DTN and endovascular therapy (or getting 30-60-90 off to a good start).

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Disclosure Statement of Financial Interest

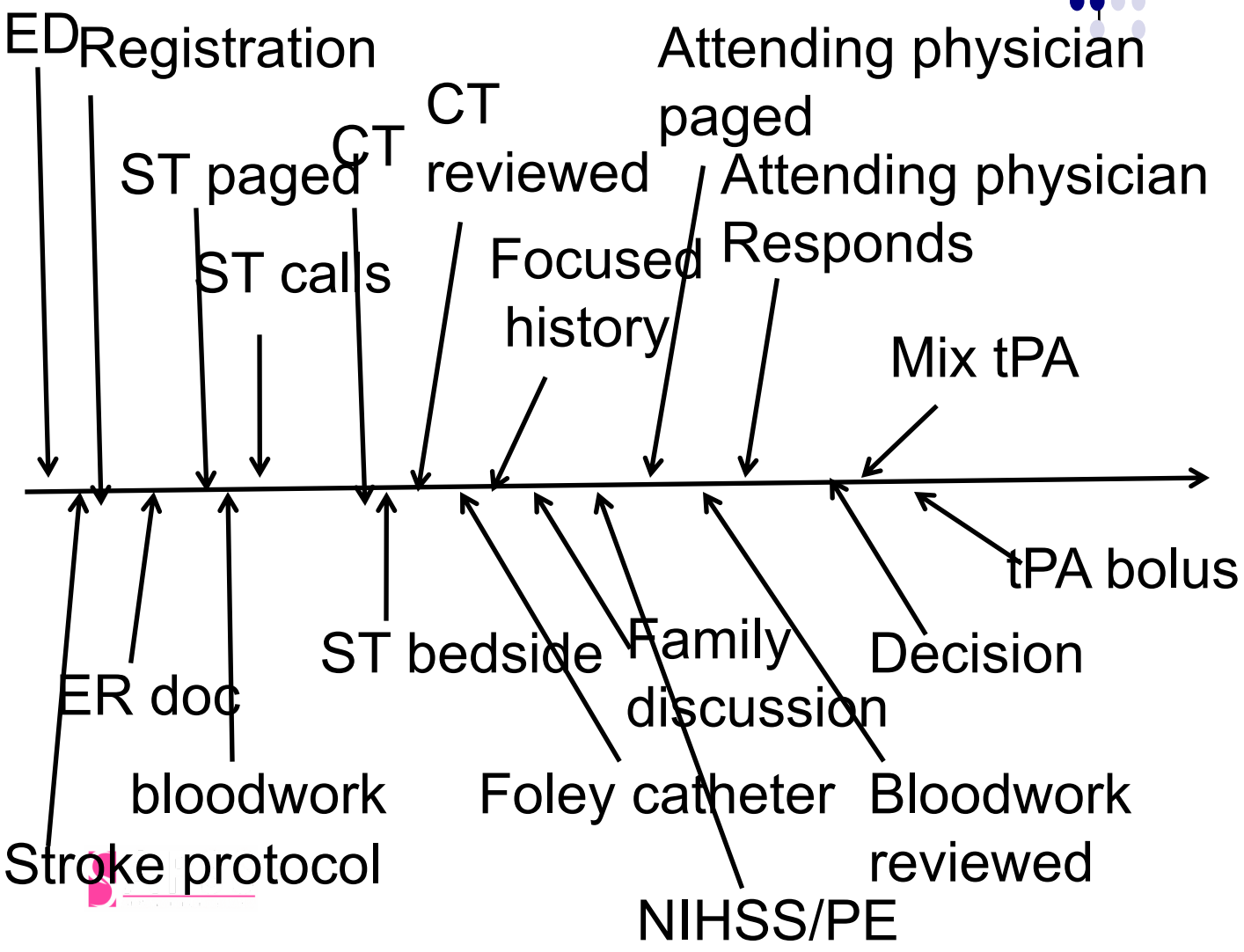
Within the past 12 months, I or my spouse/partner have had a financial interest/arrangement or affiliation with the organization(s) listed below.

Affiliation/Financial Relationship	Company
Grant/Research Support	CIHR, CSN, HSFC, IAHS, AHS
Honoraria for 2 ad board meetings	BMS Phizer/ Bayer
Major Stock Shareholder/Equity	None
Royalty Income	None
Ownership/Founder	None
Intellectual Property Rights	None
Other Financial Benefit	None

