The Outcomes of EMS-Placed Intravenous Catheters in Patients Beyond The Prehospital Setting

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Introduction

- In 2013, the ED Benchmarking Alliance (EDBA) data survey determined that approximately 17% of all ED patients arrive by EMS.[1]
- Peripheral intravenous catheters (PIVCs) have been found to be placed in up to 60% of patients cared for by certain EMS systems.[2,3]
- Studies have explored how providing therapy on scene via PIVCs impacts patient's medical outcomes after the pre-hospital setting for certain high acuity conditions (i.e. sepsis and cardiac arrest) [4,5]
- However, limited studies have investigated whether pre-hospital administration of PIVCs may affect not only patients' medical outcomes but also the efficiency of their care in the ED, particularly for patients presenting with lower acuity conditions.[6]

Figure 1: Peripheral Intravenous Catheter (PIVC)

- Since the establishment of vascular access allows for ready access to treatment and possible blood draws, the placement of PIVCs may improve the productivity of patient care in all settings.
- We hypothesize that PIVC will positively impact the process of ED care regardless of the location where the IV was established.

Aims and Objectives

The primary objective of this study is to primarily describe outcomes of PIVCs placed in patients transported to the ED by EMS and who are subsequently discharged from the ED.

Our secondary objective is the assess the failure rate and ED length of stay (LOS) of these patients compared to those transported by EMS without PIVR placement.

Methods

Study Design
Retrospective Observational Study
Analyzing outcomes of PIVCs placed by EMS at 4 suburban Michigan EDs.

Population
Adult EMS Patients
Jan 2021 – July 2023. Included: Discharged adults. Excluded: Children/missing data.

Data Source
Electronic Medical Record
Data retrieved via standardized vascular access flowsheets from ED nursing staff.

Analysis
Comparative Analysis
Stratified by ESI (severity). Compared EMS vs. ED placement for failure rates & LOS.

Inclusion: Adult patients transported by EMS and subsequently discharged from the ED.
Exclusion: Pediatric patients (<18), missing data, or unknown mode of arrival.

Stratification: Patients were stratified by Emergency Severity Index (ESI) to assess whether illness severity impacted PIVC placement/survival.

Primary Comparisons:
- To provide context of survival of EMS placed IVs, we compared EMS vs ED placed failure rates.
- To assess impact of EMS PIVC on the process of ED care, we evaluated ED length of stay (stay time) between these two groups.

Results

- 26,920 total PIVCs placed in patients.
- Average age 56 (± 21.4).
- 19.9% of EMS transports receive PIVCs.
- ESI is slightly lower (more severe) in patients who receive IVs by EMS (2.66 vs. 2.72).
- Mean patient stay time is lower in patients with EMS-placed PIVCs (6.03 vs.10.03 hours).
- Mean dwell time of PIVCs is lower in patients with EMS-placed PIVCs (5.22 vs. 7.32 hours).
- Failure rate of PIVCs is slightly lower in patients with EMS-placed PIVCs (2.9% vs. 3.4%).

IV started by EMS vs. Non-EMS	EMS (N=5358)	NonEMS (N=21562)	Total (N=26920)
Average Age ± Standard Deviation	55.47 (21.28)	56.47 (21.46)	56.27 (21.42)
18-64	3354 (62.6%)	13191 (61.2%)	16545 (61.5%)
65-80	1242 (23.2%)	4923 (22.8%)	6165 (22.9%)
80+	762 (14.2%)	3448 (16.0%)	4210 (15.6%)
Sex			
Female	2859 (53.4%)	12050 (55.9%)	14909 (55.4%)
Male	2499 (46.6%)	9512 (44.1%)	12011 (44.6%)
Race/Ethnicity			
Black	1210 (22.6%)	7025 (32.6%)	8235 (30.6%)
White	3736 (69.7%)	13200 (61.2%)	16936 (62.9%)
Other	412 (7.7%)	1337 (6.2%)	1749 (6.5%)
Mean ESI ± Standard Deviation	2.66 ± 0.61	2.72 ± 0.66	2.71 ± 0.65
ESI[1-2]	1936 (36.3%)	6801 (31.7%)	8737 (32.6%)
ESI[3-5]	3398 (63.7%)	14678 (68.3%)	18076 (67.4%)
Mean Stay Time	6.03 ± 10.22	10.03 ± 24.25	9.24 ± 22.23
Mean Dwell Time of PIVC	5.22 ± 6.20	7.32 ± 13.71	6.90 ± 12.61
Removal Reason of PIVC			
Completed By Discharge	3891 (73.2%)	16108 (75.4%)	19999 (74.9%)
Failure	155 (2.9%)	726 (3.4%)	881 (3.3%)
Therapy Completed	1273 (23.9%)	4536 (21.2%)	5809 (21.8%)
Missing	39	192	231

Table 1: Preliminary descriptive statistics of IV started by EMS vs. Non-EMS

Conclusions

- Stay time is shorter for patients with EMS-placed PIVCs vs non-EMS.
- The rate of IV failure during ED visit appears very low regardless of group.
- Prehospital IV placement may improve ED efficiency
- EMS is initial continuum of emergency care, so therapies given in the field may shorten time for treatment needed in the ED.
- Further investigation is warranted to better analyze the value proposition of EMS IVs, which could potentially guide improvements in EMS IV placement through training, equipment, and technology.

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