



MONTANA EMS ANNUAL REPORT 2023

A SUMMARY OF 2022 EMS DATA



MONTANA
EMS, TRAUMA SYSTEMS &
INJURY PREVENTION PROGRAM

EXECUTIVE SUMMARY

We are pleased to present the Montana EMS Annual Report 2023 made possible by the hard work of more than 5,000 emergency care providers across the state. The report analyzes 2022 EMS data by agency-type (non-transporting, ground transport, air transport) and by time-sensitive illnesses and injuries, including alcohol/drug exposure, trauma, traumatic brain injury, stroke, heart attack, and cardiac arrest.

The intent of this report is to provide EMS agencies, public health professionals, and policy makers with information that can be used to enhance performance, identify education opportunities, and describe prehospital emergency care in Montana.

In addition to this report, the EMS and Trauma System Section publishes several standard reports each year including:

- **Annual Trauma Systems Report** - focuses on traumatic injury data obtained primarily from the Montana trauma registry,
- **Annual Injury Prevention Report** - provides an overview of injury deaths, nonfatal hospitalizations, and nonfatal ED visits.

Moving forward, we are changing the way we deliver information. Rather than creating static reports like this one, we will present information using web-based dashboards that combine both pre-formatted reports for popular topics with searchable data sets that allow the user to query multiple years of data using a variety of illness and injury data elements.

Illness and Injury Dashboards:

- [EMS Performance Improvement Dashboard](#)
- [Fatal Injury and Overdose Dashboard](#)

Key Findings of This Report:

- 127 ground transporting agencies (GTAs) responded to 138,009 requests for service, up from 132,910 last year.
- 14 air medical agencies (AMAs) responded to 6,809 requests for service, up from 5,325 last year.
- While not required by law, 22 non-transporting agencies (NTAs) submitted records, an increase from 14 in 2020.
- Missing data limits the quality of reporting. For example, primary impression was missing for 13% of pediatric 911 transports and 29% of pediatric interfacility transports.
- 911 call volumes have returned to pre-COVID patterns.
- Data continue to demonstrate the dramatic impact of interfacility transports on volunteer ground ambulances. The median duration of an interfacility transport call is 3 hours and 6 hours for 90th percentile.

Opportunities:

- To ensure compatibility of Montana data with National EMS Information System (NEMSIS) standards, the Montana EMS registry and ePCR system is being updated to NEMSIS version 3.5. This will enable the EMS and Trauma System Section to revise data collection standards to improve data completeness.
- This is the third year that PCR data have been reported. Subsequent reporting will include trend lines for many of the measures contained in the report.



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EMS System Manager



Terry Mullins
Section Supervisor

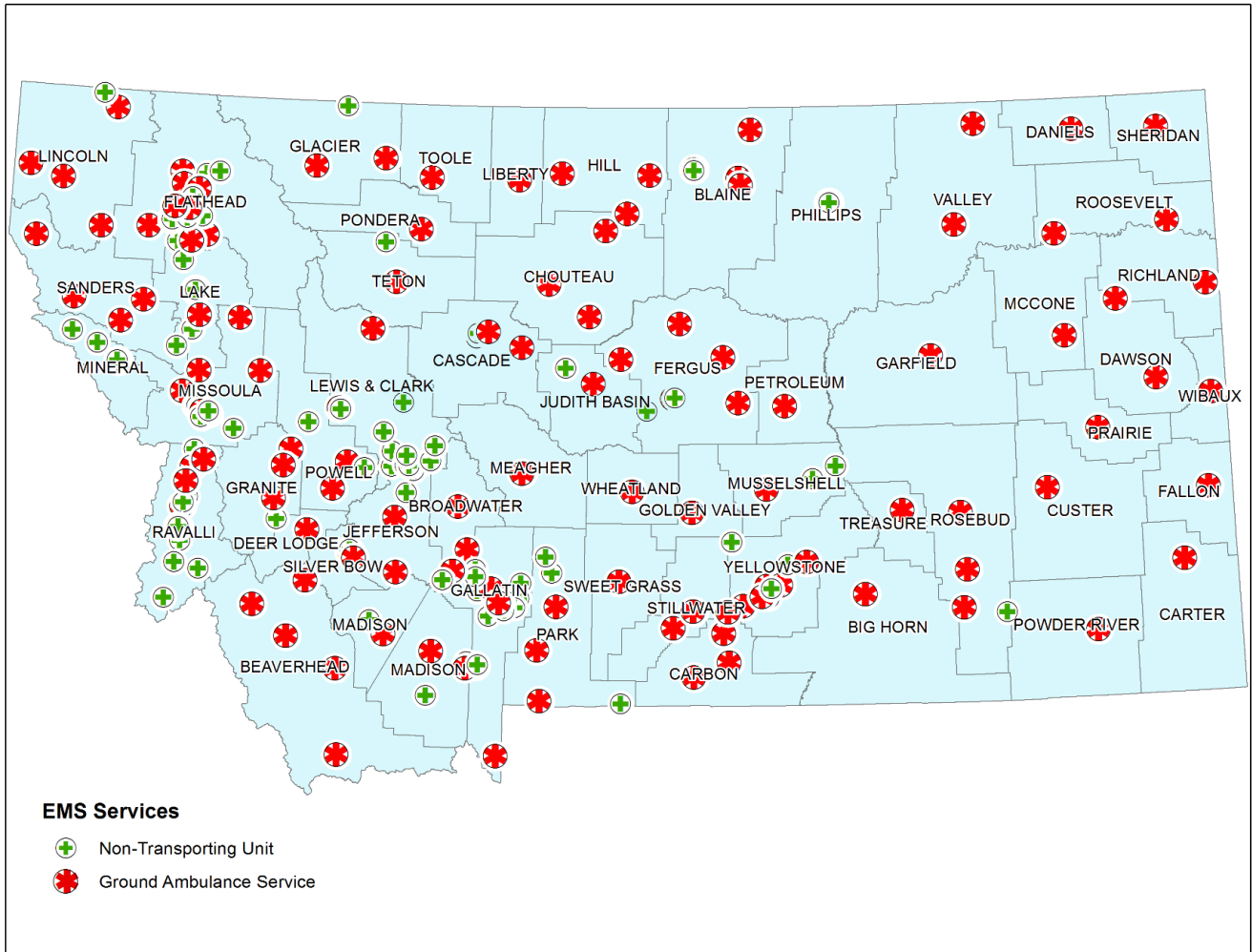


Hannah Yang
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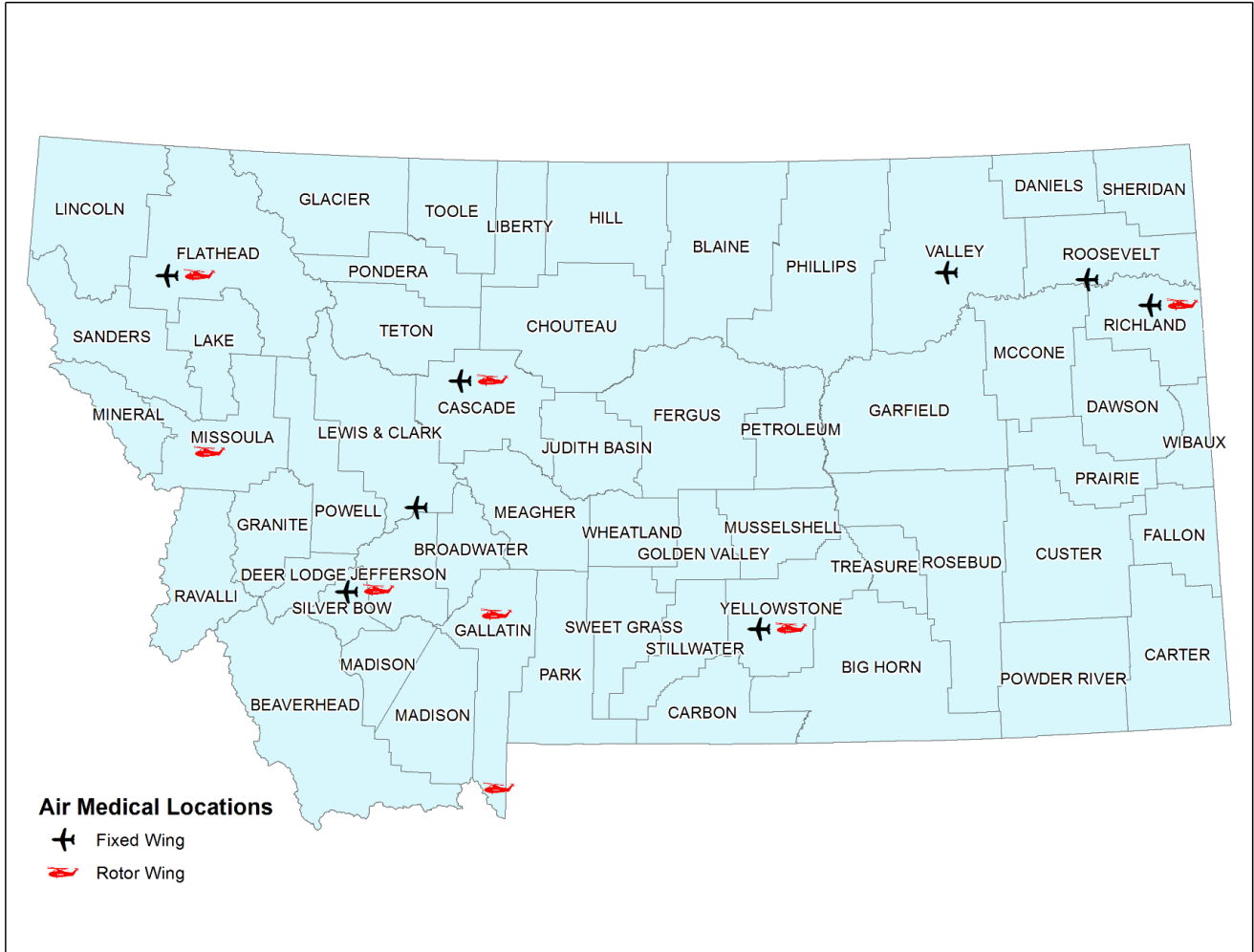
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MONTANA EMS AGENCIES (GROUND)



MONTANA EMS AGENCIES (AIR)



Special thanks to the following EMS Agencies that contributed data to this report:

Ground Transporting Agencies
 A-1 Ambulance
 Absarokee Rural Fire District*
 Alert III - Ground
 American Medical Response (Billings)
 American Medical Response (Bozeman)
 Anaconda Fire
 Arlee Ambulance Service*
 Augusta Volunteer Ambulance Service*
 Beartooth EMS & Rescue
 Beaverhead EMS*
 Belt Volunteer Ambulance*
 Best Practice Medicine
 Big Horn County Ambulance
 Big Mountain Fire & Rescue
 Big Sandy Volunteer Ambulance Service*
 Big Sky Fire Department
 Bigfork Fire District
 Billings Clinic Broadwater
 Bitterroot Health Ambulance
 Blackfeet Tribal EMS
 Blaine County Ambulance I*
 Blaine County Ambulance III*
 Boulder Ambulance Service*
 Central Montana Medical Center Ambulance Service
 Central Valley Fire District / Belgrade City
 Fire Department
 City of Bozeman Fire Dept
 City of Havre Ambulance/Fire Department
 City of Whitefish Fire Department
 Clarks Fork Valley Ambulance*
 Clarkston Fire Service Area*
 Coast2coast Public Safety
 Colstrip Ambulance Service*
 Columbus Rural Fire District 3
 Community Ambulance Service of Western
 Sanders County*
 Condon/Swan Valley QRU*
 Dahl Memorial Healthcare Ambulance*
 Daniels County Ambulance Service*
 Denton Ambulance*
 Eagle Ambulance Service, Inc.
 Eureka Volunteer Ambulance Service*
 Evergreen Fire Rescue
 Fallon County Ambulance*
 Fisher River Valley Fire/Rescue*
 Fort Belknap EMS
 Frenchtown Rural Fire District
 Garfield Ambulance*
 Geraldine Community Ambulance Service*
 Glendive Ambulance Service*
 Golden Valley Quick Response Ambulance*
 Grass Range Ambulance Service*
 Grasshopper Valley Ambulance*
 Great Falls Emergency Services
 Great Falls Fire Rescue
 Hebgen Basin Fire District
 Help Flight St Vincent Healthcare - Ground
 Hill County Ambulance Service of Rudyard*
 Hot Springs Community Ambulance Service Inc.*
 Joliet EMS Inc.*
 Judith Basin County EMS*
 Kalispell Fire/Ambulance Department
 Lakeside QRU, Inc*
 Laurel Volunteer Ambulance Service*
 Libby Volunteer Ambulance*
 Liberty County Ambulance and QRU*
 Lima Rural Fire Department and Ambulance*
 Lincoln Volunteer Ambulance Service*
 Livingston Fire Rescue
 Lockwood Rural Fire District Ambulance
 Logan Health Emergency Medical Services
 Madison Valley Ambulance Service
 Marion Fire District*
 Meagher County Ambulance*
 Memorial Ambulance of Fort Benton*
 Miles City Fire Rescue
 Missoula Emergency Services Inc.
 Montana Medical Transport Ambulance
 Musselshell County Ambulance*
 North Valley EMS Inc.*
 Northeast Montana Health Services
 Northern Cheyenne Ambulance Service
 Northern Rockies EMS
 Paradise Valley Fire Service Area*
 Park City Volunteer Ambulance Service*



Petroleum County Ambulance Service*
Phillips County Ambulance*
Plains Community Ambulance*
Polson Ambulance Inc.
Pondera Logan Health Ambulance
Powder River County EMS*
Powell EMS*
Prairie County Ambulance Service*
Priority Guided Health
Pulse dba Jefferson Valley EMS and Rescue*
Red Lodge Fire/Rescue*
Redwater Valley Ambulance Service*
Richey Ambulance Service*
Richland County Ambulance*
Roosevelt Memorial Medical Center Ambulance*
Rosebud County*
Ruby Valley EMS*
Seeley Lake QRU/Rural Fire Department*
Sheridan Memorial Hospital EMS*
Smith Valley Volunteer Fire Department Ambulance*
Spectrum
St Peters Hospital Ambulance
Stat Ambulance Service*
Stevensville City & Rural Fire Dept.*
Stillwater Mining Company - East Boulder/Nye
Superior Area Ambulance Service*
Sweet Grass County Ambulance Service*
Teton County Ambulance Service*
Thompson Falls Ambulance*
Three Forks Area Ambulance Service*
Three Rivers EMS*
Toole County Ambulance*
Treasure County Ambulance Service*
Troy Volunteer Ambulance Service*
Victor Volunteer Rural Fire Department QRU*
Vitalogy EMS
West Valley Volunteer Fire Department*
Wheatland County Ambulance Service*
Wibaux County Ambulance Service*
Winifred Community Ambulance*
Wisdom Volunteer Ambulance Service*
Wise River Volunteer Fire Company*
Worden Fire Department & Ambulance*
Yellowstone Mountain Club Rural Fire District

Non-Transporting Agencies

Amsterdam Volunteer Fire Company*
Billings Fire Department
Cascade County QRT*
Chief Cliff Fire Service QRU*
Chouteau County QRU*
Cooke City Silvergate Emergency Services*
Corvallis QRU*
Elliston EMS*
Florence Volunteer Fire & QRU*
Gallatin River Ranch Fire Rescue*
Gore Hill Fire Rescue*
Helena Fire Department
Manhattan Volunteer Fire Department*
Missoula Rural Fire Department
Montana City Volunteer Fire Department*
Spanish Peaks Mountain Club NTU
Superior Fire Department*
Teton County EMS- Pendroy QRU*
Tri-Lakes Volunteer Fire Department*
West End QRU*
Wilderness Medics, Inc.

Air Medical Agencies

Rotor Wing
Alert I - Rotor
Billings Clinic Medflight Bozeman-Rotor
Help Flight St Vincent Healthcare - Rotor
Life Flight Network Butte
Mercy Flight Benefis Healthcare - Rotor
Rocky Mountain Holdings, LLC. dba Air Idaho Rescue

Fixed Wing

Alert II - Fixed
Billings Clinic Medflight - Fixed
Help Flight St Vincent Healthcare - Fixed
Life Flight Network Fixed Wing Butte
Mercy Flight - Benefis Healthcare - Fixed
Montana Medical Transport - Fixed
Sidney Health Center Care Flight
Stat Air Ambulance Service - Fixed

REPORT BACKGROUND

This report describes Emergency Medical Services (EMS) system utilization and performance in Montana during 2022 using the state's EMS incident dataset.

Montana's EMS incident dataset consists of patient care documentation collected by emergency care providers. Montana law requires all ground transporting agencies (GTAs) and air medical agencies (AMAs) licensed in the state to submit a patient care report (PCR) for each patient encountered during an EMS activation. Non-transporting agencies (NTAs) are not required to report data, however, some do. The EMS incident dataset captures agency information, patient demographics, response times, incident location, prehospital interventions, and treatments provided to the patient. 70% of PCRs are uploaded to the state data repository within 24 hours of the patient encounter. Montana has been collecting NEMSIS v3.4.0 data since January 2017, and will begin collecting NEMSIS v3.5 data in 2023.

The report includes system utilization volumes, demand analysis, descriptive analysis of who is utilizing EMS and why EMS is activated along with focused reports on time sensitive illnesses and injuries. It is divided into separate sections for ground transporting agencies, non-transporting agencies, and air medical agencies including rotor wing agencies (RWAs) and fixed wing agencies (FWAs). Within each section, data is divided by response type and patient disposition.

METHODS

This report includes EMS incidents that occurred in Montana between Jan 1, 2022- Dec 31, 2022. Records for out-of-state incidents and records missing values for incident state, response type, or patient disposition were excluded from the analysis. 2021 US Census single race population estimates were used to calculate age adjusted rates per 100,000 residents.^a

The EMS dataset is a registry of EMS activations; it is not a "patient-based" dataset. A single patient or a single event may be represented in more than one record for a variety of reasons. For example, if several agencies responded to the same incident, they would each submit a PCR.

Extreme outliers were excluded when calculating response times and distances traveled.

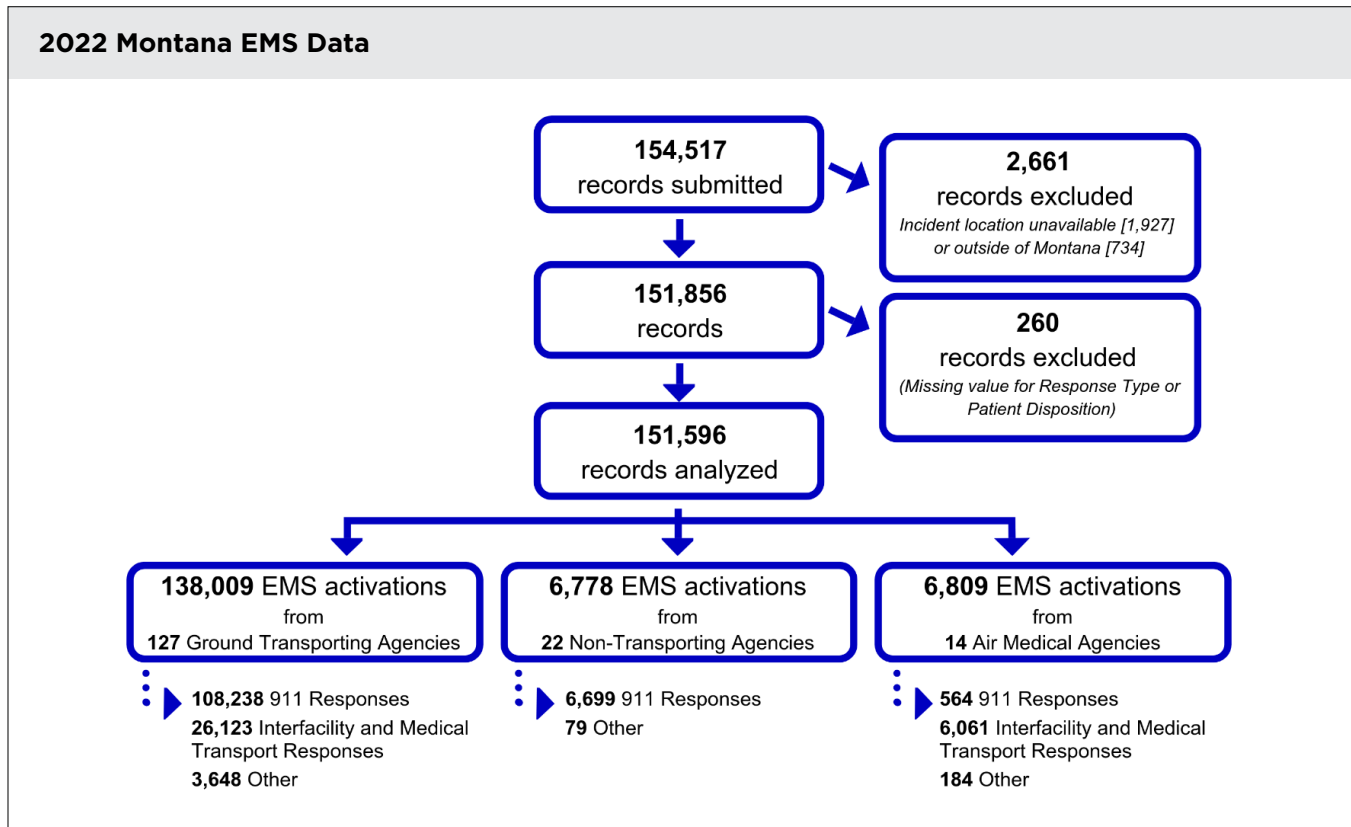
Response times were defined as follows:

1. Chute time: "Unit notified by dispatch" to "Unit en route". Measures the time it takes the ambulance crew start moving toward the scene, from the time they are notified
2. On-scene time: "Unit on scene" to "Unit left scene". Measures the time spent by the EMS crew on scene.
3. Time at sending facility: "Unit on scene" to "Unit left scene". Measures the time spent by EMS at the sending/first facility while picking up the patient during an interfacility or medical transport.
4. EMS transport time: "Unit left scene" to "Unit arrived at destination". Measures patient-loaded travel time
5. Turnaround time: "Unit arrived at destination" to "Unit back in service". Measures the time from when the ambulance arrives at the ED with a patient until the EMS unit is back in service
6. Total call time: "Unit notified by dispatch" to "Unit back in service". Measures the time from when the ambulance was notified by dispatch until the EMS unit is back in service.

Analysis was done in SAS version 9.4.

^a Within each agency type and response type category, any value greater than the third quartile plus the interquartile range multiplied by ten (Q3+10xIQR) was excluded.

OVERVIEW OF EMS INCIDENT DATASET



IMPORTANT DEFINITIONS

EMS Activation is an occurrence which initiates an EMS response with the potential of patient medical evaluation and/or care.

Response Type describes the circumstances under which a particular EMS Agency was requested to respond.

- 911 Response: EMS activation where the response is emergent or immediate to an incident location (scene), regardless of method of notification (e.g., 9-1-1, direct dial, walk-in, flagging down, air ambulance scene flight)
- Interfacility Transport Response: Emergent response for transport from one healthcare facility to another for the purpose of continuation of acute care
- Medical Transport Response: Non-emergent response for transport that is not between hospitals or that does not require an immediate response, i.e.- to/from an appointment, for a scheduled procedure
- Other includes intercept, standby, mutual aid, and public assistance.

Patient Disposition describes whether care and/or transport were provided to the patient by the responding EMS personnel.

