

WASHOE COUNTY HEALTH DISTRICT

ENHANCING QUALITY OF LIFE

Washoe County Special Trauma Report

2018 – 2020

April 2022



Public Health
Prevent. Promote. Protect.

**WASHOE COUNTY
HEALTH DISTRICT**
ENHANCING QUALITY OF LIFE



VISION

A healthy community

MISSION

**To protect and enhance the well-being and quality of life for all in Washoe
County**

Table of Contents

Background.....	3
Methodology.....	4
Falls.....	5
Homicide.....	11
Suicide.....	17
References.....	21
Acknowledgements.....	22

Background

On December 17, 2021, the EMS Oversight Program received feedback from hospital and pre-hospitalization partners via the Washoe County Community Trauma and Injury Prevention Engagement Survey 2021. The survey finding is meant to highlight selected health topics that are relevant to organizations engaging in this survey. Led by the Washoe County EMS Oversight Program, this project complements the Washoe County Health District of strategic objective of impactful partnership to make meaningful progress on health issues.

From the 22 individuals solicited for the survey, 10 respondents completed the Washoe County Trauma and Injury Prevention Engagement Survey. Survey response rate is 50% with participation from respondents affiliated with organization listed below:

- Renown South Meadows Emergency Department
- North Lake Tahoe Fire Protection District
- Truckee Meadows Fire and Rescue
- Washoe County Health District
- Reno Fire Department
- Safe Kids Coalition

Based on the selected injury topics provided in the survey, survey respondents agree that motor vehicle accident, homicide /suicide, poisoning, and fall injuries are very relevant health topics for their organization's projects and initiatives. Below are descriptive statistics describing the selected injury topics based on the question, "How relevant is this health topic to your organization?".

How relevant is this health topic to your organization?

Injury Topics	Respondents Rating on Relevancy (Cumulative)
Homicide/Suicide	87.5%
Falls	87.5%
Poisoning	87.5%
Motor Vehicle Crash	66.6%

Over 3/4 of survey respondents state that injury topics related to homicide/suicide, and falls are very relevant to their organization. For each of the injury topics, respondents were asked to select variables of interests associated with the injury ranging from demographics to prehospitalization characteristics. Respondents rating on relevancy is summarized in table shown above.

Methodology

Sample sizes for each injury topics was taken into consideration prior to conducting analyses. From the top three relevant injury topics, homicide/suicide and fall injuries are the injury topics with the best prospects for analysis due to large sample of observations aggregated from State of Nevada Trauma Registry database from 2018, 2019 and 2020 calendar year. Pearson Chi Square and Fisher Exact Test analysis was performed to quantify the significance of categorical variables such as age, gender, race/ethnicity, alcohol/drug use, and patient residence to each corresponding injury topic. Paired t-test analysis was executed on vital signs to characterize patient outcomes quantitatively before and after receiving 911 intervention. Vital signs are important component of monitoring adult or child prehospitalization and hospitalization care. Monitoring vital signs allow prompt detection of delayed recovery or adverse events of patient's conditions. Vital signs are categorized under clinical measures in this report.

I. Background

Preventing older adult falls is a public health priority. Each year, 3 million older adults are treated in emergency departments for a fall injury¹. In Washoe County, fall injury among older adults is associated with longer hospital stay². In 2020, patients with fall injuries in Washoe County spend 10% of a single calendar year in trauma center. Among adults aged 65 years and older, falls are the leading cause of emergency department visits and account for 12% of all 911 medical calls in Washoe County³. In this special trauma report, we seek to understand patient characteristics among patients with fall injury, clinical characteristics, and survivorship (alive or dead) to inform prehospitalization triage, medical intervention and provide evidence-based resource for injury prevention program planning and design in Washoe County.

II. Patient Characteristics

Among 1,970 patients with fall injuries reported from January 1, 2018 to December 31, 2020 more than three-fourth, 1,888 (95.7%) patients survived from fall injuries whereas 84 patients (4.3%) did not (Table 1). Death to case ratio for all fall injury over the span of reported year is 4 deaths per 100 new cases. From the demographics results of the sample study, patients with fall injuries are likely female (56.0%), White (87.3%), non-Hispanic 1,849 (94.2%), and 65 years old and older (71.9%), with no indication of cardiac arrest at the scene of injury (99.7%). With every categorical increase in injury severity score, and Glasgow Coma Scale, death to case ratio also increases (Table 2).

$$\text{Death-to-case ratio (per 100 new cases)} = \frac{\text{\# of deaths due to falls}}{\text{\# of new cases reported due to falls}} \times 100$$

Emergency department sedation is associated with higher death-to-case ratio compared to patients who did not receive sedation. Based on the nature of prehospitalization care as a lifesaving medical intervention, we calculate the death-to-case ratio among all cases as a measure of severity of injury. The death-to-case ratio is calculated by dividing the number of deaths attributed to falls during the reported period divided by number of new cases of fall injury identified during the same period for each measure.

Falls

Table 1. Demographic and Prehospitalization Characteristics Associated with Outcomes of Fall Injuries in Washoe County, January 1, 2018 to December 31, 2020.

