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EDITED BY

David Häske,
University of Tübingen, Germany

REVIEWED BY

Bernardo Liberato,
Emory University, United States
Daian Popa,
University of Medicine and Pharmacy "Victor
Babes" Timisoara, Romania

*CORRESPONDENCE

Layne Dylla
✉ Layne.Dylla@yale.edu

[†]These authors have contributed equally to
this work

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Prehospital intravenous access is associated with decreased door-to-computed tomography and door-to-intravenous thrombolysis time, but not door-to-endovascular therapy time

Geoffrey Sowitz ^{1†}, Courtney D. Wham ^{1†}, Daria Nicke ¹,
Ian Espinoza ¹, Monisha Lensink-Vasan¹, Breanna Thrower¹,
Jacob Duenas¹, Stefan Sillau ², Andra Farcas ¹,
Michelle Leppert ², Elizabeth Molina Kuna ³ and
Layne Dylla ^{4*} for the IMPACT investigators

¹Department of Emergency Medicine, University of Colorado School of Medicine, Aurora, CO, United States, ²Department of Neurology, University of Colorado School of Medicine, Aurora, CO, United States, ³Department of Health Systems, Management, and Policy, Colorado School of Public Health, Aurora, CO, United States, ⁴Department of Emergency Medicine, Yale School of Medicine, New Haven, CT, United States

Introduction: Prehospital stroke care can influence in-hospital stroke care, including facilitating earlier diagnosis and treatment. This study sought to determine the association between prehospital IV access and time to computed tomography (CT), intravenous (IV) thrombolytic administration, and endovascular therapy in patients with stroke.

Methods: This was a multi-institutional, multi-agency retrospective analysis of patients who were identified as having stroke-like presentations by emergency medical services (EMS) and had a final clinical diagnosis of stroke or transient ischemic attack (TIA) from January 1, 2020, to December 31, 2022. Data were analyzed using descriptive statistics and multivariable linear regressions controlling for receiving hospital stroke certification level, sex, age, initial NIHSS score, hospital prenotification of suspected stroke, and EMS-documented blood glucose level, stroke scale, and last known well (LKW) time.

Results: Of the 3,109 patients in the study, 91.2% ($n = 2,834$) arrived with IV access obtained from EMS. Patients who arrived with IV access had a median door-to-CT time of 10 min [interquartile range (IQR) 7–16 min] compared to those without IV access who had a median door-to-CT time of 12 min (IQR 8–21 min; $p < 0.05$). After adjusting for covariates, arrival without IV access increased the door-to-CT time by 26% [ratio estimate 1.26, 95% confidence interval (CI), 1.14–1.39] compared to those with IV access. Similarly, after controlling for covariates, lack of prehospital IV access was associated with increased time to intravenous thrombolysis (IVT; ratio estimate 1.17, 95% CI, 1.01–1.36), but not with time to endovascular thrombectomy (EVT; ratio estimate 1.05, 95% CI, 0.82–1.33) compared to those with prehospital IV access.

Conclusion: EMS insertion of an IV prior to hospital arrival was associated with shorter time to imaging and shorter time to intravenous thrombolysis but was not associated with a difference in time to endovascular thrombectomy.

KEYWORDS

prehospital, emergency medical services, stroke, cerebrovascular accident, intravenous access, TIA, thrombolysis, thrombectomy

Introduction

Worldwide, stroke is the second-leading cause of death, with the number of annual deaths increasing by 43% over the last 20 years (1). A high-functioning stroke system can significantly reduce the morbidity and mortality of patients with stroke. However, when it comes to recognition and intervention, time is of the essence. For every minute in delay to treatment, a patient loses approximately 1.9 million neurons, and for each hour that passes without treatment, the neuronal loss equates to roughly 3.6 years of normal aging (2).

Intravenous thrombolysis (IVT) efficacy is time dependent, and reductions in time to IVT administration [door-to-needle (DTN) time] both improve clinical outcomes and decrease mortality (3–5). Computed tomography (CT) or other advanced imaging is essential in making the decision of whether to treat with either IVT or endovascular thrombectomy (EVT). Decreased door-to-CT (DTCT) time is associated with decreased DTN time and represents an important target for improving in-hospital stroke care (6).

