Matanuska Susitna Borough Emergency Medical Services Data Analysis

December 10, 2020

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Abbreviations

The Emergency Medical Services (EMS) field makes frequent use of acronyms. To reduce confusion for the purposes of this report the following acronyms are defined below.

AEMT   Licensed by Alaska DHSS as EMT-2/3 (ILS)

ALS   Advanced Life Support

BLS   Basic Life Support

CAD   Computer Aided Dispatch software system

CVA   Cerebrovascular Accident

E-9-1-1   Enhanced 9-1-1 System (provides number and location services)

EMD   Emergency Medical Dispatch (pre-arrival instructions for 9-1-1 incidents)

EMR   Emergency Medical [First] Responder

EMS   Emergency Medical Services

EMT   Licensed by Alaska DHSS as EMT-1 (BLS)

ETT   Emergency Trauma Technician

ICH   Intracerebral hemorrhage

TIA   Transient ischemic attach

TPF   The Paramedic Foundation

Acknowledgments

Executive Summary

Data for this report was obtained from Matanuska-Susitna Borough Emergency Medical Services (MSBEMS) and in-depth interviews with emergency medical technicians (EMTs), paramedics, fire chiefs, medical providers, hospital staff, and other first responders. In a 12-month period during 2018-2019, MSBEMS responded to approximately 9,248 emergency calls. The calls to MSBEMS were almost evenly split between the classification of non-emergent[1] (53%, 4,231) and emergent calls (47%, 3,728).

The MSBEMS system responds to calls that were distributed almost evenly by gender. Older residents are more likely to request assistance than younger residents. The collection of data on race/ethnicity and sexual orientation and gender was incomplete and this is an area that can be improved in the future to both understand patterns in health inequity and improve healthcare delivery. Most of the service was provided in the core area of the borough. This is defined as the area including and surrounding Wasilla and Palmer.

Older Residents

Annually, there were approximately 2,722 calls from older residents (60+ years) representing 29% of all 911 calls. These calls cost $3,810,976. Forty-nine percent of the calls were classified as requiring a non-emergent response. The most common call types for older residents were:

1. Falls (23%)
2. Breathing problems (12%)
3. Sick person (11%)
4. Medical-other (9%)
5. Chest pain (7%)
6. Abdominal pain (6%)

Eighty-one percent of calls for older residents resulted in transport to the hospital. Eleven percent of calls that did not result in transport after treatment cost $128,609 and the four percent of the calls for lift assist cost a total of $46,323.

Residents with Behavioral Health Needs

Behavioral health includes both mental health and substance use disorder. In 12 months, there were 2,574 calls for patients with behavioral health needs representing 28% of all 911 calls. These calls cost $3,582,546. Many EMS patients that have behavioral health needs do not always call for an obvious psychiatric complaint. The most common call types for patients with a history of behavioral health needs were:

1. Overdose, withdrawal, toxic exposure (11%)
2. Falls (9%)
3. Psychiatric problems (8%)
4. Sick person (8%)
5. Chest pain (7%)
6. Abdominal pain (6%)

The percent of calls that were classified as nonemergent for behavioral health patients is like that of all EMS patients (53%). Eighty-one percent are treated and transported to the hospital. Ten percent are

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[1] A call is classified as "non-emergent" if the response to the situation does not require the urgency of driving with lights and a siren for response.

treated onsite and refuse transport and four percent refused care after an assessment. The treatment onsite and no-transport calls cost a total of $110,483 and care refusal calls cost $45,171. Lift assist calls for this population cost $11,509.

Residents with Chronic Health Conditions
Chronic health conditions last one or more years and require ongoing medical attention and/or limit activities of daily living. In 12 months, there were 5,159 calls for patients with chronic conditions representing 56% of all 911 calls. These calls cost approximately $7,198,060. Most calls (81%) from patients with chronic health conditions required treatment and transport to the hospital. Nine percent of the calls were treated onsite and refused transport and cost $203,701. Four percent refused care and cost $92,068. One percent of the calls required lift assist and cost $21,003. The most common types of calls from these patients were:
1. Falls (14%)
2. Medical other (12%)
3. Breathing problems (12%)
4. Chest pain (9%)
5. Sick person (9%)
6. Abdominal pain (5%)

High Utilizer Patients
High utilizer patients are defined as patients that use MSBEMS five or more times a year. Reducing the demand from high utilizers can bring about cost-savings and contribute to patients' improved health. In 2019, there were 33 high utilizers. In the same year, 280 patients (2.7 average calls per patient) accounted for a total of 780 MSBEMS encounters which cost the Borough approximately $843,404. All high utilizers had a past medical history of mental health issues and many experience chronic health conditions. Approximately, half (49%) of calls for high utilizer patients were classified as non-emergent. The most common types of calls from high utilizer patients were:
1. Sick person
2. Medical other
3. Falls
4. Breathing problems
5. Abdominal pain
6. Psychiatric problems

The data presented in this report reveals that MSBEMS plays an integral role in the Mat-Su healthcare system; however, there appears to be a portion of EMS care that could be channeled to less expensive and more effective programs. The data reveals that approximately half of all calls responded to by EMS were classified as needing a non-emergent response. Older residents had 22% of calls that required treatment but did not result in transport to the hospital. These types of calls were less frequent but still substantial for residents with behavioral health needs (10%) and residents with chronic illness (10%).

The overall cost savings for decreasing these non-emergent response calls cannot be determined based on this analysis; however, the cost of non-emergent response calls for the older residents is $1.867,378 and for residents with behavioral health needs is $1,755,448. Many of these calls may be prevented by creating services that reach residents prior to them calling 911. This could include filling gaps in the physical, behavioral, and long-term care continuums of care and increasing access to existing services in

our community. Additionally, there are behavioral health crisis calls that may be better addressed by a specialized unit like a Mobile Crisis Unit.

There are several programs that have been shown to avert the need for emergency medical care. One of which, the High Utilizer Mat-Su Program (HUMS) is already active in the borough and one is being developed by the State of Alaska (Mobile Crisis Unit as part of the Crisis Now initiative). Two others that could be explored are establishing a Community Paramedicine Program and a client-centered home-based intervention program for older residents, an example of which is the Community Aging in Place-Advancing Better Living for Elders (CAPABLE Program).

Recommendations

Recommendation 1: Establish a Community Health Advisory Committee to address non-emergent service needs

The Paramedic Foundation recommends development of a targeted effort to address the calls that MSBEMS are getting that, while feeling like an emergency and immediate need to the patient, may be addressed earlier by a form of preventive care or addressed at the time of the call by a more appropriate services like a Mobile (behavioral health) Crisis Unit. A Community Health Advisory Committee (CHAC) should be initiated with a project charter and membership specifically designed for this purpose. The CHAC could be composed of MSBEMS leadership, and representation from Mat-Su Regional Medical Center, long-term care and assisted-living programs, and the following sectors: senior services, medical services, allied health, social services and behavioral health. The CHAC can review the data in this report, discuss the need for services to address the non-emergent needs of EMS patients, and guide and monitor the development of these services.

Recommendation 2. Implement programs to address non-emergent service needs

Initial efforts should be focused on a few targeted areas for risk and expense reduction that will also result in improved health outcomes and greater quality of life for the affected populations. There will be some overlap between these efforts. The populations to focus on are older residents, residents with behavioral health needs and/or chronic health conditions, and EMS high utilizers.

Recommendation 3. Explore lessons learned from the Emergency Triage, Treat, and Transport [ET3] Model

In February 2020, the U.S. Centers for Medicare & Medicaid Services (CMS) announced its first cohort of model applicants for an initiative it named Emergency Triage, Treat, and Transport (ET3), to allow CMS beneficiaries to access the most appropriate emergency services at the right time and place. Although this program is not available in Alaska, it illustrates the federal support for significant changes in the EMS funding models that are likely to be coming to Alaska. It will be important for the CHAC to review information about this initiative.

Recommendation 4. Improve MSBEMS Data

The analysis for this report brought to light several next steps for MSBEMS that will improve future reports and analyses. Cleaning up the existing data collection platform would allow for more detailed and accurate reports

Methodology

The Paramedic Foundation did the EMS data collection and analysis. They submitted a preliminary document to the MSHF, and Actionable Data Consulting (ADC) assisted in developing this report. A portion of the EMS analysis findings were not used in this report and are available on request from the MSHF.