Patient Demographic & Characteristics		Frequency N (%)	Outcomes of Fall Injuries		Death to Case Ratio ^b	p-value
			Alive N (%)	Death N (%)		
Age^c	0-14	44 (2.2%)	44 (2.2%)	0 (0.0%)	0.0	<0.0001 ^a
	15-44	174 (8.8%)	173 (8.7%)	1 (0.1%)	0.6	
	45-64	335 (16.7%)	326 (16.5%)	9 (0.5%)	2.7	
	≥65	1419 (71.9%)	1345 (68.2%)	74 (3.7%)	5.2	
Sex	Male	867 (44.0%)	813 (41.3%)	54 (2.7%)	6.2	0.0001 ^a
	Female	1103 (56.0%)	1073 (54.5%)	30 (1.5%)	2.7	
Race^c	African American	22 (1.1%)	22 (1.1%)	0 (0.0%)	0.0	0.0004 ^a
	American Indian	21 (1.1%)	20 (1.0%)	1 (0.1%)	5.0	
	Asian Pacific Islander	45 (2.3%)	45 (2.3%)	0 (0.0%)	0.0	
	Hispanic	109 (5.8%)	109 (5.5%)	5 (0.3%)	4.6	
	White	1721 (87.3%)	1643 (83.3%)	78 (4.0%)	4.5	
	Other	26 (1.3%)	23 (1.3%)	0 (0.0%)	0.0	
	Unknown	22 (1.1%)	22 (1.1%)	0 (0.0%)	0.0	
	Ethnicity	Hispanic or Latino	114 (5.8%)	109 (5.6%)	5 (0.2%)		4.4	0.9537
Not Hispanic or Latino	1849 (94.2%)	1770 (90.2%)	79 (4.0%)	4.3		
State Residence	Nevada	1703 (86.4%)	1638 (83.1%)	65 (3.3%)	3.8	0.0143 ^a
	California	269 (13.6%)	250 (12.7%)	19 (0.9%)	7.1	
Prehospitalization Measures (first recorded measurements at the scene of injury)		Frequency N (%)	Outcomes of Fall Injuries		Death to Case Ratio ^b	p-value
			Alive N (%)	Death N (%)		
Prehospitalization Glasgow Coma Scale	Mild	983 (94.4%)	944 (90.1%)	39 (3.8%)	4.0	<0.0001 ^a
	Moderate	30 (5.4%)	25 (2.4%)	5 (0.5%)	16.7	
	Severe	28 (2.7%)	16 (1.5%)	12 (1.2%)	42.9	
Prehospitalization Cardiac Arrest^c	No	1963 (99.7%)	1882 (95.6%)	81 (4.1%)	4.1	<0.0001 ^a
	Yes	6 (0.4%)	3 (0.2%)	3 (0.2%)	50.0	
Transport Mode^c	Ground	1296 (67.6%)	1229 (64.1%)	67 (3.5%)	5.2	<0.0001 ^a
	Helicopter	14 (0.7%)	13 (0.6%)	1 (0.7%)	7.1	
	Fixed-Wing	3 (0.1%)	3 (0.1%)	0 (0.0%)	0.0	
	Private Vehicle or Walk In	598 (31.1%)	589 (30.1%)	9 (0.5%)	1.5	
	Police	4 (0.2%)	4 (0.2%)	0 (0.0%)	0.0	
	Public Safety	1 (0.1%)	1 (0.1%)	0 (0.0%)	0.0	

^a p-value ≤ 0.05 infer statistically significant association between selected measure(s) and survivorship outcome (alive or dead).

^b Death to case ratio represents number deaths attributed to every 100 injuries during a specified period.

^c Calculated using Fisher's Exact test due to cells counts less than 5.

Falls

Table 2. Emergency Department Clinical Characteristics Associated with Outcomes of Fall Injuries in Washoe County, January 1, 2018 to December 31, 2020.

Emergency Department Measures (first recorded measurements in the ED/Hospital within 30 minutes or less of ED/Hospital arrival)		Frequency N (%)	Outcomes of Fall Injuries		Death to Case Ratio ^b	p-value
			Alive N (%)	Death N (%)		
ED Glasgow Coma	Mild	1862 (94.8%)	1814 (92.4%)	48 (2.4%)	2.6	<0.0001 ^a
	Moderate	38 (1.9%)	32 (1.6%)	6 (0.3%)	15.8	
	Severe	64 (1.7%)	34 (1.7%)	30 (1.5%)	46.9	
ED Alcohol Use	No/Not Tested	1322 (67.1%)	1297 (65.8%)	25 (1.3%)	1.9	<0.0001 ^a
	No/Confirmed by Test	396 (20.1%)	358 (18.2%)	38 (1.9%)	9.6	
	Yes/Confirmed by Test Legal Limit	97 (4.9%)	87 (4.4%)	10 (0.5%)	10.3	
	Yes/Confirmed by Test Illegal Limit	154 (7.8%)	143 (7.3%)	11 (0.6%)	7.1	
ED Drug Use ^c	No/Not Tested	1901 (97.0%)	1822 (93.0%)	79 (4.0%)	4.2	0.0075 ^a
	No/Confirmed by Test	23 (1.2%)	20 (1.0%)	3 (0.2%)	13.0	
	Yes/Confirmed by Test Prescription Drugs	15 (0.7%)	14 (0.7%)	1 (0.1%)	6.7	
	Yes/Confirmed by Test Illegal Use	20 (1.0%)	19 (0.9%)	1 (0.1%)	5.0	
ED Injury Severity	Minor	1089 (55.2%)	1073 (54.4%)	16 (0.8%)	1.5	<0.0001 ^a
	Moderate	668 (33.9%)	650 (32.9%)	18 (0.9%)	2.7	
	Severe	121 (6.1%)	104 (5.3%)	17 (0.8%)	14.0	
	Very Severe	91 (4.6%)	58 (2.9%)	33 (1.7%)	36.3	
	Missing	3 (0.2%)	3 (0.2%)	0 (0.0%)	0.0	
ED Sedation	No	1748 (89.5%)	1688 (86.5%)	60 (3.0%)	3.4	<0.0001 ^a
	Yes	204 (10.5%)	183 (9.4%)	21 (1.1%)	10.3	

^a p-value ≤ 0.05 infer statistically significant association between selected measure(s) and survivorship outcome (alive or dead).