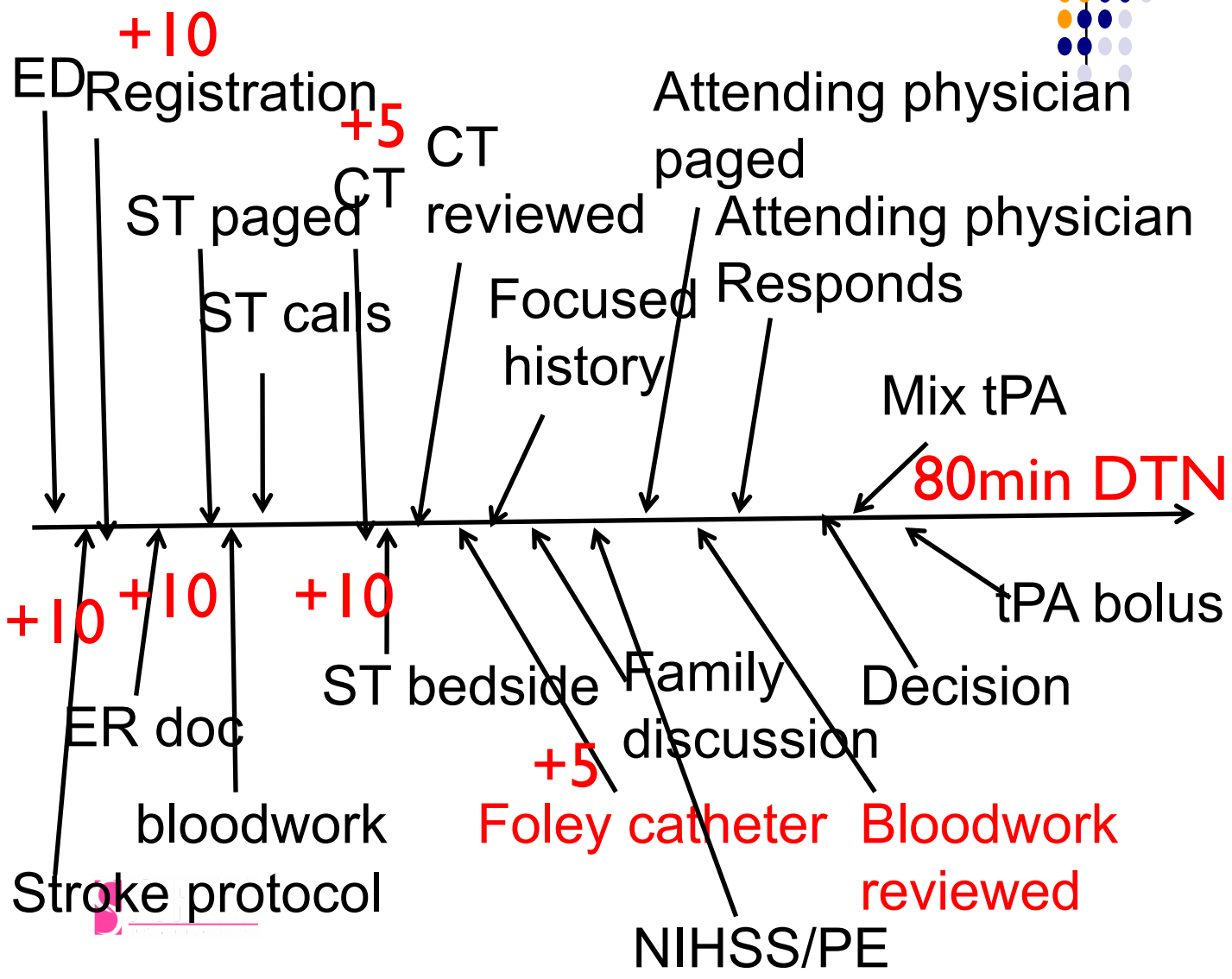
OBJECTIVES

- To discuss what fast DTN needs for fast endovascular

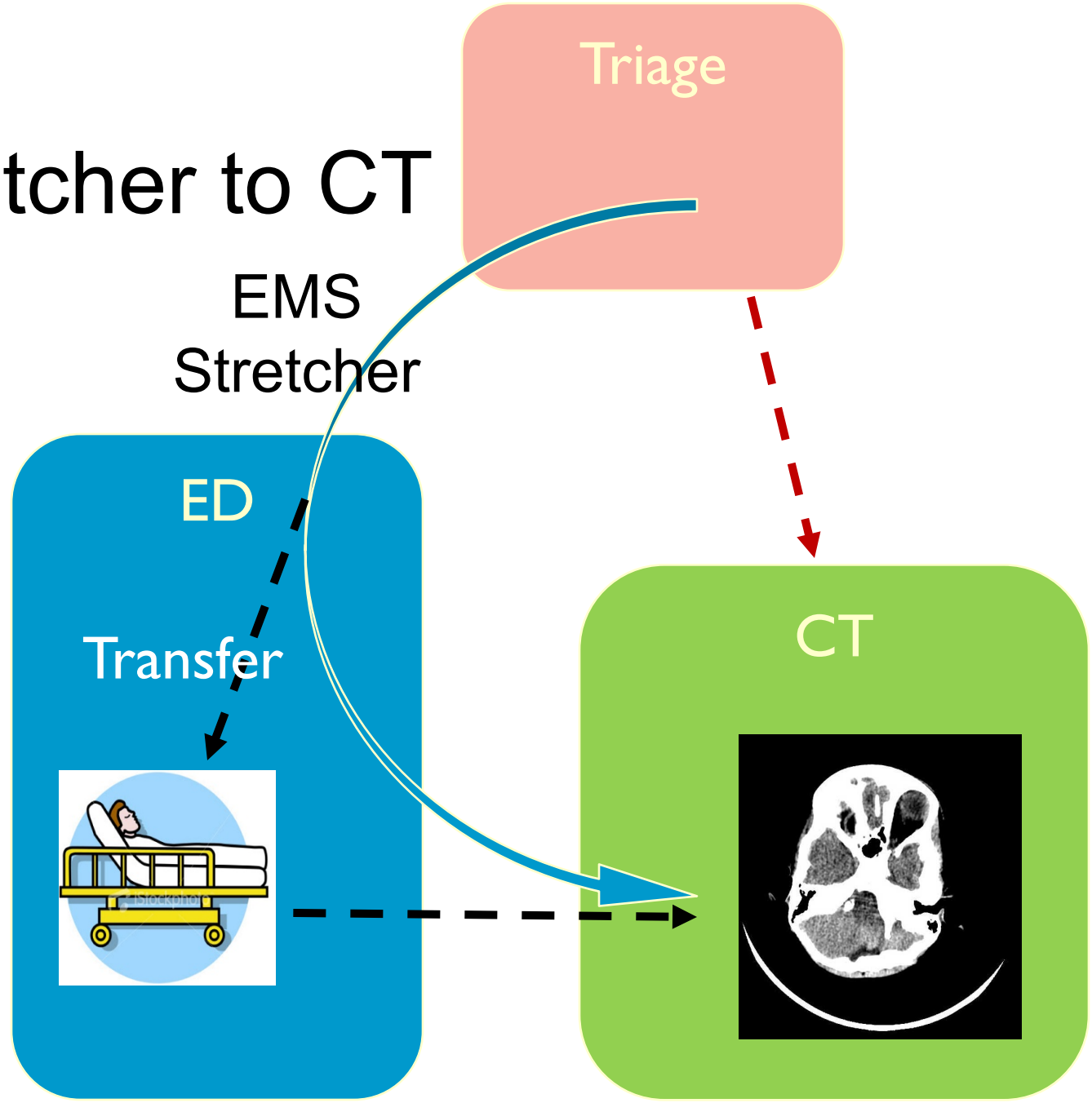
Timelines in tPA use



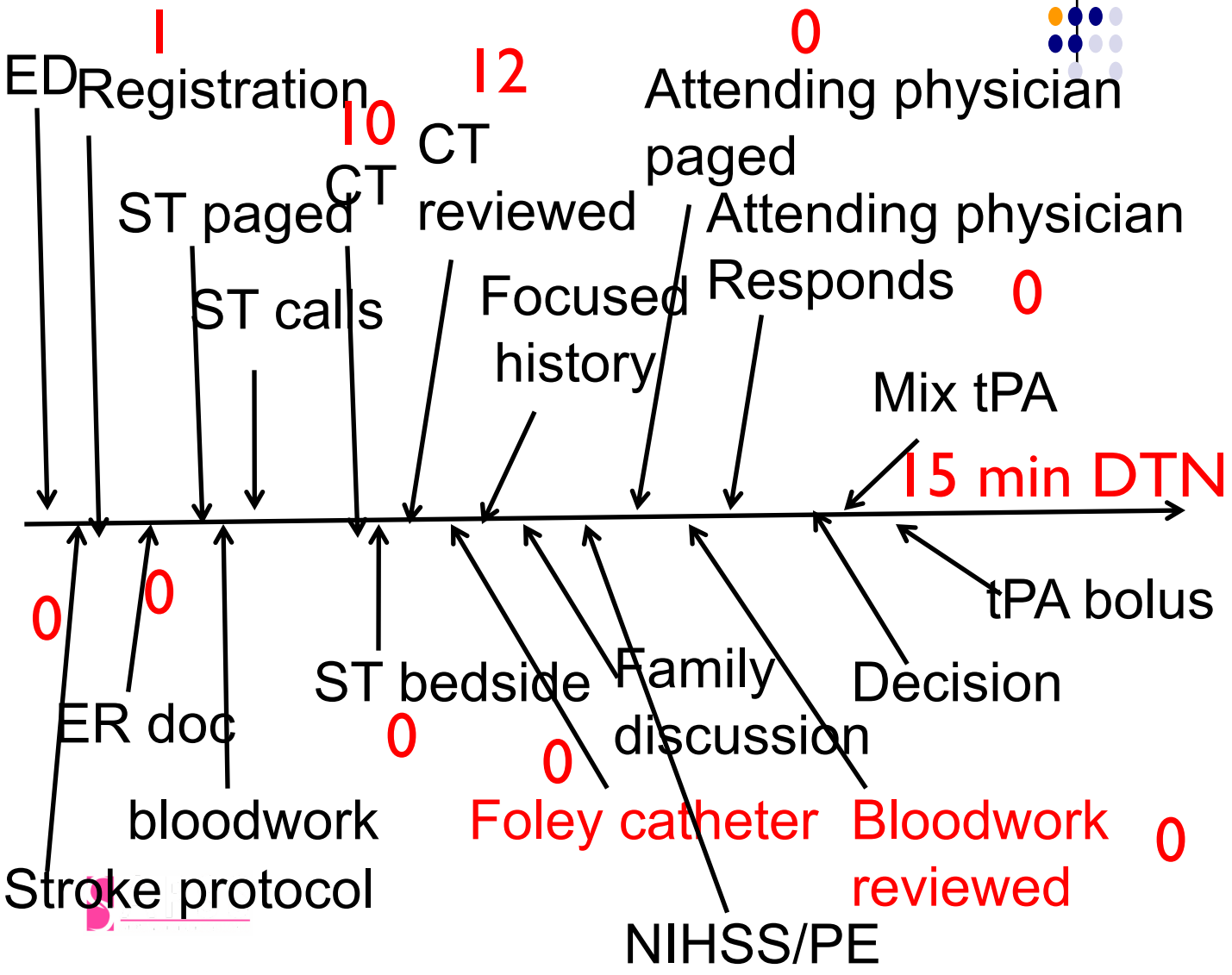
Timelines in tPA use



Stretcher to CT



Timelines in tPA use

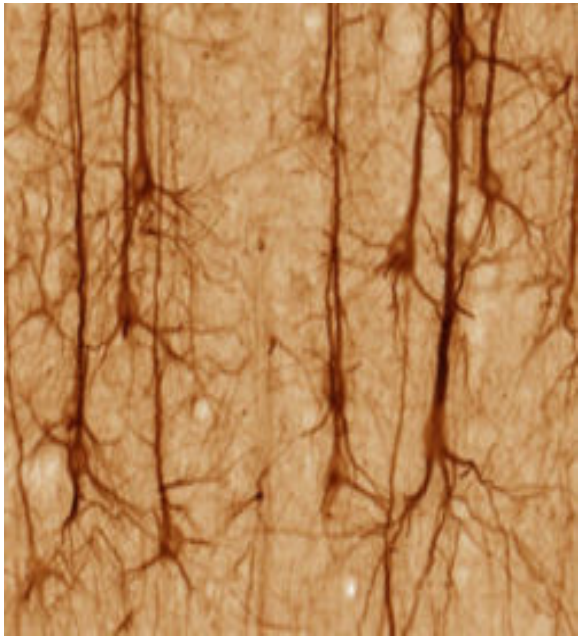


The neuron…

In a typical large vessel acute ischemic stroke…

