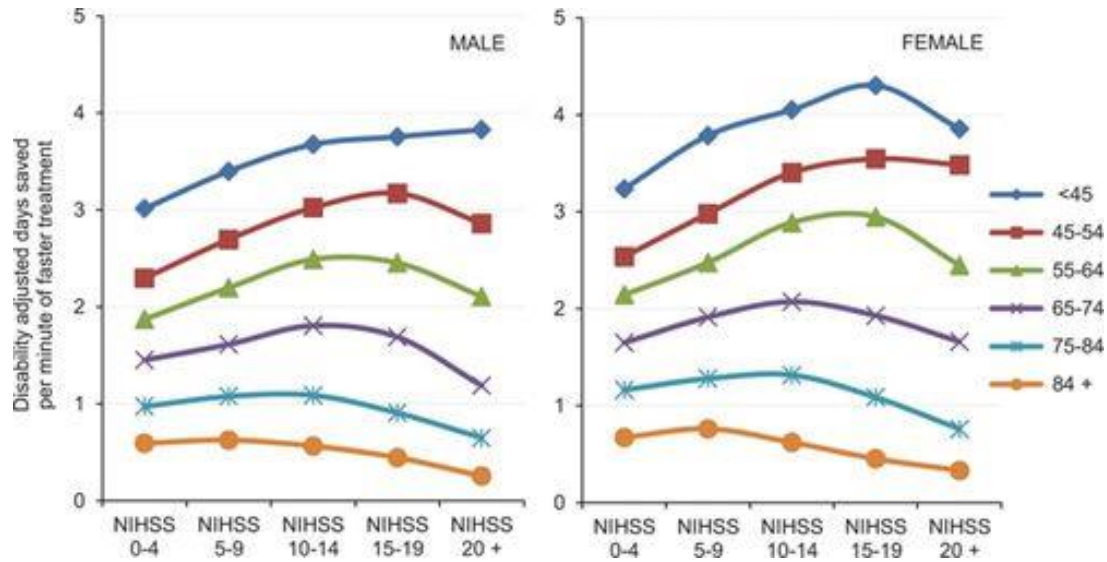
- tPA: 3 – 4.5 hours from last known well (LKW)
- Endovascular therapy (EVT): up to 24 hours

# Time is Brain

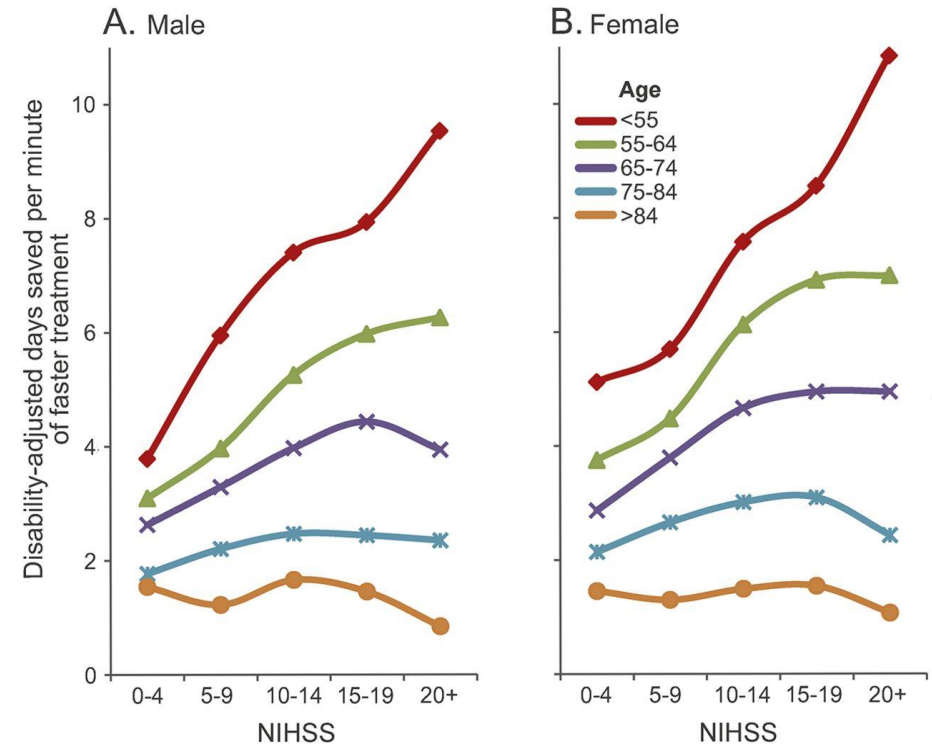
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- As ischemia progresses, neurons are irreversibly lost
- ~ 2 million neurons/min for large vessel occlusion (LVO)
  - Can range from ~ 35,000 – 27 million/min
- ~ 31 million neurons/year as part of normal aging
- Accelerated aging: 9.9 hours – 10 months/min (25 days – 50 years/hour)
  - ~ 4 years/hour