^b Death to case ratio represents number deaths attributed to every 100 injuries during a specified period.

^c Calculated using Fisher's Exact test due to cells counts less than 5.

Falls

Table 3. Clinical Measures Associated with Fall Cases and Statistical Evaluation of Patient Outcome Before and After Prehospitalization Care.

Clinical Measure(s)	Alive (N=956)		Dead (N=52)		Paired t-test (N=1,012)	
	Mean	Average Standard Deviation (Mean 95%CI)	Mean	Average Standard Deviation (Mean 95%CI)	Mean ^a	p-value
Prehospitalization Oxygen Saturation (%)	94.8%	4.8% (94.5%-95.1%)	93.0%	9.5% (90.3%-95.6%)	-0.5%	0.0081 ^b
ED Oxygen Saturation (%)	95.3%	3.9% (95.0%-95.5%)	94.2%	5.7% (90.9%-96.1%)		
Prehospital Systolic Blood Pressure (mm Hg)	144.4	28.8 (142.6-146.2)	136.0	32.0 (127.6-146.9)	0.88	0.2593 ^b
ED Systolic Blood Pressure (mm Hg)	143.0	26.4 (141.9-145.3)	133.0	33.1 (123.7-142.2)		
Prehospital Pulse Rate (number per minute)	84.7	17.8 (83.7-85.8)	88.0	21.2 (82.2-94.4)	3.01	<0.0001 ^b
ED Pulse Rate (number per minute)	81.7	17.0 (80.6-82.8)	85.0	21.2 (79.2-91.0)		

^a Negative mean (difference) represents a smaller prehospitalization value(s) compared to emergency department value(s). Positive mean (difference) represents a larger prehospitalization value(s) compared to emergency department value(s).

^b p-value ≤ 0.05 infer significant statistical difference between prehospitalization and emergency department measures.

- Based on the analysis of 1,012 patient sample with fall injuries, increase in average oxygen saturation observed at the time of emergency department arrival compared to oxygen saturation at the scene of injury.
- Based on the analysis of 1,012 patient sample with fall injuries no statistical difference observed between average blood pressure observed at the time of emergency department arrival compared to blood pressure recorded at the scene of injury.
- Based on the analysis of 1,012 patient sample with fall injuries, there is a statistical difference in average pulse rate observed at the time of emergency department arrival compared to pulse rate recorded at the scene of injury.

III. Clinical Significance

We deployed a statistical technique called paired sample t-test to determine whether there was a statistically significant average difference in clinical measurements first recorded at the scene of injury (prehospitalization), and within 30 minutes of emergency department arrival from all patients (n=1,012) with fall injuries regardless of survivorship (alive or dead). The mean paired t-test is calculated by subtracting emergency department measures from prehospitalization measures.

Mean paired t-test (difference) calculated as: prehospitalization measures - emergency department measures.

Oxygen saturation measure results indicates that the average prehospitalization oxygen saturation is 94.7%, and for Emergency Department Oxygen Saturation 95.2%. The average difference between oxygen saturation before and after 911 medical intervention is -0.52. Since the p -value for oxygen saturation is 0.0081 and is less than the standard significance level of 0.05, the ED oxygen saturation average is greater than the prehospitalization oxygen saturation average.

Blood pressure measure results indicates that the average Prehospitalization Systolic BP is 144.4 mm Hg, and for Emergency Department Systolic BP is 143.4 mm Hg. The average difference between blood pressure before and after 911 medical intervention is 0.88. Since the p -value for blood pressure is 0.2593 and is greater than the standard significance level of 0.05, the ED blood pressure average is equivalent to prehospitalization blood pressure average.

Pulse rate measure results indicates that the average prehospital pulse rate is 84.9 beats per minute, and for emergency department recorded pulse Rate is 82 beats per minute. The average difference between pulse rate before and after 911 medical intervention is 3 beats per minute. Since the p -value for pulse rate is less than 0.0001 and is less than the standard significance level of 0.05, the emergency department average pulse rate is lower than the prehospitalization average pulse rate.

IV. Conclusion

During the study period between January 1, 2018 to December 31, 2020, in Washoe County:

- Falls are more common among older senior female adults than older senior male adults.
- Despite cases more likely among female, death to case ratio for fall injuries are higher among male patients.
- More than 95% of patients with fall injuries who utilized prehospitalization resources sustain mild Glasgow Coma Score (GCS).
- Oxygen saturation and pulse rate are significantly different at the scene of injury and within 30 minutes of emergency department arrival.
- Results and implication of findings can only be generalizable to a sample population with similar demographic diversity described in Table 1.
- Evidence based resource⁴ for fall prevention including algorithm for risk, screening, assessment, and intervention is available through CDC program STEADI - Stopping Elderly Accidents, Death and Injuries.