Most patients with an acute stroke arrive at the emergency department via emergency medical services (EMS) transport (7, 8). Patients who arrive via EMS receive faster evaluation, imaging, and treatment compared to patients who arrive via private vehicle, which has made prehospital stroke recognition, evaluation, and management a major focus of improving outcomes (9, 10). EMS providers can accurately diagnose stroke in the prehospital setting using validated stroke scales (11–13). Prehospital identification of patients with acute stroke is associated with improved in-hospital care, including shorter times to CT and therapy (14). Interventions associated with decreased DTCT and DTN times include EMS-to-hospital prenotification of suspected stroke, obtaining a last known well (LKW) time, and documenting a blood glucose level (15–21).

The American Heart Association (AHA) updated its prehospital stroke care guidelines in 2019 and identified eight recommendations for optimal care (22). Full compliance with these guidelines is poor, ranging from only 0.39% of encounters in a nationwide dataset to 5.1% in smaller local datasets, likely due in part to transport-related time constraints in the prehospital setting (21). While the updated AHA guidelines do not mention intravenous (IV) access in the prehospital environment, the previous 2013 AHA guidelines recommend establishment of IV access per local protocol but note that prehospital interventions should not delay rapid transport to the receiving hospital (23). Other guidelines give a level C recommendation to obtaining IV access during transport, acknowledging the utility of this intervention while noting that it should not delay transport (24). These guidelines identify a reasonable concern regarding

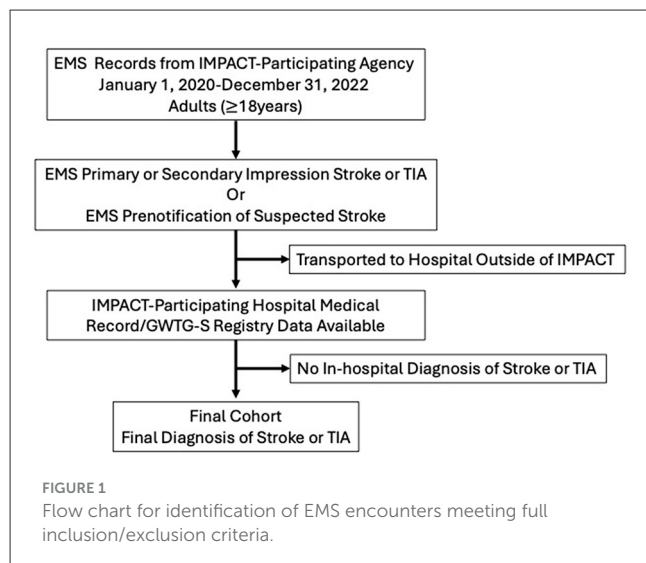
prehospital IV access—obtaining IV access could delay rapid transport to the hospital, including extending the on-scene time (time from EMS arrival to the patient until initiation of transport to the hospital).

The impact of prehospital IV access on time to imaging and intervention in patients with acute stroke is unknown. This study sought to determine the association between prehospital IV access and time to CT, IVT, and EVT in patients with suspected stroke. The hypothesis was that IV access could facilitate more rapid in-hospital care and that there would be no significant differences in on-scene or transport times.

Methods

Population

This was a multi-institutional, multi-agency retrospective analysis of adult (aged 18 years or older) patients who were identified as having a suspected stroke by EMS clinicians in the field and had a final diagnosis of hemorrhagic or ischemic stroke or transient ischemic attack (TIA) that were included in the IMPACT (Innovative Measures for Prehospital Advancement in Cerebrovascular Treatment) collaboration between January 1, 2020, and December 31, 2022. Patient encounters were included if: (1) EMS primary or secondary impression was stroke, cerebral vascular accident (CVA), or TIA or if an EMS clinician activated a “stroke alert,” and (2) the final in-hospital diagnosis was CVA (ischemic or hemorrhagic) or TIA (Figure 1). Spontaneous subarachnoid hemorrhages, but not those due to trauma, were included as a hemorrhagic stroke. TIA diagnosis was based on the treating physician’s clinical judgement. EMS impressions were based on prehospital provider clinical assessment and use of validated prehospital stroke scales. There was variation between and within agencies as to the preferred stroke scale, which included the Cincinnati Prehospital Stroke Scale (CPSS), Face Arm Speech Time (FAST), Balance Eyes-Face Arm Speech Time (BE-FAST), and the Miami Emergency Neurologic Deficit Exam (MEND), as well as stroke severity or large vessel occlusion scales, such as the Field Assessment Stroke Triage for Emergency Destination (FAST-ED), Los Angeles Motor Scale (LAMS), and Vision, Aphasia, Neglect (VAN) tools. IMPACT includes EMS agencies (both private and fire-based) and hospitals [academic and community hospitals that were a mix of comprehensive stroke centers (CSC), primary stroke centers (PSC), acute stroke ready hospitals (ASRH), and those that were not a recognized stroke center] from across Colorado or on the border with Colorado. EMS agencies transport patients based