# Time is Brain



IV tPA: Healthy days gained per minute of faster treatment



EVT: Healthy days gained per minute of faster treatment

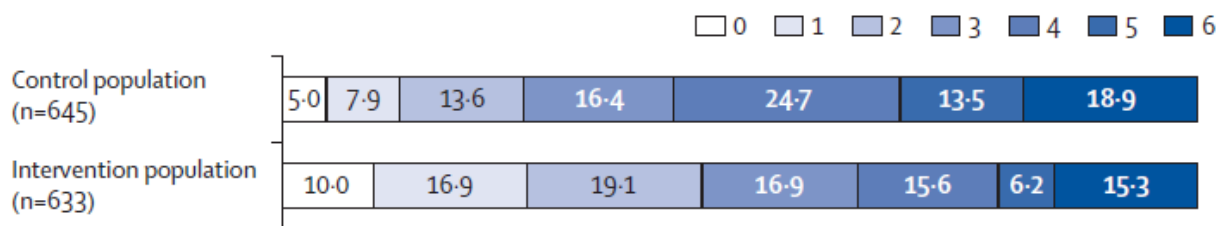
# Time is Brain – Investigation

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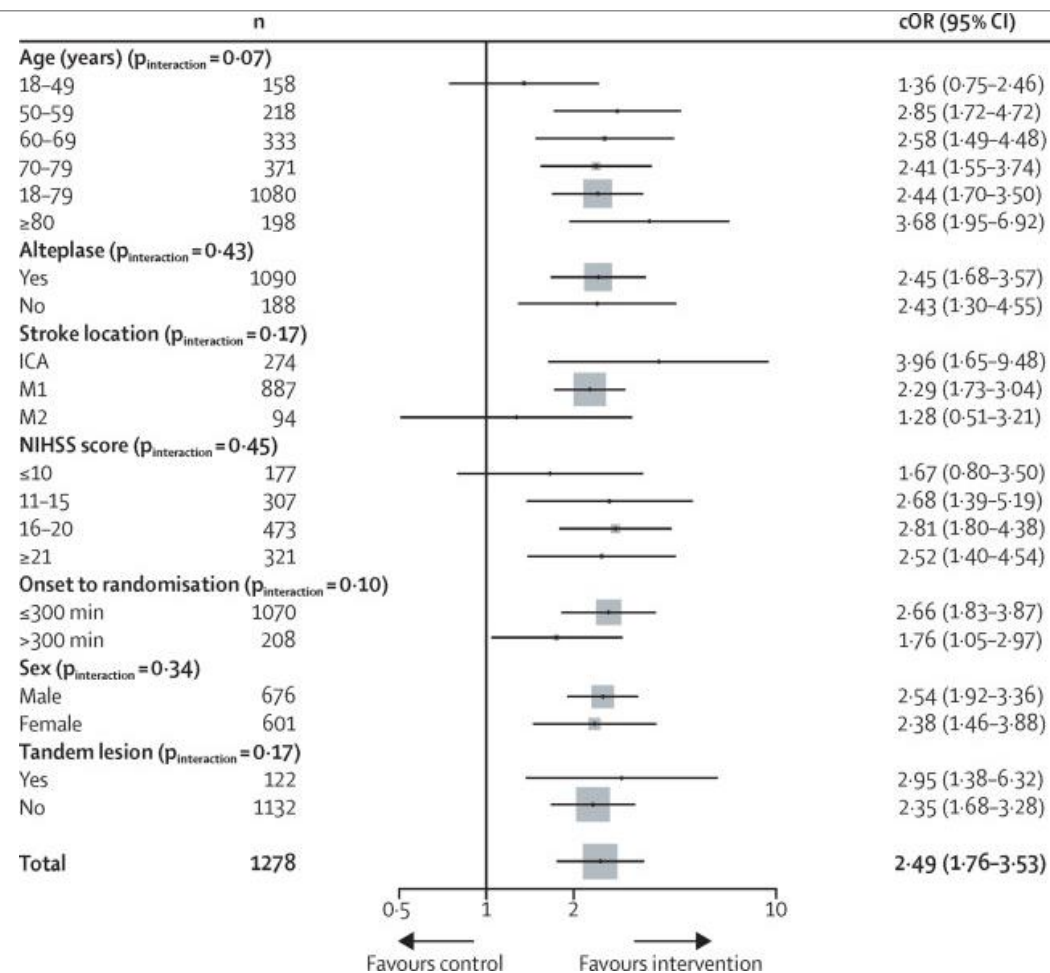
- Clinical examination
  - NIHSS
- Non-contrast CT Head
- CTA
- Transfer to EVT center if LVO
  - *Mechanical thrombectomy requires the patient to be at an experienced stroke center with rapid access to cerebral angiography, qualified neurointerventionalists, and a comprehensive periprocedural care team. Systems should be designed, executed, and monitored to emphasize expeditious assessment and treatment.*

