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VALIDATE

Validation of Artificial Intelligence to Limit Delays in Acute Stroke Treatment and Endovascular Therapy

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DISCLOSURES

Thomas Devlin, MD, PhD -   speakers bureau, equity interest in VIZ
Morgan Figurelle, DO -   none
Amanda Avila, MD -   none
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Viz.ai is in 1300 hospitals Worldwide Based on Single Center Data

TABLE 1.   PREVIOUS STUDIES ON VIZ.AI

	HOSPITAL	AUTHORS	TITLE	STUDY DESIGN	STUDY PERIOD	SAMPLE SIZE	MAIN RESULTS	REFERENCE
1	Mount Sinai, New York, NY.	Morey, JR...Fifi, JT.	Impact of Viz LVO on Time-to-Treatment and Clinical Outcomes in Large Vessel Occlusion Stroke Patients Presenting to Primary Stroke Centers	Single Center Hub - Spoke model comparing metrics before and after VIZ LVO implementation.	Pre- Viz: July 1, 2018, and March 15, 2019 / Post -Viz July 1, 2019, and March 15, 2020	55 patients (29 pre-Viz cohort / 26 post Viz cohort)	Post-VIZ implementation: (1) faster door-to-NIV notification (delta = 15 min (40 vs 25 min, p=0.01) with less variation (p< 0.05) ; (2) door-to-puncture time was shorter but not significant (delta = 25 min shorter in Viz cohort, p= 0.15, NS⁻).	medRxiv preprint doi: https://doi.org/10.1101/2020.07.02.20143834; this version posted July 5, 2020.
2	University of California, San Diego., CA.	Figurelle ME... Meyer BC.	(VISION): Viz.ai Implementation of Stroke Augmented Intelligence and Communication Platform to Improve Indicators and Outcomes for a Comprehensive Stroke Center and Network	Single Center Hub - Spoke model comparing metrics before and after VIZ LVO implementation. Assessed effect of day vs night shift arrival	Pre-Viz.ai period (June 10, 2020, to January 17, 2021) vs. Post Viz.ai deployment period (January 18, 2021, to June 17, 2021	82 NIR cases total. (pre-VIZ/post-VIZ) Direct to Hub day (7/7), direct to Hub night (10/5), Spoke arrival day (13/6). Spoke arrival night (17/17).	Post-VIZ implementation: (1) faster door to groin times for both patients presenting to the Spoke and Hub (HUB-DTG-24hr: 32% reduction, 127 min vs 86 min (delta = 41); p=0.006; SPOKE-DTG-24hr 33% reduction, 42 min vs 28 min; (delta = 14), p=0.036).	AJNR Am J Neuroradiol 2023, http://dx.doi.org/10.3174/ajnr.A7716
3	Erlanger Health System - Univ of Tennessee, Chattanooga, TN.	Devlin T ... Saver J.	(DISTINCTION): Utilization of Applied Artificial Intelligence to Facilitate LVO Detection and Synchronizing Workflow to Improve Time to Treatment in High-Volume Hub & Stroke Networks	Single Center Hub - Spoke model comparing metrics before and after VIZ LVO implementation.	Nov. 2017 - Jul. 2019	Pre Viz: 11 patients ; Post Viz: 4 patients	Post-Viz LVO implementation significant improvement in Spoke door-in to hub groin puncture (mean = 218 vs. 141, p=0.02; and in Spoke CT to groin puncture time (mean = 200 vs. 132, p = 0.04).	World Stroke Organization, 2020, Abstract #3069 - AS38.
4	Semmes-Nurphey Clinic,University of Tennessee, Memphis, TN.	Elijovich L ...Hoit D.	Automated emergent large vessel occlusion detection by artificial intelligence improves stroke workflow in a hub and spoke stroke system of care	Single Center Hub - Spoke model comparing metrics before and after VIZ LVO implementation.	Dec. 2018 - Dec. 2019	104 patients	Post-Viz: Significant improvement in median time form CTA completion to NIV contact (delta = 19 min (26 min v 7), p<0.001) and Spoke door in to arterial puncture for patients transferred from spoke to hub for EVT (delta 44 min, 185 vs 141, p=0.027).	J Neurointerv Surg, 2022 Jul;14(7):704-708. doi: 10.1136/neurintsurg-2021-017714
5	Valley Baptist medical Center, Harlingen, Texas	Hassan AE ... Wondwossen GT	The implementation of artificial intelligence significantly reduces door-in-door-out times in a primary care center prior to transfer	Single Center Hub - Spoke model comparing metrics before and after VIZ LVO implementation.	Pre Viz: Feb 2017 to Nov 2018 - Post Viz: Nov 2018 - June 2020	Pre Viz = 28; Post-Viz= 35	Post Viz.ai median CTA time at PSC to door-in at CSC was significantly reduced by an average of 22.5 min. (132.5 min versus 110 min; p = 0.0470).	Interv Neuroradiol - 2022 Aug 25;15910199221122848. doi: 10.1177/15910199221122848.
6	Valley Baptist medical Center, Harlingen, Texas	Hassan AE... Tekle WG	Artificial Intelligence–Parallel Stroke Workflow Tool Improves Reperfusion Rates and Door-In to Puncture Interval	Single Center - Hub and Spoke Model	Pre-Viz: Nov 2016 - Nov 2018; Post-Viz: Dec 2018 - May 2020	Pre-Viz: 86 patients; Post-Viz: 102 pts	Mean Door-in to Puncture time at the Hub improved (delta = 86.7 min; 206.6 vs 119.9 min; p<0.001). Significant improvement in rate of reperfusion TICI 2b-3 (p=0.036).	Stroke Vasc Interv Neurol. 2022;2:e000224. DOI: 10.1161/SVIN.121.000224

