



INTRODUCTION

Characterizing the population of acute ischemic stroke (AIS) patients presenting in the delayed reperfusion window is important to ensure equitable implementation of recently updated treatment guidelines.

HYPOTHESIS

Descriptive data analysis of AIS patients presenting beyond 4.5 hours from last seen normal (LSN) up to 24 hours from LSN will provide information on the distribution of patients, severity, and clinical outcomes within Florida.

METHODS

- Florida Stroke Registry (FSR) data for patients presenting within 24 hours of LSN from Jan 2010 - Jan 2020 were analyzed.
- In univariate analysis, continuous variables were summarized as means with SD (differences were assessed using the Student t test or Wilcoxon–Mann–Whitney test if data were not normally distributed) and categorical variables were presented as frequencies with percentages (differences were assessed using the Pearson χ^2 test).
- Multilevel generalized linear regression model was used to identify differences between delayed AIS cases (>4.5 hours) versus those presenting within the conventional time window (\leq 4.5 hours), adjusting for all variables listed in table 2.

FUNDING

This study is supported by Florida Department of Health Funding #: COHAN-A1.

RESULTS

Table 1. Demographics of Stroke Patients Presenting within 24 Hours of Last Seen Normal (LSN)

Variables	All		Time arrival from Last Known Well								P-value
			0-4.5 hours LSN		4.5-9 hour from LSN		9-24 hours LSN		Unknown LSN		
	N	%	N	%	N	%	N	%	N	%	
All	150695	100	60311	100	15645	100	22416	100	52323	100	
On-hours	71144	47.2	27113	45	5593	35.7	12045	53.7	26393	50.4	<.0001
Off-hours	79551	52.8	33198	55	10052	64.3	10371	46.3	25930	49.6	
Received thrombolysis	22758	15.1	22292	37	86	0.5	73	0.3	307	0.6	<.0001
Received EVT	8243	5.5	5073	8.4	1081	6.9	1168	5.2	921	1.8	<.0001
Received EVT and thrombolysis	2937	1.9	2888	4.8	11	0.1	13	0.1	25	0	<.0001
No intervention	122631	81.4	35834	59.4	14489	92.6	21188	94.5	51120	97.7	<.0001
Death, %	5462	3.6	2494	4.1	600	3.8	701	3.1	1667	3.2	<.0001
Discharge Disposition, % home	73473	48.8	29941	49.6	7194	46	10620	47.4	25718	49.2	<.0001
Discharge Disposition, % rehab	23471	15.6	9221	15.3	2976	19	4229	18.9	7045	13.5	
Ambulate unassisted, %	54807	36.4	23948	39.7	5861	37.5	8759	39.1	16239	31	<.0001
Discharge Modified Rankin Score 0-2	28168	18.7	12850	21.3	3022	19.3	4771	21.3	7525	14.4	<.0001
Discharge Modified Rankin Score 3-6	38930	25.8	15951	26.4	4637	29.6	6838	30.5	11504	22	
Discharge Modified Rankin Score missing	83597	55.5	31510	52.2	7986	51	10807	48.2	33294	63.6	
Advanced Notification by EMS Yes	48214	32	28053	46.5	4921	31.5	6417	28.6	8823	16.9	<.0001
Advanced Notification by EMS No	29334	19.5	10232	17	2727	17.4	4127	18.4	12248	23.4	
Advanced Notification by EMS Missing	73147	48.5	22026	36.5	7997	51.1	11872	52.9	31252	59.7	
Sex Male	76168	50.5	30724	50.9	8243	52.7	11377	50.8	25824	49.4	<.0001
Sex Female	74527	49.5	29587	49.1	7402	47.3	11039	49.2	26499	50.6	
Non-Hispanic White	95458	63.3	40520	67.2	9940	63.5	14185	63.3	30813	58.9	<.0001
Non-Hispanic Black	27411	18.2	9164	15.2	2778	17.8	4127	18.4	11342	21.7	
FL-Hispanic	20887	13.9	8196	13.6	2139	13.7	3191	14.2	7361	14.1	
PR-Hispanic	6939	4.6	2431	4	788	5	913	4.1	2807	5.4	
Insurance Private	48575	32.2	20860	34.6	5345	34.2	7788	34.7	14582	27.9	<.0001
Insurance Medicare	50495	33.5	20278	33.6	5234	33.5	7390	33	17593	33.6	
Insurance No Insurance/Medicaid	13536	9	4889	8.1	1456	9.3	2290	10.2	4901	9.4	
Insurance Unknown/Missing	38089	25.3	14284	23.7	3610	23.1	4948	22.1	15247	29.1	
Current smoker, %	23654	15.7	8474	14.1	2562	16.4	4062	18.1	8556	16.4	<.0001
Hypertension, %	101290	67.2	42474	70.4	11213	71.7	15982	71.3	31621	60.4	<.0001
Diabetes mellitus, %	45038	29.9	16970	28.1	5086	32.5	7120	31.8	15862	30.3	<.0001
Dyslipidemia, %	59301	39.4	25366	42.1	6575	42	9304	41.5	18056	34.5	<.0001
CAD/prior MI, %	31735	21.1	14010	23.2	3556	22.7	4598	20.5	9571	18.3	<.0001
Previous stroke/TIA, %	39894	26.5	17138	28.4	4193	26.8	5872	26.2	12691	24.3	<.0001
Academic hospital Yes	42953	28.5	15532	25.8	4325	27.6	6502	29	16594	31.7	<.0001
Academic hospital No	107742	71.5	44779	74.2	11320	72.4	15914	71	35729	68.3	
Intravenous alteplase-treated patients per year High volum (\geq 20)	104749	69.5	44305	73.5	11612	74.2	16115	71.9	32717	62.5	<.0001
Intravenous alteplase-treated patients per year High vs Low volume (<20) State FL	45946	30.5	16006	26.5	4033	25.8	6301	28.1	19606	37.5	
State PR	6939	4.6	2431	4	788	5	913	4.1	2807	5.4	
Region East Central	33024	21.9	11257	18.7	2903	18.6	4312	19.2	14552	27.8	<.0001
Region North	11539	7.7	4669	7.7	1396	8.9	1912	8.5	3562	6.8	
Region PR	6939	4.6	2431	4	788	5	913	4.1	2807	5.4	
Region Panhandle	5366	3.6	2448	4.1	764	4.9	942	4.2	1212	2.3	
Region South	54395	36.1	21903	36.3	5458	34.9	8022	35.8	19012	36.3	
Region West Central	39432	26.2	17603	29.2	4336	27.7	6315	28.2	11178	21.4	