# EVT for LVO

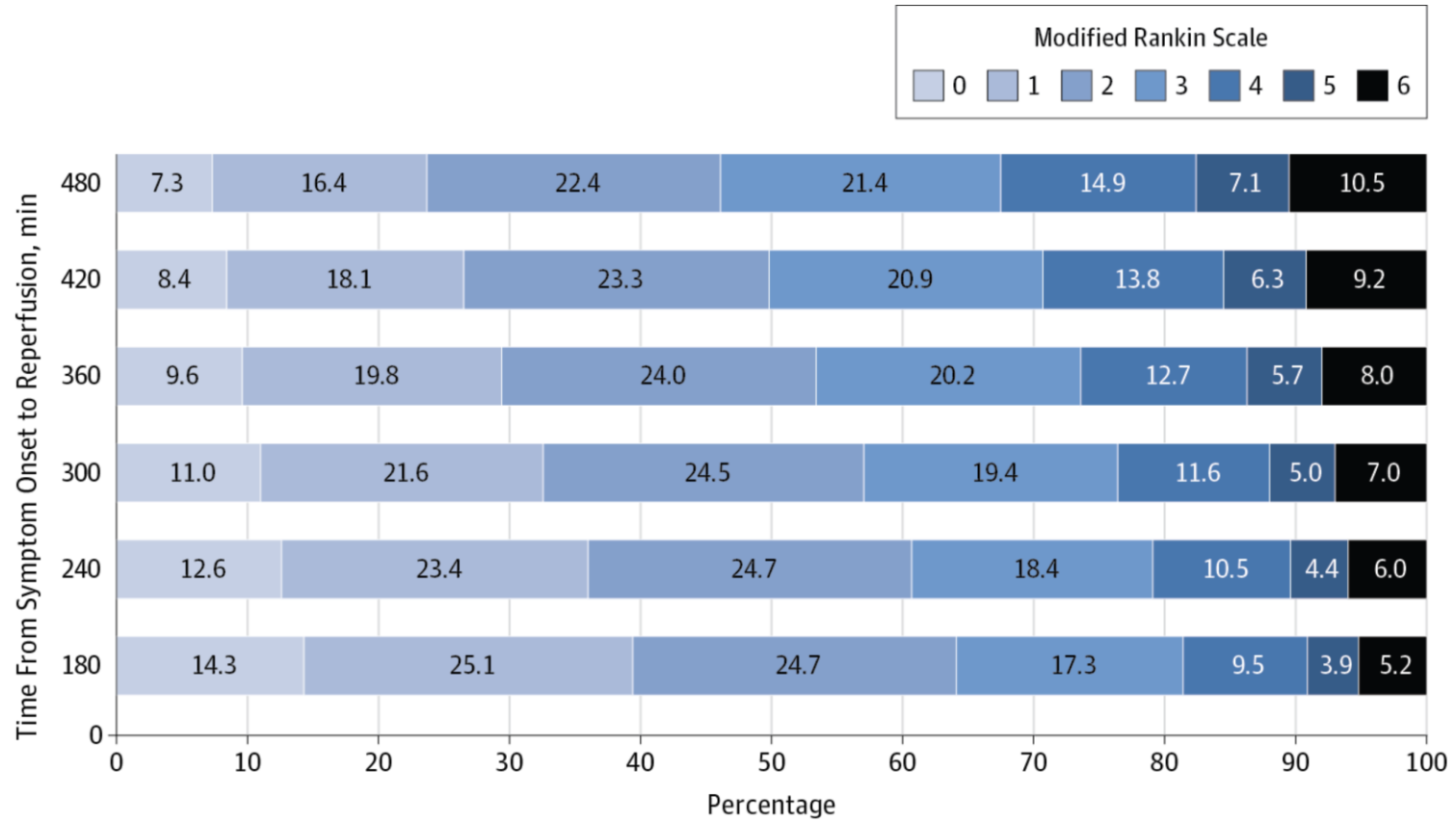
## A Overall



NNT: 2.6 for improvement of 1 mRS level

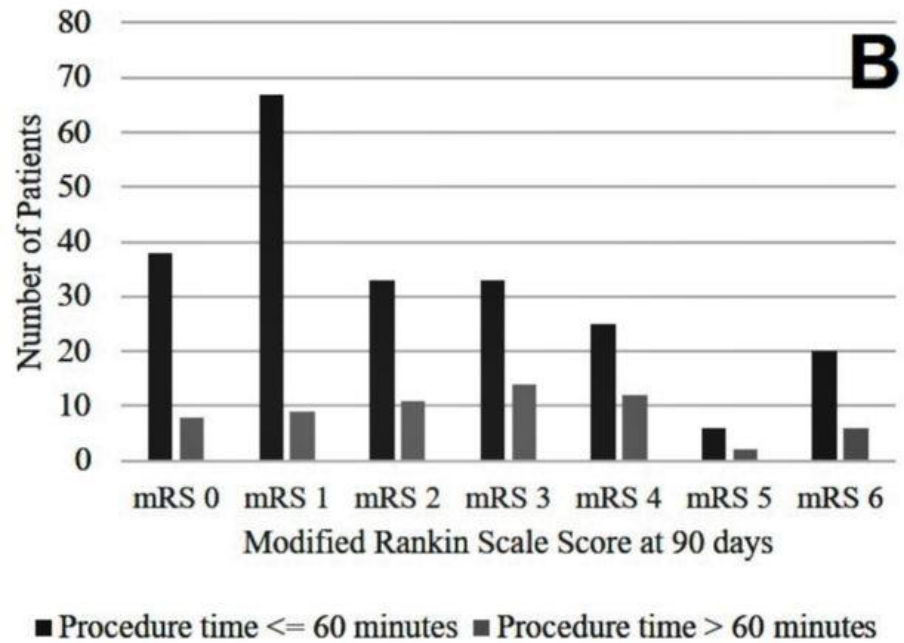
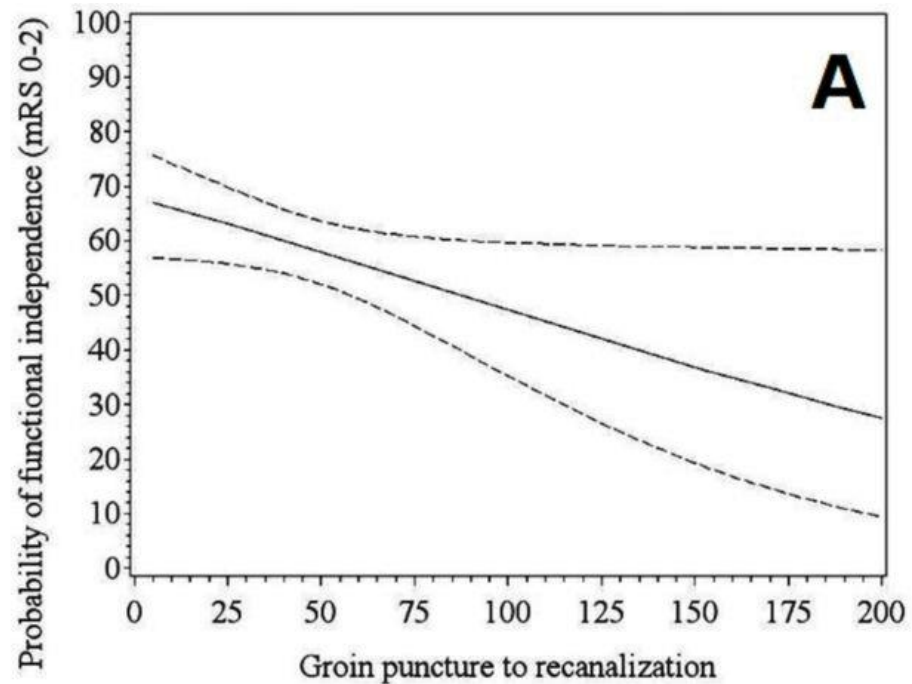


