
Virginia Department of Health

Office of Emergency Medical Services (OEMS)

Short Report: Prehospital Trauma Triage Status by Level of Service Provided,
Virginia, July 1, 2022 – June 30, 2023

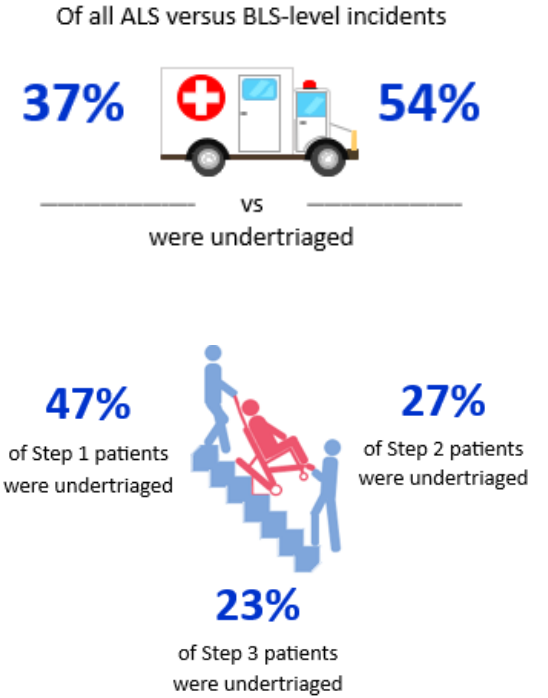
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This report is based on the deliberations and analyses performed by Office of EMS Epidemiology staff. Please be advised that the accuracy of the data within ESO is limited by system performance and the accuracy of data submissions from EMS agencies. See Appendix 2 for information on the data source and processing steps that generated this report.

Key Takeaways

- From July 2022 to June 2023, over one-third of prehospital trauma patients provided Advanced Life Support (ALS) services and over one-half of prehospital trauma patients provided Basic Life Support (BLS) services (excluding mass casualty incidents and air transports) were under-triaged.
- Among ALS incidents, a higher proportion receiving ALS-Advanced Emergency Medical Technician (AEMT) and ALS-Intermediate level care were under-triaged compared to ALS-Paramedic level care.
- For all ALS and BLS levels of care, the highest proportion of under-triaged incidents occurred among Step 1 patients, followed by Step 2 and Step 3 patients.
- Almost one-fifth of the records analyzed in this report showed a discrepancy between the documented unit level of care and the primary caregiver crew member level; almost half of records with ALS-AEMT documented as the unit level of care showed discrepancies.



Almost **1** out of every **5** records were discrepant between reported crew and unit levels of care

Summary of Analyses

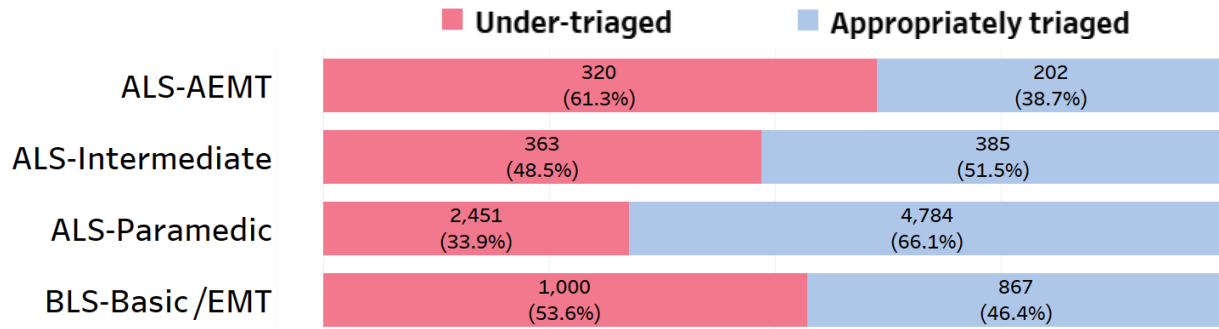


Advanced and Basic Life Support Level of Care

Of the 10,405 trauma incidents included in the analyses, the level of care of the responding unit was reported as ALS for 8,526 (81.9%) incidents and as BLS for 1,870 (18.0%) incidents. There were 9 (0.1%) incidents reported as Specialty Critical Care (SCC) with no Primary Caregiver documented; as such, level of care could not be determined.