1.9 million neurons
14 billion synapses
12 km of myelinated fibers

are destroyed each minute…
(Saver et al, 2006)



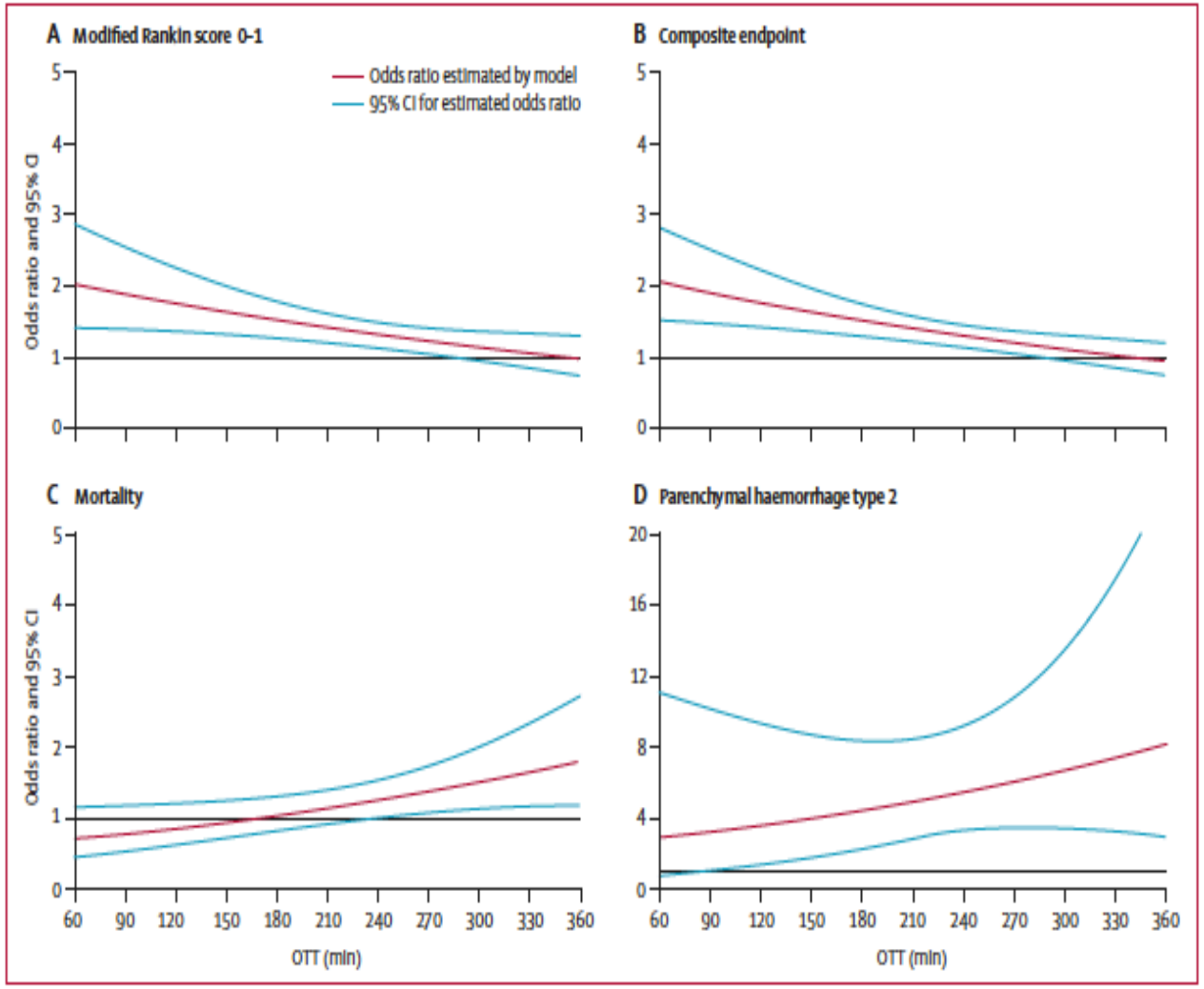
5 min ~ 10 million neurons, 60km of wires

10 min ~ 20 million neurons, 120km of wires

15 min ~ 30 million neurons, 180 km of wires…

Time and outcome

[Lees et al. *Lancet* 2010; 375: 1695–1703]