- **911 Transport:** A 911 response that resulted in patient transport by the responding EMS unit
- **IFM Transport:** An interfacility or medical transport (IFMT) response that resulted in patient transport by the responding EMS unit

Table 1 shows the patient disposition categories in detail.²

Table 1. EMS activations by patient disposition and agency type, 2022

Patient Disposition	Ground Transporting Agencies	Non-Transporting Agencies	Air Medical Agencies	All
Patient Transported by this EMS Unit	95,137	351	6,445	101,933
Patient Treated, Transported by this EMS Unit	94,994	345	6,445	101,784
Patient Dead at Scene-No Resuscitation Attempted (With Transport)	53	0	0	53
Patient Dead at Scene-Resuscitation Attempted (With Transport)	41	6	0	47
Patient Refused Evaluation/Care (With Transport)	49	0	0	49
Patient Treated, No Transport (per protocol)	6,391	3,089	9	9,489
Patient Treated, Transferred Care to Another EMS Unit	4,252	2,972	9	7,233
Patient Treated, Released (per protocol)	1,678	73	0	1,751
Patient Treated, Transported by Law Enforcement	184	10	0	194
Patient Treated, Transported by Private Vehicle	277	34	0	311
Patient Evaluated, No Treatment/Transport Required	3,928	137	0	4,065
Patient Refusal, No Transport	12,155	363	24	12,542
Patient Refused Evaluation/Care (Without Transport)	8,628	259	24	8,911
Patient Treated, Released (Against Medical Advice)	3,527	104	0	3,631
Patient Dead at Scene, No Transport	1,540	130	38	1,708
Patient Dead at Scene-No Resuscitation Attempted (Without Transport)	893	91	4	988
Patient Dead at Scene-Resuscitation Attempted (Without Transport)	647	39	34	720
Other (No Patient Contact)	18,858	2,708	293	21,859
Assist/Standby/Non-Patient	5,885	2,692	11	8,588
Assist, Agency	2,079	2,654	1	4,734
Assist, Public	1,982	32	0	2,014
Assist, Unit	99	5	0	104
Standby-No Services or Support Provided	36	0	10	46
Standby-Public Safety, Fire, or EMS Operational Support Provided	1,111	1	0	1,112
Transport Non-Patient, Organs, etc.	578	0	0	578
Canceled	12,973	16	282	13,271
Canceled (Prior to Arrival at Scene)	5,803	7	256	6,066
Canceled on Scene (No Patient Contact)	6,338	9	10	6,357
Canceled on Scene (No Patient Found)	832	0	16	848
All Patient Contacts	119,151	4,070	6,516	129,737
All EMS Activations	138,009	6,778	6,809	151,596

Figure 1. Map of all 911 responses by county (age-adjusted rate per 100,000 population), Montana, 2022

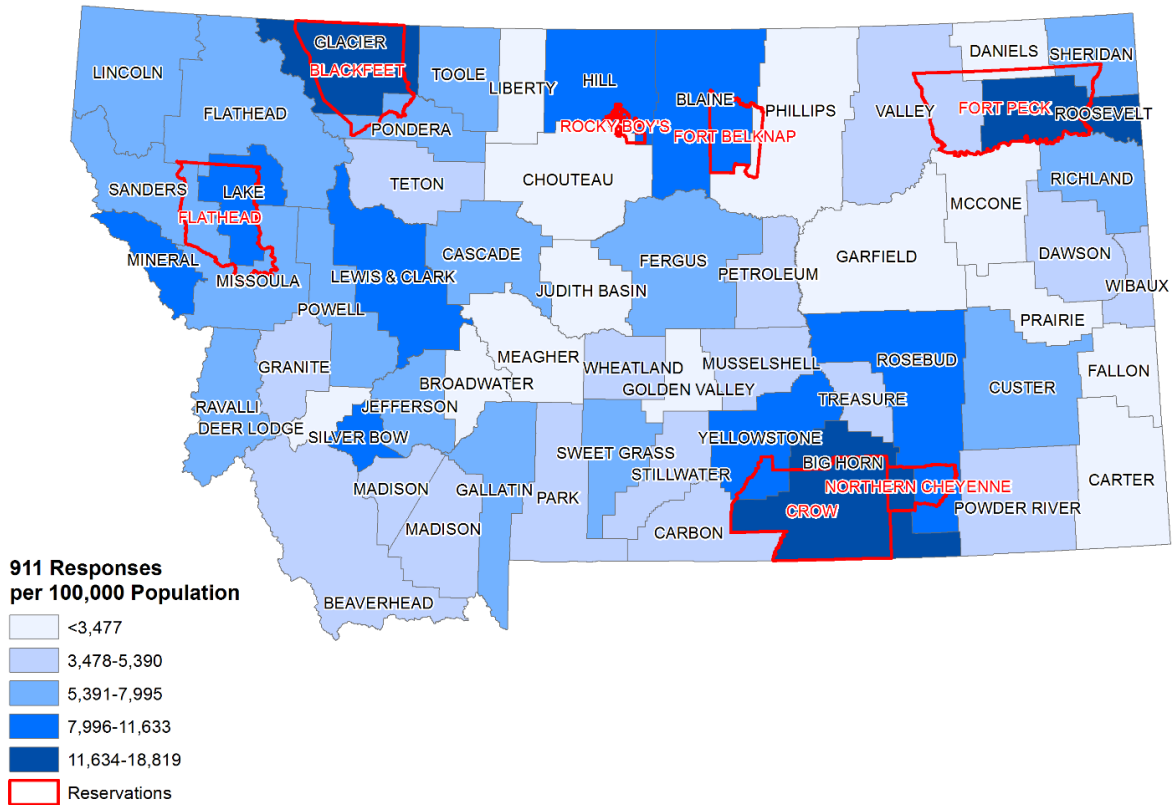


Figure 2. Weekly count of all 911 responses, 2022

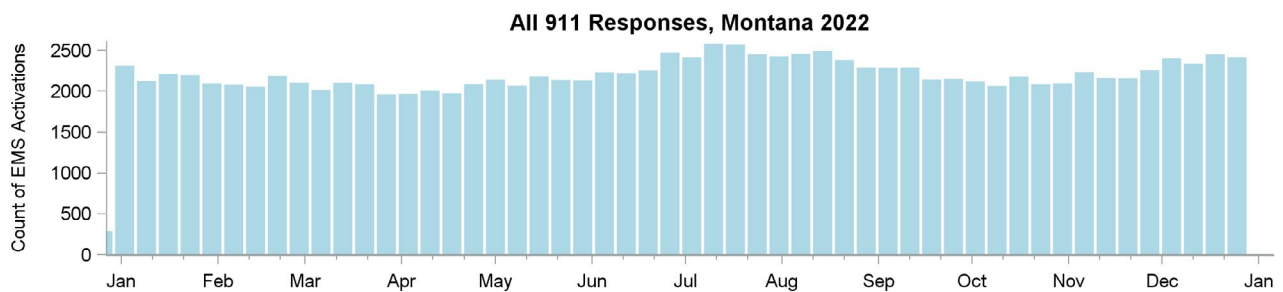


Figure 3. Map of all IFMT responses by county (age-adjusted rate per 100,000 population), Montana, 2022

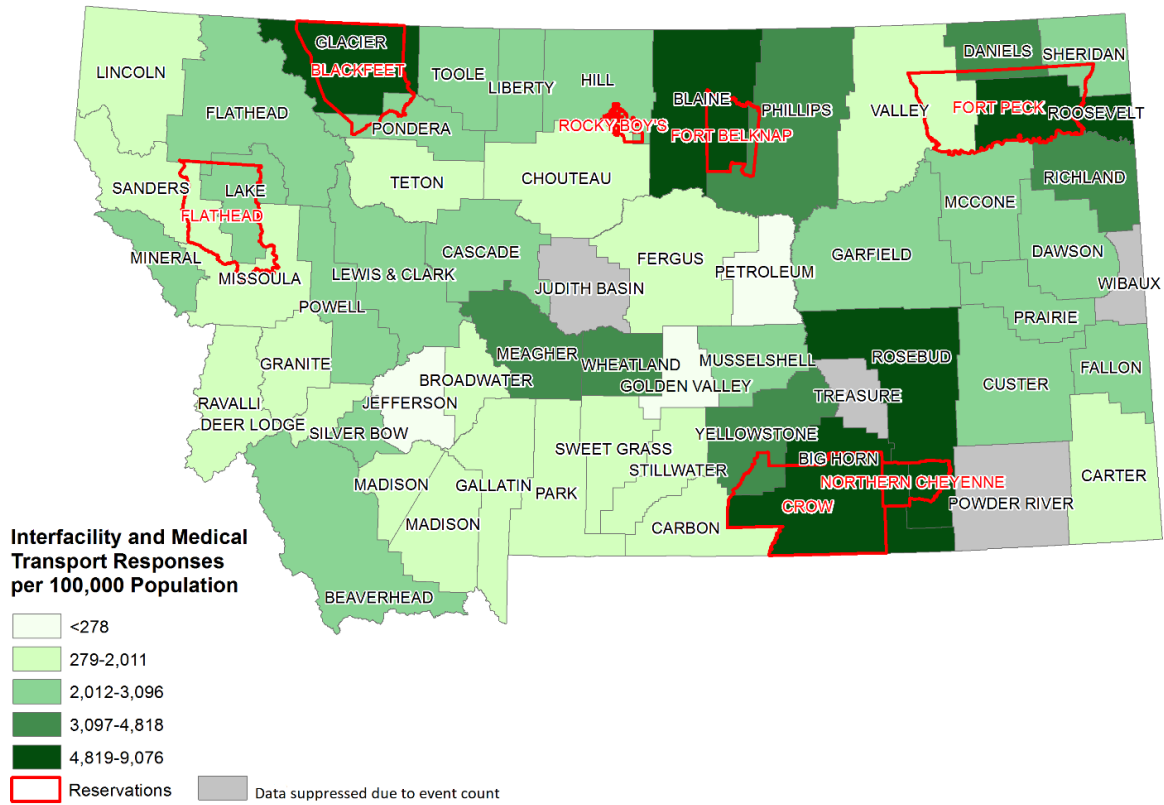
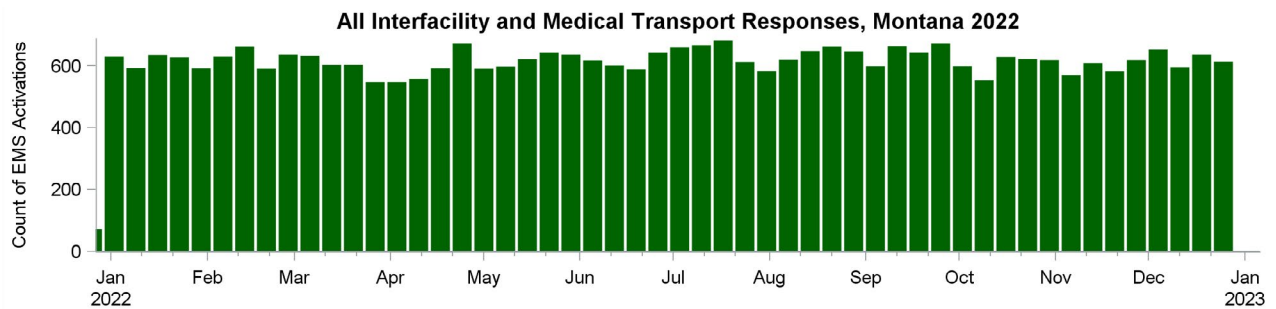


Figure 4. Weekly count of all IFMT responses, 2022



GROUND TRANSPORTING AGENCIES

GROUND TRANSPORTING AGENCIES

A total of 127 GTAs submitted data for this report, documenting 138,009 EMS activations during 2022. 85% (N=117,464) of the records were submitted by paid GTAs and 15% (N=20,545) by volunteer GTAs.

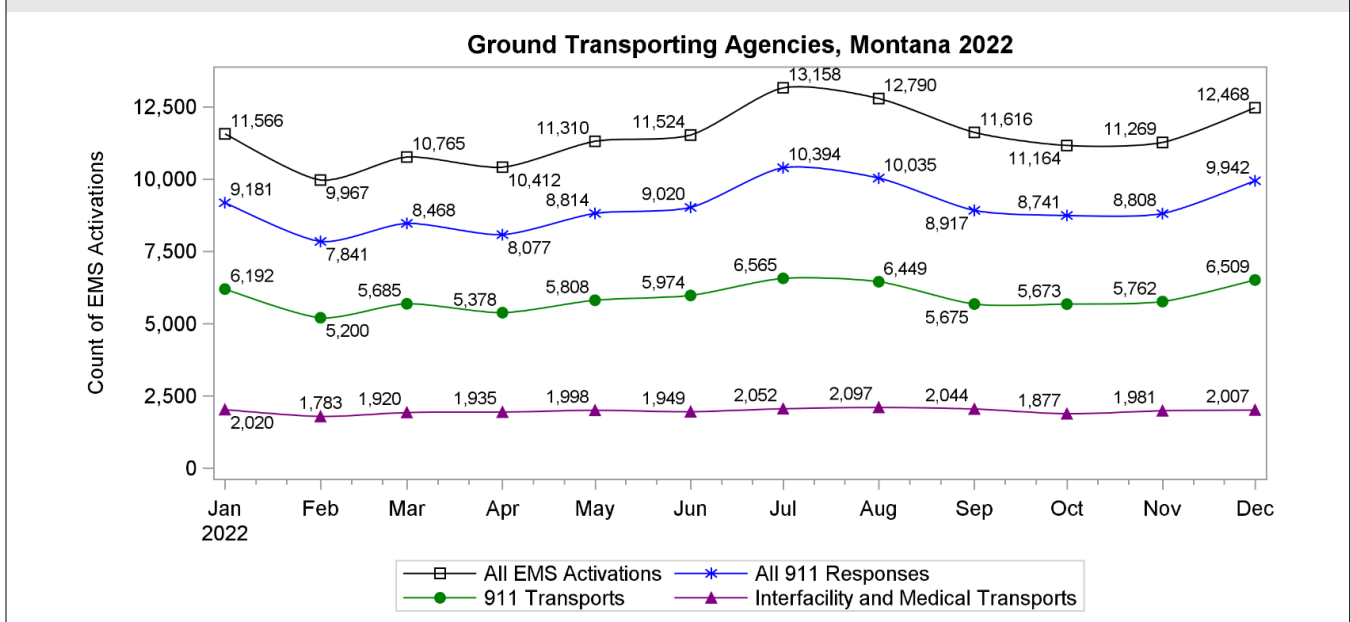
SYSTEM UTILIZATION

Table 2. EMS activations by patient disposition and response type, GTAs, 2022

Patient Disposition	Response Type			All (N)	All (Col %)
	911 Response	Interfacility and Medical Transport (IFMT) Response	Other		
Patient Transported by This EMS Unit	70,870	23,663	604	95,137	69%
Patient Treated, No Transport (per protocol)	6,161	70	160	6,391	5%
Patient Evaluated, No Treatment/Transport Required	3,690	55	183	3,928	3%
Patient Refusal/AMA, No Transport	11,754	62	339	12,155	9%
Patient Dead at Scene, No Transport	1,520	2	18	1,540	1%
Assist, Standby, or Non-patient Transport	2,263	1,519	2,103	5,885	4%
Canceled Call	11,980	752	241	12,973	9%
All (N)	108,238	26,123	3,648	138,009	100%
All (Row %)	78%	19%	3%	100%	

911 responses accounted for 78% of the activations (N=108,238), while IFMT responses comprised 19% (N=26,123). Of the 911 responses, 65% (N=70,870) resulted in patient transport by the responding EMS unit (Table 2). Table 4 details why the remaining 37,368 patients were not transported following a 911 response. 91% (N=23,663) of the IFMT responses resulted in patient transport.

Figure 5. System utilization volumes by month, GTAs, 2022



On average there were 11,501 EMS activations per month (a 3.7% increase from 2021 average of 11,076 per month), 9,020 monthly 911 responses, 5,906 monthly 911 transports, and 1,972 monthly IFM transports. July and August had the highest EMS utilization in all categories during 2022.

DEMAND ANALYSIS, 911 RESPONSES

Table 3. 911 response demand analysis showing percentage of total N=108,238, GTAs, 2022

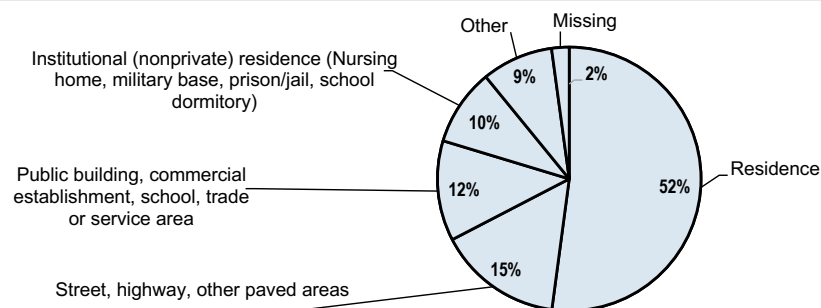
Hour of Day	Day of Week							Total
	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	
0	0.46	0.39	0.38	0.41	0.35	0.39	0.52	2.91
1	0.41	0.34	0.29	0.32	0.33	0.33	0.47	2.48
2	0.40	0.31	0.28	0.28	0.27	0.33	0.40	2.26
3	0.33	0.26	0.26	0.24	0.27	0.26	0.32	1.94
4	0.28	0.26	0.27	0.24	0.26	0.25	0.27	1.83
5	0.28	0.28	0.25	0.28	0.26	0.29	0.30	1.95
6	0.34	0.38	0.34	0.37	0.36	0.34	0.33	2.46
7	0.42	0.55	0.53	0.52	0.49	0.51	0.46	3.49
8	0.50	0.67	0.66	0.68	0.64	0.62	0.55	4.33
9	0.62	0.75	0.74	0.76	0.71	0.67	0.68	4.93
10	0.69	0.84	0.79	0.82	0.78	0.75	0.74	5.41
11	0.70	0.80	0.86	0.82	0.84	0.83	0.76	5.61
12	0.77	0.80	0.83	0.85	0.83	0.86	0.79	5.72
13	0.68	0.82	0.81	0.81	0.80	0.83	0.79	5.54
14	0.74	0.78	0.76	0.82	0.79	0.84	0.75	5.48
15	0.70	0.82	0.82	0.86	0.86	0.82	0.81	5.70
16	0.81	0.80	0.79	0.85	0.83	0.79	0.76	5.64
17	0.76	0.81	0.80	0.83	0.84	0.81	0.82	5.67
18	0.71	0.76	0.83	0.75	0.84	0.81	0.83	5.53
19	0.69	0.63	0.76	0.73	0.76	0.73	0.75	5.06
20	0.67	0.66	0.66	0.67	0.66	0.74	0.78	4.85
21	0.60	0.57	0.60	0.61	0.65	0.66	0.67	4.36
22	0.52	0.53	0.49	0.49	0.50	0.62	0.61	3.78
23	0.42	0.41	0.38	0.43	0.44	0.48	0.50	3.06
Total	13.52	14.21	14.20	14.47	14.37	14.55	14.67	100.00

Table 3 presents the temporal pattern of demand for 911 GTA service. Each cell represents the percentage of 911 responses that occurred during that day of week and hour of day, with red colors representing higher demand. Demand analysis can inform needs for staffing, scheduling, and resource allocation.

15% of GTA 911 responses occurred on Saturdays, which was the busiest day of the week. 56% of GTA 911 responses occurred between the hours of 10AM-8PM.

SCENE LOCATION, 911 RESPONSES

Figure 6. Scene location, All 911 responses (N=108,238), GTAs, 2022



911 RESPONSES, NO TRANSPORT

Table 4. Reason for 911 responses with no patient transport, GTAs, 2022

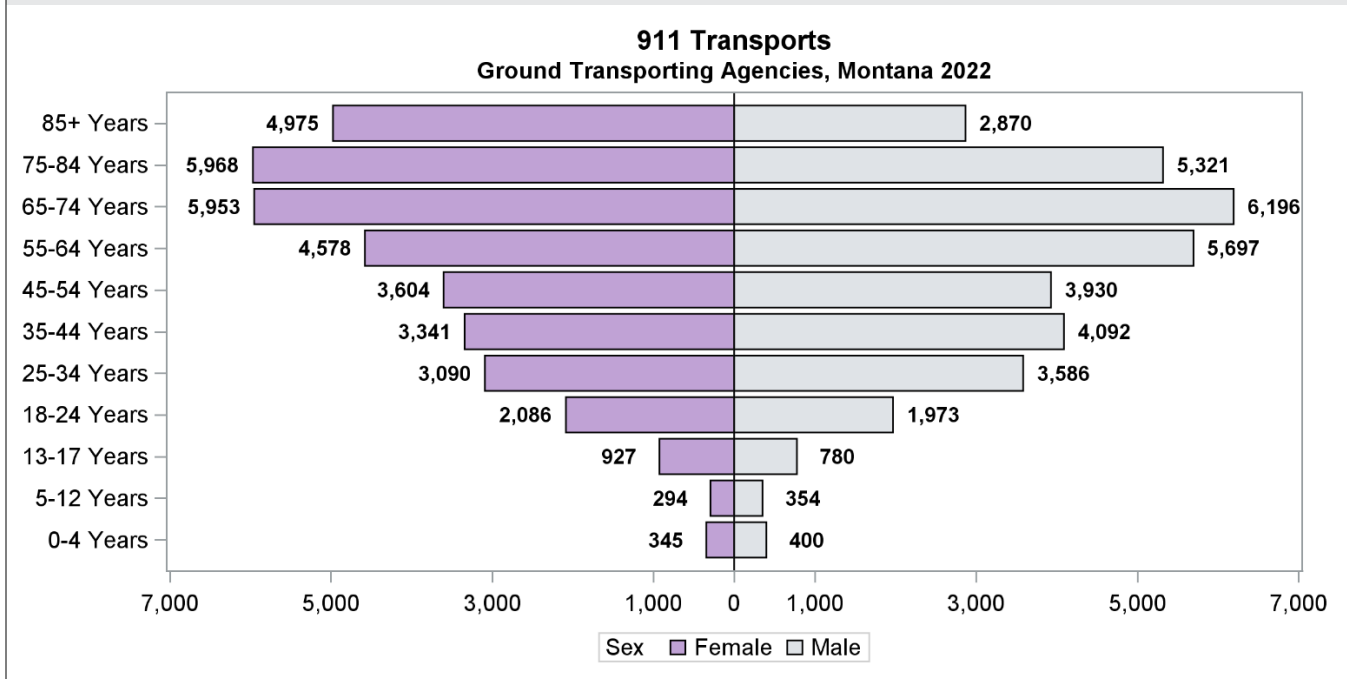
Reason for no patient transport	N	%
Canceled call	11,980	32%
Patient refusal	11,754	31%
Patient evaluated/treated, released (per protocol)	5,701	15%
Patient treated, transferred care to another EMS unit	4,150	11%
Assist/standby/non-patient transport (ie- organs)	2,263	6%
Patient dead at scene, no transport	1,520	4%
All	37,368	100%

37,368 GTA 911 responses did not result in patient transport. Canceled calls and patient refusals accounted for 63% of 911 responses with no patient transport (Table 4). The overall cancelled call rate in 2022 (11.0%) for 911 responses was similar to 2020 (10.9%) and 2021 (10.6%).

PATIENT DEMOGRAPHICS, 911 TRANSPORTS

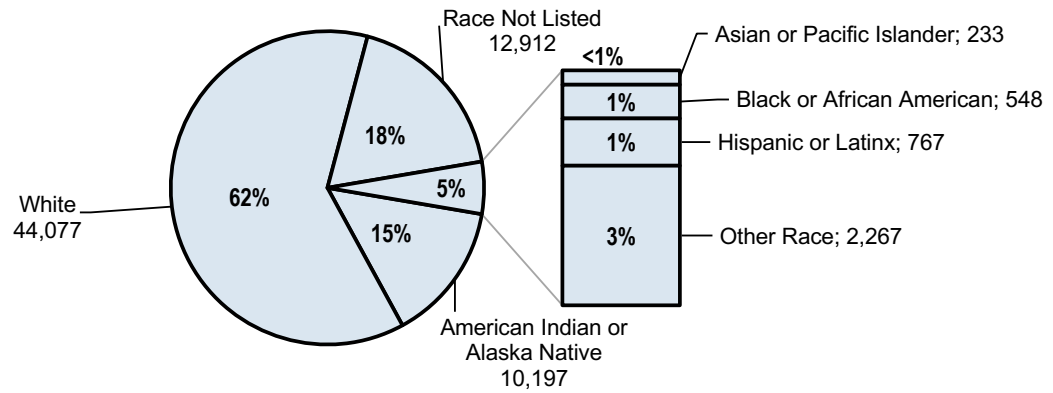
In 2022, patients aged 55 years and older comprised nearly 60% of all GTA 911 transports (Figure 7), which is significant because they make up only 33% of Montana’s general population.

Figure 7. Age-sex pyramid*, 911 transports, GTAs, 2022



GROUND TRANSPORTING AGENCIES

Figure 8. Patient race/ethnicity distribution, 911 transports (N=70,870), GTAs, 2022



*The data field "Patient Race" allows for multiple selections, therefore the sum may be greater than 100%.

PRIMARY IMPRESSION, 911 TRANSPORTS

Table 5. Top 10 primary impressions^b, 911 transports (N=70,870)*, GTAs, 2022

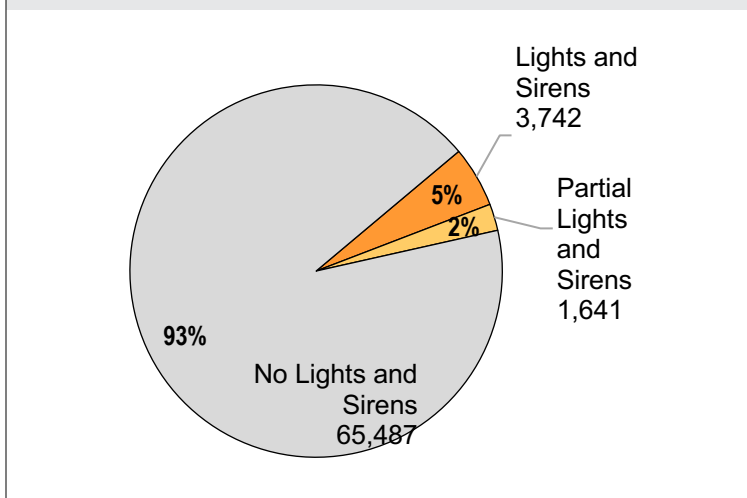
#	Primary Impression Pediatrics (Age 0-17)	N	%	Primary Impression Adults (Age 18 and Over)	N	%
1	Injury	934	30%	Injury	12,028	18%
2	Neurological/LOC	579	19%	Neurological/LOC	10,669	16%
3	Mental Health/Behavioral	391	13%	Abdominal, Digestive, Gastrointestinal	6,961	10%
4	Respiratory	181	6%	Respiratory	6,679	10%
5	Alcohol, Drug, or Other Substance Exposure	166	5%	Cardiovascular/Circulatory	5,795	9%
6	Pain	147	5%	Pain	5,771	9%
7	Abdominal, Digestive, Gastrointestinal	132	4%	Malaise	4,785	7%
8	Environment	77	2%	Alcohol, Drug, or Other Substance Exposure	4,188	6%
9	Observation/Exam	51	2%	Mental Health/Behavioral	4,156	6%
10	Illness, Fever, Other Infectious Diseases	46	1%	Endocrine, Nutritional, Metabolic	1,407	2%
	All Top 10	2,704	87%	All Top 10	62,439	92%
	Other	147	5%	Other	4,662	7%
	Missing Impression	260	8%	Missing Impression	404	1%
	Total (Patient Age 0-17)	3,111	100%	Total (Patient Age 18 and Over)	67,505	100%

*Of 70,870 GTA 911 transports, 254 were missing age and were excluded from Table 5.

Injury/Trauma was the top primary impression for both pediatric (30%) and adult (18%) 911 transports. Among pediatrics aged 0-17 years, Neurological/Level of Consciousness (LOC) complaints accounted for 19% of 911 transports, followed by Mental Health/Behavioral (13%). Among adults aged 18 and over, Neurological/LOC (16%) and Abdominal /Digestive/Gastrointestinal (10%) were the second and third most common primary impressions.

LIGHTS AND SIRENS, 911 TRANSPORTS

Figure 9. Lights and sirens during patient transport, 911 transports (N=70,870) GTAs, 2022



In 2022, 5.3% of GTAs used lights and sirens during patient transports. This shows improvement over previous years (2020: 6.0%, 2021: 5.9%).

^b Primary Impression ICD-10-CM codes grouping

PRIMARY IMPRESSION, 911 TRANSPORTS

Table 6. Primary Impression for 911 transports with lights and sirens during patient transport, GTAs, 2022

Primary Impression category	N	%
Injury/Trauma	767	20%
Cardiovascular/Circulatory	685	18%
Neurological	593	16%
Respiratory	387	10%
Level of Consciousness	385	10%
Other	925	25%
Lights and Sirens Total	3,742	100%

3,742 GTA 911 transports (5%) used lights and sirens during patient transport. The majority of these were Injury/Trauma patients (20%), followed by Cardiovascular/Circulatory (18%).