Over one-third of ALS incidents were under-triaged (3,143; 36.9%). In contrast, over one-half of BLS incidents were under-triaged (1,003; 53.6%) (Supplementary Table 1). Odds of under-triage were significantly increased in BLS compared to ALS incidents (OR: 1.98, 95% CI: 1.79—2.19, p < 0.01). Significant associations also existed between triage status and Level of Care subtype ($\chi^2=378.2$, df=4, p<0.01) (Figure 1; Supplementary Table 1).

Figure 1. Triage Status Counts and Percentages by Level of Care of the Responding EMS Unit (excluding levels with counts ≤ 10*), Virginia, June 2022 to July 2023



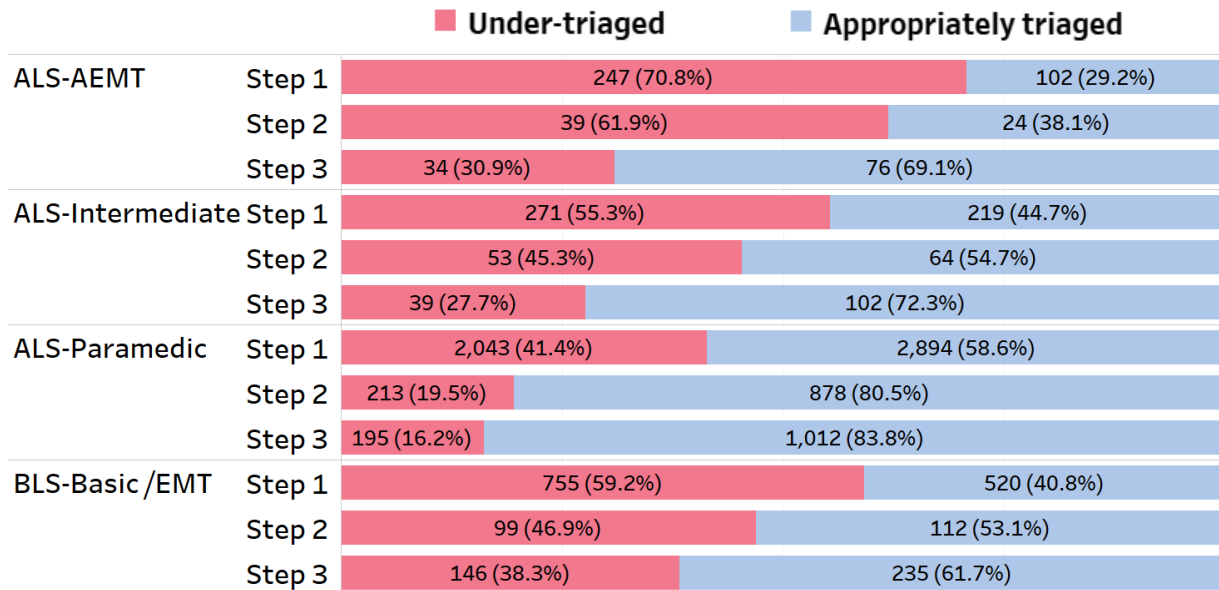
*See Supplementary Table 1 for Levels of Care (e.g., ALS-Nurse, ALS-Physician) with counts ≤ 10

Trauma Triage Step Criteria

Of the 10,405 trauma incidents included in the analyses, 7,077 (68.0%) met Step 1 criteria, 1,483 (14.3%) met Step 2 criteria, and 1,845 (17.7%) met Step 3 criteria. Nearly half (3,333; 47.1%) of Step 1 incidents and just over one-fourth (404; 27.2%) of Step 2 incidents were considered under-triaged (i.e., transported to a Level III or non-trauma center). Just under one-fourth (416; 22.5%) of Step 3 incidents were considered under-triaged (i.e., transported to a non-trauma center) (Supplementary Table 2).