on local protocols, which recommend transport to “the closest appropriate facility.” It is not the current practice of any agency within IMPACT to bypass hospitals capable of basic stroke care to transport to higher designations, such as CSCs.

Data abstraction

Data were extracted by a group of highly trained abstractors. Before completing data extraction for this study, each individual had to complete training and practice chart extractions (minimum of 30 practice charts) to demonstrate 90% accuracy for all variables extracted. EMS agency variables and data for hospitals that were not recognized as stroke centers were extracted using standardized case report forms created in REDCap, a HIPAA-compliant program. Additional in-hospital data were extracted from local Get with the Guidelines Stroke (GWTG-S) registries for any hospital that was a recognized stroke center. The variables from the local GWTG-S registry case report included age, sex, race (White, Black or African American, other, or unable to determine/missing), ethnicity (Hispanic or non-Hispanic), past medical history, DTCT time, DTN time, time to endovascular thrombectomy (DTG), and National Institutes of Health Stroke Scale (NIHSS) score. Missing data from within the GWTG-S registry were manually extracted from the electronic health record when possible. The terms door-to-endovascular thrombectomy and door-to-groin (DTG) are used interchangeably in this manuscript. Door-to-thrombectomy is a broader term that can include door-to-groin puncture, door-to-device, door-to-first pass, or door-to-recanalization. Door-to-groin was the preferred variable; however, when this was missing, the door-to-first pass or door-to-device were used. Prehospital variables included age, sex, race, ethnicity, computer-aided dispatch times, primary and secondary impressions, vital signs, exam findings, and interventions performed prior to hospital arrival (including those items in the AHA guidelines and IV access). IV access was categorized as a binary variable (present or absent) for analysis. Because of incomplete and inconsistent documentation

of unsuccessful prehospital IV access attempts, these data were not collected for analysis. AHA recommendations for prehospital stroke care include: (1) documentation of a stroke scale, (2) prenotification of receiving hospital when a stroke scale is positive, (3) blood glucose measurement, (4) 12-lead electrocardiogram, (5) supplemental oxygen for hypoxia (pulse oximetry <94%), (6) documentation of LKW time, (7) less than 2 min from dispatch to being enroute, and (8) less than 15 min on scene (14, 22–24). Any acute intervention was defined as a patient receiving IVT and/or EVT.

Data analysis

Descriptive statistics characterized the cohort, reporting the number and proportion for categorical variables and mean, standard deviation, and median with interquartile range (IQR) for continuous variables. In cases where continuous variables were skewed or not normally distributed, we also reported the geometric mean with 95% confidence intervals (CI). For time-to variables, any time of 0 min was transformed to 0.5 min to allow for appropriate analysis and to account for the reasonable assumption that there would be a minimum of 30 s between the time a patient entered the emergency department and arrived at CT, even when a patient went straight to CT. Times were log transformed prior to analysis. Univariate analysis of those transported with or without IV therapy used chi-square or an ANOVA-type test on the log-transformed data to identify differences. Multivariable regression models, with random effects for hospital, were used to test the association between prehospital IV access and DTCT, DTN, or DTG times while controlling for stroke certification of the receiving hospital (CSC, PSC, ASRH, or not stroke certified), sex, age, initial NIHSS, documentation of a stroke scale, documentation of a blood glucose level, documentation of LKW, and completion of EMS prenotification. The model for DTG did not include stroke certification level as EVT could only be performed at a CSC. Analyses were performed on an available case basis. All analyses were performed using SAS 9.4 software.