RESPONSE TIMES FOR PAID AND VOLUNTEER AGENCIES, 911 TRANSPORTS

Figure 10. Median and 90th percentile response times, 911 transports (N=59,948), Paid GTAs, 2022

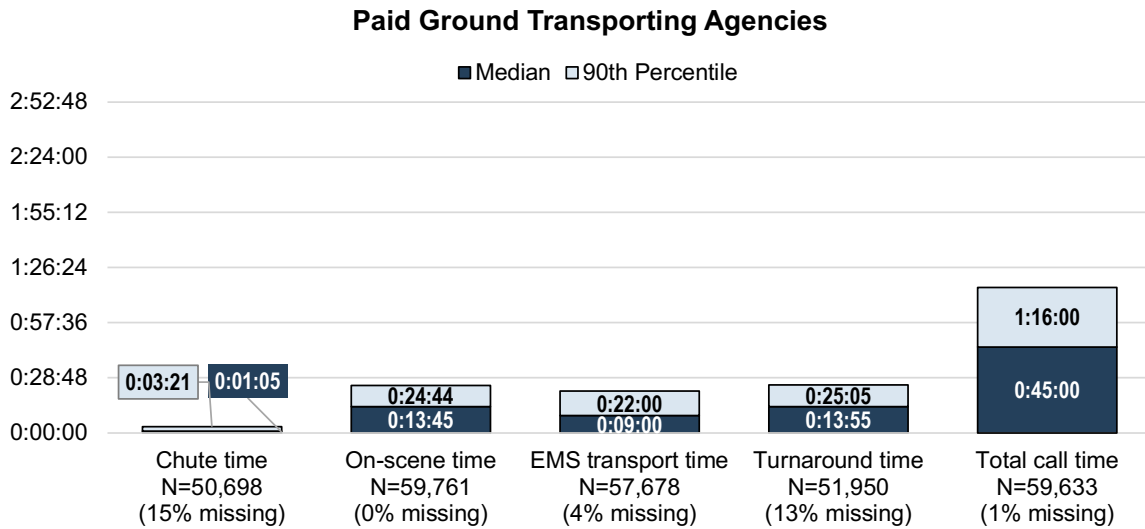
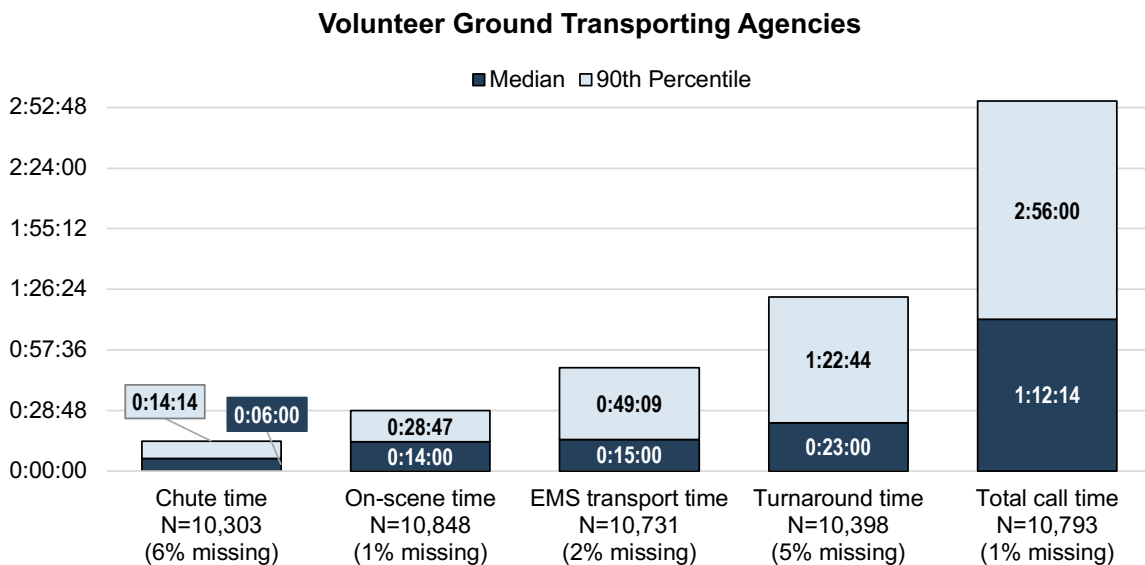


Figure 11. Median and 90th percentile response times, 911 transports (N=10,922), Volunteer GTAs, 2022



Of 70,870 GTA 911 transports, 85% (N=59,948) were by paid GTAs and 15% (N=10,922) by volunteer GTAs. Similar to findings from past years, the 90th percentile chute time was four times longer for volunteer (14m 14s) compared to paid GTAs (3m 21s). 90th percentile on-scene time was comparable for both, around 25-29 minutes. 90th percentile EMS transport time was over twice as long for volunteer agencies (49m) versus paid (22m). Turnaround time was over three times as long for volunteer agencies (1h 23m) versus paid (25m). Total call time was 2.3 times longer for volunteer agencies (2h 56m) than paid (1h16m).

DISTANCES TRAVELED, 911 TRANSPORTS

Table 7. Distance traveled to the scene, 911 transports, GTAs, 2022

	Median Distance (Miles)	90 th Percentile Distance (Miles)	N	% Missing Data
Paid or Volunteer Agency				
Paid Agencies	3.0	19.0	9,273	85%
Volunteer Agencies	2.2	16.9	5,065	54%
Scene County				
Small Metro	5.6	20.2	272	99%
Micropolitan	3.0	10.0	4,477	76%
Non-core (Rural)	2.4	21.0	9,422	55%
Missing County	7.0	24.8	167	94%
All	2.7	18	14,338	80%

Table 8. Distance traveled from scene to destination, 911 transports, GTAs, 2022

Paid or Volunteer Agency				
Paid Agencies	3.1	13.6	55,699	7%
Volunteer Agencies	9.1	39.0	9,658	12%
Scene County				
Small Metro	3.2	7.9	26,756	6%
Micropolitan	4.0	16.0	17,916	4%
Non-core (Rural)	2.5	30.0	18,267	13%
Missing County	6.7	22.5	2,418	9%
All	3.4	19.5	65,357	8%

The majority of 911 transports (80%) were missing data on distance traveled to the scene, however, volunteer and rural agencies tend to document this information more consistently than paid or urban agencies. In contrast, distance traveled from scene to destination (patient transport distance) was missing in 8% of 911 transports. Volunteer agencies transport 911 patients nearly 3 times as far as paid agencies. The 90th percentile distance for volunteer agencies was 39.0 miles, and for paid agencies it was 13.6 miles. In addition, the 90th percentile 911 patient transport distance is longer when the incident location (scene) is in a rural county (30.0 miles) versus small metro county (7.9 miles).

DEMAND ANALYSIS, INTERFACILITY AND MEDICAL TRANSPORT RESPONSES

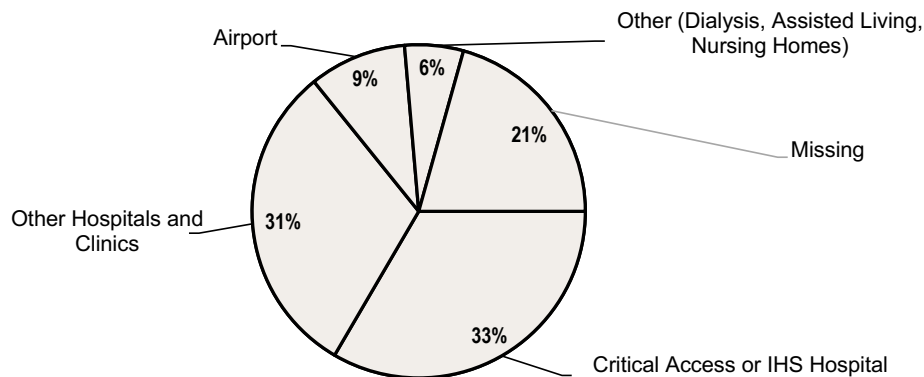
Table 9. IFMT response demand analysis showing percentage of total N=26,123, All IFMT responses, GTAs, 2022

Hour of Day	Day of Week							Total
	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	
0	0.46	0.40	0.42	0.44	0.46	0.40	0.44	3.01
1	0.38	0.28	0.27	0.29	0.25	0.32	0.33	2.12
2	0.31	0.28	0.30	0.23	0.28	0.26	0.37	2.04
3	0.20	0.29	0.23	0.23	0.20	0.24	0.30	1.69
4	0.18	0.19	0.23	0.17	0.19	0.13	0.21	1.29
5	0.19	0.20	0.16	0.16	0.23	0.18	0.17	1.29
6	0.23	0.24	0.26	0.24	0.26	0.22	0.24	1.69
7	0.29	0.33	0.36	0.34	0.33	0.38	0.33	2.35
8	0.28	0.52	0.61	0.66	0.66	0.50	0.36	3.59
9	0.36	0.69	0.86	0.77	0.82	0.86	0.45	4.81
10	0.46	0.88	1.05	1.05	1.01	1.05	0.59	6.09
11	0.55	1.00	1.10	1.08	1.09	1.11	0.66	6.60
12	0.66	1.03	1.13	1.03	1.21	1.16	0.77	6.98
13	0.59	1.13	1.09	1.13	1.11	1.07	0.75	6.86
14	0.66	1.10	1.06	1.06	1.19	1.17	0.75	6.99
15	0.59	1.03	1.19	1.01	1.13	1.16	0.68	6.78
16	0.54	1.10	0.97	0.90	0.95	0.96	0.76	6.19
17	0.66	0.90	0.88	0.83	0.87	0.84	0.65	5.65
18	0.55	0.70	0.70	0.67	0.76	0.83	0.55	4.75
19	0.51	0.68	0.49	0.63	0.61	0.70	0.65	4.27
20	0.60	0.64	0.53	0.57	0.70	0.71	0.61	4.37
21	0.51	0.58	0.63	0.56	0.62	0.57	0.56	4.03
22	0.42	0.44	0.52	0.52	0.61	0.52	0.54	3.58
23	0.46	0.46	0.38	0.42	0.44	0.44	0.37	2.96
Total	10.63	15.08	15.43	15.00	15.96	15.80	12.10	100.00

Table 9 presents the temporal pattern of demand for IFMT service among GTAs. Each cell represents the percentage of IFMT responses that occurred during that day of week and hour of day, with red colors representing higher demand. Most GTA interfacility and medical transport responses occurred on weekdays, with Thursday as the busiest day (16%). 51% of IFMT responses occurred between the hours of 9AM to 5PM.

SENDING FACILITY, INTERFACILITY AND MEDICAL TRANSPORT RESPONSES

Figure 12. Sending facility, All IFMT responses (N=26,123), GTAs, 2022



PATIENT DEMOGRAPHICS, INTERFACILITY AND MEDICAL TRANSPORTS

Figure 13. Age-sex pyramid*, IFM transports, GTAs, 2022

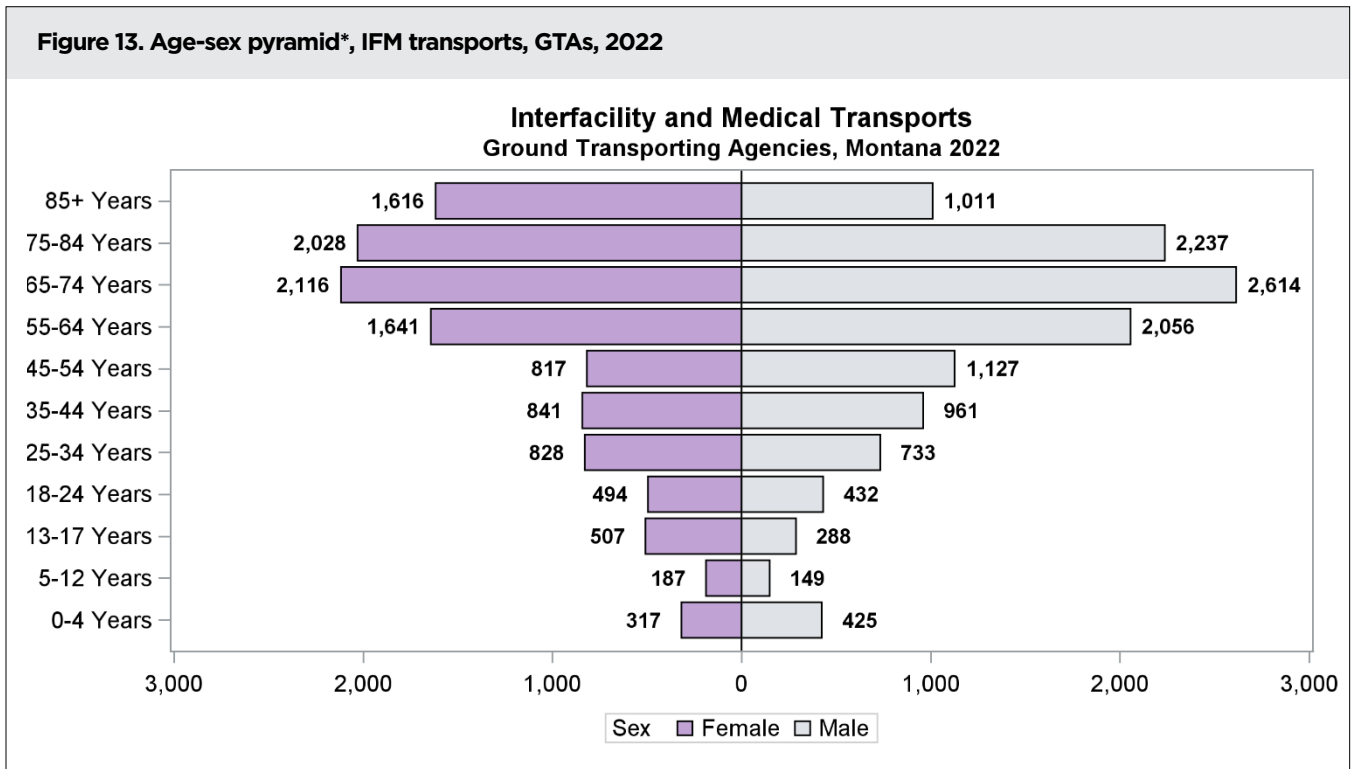
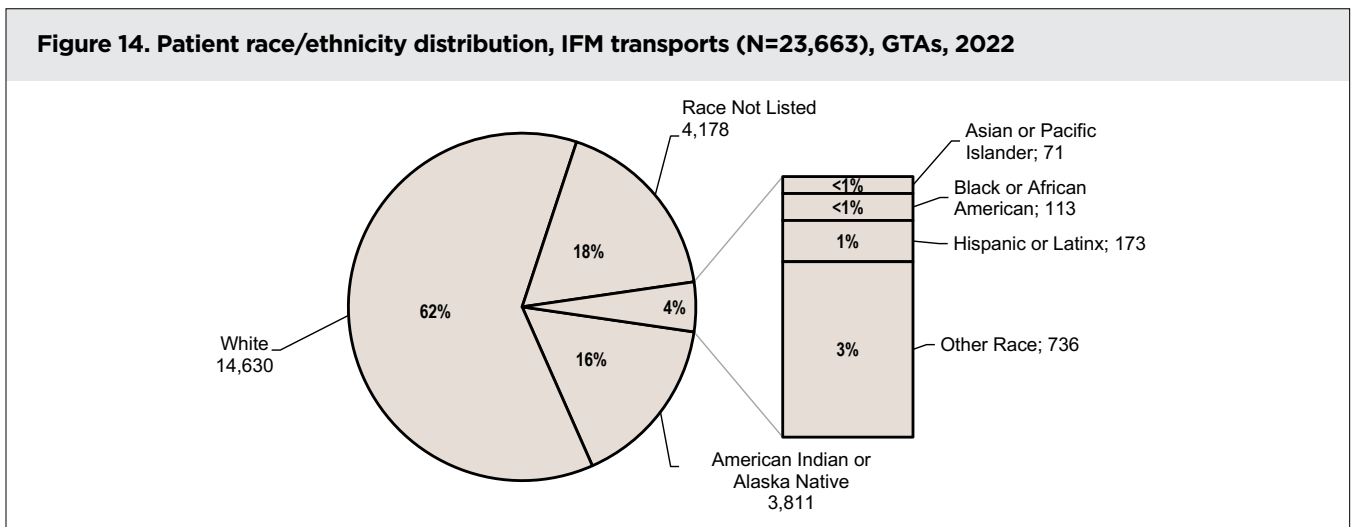


Figure 14. Patient race/ethnicity distribution, IFM transports (N=23,663), GTAs, 2022



*The data field "Patient Race" allows for multiple selections, therefore the sum may be greater than 100%.

PRIMARY IMPRESSION, INTERFACILITY AND MEDICAL TRANSPORTS

Table 10. Top 10 primary impressions, IFM transports where the sending facility was a critical access or Indian Health Service (CAH/IHS) hospital or clinic (N=7,887)*, GTAs, 2022

#	Primary Impression Pediatrics (Age 0-17)	N	%	Primary Impression Adults (Age 18 and Over)	N	%
1	Mental Health/Behavioral	137	20%	Abdominal, Digestive, Gastrointestinal	1,250	17%
2	Abdominal, Digestive, Gastrointestinal	90	13%	Injury	967	14%
3	Respiratory	87	13%	Cardiovascular/Circulatory	898	13%
4	Injury	62	9%	Respiratory	682	10%
5	Neurological/LOC	31	5%	Neurological/LOC	678	9%
6	Illness, Fever, Other Infectious Diseases	27	4%	Pain	467	7%
7	Endocrine, Nutritional, Metabolic	25	4%	Malaise	395	6%
8	Pain	16	2%	Illness, Fever, Other Infectious Diseases	295	4%
9	Alcohol, Drug, or Other Substance Exposure	12	2%	Mental Health/Behavioral	279	4%
10	Obstetric	7	1%	Dependence/Mobility	175	2%
	All Top 10	494	73%	All Top 10	6,086	85%
	Other	25	4%	Other	897	13%
	Missing Impression	160	24%	Missing Impression	170	2%
	Total (Patient Age 0-17)	679	100%	Total (Patient Age 18 and Over)	7,153	100%

*Of 7,887 IFM ground transports sent from CAH or IHS facilities, 55 were missing age and were excluded from Table 10.

Table 11. Top 10 primary impressions, IFM transports where the sending facility was not a CAH/IHS hospital or clinic (N=7,547)*, GTAs, 2022

#	Primary Impression Pediatrics (Age 0-17)	N	%	Primary Impression Adults (Age 18 and Over)	N	%
1	Mental Health/Behavioral	297	51%	Dependence/Mobility	1,257	18%
2	Respiratory	34	6%	Mental Health/Behavioral	848	12%
3	Observation/Exam	22	4%	Malaise	761	11%
4	Abdominal, Digestive, Gastrointestinal	22	4%	Unspecific	619	9%
5	Neurological/LOC	19	3%	Neurological/LOC	587	8%
6	Injury	18	3%	Respiratory	456	7%
7	Malaise	14	2%	Injury	436	6%
8	Unspecific	12	2%	Abdominal, Digestive, Gastrointestinal	371	5%
9	Illness, Fever, Other Infectious Diseases	9	2%	Cardiovascular/Circulatory	354	5%
10	Cardiovascular/Circulatory	7	1%	Pain	350	5%
	All Top 10	454	78%	All Top 10	6,039	87%
	Other	21	4%	Other	859	12%
	Missing Impression	106	18%	Missing Impression	42	1%
	Total (Patient Age 0-17)	581	100%	Total (Patient Age 18 and Over)	6,940	100%

*Of 7,547 IFM ground transports sent from other hospitals or clinics, 26 were missing age and were excluded from Table 11

This analysis compares why patients are transferred from CAH or IHS hospitals, versus from other (typically larger) hospitals, by ground ambulance.

Of 23,663 IFM ground transports, 33% (N=7,887) were sent from CAH or IHS hospitals, and 32% (N=7,547) were sent from other hospitals. 20% (N=4,634) were missing the sending facility name, and 9% (N=2,181) listed airports as the sending facility. The remaining 6% (N=1,414) were sent from facilities such as nursing homes, assisted living, and dialysis. Mental Health/Behavioral complaints were the most common primary impression for pediatric patients, accounting for 31% of all IFM Transports regardless of what type of facility was sending the patient. For adults, when the sending facility was a CAH or IHS hospital, the most common primary impression was Abdominal/Digestive/Gastrointestinal (17%), followed by (Injury/Trauma (14%), and Cardiovascular/Circulatory (13%). When the sending facility was a non-CAH/IHS hospital, the most common primary impressions were Dependence/Mobility (18%) - which are likely non-acute medical transports, and Mental Health/Behavioral (12%).

RESPONSE TIMES FOR PAID AND VOLUNTEER AGENCIES, IFM TRANSPORTS

Figure 15. Median and 90th percentile response times, IFM transports (N=21,204), Paid GTAs, 2022

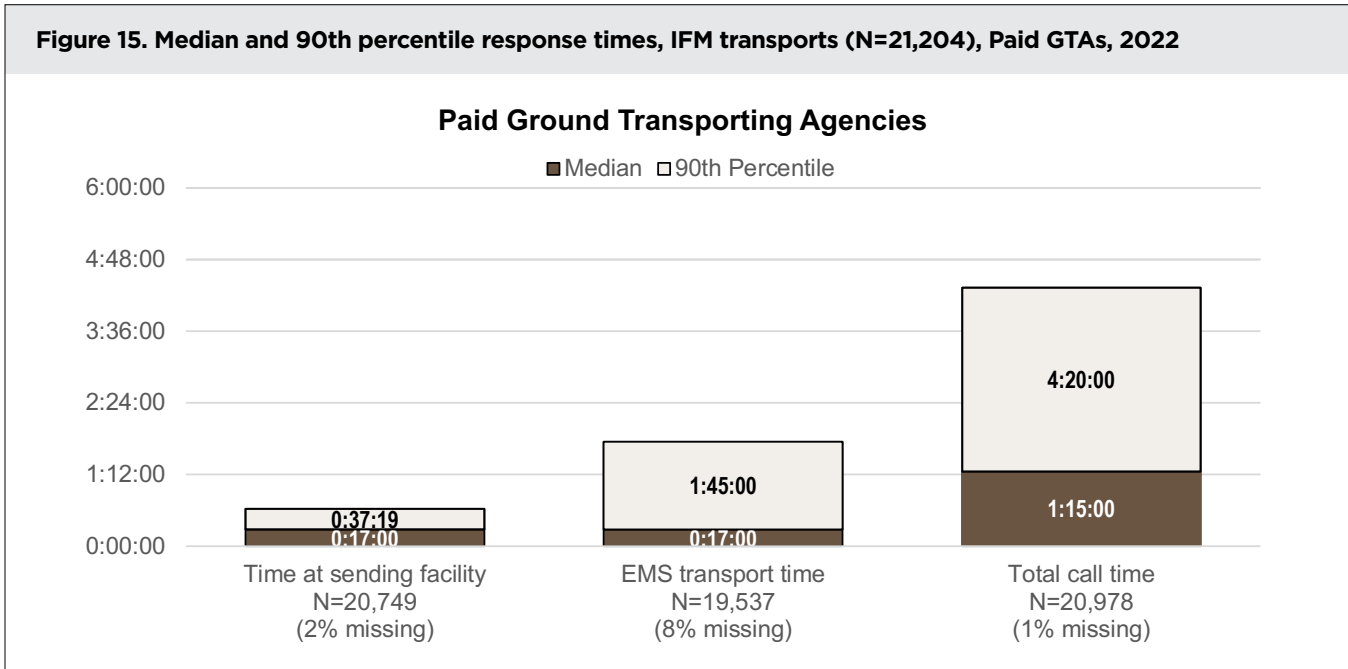
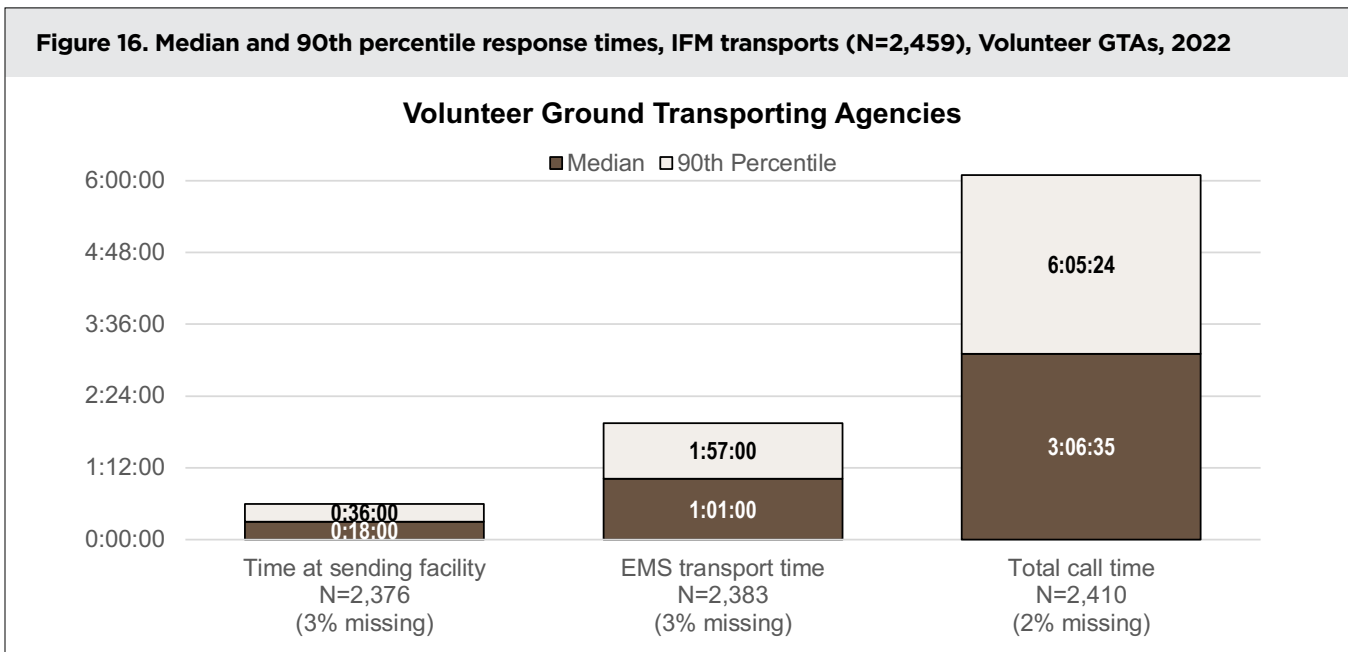


Figure 16. Median and 90th percentile response times, IFM transports (N=2,459), Volunteer GTAs, 2022



Of 23,663 IFM ground transports, 90% (N=21,204) were by paid GTAs and 10% (N=2,459) by volunteer GTAs. Similar to findings from past years, the 90th percentile time spent at sending facility was comparable for both volunteer and paid GTAs, around 36-37 minutes. 90th percentile EMS transport time was also similar for both volunteer and paid GTAs, around 1h 45m- 1h 57m. However, the median EMS transport time was considerably longer for volunteer agencies (1h 1m) versus paid (17m). This indicates that paid agencies skew towards shorter EMS transport times than volunteer agencies. 90th percentile total call time was 1.4 times longer for volunteer agencies and median total call time was 2.5 times longer for volunteer versus paid GTAs.

