



Stroke Triage

Oregon Stroke Network Meeting 2019
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The Spirit of Health



- No disclosures



Why?

- Modern stroke care reduces disability
- EMS is major link in stroke system of care
- Several advances
 - Imaging selection
 - Devices
 - Acute focus on time to treatment
 - *Field triage and transport*

- EMS crucial in providing appropriate care to stroke patients
- First medical contact in the chain of stroke care





Where to go?

- Transporting the patient to the right place the first time can mean difference between good outcome and bad outcome
- Patients with large vessel occlusion (LVO) benefit from transfer to closest thrombectomy-capable center
- However, if vessel status (LVO) is not known, transport strategy is uncertain



Where to go?

- Destination depends on several factors
 - Distance to hospital
 - Capabilities of hospital
 - Clinical status of patient
- Can be challenging decision



Why is triage important?

- Ability to dramatically improve outcomes
- LVO treatment very effective
 - NNT 2.6
- Minority of stroke case are LVO (~20%)

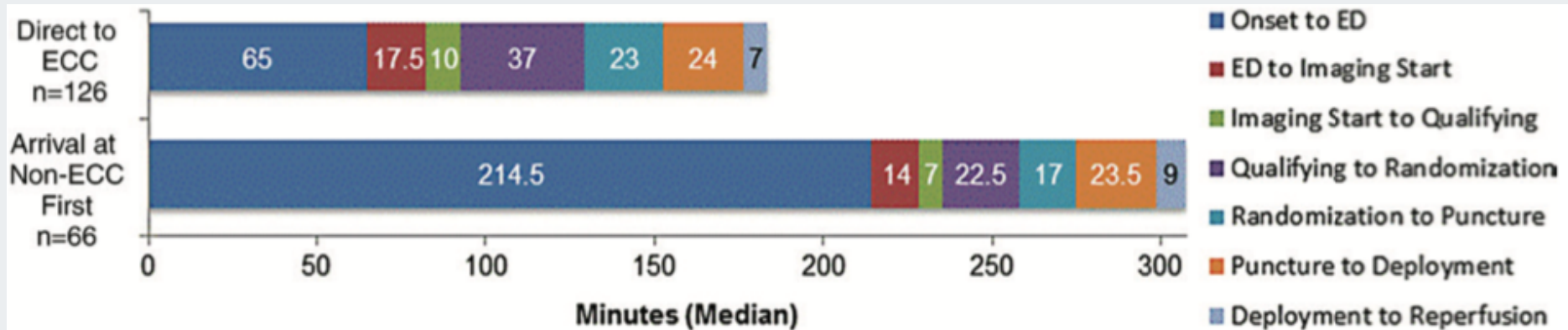


Why does identification of ELVO matter?

- Early identification → faster treatment
- Faster treatment → better outcomes



Time delay with transfer



- SWIFT Prime

- Transfer patients vs direct to endovascular center:

- 275 vs 179.5 minutes symptom onset to reperfusion, 95 minute difference



Time is brain

- Every hour of delay leads to 38% decrease in likelihood of good outcome
- For every 1000 patients undergoing IA therapy, 15 minutes faster means ~ 39 patients have a better clinical outcome