Results

Demographics and patient characteristics

Within the study period, 3,109 patients were identified as meeting the inclusion criteria within the IMPACT network. IV access was obtained in 2,834 (91.2%) of patients. There was no difference in those with or without prehospital IV access in terms of sex, age, ethnicity, presence of any cardiovascular risk factor, or initial NIHSS score (Table 1). The overall study group was 49.5% female, with a median age of 75 years (IQR 64–84 years) and 5.7% Hispanic. There was a higher proportion of White patients among those with prehospital IV access (65.2%, $n = 1,848$) compared to those without prehospital IV access (57.1%, $n = 157$; $p < 0.01$). Of the patients who had an IV placed by an EMS clinician, 40.0% ($n = 1,133$) arrived with two or more points of IV access. There was no difference in on-scene time between those with IV access obtained by EMS (median 14 min, IQR 10–19 min) compared to

TABLE 1 Patient and encounter characteristics.

Characteristic		No IV access (N = 275)	IV access (N = 2,834)
Age in years, median (IQR)		76 (65–85)	75 (64–84)
Mean (95% CI)		73.5 (71.7–75.3)	73.4 (72.9–73.9)
Male sex, n (%)		129 (46.9%)	1,442 (50.9%)
Race ^a , n (%)	White	157 (57.1%)	1,848 (65.2%)
	Black or African American	21 (6.6%)	122 (4.3%)
	Other	17 (6.2%)	142 (5.0%)
	Unable to determine/missing	80 (29.1%)	722 (25.5%)
Ethnicity, n (%)	Hispanic	19 (6.9%)	158 (5.6%)
Medical history, n (%)	Hypertension	173 (62.9%)	1,640 (57.9%)
	Diabetes mellitus ^a	92 (33.5%)	727 (25.7%)
	Atrial fibrillation ^a	68 (24.7%)	558 (19.7%)
	CAD or CHF ^a	102 (37.1%)	886 (31.3%)
	Chronic kidney disease	47 (17.1%)	453 (16.0%)
	Dyslipidemia	131 (47.6%)	1,276 (45.0%)
	Any cardiovascular risk factor	237 (86.2%)	2,345 (82.7%)
Prehospital compliance with AHA recommendations, n (%)	Stroke scale performed	200 (73.0)	2,077 (73.5)
	Blood glucose obtained	231 (84.0%)	2,401 (84.7%)
	12-lead ECG performed	201 (73.1%)	2,194 (77.4%)
	LKW documented	205 (74.6%)	2,227 (78.6%)
	Prenotification	182 (66.2%)	1,776 (62.7%)
	Dispatch to enroute <2 min	225 (81.8%)	2,266 (80.0%)
	On-scene time <15 min	153 (55.6%)	1,597 (56.4%)
On-scene time in minutes, median (IQR)		14 (10–19)	14 (10–18)
Geometric mean (95% CI)		13.5 (12.8–14.4)	13.2 (13.0–13.4)
EMS total transport time in minutes ^a , median (IQR)		9 (6–13)	10 (7–14)
Geometric mean (95% CI)		8.2 (7.5–8.9)	9.6 (9.3–9.8)
Time between LKW and arrival in minutes, median (IQR)		122.5 (55.0–308.0)	97 (47.0–349.0)
Geometric mean (95% CI)		138.7 (117.9–163.2)	128.2 (121.9–134.8)
NIHSS, median (IQR)		7 (3–14)	6 (2–15)
Mean (95% CI)		9.3 (8.3–10.3)	9.4 (9.1–9.7)
Received any acute intervention (IVT or EVT)		71 (25.8%)	761 (26.9%)

^a*p* < 0.05 by chi-square or ANOVA-type test for log-transformed data.

those without prehospital IV access (median 14 min, IQR 10–19 min; *p* = 0.44), but the total transport time among those in whom IV access was obtained was longer than those in whom IV access was not obtained (with IV: median 10 min, IQR 7–14 min; without IV: median 9 min, IQR 6–13 min, *p* < 0.05).

Prehospital IV access was associated with reduced door-to-CT times

Patients who arrived with prehospital IV access had a median DTCT time of 10 min (IQR 7–16 min; geometric mean 11.1 min,

95% CI, 10.7–11.6 min), whereas patients who arrived without prehospital IV access had a median DTCT time of 12 min (IQR 8–21 min; geometric mean 13.9 min, 95% CI, 12.5–15.6 min, *p* < 0.05). DTCT time was missing in 8% (*n* = 22) of encounters without prehospital IV access and 7.5% (*n* = 213) of encounters with prehospital IV access. These were excluded from the multivariable modeling. After controlling for variables determined *a priori* to impact DTCT time (stroke center certification level, sex, age, NIHSS score at admission, prehospital blood glucose level, documentation of LKW time, and prenotification to the receiving facility of suspected stroke), the lack of prehospital IV access was associated with a 26% increase in DTCT times compared

TABLE 2 Multivariable linear regression modeling of DTCT.