Table 2. Multilevel generalized linear regression model

Variable	Odds Ratio	95% Confidence Interval
Age (18 - 64)	1.23	1.17 - 1.29
Age (65 to 79)	1.14	1.10 - 1.18
Black	1.12	1.06 - 1.18
Hispanic	1.05	0.98 - 1.13
Hispanic (Puerto Rico)	1.25	0.68 - 2.31
Female	1.00	0.98 - 1.03
Medicare	1.04	0.99 - 1.09
No Insurance/Medicaid	1.18	1.11 - 1.25
Unknown/Missing	1.03	0.94 - 1.11
Arrival by EMS	0.59	0.56 - 0.62
Unknown/Missing	0.58	0.51 - 0.66
Arrival during off hours	0.92	0.89 - 0.95
Functionally Independent	0.89	0.84 - 0.93
Unknown/Missing	0.98	0.90 - 1.06
Ambulate Independently	1.24	1.15 - 1.35
Unknown/Missing	1.26	1.16 - 1.36
NIHSS 5 and above	1.05	1.01 - 1.10
Unknown/Missing	0.79	0.69 - 0.89
mRS 6	1.21	1.15 - 1.28
Unknown/Missing	0.88	0.83 - 0.94
Discharge Home	0.82	0.76 - 0.89
Discharge to Rehab	1.30	1.20 - 1.41
Discharge to Skilled Nursing	1.15	1.07 - 1.23
Discharge other	0.80	0.72 - 0.90
Discharge Died	0.85	0.74 - 0.97
EVT	0.86	0.79 - 0.94
Smoker	1.32	1.27 - 1.38
Hypertension	1.03	0.99 - 1.07
Diabetes	1.13	1.09 - 1.17
Dyslipidemia	0.98	0.94 - 1.02
CAD	0.90	0.86 - 0.93
Stroke	0.76	0.74 - 0.79
Teaching Hospital	1.24	1.09 - 1.40
High volume tPA Hospital	1.04	0.93 - 1.16
East Central Region	0.81	0.71 - 0.93
North Region	1.09	0.84 - 1.42
Puerto Rico	1.00	1.00 - 1.00
Panhandle Region	0.78	0.68 - 0.90
West Central Region	0.79	0.70 - 0.90