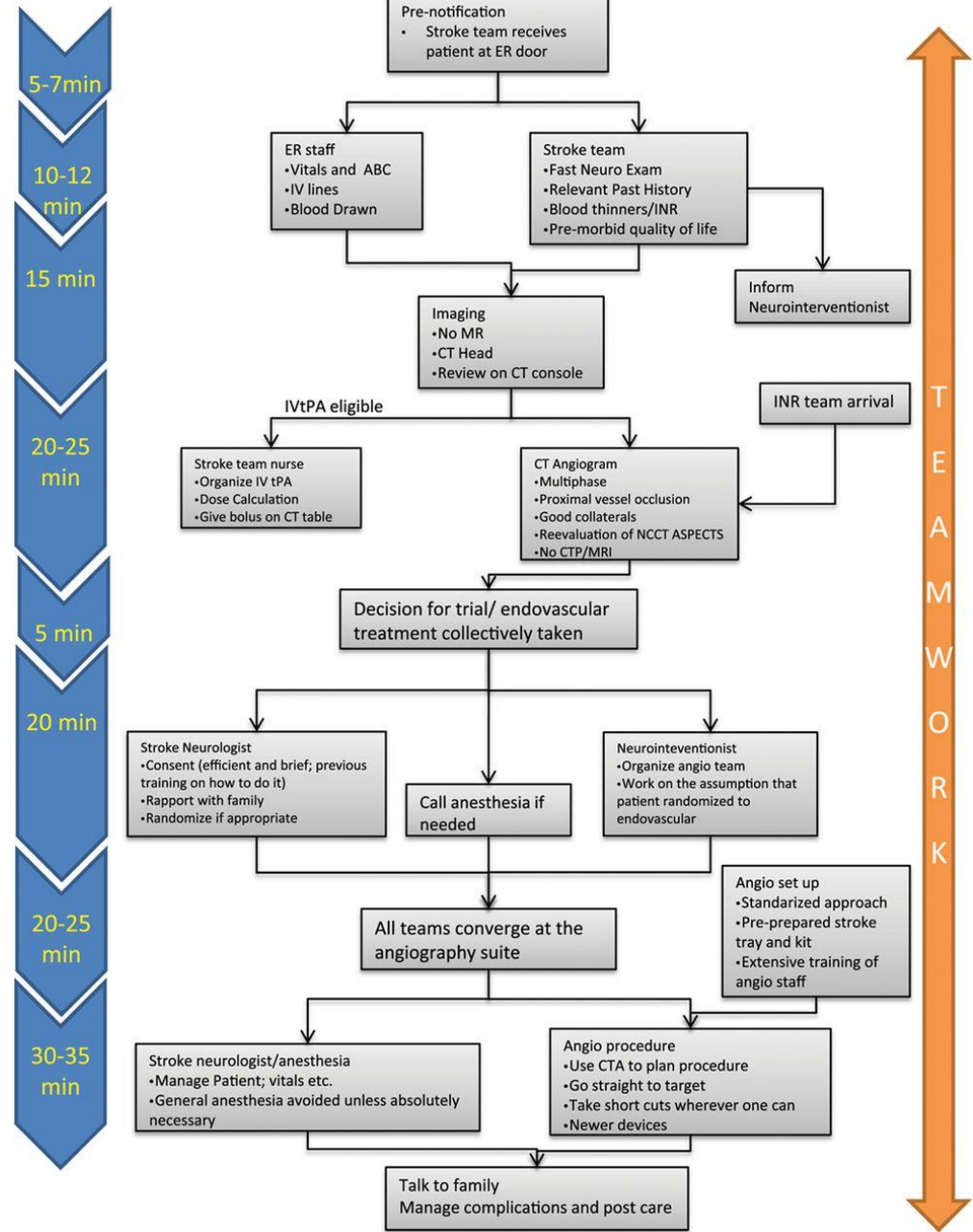
# EVT for LVO





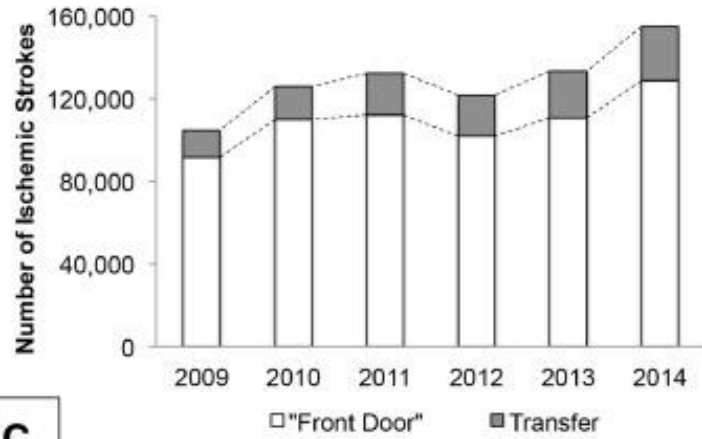
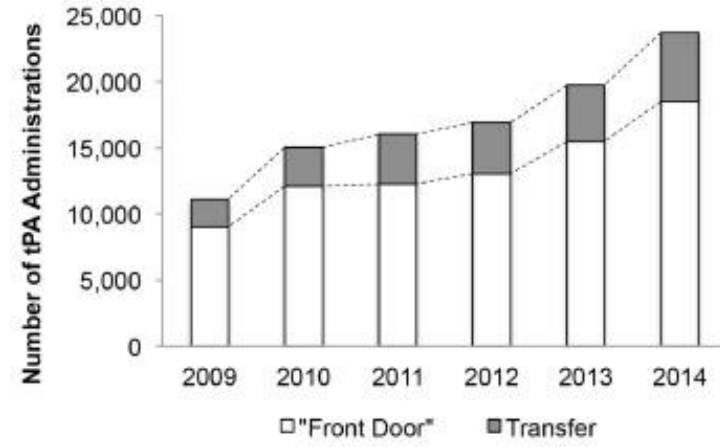
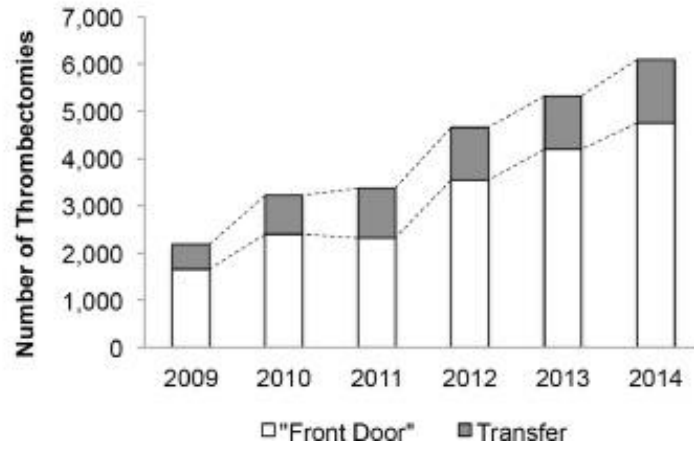
# EVT for LVO





5-7min  
10-12 min  
15 min  
20-25 min  
5 min  
20 min  
20-25 min  
30-35 min

T  
E  
A  
M  
W  
O  
R  
K

**A****B****C**

# Recommendations/Guidelines

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- Brain imaging studies performed within 20 minutes of arrival in the ED in at least 50% of tPA and/or EVT eligible patients
  - Multimodal CT and MRI should not delay tPA administration
- The Brain Attack Coalition recommends that transfers occur within 2 hours of the patient presenting to a “spoke” hospital

