

**Trauma Communications Center
Coordinated Stroke Triage**

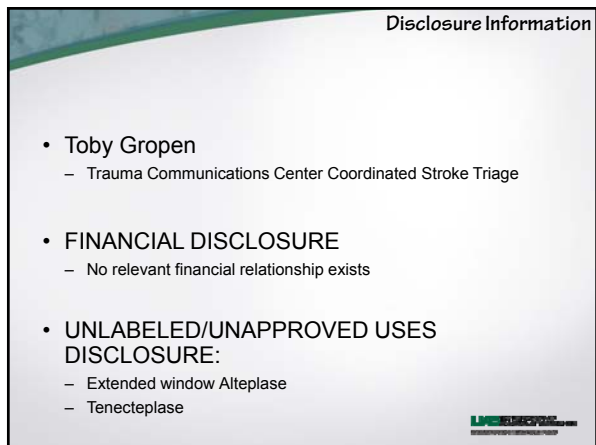
Toby Gropen
August 24, 2019



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Disclosure Information

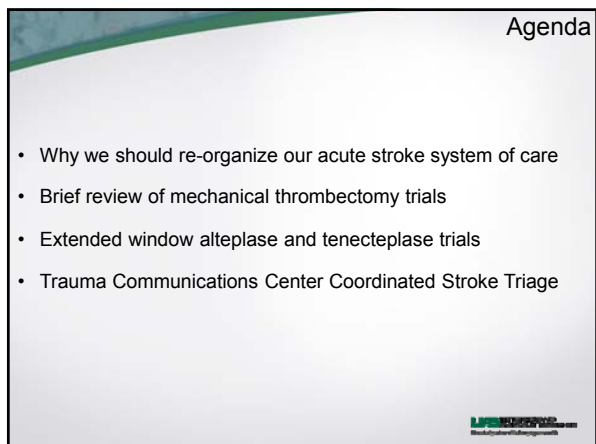
- Toby Gropen
 - Trauma Communications Center Coordinated Stroke Triage
- FINANCIAL DISCLOSURE
 - No relevant financial relationship exists
- UNLABELED/UNAPPROVED USES DISCLOSURE:
 - Extended window Alteplase
 - Tenecteplase



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Agenda

- Why we should re-organize our acute stroke system of care
- Brief review of mechanical thrombectomy trials
- Extended window alteplase and tenecteplase trials
- Trauma Communications Center Coordinated Stroke Triage

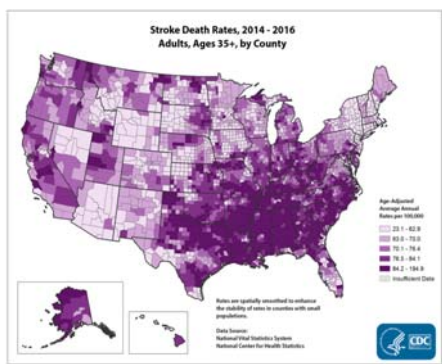


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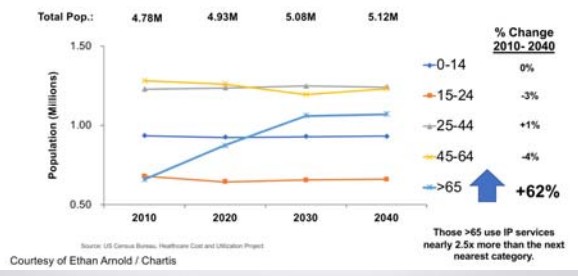
Why? Because . . .

Persons living in the southeastern US have a higher stroke prevalence, led by Alabama

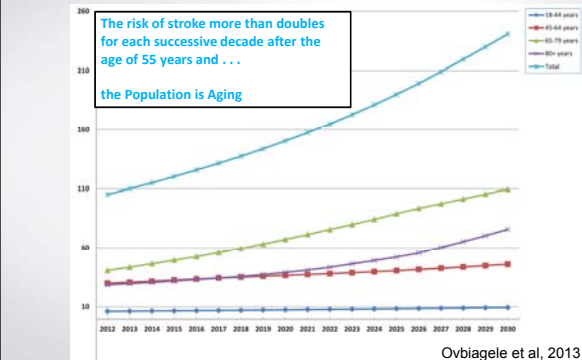
From 2014 - 2016, Alabama had the highest stroke mortality in the US