V. Limitations

In this report, prehospitalization measures tested for statistical significance did not consider confounding factors such as age, and gender. For example, blood pressure measurement differs across age groups, sex, and patients with co-morbidities. Pre-existing high blood pressure conditions among patients were not assessed in the analysis. Blood pressure readings among patients with pre-existing high blood pressure does influence normal baselines for pre and post 911 interventions reading. Further statistical analysis such as stratification of blood pressure across different age groups can address this limitation.

Vital signs comparison presented in this report was not reviewed case-by-case based on any medical review standards. Clinical measures are entered by hospital nurses into the Nevada Trauma Registry. In any event that a prehospitalization measure is not captured, the case is excluded from the analyses. A case-by-case review may lead to more robust conclusions but reconciliation for de-identified health records is time laborious, and not possible through the registry.

Homicide

I. Background

Violence is a serious public health issue that affects communities and the people who live in it. Homicide and assault are top preventable types of violence that cause harm in communities across the country. Both homicide and assault rates are especially higher in racially segregated and high-poverty neighborhoods and the data shows significant increases in many areas across the nation⁵. In 2020, the U.S reported the highest homicide rates ever recorded since 1995⁶. Common types of violent crimes in Washoe County consists of murder, rape, aggravated assaults, and robbery. In 2021, over 2/3 of violent offense committed in Washoe County was due to aggravated assault⁷.

II. Patient Characteristics

Among 316 patients with injuries sustained from homicide incidents reported from January 1, 2018 to December 31,2020, 5% or 16 cases did not survive (Table 4). From the demographics results of the sample study, homicide events are more common among White (57.5%), non-Hispanic 1,849 (65.8%), males (86.7%) between the age of 15 and 44 years old (Table 4). Based on the nature of prehospitalization care as a life-saving medical intervention, we calculate the death-to-case ratio among all cases as a measure of severity of injury. The death-to-case ratio is calculated by dividing the number of deaths attributed to homicide during the reported period divided by number of new cases of homicide events identified during the same period for each measure.

$$\text{Death-to-case ratio (per 100 new cases)} = \frac{\text{\# of deaths due to homicide}}{\text{\# of new cases reported due to homicide}} \times 100$$

With every categorical increase in injury severity score, and Glasgow coma scale (GCS), death to case ratio also increases (Table 4). Patients with severe prehospitalization GCS score (3 to 8) have higher death to case ratio. From the sample of patients involved in injury sustained due to homicide, large percentage of cases did not have indication of alcohol use (41.5%) and no indication of drug test performed by the ED (94.6%). About 2/3 homicide cases utilize ground ambulatory transport and 31% arrive in the ED by private vehicle or walk in (Table 4).

Homicide

Table 4. Demographic and Prehospitalization Characteristics Associated with Outcomes of Homicide in Washoe County, January 1, 2018 to December 31, 2020.

Patient Demographic & Characteristics		Frequency N (%)	Outcomes of Homicide		Death to Case Ratio ^b	p-value
			Alive N (%)	Death N (%)		
Age^c	0-14	5 (1.5%)	4 (1.3%)	1 (0.2%)	20.0	0.0184 ^a
	15-44	212 (67.1%)	202 (64.0%)	10 (3.2%)	4.7	
	45-64	84 (26.6%)	80 (25.3%)	4 (1.3%)	4.8	
	≥65	15 (4.8%)	14 (4.4%)	1 (0.4%)	6.7	
Sex	Male	273 (86.7%)	259 (82.2%)	14 (4.4%)	5.1	0.2948
	Female	42 (13.3%)	40 (12.7%)	2 (0.6%)	4.8	
Race^c	African American	27 (8.5%)	26 (8.2%)	1 (0.3%)	3.7	0.0006 ^a
	American Indian	22 (6.9%)	21 (6.6%)	1 (0.3%)	4.5	
	Asian Pacific Islander	4 (1.3%)	4 (1.3%)	0 (1.3%)	0.0	
	Hispanic	71 (22.5%)	64 (20.2%)	7 (2.3%)	9.9	
	White	182 (57.5%)	176 (55.7%)	6 (1.8%)	3.3	
	Other	5 (1.5%)	5 (1.5%)	0 (0.0%)	0.0	
	Unknown	71 (22.6%)	64 (20.4%)	7 (2.2%)	9.9	
Ethnicity	Hispanic or Latino	243 (74.4%)	234 (74.5%)	9 (2.8%)	2.5	0.0380 ^a
	Not Hispanic or Latino	208 (65.8%)	194 (61.4%)	14 (87.5%)	6.7	
State Residence	Nevada	108 (34.2%)	106 (33.5%)	2 (12.5%)	1.9	0.0606 ^a
	California	5 (1.5%)	4 (1.3%)	1 (0.2%)	20.0	
Prehospitalization Measures (first recorded measurements at the scene of injury)		Frequency N (%)	Outcomes of Homicide		Death to Case Ratio ^b	p-value
			Alive N (%)	Death N (%)		
Prehospitalization Glasgow Coma Scale	Mild	134 (87.0%)	132 (85.7%)	2 (1.3%)	1.5	<0.0001 ^a
	Moderate	7 (4.5%)	7 (4.5%)	0 (0.0%)	0	
	Severe	13 (8.4%)	2 (1.3%)	11 (7.1%)	84.6	
Prehospitalization Cardiac Arrest^c	No	312 (98.7%)	299 (94.6%)	13 (4.1%)	4.2	<0.0001 ^a
	Yes	4 (1.3%)	1 (0.3%)	3 (1.0%)	75.0	
Transport Mode^c	Ground	174 (61.5%)	161 (56.9%)	13 (4.6%)	7.5	0.0068 ^a
	Helicopter	12 (4.2%)	12 (4.2%)	0 (0.0%)	0.0	
	Fixed-Wing	1 (0.5%)	1 (0.4%)	0 (0.0%)	0.0	
	Private Vehicle or Walk In	87 (30.7%)	86 (30.4%)	1 (0.3%)	1.1	
	Police	9 (3.2%)	9 (3.2%)	0 (0.0%)	0	

^ap-value ≤ 0.05 infer statistically significant association between selected measure(s) and survivorship outcome (alive or dead).