Shorter DTN = better outcomes

- Every 15 min drop in DTN associated with a 5% reduction in mortality (OR 0.95; p<0.0001)
- Those with DTN < 60 min have reduced risk of intracranial hemorrhage 4.7% vs 5.6%

Fonarow et al, Circulation 2011, 123:750-758

COMMENTARY

Good is not Good Enough: The Benchmark Stroke Door-to-Needle Time Should be 30 Minutes

Noreen Kamal, Oscar Benavente, Karl Boyle, Brian Buck, Ken Butcher, Leanne K. Casaubon, Robert Côté, Andrew M Demchuk, Yan Deschaintre, Dar Dowlatshahi, Gordon J Gubitz, Gary Hunter, Tom Jeerakathil, Albert Jin, Eddy Lang, Sylvain Lanthier, Patrice Lindsay, Nancy Newcommon, Jennifer Mandzia, Colleen M. Norris, Wes Oczkowski, Céline Odier, Stephen Phillips, Alexandre Y Poppe, Gustavo Saposnik, Daniel Selchen, Ashfaq Shuaib, Frank Silver, Eric E Smith, Grant Stotts, Michael Suddes, Richard H. Swartz, Philip Teal, Tim Watson, Michael D. Hill

doi:10.1017/cjn.2014.41

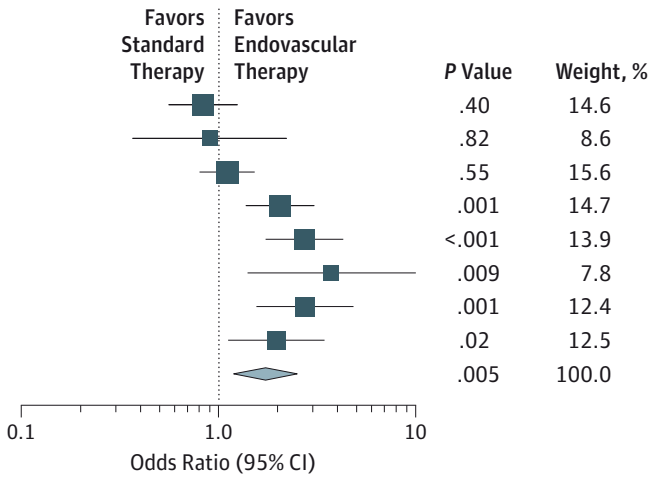
Can J Neurol Sci. 2014; 41: 694-696

Figure 3. Secondary Efficacy and Safety Outcomes of Endovascular Therapy vs Standard Therapy

A Functional independence (modified Rankin Scale score 0-2) at 90 d

Source	Endovascular Therapy Events/No.	Standard Therapy Events/No.	Odds Ratio (95% CI)	*P* Value	Weight, %
SYNTHESIS,[26] 2013	76/181	84/181	0.84 (0.55-1.27)	.40	14.6
MR RESCUE,[27] 2013	12/64	11/54	0.90 (0.36-2.25)	.82	8.6
IMS III,[28] 2013	177/415	86/214	1.11 (0.79-1.55)	.55	15.6
MR CLEAN,[29] 2015	76/233	51/267	2.05 (1.36-3.09)	.001	14.7
ESCAPE,[30] 2015	87/164	43/147	2.73 (1.71-4.37)	<.001	13.9
EXTEND-IA,[31] 2015	25/35	14/35	3.75 (1.38-10.17)	.009	7.8
SWIFT-PRIME,[32] 2015	59/98	33/93	2.75 (1.53-4.94)	.001	12.4
REVASCAT,[33] 2015	45/103	29/103	1.98 (1.11-3.53)	.02	12.5
Overall	557/1293	351/1094	1.71 (1.18-2.49)	.005	100.0

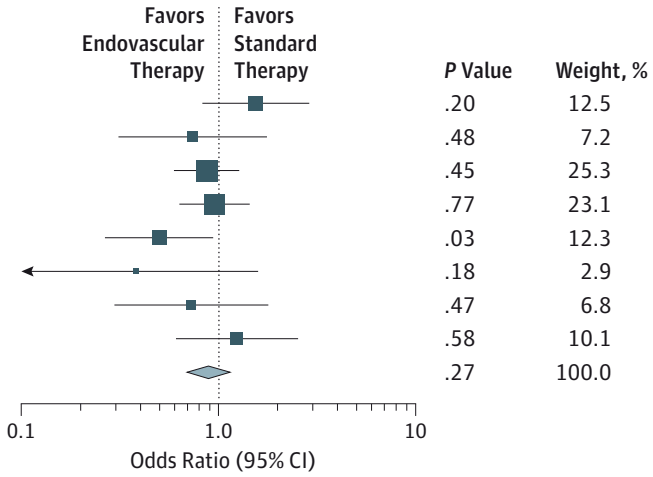
$I^2 = 75.4\%$, $P < .01$



B Mortality at 90 d

Source	Endovascular Therapy Events/No.	Standard Therapy Events/No.	Odds Ratio (95% CI)	*P* Value	Weight, %
SYNTHESIS,[26] 2013	26/181	18/181	1.52 (0.80-2.88)	.20	12.5
MR RESCUE,[27] 2013	12/64	13/54	0.73 (0.30-1.76)	.48	7.2
IMS III,[28] 2013	83/434	48/222	0.86 (0.58-1.28)	.45	25.3
MR CLEAN,[29] 2015	49/233	59/267	0.94 (0.61-1.44)	.77	23.1
ESCAPE,[30] 2015	17/164	28/147	0.49 (0.26-0.94)	.03	12.3
EXTEND-IA,[31] 2015	3/35	7/35	0.38 (0.09-1.59)	.18	2.9
SWIFT-PRIME,[32] 2015	9/98	12/97	0.72 (0.29-1.79)	.47	6.8
REVASCAT,[33] 2015	19/103	16/103	1.23 (0.59-2.55)	.58	10.1
Overall	218/1312	201/1106	0.87 (0.68-1.12)	.27	100.0

$I^2 = 17.7\%$, $P = .29$



Metanalysis 2015 JAMA

Treatment details and process times		
Treatment with intravenous alteplase	526 (83%)	569 (87%)
Treatment with intravenous alteplase documented within 180 min	442 (70%)	462 (71%)
Process times (min)		
Onset to randomisation	195·5 (142–260)||	196 (142–270)*
Onset to intravenous alteplase	100 (75–133)**	100 (74–140)††
Onset to reperfusion	285 (210–362)	NA

Data are median (IQR), n (%), or mean (SD). NIHSS=National Institutes of Health Stroke Scale. ASPECTS=Alberta Stroke Program Early CT Score. *n=650. †n=631. ‡n=648. §n=620. ¶n=644. ||n=632. **n=598. ††n=618.