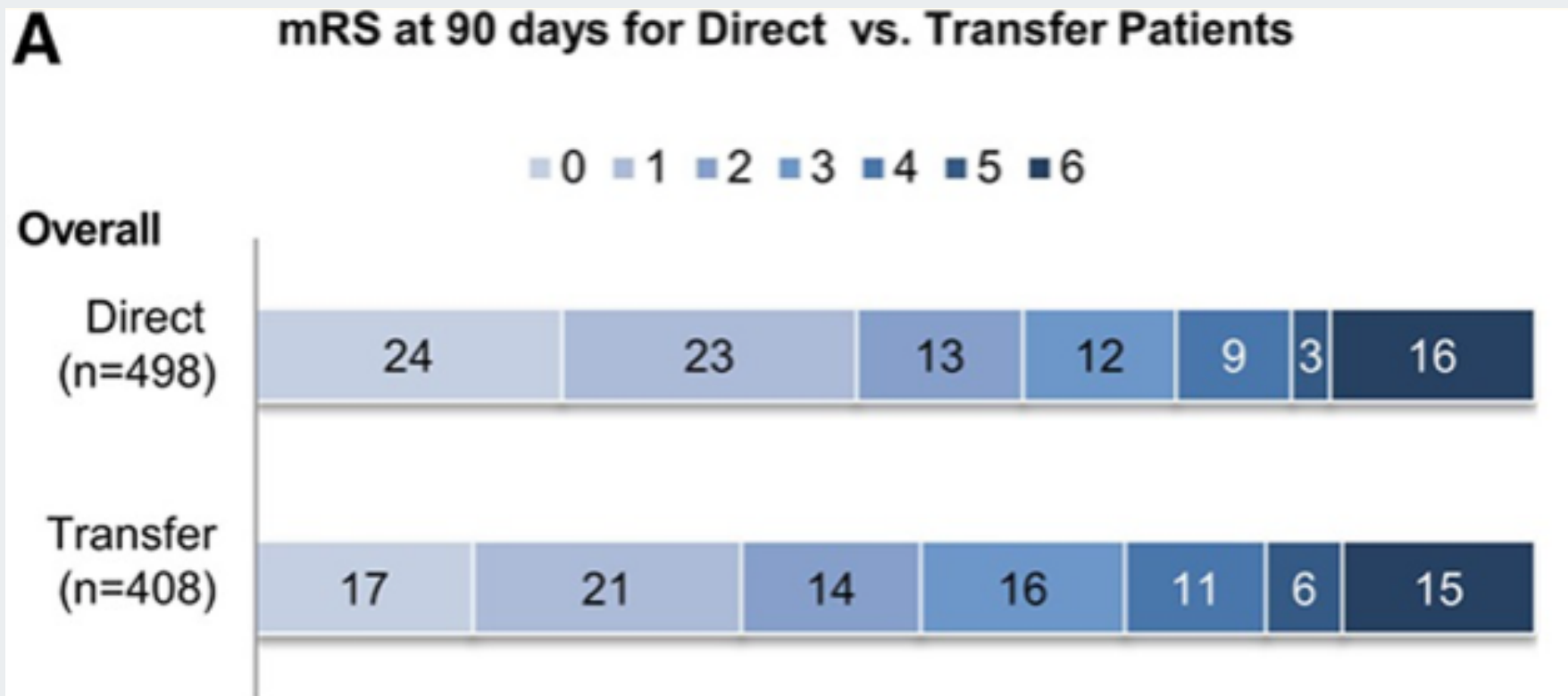
Menon, B. K., et al. *Stroke; a Journal of Cerebral Circulation*, 45(7), 2024–2029. <http://doi.org/10.1161/STROKEAHA.114.005050>

Saver et al. **JAMA**. 2016; 316:1279–1288. doi: 10.1001/jama.2016.13647

SWIFT Prime analysis

- Revascularization within 2.5 hours associated with functional independence in 91% of patients
- Likelihood of independence 10% less if revascularized between 2.5 and 3.5 hours
- Every 60 minute delay after 3.5 hours results in 20% lower likelihood of independence

STRATIS registry



Right place, first time

- Need to know
 - Transport times to closest stroke facilities
 - Facility capabilities
 - IV tPA
 - Endovascular
 - Facility performance
 - Door to needle
 - Door to TICI 2b/3



EMS decision making

- Last known well
 - 0-4.5 hours
 - 0-6 hours
 - 6-24 hours
- Stroke severity screening
 - ELVO?
- Pre-morbid functional status
- Anticoagulation status
- Family preference

Field identification of large vessel occlusion

- More sensitive scales developed for LVO
 - RACE
 - C-STAT
 - VAN
 - All include *cortical signs* and weakness



C-STAT Assessment for LVO

Item	Findings	Score
Gaze	Absent	0
	Present	2
Arm Weakness	Absent	0
	Present	1
Alteration of consciousness	Absent	0
	Present	1
C-STAT Positive		2 or greater



Where to?