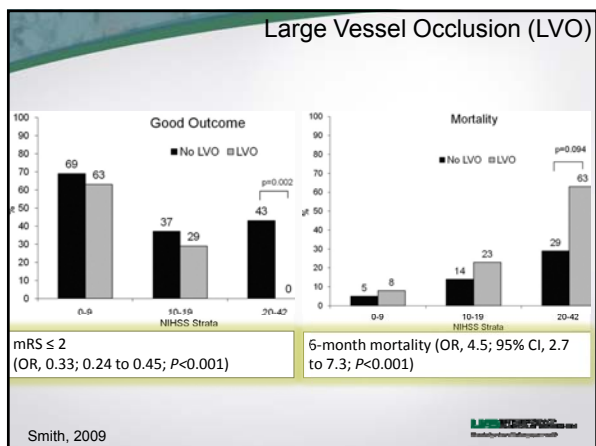


POPULATION CHANGE: ALABAMA 2010-2040



Projected Costs of Stroke in Billions (2010\$)

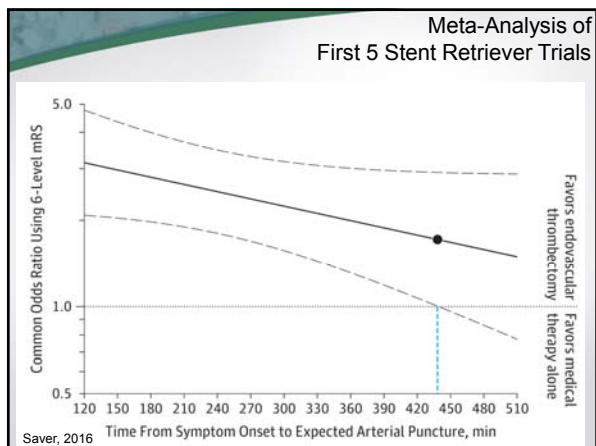


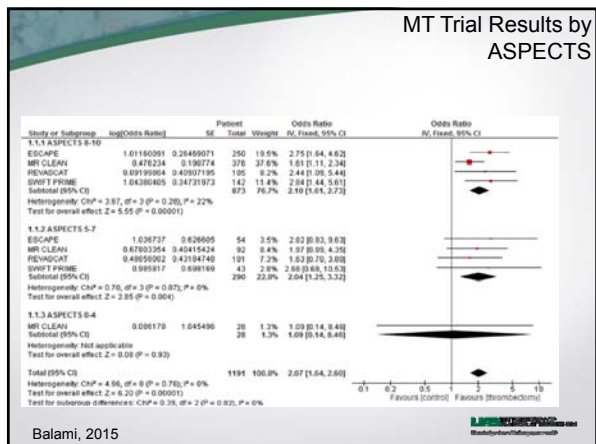


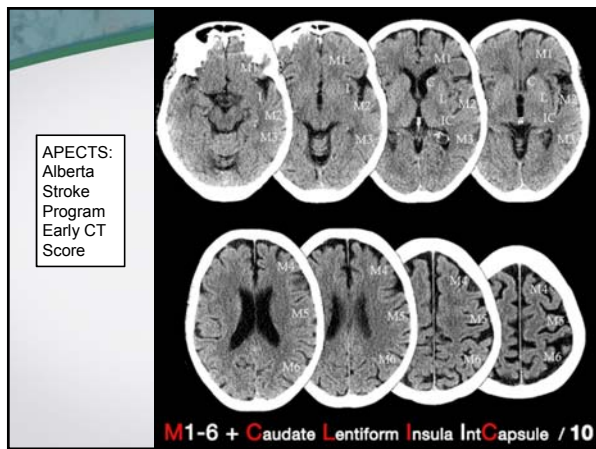
Stent Retriever Trials

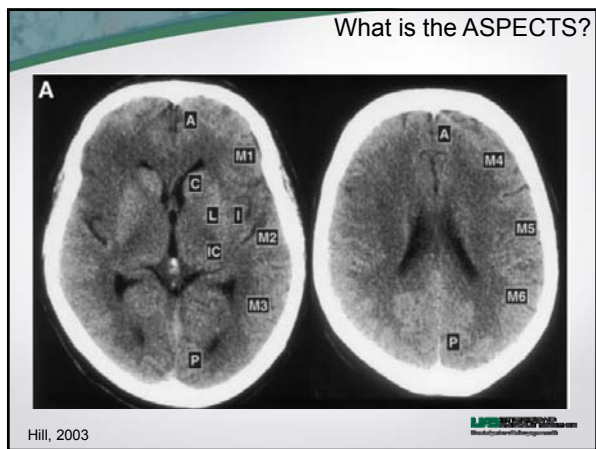
Study	Total N	Window From LKW (hrs)	% Rx tPA	Brain Imaging Selection	% mRS ≤ 2 MT group	Increase in % mRS ≤ 2	NNT for mRS ≤ 2
MR CLEAN	500	< 6	89	CT no bleed	33	14	7.1
ESCAPE	315	< 12	76	ASPECTS 6-10 Mod-good collaterals	53	24	4.2
REVASCAT	206	< 6	73	ASPECTS 7-10 CT APECTS 6-10 MRI	44	16	6.3
SWIFT PRIME	196	< 6	100	Penumbra imaging Small-mod core	60	25	4.0
EXTEND-IA	70	< 6	100	CTP mismatch	72	33	3.0
DAWN	206	6-24	9	DWI or CTP core	49	36	2.8
DEFUSE 3	182	6-16	10	Penumbra imaging	45	28	3.6