Table 1: **Baseline characteristics in the pooled data**

Hermes Metanalysis 2016 Lancet

The 30-60-90 metric:

- DTN – 30 minutes
- Door to groin puncture 30 minutes
- Groin puncture to recanalization 30 minutes

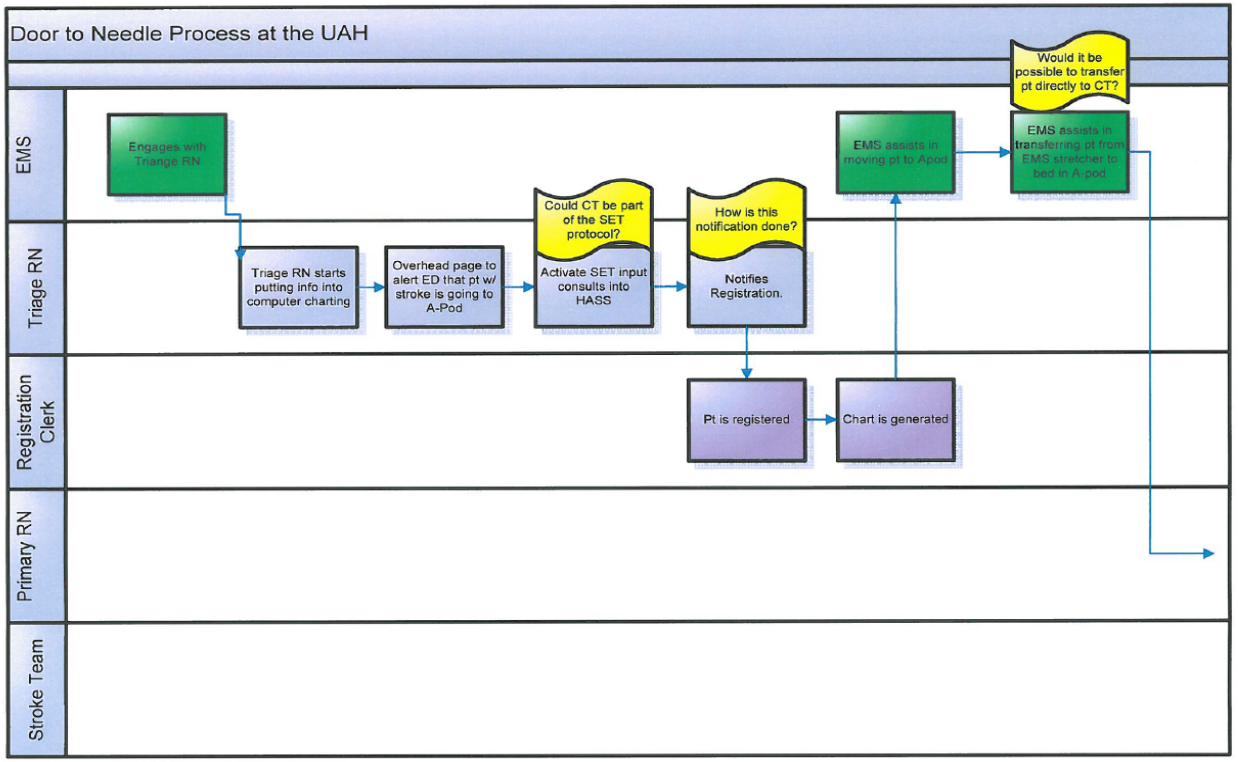
Methods- Quality and Process Improvement – now for IA

- Process mapping
  - Fishbone Diagrams, swim lane charts
- PDSA cycles
- Time in motion study
- Case reviews – every lysis assessment every week!
- Intense involvement of administration, stroke neurology

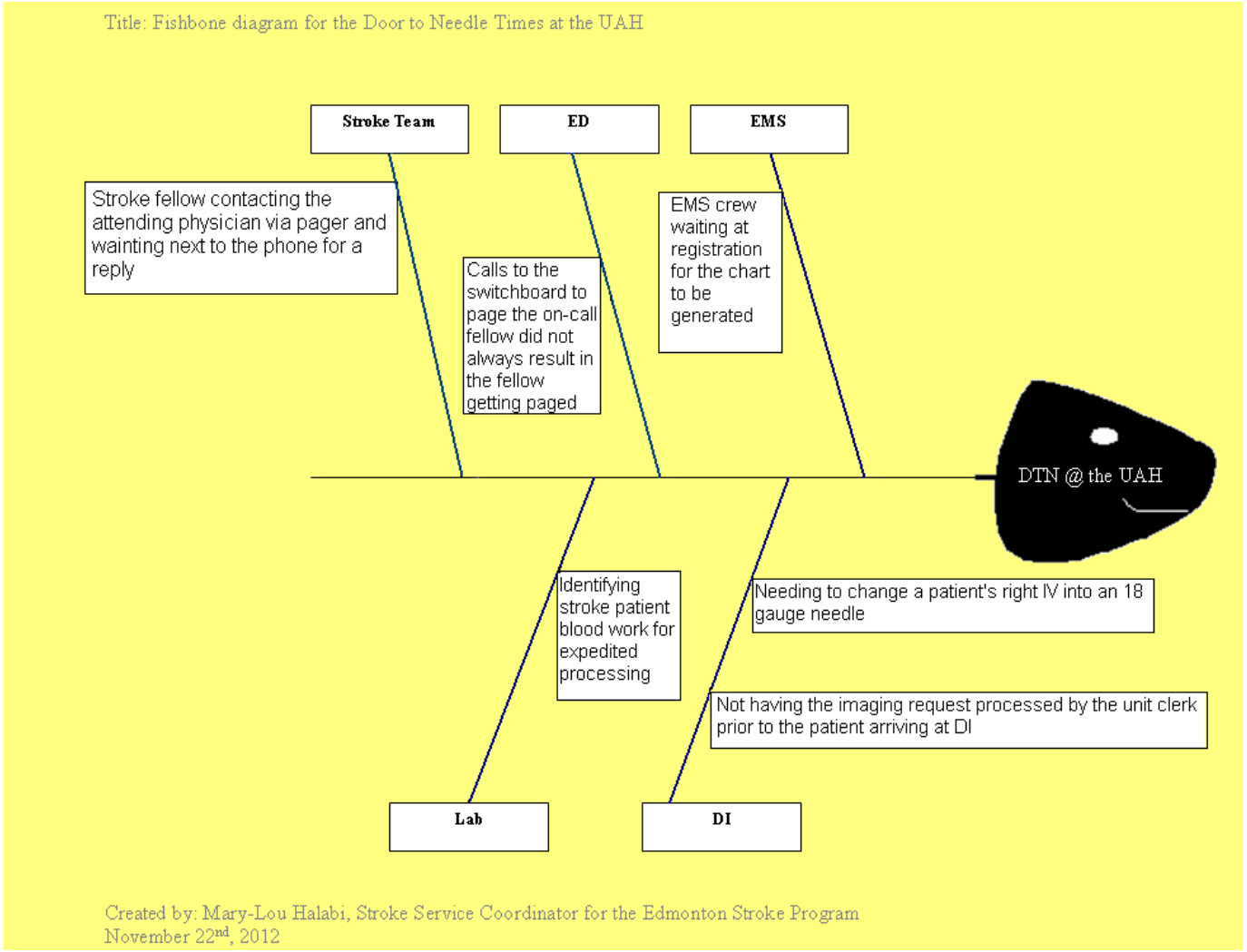
Methods- Engagement

- Engaging stakeholders
  - Intensive involvement by the ED
  - Diagnostic imaging
- Building relationships
- Education sessions

