

EMERGENCY MEDICAL SERVICES RESOLUTION OF HYPOXEMIA

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BACKGROUND

- Unresolved hypoxia is detrimental to patient outcomes and is linked to increased mortality.
- Hypoxia is resolved by administration of oxygen until the patient's oxygen saturation reading, SPO2, is within normal limits.
- The purpose of this study is to determine whether EMS is resolving hypoxemia from the first documented SPO2 to the last documented SPO2, prior to arrival to the emergency department (ED).

METHODS

- Retrospective analysis of 2022 ImageTrend Collaborate data
- Inclusion/Exclusion criteria adapted from the EMS Performance Measure Airway-24 developed by the National EMS Quality Alliance for the National Association of State EMS Officials¹
- Inclusion criteria:
 - 911 EMS patients transported to an emergency department
 - Adults ≥ 18 years old
 - Primary or secondary impression of Respiratory Distress
 - Initial SPO2 ≤ 89%
 - At least 2 documented SPO2 values
- Excluded cardiac arrest prior to EMS arrival
- Hypoxia defined as SPO2 <90%
- Resolution of hypoxia defined as final documented SPO2 ≥ 90%

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Table 1: Patient Demographics

Characteristic	Total	Resolution	No Resolution	p-Value
	N=71,792	N=55,133 (76.8%)	N=16,659 (23.2%)	<0.001
Age in Years				
Median [IQR]	71 [61,80]	71 [61,80]	71 [62,80]	0.329
Race				
White	43,161 (60.1%)	33,055 (60.0%)	10,106 (60.7%)	0.103
Black/African American	9,890 (13.8%)	7,862 (14.3%)	2,028 (12.2%)	<0.001
Hispanic/Latino	2,860 (4.0%)	2,114 (3.8%)	746 (4.5%)	<0.001
Other/Multiple	2,740 (3.8%)	2,158 (3.9%)	582 (3.5%)	0.014
Missing	13,141 (18.3%)	9,944 (18.0%)	3,197 (19.2%)	<0.001
Gender				
Female	36,600 (51.0%)	28,911 (52.4%)	7,689 (46.2%)	<0.001
Male	35,031 (48.8%)	26,111 (47.4%)	8,920 (53.5%)	<0.001
Missing	161 (0.2%)	111 (0.2%)	50 (0.3%)	0.023
Urbanicity				
Metro	60,173 (83.8%)	46,284 (83.9%)	13,889 (83.4%)	0.078
Non-Metro	9,077 (12.6%)	6,882 (12.5%)	2,195 (13.2%)	0.019
Rural	1,551 (2.2%)	1,200 (2.2%)	351 (2.1%)	0.026
Missing	991 (1.4%)	767 (1.4%)	224 (1.3%)	0.679
Region				
South	34,056 (47.4%)	26,493 (48.1%)	7,563 (45.4%)	<0.001
West	19,274 (26.8%)	14,413 (26.1%)	4,861 (29.2%)	<0.001
Midwest	12,415 (17.3%)	9,617 (17.4%)	2,798 (16.8%)	0.054
Northeast	6,029 (8.4%)	4,595 (8.3%)	1,434 (8.6%)	0.272
Missing	18 (0.0%)	15 (0.0%)	3 (0.0%)	0.705
Cardiac Arrest	826	260 (31.5%)	566 (68.5%)	<0.001

Table 2: Primary Impressions

Primary Impression	Total	Resolution of Hypoxia	No Resolution of Hypoxia
Resp Arrest	501	307 (61.30%)	194 (38.70%)
Resp Failure	3,808	2344 (61.60%)	1464 (38.40%)
Pulmonary Edema	2,874	1969 (68.50%)	905 (31.50%)
FBAO	272	188 (69.10%)	84 (30.90%)
ARDS	2,702	1952 (72.20%)	750 (27.80%)

RESULTS

- N=71,791
- Successful resolution of hypoxemia occurred in 55,133(76.8%)
- Did not resolve in 16,659(23.2%).
- Overall, 826(1.2%) patients had subsequent cardiac arrest;
 - 260/826 (31.5%) had resolution
 - 566/826 (68.5%) no resolution of hypoxemia, p<0.0000001.
- Of 150/826(18.2%) cardiac arrest patients who died in the field or ED,
 - 30/150(20.0%) had resolution
 - 120/150(80%) no resolution of hypoxemia, p<0.0000001;
 - Odds of death in the field or ED after cardiac arrest with unsuccessful resolution of hypoxemia was OR:15.74,CI: 9.06,28.24

LIMITATIONS

- Retrospective study design
- Time of last SPO2 may be different than time of completion of EMS care.
- Intermittent fluctuations may not be captured using first and last SPO2

CONCLUSION

- EMS treatment of hypoxemia did not achieve guideline standards for resolution in 23.2% of cases.
- Unsuccessful EMS resolution of hypoxemia was significantly associated with a higher proportion of subsequent cardiac arrest and odds of death in the field or ED.

¹National Association of EMS State Officials. (2024). Airway measures: Measure specifications. [PDF file]. Retrieved from https://www.nasemso.org/wp-content/uploads/Airway_Measures.pdf