^bDeath to case ratio represents number deaths attributed to every 100 injuries during a specified period.

^cCalculated using Fisher's Exact test due to cells counts less than 5.

Homicide

Table 5. Emergency Department Clinical Characteristics Associated with Outcomes of Homicide in Washoe County, January 1, 2018 to December 31, 2020.

Emergency Department Measures (first recorded measurements in the ED/Hospital within 30 minutes or less of ED/Hospital arrival)		Frequency N (%)	Outcomes of Homicide		Death to Case Ratio ^b	p-value
			Alive N (%)	Death N (%)		
ED Glasgow Coma	Mild	273 (86.6%)	271 (86.0%)	2 (0.6%)	0.7	<0.0001 ^a
	Moderate	5 (1.6%)	5 (1.6%)	0 (0.0%)	0.0	
	Severe	37 (11.7%)	23 (7.3%)	14 (4.4%)	37.8	
ED Alcohol Use	No/Not Tested	68 (21.5%)	61 (19.3%)	7 (2.2%)	18.9	0.0640 ^a
	No/Confirmed by Test	131 (41.5%)	127 (40.2%)	4 (1.3%)	3.1	
	Yes/Confirmed by Test Legal Limit	38 (12.0%)	38 (12.0%)	0 (0.0%)	0.0	
	Yes/Confirmed by Test Illegal Limit	79 (25.0%)	74 (23.4%)	5 (1.6%)	6.3	
ED Drug Use ^c	No/Not Tested	297 (94.6%)	281 (89.5%)	16 (5.1%)	5.4	0.4012
	No/Confirmed by Test	8 (2.5%)	8 (2.5%)	0 (0.0%)	0.0	
	Yes/Confirmed by Test Prescription Drugs	3 (1.0%)	3 (1.0%)	0 (0.0%)	0.0	
	Yes/Confirmed by Test Illegal Use	6 (2.0%)	6 (2.0%)	0 (0.0%)	0.0	
ED Injury Severity	Minor	167 (52.8%)	166 (52.5%)	1 (0.32%)	0.6	<0.0001 ^a
	Moderate	94 (29.8%)	93 (29.4%)	1 (0.32%)	1.1	
	Severe	34 (10.7%)	32 (10.1%)	2 (0.63%)	5.9	
	Very Severe	21 (6.7%)	9 (2.9%)	12 (3.8%)	57.1	
	Missing	236 (74.7%)	225 (71.2%)	11 (3.5%)	4.7		0.5753
ED Sedation	No	80 (25.3%)	75 (23.7%)	5 (1.6%)	6.3	<0.0001 ^a
	Yes	273 (86.6%)	271 (86.0%)	2 (0.6%)	0.7	

^ap-value ≤ 0.05 infer statistically significant association between selected measure(s) and survivorship outcome (alive or dead).

^bDeath to case ratio represents number deaths attributed to every 100 injuries during a specified period.

^cCalculated using Fisher's Exact test due to cells counts less than 5.

Homicide

Table 6. Clinical Measures Associated with Homicide Cases and Statistical Evaluation of Patient Outcome Before and After Prehospitalization Care.

Clinical Measure(s)	Alive (N=132)		Dead (N=8)		Paired t-test (N=140)	
	Mean	Average Standard Deviation (Mean 95%CI)	Mean	Average Standard Deviation (Mean 95%CI)	Mean ^a	p-value
Prehospitalization Oxygen Saturation (%)	95.4%	5% (94.5%-96.3%)	50.6%	43.5% (14.2%-87.0%)	-1.5%	0.0058 ^b
ED Oxygen Saturation (%)	96.5%	3.2% (95.9%-97.1%)	58.3%	48.9% (17.5%-99.3%)		
Prehospital Systolic Blood Pressure (mm Hg)	127.1	27.4 (122.3-131.7)	48.2	47.2 (8.7-87.7)	1.03	0.6208
ED Systolic Blood Pressure (mm Hg)	125.2	22.9 (121.2-129.1)	60.6	75.8 (2.7-124.0)		
Prehospital Pulse Rate (number per minute)	96.1	22 (92.3-99.9)	56.3	56 (9.4-103.1)	0.82	0.5863
ED Pulse Rate (number per minute)	95.3	20 (91.9-98.8)	54.6	62.2 (91.9-98.8)		

^aNegative mean (difference) represents a smaller prehospitalization value(s) compared to emergency department value(s). Positive mean (difference) represents a larger prehospitalization value(s) compared to emergency department value(s).

^bp-value ≤ 0.05 infer significant statistical difference between prehospitalization and emergency department measures.