# New Measures

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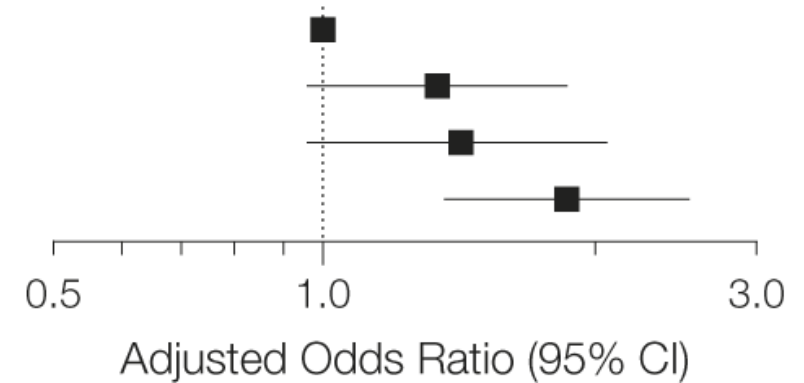
Set Measure ID	Performance Measure Name
STK-OP-1b	Hemorrhagic Stroke
STK-OP-1c	Ischemic Stroke; IV Alteplase Prior to Transfer (Drip and Ship)
STK-OP-1d	Ischemic Stroke; No IV Alteplase Prior to Transfer, LVO and MER Eligible
STK-OP-1e	Ischemic Stroke; No IV Alteplase Prior to Transfer, LVO and NOT MER Eligible
STK-OP-1f	Ischemic Stroke; No IV Alteplase Prior to Transfer, No LVO
STK-OP-1a	Overall Rate (Not Reported)



# DIDO – STEMI

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DIDO Time, min	Mortality, No. of Patients/Total (%)	Adjusted Odds Ratio (95% CI)
≤30	43/1600 (2.7)	1.0 (Reference)
31-60	192/4841 (4.0)	1.34 (0.96-1.86)
61-90	146/3013 (4.9)	1.41 (0.96-2.06)
>90	430/5176 (8.3)	1.86 (1.36-2.54)



# DIDO – LVO

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“A door- in door-out time  $\leq$  30 minutes may be required to make drip and ship paradigm effective”



# DIDO – LVO

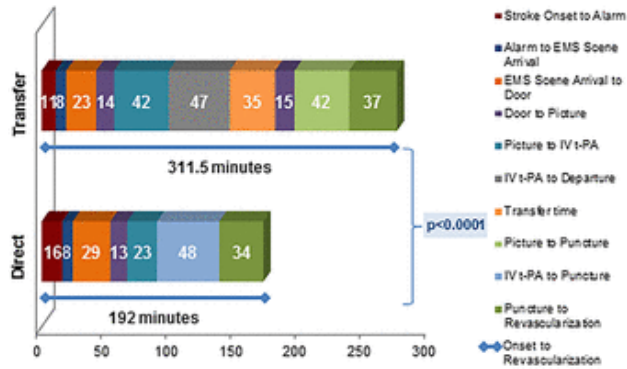
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**Workflow times by admission status (minutes)**

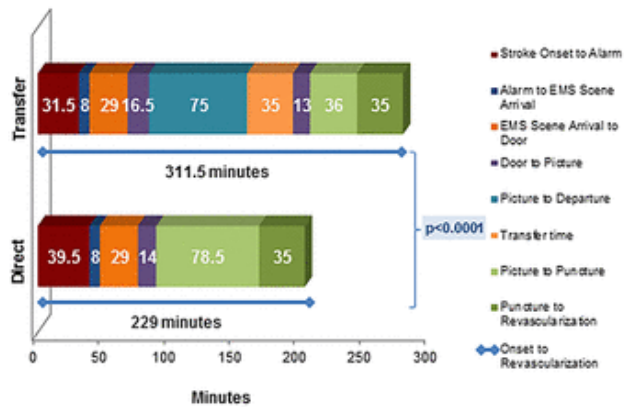


# DIDO – LVO

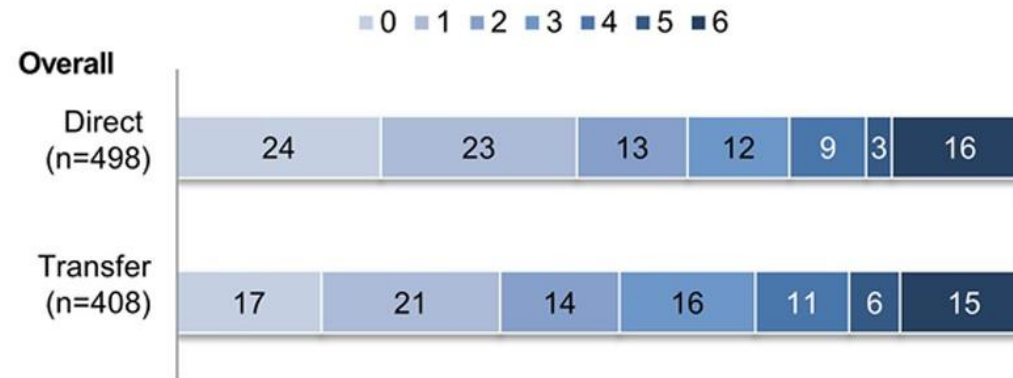
**A** Median Times from Stroke Onset to Revascularization for Direct vs. Transfer Patients (IV-tPA + MT Subgroup)