Within all Step classifications, BLS units reported a higher proportion of under-triaged trauma patients compared with ALS units. Among all level of care subtypes that provided care for >10 trauma patients, the highest proportion of under-triaged trauma patients was noted among ALS-AEMTs (Figure 2; Supplementary Table 2).

Figure 2. Triage Status Counts and Percentages by Level of Care of the Responding EMS Unit (excluding levels with counts ≤ 10*) and Step Classification, Virginia, June 2022 to July 2023



*See Supplementary Table 2 for Levels of Care (e.g., ALS-Nurse, ALS-Physician) with counts ≤ 10

Data Quality Concerns

This report utilized Level of Care of this Unit (eResponse.15) to determine Level of Care Group and Level of Care Subtype. However, data reporting discrepancies exist between this field and values documented in Crew Member Level (eCrew.02) and Crew Member Response Role (eCrew.03). Of the 10,405 records analyzed in this report, 129 (1.2%) records did not include any documentation about primary caregiver in the Crew Member Response Role field. Of the remaining 10,276 records with at least one primary caregiver documented, 1,935 (18.8%) showed a discrepancy between the primary caregiver crew level and the level of care of the unit. For example, among records with a primary caregiver documented, 1,086 (15.2%) of the 7,158 records with Level of Care of this Unit documented as ALS-Paramedic reported the primary caregiver as some other level (i.e., Intermediate, AEMT, Basic Emergency Medical Technician [EMT], EMR [Emergency Medical Responder], Student, or Other Healthcare Professional) (Supplementary Table 3).

Of note, among records with a primary caregiver documented and ALS-AEMT reported as the Level of Care of this Unit (n = 515), almost half (n = 249, 48.3%) were discrepant between unit and primary caregiver crew level (i.e., the primary caregiver was reported to be a Paramedic, Intermediate, Basic EMT, Student, Other Healthcare Professional, or Non-Healthcare Professional) (Supplementary Table 3). Notably, ALS-AEMT incidents also showed a high proportion of under-triaged patients compared to all other levels of care, highlighting the importance of improving data reporting to ensure the reliability and usefulness of EMS data report insights.

Conclusion

The purpose of this report is to highlight process and educational gaps, data quality concerns, and further research opportunities to continually improve the Virginia EMS system. Future analyses should aim to further elucidate the higher proportion of under-triaged incidents occurring among BLS compared to ALS units, and ALS-AEMT and ALS-Intermediate compared to ALS-Paramedic units, including assessing incidents by patient age group, body region and cause of patient injury, and incident scene urbanicity measures. Additional research ideas, data requests, and questions concerning this report can be directed to the OEMS Epidemiology team at epi.oems@vdh.virginia.gov.

We want to thank our EMS providers and agencies who spend considerable time and effort reporting EMS encounter data. Without you, we would not be able to conduct meaningful prehospital research. Your work helps improve EMS patient care in Virginia and greatly increases industry knowledge.

thank you

Appendix 1: Supplementary Tables

Supplementary Table 1. Triage Status Counts and Percentages by Level of Care of the Responding EMS Unit, Virginia, June 2022 to July 2023