DISTANCES TRAVELED, INTERFACILITY AND MEDICAL TRANSPORTS

Table 12. Distance traveled to the sending facility, Interfacility and medical transports, GTAs, 2022

	Median Distance (Miles)	90 th Percentile Distance (Miles)	N	% Missing Data
Paid or Volunteer Agency				
Paid Agencies	2.5	45.0	2,591	88%
Volunteer Agencies	1.2	27.1	1,137	54%
Sending Facility County				
Small Metro	57.1	105.0	103	99%
Micropolitan	7.0	28.7	544	91%
Non-core (Rural)	1.0	32.0	3,060	63%
Missing County	1.0	59.0	21	93%
All	1.7	37.0	3,728	84%

Table 13. Distance traveled from sending facility to destination, Interfacility and medical transports, GTAs, 2022

	Median Distance (Miles)	90 th Percentile Distance (Miles)	N	% Missing Data
Paid or Volunteer Agency				
Paid Agencies	6.9	100.0	19,210	9%
Volunteer Agencies	59.3	118.5	2,006	18%
Sending Facility County				
Small Metro	4.0	17.5	8,678	6%
Micropolitan	5.8	91.0	5,175	11%
Non-core (Rural)	57.1	130.0	7,097	14%
Missing County	22.6	126.0	266	18%
All	7.1	101.7	21,216	10%

Most agencies are not documenting the distance traveled to the sending facility for interfacility and medical transports (84% missing overall). Most agencies are documenting patient-loaded travel distance from the sending facility to destination for interfacility and medical transports (10% missing overall). The median distance is 8 times higher for volunteer agencies (59.3 miles) compared to paid agencies (6.9 miles). Patient transport distance is 13 times longer when the sending facility is located in a rural county (57.1 miles) versus a small metro county (4.0 miles).

NON-TRANSPORTING AGENCIES

A total of 22 NTAs submitted data for this report, documenting 6,699 EMS activations during 2022. Nearly all (92%, N=6,242) of the records were submitted by paid NTAs and 8% (N=536) by volunteer NTAs. The number of records submitted by volunteer NTAs doubled in 2022 compared to 2021. However, the majority of the 100 licensed NTAs are not submitting data. The NTAs that did not submit data are mostly small, rural volunteer agencies, therefore, data presented in this section is not representative and should be interpreted with caution.

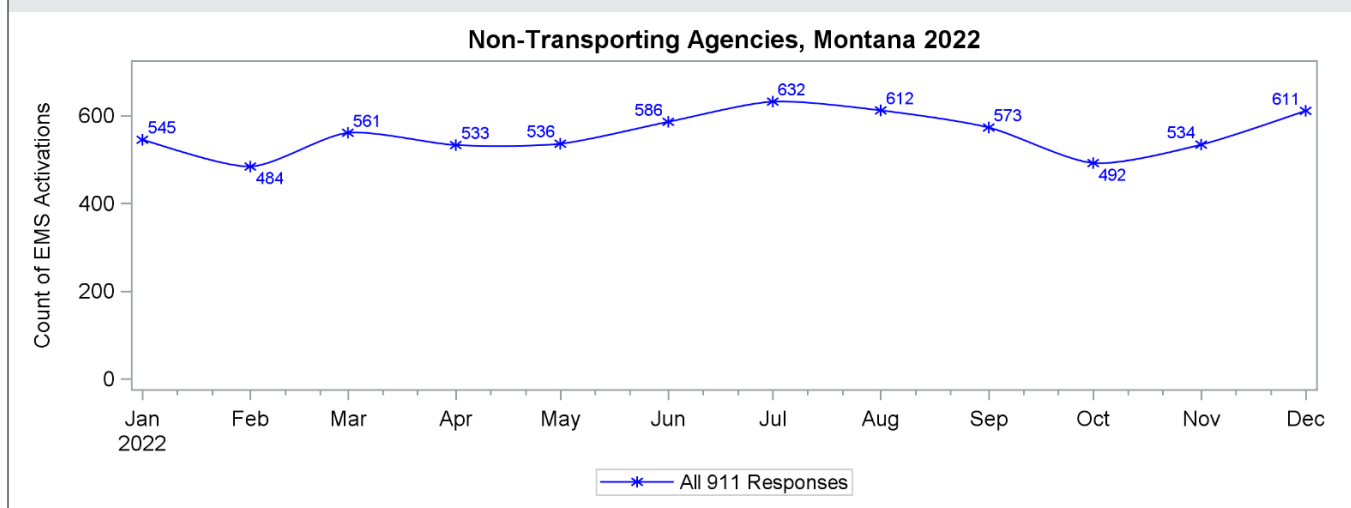
SYSTEM UTILIZATION

Table 14. EMS activations by patient disposition and response type, NTAs, 2022

Patient Disposition	Response Type		All	All (Col %)
	911 Response	Other		
Patient Transported by this EMS Unit	349	2	351	5%
Patient Treated, Transferred Care to Another EMS Unit	2,957	15	2,972	44%
Patient Treated, Released (per protocol)	66	7	73	1%
Patient Treated, Transported by Law Enforcement	9	1	10	0%
Patient Treated, Transported by Private Vehicle	33	1	34	1%
Patient Evaluated, No Treatment/Transport Required	128	9	137	2%
Patient Refusal/AMA, No Transport	348	15	363	5%
Patient Dead at Scene, No Transport	130	0	130	2%
Assist, Standby, or Non-patient Transport	2,665	27	2,692	40%
Canceled Call	14	2	16	0%
All	6,699	79	6,778	100%
All (Row %)	99%	1%	100%	

99% of NTA EMS activations (N=6,699) were 911 responses (Table 14). Approximately 40% (N=2,636) of the 911 responses had patient disposition of “Agency Assist”, which is defined as “This EMS unit only provided assistance (e.g., manpower, equipment) to another agency and did not provide treatment or primary patient care at any time during the incident.”²

Figure 17. System utilization volumes by month, NTAs, 2022



DEMAND ANALYSIS, 911 RESPONSES

Table 15. 911 response demand analysis showing percentage of total N=6,699, NTAs, 2022

Hour of Day	Day of Week							Total
	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	
0	0.33	0.25	0.33	0.39	0.22	0.24	0.28	2.05
1	0.22	0.15	0.21	0.30	0.15	0.18	0.30	1.51
2	0.22	0.18	0.21	0.27	0.07	0.16	0.27	1.39
3	0.19	0.19	0.25	0.22	0.27	0.15	0.18	1.46
4	0.21	0.24	0.21	0.30	0.15	0.34	0.24	1.69
5	0.18	0.27	0.18	0.28	0.22	0.27	0.18	1.58
6	0.37	0.37	0.57	0.46	0.25	0.33	0.30	2.66
7	0.58	0.66	0.67	0.70	0.66	0.63	0.40	4.30
8	0.70	0.72	1.02	0.84	0.84	0.79	0.61	5.51
9	0.57	0.72	0.85	0.79	0.67	0.75	0.81	5.15
10	0.73	0.96	0.90	0.82	0.67	0.82	0.79	5.69
11	1.03	0.82	0.94	0.94	0.88	0.88	0.81	6.30
12	0.97	0.64	1.09	0.96	0.93	0.78	0.82	6.18
13	0.63	0.81	1.07	0.90	0.90	1.06	0.79	6.15
14	0.63	1.00	0.64	0.73	0.79	0.99	0.84	5.61
15	0.67	0.85	1.03	0.90	0.82	1.19	0.61	6.08
16	0.78	0.70	0.91	0.85	0.64	0.73	0.73	5.34
17	0.72	0.81	1.13	0.99	1.00	0.81	0.93	6.37
18	0.78	0.82	0.99	0.88	0.99	1.04	0.67	6.17
19	0.66	0.55	0.75	0.79	0.85	0.60	0.57	4.76
20	0.43	0.78	0.73	0.58	0.45	0.69	0.64	4.30
21	0.78	0.49	0.54	0.58	0.63	0.49	0.82	4.33
22	0.45	0.43	0.48	0.39	0.45	0.36	0.48	3.03
23	0.42	0.37	0.22	0.31	0.37	0.36	0.34	2.40
Total	13.24	13.78	15.91	15.17	13.87	14.63	13.40	100.00

Table 15 presents the temporal pattern of demand for 911 service among NTAs. Each cell represents the percentage of 911 responses that occurred during that day of week and hour of day, with red colors representing higher demand. 16% of NTA 911 responses occurred on Tuesdays, which was the busiest day of the week. 59% of NTA 911 responses occurred between the hours of 10AM to 8PM.

PRIMARY IMPRESSION, 911 RESPONSES

Table 16. Top 10 primary impressions, All 911 responses (N=6,699)*, NTAs, 2022

#	Primary Impression Pediatrics (Age 0-17)	N	%	Primary Impression Adults (Age 18 and Over)	N	%
1	Injury	66	16%	Injury	652	11%
2	Neurological/LOC	50	12%	Neurological/LOC	644	11%
3	Mental Health/Behavioral	29	7%	Cardiovascular/Circulatory	481	8%
4	Respiratory	10	2%	Respiratory	405	7%
5	Abdominal, Digestive, Gastrointestinal	9	2%	Malaise	342	6%
6	Observation/Exam	8	2%	Abdominal, Digestive, Gastrointestinal	261	4%
7	Alcohol, Drug, or Other Substance Exposure	8	2%	Pain	237	4%
8	Environment	7	2%	Mental Health/Behavioral	207	4%
9	Illness, Fever, Other Infectious Diseases	6	1%	Alcohol, Drug, or Other Substance Exposure	157	3%
10	Endocrine, Nutritional, Metabolic	6	1%	Illness, Fever, Other Infectious Diseases	105	2%
	All Top 10	199	49%	All Top 10	3,491	59%
	Other	11	3%	Other	343	6%
	Missing Impression	195	48%	Missing Impression	2,056	35%
	Total (Patient Age 0-17)	405	100%	Total (Patient Age 18 and Over)	5,890	100%

*Of 6,699 NTA 911 responses, 404 were missing age and were excluded from Table 16

PATIENT DEMOGRAPHICS, 911 RESPONSES

Figure 18. Age-sex pyramid*, All 911 responses, NTAs, 2022

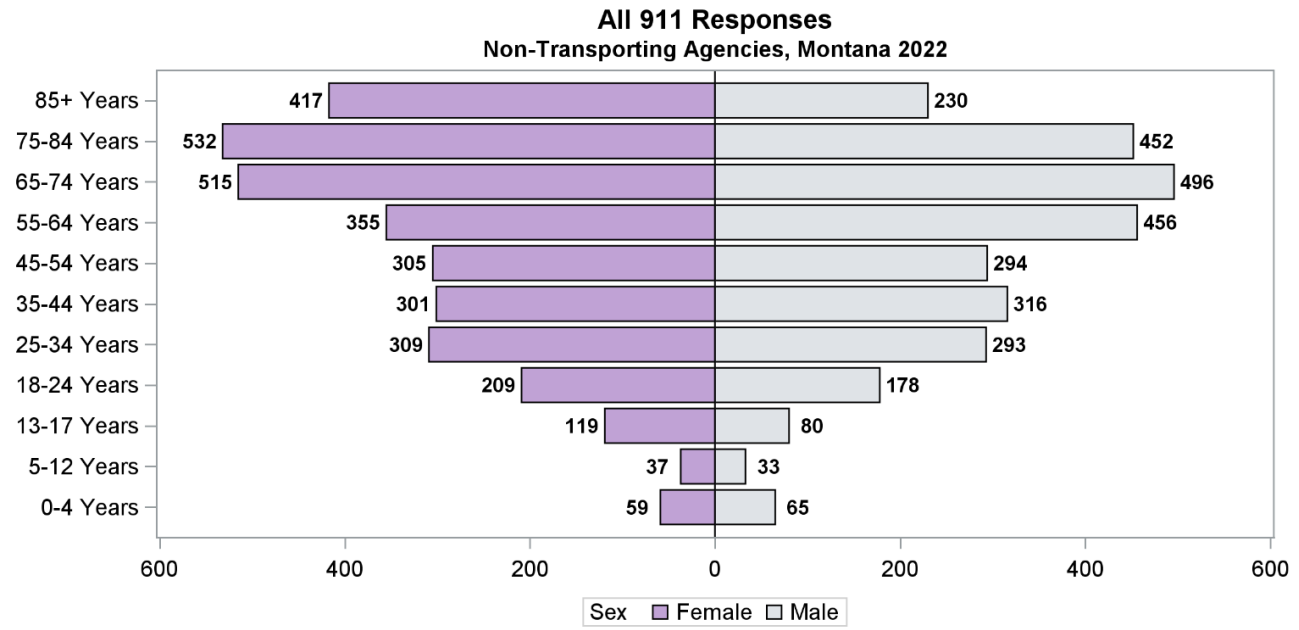
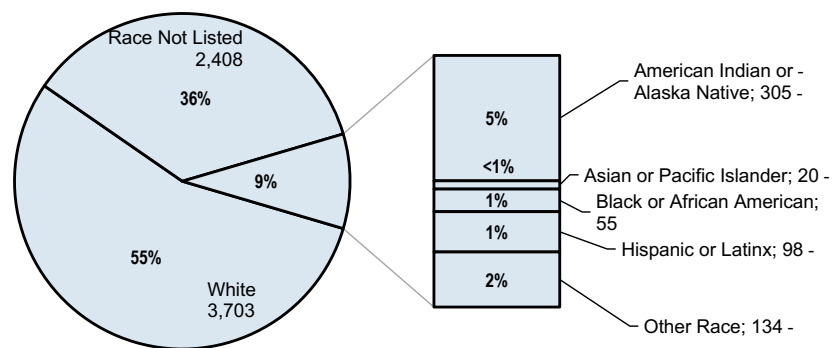


Figure 19. Patient race/ethnicity distribution, All 911 responses (N=6,699), NTAs, 2022



*The data field "Patient Race" allows for multiple selections, therefore the sum may be greater than 100%

RESPONSE TIMES FOR PAID AND VOLUNTEER AGENCIES, 911 RESPONSES

Figure 20. Median and 90th percentile response times, All 911 responses (N=6,193), Paid NTAs, 2022

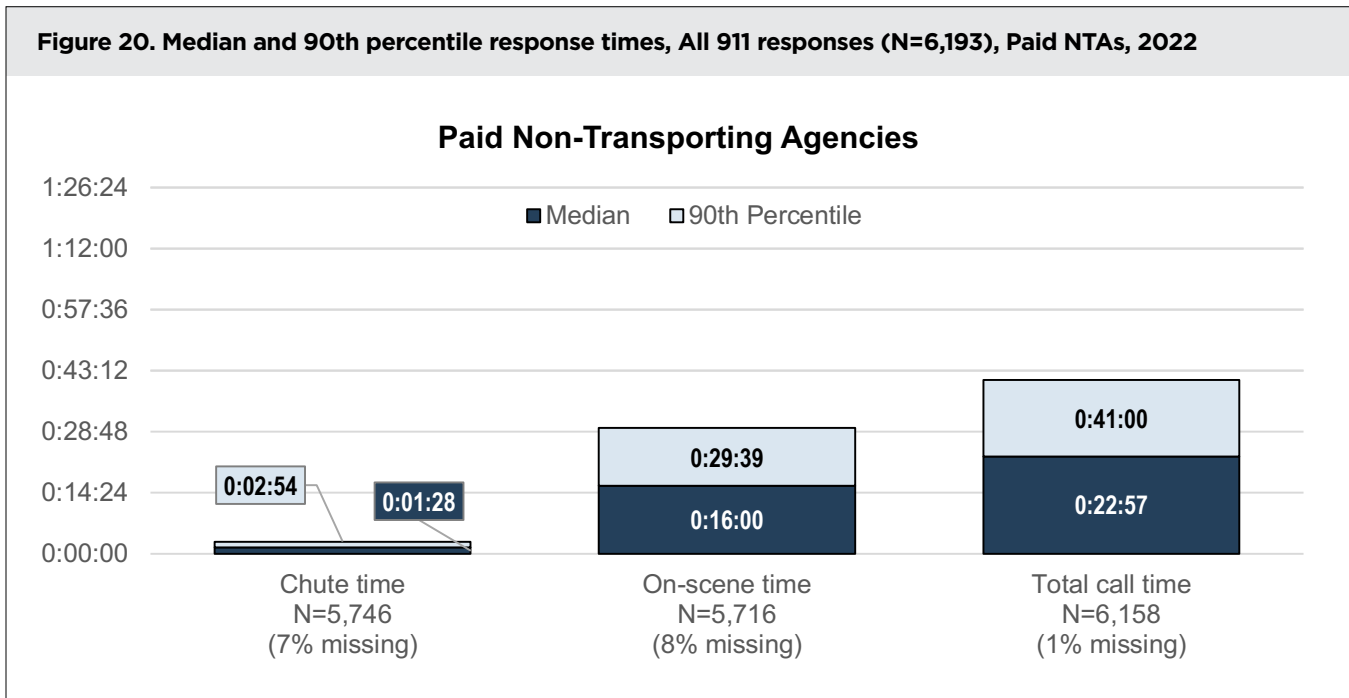
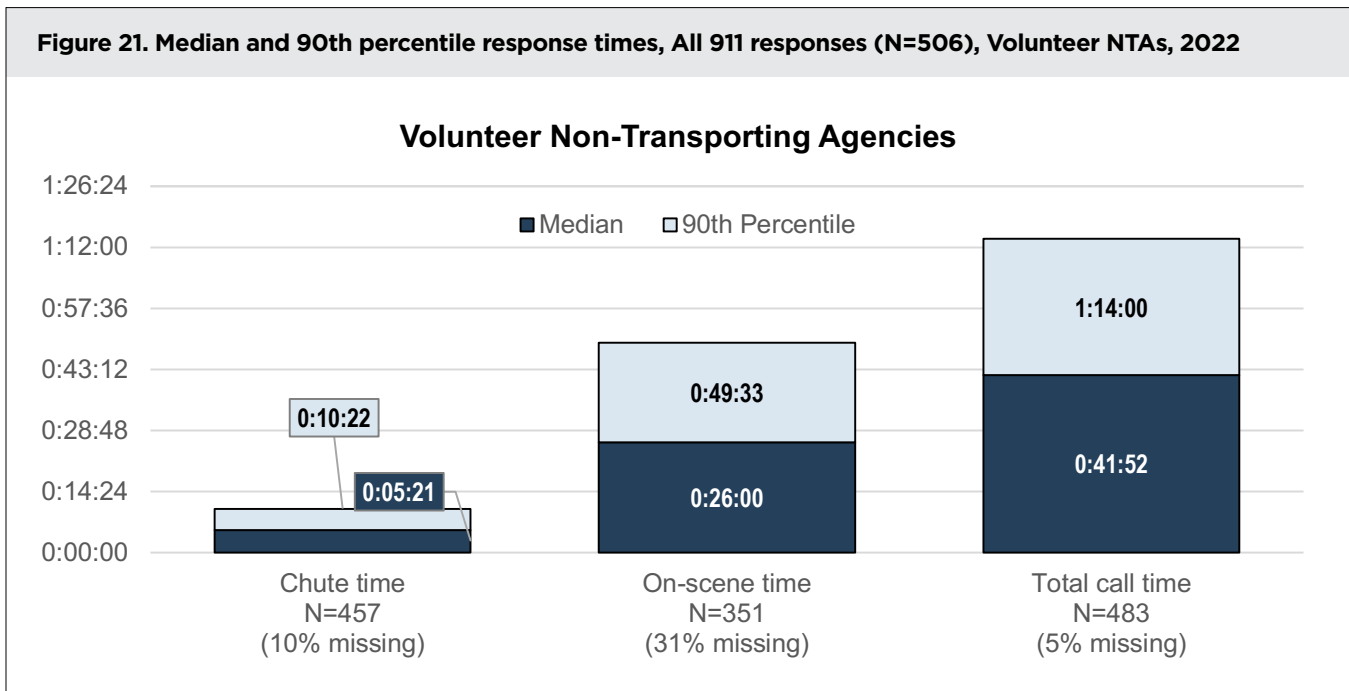


Figure 21. Median and 90th percentile response times, All 911 responses (N=506), Volunteer NTAs, 2022



Of 6,699 GTA 911 responses, 92% (N=6,193) were by paid agencies and 8% (N=506) by volunteer agencies. 90th percentile chute time was over three times longer for volunteer (10m) compared to paid NTAs (2m 54s). 90th percentile on-scene time was 1.7 times longer for volunteer NTAs (50m) compared with paid (30m). Total call time was nearly 2 times longer for volunteer NTAs (1h 14m) than paid (41m).

AIR MEDICAL AGENCIES

A total of 14 AMAs (6 rotor wing and 8 fixed wing) submitted data for this report, documenting 6,809 EMS activations during 2022. 43% (N=2,906) of the records were submitted by RWAs and 57% (N=3,903) by FWAs.

SYSTEM UTILIZATION

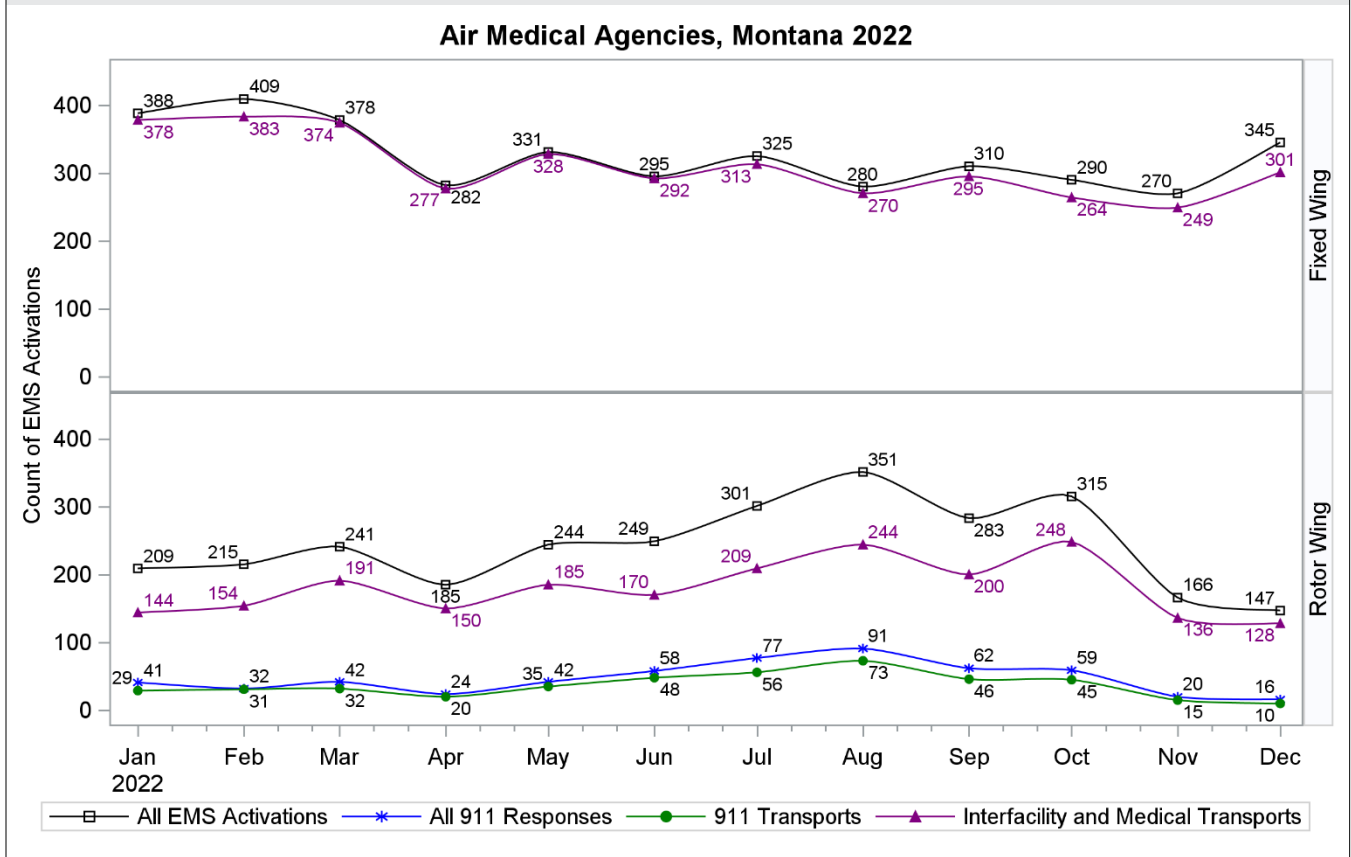
Table 17. EMS activations by patient disposition and response type, Fixed and rotor wing AMAs, 2022

Patient Disposition	Rotor Wing				All (Col %)
	911 Response	IFMT Response	Other	All RWA	
Patient Transported by this EMS Unit	440	2,159	94	2,693	93%
Patient Treated, No Transport (per protocol)	4	3	0	7	0%
Patient Evaluated, No Treatment/Transport Required	0	0	0	0	0%
Patient Refusal/AMA, No Transport	22	0	1	23	1%
Patient Dead at Scene, No Transport	26	5	3	34	1%
Assist, Standby, or Non-patient Transport	0	1	10	11	0%
Canceled Call	72	19	47	138	5%
All	564	2,187	155	2,906	100%
All (Row %)	19%	75%	5%	100%	
Patient Disposition	Fixed Wing				All (Col %)
	911 Response	IFMT Response	Other	All FWA	
Patient Transported by this EMS Unit	0	3,724	28	3,752	96%
Patient Treated, No Transport (per protocol)	0	2	0	2	0%
Patient Evaluated, No Treatment/Transport Required	0	0	0	0	0%
Patient Refusal/AMA, No Transport	0	1	0	1	0%
Patient Dead at Scene, No Transport	0	3	1	4	0%
Assist, Standby, or Non-patient Transport	0	0	0	0	0%
Canceled Call	0	144	0	144	4%
All	0	3,874	29	3,903	100%
All (Row%)	0%	99%	1%	100%	0%

Nearly all (95%, N=3,724) FWA activations were IFM transports. Among RWA activations, 75% (N=2,187) were IFMT responses and 19% (N=564) were 911 responses. 78% (N=440) of RWA 911 responses resulted in patient transport (Table 17). The RWA cancellation rate for 911 (scene) responses was 13%, an improvement from 2020 and 2021 when it was 23%-24%. Table 19 details why the remaining 124 patients were not transported following 911 responses.

AIR MEDICAL AGENCIES

Figure 22. System utilization volumes by month, Fixed and rotor wing AMAs, 2022



Rotor wing utilization increased during the summer months. On average there were 325 fixed wing and 242 rotor wing EMS activations per month in 2022.