Quantitative Data Methods

Quantitative data was provided for analysis to the Paramedic Foundation from Matanuska-Susitna Borough Emergency Medical Services (MSBEMS) from a clinical documentation system known as EMS Charts. The data was analyzed for the period from February 1, 2018 to August 31, 2019. Data was also obtained from the US Census website and the National EMS Information System (NEMSIS) website. For some data points a ratio was used to convert 18 months of data to 12 months of data to increase understanding of the findings. For the cost data, to make meaningful distinctions between agencies, models, and systems, several different ratios were employed. Several cost ratios were calculated including cost per transport and cost per response

Qualitative Data & Methods

In May 2019, The Paramedic Foundation (TPF) conducted 20 in-person interviews with stakeholders, including fire chiefs, EMTs, paramedics, medical directors, dispatch directors, and elected officials. The interviews were semi-structured and were conducted by two TPF staff members to address the primary research questions and to elicit related service issues.

Staff at the Mat-Su Health Foundation and from Actionable Data Consulting assisted with writing up the results and creating this report.

Limitations

The analysis is limited by the data that could be made available by MSBEMS. The reliance on Borough software systems to access billing reports was a factor in being able to establish the cost of delivering services. Additionally, using a ratio to convert 18 months of data to 12 months to be able to report on indicators with an annual timeframe may not accurately reflect a year's worth of data because there may be seasonal change in the types of calls handled by the MSBEMS.

Matanuska-Susitna Borough Emergency Medical Services (MSBEMS) Overview

Matanuska-Susitna Emergency Services cover the entire Matanuska-Susitna Borough which is located about 40 miles northeast of Anchorage in southcentral Alaska and occupies an area of 24,608 square miles. The 2019 population of the borough was 106,438 with a population density of 3.6 persons per square mile (Alaska Department of Labor and Workforce Development, 2020). Matanuska-Susitna Borough Emergency Services is composed of nine fire departments, emergency medical service (EMS) operations, and water & dive rescue operations. The program uses a combination of full-time and paid-on-call responders. There are two divisions, Fire and Rescue, each has its own funding, membership requirements, operations, and equipment. All 911 calls are routed through MatCom, a dispatch service run by the City of Wasilla.

Matanuska Susitna Borough Emergency Medical Services (MSBEMS) is a coordinated response to deliver emergency medical care involving multiple people and agencies. EMS operates at the crossroads between health care, public health and public safety. A combination of resources and coordination between these three sectors is needed for an efficient EMS system. According to EMS.gov, an EMS system contains the following components:

- Agencies and organizations (both private and public)
- Communications and transportation networks
- Trauma systems, hospitals, trauma centers, and specialty care centers
- Rehabilitation facilities
- Highly trained professionals
    - Volunteer and career prehospital personnel
    - Physicians, nurses, and therapists
    - Administrators and government officials
- An informed public that knows what to do in a medical emergency (National Highway Traffic Safety Administration, 2020)

Formerly, MSBEMS relied on a mix of paid and volunteer personnel. While volunteers are highly regarded and appreciated for their dedication, they are also subject to the demands of life beyond EMS, including their "day jobs." To improve the reliability of its services, MSBEMS now employees its personnel who are comprised of several levels of providers. Table 1 outlines the MSBEMS positions.

Table 1. Number of MSBEMS Staff Positions	
Position	**Count**
Full-time Paramedic	24
On-call Paramedic	2
EMT-2	24
On-call EMT	8
Educator	2
Emergency Trauma Technician Driver	2
Leadership position	5
Administrative position	4

Source: MSBEMS

Figure 1. Map of Matanuska-Susitna Borough road system with EMS locations
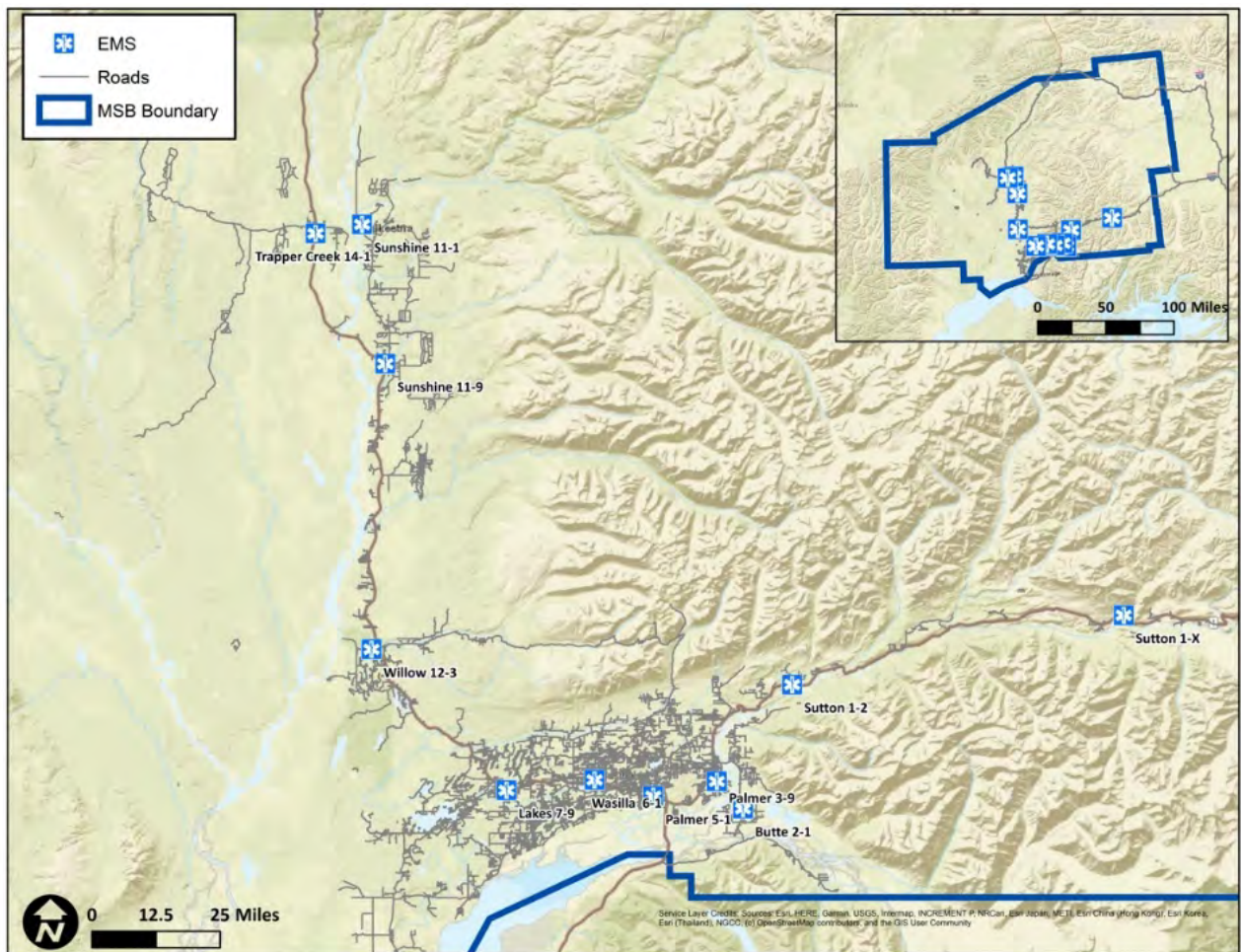
Most EMS Calls (82%) occur in the core area of the borough. This is defined as the area including and surrounding Wasilla and Palmer. Table 2. shows how EMS locations are distributed geographically.

Table 2. Geographic location of calls	
Residence Location	**Percent**
Wasilla	59
Palmer	23
Big Lake	5
Willow	4
Houston	2
Talkeetna	2
Sutton	1
Trapper Creek	1
Skwenta	<1
Non-Borough AK	3
Out-of-state	1
Total	100
Source: MSBEMS 12 months of data interpolated from 2/1/2018 - 8/31/19	

There are seven types of services provided by the MSBEMS (see Table 3):
- 911 Response: Requests for emergency assistance processed by MatCom
- Standby services: Ambulance and EMS staff "standby" at an event, either planned (i.e., athletic event) or an emergency (i.e., SWAT team event).
- Public Assistance/Other call: A call where medical need has not been established, but another emergency or safety service is provided.
- Medical Transport/Interfacility Transport: Request for someone who does not have a medical emergency but needs an ambulance for transport (i.e., hospital to nursing home).
- Intercept: One ambulance will intercept another to transfer a patient into another ambulance with a more appropriate level of care.
- Mutual Aid: A request from another jurisdiction, often because of an overwhelming need for additional resources that are not available in that jurisdiction.