Variable	Ratio estimate (95% CI)
No IV access vs. IV access	1.26 (1.14–1.39)
PSC/ASRH vs. not stroke certified	0.69 (0.43–1.10)
CSC vs. not stroke certified	0.89 (0.52–1.52)
CSC vs. PSC/ASRH	1.29 (0.83–1.99)
Male vs. female	0.97 (0.91–1.00)
Age (per year)	1.00 (1.00–1.00)
NIHSS (per unit)	0.99 (0.98–0.99)
Documented stroke scale	0.96 (0.89–1.04)
Blood glucose obtained	1.00 (0.90–1.10)
Documented LKW or symptom onset	0.86 (0.80–0.93)
Prenotification to receiving hospital of suspected stroke	0.51 (0.47–0.55)

to those who had IV access from the prehospital setting (ratio estimate 1.26, 95% CI, 1.14–1.39; **Table 2**). The adjusted geometric mean DTCT time among those without prehospital IV access was 15.9 min (95% CI, 12.8–19.7 min) while it was only 12.6 min (95% CI, 10.3–15.4 min) among those with prehospital IV access.

Prehospital IV access was associated with reduced door-to-intravenous thrombolytic times

Overall, 17.6% ($n = 547$) of all patients received IVT, of whom 92.7% ($n = 507$) arrived with prehospital IV access and 7.3% ($n = 40$) arrived without prehospital IV access. The median DTN in patients with prehospital IV access was 36 min (IQR 26–49 min; geometric mean 37.1 min, 95% CI, 35.5–38.8 min), which was similar to the median DTN time in patients without prehospital IV access (median 40 min, IQR 32–53 min; geometric mean 41.0 min, 95% CI, 36.0–46.7 min, $p > 0.05$). After controlling for variables determined *a priori* to impact DTN time (stroke center certification level, sex, age, NIHSS, prehospital blood glucose level, documentation of LKW time, and prenotification to the receiving facility of suspected stroke), arrival without prehospital IV access was associated with a 17% increase in DTN time compared to arrival with prehospital IV access (ratio estimate 1.17, 95% CI, 1.01–1.36; **Table 3**). The adjusted DTN geometric mean was 45.7 min (95% CI, 40.1–51.9 min) among those with prehospital IV access and 53.4 min (95% CI, 44.2–64.4 min) among those without prehospital IV access.

Prehospital IV access was not associated with reduced door-to-endovascular therapy times

Only 5.3% ($n = 165$) of all patients received EVT. Of these, 90.9% ($n = 150$) of patients arrived from the field with IV

TABLE 3 Multivariable linear regression modeling of DTN.

Variable	Ratio estimate (95% CI)
No IV access vs. IV access	1.17 (1.01–1.36)
PSC/ASRH vs. not stroke certified	0.74 (0.55–1.00)
CSC vs. not stroke certified	0.70 (0.51–0.96)
CSC vs. PSC/ASRH	0.95 (0.76–1.18)
Male vs. female	0.96 (0.89–1.05)
Age (per year)	1.00 (1.00–1.00)
NIHSS (per unit)	1.00 (0.99–1.00)
Documented stroke scale	0.91 (0.82–1.01)
Blood glucose obtained	0.92 (0.80–1.05)
Documented LKW or symptom onset	0.95 (0.86–1.06)
Prenotification to receiving hospital of suspected stroke	0.86 (0.77–0.95)

TABLE 4 Multivariable linear regression modeling of DTG times.

Variable	Ratio estimate (95% CI)
No IV access vs. IV access	1.05 (0.82–1.33)
Male vs. female	0.99 (0.90–1.09)
Age (per year)	1.00 (0.99–1.00)
NIHSS (per unit)	1.00 (0.99–1.00)
Documented stroke scale	0.99 (0.87–1.13)
Blood glucose obtained	1.09 (0.95–1.26)
Documented LKW or symptom onset	0.90 (0.77–1.04)
Prenotification to receiving hospital of suspected stroke	0.97 (0.87–1.09)