LKW, last known well; mRS, modified Rankin Score; MT, mechanical thrombectomy; NNT, number needed to treat; CT computerized tomography; ASPECTS, Alberta Stroke Program Early CT Score; MRI, magnetic resonance imaging; CTP, CT Perfusion; DWI, diffusion weighted imaging










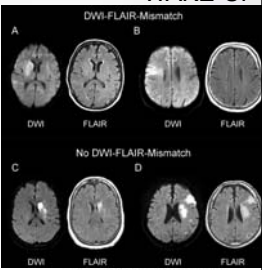
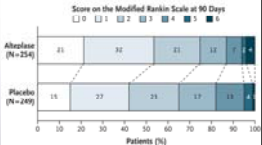
2018 Guidelines Update on Late Window MT

- In selected patients with AIS within 6 to 16 hours of last known normal who have LVO in the anterior circulation and meet other DAWN or DEFUSE 3 eligibility criteria, mechanical thrombectomy is recommended. (I, A)
- In selected patients with AIS within 6 to 24 hours of last known normal who have LVO in the anterior circulation and meet other DAWN eligibility criteria, mechanical thrombectomy is reasonable. (IIa, B-R)



WAKE-UP

- RCT, AIS patients with unknown LKW
- + DWI, - FLAIR → Alteplase vs placebo
- Stopped early with 503 patients
- Median NIHSS=6, age 65 yrs
- Wake up in 89%
 - LKW just over 10 hours
 - mRS≤1 at 90 days
 - 41.8% placebo vs. 53.3% alteplase OR=1.6 (1.09-2.36)
- Sx IPH 0.4% vs. 2.0% t-PA
- 3 deaths (1.2%) vs. 10 deaths (4.1%) t-PA

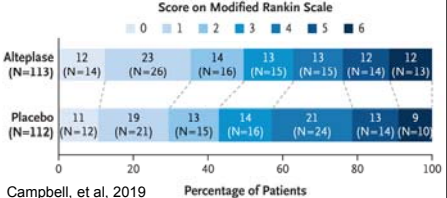



Score	Alteplase (N=254)	Placebo (N=249)
0	21	15
1	32	27
2	51	29
3	18	17
4	1	1
5	1	1
6	1	1

Thomalla, et al, 2018

EXTEND

- RCT with alteplase vs. placebo in patients with perfusion mismatch > 1.2 (≥10 ml) and LKW 4.5 to 9 hrs or was (if < 9 hrs of midpoint of sleep)
- Stopped after 225 patients after wake-up published
 - LKW to Rx just over 7 hours, NIHSS 10 vs 12, age 71 vs 74, 65% wake up
 - LVO 72% vs 69% t-PA, core 2.4 vs 4.6 ml
- No difference on mRS shift analysis
- Sx IPH 1 (0.9%) vs 7 (6.2%) alteplase



Score	Alteplase (N=113)	Placebo (N=112)
0	12	11
1	23	19
2	14	13
3	13	14
4	13	21
5	12	13
6	12	9

Campbell, et al, 2019

What about Tenecteplase?

- Why tenecteplase rather than alteplase?
- NOR-TEST: tenecteplase vs. alteplase in AIS
 - PROBE, baseline NIHSS=4, 17-18% mimics, 1107 pts, < 4.5 hrs
 - No difference, similar safety
- EXTEND-IA TNK: tenecteplase vs. alteplase before MT
 - RCT, baseline NIHSS=17, 101 pts, < 4.5 hrs, occlusion of ICA, MCA, or BA
 - TIC1 ≥ 2b: 22% tenecteplase vs. 10% alteplase (p=0.03)
 - 90 day mRS ordinal shift (p=0.04)

EXTEND-IA TNK Results (TIC1 ≥ 2b)

Group	0	1	2	3	4	5	6	7	8	9	10
Tenecteplase Group (n=101)	28	21	14	14	8	2	1	1	1	1	1
Alteplase Group (n=101)	18	23	14	14	7	1	1	1	1	1	1

Patients (%)

Logallo et al, 2017; Campbell et al, 2018

Extended Window Trials of Tenecteplase


- **TIMELESS**
 - RCT tenecteplase in extended window patients with proximal occlusions
 - LKW 4.5 to 24 hrs, NIHSS≥5, EIC > 1/3 MCA
 - LVO (ICA, M1, M2), mismatch >1.8, volume>15 ml, core < 70 ml
- **TEST OF TIME**
 - RCT tenecteplase in extended window patients with distal occlusions
 - LKW 4.5 to 24 hrs, ASPECTS ≥ 7, no LVO,
 - PWI > 10 ml; early futility assessment if more conservative target mismatch is needed (mismatch ≥ 1.2, core < 70 ml, mismatch volume ≥ 10 ml)

What are the Elements of a Trauma System? Are Trauma Systems Effective?