Table 3. Percent of Type of service provided	
MSBEMS Type of Service	**Percent**
911 Response (Scene)	93
Standby	6
Public Assistance/Other	0.25
Medical Transport	0.18
Intercept	0.08
Mutual Aid	
Total	100.00
Source: MSBEMS data, 5/18/2020 – 4/19/2020	

Although some requests for emergency medical assistance are for life-threatening emergencies, most are not. It is difficult to determine in advance which 911 calls are true emergencies, and which are not. Initially, the urgency of the response will be determined by MatCom dispatch staff who are answering 911 calls.

The start of the response process begins when a caller places a call to 911 for medical assistance. A specially trained call taker will answer the call. Through a series of strict protocol-based scripted questions the call taker first learns the location of the incident and the nature of the emergency. The call taker then provides specific first aid or CPR instructions while awaiting the EMS response. The call taker's prioritization and determination of urgency are based on a combination of the 911 dispatch training, policies, and procedures. These are assigned a five-digit Determinant Code that is used to determine what resources are deemed appropriate to send to the emergency.

The first consideration is what sort of response time is needed – COLD or HOT; and the second consideration is what rescuer ability is needed – Basic Life Support (BLS) or Advance Life Support (ALS).
- COLD: Immediate response not necessary – no lights/sirens
- HOT: Immediate response necessary – light/sirens
- Basic Life Support (BLS): Ambulance staffed by Emergency Medical Technicians (EMTs) for patients who require basic medical monitoring
- Advanced Life Support (ALS): Ambulance staffed by a Paramedic for patients who require a higher level of service than BLS. [2]

Proper routing is important for risk management and proper triaging of responses to provide the appropriate response. The highest level of predictable response is sent until an appropriate responder arrives on the scene and can reclassify or re-triage the emergency based on their firsthand assessment of the situation. When a 911 call is received a determinant category is assigned. These categories determine the appropriate response that is sent to the scene. Emergent calls are classified as Echo, Delta, and Charlie and non-emergent calls are classified as Alpha, Bravo, and Omega.
- Echo: Life threatening cardiac or respiratory arrest requiring ALS
- Delta: Life-threating other than cardiac or respiratory arrest requiring ALS
- Charlie: Serious but not life-threatening requiring ALS and immediate response
- Bravo: Serious, not life-threatening requiring BLS and urgent response
- Alpha: Non-serious or non-life threating requiring BLS
- Omega: Minor illness or injury requiring BLS[3]

The majority of MSBEMS calls were in response to 911 calls (93%) followed by standby (6%) and then public assistance, medical transport and intercept which each made up under 1% of the calls. The calls to MSBEMS were almost evenly split between the classification of non-emergent (53%) and emergent calls (47%).

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[2] EMTs and paramedics differ based on their level of education and kind of procedures they can perform. Paramedics receive more training and can administer a higher level of medical care.
[3] MatCom uses the Medical Priority Dispatch System to standardize the EMS process to allow MSBEMS to respond consistently to calls in a timely fashion with the appropriate resources. The classification system is more extensive that presented in this report.

Demographics of MSBEMS Patients

In a 12-month period MSBEMS responded to 9,248 EMS calls. An analysis of 18 months of calls between 2/1/2018 to 8/31/2019 revealed that 42% of the calls were from females, 40% from males and 18% had missing data for gender classification. The percent of patients of different race/ethnicities was very similar to the overall racial/ethnic makeup of the borough (see Table 4). The median age of the patients was 35.5 years and the higher the age of the patient the more likely they are to use the EMS system.

Table 4. Race/Ethnicity of MSBEMS Patients

Racial/Ethnic Category	% of EMS patients	Percent of borough population[4]
White, non-Hispanic	81	82
Alaska Native/American Indian	13	12
Black, Non-Hispanic	1	2
Unknown	1	
Asian	1	3
Hispanic Origin	1	5
Hawaiian/Other Pacific Islander	1	1

Source: MSBEMS Data and AK Department of Labor and Workforce Development, 5/18/2018 – 4/19/2019

Table 5. Age of MSBEMS patients

Age Group	% of EMS Patients
0-9 years	4.1
10-19 years	4.8
20-29 years	9.4
30-39 years	9.5
40-49 years	9.0
50-59 years	14.2
60-69 years	16.7
70-79 years	13.8
80-89 years	8.4
90+ years	2.8
Unknown	7.3

Source: MSBEMS and AK Department of Labor and Workforce Development, 5/18/2018 – 4/19/2019

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[4] For these racial categories the respondent could select more than one category therefore all the categories summed will add up to more than 100%.

In determining the urgency of response for a call, the highest level of urgency is usually chosen by the MATCOM call-taker and when the appropriate responder arrives on the scene they can reclassify or re-triage the emergency based on their firsthand assessment. The effect of this is that high urgency cases are likely addressed with appropriate resources. It is illuminating to compare the response categorization determined by the call taker (emergent or non-emergent) with the categorization of transport which is determined by the EMS staff on the scene after assessing the situation.

Table 6. Percent of MSBEMS calls by level of severity		
High Urgency ↑ Low Urgency	Code	% of EMS Patients
	Echo	3
	Delta	30
	Charlie	20
	Bravo	15
	Alpha	32
	Total	100
Source: MSBEMS 18 months of data, 2/1/2018 - 8/31/19		

Fifty-three percent of MSBEMS calls were classified as non-emergent (Alpha or Bravo) and 47 percent were classified as emergent (Charlie, Delta, Echo). The transport classification of those calls was 61% emergent and 39% non-emergent. National EMS data and MSBEMS had similar transport urgency levels; however, there was a large difference in categorization of response urgency. Nationally, EMS programs were more likely to classify responses as emergent (71%) as compared to transports (63%). Matcom classified less 911 call responses as emergent (47%) as compared to transports (61%). This may indicate that a lower level of staff response is being sent to the scene than what is required. This is an area for more investigation.

Table 7. Percent of calls by Response/Transport and Urgency		
	MSBEMS (%)	National EMS Data (%)
Response		
Emergent	47	71
Non-emergent	53	29
Transport		
Emergent	61	63
Non-emergent	39	37
Source: MSBEMS, 2/1/2018 – 8/31/2019		

Table 8 lists the top five call types for emergent and non-emergent calls. Figure 2 and 3 provide a more complete distribution of the call types.

Table 8. Leading call types by emergent status

Emergent call types	Non-emergent call types
1. Breathing problems (16%)	1. Falls (23%)
2. Chest pain (12%)	2. Traffic accident (13%)
3. Traffic accident (11%)	3. Sick person (10%)
4. Sick person (7%)	4. Medical-other (9%)
5. Abdominal pain (6%)	5. Abdominal pain (7%)
6. Unconscious/fainting	6. Psychiatric problems (7%)

Source: MSBEMS, 2/1/2018 – 8/31/2019

Both emergent and non-emergent calls had high percentages of sick person, abdominal pain, and traffic accident call types. Behavioral health type calls (psychiatric problems, overdoes/withdrawal/toxicity, altered mental status) were more commonly categorized as non-emergent calls. Trauma-related calls and fall calls were more commonly classified as non-emergent, as well (see Figures 2 and 3).

Figure 2. Percent of emergent calls by type
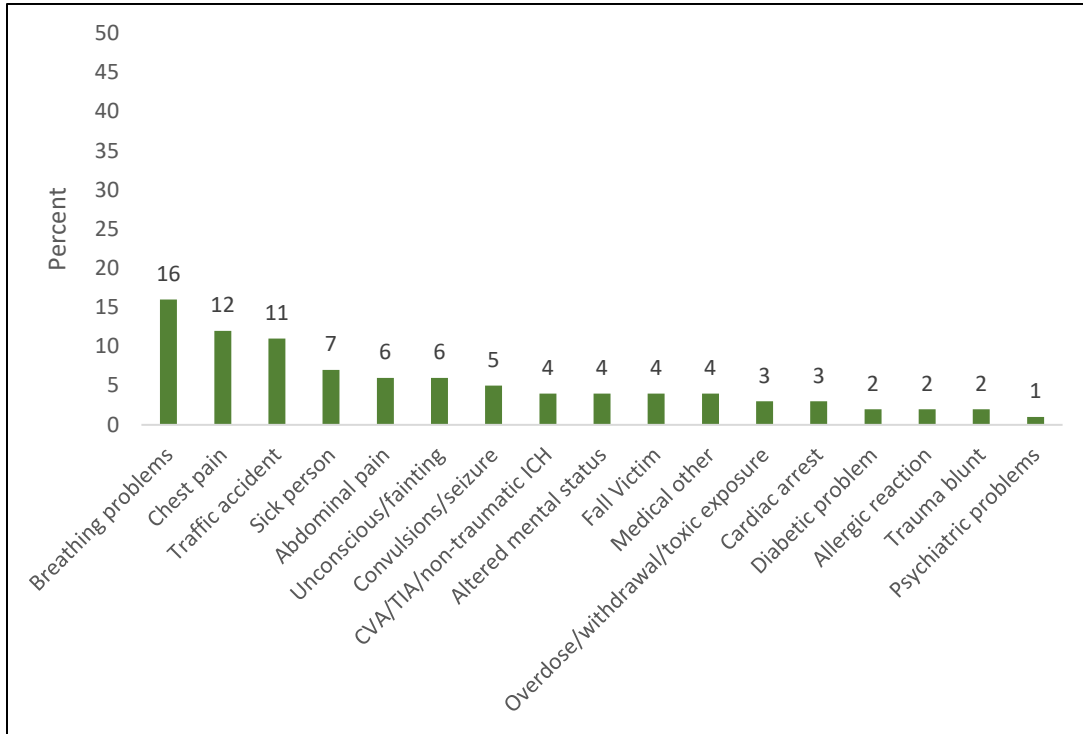
Source: MSBEMS, 2/1/2018 – 8/31/2019