**B** Median Times from Stroke Onset to Revascularization for Direct vs. Transfer Patients (MT Alone Subgroup)



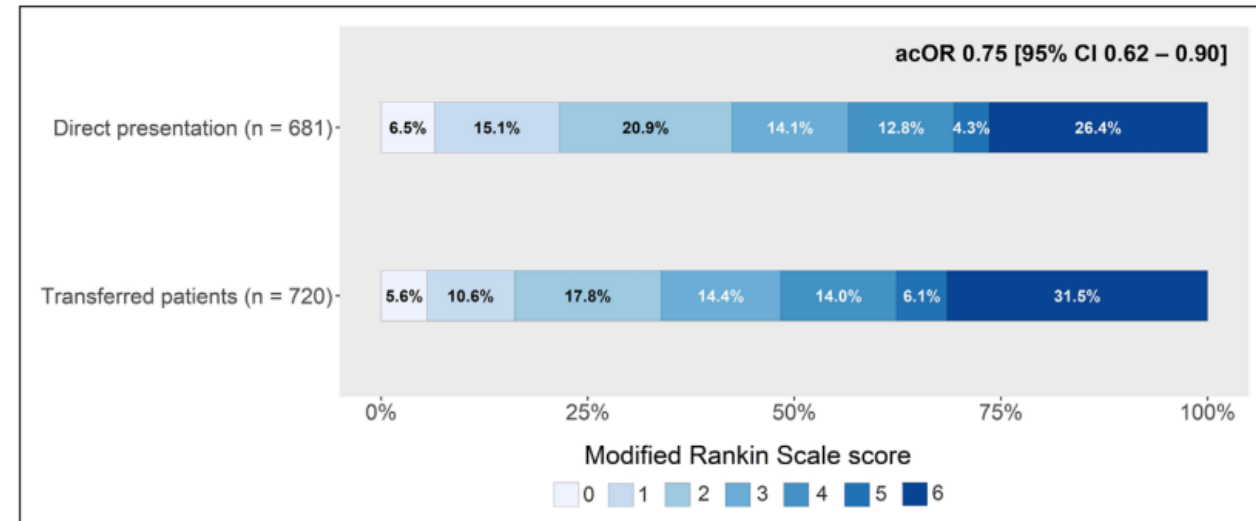
**A** mRS at 90 days for Direct vs. Transfer Patients



P = 0.012

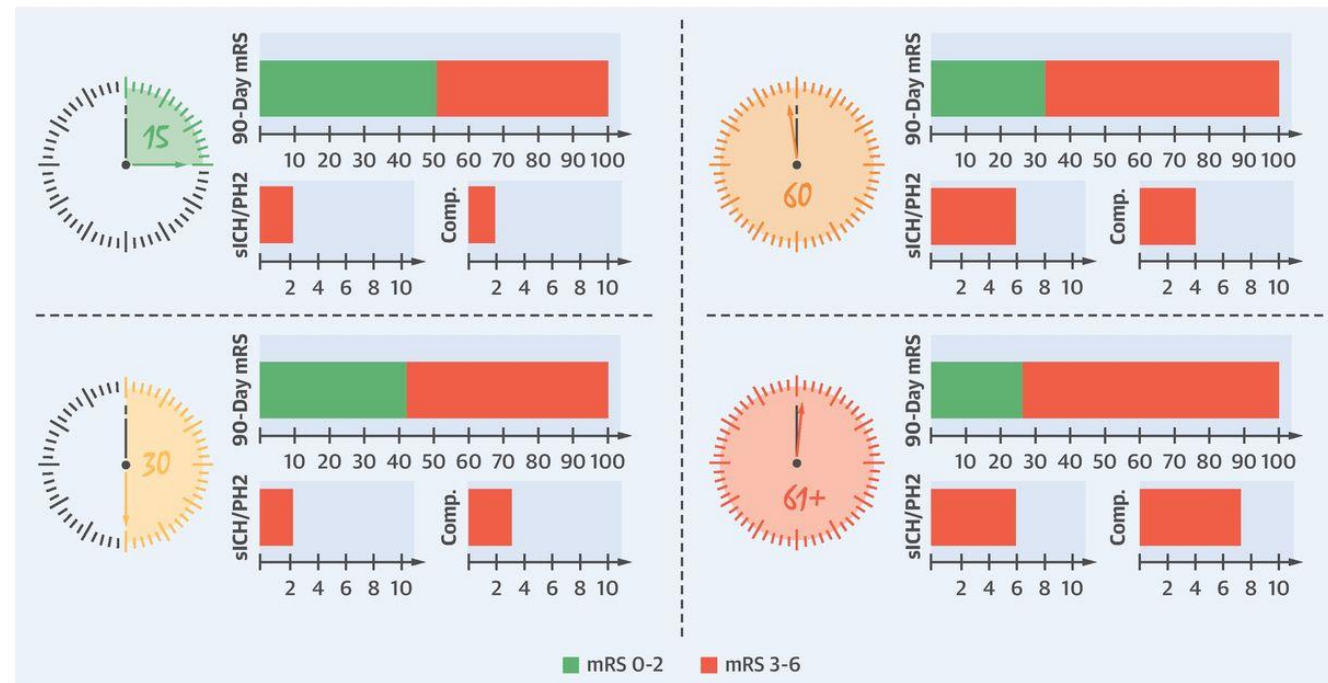
# DIDO – LVO

	Direct Presentation, n=705	Transferred Patients, n=821	P Value	Missing Values, n (%)
Onset to door first hospital	55 (37–105)	50 (35–80)	<0.01	197/1526 (12.9)
Onset to door intervention center	55 (37–105)	174 (139–220)	<0.01	30/1526 (2.0)
Onset to IVT	82 (63–125)	79 (60–115)	<0.01	218/1173 (18.6)
Door to needle	24 (18–34)	26 (20–36)	0.02	215/1173 (18.3)
Door to door*	N/A	112 (91–140)	N/A	196/822 (23.5)
Primary stroke center to intervention center (estimated)	N/A	21 (15–31)	N/A	3/821 (0.4)
Door in door out† (estimated)	N/A	88 (68–117)	N/A	197/821 (24.0)
Door first hospital to groin puncture	104 (80–135)	164 (135–198)	<0.01	197/1526 (12.9)
Door intervention center to groin puncture	104 (80–135)	47 (31–70)	<0.01	30/1526 (2.0)
Onset to groin puncture	170 (135–246)	230 (190–277)	<0.01	0
Duration of procedure	62 (40–90)	63 (40–87)	0.79	163/1526 (10.7)
Onset to reperfusion	238 (185–314)	288 (244–343)	<0.01	91/1526 (6.0)



# DIDO – LVO

## CENTRAL ILLUSTRATION: Procedure Time-Dependent Increase in Rates of Poor Outcome, Complications, and Hemorrhage After ET



Alawieh, A. et al. J Am Coll Cardiol. 2019;73(8):879-90.

