Accessing Higher Levels of Care: A Multi-State Comparison of Air and Ground Interfacility Transports

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INTRODUCTION

Interfacility transports (IFT) are a critical yet underexamined element of the emergency healthcare continuum, enabling timely transitions to higher levels of care for patients with complex medical or traumatic conditions. These transports—performed by emergency medical service (EMS) clinicians—occur via air transport (AT) and ground transport (GT) services, depending on acuity, geography, and available resources. As EMS systems across the U.S. face growing workforce shortages and operational strain, a comprehensive understanding of IFT patterns is essential. Enhanced insight into transport modality, frequency, and clinical indication can inform policy, support targeted workforce development, and promote more efficient deployment of EMS assets.

OBJECTIVE

Describe the utilization of EMS AT vs. GT for hospital-to-hospital IFT.

METHODS

- Retrospective observational analysis utilizing 2024 prehospital data
- Ten U.S. states—Arizona, Colorado, Connecticut, Kansas, Kentucky, Montana, Oregon, South Dakota, Utah, and Wyoming
- Hospital-to-Hospital IFT was identified utilizing scene location type (eScene.09) and type of destination (eDisposition.21) from standardized EMS records using the ImageTrend Elite Platform.
- Analyses:
  - AT and GT modalities using descriptive statistics to identify patient demographics, incident characteristics, and EMS care delivery.
  - Initial patient vitals (Glasgow coma total score, systolic blood pressure (SBP), diastolic blood pressure (DBP), heart rate, respiratory rate, and pulse oximetry), as well as
  - Top 10 documented medications and procedures administered during transport.

RESULTS

- 463,628 IFTs analyzed, 72,397 (16%) were AT and 391,231 (84%) were GT.
- Differences were noted in pediatric ≤1 year (6.3% vs. 3.3%), white race (51.3% vs. 67.7%), missing race (22.4% vs. 9.8%) and non-metro incident location (53.2% vs. 20.7%).
  - 7.4% of AT and 12.1% of GT had a service request of 9-1-1 response.
- There were significant differences in the primary impressions observed between AT and GT:
  - Neurological (18.0% vs. 8.7%)
  - Cardiovascular (15.7% vs. 9.9%)
  - Injury/trauma (10.7% vs. 6.3%)
  - Mental health (0.6% vs. 8.0%)
- Documented medications and procedures had large variability between modalities. (AT vs GT)
  - Top medications
    - Oxygen (28% vs. 10.2%), fentanyl (22.0% vs. 2.5%), and ondansetron (10.4% vs. 2.1%).
  - Top procedures
    - 3/4/5 lead echocardiogram (ECG) (31.2% vs. 19.3%), patient assessment (0.1% vs. 16.2%), and contacting medical control (29.0% vs. 4.7%).
- Air IFT had a higher proportion of incidents with documented:
  - Severe/Moderate GCS (9.8% vs. 3.1%)
  - Abnormal SBP (38.0% vs. 35.8%)
  - Abnormal DBP (18.9% vs. 13.9%)
  - Abnormal heart rate (39.2% vs 26.9%)
  - Abnormal pulse oximetry (4.1% vs. 3.0%)
  - Abnormal respiratory rate (37.7% vs 14.4%).

CONCLUSION

Although all included transports met criteria for hospital-to-hospital transfers, 7.4% of air and 12.1% of ground interfacility transports were associated with a 9-1-1 service request type. This finding may reflect variation in dispatch protocols, operational workflows, or state-level coding practices. Air transports were more commonly associated with higher-acuity cases—defined by abnormal vital signs, a greater frequency of medications administered, and more procedures performed—and were more likely to occur in non-metro areas. These patterns highlight the essential role of air transport in supporting access to advanced care across geographically dispersed regions and underscore the need for further research into EMS triage, transport decision-making, and interfacility coordination to optimize resource use and ensure equitable patient care.