Level of Care Group	Level of Care Subtype	Triage Status Count (% Across)		Total Count (% Down)
		Under-triaged	Appropriately triaged	
Unknown	Primary Caregiver Unknown-Specialty Critical Care (SCC)	7 (77.8)	2 (22.2)	9 (0.1)
	Unknown Grand Total	7 (77.8)	2 (22.2)	9 (0.1)
ALS	ALS-AEMT	320 (61.3)	202 (38.7)	522 (5.0)
	ALS-Intermediate	363 (48.5)	385 (51.5)	748 (7.2)
	ALS-Nurse	0 (0.0)	1 (100.0)	1 (<0.1)
	ALS-Paramedic	2,451 (33.9)	4,784 (66.1)	7,235 (69.5)
	ALS-Physician	0 (0.0)	1 (100.0)	1 (<0.1)
	ALS Primary Caregiver-SCC	9 (47.4)	10 (52.6)	19 (0.2)
	ALS Grand Total	3,143 (36.9)	5,383 (63.1)	8,526 (81.9)
BLS	BLS-Basic/EMT	1,000 (53.6)	867 (46.4)	1,867 (17.9)
	BLS-First Responder/EMR	2 (100.0)	0 (0.0)	2 (<0.1)
	BLS Primary Caregiver-SCC	1 (100.0)	0 (0.0)	1 (<0.1)
	BLS Grand Total	1,003 (53.6)	867 (46.4)	1,870 (18.0)
Grand Total		4,153 (39.9)	6,252 (60.1)	10,405 (100)

Supplementary Table 2. Triage Status by Step Classification and Level of Care of the Responding EMS Unit, Virginia, June 2022 to July 2023

Step Classification	Level of Care Group	Level of Care Subtype	Triage Status Count (% Across)		Total Count (% Down)
			Under-triaged	Appropriately triaged	
Step 1	ALS	ALS-AEMT	247 (70.8)	102 (29.2)	349 (3.4)
		ALS-Intermediate	271 (55.3)	219 (44.7)	490 (4.7)
		ALS-Paramedic	2,043 (41.4)	2,894 (58.6)	4,937 (47.4)
		ALS Primary Caregiver-Specialty Critical Care (SCC)	8 (50.0)	8 (50.0)	16 (0.2)
		ALS Step 1 Total	2,569 (44.4)	3,223 (55.6)	5,792 (55.7)

Supplementary Table 2. Triage Status by Step Classification and Level of Care of the Responding EMS Unit, Virginia, June 2022 to July 2023 (continued)

Step Classification	Level of Care Group	Level of Care Subtype	Triage Status Count (% Across)		Total Count (% Down)
			Under-triaged	Appropriately triaged	
Step 1	BLS	BLS-Basic/EMT	755 (59.2)	520 (40.8)	1,275 (12.3)
		BLS-First Responder/EMR	2 (100.0)	0 (0.0)	2 (<0.1)
		BLS Primary Caregiver-SCC	1 (100.0)	0 (0.0)	1 (<0.1)
		BLS Step 1 Total	758 (59.3)	520 (40.7)	1,278 (12.3)
	Unknown	Primary Caregiver Unknown-SCC	6 (85.7)	1 (14.3)	7 (0.1)
		Unknown Level Step 1 Total	6 (85.7)	1 (14.3)	7 (0.1)
	Step 1 Grand Total			3,333 (47.1)	3,744 (52.9)
Step 2	ALS	ALS-AEMT	39 (61.9)	24 (38.1)	63 (0.6)
		ALS-Intermediate	53 (45.3)	64 (54.7)	117 (1.1)
		ALS-Paramedic	213 (19.5)	878 (80.5)	1,091 (10.5)
		ALS Step 2 Total	305 (24.0)	966 (76.0)	1,271 (12.2)
	BLS	BLS-Basic/EMT	99 (46.9)	112 (53.1)	211 (2.0)
		BLS Step 2 Total	99 (46.9)	112 (53.1)	211 (2.0)
	Unknown	Primary Caregiver Unknown-SCC	0 (0.0)	1 (100.0)	1 (<0.1)
		Unknown Level Step 2 Total	0 (0.0)	1 (100.0)	1 (<0.1)
Step 2 Grand Total			404 (27.2)	1,079 (72.8)	1,483 (14.3)
Step 3	ALS	ALS-AEMT	34 (30.9)	76 (69.1)	110 (1.1)
		ALS-Intermediate	39 (27.7)	102 (72.3)	141 (1.4)
		ALS-Nurse	0 (0.0)	1 (100.0)	1 (<0.1)
		ALS-Paramedic	195 (16.2)	1,012 (83.8)	1,207 (11.6)
		ALS-Physician	0 (0.0)	1 (100.0)	1 (<0.1)
		ALS Primary Caregiver-SCC	1 (33.3)	2 (66.7)	3 (<0.1)
		ALS Step 3 Total	269 (18.4)	1,194 (81.6)	1,463 (14.1)
	BLS	BLS-Basic/EMT	146 (38.3)	235 (61.7)	381 (3.7)
		BLS Step 3 Total	146 (38.3)	235 (61.7)	381 (3.7)
	Unknown	Primary Caregiver Unknown-SCC	1 (100.0)	0 (0.0)	1 (<0.1)
		Unknown Level Step 3 Total	1 (100.0)	0 (0.0)	1 (<0.1)
Step 3 Grand Total			416 (22.5)	1,429 (77.5)	1,845 (17.7)
Grand Total			4,153 (39.9)	6,252 (60.1)	10,405 (100.0)