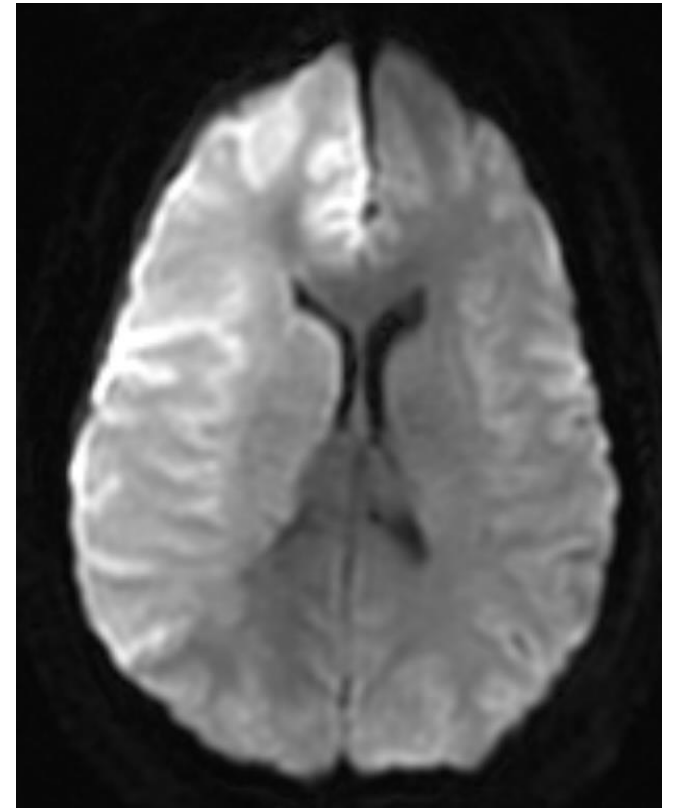
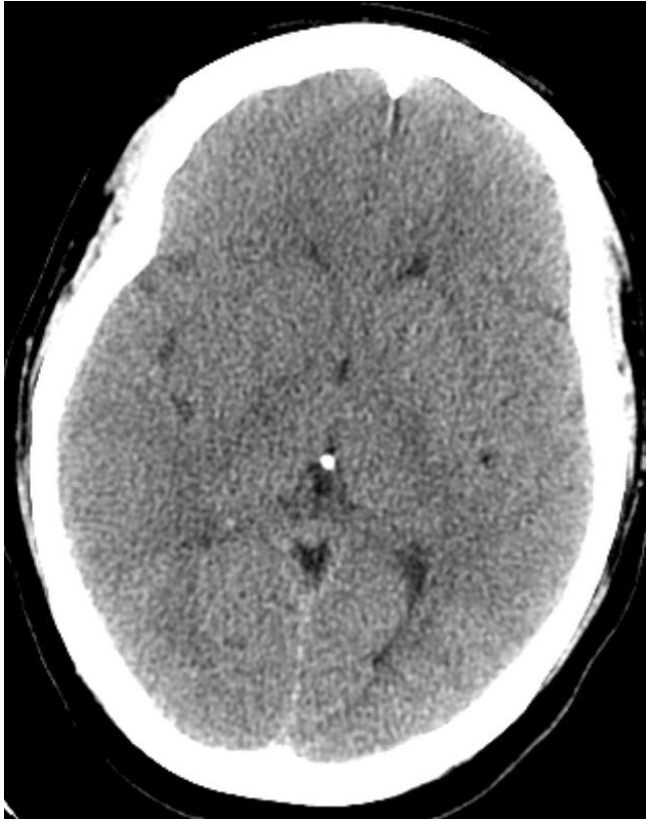
# Case 1

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- Patient presented with left sided weakness
- LSW: 2300
- Door In: 0015
  - At the spoke hospital within 75 minutes of LSW
  - Treated with IV tPA
- Door Out: 0323
  - 308 minutes = 5 hours 8 minutes

# Case 1

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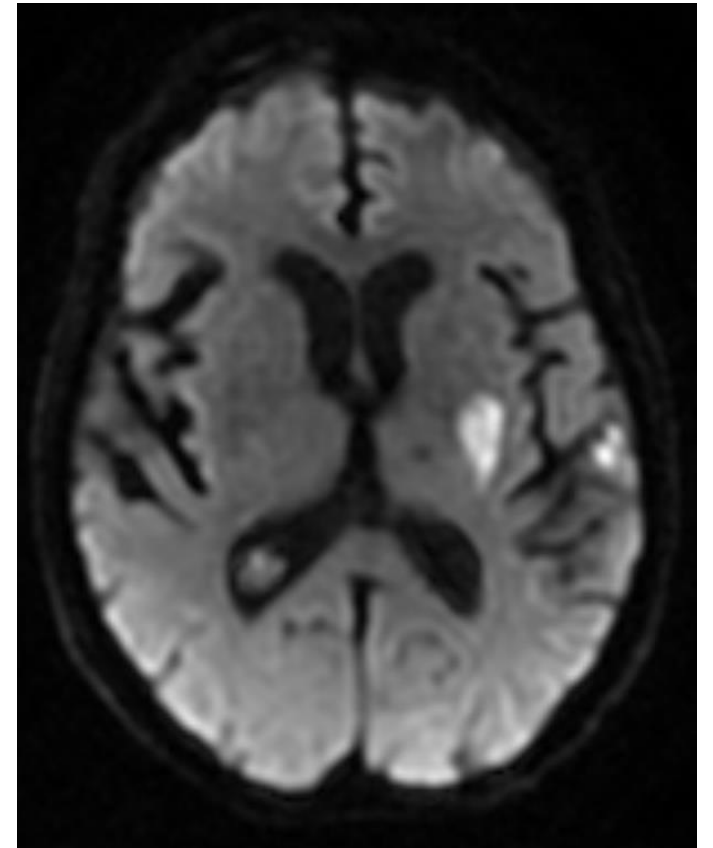
# Case 2

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- Patient presented with right sided weakness and aphasia
- LSW: 2300
- Door In: 0241
  