Figure 3. Percent of non-emergent calls by type
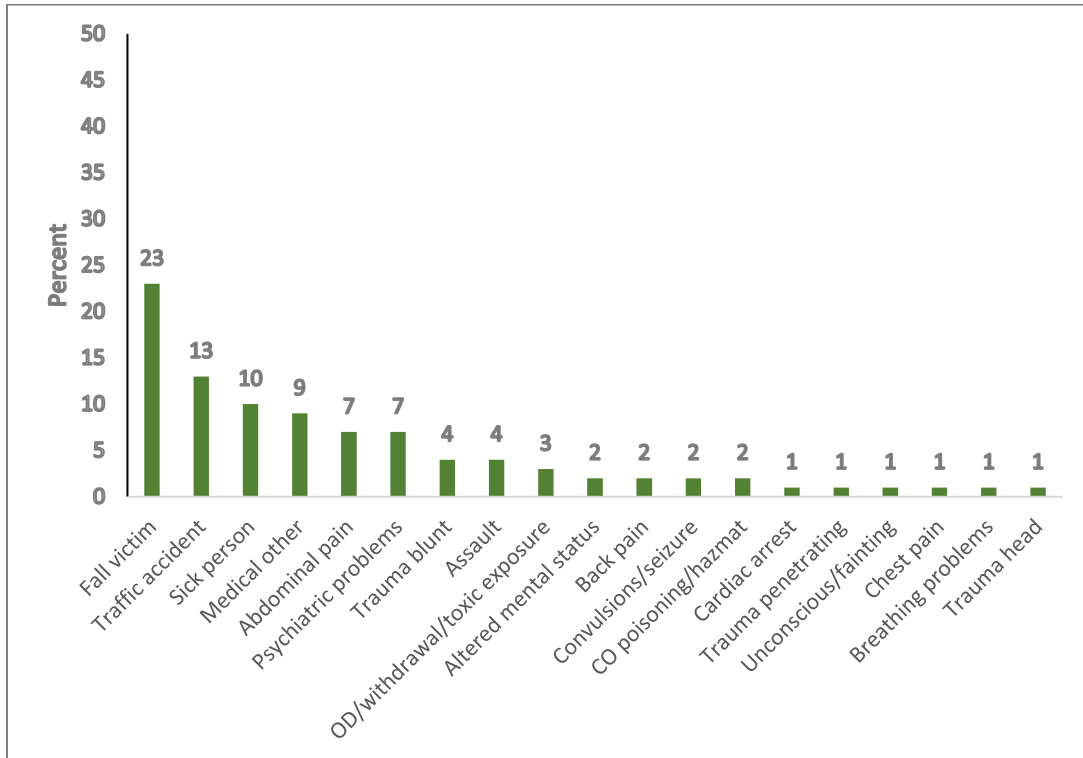
Source: MSBEMS, 2/1/2018 – 8/31/2019

Special Populations

Older residents

Annually, there were approximately 2,722 calls from older residents (60+ years) representing 29% of all 911 calls. These calls cost $3,810,976. Forty-nine percent of the calls were classified as non-emergent. The Matanuska-Susitna Borough is home to over 15,000 older residents (age 60 and older). Per-capita, the borough, leads the state in older resident growth and has numerous assisted living facilities, senior housing units, and two new large skilled nursing/assisted living facilities. In understanding the needs of older residents, it is important to know if many calls for falls and lift assists come from these facilities. The cost of a lift assist using MSBEMS is $254 per fall. As the number of older residents increases these costs will increase, as well. This analysis did not analyze data by location of call. Across the country, many facilities develop policies to prevent their staff from assisting patients up from the floor if they have fallen and can't get up. These "no lift" facilities add to the EMS burden if they have these policies.

The most common call types for older residents are:

1. Falls (23%)
2. Breathing problems (12%)
3. Sick person (11%)
4. Medical-other (9%)
5. Chest pain (7%)
6. Abdominal pain (6%)

Figure 4. Call types for MSBEMS older residents
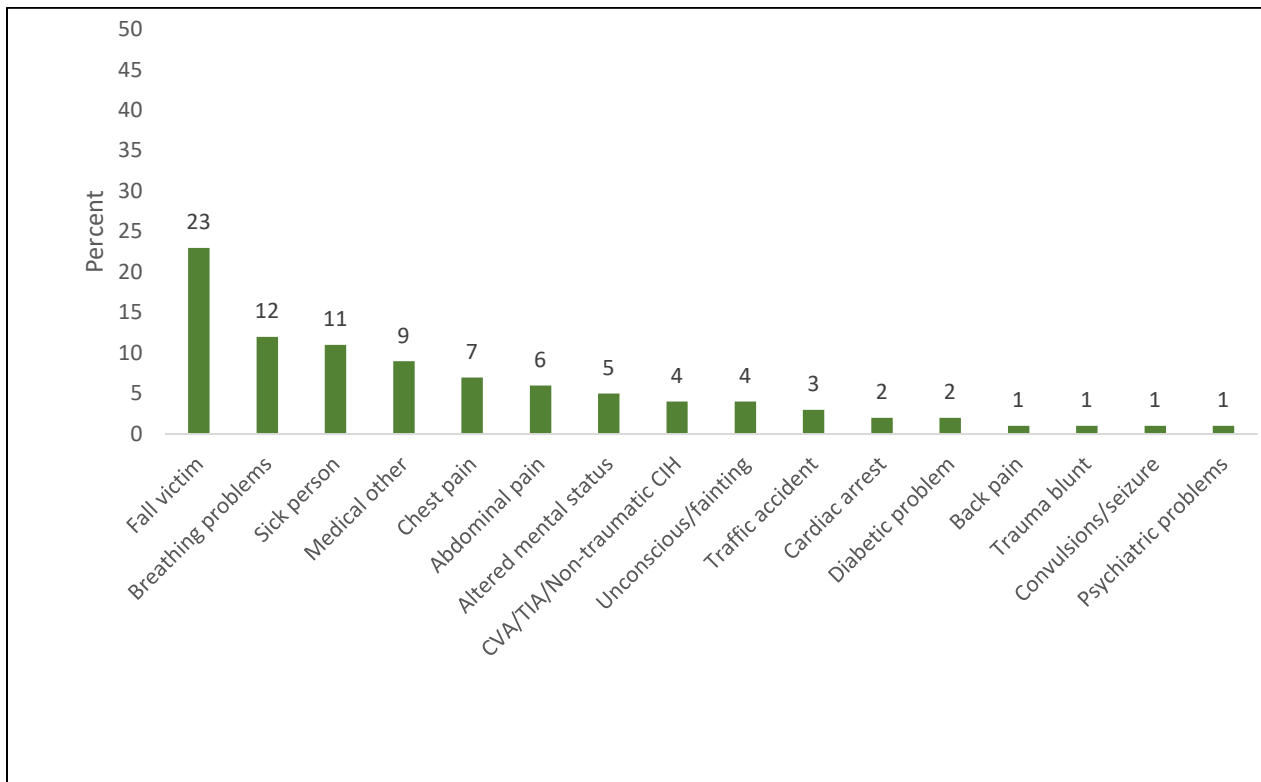
Source: MSBEMS, 2/1/2018 – 8/31/2019

Table 9. Annual percent, number, and cost of calls from older residents

Disposition	% of calls	# of calls	Cost of calls	Cost per call
Treated and transported	81	2215	$3,592,024	$1,622/call
Treated and refused transport	11	298	$128,609	$432/call
Lift assist only, medical care not required	4	107	$46,323	$432/call
Obvious death, no resuscitation attempted	2	50	$21,866	$432/call
Treated, transferred to air medical service	1	33	$14,098	$422/call
Treated and pronounced dead at scene	1	19	$8,056	$422/call
Total		2,722	$3,810,976	

Source: MSBEMS 12 months of data interpolated from 2/1/2018 - 8/31/19

The patients that EMS responds to have three options to choose from should they have decision-making capacity:

1) Transport to the emergency department by ambulance
2) Transport to the emergency department by another means
3) To refuse transport to the emergency department

Eighty-one percent of calls for older residents resulted in transport to the hospital. Eleven percent of calls that did not result in transport after treatment cost $128,609 and the four percent of the calls for lift assist cost a total of $46,323. These calls may be able to be addressed or prevented by a lower level of care.