DEMAND ANALYSIS, ROTOR WING 911 RESPONSES

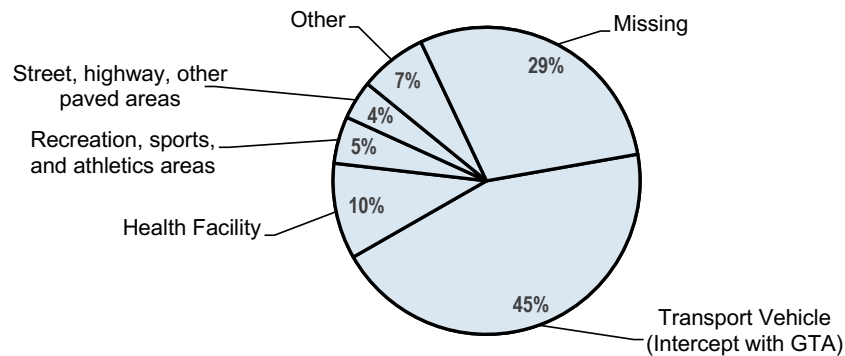
Table 18. 911 response demand analysis showing percentage of total N=546, RWAs, 2022

Hour of Day	Day of Week							Total
	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	
0	0.18	0.35	0.18	0	0.18	0.18	0.18	1.24
1	0.18	0.71	0	0.18	0.71	0.35	0.35	2.48
2	0.18	0.35	0	0	0	0	0.18	0.71
3	0.18	0.35	0	0.18	0.18	0	0.35	1.24
4	0.53	0.53	0.18	0.18	0.35	0	0.35	2.13
5	0	0	0.18	0.18	0.35	0.18	0.53	1.42
6	0.35	0.18	0	0.18	0.71	0.35	0.35	2.13
7	0.18	0.35	0.71	0.35	0.89	0.53	0.53	3.55
8	0.71	0.53	0.18	0.35	0.53	0.18	0.71	3.19
9	1.42	0.71	0.71	0.35	0.53	0.53	0.18	4.43
10	1.06	1.24	0.89	0.35	0.89	1.06	1.77	7.27
11	0.71	0.53	1.24	0.89	0.35	0.53	1.06	5.32
12	0.18	1.24	0.71	1.06	0.89	1.24	1.24	6.56
13	1.24	0.71	0.53	0.89	1.42	1.24	0.89	6.91
14	1.77	1.42	0.35	1.24	0.71	0.71	1.77	7.98
15	1.24	1.06	1.60	0.89	1.06	1.60	0.89	8.33
16	1.06	0.35	1.06	0.53	1.60	0.71	1.06	6.38
17	1.06	1.06	0.53	0.53	0.71	0.71	0.71	5.32
18	0.89	0.35	0.53	0.35	1.06	0.71	0.18	4.08
19	1.60	0.35	0.53	1.24	0.35	0.89	1.24	6.21
20	0	0.35	0.53	0.71	0.35	0.71	1.60	4.26
21	0.71	0.53	0.35	0.53	0.18	0.71	0.89	3.90
22	0.35	0	0.18	0.18	0.53	1.24	0.71	3.19
23	0.35	0.35	0.18	0	0	0.71	0.18	1.77
Total	16.13	13.65	11.35	11.35	14.54	15.07	17.91	100.00

Table 18 presents the temporal pattern of demand for 911 service among RWAs. Each cell represents the percentage of 911 responses that occurred during that day of week and hour of day, with red colors representing higher demand. Saturdays (18%) and Sundays (16%) were the busiest days of the week for rotor wing 911 responses. 64% of rotor wing 911 responses occurred between the hours of 10AM-8PM.

SCENE LOCATION, ROTOR WING 911 RESPONSES

Figure 23. Scene location, All 911 responses (N=564), RWAs, 2022



ROTOR WING 911 RESPONSES WITH NO TRANSPORT

Table 19. Reason for 911 responses with no patient transport, RWAs, 2022

Reason for no patient transport	N	%
Canceled call	72	58%
Patient refusal	22	18%
Patient treated, no transport (per protocol)	4	3%
Patient dead at scene	26	21%
All	124	100%

There were 124 RWA 911 responses that did not result in patient transport. Canceled calls accounted for nearly 60% while patient refusals accounted for 18% (Table 19).

PATIENT DEMOGRAPHICS, ROTOR WING 911 TRANSPORTS

Figure 24. Age-sex pyramid*, 911 transports, RWAs, 2022

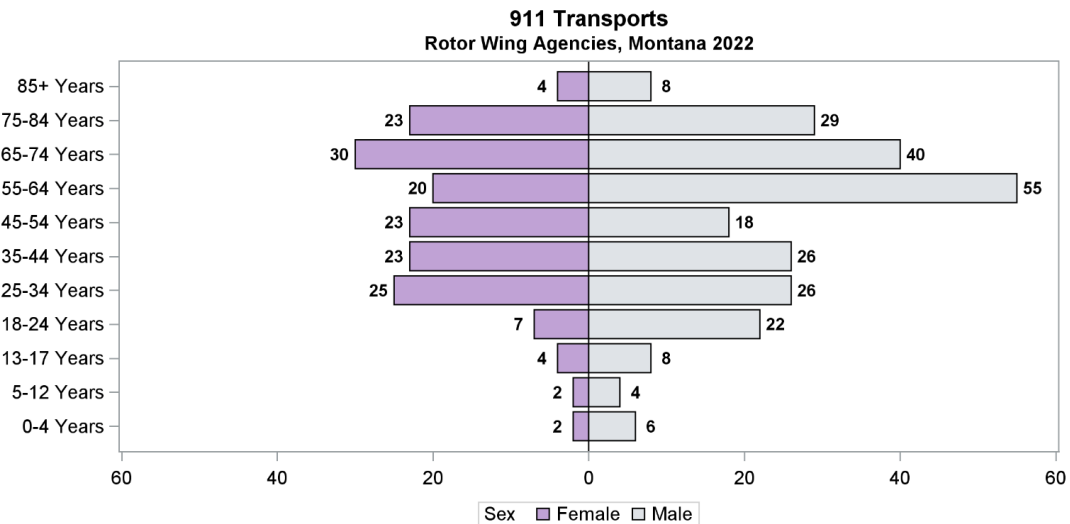
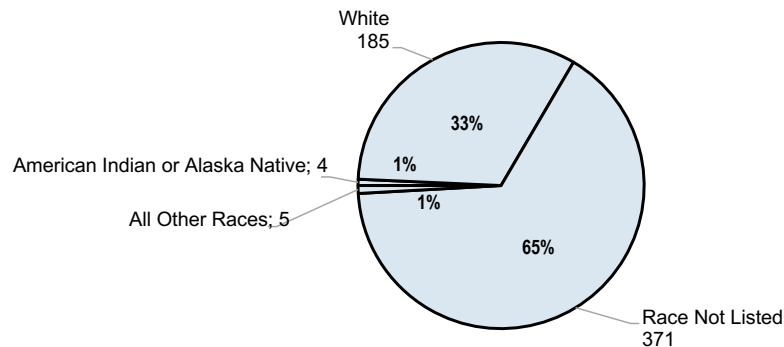


Figure 25. Patient race/ethnicity distribution, 911 transports (N=440), RWAs 2022



*The data field "Patient Race" allows for multiple selections, therefore the sum may be greater than 100%

PRIMARY IMPRESSIONS, ROTOR WING 911 TRANSPORTS

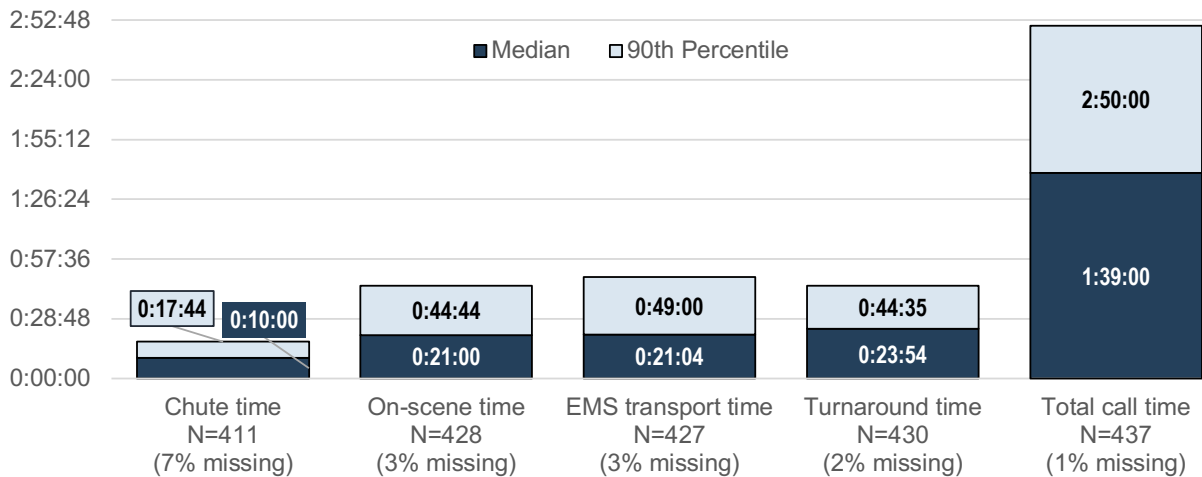
Table 20. Top 10 primary impressions, 911 transports (N=440)*, RWAs, 2022

#	Primary Impression Pediatrics (Age 0-17)	N	%	Primary Impression Adults (Age 18 and Over)	N	%
1	Injury	13	46%	Injury	146	37%
2	Neurological/LOC	5	18%	Neurological/LOC	72	18%
3	Respiratory	2	7%	Cardiovascular/Circulatory	51	13%
4	Environment	2	7%	Pain	18	5%
5	Cardiovascular/Circulatory	2	7%	Respiratory	13	3%
6				Abdominal, Digestive, Gastrointestinal	12	3%
7				Obstetric	5	1%
8				Observation/Exam	5	1%
9				Malaise	4	1%
10				Environment	3	1%
	All Top 10	24	86%	All Top 10	329	83%
	Other	0	0%	Other	11	3%
	Missing Impression	4	14%	Missing Impression	57	14%
	Total (Patient Age 0-17)	28	100%	Total (Patient Age 18 and Over)	397	100%

*Of 440 rotor wing 911 transports, 15 were missing age and were excluded from Table 20.

RESPONSE TIMES, ROTOR WING 911 TRANSPORTS

Figure 26. Median and 90th percentile response times, 911 transports (N=440), RWAs, 2022



DEMAND ANALYSIS, AIR MEDICAL INTERFACILITY AND MEDICAL TRANSPORT RESPONSES

Table 21. IFMT response demand analysis showing percentage of total N=6,061, Fixed and rotor wing AMAs, 2022

Hour of Day	Day of Week							Total
	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	
0	0.46	0.46	0.35	0.33	0.38	0.41	0.46	2.85
1	0.36	0.33	0.31	0.35	0.26	0.21	0.38	2.21
2	0.28	0.38	0.25	0.21	0.31	0.28	0.30	2.01
3	0.28	0.33	0.20	0.13	0.23	0.30	0.18	1.65
4	0.18	0.28	0.16	0.18	0.30	0.23	0.23	1.57
5	0.30	0.15	0.23	0.30	0.16	0.13	0.23	1.50
6	0.41	0.16	0.15	0.23	0.30	0.35	0.28	1.88
7	0.40	0.30	0.36	0.23	0.43	0.56	0.41	2.69
8	0.25	0.53	0.73	0.59	0.59	0.46	0.38	3.53
9	0.89	0.38	0.63	0.74	0.76	0.56	0.45	4.41
10	0.30	0.56	0.56	0.73	0.64	0.79	0.74	4.32
11	0.63	0.84	0.78	0.73	0.81	0.73	0.74	5.25
12	0.79	0.86	0.74	0.86	0.86	0.74	0.78	5.63
13	0.69	0.96	1.04	0.78	0.79	0.96	0.68	5.89
14	0.73	0.76	1.14	0.96	1.04	0.91	0.99	6.52
15	0.64	1.02	0.76	0.74	0.87	0.74	0.86	5.64
16	0.87	0.76	0.91	1.11	0.68	1.09	0.87	6.29
17	0.81	0.91	1.01	1.29	0.87	1.19	0.91	6.98
18	0.78	0.87	0.69	0.78	0.86	0.79	0.91	5.68
19	0.84	0.68	0.71	0.84	0.76	0.97	0.82	5.63
20	0.73	0.59	0.82	0.86	0.82	0.99	0.82	5.64
21	0.58	0.56	0.53	0.89	0.53	1.02	0.61	4.72
22	0.48	0.49	0.56	0.71	0.54	0.79	0.56	4.14
23	0.46	0.49	0.58	0.51	0.43	0.41	0.49	3.38
Total	13.13	13.66	14.19	15.06	14.24	15.62	14.09	100.00

Table 21 presents the temporal pattern of demand for IFM service among AMAs. Each cell represents the percentage of IFMT responses that occurred during that day of week and hour of day, with red colors representing higher demand. Fridays (16%) were the busiest day of the week for air medical interfacility and medical transports. 44% of air medical interfacility and medical transports occurred between the hours of 9AM to 5PM.

PATIENT DEMOGRAPHICS, AIR MEDICAL INTERFACILITY AND MEDICAL TRANSPORTS

Figure 27. Age-sex pyramid*, IFM transports, Fixed and rotor wing AMAs, 2022

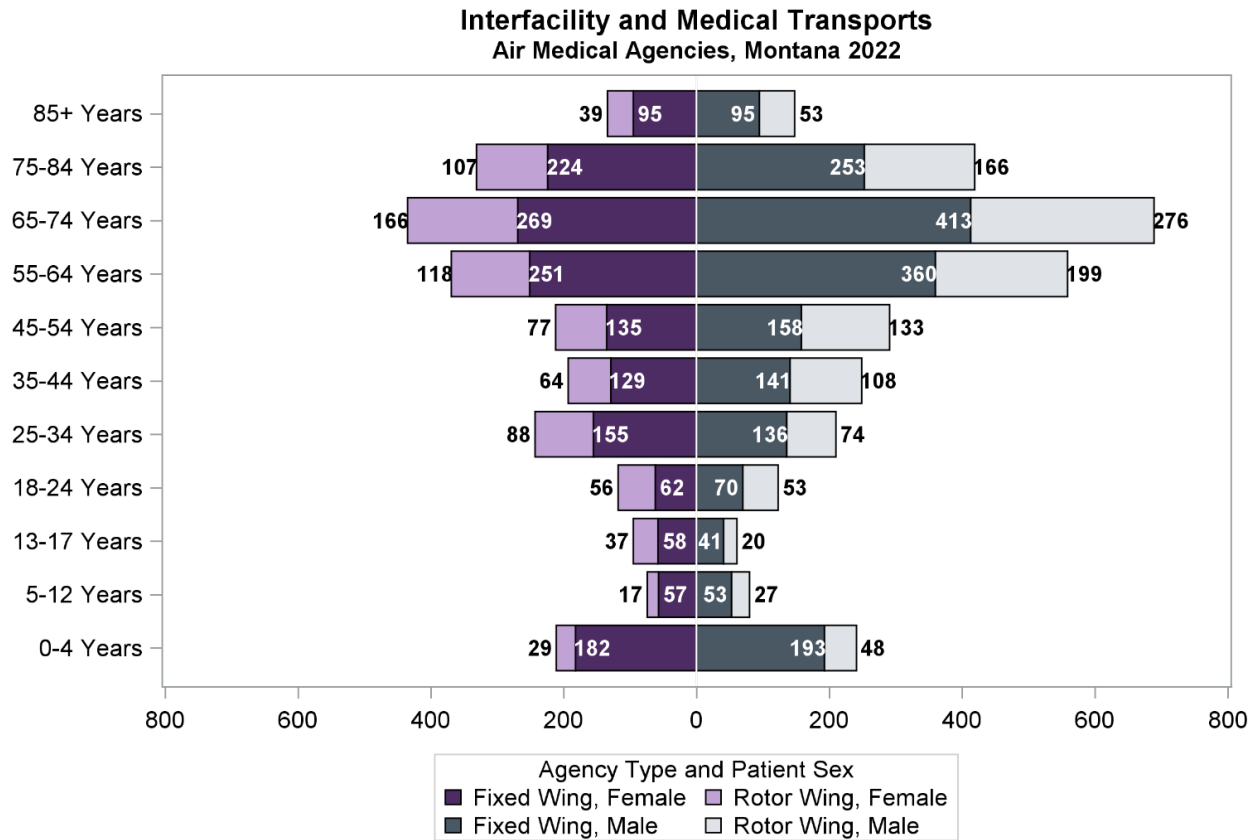
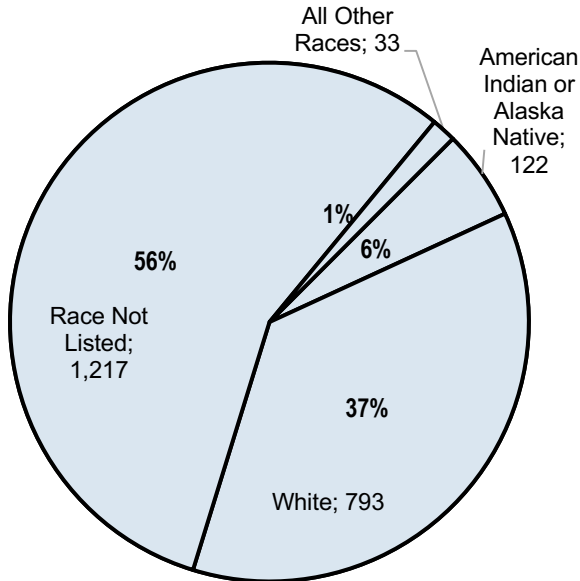
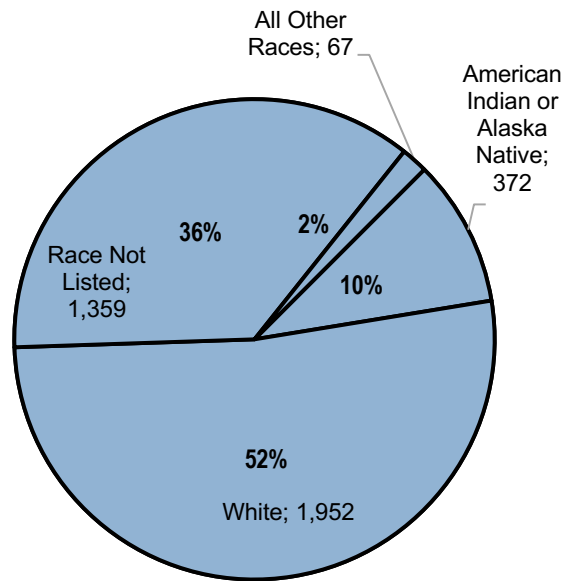


Figure 28. Patient race/ethnicity distribution, IFM transports (N=5,883), Fixed and rotor wing AMAs, 2022

Rotor Wing Agencies (N=2,159)



Fixed Wing Agencies (N=3,724)



*The data field "Patient Race" allows for multiple selections, therefore the sum may be greater than 100%

PRIMARY IMPRESSION, AIR MEDICAL INTERFACILITY AND MEDICAL TRANSPORTS

Table 22. Top 10 primary impressions, IFM transports (N=2,159)*, RWAs, 2022

#	Primary Impression Pediatrics (Age 0-17)		Primary Impression Adults (Age 18 and Over)			
	N	%	N	%		
1	Injury	34	18%	Cardiovascular/Circulatory	355	18%
2	Neurological/LOC	31	16%	Neurological/LOC	347	18%
3	Respiratory	28	15%	Injury	245	13%
4	Abdominal, Digestive, Gastrointestinal	14	7%	Abdominal, Digestive, Gastrointestinal	163	8%
5	Alcohol, Drug, or Other Substance Exposure	10	5%	Respiratory	159	8%
6	Observation/Exam	8	4%	Illness, Fever, Other Infectious Diseases	75	4%
7	Malaise	4	2%	Pain	62	3%
8	Pain	3	2%	Observation/Exam	55	3%
9	Mental Health/Behavioral	2	1%	Obstetric	50	3%
10	Illness, Fever, Other Infectious Diseases	2	1%	Endocrine, Nutritional, Metabolic	27	1%
	All Top 10	136	70%	All Top 10	1,538	79%
	Other	6	3%	Other	83	4%
	Missing Impression	51	26%	Missing Impression	328	17%
	Total (Patient Age 0-17)	193	100%	Total (Patient Age 18 and Over)	1,949	100%

*Of 2,159 rotor wing IFM transports, 17 patients were missing age and were excluded from Table 22.

Table 23. Top 10 primary impressions, IFM transports (N=3,724)*, FWAs, 2022

#	Primary Impression Pediatrics (Age 0-17)		Primary Impression Adults (Age 18 and Over)			
	N	%	N	%		
1	Respiratory	75	12%	Cardiovascular/Circulatory	544	18%
2	Injury	58	9%	Neurological/LOC	480	16%
3	Neurological/LOC	46	7%	Abdominal, Digestive, Gastrointestinal	372	12%
4	Abdominal, Digestive, Gastrointestinal	35	6%	Respiratory	322	11%
5	Illness, Fever, Other Infectious Diseases	18	3%	Injury	317	10%
6	Endocrine, Nutritional, Metabolic	14	2%	Illness, Fever, Other Infectious Diseases	138	5%
7	Malaise	13	2%	Pain	82	3%
8	Cancer	12	2%	Obstetric	75	2%
9	Observation/Exam	10	2%	Malaise	52	2%
10	Pain	8	1%	Mental Health/Behavioral	43	1%
	All Top 10	289	47%	All Top 10	2,425	79%
	Other	31	5%	Other	251	8%
	Missing Impression	295	48%	Missing Impression	377	12%
	Total (Patient Age 0-17)	615	100%	Total (Patient Age 18 and Over)	3,053	100%

*Of 3,724 fixed wing IFM transports, 56 were missing age and were excluded from Table 23.

Of 5,883 air medical IFM transports, 37% (N=2,159) were rotor wing and 63% (N=3,724) were fixed wing. Respiratory complaints accounted for 12%(N=103) of pediatric air medical IFM transports overall, followed by Injury/Trauma (11%, N=92). Among adult patients, Cardiovascular/Circulatory was the most common type of primary impression, accounting for 18% of adult IFM air transports (N=899), followed by Neurological/LOC (16%, N=827) and Injury/Trauma (11%, N=561).

RESPONSE TIMES, AIR MEDICAL INTERFACILITY AND MEDICAL TRANSPORTS

Figure 29. Median and 90th percentile response times, IFM transports, Sending facility= CAH and IHS hospitals and clinics (N=2,998), Fixed and rotor wing AMAs, 2022

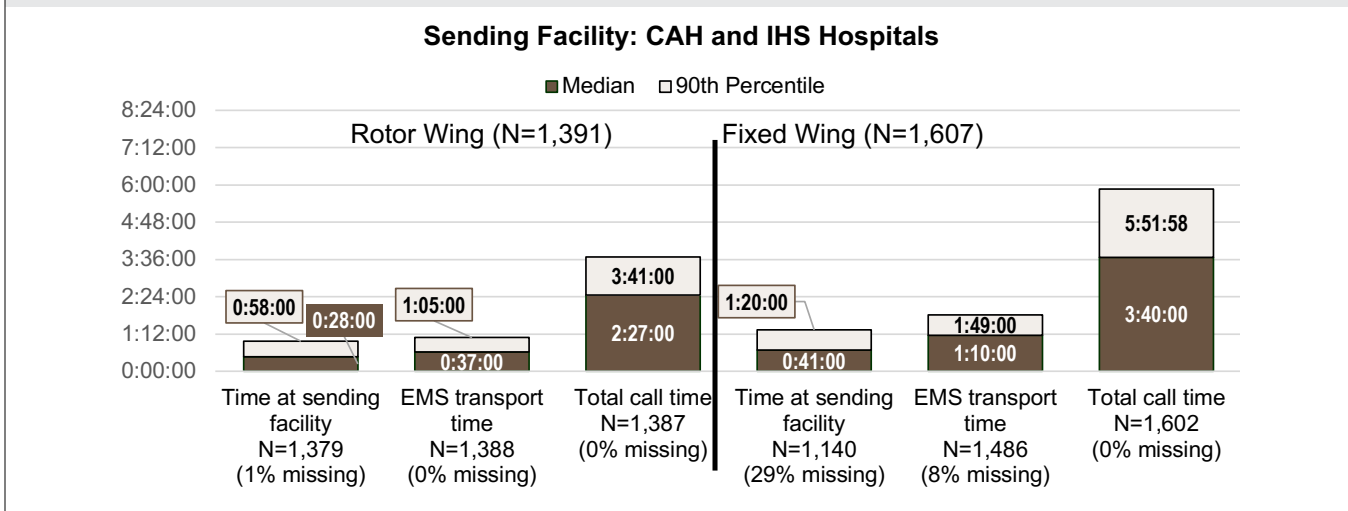
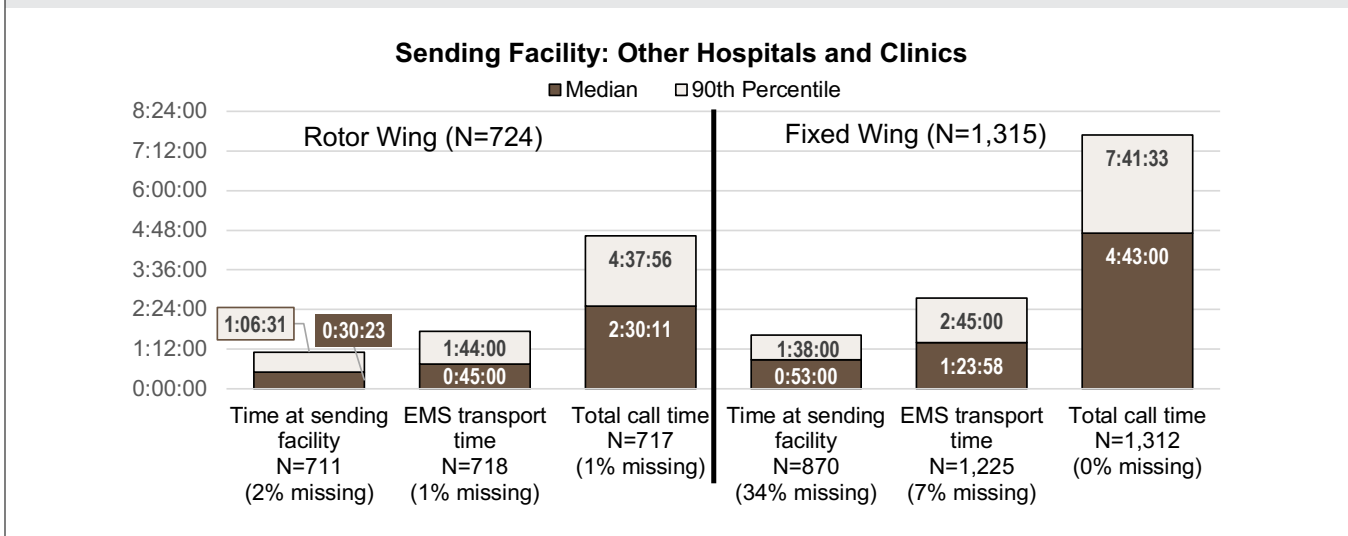


Figure 30. Median and 90th percentile response times, IFM transports, Sending facility= other hospitals and clinics (N=2,039), Fixed and rotor wing AMAs, 2022



Of 2,159 rotor wing IFM transports, 64% originated from CAH or IHS hospitals (N=1,391) and 34% were sent from other hospitals or clinics (N=724). 41 were missing a valid sending facility name, and 3 listed airports as the sending facility. Among RWAs, 90th percentile time spent at sending facility was comparable for all facility types (58-67 min). EMS transport time was also similar for different facility types, around 1h 5m to 1h 44 min.