- Based on the analysis of 140 patient sample involve in homicide event, increase in average oxygen saturation observed at the time of emergency department arrival compared to oxygen saturation recorded at the scene of injury.
- Based on the analysis of 140 patient sample involve in homicide event, no statistically significant difference in average blood pressure observed at the time of emergency department arrival compared to blood pressure recorded at the scene of injury.
- Based on the analysis of 140 patient sample involve in homicide event, no statistically significant difference in average pulse rate observed at the time of emergency department arrival compared to average pulse rate recorded at the scene of injury.

III. Clinical Significance

We deployed a statistical technique called paired sample t-test to determine whether there was a statistically significant average difference in clinical measurements first recorded at the scene of injury (prehospitalization), and within 30 minutes of emergency department arrival from all patients (n=140) with homicide injury regardless of survivorship (alive or dead). The mean paired t-test is calculated by subtracting emergency department measures from prehospitalization measures.

Mean paired t-test (difference) calculated as: prehospitalization measures - emergency department measures.

Oxygen saturation measure results indicates that the average prehospitalization oxygen saturation is 92.8%, and for Emergency Department Oxygen Saturation 94.4%. The average difference between oxygen saturation before and after 911 medical intervention is 1.5%. Since the *p*-value for oxygen saturation is 0.0058 and is less than the standard significance level of 0.05, the ED oxygen saturation average is greater than the prehospitalization oxygen saturation average.

Blood pressure measure results indicates that the average prehospitalization systolic blood pressure is 122.5 mm Hg, and for Emergency Department Systolic BP is 121.5 mm Hg. The average difference between blood pressure before and after 911 medical intervention is 1.03. Since the *p*-value for blood pressure is 0.6208 and is greater than the standard significance level of 0.05, the ED blood pressure average is equivalent to prehospitalization blood pressure average.

Pulse rate measure results indicates that the average prehospital pulse rate is 93.8 beats per minute, and for emergency department recorded pulse Rate is 93.0 beats per minute. The average difference between pulse rate before and after 911 medical intervention is 1 beat per minute. Since the *p*-value for pulse rate is 0.5863 and is greater than the standard significance level of 0.05, the emergency department average pulse rate is equivalent to prehospitalization average pulse rate.

IV. Conclusion

During the study period between January 1, 2018 to December 31, 2020, in Washoe County :

- Homicide cases are more likely among male between the age of 15-44 years old.
- Approximately 2/3 of homicide cases utilized ground ambulance as primary means for emergency care transport.
- 87% of homicide patient sustain mild Prehospitalization Glasgow Coma Scale survive. However, high death to case ratio is likely among patients with severe Prehospitalization Glasgow Coma Scale.
- Oxygen saturation is statistically higher by 1.5% within 30 minutes of emergency department arrival compared to reported oxygen saturation at the scene of injury among reported homicide cases admitted to ED.
- Results and implication of findings can only be generalizable to a sample population with similar demographic diversity described in Table 4.

V. Limitations

In this report, prehospitalization measures tested for statistical significance did not consider confounding factors such as age, and gender. For example, blood pressure measurement differs across age groups, sex, and patients with co-morbidities. Pre-existing high blood pressure conditions among patients were not assessed in the analysis. Blood pressure readings among patients with pre-existing high blood pressure does influence normal baselines for pre and post 911 interventions reading. Further statistical analysis such as stratification of blood pressure across different age groups can address this limitation.

Vital signs comparison presented in this report was not reviewed case-by-case based on any medical review standards. Clinical measures are entered by hospital nurses into the Nevada Trauma Registry. In any event that a prehospitalization measure is not captured, the case is excluded from the analyses. A case-by-case review may lead to more robust conclusions but reconciliation for de-identified health records is time laborious not possible through the registry.

I. Background

Suicide and suicide attempts are preventable. The National Suicide Prevention Lifeline (NSPL) defines suicide as the act of injuring oneself with the intent to die¹. In the U.S., middle-aged adults accounted for 47.2% of all suicides, and the 9th leading cause of the death in age group 35-64 years old⁸. Suicide and suicide attempt rates differ across communities, race/ethnicities, among persons who identify as sexual minority (LGBTQ+) and varies depending on occupation such as veterans⁹. The CDC released a technical package for preventing suicide to inform local, state, and territorial public health ecosystem on the latest evidence-based strategies to prevent suicides and identify at-risk-population¹⁰. A systematic review concluded suicide risk among self-harm patients to be 100 times higher than in the general population. The review identified high risk groups associated with suicide among patients with history of fatal and non-fatal repetition of self-harm⁴.

II. Patient Characteristics

Among 53 patients admitted to the Emergency Department from January 1, 2018 to December 31, 2020 due to suicide attempts, more than three-fourth (79%) survived (Table 7). Death to case ratio for suicide over the span of reported year is 21 deaths per 100 new suicide cases. From the demographic results of the sample study, patients admitted due to suicide attempts are likely male (67.9%), White (79.3%), Hispanic (88.5%), and likely to be in the 15-64 years age group (88.7%), with no history of cardiac arrest (96.2%). Historical trends indicate suicide increase during economic recessions following economic and financial strain among working age individuals (25 to 64 years old). The demographic profile among suicide patients in Washoe County mimics findings at the national level. Economic stress exacerbates symptoms of declining physical and mental health. With every categorical increase in injury severity score, and Glasgow Coma Scale, death to case ratio also increases (Table 8).