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- 15 min Faster Door-to NIR Contact
- Faster Door-to-Table (Spoke = 42 min / Hub =14 min)
- Faster Spoke door-in- & spoke CT- to Table
- Faster spoke CTA to NIR call (19 min) Spoke door to Table (44 min)
- Faster Spoke CTA to Hub Door-in (22.5 min)
- Faster Hub Door to Puncture (86.7 min) Higher Rate of TICI2b-3 Reperfusion (9.2%)

Critique of past Studies on Viz.ai

*While the studies to date have been small,
the fact that many found statistically significant improvement in stroke
workflow after Viz.ai installation suggests the technology may be
highly impactful.*

LIMITATIONS of Previous Viz.ai Studies

1. Small sample size questions generalizability & reproducibility of results.

2. All were serial cohort studies with significant time between cohorts.

3. Many metrics were assessed not directly controlled by Viz.ai.

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Collected a large data set from the TeleCare by TeleSpecialists™ database on acute stroke consultations performed by TeleSpecialists Neurologists.

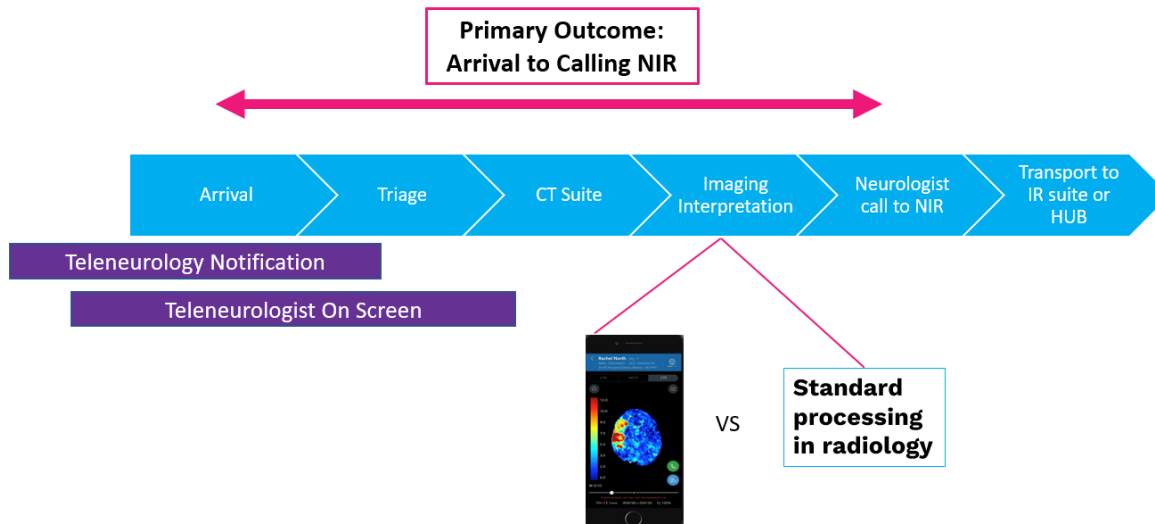Data was collected from Dec 1, 2021 through Mar 31, 2022.