Of 3,724 fixed wing IFM transports, 43% were sent from CAH or IHS hospitals (N=1,607), and 35% from other hospitals or clinics (N=1,315). 101 were missing a valid sending facility name, and 704 listed airports as the sending facility. Among FWAs, the 90th percentile EMS transport time and total call time were longer when the sending facility was a non-CAH/IHS hospital. This reflects transports going out-of-state originating from larger hospitals.



TIME SENSITIVE ILLNESS AND INJURY

To assist EMS agencies with the development and improvement of their quality improvement activities, this section of the Annual Report focuses on time sensitive illnesses and injuries (TSII). Research shows that care provided by EMS can dramatically improve the outcomes for TSII patients.³⁻⁸ This section of the report covers alcohol and drug exposure, naloxone administration, mental and behavioral health crisis, severe injury, traumatic brain injury, stroke, chest pain/ST-segment myocardial infarction (STEMI), and out-of-hospital cardiac arrest.

ALCOHOL AND DRUG RELATED CALLS^c

In 2021, 54,000 people died of acute alcohol-related causes in the United States⁹, and over 110,000 died of drug overdoses.¹⁰

In Montana during 2022, there were 9,494 EMS activations related to alcohol or drug use, which is known to contribute to motor vehicle crashes (MVCs), homicide, suicide, domestic violence, and other unintentional injuries like drowning. 40% of MVC fatalities in Montana involve alcohol-impaired drivers¹¹, and MVC patients included in the Montana Trauma Registry are more likely to have a serious or critical injury if they had a positive alcohol or drug test.¹²

Figure 31. Alcohol or drug related system utilization volumes by month, GTAs, 2022

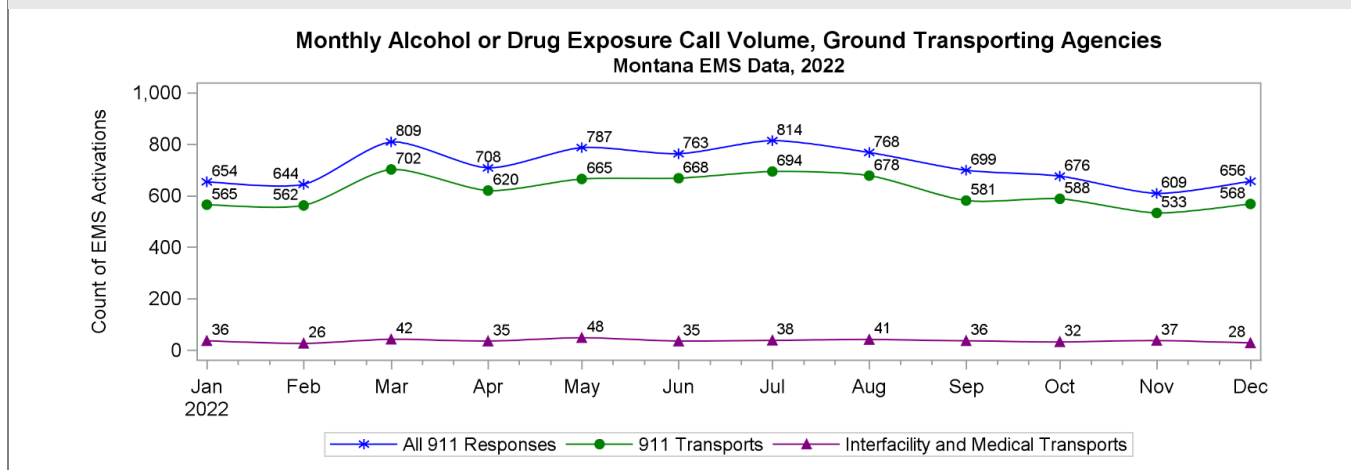
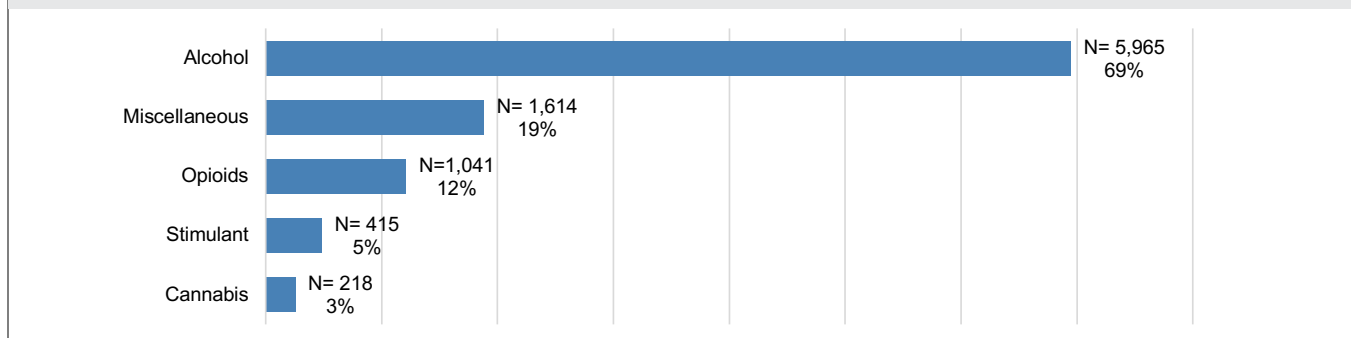


Figure 32. Relative frequency of substances involved, alcohol/drug related 911 responses (N=8,587), GTAs, 2022



^cOne record/call may contain multiple qualifying substance related codes. Therefore, the sum of the indicator totals may be greater than the total number of substance exposure related calls (N=8,587).

Alcohol was involved in 69% (N=5,965) of all substance-related 911 responses. The “Miscellaneous” category includes cases where no specific substance was noted; it also includes sedative/hypnotic/anxiolytics and hallucinogens. Opioids were involved in 12% (N=1,041) of substance exposure-related 911 responses. Naloxone, a medication used for the emergency treatment of a known or suspected overdose, was documented in 436 of the 1,041 opioid-related calls (41.9%).

^cAny Mention of alcohol/drug exposure ICD-10-CM code -subcodes included- (T36-T50, F10-F16, F19, T65.2, T65.9, F55, O35.5, O99.32) in provider primary of secondary impression; or, meets [opioid OD syndrome definition](#)

For more information on opioid overdose related 911 responses please visit the EMS Data on Opioid Overdose 2022 report on the EMSTS webpage.

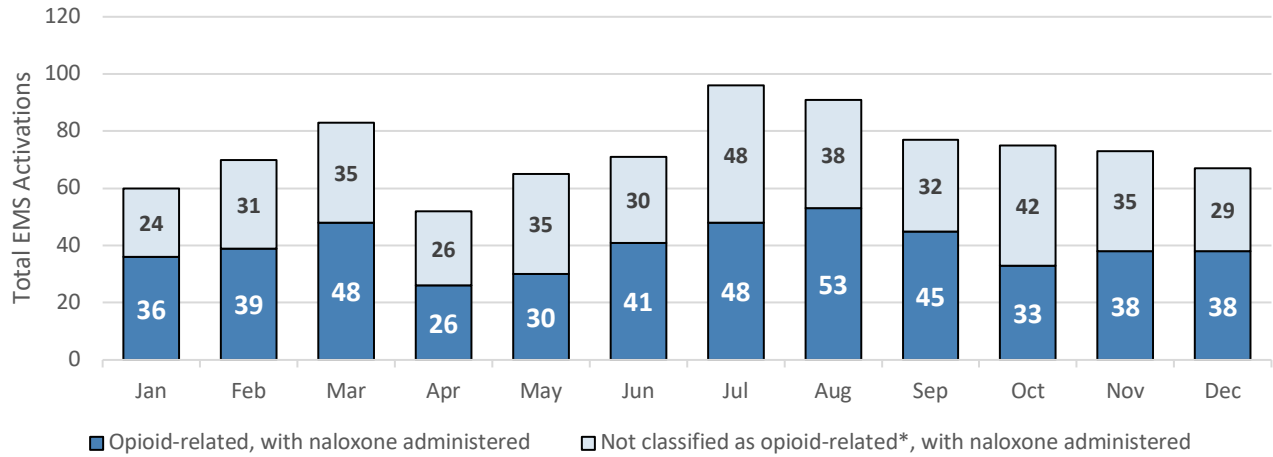
Table 24. Alcohol/drug exposure-related 911 responses, GTAs, 2022		
Patient Disposition	N	%
Patient Transported by this EMS Unit	7,424	86.5%
Patient Treated/Evaluated, No Transport (per protocol)	540	6.3%
Patient Refusal/AMA, No Transport	564	6.6%
Patient Dead at Scene, No Transport	36	0.4%
Other (No Patient Contact)	23	0.2%
Patient Sex		
Female	3,336	38.8%
Male	5,224	60.8%
Not Reported	27	0.3%
Patient Age		
0-17 Years	363	4.2%
18-44 Years	4,559	53.1%
45-64 Years	2,783	32.4%
65+ Years	820	9.5%
Not Reported	62	0.7%
Incident County NCHS Urban-Rural Classification		
Small Metro	4,030	46.9%
Micropolitan	1,839	21.4%
Non-core (Rural)	2,204	25.7%
Not Reported	514	6.0%
Self-Harm Indicated		
Self-harm code	961	11.2%
No self-harm code	7,626	88.8%
Total	8,587	100.0%

NALOXONE ADMINISTRATION

Naloxone is an opioid antagonist medication used for the emergency treatment of a known or suspected opioid overdose. It has limited negative side effects if given to a patient who has not taken opioids, so it is sometimes given to rule out opioid overdose. There was a total of 1,133 naloxone administrations documented during 880 EMS activations during 2022 – nearly half of the activations were not classified as opioid related (N=475, 46%). The most common non-opioid patients who were given naloxone were cardiac, altered level of consciousness, and unspecified overdose.

For more information, please visit the [Naloxone Administration by EMS 2022](#) report on the EMSTS webpage.

Figure 33. Opioid overdose-related versus non-opioid EMS activations with naloxone administered, by month, All EMS agencies, 2022



MENTAL AND BEHAVIORAL HEALTH^d

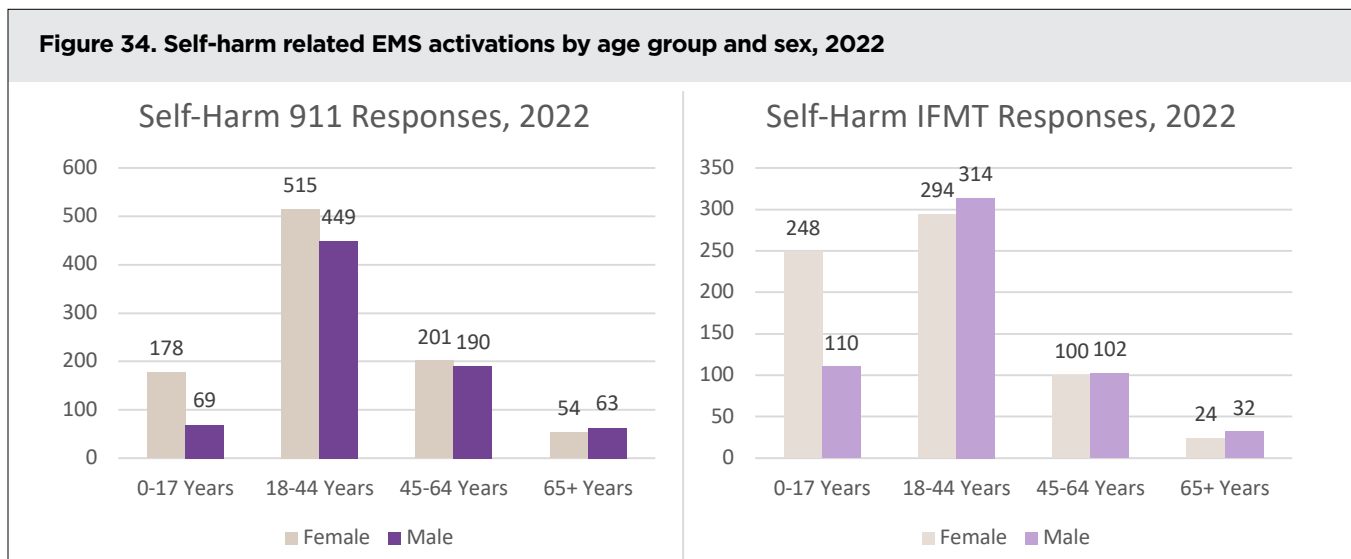
Like other states, Montana has a shortage of behavioral health facilities and licensed mental healthcare providers. Efforts to train first responders, including EMS providers, on recognizing and de-escalating a behavioral health crisis will help to reduce the severity of an event and help the patient to have a better recovery.

There was a total of 8,528 EMS activations due to mental and behavioral health. 71% were 911 responses (N=6,069), while 28% were interfacility or medical transport responses (N=2,401).

Among 911 responses, 40% had an anxiety-related primary impression (N=2,453), while 29% had a primary impression related to self-harm or suicide (N=1,744). Over half of IFMT responses were self-harm or suicide related (51%, N=1,227) while 33% were due to unspecified/miscellaneous mental problems (N=797) (Table 25).

Primary Impression	911 Responses		Interfacility and Medical Transport Responses	
	Count	Percentage	Count	Percentage
Anxiety	2,453	40%	150	6%
Self-Harm	1,744	29%	1,227	51%
Unspecified/Miscellaneous ²	1,285	21%	797	33%
Mood disorder	195	3%	173	7%
Assault	250	4%	53	2%
Psychotic	142	2%	1	0%
All	6,069	100%	2,401	100%

Self-harm related EMS activations showed variation by age and sex. Among pediatric patients (age 0-17 years), there were over twice as many female patients for both 911 and IFMT responses (Figure 34). 1 in 3 interfacility transports for self-harm were patients aged 0-17 years.



^d Provider primary impression is a mental or behavioral health code ([Definitions available online](#))

^e Unspecified/miscellaneous includes “Mental disorder NOS”, “Homicidal and suicidal ideations”, “Other symptoms and signs involving emotional state”, “Strange and inexplicable behavior”, “Visual or Auditory hallucinations”

INJURY/TRAUMA^f

INJURY/TRAUMA-RELATED 911 TRANSPORTS

Trauma (injury) is the main reason for 911 transport, accounting for approximately 1 in 5 ground 911 transports and 2 in 5 air medical 911 transports. During 2022, there were 24,486 GTA 911 responses related to injury/trauma and 76% (N=18,617) resulted in transport of the patient. There were 272 rotor wing 911 responses for trauma and 96% (N=260) resulted in transport of the patient.

Figure 35. Trauma-related 911 response volumes by month, GTAs/RWAs, 2022

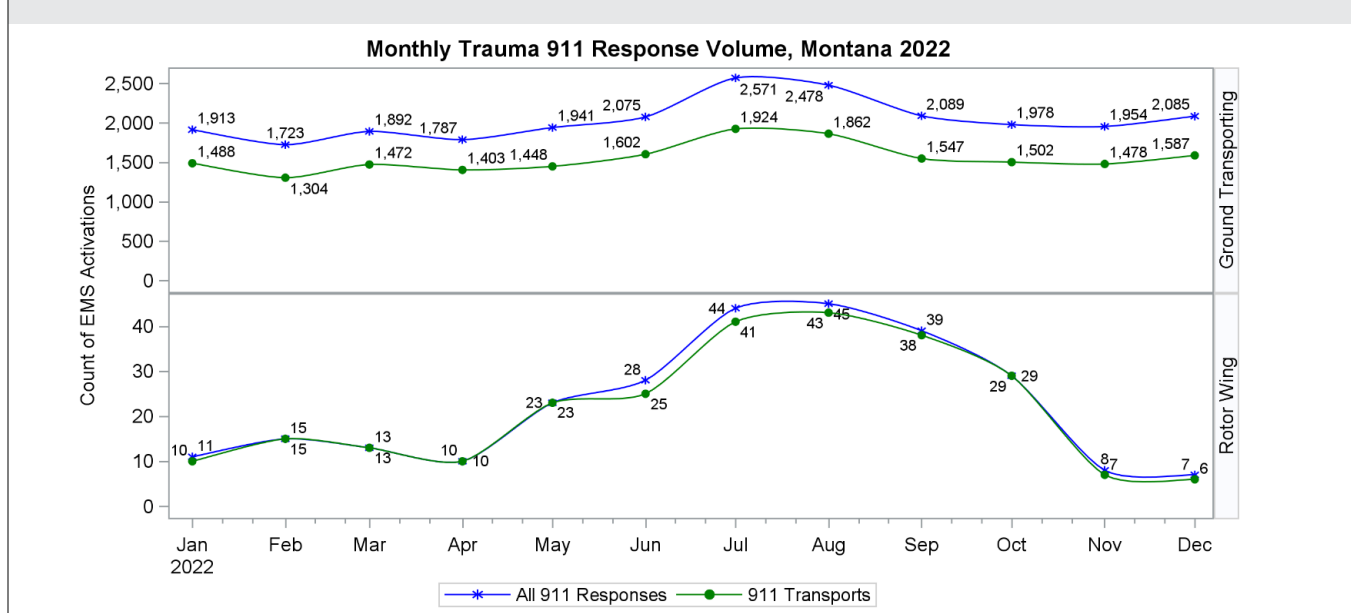
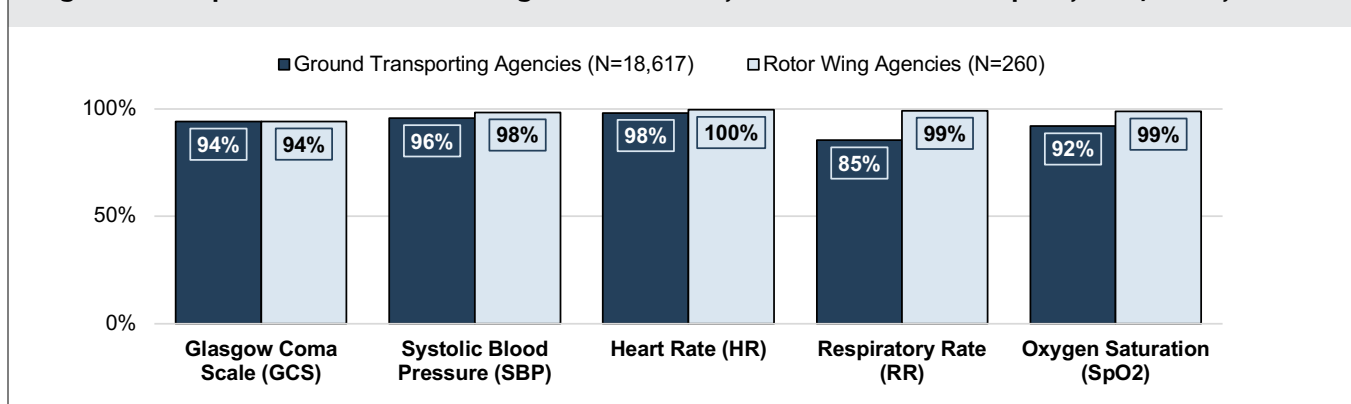


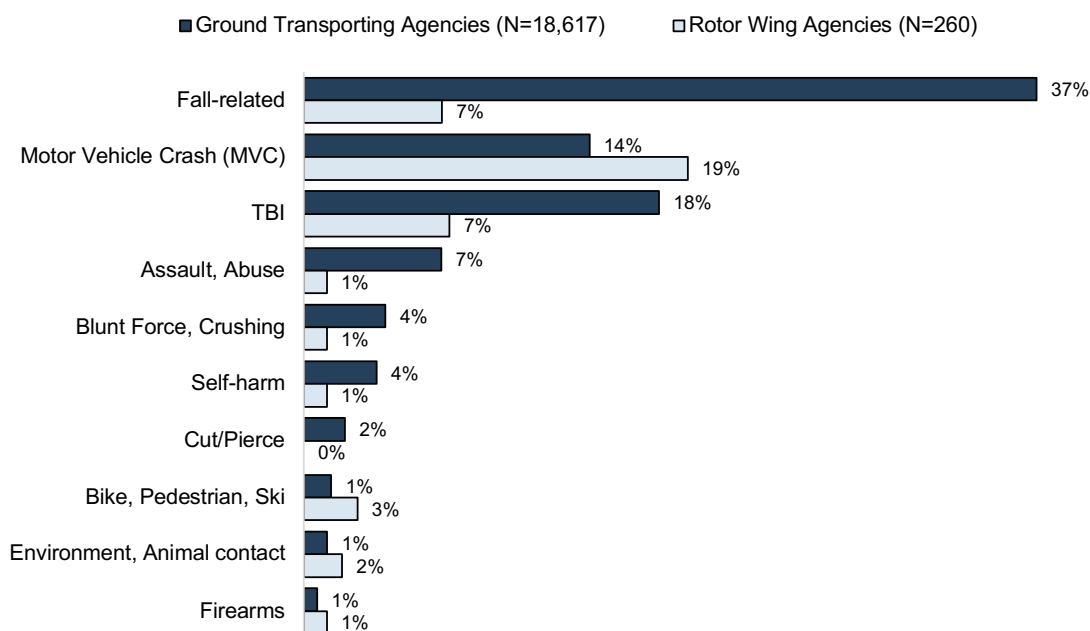
Figure 36. Completion rate of initial vital sign documentation, Trauma-related 911 transports, GTAs/RWAs, 2022



In order to accurately assess, treat and monitor a trauma patient, vital sign measurement is of paramount importance. RWAs have above a 94% completion rate (at least one measurement) for all the vital signs. GTAs have above a 92% completion rate for all the vital signs except respiratory rate, which was completed in 85% of PCRs.

^f Trauma case definition: Possible Injury (eSituation.02) = "Yes"; OR Cause of Injury (eInjury.01) is not blank; OR Provider primary or secondary impression (eSituation.11/eSituation.12) of Any S Code, R58, T07, G89.11, T14.90, T79.4, L55.0-L55.2, T30.0, O71.9, T14, T30.0, T79.9 OR Dispatch complaint (eDispatch.01) = "automated crash notification, OR Vehicular Injury Risk Factors (eInjury.04) is one of the following values: 2904001: Auto v. Pedestrian/Bicyclist Thrown, Run Over, or > 20 MPH Impact, 2904007: Crash Death in Same Passenger Compartment, 2904009: Crash Ejection (partial or complete) from automobile, 2904011: Crash Intrusion, including roof: > 12 in. occupant site; > 18 in. any site, 2904013: Crash Vehicle Telemetry Data (AACN) Consistent with High Risk of Injury, 2904015: Motorcycle Crash > 20 MPH

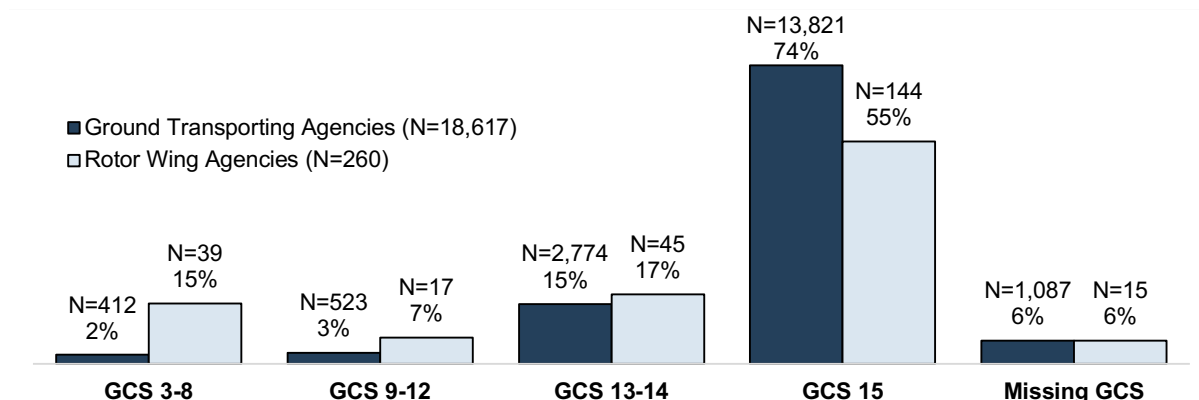
Figure 37. Relative frequency of top 10 causes of injury*, Trauma-related 911 transports, GTAs/RWAs, 2022



*Cause-of-injury is a multi-select field. The categories presented here are NOT mutually exclusive.

Falls were the most commonly documented cause of injury for GTA trauma-related 911 transports (37%), followed by TBIs (18%) and MVCs (14%). Among RWA trauma 911 transports, 19% were MVC-related followed by TBIs (7%) and falls (7%).

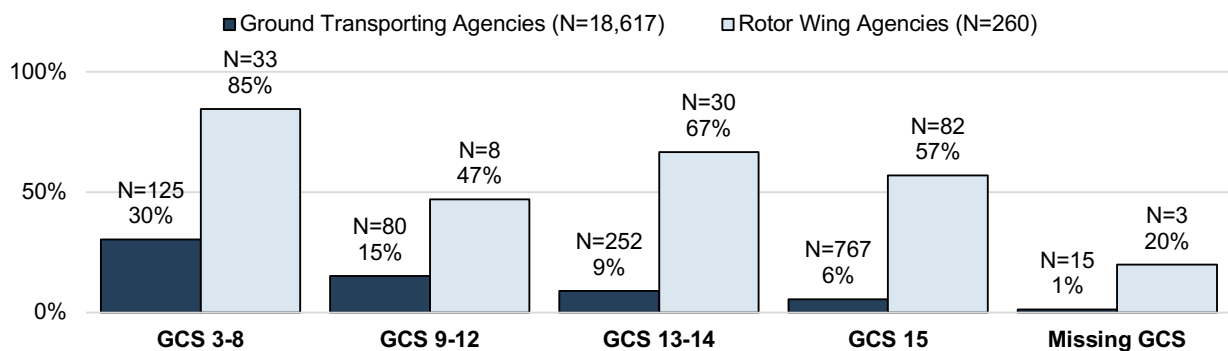
Figure 38. Number and percentage of trauma-related 911 transports by GCS category, GTAs/RWAs, 2022



The Glasgow Coma Scale (GCS) is used to objectively describe the extent of a patient’s consciousness according to three aspects of responsiveness: eye-opening, motor, and verbal responses. Scores range from 3 (completely unconscious) to 15 (fully conscious). Figure 38 compares the distribution of patient GCS scores for GTAs versus RWAs. 1 in 5 (22%, N=56) RWA trauma patients had a GCS score of 12 or lower, versus 1 in 20 (5%, N=935) for GTA trauma patients. 74% of GTA trauma 911 transports were for fully conscious patients (GCS 15), versus 55% for RWAs.