Process Mapping For EMS and Triage



Fishbone Diagram



Access to endovascular therapy

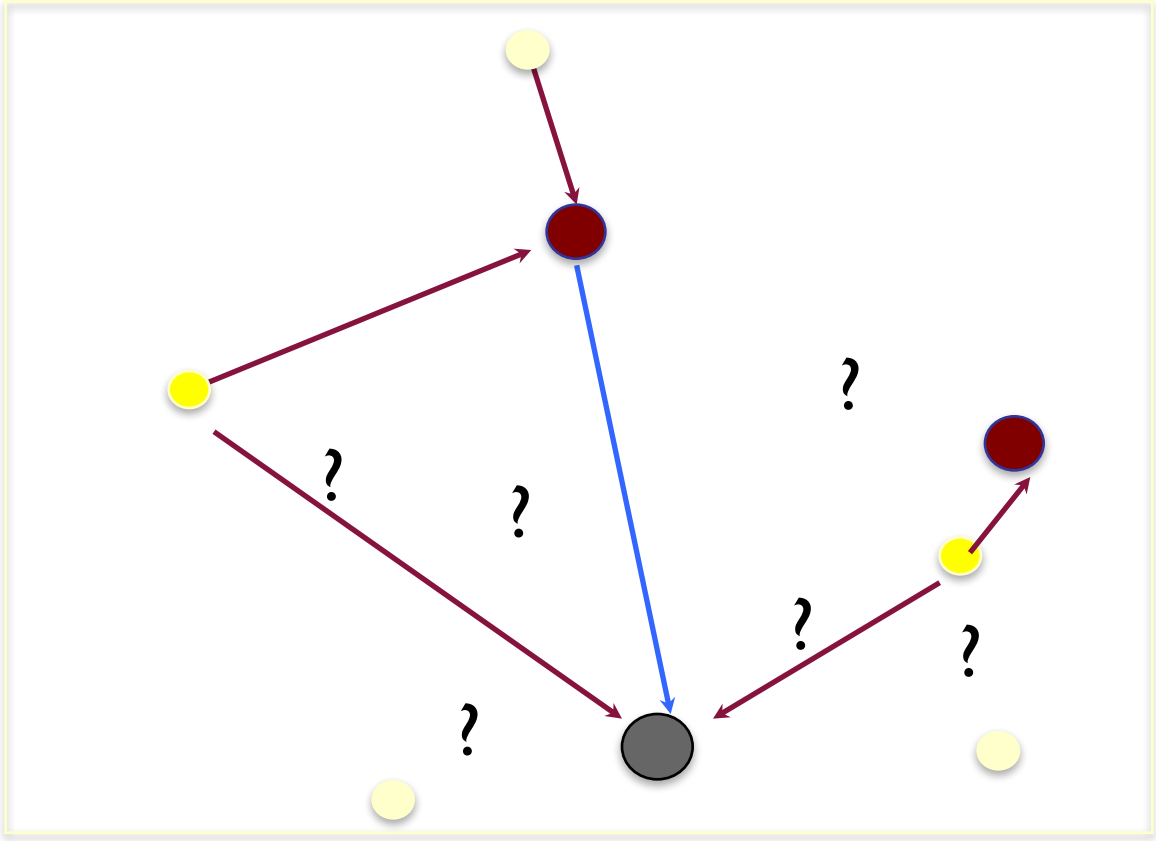
Access to endovascular therapy

What factors determine the destination primary or comp stroke centre?

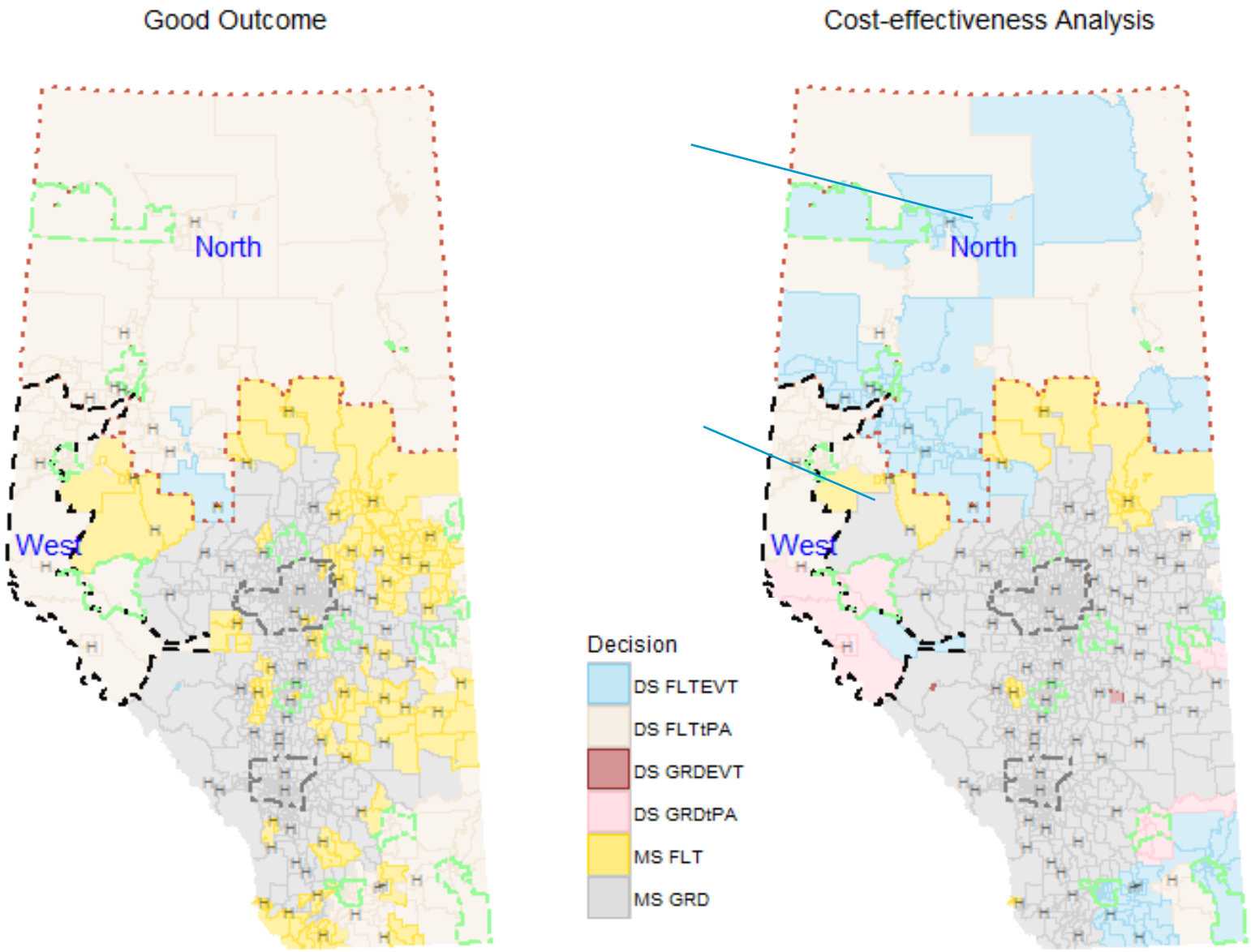
- Hospital system?
- Geography/proximity?
- Time (transport and door to treatment)?
- Quality and volume?