Falls are the leading call type for older residents. Figure 5 shows that most falls occur to individuals 60 years or older (73%). Elderly citizens more frequently lose their balance and have complicated medical histories and medications, making them more susceptible to dizziness and weakness that results in the individual falling or collapsing to the floor. Due to the decreased mobility of the individual as well as their spouse, they frequently require assistance. This type of call is known as a "lift assist." Commonly, after assisting the individual, they will decline further evaluation and/or treatment and transport. Forty-one percent of MSBEMS fall calls do not require transport.

Figure 5. Percent of falls by age
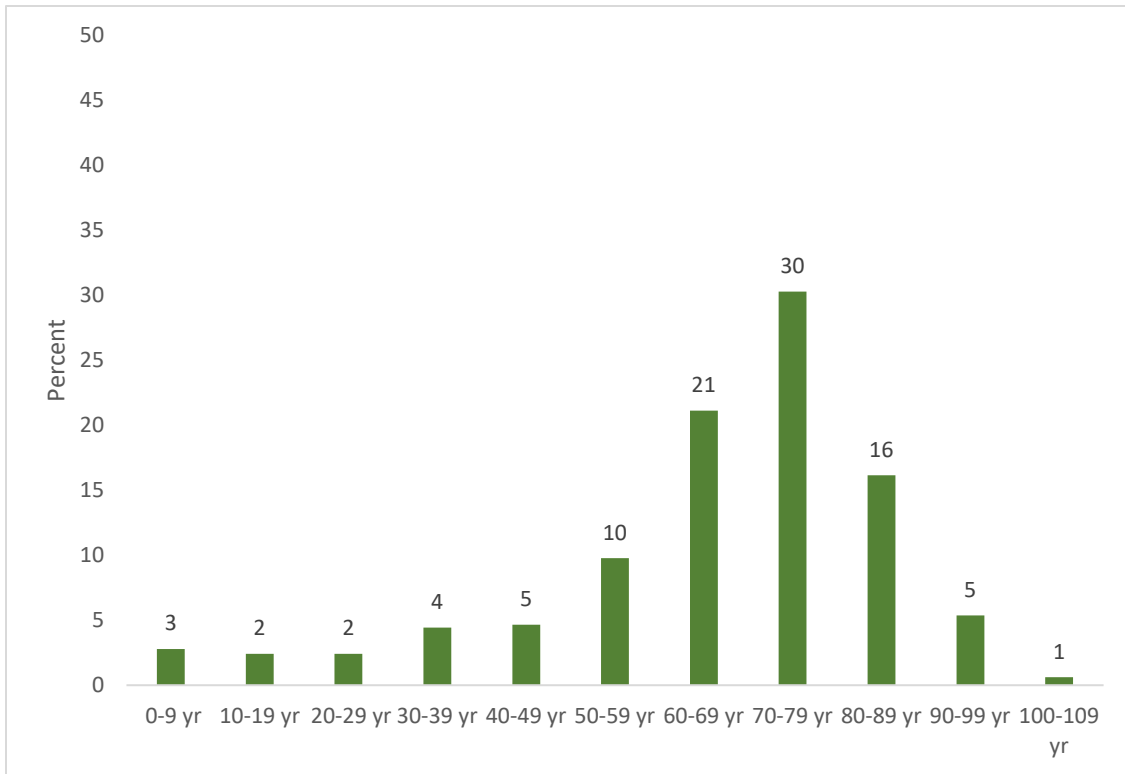
Source: MSBEMS, 2/1/2018 – 8/31/2019

Patients with Behavioral Health Needs

Behavioral health includes mental health and substance use disorder. In 12 months, there were 2,574 calls from patients with behavioral health needs costing $3,582,546. These calls made up 28% of all EMS calls. Many EMS patients that have behavioral health problems do not always call for an obvious psychiatric complaint. The most common call types for patients with a history of behavioral health problems are:

1. Overdose, withdrawal, toxic exposure (11%)
2. Falls (9%)
3. Psychiatric problems (8%)
4. Sick person (8%)
5. Chest pain (7%)
6. Abdominal pain (6%)

Figure 6. Call types for MSBEMS patients with behavioral health needs
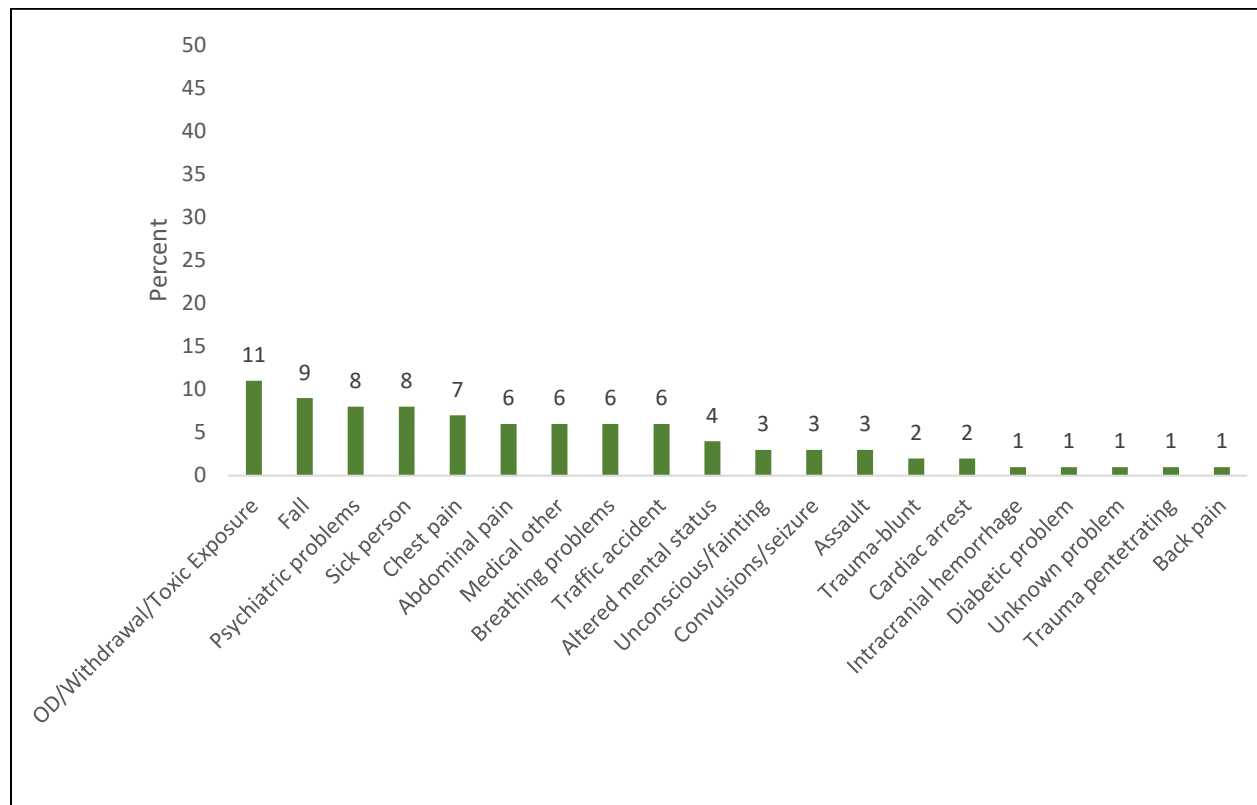
Source: MSBEMS, 2/1/2018-8/31/2019

Forty-seven percent of calls from patients with behavioral health needs were classified as non-emergent.