Figure 1. States Participating in Study

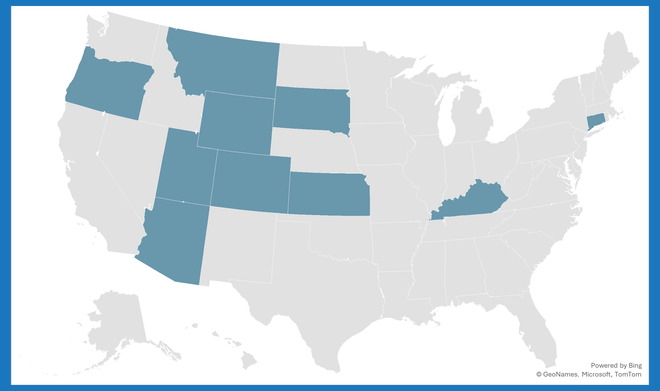

Figure 2. Interfacility Transports: Abnormal Vitals

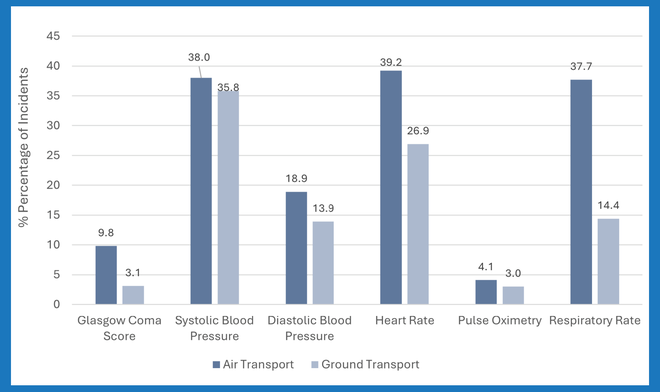

Table 1. Interfacility[1] EMS Transport Incident Characteristics

Variable	Air IFT 72,397 (15.6) N (%)	Ground IFT 391,231 (84.4) N (%)	Total 463,628 (100) N (%)
Sex			
Male	37,850 (52.3)	200,366 (51.2)*	238,216 (51.4)
Female	34,013 (47.0)	184,476 (47.2)	218,489 (47.1)
Missing	*534 (0.7)*	*6,389 (1.6)**	*6,923 (1.5)*
Age (median, IQR)[4]	59 (34-72)	60 (37-74)*	59 (36-73)
Age (years)			
≤ 1	4,584 (6.3)	12,775 (3.3)*	17,359 (3.7)
2-5	1,729 (2.4)	6,863 (1.8)*	8,592 (1.9)
6-12	1,830 (2.5)	9,461 (2.4)	11,291 (2.4)
13-17	2,094 (2.9)	14,073 (3.6)*	16,167 (3.5)
18-34	8,422 (11.6)	49,335 (12.6)*	57,757 (12.5)
35-64	24,080 (33.3)	137,630 (35.2)*	161,710 (34.9)
≥ 65 years	29,156 (40.5)	159,339 (40.7)	188,495 (40.7)
Missing	502 (0.7)	1,755 (0.4)*	2,257 (0.5)
Race			
White	37,121 (51.3)	264,668 (67.7)*	301,789 (65.1)
Black/African American	1,212 (1.7)	20,935 (5.4)*	22,147 (4.8)
Hispanic	5,466 (7.6)	38,935 (10.0)*	44,401 (9.6)
Multiple/Other Races[2]	12,398 (17.1)	28,369 (7.3)*	40,767 (8.8)
Missing	16,200 (22.4)	38,324 (9.8)*	54,524 (11.8)
Type of Service Requested (eResponse.05)			
9-1-1 Response	5,376 (7.4)	47,192 (12.1)*	52,568 (11.3)
Interfacility	66,089 (91.3)	322,188 (82.4)*	388,277 (83.7)
Intercept	105 (0.1)	2,388 (0.6)*	2,493 (0.5)
Medical Transport	573 (0.8)	16,671 (4.3)*	17,244 (3.7)
Other	249 (0.3)	2,762 (0.7)*	3,011 (0.6)
Scene County Urbanicity[3]			
Metro	30,790 (42.5)	308,515 (78.9)*	339,305 (73.2)
Non-Metro	38,497 (53.2)	81,176 (20.7)*	119,673 (25.8)
Missing	*3,110 (4.3)*	*1,540 (0.4)**	*4,650 (1.0)*
Incident Scene State			
Arizona	20,354 (16.6)	102,441 (83.4)*	122,795 (26.0)
Connecticut	247 (3.2)	7,531 (96.8)*	7,778 (1.7)
Colorado	11,264 (15.1)	63,533 (84.9)*	74,797 (16.1)
Kansas	7,058 (12.4)	49,705 (87.6)*	56,763 (12.2)
Kentucky	3,657 (5.7)	60,923 (94.3)*	64,580 (13.9)
Montana	7,936 (36.9)	13,574 (63.1)*	21,510 (4.6)
Oregon	5,744 (13.0)	38,537 (87.0)*	44,281 (9.6)
South Dakota	5,784 (31.8)	12,425 (68.2)*	18,209 (3.9)
Utah	5,826 (13.8)	36,286 (86.2)*	42,112 (9.1)
Wyoming	4,527 (41.9)	6,276 (58.1)*	10,803 (2.3)