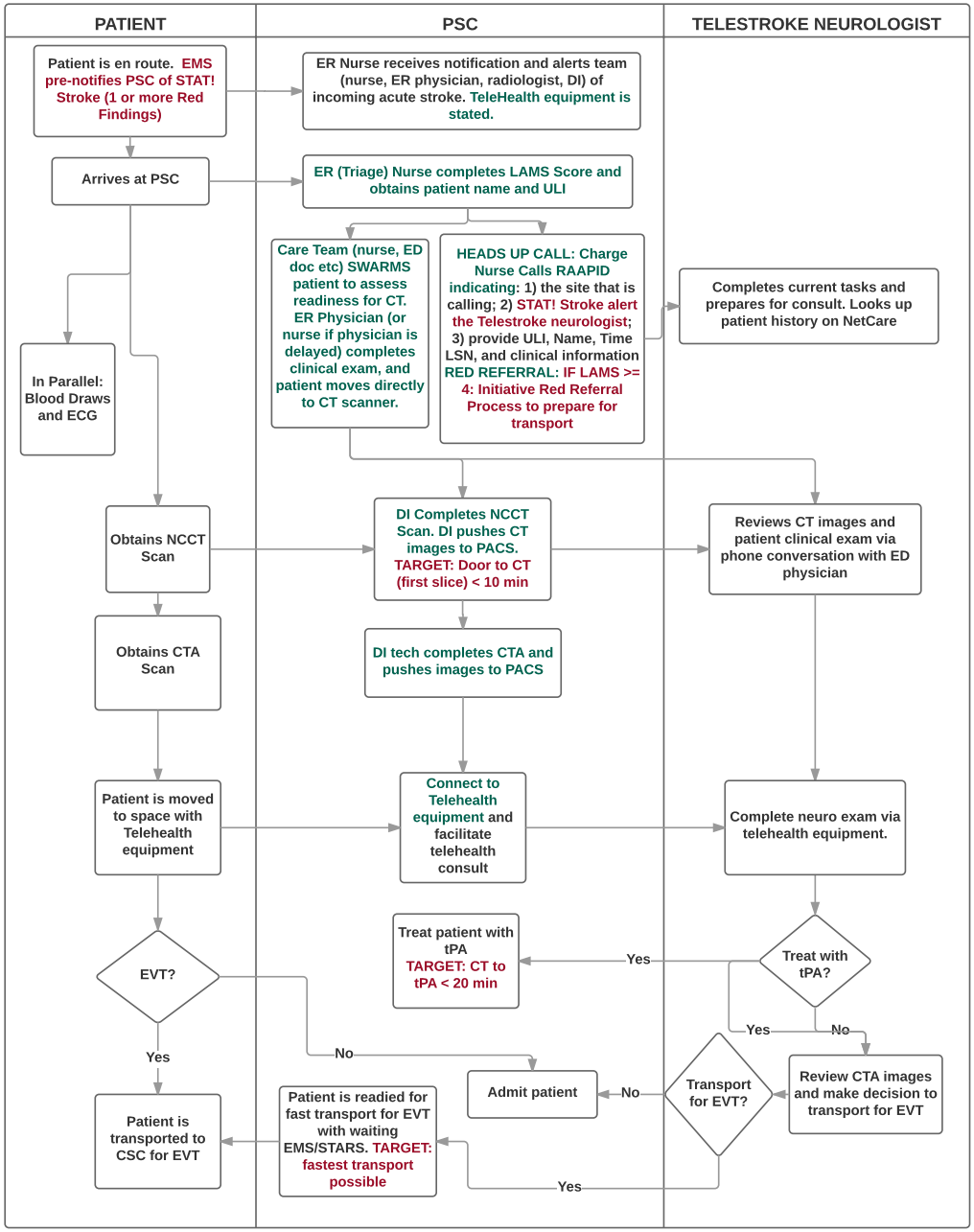
PSC

CSC



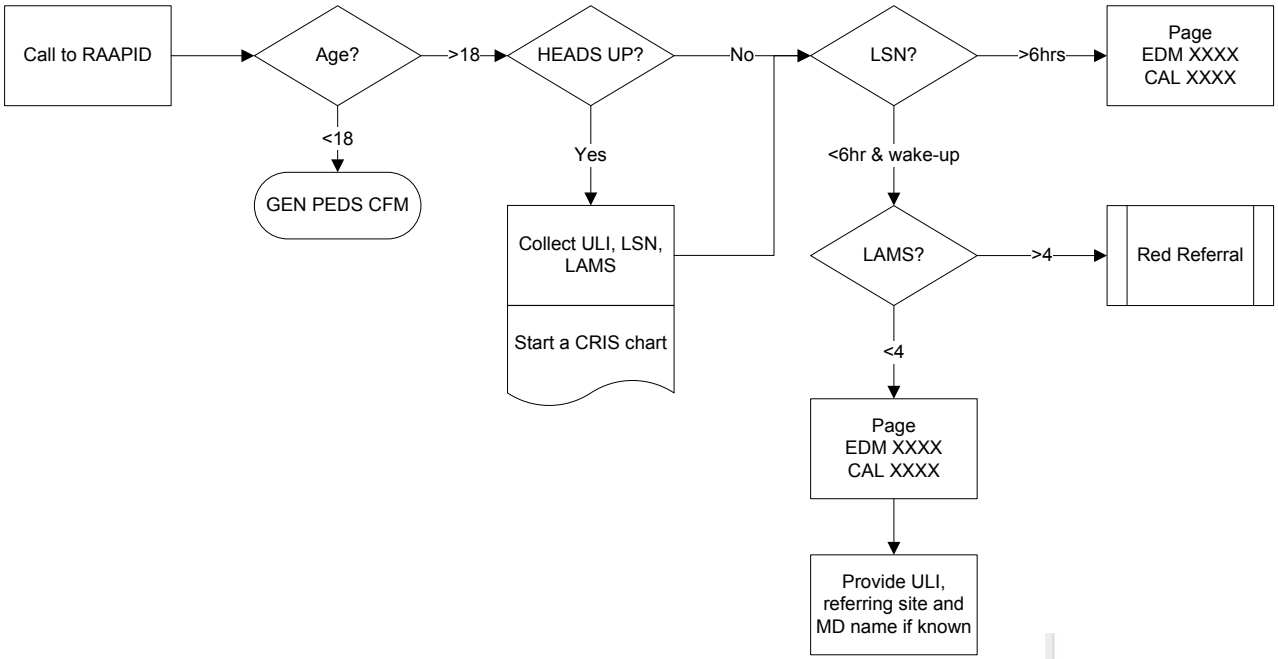
Good Outcome vs. Cost-effectiveness Analysis