Primary Analysis: Concurrently Compared Workflows Metrics Between 2 Cohorts: Viz vs Non-AI.

Secondary Analysis: Subgroups (Thrombectomy vs Non-Thrombectomy Center) contact with NIR.

Exclusions: Another AI system OR if teleneuro did not contact the NIR directly.

Statistical analysis was done by an independent team of biostatisticians at the University of Tennessee Chattanooga.
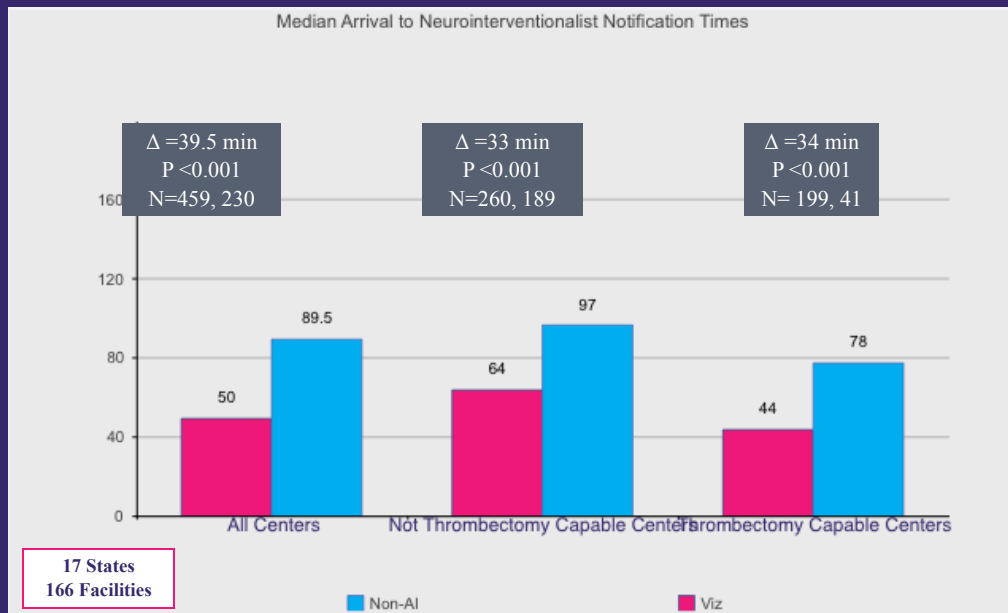
VALIDATE WORKFLOW

Primary Outcome: Arrival to Calling NIR

Arrival → Triage → CT Suite → Imaging Interpretation → Neurologist call to NIR → Transport to IR suite or HUB

Teleneurology Notification

Teleneurologist On Screen

VS

Standard processing in radiology

VALIDATE RESULTS

14,116 patients enrolled - 17 states - 166 facilities
Viz cohort – 8,557 patients, 76 hospitals
Non-AI cohort – 5,559, 90 hospitals

	Non-AI (5,559)	VIZ (8,557)	P value
Sex, Female n(%)	2,961 (53.3%)	4,624 (54.0%)	0.3776
Age mean, sd	65.5 ± 15.9	66.8 ± 16.3	< 0.001
Median NIHSS (IQR)	2 (1.0, 6.0)	2 (0.0, 6.0)	<0.001
Median Pre-mRS (IQR)	0 (0.0, 1.0)	0 (0.0, 1.0)	0.2602
Prenotification (%)	997 (17.9%)	2,134 (24.9%)	< 0.001

Patient Arrival to Call To NIR

Median Arrival to Neurointerventionalist Notification Times

Δ =39.5 min
P <0.001
N=459, 230

Δ =33 min
P <0.001
N=260, 189

Δ =34 min
P <0.001
N= 199, 41

- All Centers: 50 (Viz), 89.5 (Non-AI)
- Not Thrombectomy Capable Centers: 64 (Viz), 97 (Non-AI)
- Thrombectomy Capable Centers: 44 (Viz), 78 (Non-AI)