DISCUSSION

- As compared to early presenters, delayed window patients were younger; more Black vs. White, have higher NIHSS, more likely to present to an academic hospital in South Florida, less likely to arrive by EMS, and less likely to receive reperfusion therapies.
- In our multivariable regression analysis, delayed window presentation was negatively associated with discharge home, and ambulatory status at discharge.
- Based on the extended time window thrombolysis trials, approximately 20 – 30% of these patients could be eligible for thrombolysis if screened by appropriate imaging.¹⁻⁵

SUMMARY

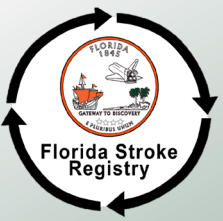
We found significant race, ethnic, socioeconomic and geographical disparities amongst those presenting in the delayed vs early reperfusion time windows with consequential effects on patient outcomes. Stroke education to younger minorities and adaptation of regional stroke systems of care are urgently needed.

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- Thomalla G, Simonsen CZ, Bouttief F, Andersen G, Berthezene Y, Cheng B, et al. Mri-guided thrombolysis for stroke with unknown time of onset. *N Engl J Med.* 2018;379:611-622
- Ma H, Campbell BCV, Parsons MW, Churilov L, Levi CR, Hsu C, et al. Thrombolysis guided by perfusion imaging up to 9 hours after onset of stroke. *N Engl J Med.* 2019;380:1795-1803
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AUTHOR DISCLOSURES

Dr Romano is a PI of the Florida–Puerto Rico Collaboration to Reduce Stroke Disparities (NIH/NINDS U54NS081763) and a PI for the Transition of Care Stroke Disparity Study (NIH/NIMHD 1R01MD012467). Dr Rundek is a PI for the Transition of Care Stroke Disparity Study (NIH/NIMHD 1R01MD012467). The remaining authors have no disclosures to report.

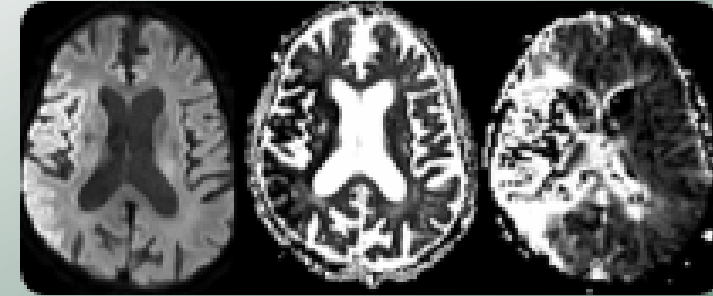


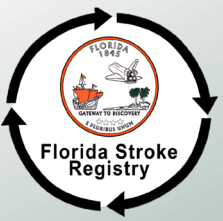
Introduction:

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Hypothesis:

Descriptive data analysis of AIS patients presenting beyond 4.5 hours from last seen normal (LSN) up to 24 hours from LSN will provide information on the distribution of patients, severity, and clinical outcomes within Florida.