Table 10. Percent of behavioral health (BH) patient calls by level of urgency

High Urgency	Code	% of EMS Patients	% of BH patients
↑	Echo	3	3
	Delta	30	27
	Charlie	20	21
	Bravo	15	13
Low Urgency	Alpha	32	37
	Total	100	

Source: MSBEMS 2/1/2018 - 8/31/19

For 12 months during 2018-2019, MSBEMS received 2,574 calls from behavioral health patients costing $3,582,546.

Table 11. Annual percent, number, and cost of call from residents with behavioral health needs

Disposition	% of calls	# of calls	Cost of calls	Cost per call
Treated and transported	81	2077	$3,368,198	$1622
Treated and refused transport	10	256	$110,483	$432
Refused care, assessment only	4	105	$45,171	$432
Lift assist only	1	27	$11,509	$432
Cancelled	1	25	$10,645	$432
Obvious death, no resuscitation	1	21	$8,919	$432
Treated, transferred to air medical service	1	18	$7,769	$432
No treatment required	1	13	$5,754	$432
Treated, pronounced at scene	<1	12	$5,179	$432
Treated, transported by law enforcement	<1	11	$4,891	$432
No patient found	<1	5	$2,302	$432
Unit assist	<1	4	$1,726	$432
		2,574	$3,582,546	

Source: MSBEMS 12 months of data interpolated from 2/1/2018 - 8/31/19

Eighty-one percent of calls from patients with behavioral health needs are treated and transported to the hospital. Ten percent are treated onsite and refuse transport and four percent refused care after an assessment. The treatment onsite and no-transport calls cost a total of $110,483 and care refusal calls cost $45,171. Lift assist only calls for this population cost $11,509.

Patients with Chronic Health Conditions

Chronic health conditions last one or more years and require ongoing medical attention and/or limit activities of daily living. Chronic diseases such as heart disease, cancer, and diabetes are the leading causes of death and disability in the United States. Other chronic conditions include cancer, hepatic cirrhosis, congenital kidney failure, hypertension, pulmonary hypertension, glaucoma, and seizures. For 12 months during 2018-2019, there were 5,159 calls from patients with chronic conditions that cost approximately $7,198,060. These made up 56% of all EMS calls. The most common types of calls for these patients were:

1. Falls (14%)
2. Medical other (12%)
3. Breathing problems (12%)
4. Chest pain (9%)
5. Sick person (9%)
6. Abdominal pain (5%)

Figure 7. Percent of call types for patients with chronic conditions
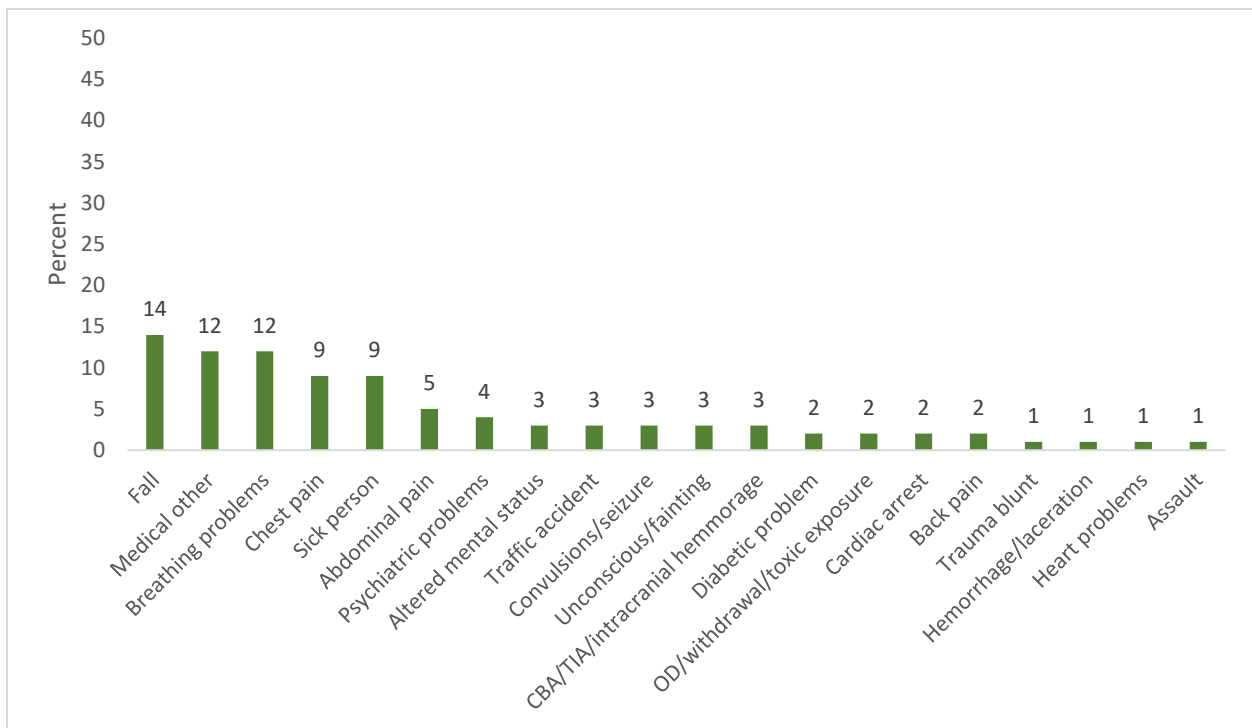
Source: MSBEMS data for 18 months, 2/1/2018-8/31/2019

Table 12. Disposition of calls from residents with chronic health problems

Disposition	% of calls	# of calls	Cost of calls	Cost per call
Treated and transported to hospital	81	4177	$6,774,260	$1622
Treated and refused transport	9	472	$203,701	$432
Refused care, assessment done	4	192	$82,861	$432
Lift assist only	1	49	$21,003	$429
Treated, transferred to air service	2	81	$35,101	$433
Death, no resuscitation	1	71	$30,785	$434
Treated, pronounced dead at scene	1	52	$22,441	$432
Patient refused care	<1	21	$9,207	$438
No treatment required	<1	19	$8,056	$424
Treated, transported by law enforcement	<1	11	$4,603	$418
Treated, transported in private vehicle	<1	4	$1,726	$432
Cancelled	<1	3	$1,439	$480
Treated, transferred care	<1	2	$863	$432
Dead a scene	<1	2	$863	$432
No patient found	<1	3	$1,151	$384
		5159	$7,198,060	

Source: MSBEMS 12 months of data interpolated from 2/1/2018 - 8/31/19

Most of calls (81%) from patients with chronic health conditions required treatment and transport to the hospital. Nine percent of the calls received treated onsite and refused transport and cost $203,701. Four percent refused care and cost $92,068. One percent of the calls required lift assist only and cost $21,003.

MSBEMS High Utilizer Patients

High Utilizers are defined as patients that use EMS five or more times in a year. Reducing the demand from high utilizers can bring about cost-savings to the EMS system. In 2019, there were 33 high utilizers. In the same year, 280 patients (2.7 average calls per patient) accounted for a total of 780 MSBEMS encounters which cost the Borough approximately $843,404.

The most common types of calls for high utilizer patients are:
1. Sick person
2. Medical other
3. Falls
4. Breathing problems
5. Abdominal pain
6. Psychiatric problems