- Door Out: 0334
  - 93 minutes = 1 hour 33 minutes

# Case 2

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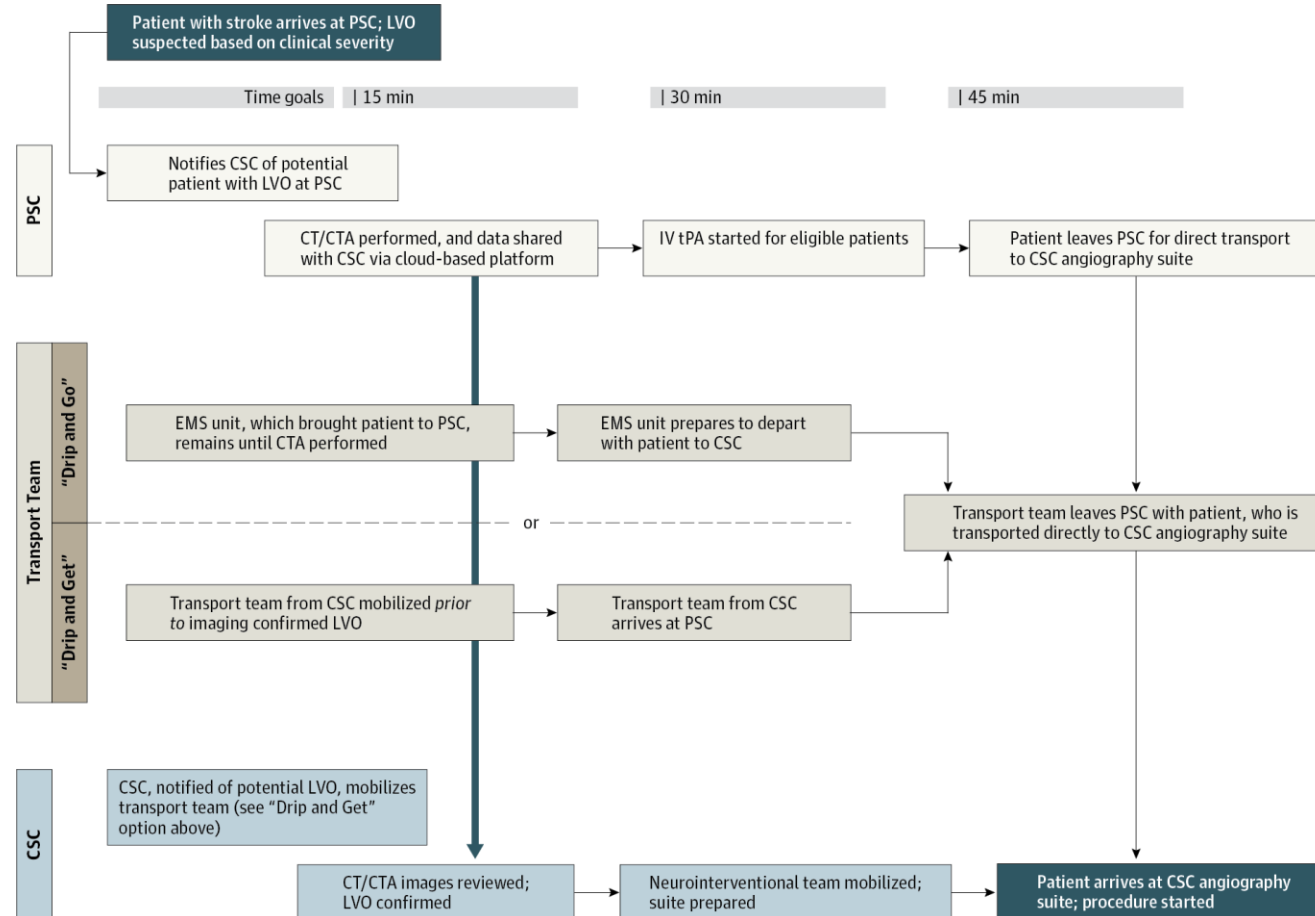


# Barriers to Transfer

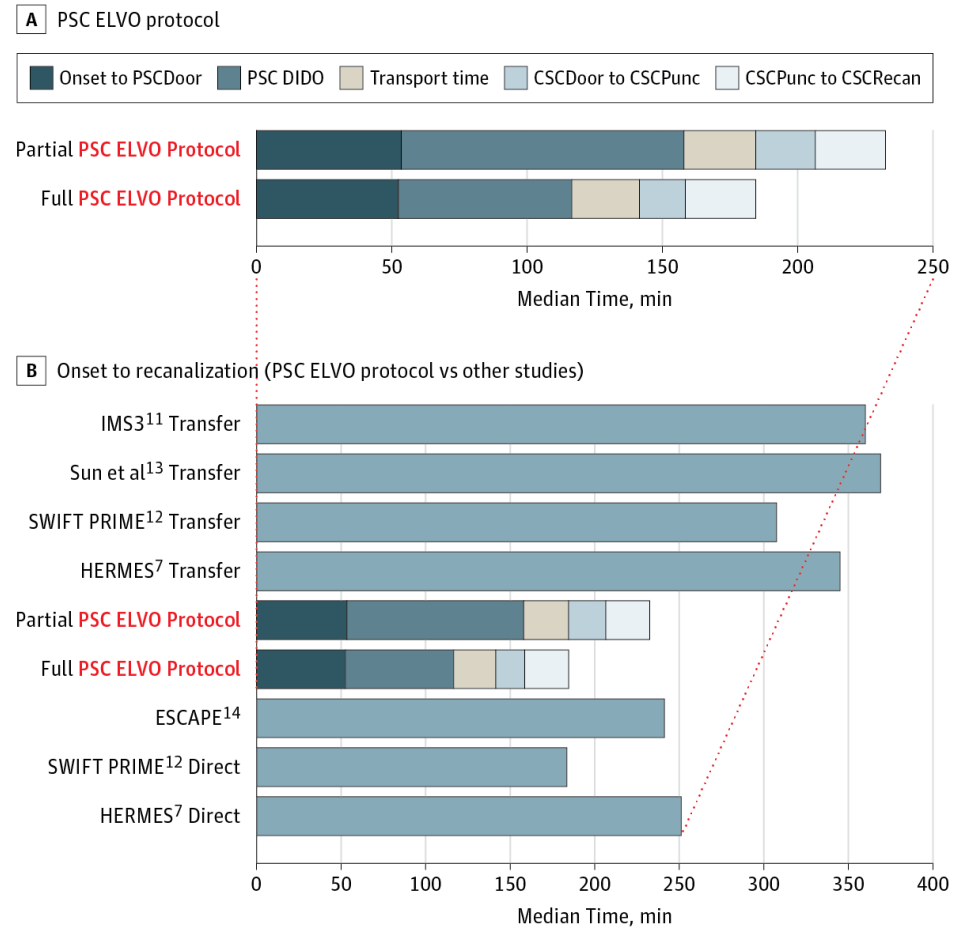
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- Sequential, instead of parallel, processes
- Weather
- Method of Transport
  - Ground vs Air
  - Availability
- "Ownership" of Patients

# Strategies for Improvement



# Strategies for Improvement



# References

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