Supplementary Table 3. Primary Caregiver and Unit Level of Care Data Quality by Level of Care of the Responding EMS Unit Subtype, Virginia, June 2022 to July 2023

Crew Response Role Data Quality	Level of Care of the Unit Subtype	Primary Caregiver and Unit Level of Care Data Quality (% Across)		Total Count (% Down)
		Discrepant	Match	
No Primary Caregiver Documented	ALS-AEMT	-	-	7 (0.1)
	ALS-Intermediate	-	-	5 (<0.1)
	ALS-Paramedic	-	-	77 (0.7)
	ALS-Physician	-	-	1 (<0.1)
	BLS-Basic/EMT	-	-	30 (0.3)
	Unknown Primary Caregiver-SCC	-	-	9 (0.1)
	No Documentation Total	-	-	129 (1.2)
Primary Caregiver Documented	ALS-AEMT	249 (48.3)	266 (51.7)	515 (4.9)
	ALS-Intermediate	172 (23.1)	571 (76.9)	743 (7.1)
	ALS-Nurse	1 (100.0)	0 (0.0)	1 (<0.1)
	ALS-Paramedic	1,086 (15.2)	6,072 (84.8)	7,158 (68.8)
	ALS Primary Caregiver-SCC	0 (0.0)	1 (100.0)	1 (<0.1)
	BLS-Basic/EMT	425 (23.1)	1,412 (76.9)	1,837 (17.7)
	BLS-First Responder/EMR	2 (100.0)	0 (0.0)	2 (<0.1)
	BLS Primary Caregiver-SCC	0 (0.0)	20 (100.0)	20 (0.2)
	Primary Caregiver Documented Total	1,935 (18.8)	8,341 (81.2)	10,276 (98.8)
	Grand Total	-	-	10,405 (100)