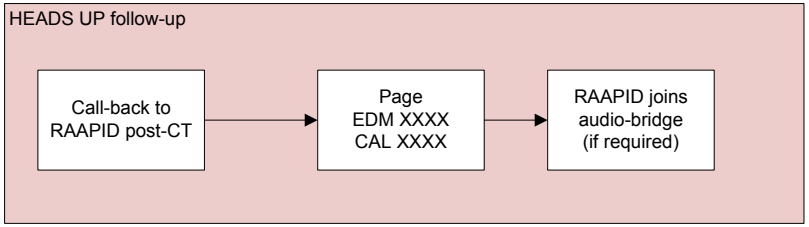


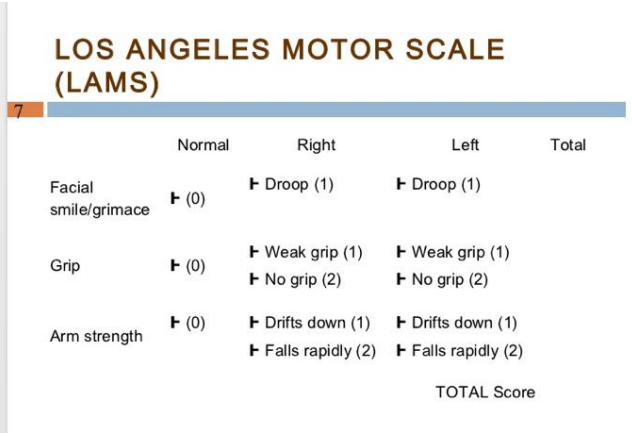

PATIENT
PSC
TELESTROKE NEUROLOGIST
Patient is en route. EMS pre-notifies PSC of STAT! Stroke (1 or more Red Findings)
ER Nurse receives notification and alerts team (nurse, ER physician, radiologist, DI) of incoming acute stroke. TeleHealth equipment is stated.
Arrives at PSC
ER (Triage) Nurse completes LAMS Score and obtains patient name and ULI
Care Team (nurse, ED doc etc) SWARMS patient to assess readiness for CT. ER Physician (or nurse if physician is delayed) completes clinical exam, and patient moves directly to CT scanner.
HEADS UP CALL: Charge Nurse Calls RAAPID indicating: 1) the site that is calling; 2) STAT! Stroke alert the Telestroke neurologist; 3) provide ULI, Name, Time LSN, and clinical information RED REFERRAL: IF LAMS >= 4: Initiative Red Referral Process to prepare for transport
Completes current tasks and prepares for consult. Looks up patient history on NetCare
In Parallel: Blood Draws and ECG
Obtains NCCT Scan
DI Completes NCCT Scan. DI pushes CT images to PACS. TARGET: Door to CT (first slice) < 10 min
Reviews CT images and patient clinical exam via phone conversation with ED physician
Obtains CTA Scan
DI tech completes CTA and pushes images to PACS
Patient is moved to space with Telehealth equipment
Connect to Telehealth equipment and facilitate telehealth consult
Complete neuro exam via telehealth equipment.
EVT?
Treat patient with tPA TARGET: CT to tPA < 20 min
Yes
Treat with tPA?
Yes
No
No
Yes
Admit patient
No
Transport for EVT?
Review CTA images and make decision to transport for EVT
Patient is transported to CSC for EVT
Patient is readied for fast transport for EVT with waiting EMS/STARS. TARGET: fastest transport possible
Yes

Stroke CFM

Notes: If this is a HEADS UP call, ensure the caller has the pt ULI, LSN (if known)







LOS ANGELES MOTOR SCALE (LAMS)

7

	Normal	Right	Left	Total
Facial smile/grimace	⊢ (0)	⊢ Droop (1)	⊢ Droop (1)	
Grip	⊢ (0)	⊢ Weak grip (1) ⊢ No grip (2)	⊢ Weak grip (1) ⊢ No grip (2)	
Arm strength	⊢ (0)	⊢ Drifts down (1) ⊢ Falls rapidly (2)	⊢ Drifts down (1) ⊢ Falls rapidly (2)	

TOTAL Score

‘ In God we trust. All others bring data.’

W. Edwards Deming

‘ Better has no limit.’

Alberta Health Services

*‘ My message is: get your sh*t together and treat fast.’*

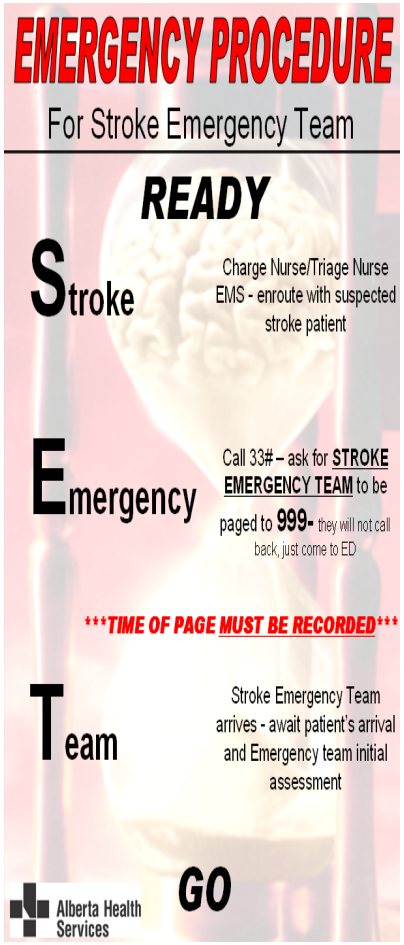
Moyank Goyal

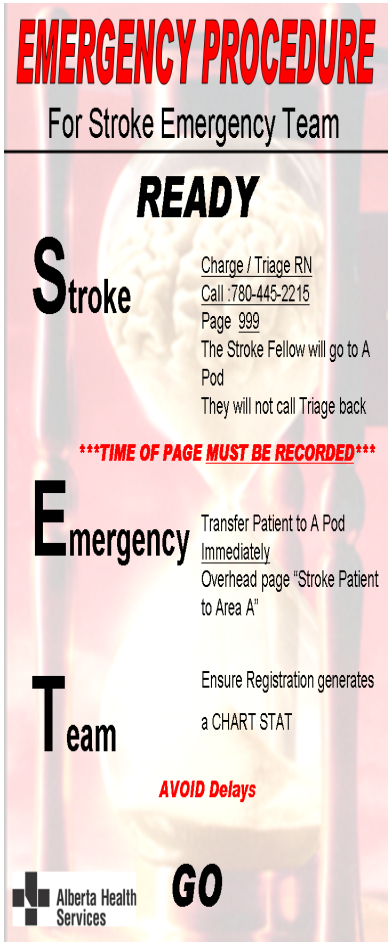
personal communication

UNIVERSITY OF ALBERTA

Results- Go for the Gold!

Evolution of a Process needs multiple modifications





Key factors

- Pre-notification
- Pre-registration / registration as unknown
- Telestroke ‘heads up’ to neurologist on arrival with patient information
- Active involvement by ED and Neurology
- Triage – to – CT; ‘swarm’ at Triage
- tPA in the CT scanner suite (for some)
- Individualized process mapping by site
- Soon - Early activation of transport process – Red referral process

Key factors

- Do what's necessary to understand the patient (be safe and accurate)
- Avoid unnecessary delay

SUMMARY

- Fast treatment saves brain, reduces disability and reduces complications
- It takes a systematic approach and buy in from everyone to treat faster
- Our experiences with DTN with help us with EVT

CONCLUSIONS

Conclusion	Level of Evidence
• **30 min DTN is within our grasp!**	• Level C
• **Faster treatment can lead to better outcomes**	• Class I, level A
• **Faster DTN could lead to faster endovascular**	• Class I, level C

Thank-you!