Emergency department sedation is associated with lower death to case ratio compared to patients who did not receive sedation. Based on the nature of prehospitalization care as a life-saving medical intervention, we calculate the death-to-case ratio among all cases as a measure of injury severity for suicide attempts. The death-to-case ratio is calculated by dividing the number of deaths attributed to suicide during the reported period divided by number of new cases of suicide identified during the same period for each measure.

$$\text{Death-to-case ratio (per 100 new cases)} = \frac{\text{\# of deaths due to suicide}}{\text{\# of new cases reported due to suicide}} \times 100$$

Suicide

Table 7. Demographic and Prehospitalization Characteristics Associated with Survivorship Outcome for Suicide in Washoe County, January 1, 2018 to December 31, 2020.

Patient Demographic & Characteristics		Frequency N (%)	Outcomes of Suicide		Death to Case Ratio ^b	p-value
			Alive N (%)	Death N (%)		
Age ^c	0-14	0.3454
	15-44	34 (64.2%)	29 (54.7%)	5 (9.4%)	14.7	
	45-64	13 (24.5%)	9 (17.0%)	4 (7.5%)	30.8	
	≥65	6 (11.3%)	4 (7.6%)	2 (3.7%)	33.3	
Sex	Male	36 (67.9%)	27 (50.9%)	9 (17.0%)	25.0	0.1680
	Female	17 (32.1%)	15 (28.3%)	2 (3.8%)	11.8	
Race ^c	African American	0.0351 ^a
	American Indian	.	.	.	.
	Asian Pacific Islander	1 (1.9%)	1 (1.9%)	0 (0.0%)	0.0	
	Hispanic	6 (11.3%)	6 (11.3%)	0 (0.0%)	0.0	
	White	42 (79.3%)	33 (62.3%)	9 (16.9%)	22.0	
	Other	4 (7.4%)	2 (3.7%)	2 (3.7%)	100.0	
	Unknown	6 (11.5%)	6 (11.5%)	0 (0.0%)	0.0	
Ethnicity	Hispanic or Latino	6 (11.5%)	6 (11.5%)	0 (0.0%)	.	0.2209
	Not Hispanic or Latino	46 (88.5%)	35 (67.3%)	11 (22.5%)	23.9	
State Residence	Nevada	41 (77.4%)	32 (60.4%)	9 (16.9%)	21.9	0.3034
	California	12 (22.6%)	10 (18.9%)	2 (3.7%)	16.7	
Prehospitalization Measures (first recorded measurements at the scene of injury)		Frequency N (%)	Outcomes of Suicide		Death to Case Ratio ^b	p-value
			Alive N (%)	Death N (%)		
Prehospitalization Glasgow Coma Scale	Mild	26 (70.3%)	26 (70.3%)	0 (0.0%)	0.0	<0.0001 ^a
	Moderate	2 (5.4%)	2 (5.4%)	0 (0.0%)	0.0	
	Severe	9 (24.3%)	0 (0.0%)	9 (24.3%)	100.0	
Prehospitalization Cardiac Arrest ^c	No	51 (96.2%)	41 (77.4%)	10 (18.9%)	19.6	
	Yes	2 (3.8%)	1 (1.9%)	1 (1.9%)	50.0	
Transport Mode ^c	Ground	40 (75.5%)	31 (58.5%)	9 (17.0%)	22.5	<0.0359 ^a
	Helicopter	.	.	.	.
	Fixed-Wing	.	.	.	.
	Private Vehicle or Walk In	8 (15.1%)	8 (15.1%)	0 (0.0%)	0.0	
	Police	.	.	.	.
	Public Safety	.	.	.	.

^a p-value ≤ 0.05 infer statistically significant association between selected measure(s) and survivorship outcome (alive or dead).

^b Death to case ratio represents number deaths attributed to every 100 injuries during a specified period.

^c Calculated using Fisher's Exact test due to cells counts less than 5.

Suicide

Table 8. Emergency Department Clinical Characteristics Associated with Survivorship Outcomes of Suicide in Washoe County, January 1, 2018 to December 31, 2020.

Emergency Department Measures (first recorded measurements in the ED/Hospital within 30 minutes or less of ED/Hospital arrival)		Frequency N (%)	Outcomes of Suicide		Death to Case Ratio ^b	p-value
			Alive N (%)	Death N (%)		
ED Glasgow Coma	Mild	35 (66.0%)	34 (64.2%)	1 (1.9%)	2.9	<0.0001 ^a
	Moderate	3 (5.7%)	3 (5.7%)	0 (0.0%)	0.0	
	Severe	15 (28.3%)	5 (9.4%)	10 (18.9%)	66.7	
ED Alcohol Use	No/Not Tested	12 (22.6%)	8 (15.1%)	4 (7.6%)	33.3	0.0160 ^a
	No/Confirmed by Test	26 (49.1%)	22 (41.5%)	4 (7.6%)	15.4	
	Yes/Confirmed by Test Legal Limit	4 (7.6%)	4 (7.6%)	0 (0.0%)	0.0	
	Yes/Confirmed by Test Illegal Limit	11 (20.8%)	8 (15.1%)	3 (5.7%)	27.3	
ED Drug Use ^c	No/Not Tested	34 (68.0%)	24 (48.0%)	10 (20.0%)	29.4	0.0246 ^a
	No/Confirmed by Test	7 (14.0%)	6 (12.0%)	1 (2.0%)	14.3	
	Yes/Confirmed by Test Prescription Drugs	2 (4.0%)	2 (4.0%)	0 (0.0%)	0.0	
	Yes/Confirmed by Test Illegal Use	7 (14.0%)	7 (14.0%)	0 (0.0%)	0.0	
ED Injury Severity	Minor	28 (52.8%)	28 (52.8%)	0 (0.0%)	0.0	<0.0001 ^a
	Moderate	8 (15.1%)	7 (13.2%)	1 (1.9%)	12.5	
	Severe	4 (7.6%)	3 (5.7%)	1 (1.9%)	25.0	
	Very Severe	13 (24.5%)	4 (7.5%)	9 (17.0%)	69.2	
ED Sedation	No	43 (82.7%)	35 (67.3%)	8 (15.4%)	18.6	0.3300
	Yes	9 (17.3%)	7 (13.5%)	2 (3.9%)	22.2	

^a p-value ≤ 0.05 infer statistically significant association between selected measure(s) and survivorship outcome (alive or dead).