Figure 8. Percent of call types for high utilizer patients
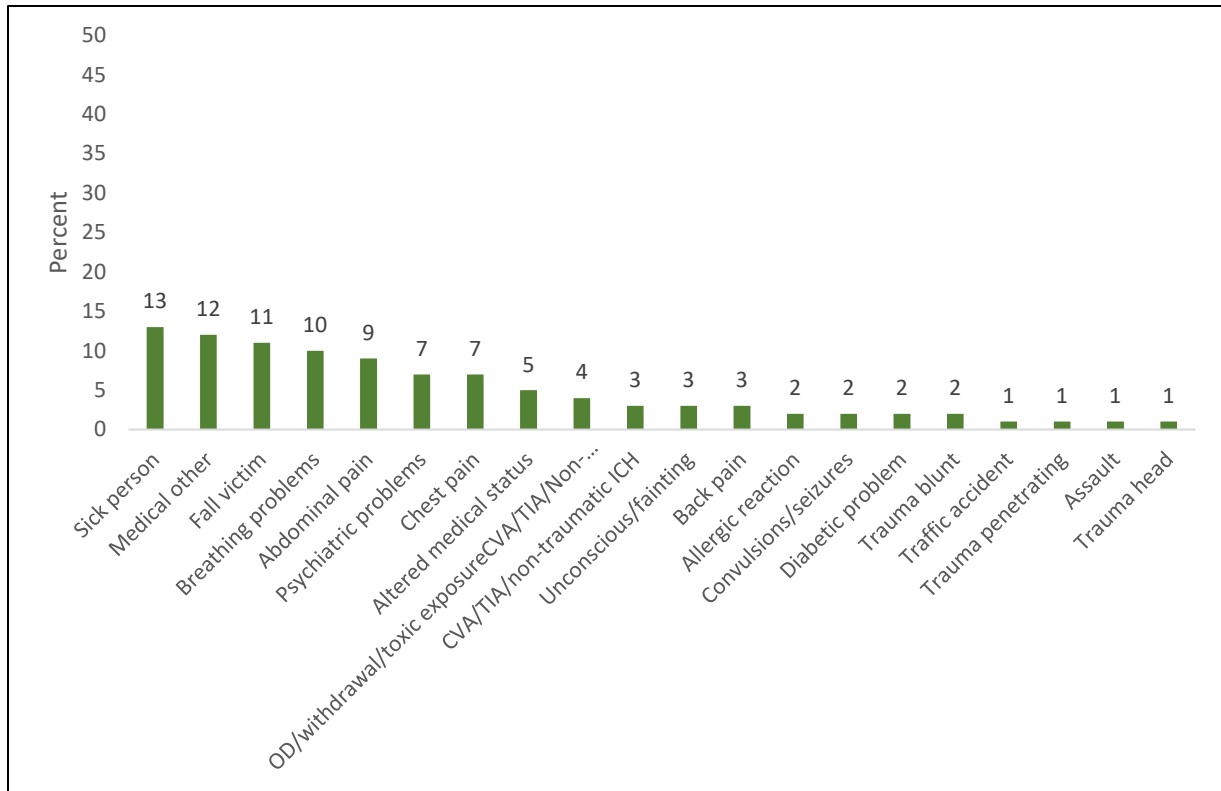
Source: MSBEMS data for 18 months, 2/1/2018-8/31/2019

All high utilizers had a past medical history of mental health issues and many experience chronic diseases.

Table 13. High utilizer past medical history

Health condition	Percent	Health condition	Percent
Mental health	100	Seizure	11
Cardiac	82	Obesity	10
Hypertension	41	Chronic pain	8
Diabetes	37	Dementia	8
Substance abuse	35	Gastrointestinal reflux disease	8
Stroke/TIA	27	Fracture	7
Chronic obstructive pulmonary disease	21	Hyperlipidemia	7
Arthroplasty	15	Urinary tract infection	7
Asthma	13	Pneumonia	7
Cancer	11	Renal failure	7
Neuropathy	11	Rheumatoid Arthritis	7

Source: MSBEMS data for 18 months, 2/1/2018-8/31/2019

Approximately, half (49%) of all calls from high utilizer patients required a non-emergent response and high utilizer patient calls included leading call types for the other subgroups, specifically falls and abdominal pain.

Table 14. Percent of calls by high utilizer patients by severity

High Urgency ↑ Low Urgency	Code	% of EMS patients	% of high utilizer patients
	Echo	3	2
	Delta	30	15
	Charlie	20	24
	Bravo	15	23
	Alpha	32	36
	Total	100	

Note: 18 months of data, 2/1/2018 - 8/31/19

Discussion

The data presented in this report reveals that the MSBEMS system serves an integral role in the local healthcare system; however, there appears to be some use of the EMS system that could be channeled to less expensive and more effective programs. The data reveals that approximately half of the calls responded to by EMS were classified as requiring a non-emergent response. This may indicate that there are gaps in services and barriers to access that prohibits residents from using the outpatient healthcare system causing residents to seek care from EMS instead. EMS, the emergency department, and inpatient care are considerably more expensive than prevention, home healthcare and outpatient care.

The EMS system responds to calls that are distributed almost evenly by gender. Older residents (60+ years) are more likely to request assistance than younger residents. The collection of data on race and sexual orientation is incomplete and this is an area that can be improved in the future to both see patterns in health inequity and improve healthcare delivery.

Almost half of all calls to EMS do not require an emergent response. This is true for calls from older residents, residents with behavioral health needs, and high utilizer patients. The data was not analyzed to determine the percent of non-emergent calls for patients with chronic illness. The overall cost savings for decreasing these non-emergent calls cannot be determined, however, the cost of calls classified as non-emergent for older residents is $1,867,378 and for residents with behavioral health needs is $1,755,448. Many of these calls may be prevented by creating services that are non-emergent and reach residents prior to them calling 911. This could include filling gaps in the physical, behavioral, and long-term care continuums of care and increasing access to existing services in our community. Additionally, there could be a more appropriate response to behavioral health emergencies from a Mobile Crisis Unit with specially trained professionals.

Table 15. Estimated annual cost of non-emergent response calls for subpopulations

Subpopulation	%	# of non-emergent calls	Estimated cost of non-emergent calls
Older residents	49	1334	$1,867,378
Residents with behavioral health needs	49	1262	$1,755,448

Source: Source: MSBEMS 12 months of data interpolated from 2/1/2018 - 8/31/19. Note: The cost estimate is calculated as the cost of the percent of non-emergent calls.

Each of these subpopulations had a certain percent of calls that were addressed without transport to the hospital (see Table 16). This was highest for older residents who had 22% of calls that did not result in transport, followed by residents with behavioral health needs (10%) and residents with chronic illness (10%). These calls are most likely problems that can be addressed by other types of less costly services such as:

- A home-based intervention program for older residents
- A mobile behavioral health-oriented crisis response team, such as in the Crisis Now initiative
- A care coordination program focused on high utilizers, such as the HUMS Program
- A Community Paramedicine Program

Appendix A describes these types of programs in detail.

Table 16   Disposition of calls by subpopulations

Disposition	Older residents % of calls and cost		BH needs % of calls and cost		Chronic illness % of calls and cost	
Treated, refused transport	22%	$128,609	10%	$110,483	10%	$203,701
Lift assist	10%	$46,323	4%	$11,509	1%	$21,003

Source: 12 months of MSBEMS data during 2018-2019
Note: Categories of subpopulations are not mutually exclusive so total cost saving cannot be calculated.

Looking at the table below, it becomes clear that there are three call types that reach across all categories of patients: falls, sick person, and abdominal pain.

Table 17. Call type by population and subpopulations			
All **resident** calls	**Older resident calls**	**Residents with BH problems**	**Residents with chronic illness**
1. **Falls** (23%) 2. Traffic accident (13%) 3. **Sick person** (10%) 4. Medical-other (9%) 5. **Abdominal pain** (7%) 6. Psychiatric problems (7%)	1. **Falls** (23%) 2. Breathing problems (12%) 3. **Sick person** (11%) 4. Medical-other (9%) 5. Chest pain (7%) 6. **Abdominal pain** (6%)	1. Overdose, withdrawal, toxic exposure (11%) 2. **Falls** (9%) 3. Psychiatric problems (8%) 4. **Sick person** (8%) 5. Chest pain (7%) 6. **Abdominal pain** (6%)	1. **Falls** (14%) 2. Medical other (12%) 3. Breathing problems (12%) 4. Chest pain (9%) 5. **Sick person** (9%) 6. **Abdominal pain** (5%)

Source: MSBEMS data for 18 months, 2/1/2018-8/31/2019

"Abdominal pain" and "sick person" are categories that catch many different diagnoses, so it is hard to interpret areas of prevention for these types of calls. Of particular interest in the list of call types by subpopulation is that "falls" is ranked highly for all subpopulations. There are several evidence-based fall risk and prevention programs that have proven success. They are out-patient or home-visiting in delivery and involve screening for falls, comprehensive fall assessment, gait and balance screening when necessary, and an individualized fall intervention program (See Appendix A). (Kruschke, 2017)

Recommendations

Recommendation 1: Establish a Community Health Advisory Committee to address non-emergent service needs.

The Paramedic Foundation recommends development of a targeted effort to address non-emergent service needs in the borough. A Community Health Advisory Committee (CHAC) should be initiated with a project charter and membership specifically designed for this purpose. The CHAC could be composed of MSBEMS leadership, and representation from Mat-Su Regional Medical Center, the long-term care and assisted-living programs, and the following sectors: senior services, medical services, allied health, social services and behavioral health. The committee can review the data in this report and discuss the need for services to address the non-emergent needs of EMS patients. Listed in Appendix A are several different programs that could address the non-emergent needs of residents. There is already movement in terms of two of these types of programs in Mat-Su. High Utilizer Mat-Su (HUMS) is a care coordination program that is decreasing repeat visits to the emergency department by borough residents. Additionally, the State of Alaska is supporting the development of Crisis Now, which has a Mobile Crisis Unit as a component. Other programs to considered are a Community Paramedicine Program and a home-based intervention program for older residents. It will be key that the CHAC promote communication between programs and sectors and discuss how these different solutions can be integrated and/or coordinated with each other.