Multnomah County

- Multiple ECCs (endovascular capable centers) available
- Bypass protocol if CSTAT positive
 - To nearest ECC
 - EMS very familiar with traffic and geography



How to apply to rest of Oregon?

- Largely rural with significant transfer distances
- Protocols must take into consideration
 - Distances between facilities
 - Facility capabilities



Large catchment area, long distances

- 3-tiered transfer system
 - Springfield/Eugene/Cottage Grove hospitals
 - If LVO confirmed at transferring facility, can admit straight to cath lab
 - Florence-Eugene corridor
 - If C-STAT positive bypass Peace Harbor
 - With consultation from Peace Harbor
 - Decisions should not be made in a vacuum
 - For all other hospitals >1 hr away, administer tPA and assess for LVO with CTA, then transfer



Triage - over vs under?

- Overtriage direct to ECC
 - Pro
 - Less likely to miss a disabling stroke
 - Some cases may require other intervention (e.g. neurosurgery)
 - Con
 - Costly transfer
 - Removes patient from home community
- Undertriage to receiving facility, then transfer
 - Pro
 - Conserves resources
 - Con
 - Delay to treatment
 - More likely to miss treatable strokes
 - Many elderly patients may not be transferred



Triage - over vs under?

- Acceptable over-triage rates for STEMI
 - 10-15%
- Acceptable over-triage rates for trauma
 - 30-50%
- Acceptable rates for ELVO?
 - Number needed to bypass?

STEMI Recommendations from Lumen meeting. *Cath Lab Digest* 2009

Number need to bypass

- Polk county study
 - Retrospective review
 - Stroke severity-adjusted EMS triage
 - For every 8 presumed acute severe strokes, 1 received endovascular or neurosurgical intervention
 - NNB (number needed to bypass) = 8

Interfacility transport

- Improving interfacility transport:
 - Communication between facilities and EMS
 - Written protocol
 - Clear imaging criteria
 - Transfer with IV tPA running
 - Knowledge of quickest travel modality (geography, distance, weather)



Oregon Stroke Care Committee



2017 Oregon Stroke Care Committee meeting

- Recommended GWTG measures to track acute stroke care
 - Type of stroke
 - LKW to ED arrival time
 - EMS-ED prenotification of stroke patient
 - ED arrival to imaging time
 - Percent of patients treated with tPA and thrombectomy
 - ED arrival to tPA time
 - Percent of patients with post-tPA complications



2017 Oregon SCC meeting

- EMS noted
 - competing interests in where to transport
 - patient preference
 - closest facility
 - most appropriate facility
 - federal and state regulations
 - regionalized system would benefit decision making
 - clear guidance necessary



2017 Oregon SCC survey

- Survey of all hospitals that treat acute stroke
 - 63 received survey, 46 responded
 - 100% stocked tPA
 - All had imaging capability
 - 1/8 could perform thrombectomy
 - 1/5 lacked formal divert/transfer protocols
 - 1/7 did not have standardized ED orders
 - 1/3 did not have standardized inpatient orders
 - 1/4 were not part of tele stroke network
 - 1/3 without certification were interested in assistance obtaining certification



2017 SCC recommendations to OHA

- Use GWTG for all primary and comprehensive stroke centers
- Continue evidence-based prevention interventions to reduce stroke risk
- Promote AHA/ASA guidelines
- Promote state-wide EMS acute stroke triage policy, similar to state trauma policy
 - guidance for triaging stroke
 - method for validation for hospitals to certify their level of care
 - method for EMS and hospital quality improvement



AHA recommendation

- Patients with severe stroke within 6 hours of onset should be bypassed to ECC if this will incur no more than 15 minutes of travel time
- In rural communities, delays of 20-30 minutes may be reasonable
- However, acceptable delay for rerouting still unclear

Conclusion

- Continue work on early field identification
- Rapid triage to nearest appropriate facility
- Hospital prenotification critical
- Acceptable time delay for bypass?