- **Trauma Systems:** Organized, coordinated effort in a defined geographic area that delivers the full range of care to all injured patients and is integrated with the local public health system
- **Trauma Communication Centers:** Physical locations, staffed around the clock with certified professionals that assist first responders in the field
- Trauma system implementation has been associated with a **15% reduction in mortality**
- *What is the acute stroke system of care missing?*

Celso et al, 2006

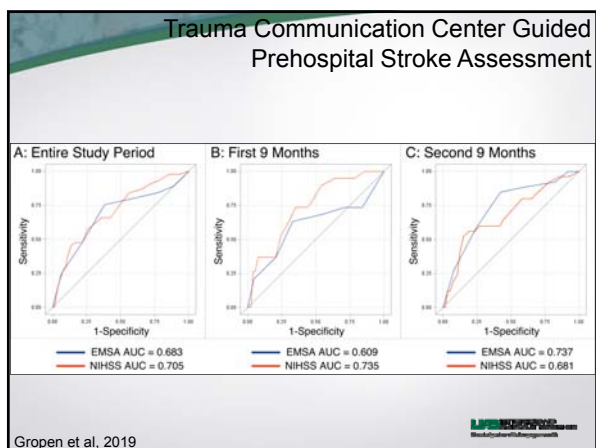
Trauma Communication Center Guided Prehospital Stroke Assessment

- Collaborators: Joe Acker, Michael Minor, Melissa Gazi, and Abi Fadairo
- Focused Experience
 - EMS • Patient
 - EMS • Patient
 - EMS • Patient
 - EMS • Patient
- Item-specific page out
 
- Focused feedback
 - Record ATCC-EMS calls
 - Review all audio files
 - Feedback to ATCC
 - Share best practices
- Timeline
 - May to July 2016: Training
 - September 1, 2016 to February 28, 2017: EMSA assessments
 - May 2017 to February, 2018: Focused feedback

Gropen et al, 2019

Emergency Medical Stroke Assessment (EMSA)

	Abnormal?	Points if abnormal
E: Eye Movement Score 1 point if abnormal		
Horizontal Gaze Ask patient to keep their head still and follow your finger left to right with their eyes In aphasic patients, call the patient's name on one side and then the other Abnormal: Patient is unable to follow as well in one direction compared to the other	<input type="checkbox"/>	1
M: Motor - Asymmetric Face, Arm, or Leg Weakness Score 1 point for each abnormal element		
Facial Weakness Ask patient to show their teeth or smile In aphasic patients, look for asymmetric grimace to pain Abnormal: One side of the face does not move as well as the other	<input type="checkbox"/>	1
Arm Weakness Ask patient to hold up both arms, palms up, for 10 seconds with eyes closed In aphasic patients, hold the patients arms up and let go Abnormal: One arm does not move or drifts down compared to the other	<input type="checkbox"/>	1
Leg Weakness Ask patient to lift up one leg and then the other for 5 seconds In aphasic patients, hold up one leg and let go, then repeat on the other side Abnormal: One leg does not move or drifts down compared to the other	<input type="checkbox"/>	1
SA: Slurred Speech or Aphasia Score 1 point for each abnormal element		
Naming Ask patient to name your watch and pen Abnormal: Patient slurs words, says the wrong words, or is unable to speak	<input type="checkbox"/>	1
Repetition Ask patient to repeat "They heard him speak on the radio last night" after you Abnormal: Patient slurs words, says the wrong words, or is unable to speak	<input type="checkbox"/>	1
Total Points:		



Stroke Severity Scales with Prospective EMS Validation

Scale	Total N	Cohort with mimics, ICH?	LVO definition	LVO N (%)	Cutoff	Sensitivity	Specificity
RACE	357	Yes (12.6%)	ICA, M1, BA	76 (21%)	≥ 5	0.85	0.68
RACE	440	Yes (39%)	Not specified	64 (15%)	≥ 5	0.66	0.72
C-STAT	58 FAST positive	Yes	Not defined	7 (12%)	≥ 2	0.71	0.70
LAMS	71 AIS	No	ICA, M1, M2, VA, BA, P1, A1	45 (63%)	≥ 4	0.76	0.65
EMSA	471	Yes (49%)	ICA, M1, BA	45 (9.6%)	≥ 4	0.76 (0.85)	0.62 (0.58)