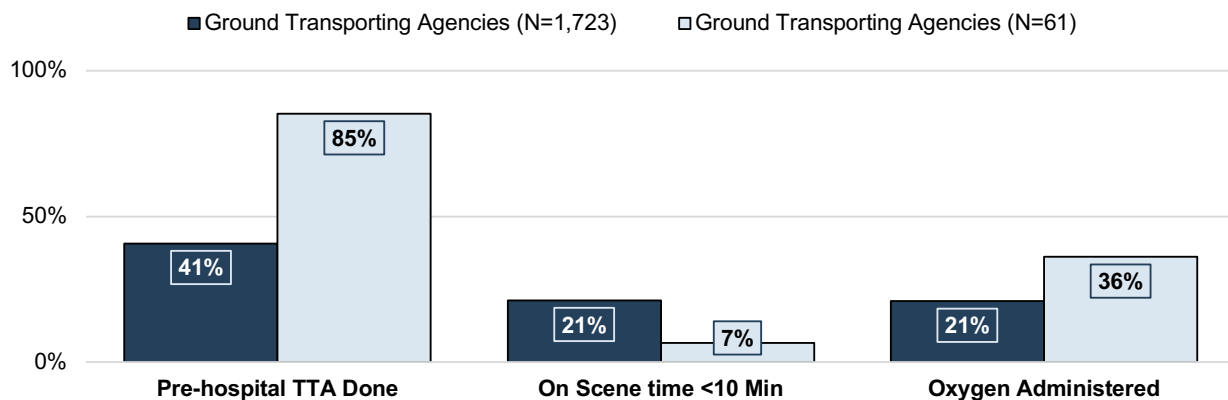
Trauma team activation (TTA) involves paging specific hospital staff to report to the emergency department as quickly as possible, including a surgeon, anesthesiologist, respiratory therapist, critical care nurse, operating room nurse, x-ray and lab technicians, chaplain, and others depending on the level of the activation (partial or full). As the first line of medical providers assessing a trauma patient, EMS plays a crucial role in ensuring that the patient receives appropriate and efficient care. The Montana Field Trauma Decision Scheme/Trauma Team Activation Criteria outlines how EMS providers should decide whether to activate or alert the trauma team of a receiving facility. Activation criteria fall into four areas: physiologic, anatomic, mechanism of injury, and special considerations.¹³

Figure 39. Rate of pre-hospital trauma team activation by GCS category, Trauma-related 911 transports, GTAs/RWAs, 2022



Pre-hospital TTA is indicated for trauma patients with a GCS score ≤ 13 . Among 911 transports with GCS 3-8, GTAs documented pre-hospital alert in 30% and RWAs did so in 85%. Documentation of pre-hospital alert was missing for 63% of GTA trauma related 911 transports, and 0% for rotor wing (this is an improvement from 2021 when 70% of GTA trauma transports were missing data).

Figure 40. EMS performance improvement indicators, Trauma-related 911 transports meeting activation criteria, GTAs/RWAs, 2022



Montana's State Trauma Care Committee (STCC) regularly reviews EMS and hospital-based performance improvement (PI) indicators to assess how the trauma system impacts patient care, morbidity, and mortality. The EMS-specific PI indicators shown in Figure 40 are measured only among the injured patients that met pre-hospital TTA criteria in any of the four areas (physiologic, anatomic, mechanism of injury, and special considerations). 9% (N=1,723) of trauma-related 911-transports by GTAs and 23% (N=61) by RWAs met pre-hospital activation criteria.

- **Pre-hospital TTA Done:** Pre-hospital TTA was documented in 41% of trauma 911 ground transports that met activation criteria, and 85% for rotor wing. Trauma team activation has been shown to fundamentally improve trauma patients' outcomes.
- **On-scene time <10 minutes:** Patients with serious trauma require rapid assessment, treatment, and transportation to a designated trauma center; the goal is EMS scene time under 10 minutes. 21% of GTA and 7% of RWA 911 transports met this goal.
- **Oxygen administered:** 21% of GTA and 36% of RWA trauma 911 transports that met activation criteria received oxygen.

INJURY/TRAUMA-RELATED INTERFACILITY AND MEDICAL TRANSPORTS

Interfacility transport plays an important role in a rural trauma system. Ground transporting agencies completed 3,486 interfacility and medical transports for injury/trauma and air medical completed 1,057 interfacility and medical transports for injury/trauma. 43% (N=452) were rotor wing and 57% (N=605) were fixed wing.

Figure 41. Trauma-related IFM transport volumes by month, GTAs and AMAs, 2022

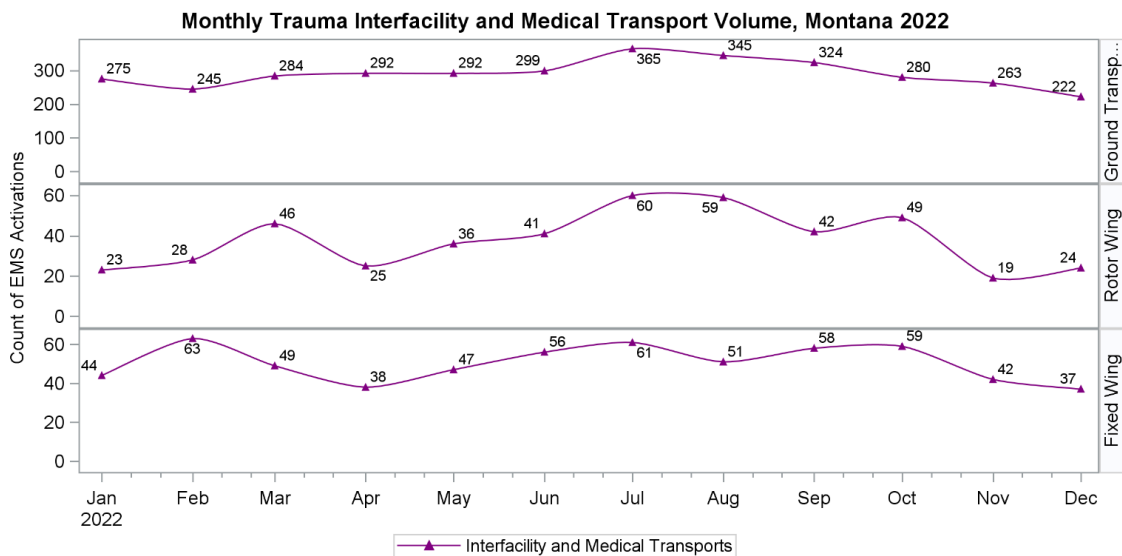
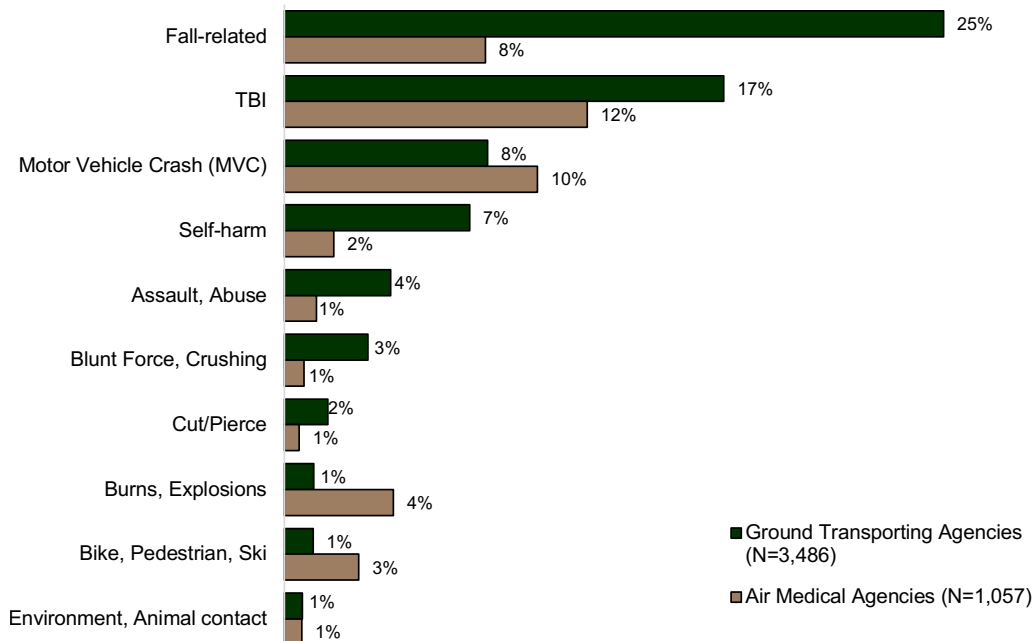


Figure 42. Relative frequency of top causes of injury, Trauma-related IMF transports, GTAs and AMAs, 2022



*Cause-of-injury is a multi-select field. The categories presented here are NOT mutually exclusive.

TRAUMATIC BRAIN INJURY (TBI)⁹

Recent peer-reviewed studies demonstrate that EMS providers and emergency department staff can significantly improve the survival and recovery of individuals with severe traumatic brain injury (TBI) by implementing three simple interventions: avoiding hypoxia, hypotension, and hyper-ventilation.⁵ Montana GTAs responded to 4,041 911 calls for TBI in 2022. 82% (N=3,314) resulted in transport of the patient.

Figure 43. TBI-related 911 response volume by month, GTAs, 2022

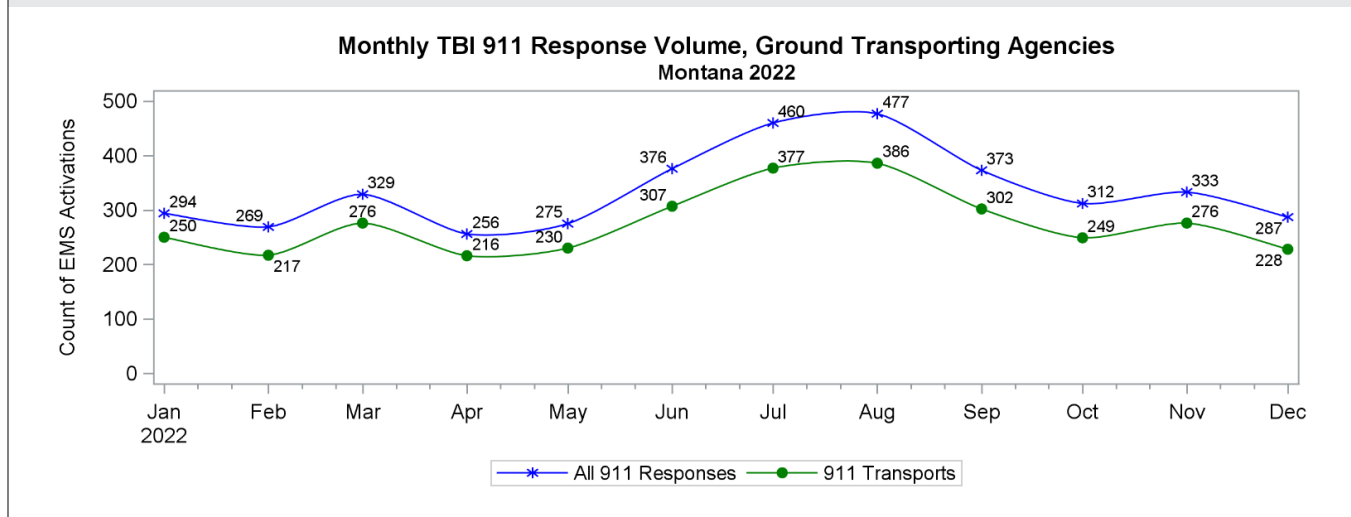
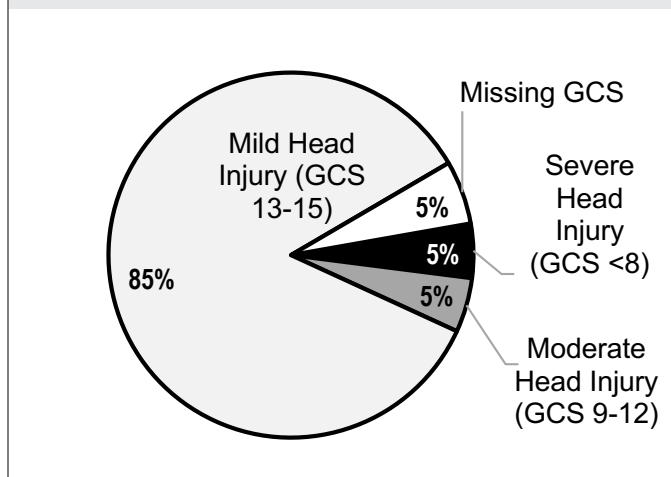


Figure 44. TBI-related 911 transports (N=3,314) by GCS category, GTAs, 2022



85% of TBI 911 transports were mild head injuries (GCS 13-15), while 5% were moderate (GCS 9-12) and 5% were severe (GCS ≤8), and 187 were missing GCS (Figure 44).

EPIC-TBI teaches avoidance of the 3 H's (hypotension, hypoxia, and hyperventilation). Among TBI 911 transports, 2% experienced hypotension and 9% experienced hypoxia, with variation by GCS (Figure 45). Among 58 TBI 911 transports with positive pressure ventilation documented, 41% had end-tidal CO₂ (ETCO₂) levels below 35mmHg indicating hyperventilation, with variation by GCS (Figure 46).

⁹TBI case definition: Provider primary or secondary impression (eSituation.11/eSituation.12) of S09.90, S02.0, S02.1, S02.8, S02.91, S04.02, S04.03, S04.04, S06, S07.1, T74.4

Figure 45. Percent of TBI-related 911 transports with at least 1 instance of hypotension or hypoxia, GTAs, 2022

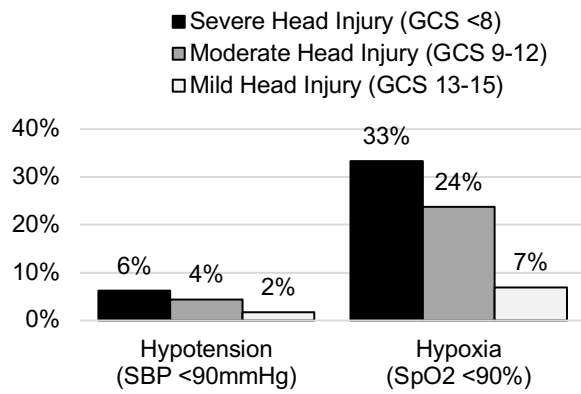
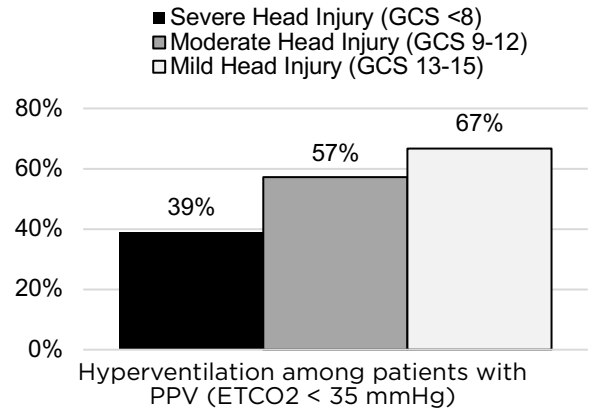
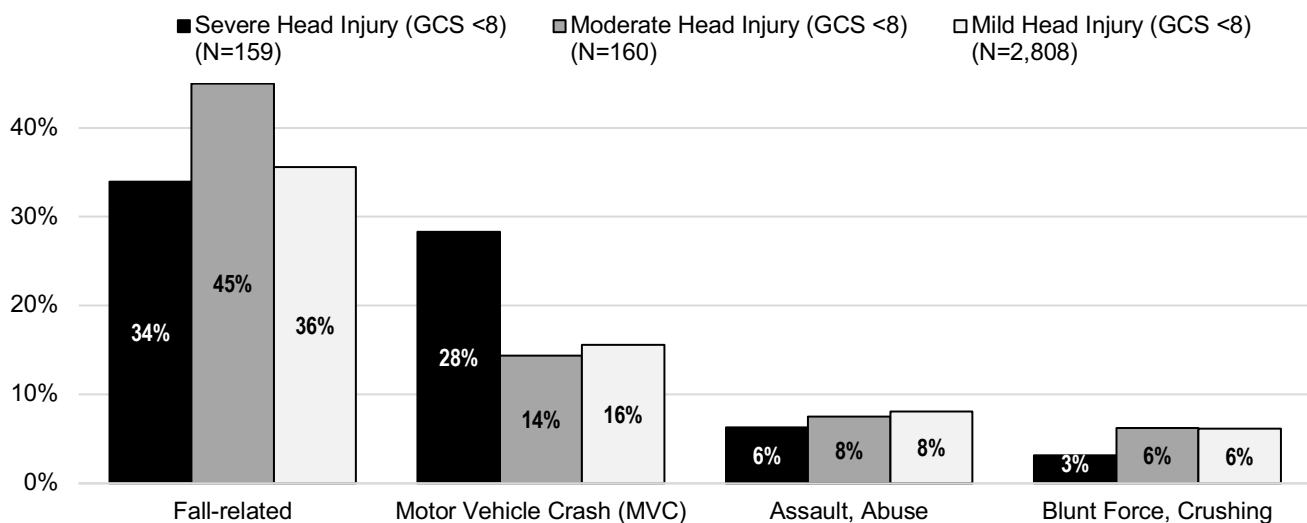


Figure 46. Percent of TBI-related 911 transports with positive pressure ventilation (PPV) and at least 1 instance of hyperventilation, GTAs, 2022



Overall, 38% of TBI cases were missing data on cause of injury, while 34% were related to falls and 15% were related to MVC's. Figure 47 shows causes of injury for TBI by severity group.

Figure 47. Relative frequency of top causes of injury, TBI-related 911 transports, 2022



SUSPECTED STROKE^h

As Montana's stroke system of care has grown, the importance of early stroke recognition, documenting time of symptom onset, evaluating the severity of the stroke and pre-notifying a stroke center that a patient is on the way all serve to improve the outcome of this illness. There were 1,966 GTA 911 responses for suspected stroke in 2022. 90% (N=1,773) resulted in transport of the patient. There were 1,078 IFM transports for stroke, 62% (N=672) were by GTAs and 38% (N=406) by air medical.

Figure 48. Suspected stroke-related 911 response volume by month, GTAs, 2022

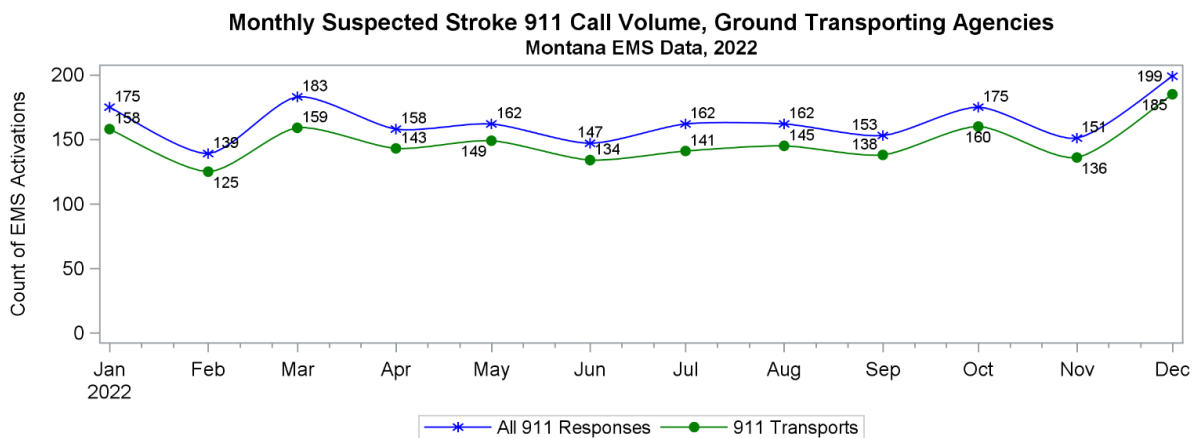
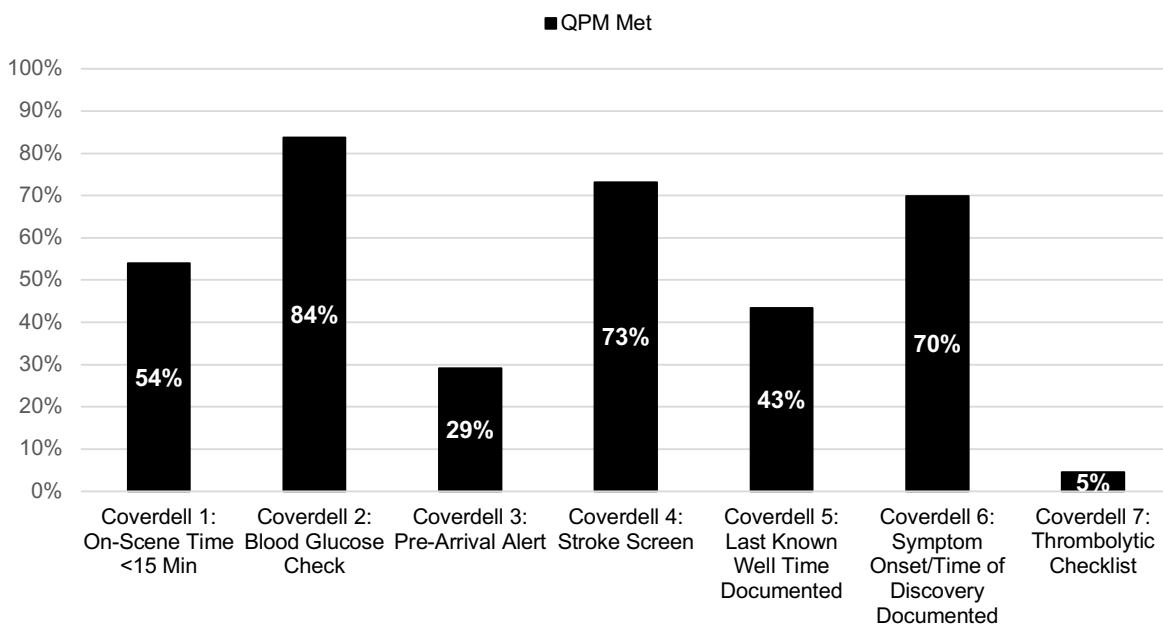


Figure 49. Paul Coverdell National Acute Stroke Program EMS quality performance measures, Suspected stroke 911 transports (N=1,773), GTAs, 2022



^hSuspected stroke case definition: Provider primary or secondary impression (eSituation.11/eSituation.12) of I60, I61, I63, G45, G46.3, G46.4; OR Stroke scale score (eVitals.19) = "Positive"

EMSTS has published the [Montana EMS Stroke Report 2022](#) which temporal trend line data for the following measures:

- 1. On-Scene Time <15 Min:** 54% of suspected-stroke 911 transports had an on-scene time less than 15 minutes. The median on-scene time for stroke 911 transports was 14:00 (mm:ss) and the 90th percentile was 24:47. American Heart Association/American Stroke Association recommends an on-scene time of less than 15 minutes because timeliness of pre-hospital care is an important link in the stroke chain of survival.
- 2. Blood Glucose Check:** 84% of suspected-stroke 911 transports had at least one blood glucose level checked and recorded. Assessment of blood glucose is an important pre-hospital intervention in the stroke chain of survival. Hypoglycemia is frequently found in patients with stroke-like symptoms; administering glucose may resolve neurological deficits.
- 3. Pre-Arrival Alert:** 29% of suspected-stroke 911 transports had documentation of EMS calling in a stroke pre-arrival alert to the receiving facility. In 14% of stroke 911 transport records, the EMS provider documented that no pre-arrival alert was provided. Documentation was missing in 55% of records. Stroke pre-notification is an important factor in reducing elapsed time before treatment and ensuring appropriate hospital resources are mobilized before patient arrival to the hospital.
- 4. Stroke Screen:** 73% of suspected-stroke 911 transports had a stroke identification screen or severity scale completed and recorded. Use of stroke screening tools in the pre-hospital is important to ensure priority triage of suspected stroke patients.
- 5. Last Known Well Time Documented:** LKW is the date and time at which the patient was last known to be without the signs and symptoms of the current stroke. This information, along with symptom onset time, is critical to determining eligibility for time-dependent treatments such as thrombolytic therapy or mechanical intervention. 43% of suspected-stroke 911 transports had a documented last known well time that was prior to the documented incident date and time. This is an increase from 2021, when only 13% had LKW.
- 6. Symptom Onset/Time of Discovery Documented:** Symptom onset is the date/time of the start of the patients' symptoms, or the earliest time that the patient was known to have symptoms. If the event was witnessed, then LKW and Symptom Onset time will be identical. Both should be recorded, even if identical. 70% of suspected-stroke 911 transports had a documented time of discovery (symptom onset) that was prior to the documented incident date and time.
- 7. Thrombolytic Checklist Used:** 5% of suspected-stroke 911 transports had a thrombolytic stroke checklist completed. Currently, Montana's state ePCR form does not have a thrombolytic checklist/worksheet available. This type of checklist identifies possible contraindications to thrombolytic therapy such as current anticoagulant use, recent surgery or trauma, active internal bleeding, and more. Use of thrombolytic stroke checklist tools in the pre-hospital setting may help determine next treatment steps, if communicated effectively to the receiving hospital.

SUSPECTED CARDIAC CHEST PAIN AND STEMI¹

Many EMS agencies have implemented STEMI systems of care in their communities. This involves training on the recognition of STEMI, early acquisition, interpretation or transmission, and hospital notification of the findings from a field 12-lead ECG. In addition, ensuring that patients have supplemental oxygen administration (when indicated) and the administration of aspirin to improve the care and outcome of STEMI.

There were 4,358 GTA 911 responses for suspected cardiac chest pain and STEMI (CP/STEMI) among patients aged 35 and older in 2022. 89% (N=3,899) resulted in transport of the patient. There were 1,721 IFM transports for suspected CP/STEMI among patients aged 35 and older, 65% (N=1,122) were by GTAs and 35% (N=600) by air medical.