access and only 9.1% ($n = 15$) of patients arrived from the field without IV access. The DTG time of patients with prehospital IV access (median 91 min, IQR 79–115 min; geometric mean 94.2 min, 95% CI, 89.2–99.5 min) was similar to the DTG time of patients without prehospital IV access (median 92 min, IQR 80–137 min; geometric mean 102.1 min, 95% CI, 80.8–129.2 min, $p > 0.05$). Even after adjusting for sex, age, NIHSS score, EMS-documented stroke scale, and LKW, EMS-measured blood glucose level, and hospital prenotification of suspected stroke, prehospital IV access was not associated with DTG times (ratio estimate 1.05, 95% CI, 0.82–1.33; **Table 4**). The adjusted geometric mean DTG time was similar in both those with and without prehospital IV access (with IV: 102.6 min, 95% CI, 78.7–133.7 min; without IV: 107.2 min, 95% CI, 78.7–146.2 min).

Discussion

In this analysis, the presence of prehospital IV access was associated with decreased time to CT and time to IVT but not with change in time to EVT. On average, we observed an approximate time saving of 3 min in door-to-CT times (12.6 vs.

15.9 min) for patients with IV access obtained in the prehospital setting compared to those arriving without an IV. This time saving increased to almost 8 min when looking at time to thrombolytic administration (45.7 vs. 53.4 min). While not found to be statistically significant in this study's dataset, a similar time saving was noted in the time to EVT of approximately 5 min (102.6 vs. 107.2 min).

It is important to note that institutional protocols vary with regard to the necessity of IV access prior to CT imaging in patients with suspected stroke. While the priority imaging is a non-contrast CT head, vascular access is critical for vascular imaging to assess for large vessel occlusions and the need for EVT, and for the administration of medications, including antihypertensives and thrombolytics. For this reason, it is the expectation at facilities in our network that patients have IV access prior to CT imaging. However, in select cases where obtaining IV access appears to significantly delay imaging (at the discretion of providers), IV access may be temporarily forgone, and the treating team may prioritize non-contrasted imaging prior to IV access. In these cases, our results could be less applicable.

It is known that on-scene time accounts for nearly half of the total alarm-to-door time (time from dispatch to arrival at the hospital) for EMS calls (25). While transport time is difficult to influence, prehospital stroke management should continue to minimize on-scene time, a task some systems are approaching with scene time limits (26). In the study presented here, there were no differences in the on-scene time between patients arriving with or without prehospital IV access, but transport times were longer in encounters where prehospital IV access was obtained. While this study was not designed to evaluate causality, it is unlikely that obtaining IV access results in longer transport times. Rather, we suspect longer transport times allow for a greater likelihood of being able to obtain IV access in the prehospital setting. Additionally, EMS clinicians need to be cognizant of the fact that time saved in hospital by having an IV in place upon arrival could easily be negated by lengthened on-scene times. This highlights the importance of using the fixed transport time to perform the most high-yield interventions, as long as no immediate life threats are identified on scene that require intervention.

When we consider the time required to obtain and secure IV access, especially in time-sensitive, high-pressure situations, 3–8 min of time saved between emergency department arrival and either CT or IVT is potentially clinically significant. This study was not designed to evaluate the clinical implications of this degree of time savings in terms of patient outcomes. However, every minute faster to IVT results in an additional day of disability-free life and every minute faster to EVT means an additional week of functional independence (27–29). Therefore, these data support the idea that minutes do count, and time really is brain.

Hospitals continue to streamline their processes for rapid evaluation and management of patients with suspected stroke. This includes interventions, such as prehospital stroke alerts, patients being transported directly to CT from the ambulance bay, and pharmacists standing by with thrombolytics at the ready. Prehospital IV access can also aid in these processes and can now be added to the shortlist of prehospital interventions with meaningful impacts on time to imaging and acute interventions (i.e., hospital

prenotification of suspected stroke, obtaining a blood glucose level, and documenting a LKW) (15–21).

In the era of electronic patient care reports, prehospital providers are tasked with performing and documenting a myriad interventions on all patient transports. Furthermore, it is nearly impossible to recognize all potential stroke patients and perform all the AHA recommendations for prehospital stroke care, especially considering the average time from patient contact to hospital arrival is less than 25 min. To ensure high-quality care in these time-limited conditions, emphasizing IV access in addition to other critical elements of stroke care may be challenging. Feedback systems represent one method of increasing compliance with the recommendations for prehospital stroke care. Hospital feedback to EMS clinicians caring for patients with confirmed ischemic strokes improved compliance with state protocols, including prehospital IV access—IV access obtained by EMS clinicians increased from 76.1 to 84.9% of encounters after the implementation of a focused feedback program (30). Beyond EMS clinician feedback, EMS medical directors will need to support prehospital providers in prioritizing tasks and provide the rationale behind these priorities. Together, this can help streamline acute stroke care and, perhaps, ultimately improve patient outcomes.