Appendix 2: Methodology

- Data were collected from the Virginia Prehospital Information Bridge (VPHIB) and ESO prehospital data systems, maintained by the Virginia OEMS.
- The data fields utilized in this report were ESORECORDID, Datetime Unit Notified by Dispatch (eTimes.03), Patient Incident Disposition (eDisposition.12), Type of Service Requested (eResponse.05), Provider’s Primary Impression (eSituation.11), Mass Casualty Incident (eScene.07), Primary Role of the Unit (eResponse.07), First Gathered Systolic Blood Pressure (eVitals.06), First Gathered Respiratory Rate (eVitals.14), First Gathered Total Glasgow Coma Score (eVitals.23), Trauma Center Criteria (eInjury.03), Vehicular, Pedestrian, or Other Injury Risk Factor (eInjury.04), Age (ePatient.15), Age Units, (ePatient.16), Destination/Transferred To Name (eDisposition.01), Destination/Transferred To Code (eDisposition.01 code), Level of Care of this Unit (eResponse.15), Crew Member ID (eCrew.01), Crew Member Level (eCrew.02), Crew Member Response Role (eCrew.03), and Submission Status.
- Inclusion criteria:
 - Datetime Unit Notified by Dispatch (eTimes.03) is between July 1, 2022, 00:00:00 ET, and June 30, 2023, 23:59:59 ET, and
 - Records that meet the Virginia case definition of EMS trauma patients, consistent with the [OEMS Quarterly Report on EMS Trauma Incidents](#) and [EMS Trauma Triage Dashboard](#):
 - Patient Incident Disposition (eDisposition.12) is equal to Treated and Transported by this EMS Unit, and
 - Type of Service Requested (eResponse.05) is equal to 911 Response (Scene), and
 - Provider’s Primary Impression (eSituation.11) is consistent with the ICD-10 codes listed in the EMS trauma patient case definition, available in the [OEMS Quarterly Report on EMS Trauma Incidents](#) (see Table 1 of each report) and [EMS Trauma Triage Dashboard](#) (see the overview section information icon).
- Exclusion criteria:
 - Records with Mass Casualty Incident (eScene.07) equal to “Yes”, or
 - Records with Primary Role of the Unit (eResponse.07) equal to “Air Transport-Helicopter” or “Air Transport-Fixed Wing”, or
 - Records with a Submission Status of “Failed” or “Pending” at the time data were queried from the VPHIB.
 - Quarter 3 2022 Trauma Triage data query: November 15, 2022
 - Quarter 4 2022 Trauma Triage data query: February 10, 2023
 - Quarter 1 2023 Trauma Triage data query: July 5, 2023
 - Quarter 2 2023 Trauma Triage data query: September 5, 2023
 - **Note:** Excluded records could meet more than one exclusion criteria. As such, counts of excluded records by exclusion reason will add up to more than the total number of records excluded.
- Step Classification was determined according to the Virginia Field Trauma Decision Scheme, available in the [OEMS Quarterly Report on EMS Trauma Incidents](#) (see Figure 1 of each report)

and [EMS Trauma Triage Dashboard](#) (see the EMS Trauma Triage Classification section flow chart icon). Data elements utilized to determine step classification were:

- First Gathered Systolic Blood Pressure (eVitals.06),
 - First Gathered Respiratory Rate (eVitals.14) with Age (ePatient.15) and Age Units (ePatient.16),
 - First Gathered Total Glasgow Coma Score (eVitals.23),
 - Trauma Center Criteria (eInjury.03), and
 - Vehicular, Pedestrian, or Other Injury Risk Factor (eInjury.04).
- Triage Status was determined according to the Virginia Trauma Triage Decision Scheme using Step Classification and the Trauma Center Designation of the destination (eDisposition.01), available in the [OEMS Quarterly Report on EMS Trauma Incidents](#) (see Figure 1 of each report) and [EMS Trauma Triage Dashboard](#) (see the EMS Trauma Triage Classification section flow chart icon). Triage Status was defined as:
 - Under-triaged:
 - Step 1 patients transported to a Level III or non-trauma center,
 - Step 2 patients transported to a Level III or non-trauma center, and
 - Step 3 patients transported to a non-trauma center.
 - Appropriately triaged:
 - Step 1 patients transported to a Level I or II trauma center,
 - Step 2 patients transported to a Level I or II trauma center, and
 - Step 3 patients transported to a Level I, II, or III trauma center.
 - Advanced and Basic Life Support categories were determined using Level of Care this Unit (eResponse.15), defined below. For records reported as Specialty Critical Care (SCC), ALS and BLS group designations were determined using the highest Crew Member Level (eCrew.02) of crew members designated as “Primary Patient Caregiver-At Scene” or “Primary Patient Caregiver-Transport” in the associated Crew Member Response Role (eCrew.03) field.
 - Advanced Life Support:
 - Level of Care of this Unit is equal to ALS-AEMT, ALS-Intermediate, ALS-Nurse, ALS-Paramedic, or ALS-Physician, or
 - Level of Care of this Unit is equal to Specialty Critical Care, and
 - Primary caregiver Crew Member Level equal to Physician, Nurse Practitioner, Licensed Practical Nurse (LPN), Registered Nurse, Physician Assistant, EMT-Paramedic, 2009 Paramedic, Critical Care Paramedic, EMT-Intermediate, or 2009 Advanced Emergency Medical Technician (AEMT).
 - Basic Life Support:
 - Level of Care of this Unit is equal to BLS-First Responder/EMR or BLS-Basic/EMT, or
 - Level of Care of this Unit equal to Specialty Critical Care, and
 - Primary caregiver Crew Member Level is equal to EMT-Basic, 2009 Emergency Medical Technician (EMT), 2009 Emergency Medical Responder (EMR), First Responder, Student, or Other Healthcare Professional.
 - Unknown:

- Level of Care of this Unit is equal to Specialty Critical Care, and primary caregiver Crew Member Level equal to:
 - Other Non-Healthcare Professional, or blank.
- Level of Care of this Unit Subtype is equal to the attributes reported in the Level of Care this Unit (eResponse.15) field, listed above. For records reported as Specialty Critical Care (SCC), ALS-SCC and BLS-SCC subtype designations were determined using the highest Crew Member Level (eCrew.02) of crew members designated as “Primary Patient Caregiver-At Scene” or “Primary Patient Caregiver-Transport” in the associated Crew Member Response Role (eCrew.03) field.
- The Level of Care of the Unit and Crew Member Level data quality analyses were performed by comparing Level of Care of this Unit (eResponse.15) and Crew Member Level (eCrew.02) attributes for crew members designated as “Primary Patient Caregiver-At Scene” or “Primary Patient Caregiver-Transport” in the associated Crew Member Response Role (eCrew.03) field, as defined as:
 - Discrepant:
 - Level of Care of this Unit is equal to ALS-AEMT, and
 - the primary caregiver Crew Member Level is not equal to 2009 Advanced Emergency Medical Technician (AEMT), or
 - Level of Care of this Unit is equal to ALS-Intermediate, and
 - the primary caregiver Crew Member Level is not equal to EMT-Intermediate, or
 - Level of Care of this Unit is equal to ALS-Nurse, and
 - the primary caregiver Crew Member Level is not equal to Licensed Practical Nurse (LPN), Registered Nurse, or Nurse Practitioner, or
 - Level of Care of this Unit is equal to ALS-Paramedic, and
 - the primary caregiver Crew Member Level is not equal to EMT-Paramedic, 2009 Paramedic, or Critical Care Paramedic, or
 - Level of Care of this Unit is equal to ALS-Physician, and
 - the primary caregiver Crew Member Level is not equal to Physician, or
 - Level of Care of this Unit equal to BLS-First Responder/EMR, and
 - the primary caregiver Crew Member Level is not equal to 2009 Emergency Medical Responder (EMR) or First Responder, or
 - Level of Care of this Unit equal to BLS-Basic/EMT, and
 - the primary caregiver Crew Member Level is not equal to 2009 Emergency Medical Technician (EMT) or EMT-Basic.
- Hypotheses tests for statistical significance were performed using the epitools and rstatix packages in RStudio (2022.07.1). Odds ratios and 95% confidence intervals were calculated to compare triage status by ALS and BLS group. A Chi-square test of independence was performed to compare triage status by Level of Care of this Unit subgroup.
 - epitools: <https://cran.r-project.org/web/packages/epitools/epitools.pdf>
 - rstatix: <https://cran.r-project.org/web/packages/rstatix/rstatix.pdf>