Table 2. Incident EMS Care Delivery[1]

Variable	Air IFT 72,397 (15.6%) N (%)	Ground IFT 391,231 (84.4%) N (%)	Total 463,628 (100%) N (%)
Top 10 Provider Primary Impression Groups (eSituation.11)[5]			
Abdominal	8,860 (12.2)	50,136 (12.8)*	58,996 (12.7)
Cardiovascular	11,377 (15.7)	38,689 (9.9)*	50,066 (10.8)
Neurological	13,055 (18.0)	34,145 (8.7)*	47,200 (10.2)
Respiratory	7,788 (10.8)	31,748 (8.1)*	39,536 (8.5)
Pain	3,670 (5.1)	30,276 (7.7)*	33,946 (7.3)
Injury/trauma	7,757 (10.7)	24,701 (6.3)*	32,458 (7.0)
Mental health	423 (0.6)	31,292 (8.0)*	31,715 (6.8)
Malaise	1,523 (2.1)	25,751 (6.6)*	27,274 (5.9)
Illness/infectious disease	4,169 (5.8)	14,281 (3.7)*	18,450 (4.0)
Observation	438 (0.6)	13,251 (3.4)*	13,689 (3.0)
Top 10 Medications Administered (eMedication.03)			
Oxygen (7806)	20,526 (28.4)	39,974 (10.2)*	60,500 (13.0)
Fentanyl (4337)	15,914 (22.0)	9,751 (2.5)*	25,665 (5.5)
Ondansetron (Zofran) (26225)	7,520 (10.4)	8,117 (2.1)*	15,637 (3.4)
Normal saline (NaCl 0.9 %) (125464)	3,430 (4.7)	12,496 (3.2)*	15,926 (3.4)
Heparin (5224)	4,825 (6.7)	4,321 (1.1)*	9,146 (2.0)
Norepinephrine (Levophed) (7512)	5,699 (7.9)	2,229 (0.6)*	7,928 (1.7)
Midazolam (Versed) (6960)	4,103 (5.7)	1,805 (0.5)*	5,908 (1.3)
Lactated Ringer's solution (35629)	3,119 (4.3)	2,647 (0.7)*	5,766 (1.2)
Sodium chloride (9863)	3,709 (5.1)	1,931 (0.5)*	5,640 (1.2)
Propofol (Diprivan) (8782)	4,030 (5.6)	1,282 (0.3)*	5,312 (1.1)
Top 10 Procedures Performed (eProcedure.03)			
Cardiac - 3/4/5 lead ECG	22,609 (31.2)	75,503 (19.3)*	98,112 (21.2)
Patient assessment	95 (0.1)	63,562 (16.2)*	63,657 (13.7)
Contact medical control	20,985 (29.0)	18,572 (4.7)*	39,557 (8.5)
Evaluation procedure	237 (0.3)	33,633 (8.6)*	33,870 (7.3)
Move - Patient to a stretcher	12,227 (16.9)	15,208 (3.9)*	27,435 (5.9)
Blood glucose method	7,089 (9.8)	15,029 (3.8)*	22,118 (4.8)
Cardiac - 12 lead ECG	4,946 (6.8)	16,602 (4.2)*	21,548 (4.6)
Pulse oximetry	8 (0.0)	20,258 (5.2)*	20,266 (4.4)
IV - maintain / monitor / flush	9,991 (13.8)	6,172 (1.6)*	16,163 (3.5)
Safety precautions	13,819 (19.1)	163 (0.1)*	13,982 (3.0)

[1]Interfacility Transport (IFT) identified using Incident Scene(eScene.09) = hospital and Type of Destination (eDisposition.21) = hospital
[2]Other races include American Indian or Alaska Native, Asian, Native Hawaiian or Pacific Islander, other race, or incidents where multiple races were selected
[3]Urbanicity by RUCC 2023 (https://www.ers.usda.gov/data-products/rural-urban-continuum-codes)
[4]Due to state data sharing laws in CO, MT, and CT, certain elements did not include their data or there were suppression limits if certain fields had less than counts of 2 and could not be reported to the group.
[5]Incidents could have multiple medications and procedures
Abbreviation: ECG, electrocardiogram
*Chi-square or Mann-Whitney U test p-value <0.01 between air and ground transport.
Abbreviation: IQR, interquartile range