Limitations

There were several limitations of this retrospective study. While groups arriving with and without IV access were quite comparable, we did note that patients arriving with IV access were more likely to be White than those arriving without IV access. While this study was not structured to speculate as to the causality of this, it highlights an important racial difference and may demonstrate bias within the prehospital system. Further studies are needed to investigate the systemic drivers of this disparity. Another limitation is the inconsistent documentation of patients' home medications, including anticoagulation, which is an especially pertinent piece of information when weighing risk of thrombotic and hemorrhagic events, as well as eligibility for intervention on hospital arrival. Additionally, EMS records did not consistently report the IV size or location. Not all forms of IV access can be used for advanced imaging, such as CT-perfusion scans. While evaluation of the association between door-to times and arrival with a form of IV access that can be used for both advanced imaging and administration of thrombolytics is ideal, this study was limited to binary evaluation based only on the presence or absence of any form of prehospital IV access. Additionally, differences in hospital CT protocols regarding the size and location of an IV that is acceptable for contrasted CT head and neck imaging also make identifying an "optimal" IV placement challenging.

Additionally, thrombolytic administration can be delayed due to the need for acute control of hypertension. Our dataset did not include data about patients requiring IV antihypertensives, which could modify our results, though the directionality of this possible effect modification is unclear. While this would cause a delay in thrombolytic administration, the presence of prehospital IV access could allow for more expeditious delivery of antihypertensives and could thus potentiate the results of our study. There were also low outcomes of interest in the cohorts receiving IVT or EVT, as

compared to the overall cohort, thereby limiting the ability to detect a small but significant association between prehospital IV access and time to EVT. Despite these limitations, this study provides insight into the association between prehospital IV access and patient care and outcomes in acute stroke.

Conclusions

This study demonstrates an association between prehospital IV access and a shorter time to both CT imaging and IVT administration. However, obtaining prehospital IV access was not associated with a shorter time to EVT. Given the time savings implied by these findings for time to imaging and IVT, future work with medical directors and prehospital systems should explore ways to prioritize IV access during transport for patients with suspected stroke without extending the total time between arrival at the patient and transfer of care to the emergency department.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, in de-identified form and upon reasonable request; the data are not publicly available.

Ethics statement

The studies involving humans were approved by the Colorado Multi-Institutional Review Board (COMIRB#23-1035). The studies were conducted in accordance with the local legislation and institutional requirements. Written informed consent for participation was not required from the participants or the participants' legal guardians/next of kin in accordance with the national legislation and institutional requirements.

Author contributions

GS: Conceptualization, Data curation, Visualization, Writing – original draft, Writing-review and editing. CW: Conceptualization, Data curation, Funding acquisition, Investigation, Methodology, Project administration, Supervision, Validation, Visualization, Writing – original draft, Writing – review & editing. DN: Data curation, Project administration, Supervision, Writing – review & editing. IE: Data curation, Writing – review & editing. ML-V: Data curation, Writing – review & editing. BT: Data curation, Writing – review & editing. JD: Data curation, Writing – review & editing. SS: Formal analysis, Methodology, validation, Writing – review & editing. AF: Project administration, Supervision, Writing – review & editing. ML: Project administration, Supervision, Writing – review & editing. EM: Data curation, Investigation, Writing – review & editing. LD: Conceptualization, Data curation, Funding acquisition, Investigation, Methodology, Project administration, Supervision, Validation, Visualization, Writing – original draft, Writing – review & editing.

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Conflict of interest

LD reports grant money to Yale University School of Medicine to conduct research conceived and sponsored by TETMedical, Inc. CW reports serving as a consultant for Analog Devices, Inc., a company involved in the development of healthcare technology. This relationship is outside of the submitted work.

The remaining authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Supplementary material

The Supplementary Material for this article can be found online at: <https://www.frontiersin.org/articles/10.3389/femer.2025.1692565/full#supplementary-material>

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