17 States
166 Facilities

■ Non-AI   ■ Viz

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Results

OVERALL ANALYSIS: NON-AI vs VIZ			
STEP BY STEP TIME INTERVAL COMPARISON			
	Non-AI (n=5,559)	Viz (n = 8,557)	P value
Patient Arrival to NIR Notification Time, Median(IQR)	89.5 (59.2,122.0)	50 (40.0, 82.0)	p < 0.001, delta = -39.5
Patient Arrival to TeleNeuro Call Center Start, Median(IQR)	12.6 (6.2, 26.3)	10.3 (4.8, 20.9)	p < 0.001, delta = -2.3
TeleNeuro Call Center Start to First TeleNeurologist Login	3 (2, 5)	2 (1,4)	p < 0.001, delta = -1
TIME ADJUSTED VIZ-SPECIFIC EFFECT (CALL TO NIR) = 36.2 min			

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Results

| SUBGROUP ANALYSIS: NON-AI vs VIZ AT Thrombectomy vs Non-thrombectomy Centers							
STEP BY STEP TIME INTERVAL COMPARISON							
	Non-Thrombectomy Centers				Thrombectomy Centers		
	Non-AI (N = 4,962)	VIZ (N = 5,737)	P value		Non-AI (N = 597)	VIZ (N = 2,820)	P value
Patient Arrival to NIR Notification Time, Median (IQR)	97 (62.00, 126.50)	64 (46.00, 91.00)	p < 0.001, delta = -33		78 (55.00, 95.00)	44.00 (33.75, 59.00)	p < 0.001, delta = -34
Patient Arrival to TeleNeuro Call Center Start, Median(IQR)	12.38 (5.97, 25.76)	10.97 (5.23, 21.67)	p < 0.001, delta = -1.41		14.62 (7.31, 28.80)	8.53 (3.81, 17.54)	p < 0.001, delta = -6.09
TeleNeuro Call Center Start to First TeleNeurologist Login	3 (2.0,5)	2 (1.0,4)	p < 0.001, delta = -1		3(2.0,5.0)	2.0(1.0,4.0)	p <0.001, delta = -1
TIME ADJUSTED VIZ-SPECIFIC EFFECT (CALL TO NIR): SPOKE = -30.59 min / HUB = -26.91 min							

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VALIDATE primarily leveraged Viz.ai's fast high-resolution neuroimaging platform.

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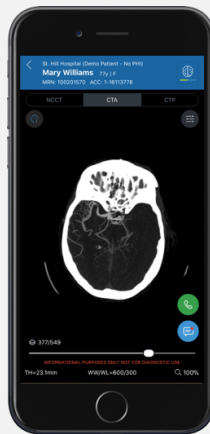TRANSFORMATIVE TELEMEDICINE

Under different stroke care models, other Viz.ai functionalities
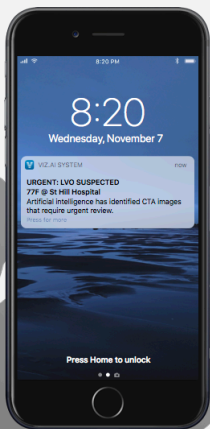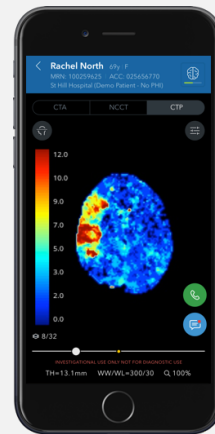

Viz Mobile Viewer
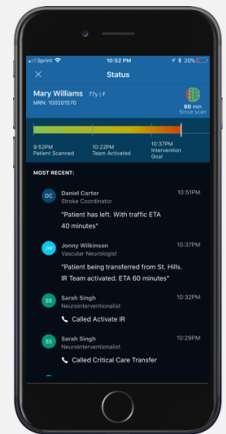Mobile non-diagnostic viewer for NCCT, CTA, CTP images.

Viz LVO
Automated detection of suspected LVOs using artificial intelligence.

Viz CTP
Automated CT perfusion analysis and mapping.

Viz Communication
HIPAA-compliant text messaging and telecommunication.

CONCLUSIONS

- The results of this large multicenter investigation show that Viz.ai is a powerful tool expediting patient workflow and first contact with the NIR within a telemedicine system.

- Benefits exists regardless of whether the patient first presents to a spoke or hub hospital.

- This 17 state, 166 site study corroborates the results of previous smaller studies that concluded a benefit of Viz.ai at driving faster LVO detection and overall patient workflow.

- This large multicenter study, when combined with the results of previous reports, represent a call to action for wider adoption of this technology into the armamentarium of acute stroke care.

Thank you