Recommendation 2. Implement programs to address non-emergent service needs

As stated in Recommendation 1, initial efforts should be focused on a few targeted areas for risk and expense reduction that will also result in improved health outcomes and greater quality of life for the affected populations. There will be some overlap between these efforts. These populations and areas of focus are:

- Older residents
    - Conduct fall risk assessment and prevention outreach
    - Conduct medication reconciliation
    - Promote readmission avoidance with Mat-Su Regional Medical Center and physician practices
    - Increase access to home adaptation services to provide simple and low-cost home improvements
    - Increase access to physical therapy for fall prevention exercises and adaptive equipment needs
- Persons with chronic health conditions
    - Persons with mental health diagnoses
        - Coordinate with statewide Crisis Now efforts for crisis response and diverting mental health calls from 911 response.
    - Substance use disorders
        - Conduct medication reconciliation
        - Develop a readmission avoidance program with Mat-Su Regional Medical Center and physician practices
    - Significant comorbidities
        - Develop a medication reconciliation program
        - Develop a readmission avoidance program with Mat-Su Regional Medical Center and physician practices
        - Develop clinical pathways that allow for same day clinic appointments with specialists, using telemedicine where internet access allows
        - Develop protocols with cardiologists and others that community paramedics can implement in the home and use to make medication adjustments based on real time clinical assessment and point of care lab testing.

Recommendation 3. Explore lessons learned from Emergency Triage, Treat, and Transport [ET3]

In February 2020, the U.S. Centers for Medicare & Medicaid Services (CMS) announced its first cohort of model applicants for an initiative it named Emergency Triage, Treat, and Transport (ET3), to allow CMS beneficiaries to access the most appropriate emergency services at the right time and place. Although this program is not available in Alaska, it illustrates the federal support for significant changes in the EMS funding models that are likely to be coming to Alaska.

ET3 is a voluntary, five-year payment model that will provide greater flexibility to ambulance care teams to address emergency health care needs of Medicare fee-for-service (FFS) beneficiaries following a 911 call. Under the ET3 model, CMS will pay participating ambulance suppliers and providers to:

1) transport an individual to a hospital emergency department (ED) or other destination covered under the regulations,
2) transport to an alternative destination partner (such as a primary care doctor's office or an urgent care clinic), or
3) provide treatment in place with a qualified health care partner, either on the scene or connected using telehealth.

Recommendation 4. Improve MSBEMS data quality and reports

The analysis for this report brought to light several next steps for MSBEMS that will improve future reports and analyses. Cleaning up the existing data collection platform would allow for more detailed and accurate reports. Identifying where ambulances, unit identifiers, and stations responded from would better enable MSBEMS to determine demands and plan for operational needs on a geographic, hour of the day, day of the week basis. Further, improving the categories for gender and collecting race/ethnic data more consistently could provide for better planning and care delivery.

Appendix A – Examples of Programs to prevent non-emergent EMS calls

An example of a home-based intervention for older residents – the CAPABLE Program

CAPABLE (Community Aging in Place-Advancing Better Living for Elders) is a client-centered home-based intervention to increase mobility, functionality, and capacity to "age in place" for low-income older adults that has been shown to improve health outcomes at lower cost.

CAPABLE consists of:
1. An occupational therapist intervention
2. A client-centered nurse intervention
3. Home safety
4. Access to handy-worker services

Each service synergistically builds on the others by increasing the participants' bio-psycho-functional capacity to function at home. This is theorized to avert costly health utilization by increasing medication management, problem-solving ability, strength, balance, nutrition, and home safety, while decreasing isolation, depression, and fall risk.

CAPABLE is unique because it is client centric. Success is defined by the client and measured by a nursing/occupational therapist team. The client decides on functional goals, such as taking a bath or walking to church, as opposed to medical ones, such as reducing blood sugar or blood pressure level. CAPABLE breaks down the functional barriers between service providers, allowing a multi-disciplinary approach that best addresses the clients' need. Also, the change in physical environment can stimulate a change in the client's motivation.

The national CAPABLE model reports a return of investment of over 6 to 1, with every $3,000 invested in the program saving over $20,000 in medical costs. It has also been shown to reduce symptoms of depression and improve functionality.

Mobile Crisis Unit

A Mobile Crisis Unit offers community-based intervention to individuals in need wherever they are; including at home, work, or anywhere else in the community where the person is experiencing a crisis. For safety and optimal engagement, two person teams should be put in place to support emergency department and justice system diversion. Emergency medical services (EMS) providers should be aware, and partner as warranted.

Minimum expectations to operate a mobile crisis team include:
1. A licensed and/or credentialed clinician CAPABLE of assessing the needs of individuals
2. The ability to respond where the person is (home, work, park, etc.) and not restrict services to select locations within the region on particular days/times
3. The ability to connect individuals to facility-based care as needed through warm hand-offs and coordinating transportation when and only if situations warrant transition to other locations.

Best Practices to operate Mobile Crisis Team Services must meet the minimum expectations and:
1. Incorporate peers within the mobile crisis team
2. Respond without law enforcement accompaniment unless special circumstances warrant inclusion to support true justice system diversion

3. Implement real-time GPS technology in partnership with the region's crisis call center hub to support efficient connection to needed resources and tracking of engagement; and

4. Schedule outpatient follow-up appointments in a manner synonymous with a warm handoff to support connection to ongoing care.

Community-based mobile crisis services use face-to-face professional and peer intervention, deployed in real time to the location of the person in crisis in order to achieve the needed and best outcomes for that individual. Most community-based mobile crisis programs utilize teams that include both professional and paraprofessional staff. For example, a master's- or bachelor's level clinician may be paired with a peer support specialist and the backup of psychiatrist or other Master's-level clinician who are on-call as needed. Peer support workers often take the lead on engagement and may also assist with continuity of care by providing support that continues beyond the resolution of the immediate crisis.

Mobile crisis units can partner with other providers such as community paramedics, law enforcement response and EMS as needed per call. Studies have showed that mobile crisis resulted in a 23% lower average cost per case, as well as reducing costs associated with inpatient hospitalization by approximately 79% in a six-month follow-up period after the crisis episode. (Substance Abuse and Mental Health Services Administration, 2020)

Mat-Su High Utilizer Program

The HUMS program was created in January 2018 to serve individuals who use the Mat-Su Regional Medical Center Emergency Department frequently. The HUMS program consists of a director, a nurse/social worker and community health workers with a variety of experience in medical and behavioral health fields.

The HUMS program has the following goals:
- Increase patient self-reliance to address their health care needs more effectively
- Increase individual patient health by assisting them in the navigation of community-based systems
- Reduce the number of barriers experienced by patients that prevent access to community-based systems of care
- Decrease the number of ED visits by HUMS patients
- Increase communication within the system of care among first responders, the emergency department, and community providers

HUMS provides varied services:
- Primary care and specialty doctor referrals
- Assist with transportation, to and from medical appointments
- Attend appointments with the patient as an advocate, or chaperone for procedures
- Medicaid, Medicare, Social Security Disability referrals
- Substance abuse, detox, behavioral health, and mental health referrals
- Assistance with housing, utilities, and basic needs

Community Paramedicine Program

Community Paramedicine offers optimal positioning of EMS resources to fill an identified gap in the healthcare system. A Community Paramedic Program closes the gaps within the healthcare system by expanding the role of EMS providers within the community. Through a standardized curriculum of advanced education with certification and degree, EMS providers are educated at the appropriate level to serve communities more broadly in the areas of:

- Primary Care
- Prevention and wellness
- Public health
- Mental health
- Disease management
- Readmission prevention
- Oral health
- Human Services

The Community Paramedicine Program is flexible by design to meet the needs and resources of the local community. The program's success is driven through a combined effort of those holding value in maintaining health and wellbeing of community members within their healthcare system, practice and community.

The Community Paramedicine Program concept is an excellent match to all areas of the world, connecting underutilized resources to underserved populations. Expanding the role of EMS personnel allows healthcare services to reach those where access to physicians, clinics or hospitals may be difficult, non-existent, or unobtainable. The Community Paramedic has a proven ability to serve as a primary care provider efficiently and professionally, and when deployed to a patient's home as an extension of a patient-centered primary care plan, Community Paramedics also assist with chronic disease management and prevention.

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