METHODS

Study Population

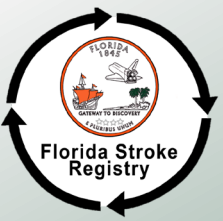
- Patients were included in the Florida Stroke Registry (FSR)
- Patients presenting within 24 hours of LSN from Jan 2010 - Jan 2020 were analyzed.

Univariate Analysis

- Continuous variables were summarized as means with standard deviation
- Differences were assessed using the Student t test or Wilcoxon–Mann–Whitney test if data were not normally distributed)
- Categorical variables were presented as frequencies with percentages (differences were assessed using the Pearson χ^2 test).

Multilevel generalized linear regression Analysis

- Compared differences between AIS cases (>4.5 hours) versus AIS within (\leq 4.5 hours)
- Regression model included adjustment for:
 - age, sex, race and insurance status; medical history of tobacco usage, hypertension, diabetes, dyslipidemia, coronary artery disease and stroke; patient level clinical variables prior ambulatory status, arrival time of day, NIHSS score, thrombolysis status, EVT status, discharge Rankin score, functional status at discharge, discharge location; hospital characteristics academic center, annual Intravenous alteplase volume and region.



RESULTS

Table 2. Multilevel generalized linear regression model

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Ambulate Independently	1.24	1.15 - 1.35
Unknown/Missing	1.26	1.16 - 1.36
NIHSS 5 and above	1.05	1.01 - 1.10
Unknown/Missing	0.79	0.69 - 0.89
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Unknown/Missing	0.88	0.83 - 0.94

Table 2 continued

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EVT	0.86	0.79 - 0.94
Smoker	1.32	1.27 - 1.38
Hypertension	1.03	0.99 - 1.07
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RESULTS

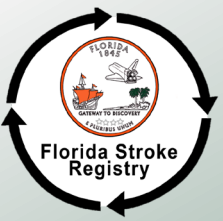
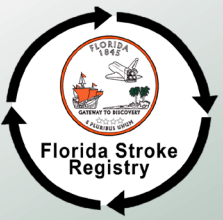


Table 1. Demographics of Stroke Patients Presenting within 24 Hours of Last Seen Normal (LSN)

Variables	All		Time arrival from Last Know Well								P-value
			0-4.5 hours LSN		4.5-9 hour from LSN		9-24 hours LSN		Unknown LSN		
	N	%	N	%	N	%	N	%	N	%	
All	150695	100	60311	100	15645	100	22416	100	52323	100	
On-hours	71144	47.2	27113	45	5593	35.7	12045	53.7	26393	50.4	<.0001
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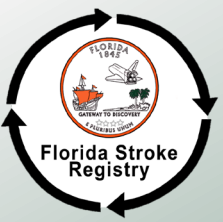


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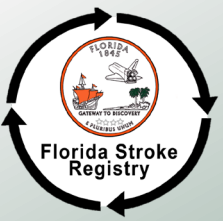


DISCUSSION



- ❑ As compared to early presenters, delayed window patients were younger; more Black vs. White, have higher NIHSS, more likely to present to an academic hospital in South Florida, less likely to arrive by EMS, and less likely to receive reperfusion therapies.
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- ❑ Based on the extended time window thrombolysis trials, approximately 20 – 30% of these patients could be eligible for thrombolysis if screened by appropriate imaging.¹⁻⁵
- ❑ Thus, stroke education to younger minorities and adaptation of regional stroke systems of care are urgently needed to broaden .





REFERENCES

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AUTHOR DISCLOSURES

Dr. Romano receives salary support to the Department of Neurology at the University of Miami from the Florida Department of Health for work on the Florida Stroke Registry. He is a PI of the Transition of Care Stroke Disparity Study (NIH/NIMH 1R01MD012467), the Mechanisms of Early Recurrence in Intracranial Atherosclerotic Disease study (1R01NS084288), the Florida Regional Coordinating Center for StrokeNet (1U24NS107267), and receives salary support from Genentech for his role as PI of the Mild and Rapidly Improving Stroke Study (MaRISS).

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