^b Death to case ratio represents number deaths attributed to every 100 injuries during a specified period.

^c Calculated using Fisher's Exact test due to cells counts less than 5.

NOTE: We did not perform paired sample t-test for patient outcome due to suicide because of small sample size. Statistical implications without large sample size may not be reliable.

III. Conclusion

During the study period between January 1, 2018 to December 31, 2020, in Washoe County :

- Suicide cases reported are higher among non-Hispanic male compared to non-Hispanic female, and in working age population.
- Approximately 2/3 of suicide cases utilized ground ambulance as primary means for emergency care transport.
- 53% of suicide patients reported having minor severity injury upon admission to the ED and 2/3 sustain mild ED Glasgow Coma Scale.
- One out of four patients admitted to Emergency Department due to suicide attempts sustain very severe injury severity score (ISS) die at the hospital.
- Evidence based resource¹¹ for suicide prevention including framework, toolkit, and courses for preventing suicide in Emergency Department designed for emergency personnel is available through Zero Suicide Initiative.

IV. Limitations

In this report, cases with ICD-10 T and X code specific to intentional self-harm yielded a relatively low sample of suicide cases (N=53) over the three-year period. Due to voluntary nature of reporting to the Nevada Trauma Registry by participating hospitals, the number of cases in this report does not provide evidence for a growing public health problem in the community.

Vital signs comparison presented in this report was not reviewed case-by-case based on any medical review standards. Clinical measures are entered by hospital nurses into the Nevada Trauma Registry. In any event that a prehospitalization or emergency department measure is not captured, the case is excluded from the analyses. A case-by-case review may lead to more robust conclusions but reconciliation for de-identified health records is time laborious and is not possible through the registry.

References

- ¹ Centers for Disease Control and Prevention, National Center for Injury Prevention and Control. Web-based Injury Statistics Query and Reporting System (WISQARS) [online]. Accessed March 16, 2022.
- ² Washoe County Health District, Division of Epidemiology and Public Health Preparedness. (February 2022). Washoe County 2020 Trauma Data Report. Reno, NV.
- ³ Washoe County Health District, Division of Epidemiology and Public Health Preparedness. EMS Oversight Program Analytics. Reno, NV.
- ⁴ Rubenstein LZ, Vivrette R, Harker JO, Stevens JA, Kramer BJ. Validating an evidence-based, self-rated fall risk questionnaire (FRQ) for older adults. J Safety Res. 2011 Dec;42(6):493-9. doi: 10.1016/j.jsr.2011.08.006. Epub 2011 Nov 17. PMID: 22152267.
- ⁵ National Center for Injury Prevention and Control, Division of Violence Prevention. Web-based Injury Statistics Query and Reporting System (WISQARS) [online].
- ⁶ The Record Increase in Homicide During 2020. Center for Disease Control and Prevention. Retrieved, March 16, 2022. <https://www.cdc.gov/nchs/pressroom/podcasts/2021/20211008/20211008.htm>
- ⁷ Violent crime 2021. Nevada Crime Statistics. Retrieved March 11, 2022, from <https://nevadacrimestats.nv.gov/tops/report/violent-crimes/washoe-county/2021>
- ⁸ Centers for Disease Control and Prevention. (2022, February 24). Facts about suicide. Centers for Disease Control and Prevention. Retrieved March 11, 2022, from <https://www.cdc.gov/suicide/facts/index.html>
- ⁹ Centers for Disease Control and Prevention. (2022, February 24). Disparities in Suicide. Centers for Disease Control and Prevention. Retrieved March 11, 2022, from <https://www.cdc.gov/suicide/facts/disparities-in-suicide.html>
- ¹⁰ Centers for Disease Control and Prevention. (2022, February 25). Suicide prevention. Centers for Disease Control and Prevention. Retrieved March 11, 2022, from <https://www.cdc.gov/suicide/>
- ¹¹ Zero Suicide Initiative. The evidence behind Zero Suicide is promising. Retrieved March 11, 2022, from <https://zerosuicide.edc.org/evidence>

Acknowledgements

Acknowledgements

This project is made possible with data support and technical assistance from Tabatha Hart, Nevada Trauma Registry Coordinator, Andrea Esp, Preparedness and Emergency Medical Services Manager, and Nancy Diao, Division of Epidemiology and Public Health Preparedness Director.

Suggested Citation

Washoe County Health District EMS Oversight Program, Division of Epidemiology and Public Health Preparedness. (April 2022). Washoe County Special Trauma Report 2018 – 2020. Reno, NV.

Additional Information

For additional information regarding the Washoe County Special Trauma Report contact

Anastasia Gunawan, MPH
Division of Epidemiology and Public Health Preparedness
Washoe County Health District
agunawan@washoecounty.gov