Of 3,899 GTA 911 transports, 72% had documentation that a 12-Lead was obtained. 8.3% (N=324) met the STEMI syndrome definition.

Figure 50. Suspected cardiac chest pain or STEMI system utilization volumes by month (patients aged 35 and older), GTAs, 2022

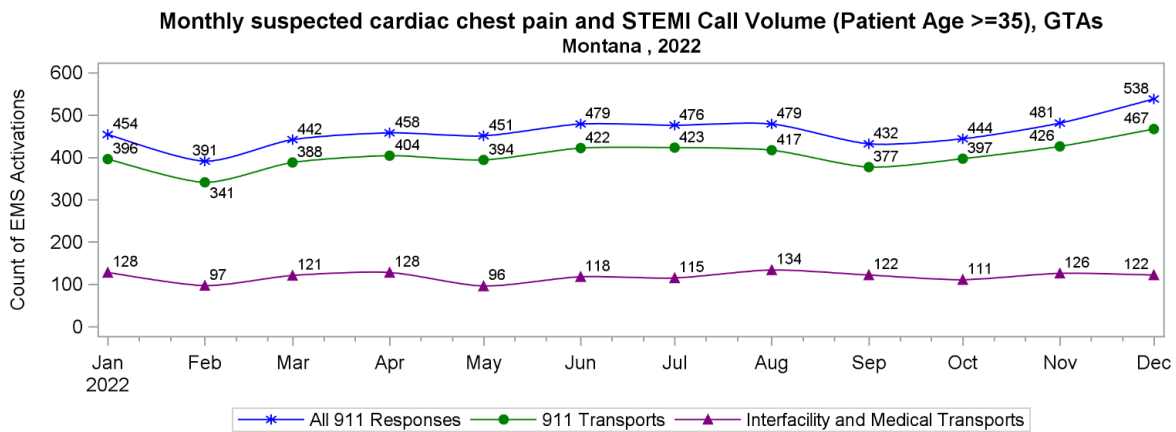
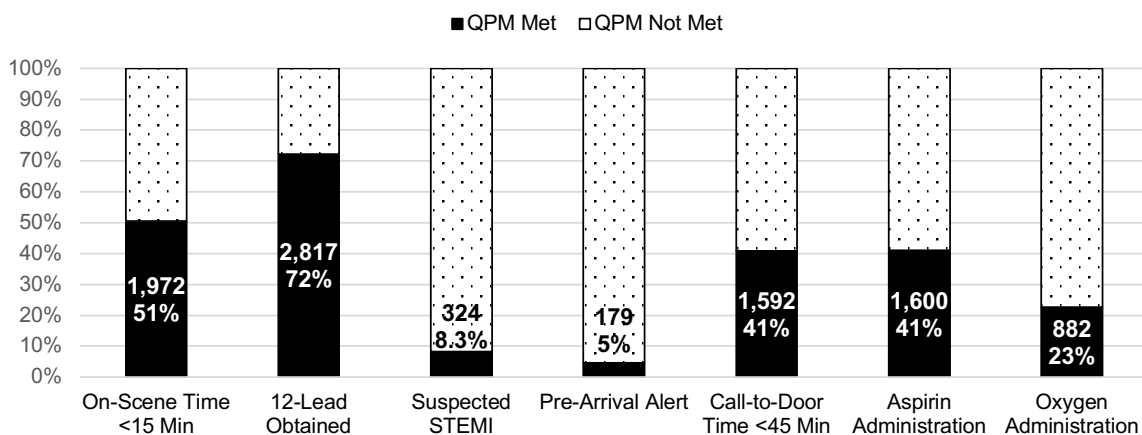


Figure 51. EMS PI indicators, Suspected cardiac chest pain and STEMI 911 transports (N=4,852), GTAs, 2022



¹Suspected cardiac chest pain case definition: Provider impression (eSituation.11/eSituation.12) or Symptom (eSituation.09/eSituation.10) of I20-I25, R07.9
 Suspected STEMI case definition: Provider impression (eSituation.11/eSituation.12) of I21.0-I21.3; OR ECG finding (eVitals.03) = "9901051", "9901053"
 "9901055", "9901057", or pre-arrival alert (eDisposition.24) - "STEMI"

- **On-Scene Time <15 Min:** 51% of CP/STEMI 911 transports had an on-scene time less than 15 minutes. The median on-scene time was 14:45 (mm:ss) and the 90th percentile was 25:00. AHA recommends an on-scene time of less than 15 minutes because timeliness of pre-hospital care is an important link in the cardiac chain of survival.
- **12-Lead Obtained:** 72% of CP/STEMI 911 transports had documentation that a 12-Lead was obtained.
- **Suspected STEMI:** 8% (N=324) of suspected cardiac chest pain and STEMI 911 transports were classified as suspected STEMI based on ECG results or provider primary/secondary impression of STEMI.
- **Pre-Arrival Alert:** 5% of CP/STEMI 911 transports had documentation of EMS calling in a STEMI or cardiac arrest pre-arrival alert to the receiving facility. 31% had documentation that no pre-arrival alert was provided. Documentation was missing in 63% of records. Pre-notification is an important factor in reducing elapsed time before treatment and ensuring appropriate hospital resources are mobilized before patient arrival to the hospital.
- **Call-to-Door Time:** Call-to-door time measures the time from when 911 was called until patient arrival at the destination facility- it does not capture care given in the hospital setting. AHA recommends less than 90 minutes from first medical contact to STEMI intervention by the hospital. 41% of CP/STEMI 911 transports had a call-to-door time less than 45 minutes. 47% (N=1,844) records were missing or had excluded call-to-door time values. The median call-to-door time was 34:15 and the 90th percentile was 58:49.
- **Aspirin Administration:** 41% of CP/STEMI 911 transports received aspirin. Aspirin inhibits platelet aggregation and can slow damage to the heart muscle and has a Class I indication for use in STEMI patients by the AHA meaning there is strong evidence and /or agreement that it helpful and good for the patient.
- **Oxygen Administration:** 23% of CP/STEMI 911 transports received oxygen.

OUT-OF-HOSPITAL CARDIAC ARREST (OHCA)¹

Agencies that adopt high performance CPR with minimally interrupted chest compressions along with educating the community on the importance of citizen CPR and community AED use dramatically improve the outcomes for individuals that suffer out-of-hospital cardiac arrest.

There were 941 GTA 911 responses for OHCA with presumed cardiac etiology in 2022. Overall, 39% (N=370) of OHCA 911 responses resulted in transport of the patient. 589 (63%) had patient disposition of “dead at scene” (Table 26). Resuscitation was attempted for 65% (N=383) of the patients who were dead at scene. 35% of OHCA 911 transports had documentation of EMS calling in a cardiac arrest or STEMI pre-arrival alert to the receiving facility. 5% had documentation that no pre-arrival alert was provided. Documentation was missing in 57% of records.

Figure 52. Presumed cardiac OHCA 911 response volume by month, GTAs, 2022

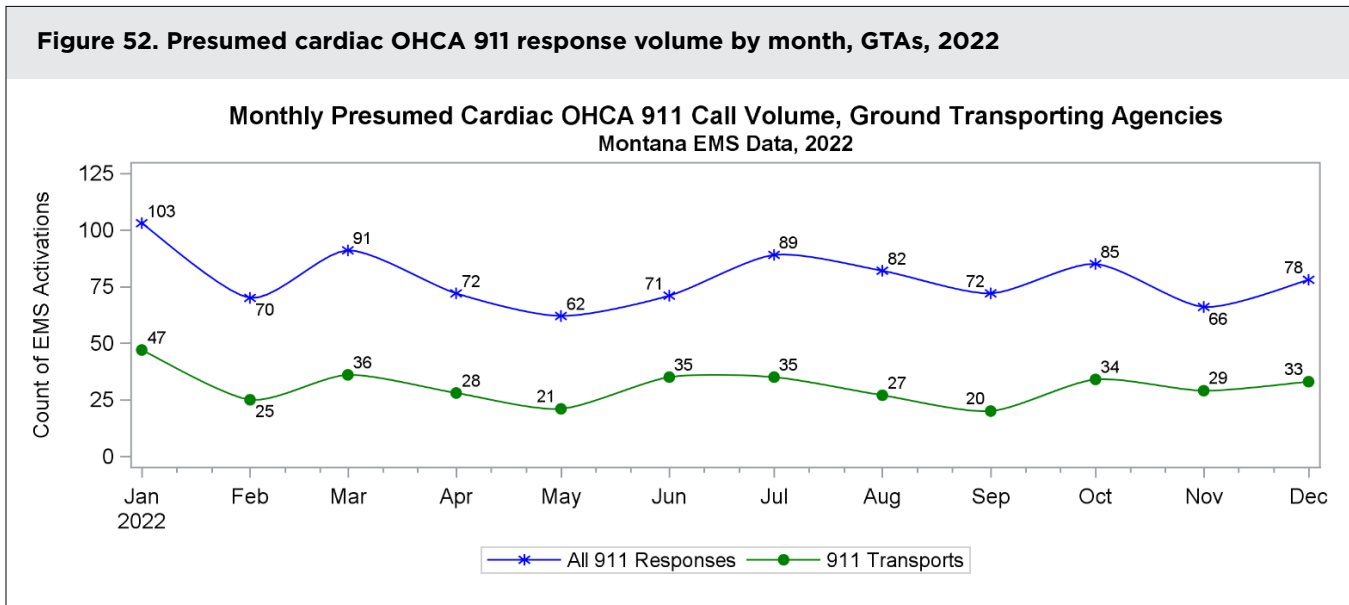
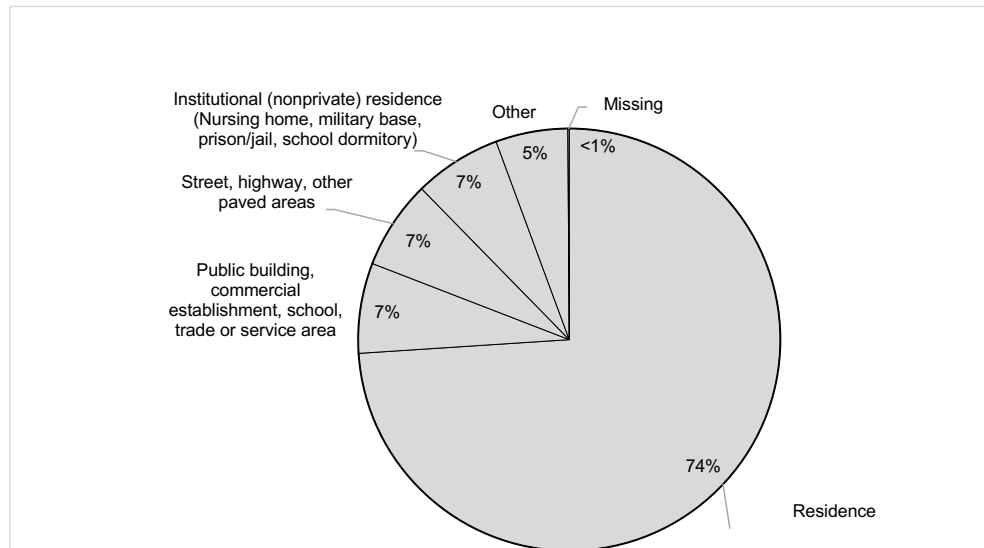


Table 26. Patient dead at scene, Presumed cardiac OHCA 911 responses by patient disposition, GTAs, 2022

Patient Dead at Scene	Patient Not Transported	Patient Transported	All
Resuscitation attempted by Responding EMS Unit	355	28	383
No resuscitation attempted by Responding EMS Unit	191	15	206
All	546	43	589

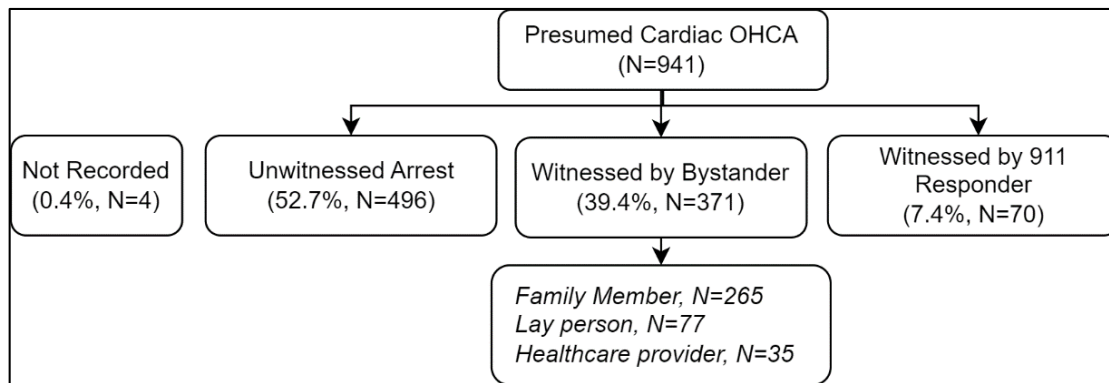
¹ Presumed cardiac OHCA case definition: Cardiac Arrest (eArrest.01) = “Yes, Prior to EMS Arrival” or “Yes, After EMS Arrival” AND Cardiac arrest etiology (eArrest.02) = “Cardiac (Presumed)”

Figure 53. Location of the arrest, Presumed cardiac OHCA 911 responses (N=941), GTAs, 2022



The majority of OHCA occurred in residences (74%), followed by institutional residences, and public places.

Figure 54. Arrest witnessed by, Presumed cardiac OHCA 911 responses, GTAs, 2022



*The data field "Arrest witnessed by" allows multiple selections, therefore the sum may be greater than the total number of OHCA (N=1,015).

Of 941 GTA 911 responses for presumed cardiac etiology OHCA, 53% were unwitnessed or not recorded, 39% were witnessed by a bystander, and 7% were witnessed by EMS personnel (Figure 56). Table 27 reports unwitnessed, bystander witnessed, and 911 responder witnessed OHCA by initial arrest rhythm as well as bystander intervention, which forms the basis for the Utstein style OHCA reporting framework.¹⁴

Table 27. Presumed cardiac OHCA 911 responses by initial rhythm and bystander intervention, GTAs, 2022

	Cardiac Arrest Unwitnessed/ Not Recorded		Cardiac Arrest Witnessed by Bystander		Cardiac Arrest Witnessed by 911 Responder		All	
	N	%	N	%	N	%	N	%
Initial Arrest Rhythm								
Asystole	321	64%	148	40%	8	11%	477	51%
Shockable Initial Rhythm*	53	11%	123	33%	19	27%	195	21%
Other Initial Rhythm^	93	19%	93	25%	41	59%	227	24%
Not Recorded/Not Applicable	33	7%	7	2%	2	3%	42	4%
CPR provided prior to EMS arrival?								
Yes	218	44%	241	65%	3	4%	462	49%
No	254	51%	104	28%	59	84%	417	44%
Not Recorded	28	6%	26	7%	8	11%	62	7%
AED used prior to EMS arrival?								
Yes, with defibrillation	24	5%	52	14%	1	1%	77	8%
Yes, Applied without defibrillation	77	15%	58	16%	4	6%	139	15%
No	397	79%	260	70%	62	89%	719	76%
Not Recorded	2	0%	1	0%	3	4%	6	1%
Total	500	100%	371	100%	70	100%	941	100%

*VF, TF, Unknown shockable rhythm; ^PEA, Unknown Non-Shockable rhythm

The Utstein framework allows for identification of the following important subgroups that highlight the contribution of cardiac rhythm and bystander actions as key determinants of resuscitation outcome:

- **Overall:** All presumed cardiac OHCA
- **Unwitnessed:** Unwitnessed presumed cardiac OHCA
- **Bystander witnessed:** Presumed cardiac OHCA witnessed by a bystander (anyone, including healthcare providers, who was not part of the dispatched response)
- **Utstein:** Bystander witnessed and found in shockable rhythm (Shockable rhythms include: Ventricular tachycardia, Ventricular fibrillation, Supraventricular tachycardia, AED-advised unknown shockable rhythm)
- **Utstein bystander:** Bystander witnessed, found in shockable rhythm, and received some bystander intervention prior to EMS arrival (CPR and/or AED)
- **911 responder witnessed:** Presumed cardiac OHCA witnessed by EMS personnel who were part of the dispatched response. This refers to cardiac arrests that occurred after EMS arrival.
- **911 responder witnessed and found in shockable rhythm:** Witnessed by EMS personnel, found in shockable rhythm

A successful resuscitation outcome is defined by return of spontaneous circulation (ROSC), signs of which may include breathing (more than an occasional gasp), coughing, movement, a palpable pulse or a measurable blood pressure. “Any ROSC” refers to a brief (approximately >30 seconds) restoration of spontaneous circulation that provides evidence of more than an occasional gasp, occasional fleeting palpable pulse, or arterial waveform. “Sustained ROSC” is deemed to have occurred when chest compressions are not required for 20 consecutive minutes and signs of circulation persist. Table 28 shows the rate of “Any ROSC” as well as “Sustained ROSC” by subgroup.

Table 28. Rates of any ROSC and sustained ROSC, Presumed cardiac OHCA 911 responses, GTAs, 2022

Utstein Subgroup	Any ROSC		Sustained ROSC >20 Min		Total Denominator
	N	%	N	%	
Overall	178	19%	26	3%	941
Unwitnessed	50	10%	4	1%	496
Bystander Witnessed	98	26%	18	5%	371
Utstein	50	41%	9	7%	123
Utstein Bystander	44	44%	9	9%	100
911 responder witnessed	30	43%	4	6%	70
911 responder witnessed and found in shockable rhythm	11	58%	1	5%	19

When an OHCA was witnessed by EMS personnel and the patient's initial cardiac rhythm was shockable, 58% of presumed cardiac OHCA 911 responses resulted in any ROSC. In comparison, under less ideal conditions with an unwitnessed arrest, 10% resulted in any ROSC.

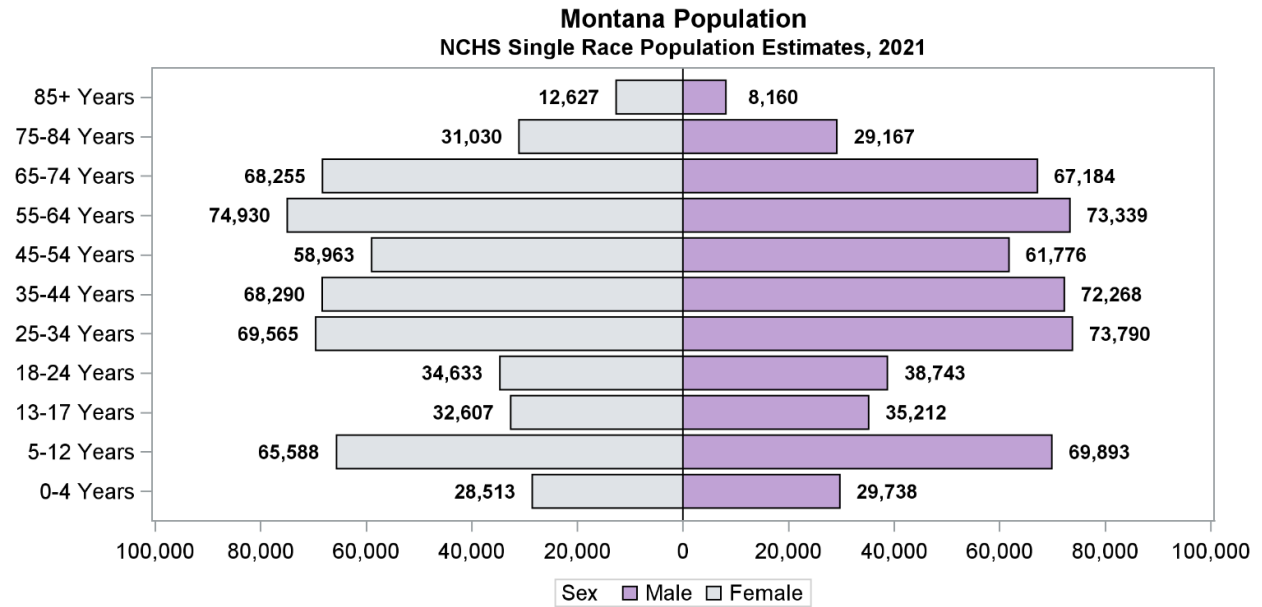
MEDICATION ADMINISTRATION TABLE (TOP 50)

	Medication Name with RxNORM Code	Count of EMS Activations	Count of Doses	
1	7806	Oxygen	13,607	14,374
2	26225/66981	Ondansetron (Zofran)	4,672	4,949
3	4337	Fentanyl	4,253	7,197
4	125464	Normal saline	3,738	3,899
5	1191	Aspirin	2,078	2,086
6	285059/ 214199/ 542137	Albuterol/Ipratropium (DuoNeb)	1,489	1,565
7	4917	Nitroglycerin	1,263	1,766
8	435	Albuterol (Proventil)	1,184	1,394
9	35629/ 1008377	Lactated Ringer's Solution	1,114	1,140
10	6960/11177	Midazolam (Versed)	1,094	1,564
11	7052	Morphine	1,008	1,536
12	7242	Naloxone (Narcan)	771	959
13	6130	Ketamine (Ketalar)	746	1,201
14	6470/202479	Lorazepam (Ativan)	694	925
15	317361	Epinephrine 1:10,000 (0.1 mg/mL)	692	2,243
16	373902	Sodium Chloride Irrigation Solution	453	508
17	9863	Sodium Chloride	407	407
18	5224	Heparin	391	412
19	4850/377980	Glucose (Oral Forms)	375	449
20	7512/227559	Norepinephrine (Levophed)	336	417
21	237653	Dextrose 50% Injectable Solution	326	343
22	6902/ 203856	Methylprednisolone (Solu-MEDROL)	300	300
23	224913/ 3423	Hydromorphone (Dilaudid)	281	471
24	237648/1795480	Dextrose 10% Injectable Solution	252	264
25	8782	Propofol (Diprivan)	249	343
26	3498	Diphenhydramine (Benadryl)	217	236
27	328316/727374/566760	Epinephrine 1:1000 (1 mg/mL)	197	378
28	703	Amiodarone (Cordarone)	191	256
29	36676	Sodium Bicarbonate	190	200
30	7213	Ipratropium (Atrovent)	166	174
31	309778	Dextrose 5% Injectable Solution	110	113
32	4832	Glucagon (Glucagen)	107	111
33	7396/ 151490	Nicardipine (Cardene)	100	150
34	1223/ 370624	Atropine	92	103
35	6915	Metaclopramide	90	101
36	68139	Rocuronium (Zemuron)	90	110
37	296	Adenosine (Adenocard)	87	127
38	8745	Promethazine (Phenergan)	85	90
39	7486	Nitrous Oxide	85	86
40	10691	Tranexamic Acid	84	86
41	3322	Diazepam (Valium)	71	91
42	11124	Vancomycin	70	70
43	6585	Magnesium Sulfate	69	75
44	3992	Epinephrine Auto-Injector	63	119
45	8591	Potassium Chloride	63	68
46	5856	Insulin	62	63
47	5093	Haloperidol (Haldol)	61	71
48	3443	Diltiazem (Cardizem)	55	66
49	71535	Vecuronium (Norcuron)	48	66
50	317630	Glucose 100 MG/ML	47	49

PROCEDURE TABLE (TOP 50)

	Procedure	Count of EMS Activations	Count of Doses
1	IV Start	26,371	29,366
2	CV - ECG monitoring	25,795	27,810
3	CV - ECG - 12 Lead Obtained	12,663	16,942
4	Glycemic management- Blood Glucose Check	8,634	9,362
5	Glycemic management- Blood Glucose Check	4,018	4,155
6	Move - Patient	3,988	4,928
7	Gen'l - Contact Medical Control	3,488	3,894
8	Vital Signs- Vital Signs Taken	3,041	3,690
9	Spinal Procedures- Cervical Spine Stabilization (C-Spine)	2,511	2,528
10	Airway - ETCO2 Monitoring	2,069	5,155
11	Spinal procedures- Full Spinal Restriction of Motion	1,378	1,395
12	Airway - Assess Patency	1,332	1,341
13	Safety precautions	1,324	1,525
14	IV - Blood Draw via IV or Venous Puncture	1,250	1,270
15	Vital Signs-Temperature taking	1,112	1,124
16	IV - Maintain / Monitor / Flush	1,004	1,067
17	Vital signs- Pulse oximetry	968	1,022
18	Airway - Assist Ventilation - Bag Valve Mask (BVM)	774	795
19	Immobilization- Splinting - General	767	784
20	Placing restraint	736	1,072
21	IO Start - Intraosseous Access	729	772
22	Airway, advanced - Ventilator - Maintenance or Adjustment	691	2,074
23	Medication Given	534	715
24	Pain- Pain assessment	523	536
25	Airway - Clear/Suction	520	628
26	Intubation - Oral	517	568
27	Wound Care - Dressing - Pressure Dressing	505	578
28	Vital Signs- Glasgow coma scale	418	420
29	Vital Signs- Blood pressure taking	416	430
30	CPR - Manual	406	430
31	Assess - Glucose Check - Prior to Glucose Given	405	413
32	Airway - Nasopharyngeal Insertion	356	367
33	Application of gauze support bandage	352	369
34	Checking of splint	347	357
35	Airway - Oropharyngeal Insertion	346	354
36	IV - Infusion Pump Used	345	382
37	Airway, advanced- Assisted Ventilation - CPAP	324	329
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APPENDIX 1. MONTANA POPULATION CHARACTERISTICS¹



ACRONYMS	
Acronym	Meaning
AED	Automatic External Defibrillator
AMA	Air Medical Agency
CAH	Critical Access Hospital
CPR	Cardio-pulmonary Resuscitation
EMS	Emergency Medical Services
EPIC	Excellence in Pre-hospital Injury Care
ePCR	Electronic Patient Care Report
FWA	Fixed Wing Agency
GCS	Glasgow Coma Scale
GTA	Ground Transporting Agency
HR	Heart Rate
IFMT	Interfacility and Medical Transport
IHS	Indian Health Service
MVC	Motor Vehicle Crash
NEMESIS	National Emergency Medical Services Information System
NTA	Non-Transporting Agency
OHCA	Out-of-Hospital Cardiac Arrest
PCR	Patient Care Report
ROSC	Return of Spontaneous Circulation
RR	Respiratory Rate
RWA	Rotor Wing Agency
SBP	Systolic Blood Pressure
SpO2	Oxygen Saturation
STCC	State Trauma Care Committee
STEMI	ST-segment Elevated Myocardial Infarction
TBI	Traumatic Brain Injury
TTA	Trauma Team Activation

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