



# Annual Report 2022

*RIGHT PATIENT. RIGHT PLACE. RIGHT TIME.*





*Right* **patient.**  
*Right* **place.**  
*Right* **time.**

As NOTS has expanded over the past 12 years, our mission and goal of collaboration has stayed strong. We believe in "right patient, to the right place, at the right time". We are very excited to bring our outstanding trauma lectures back to you in person and virtually. We want to take the time to say thank you for all that you do. Our patients of Northeast Ohio thank you too.

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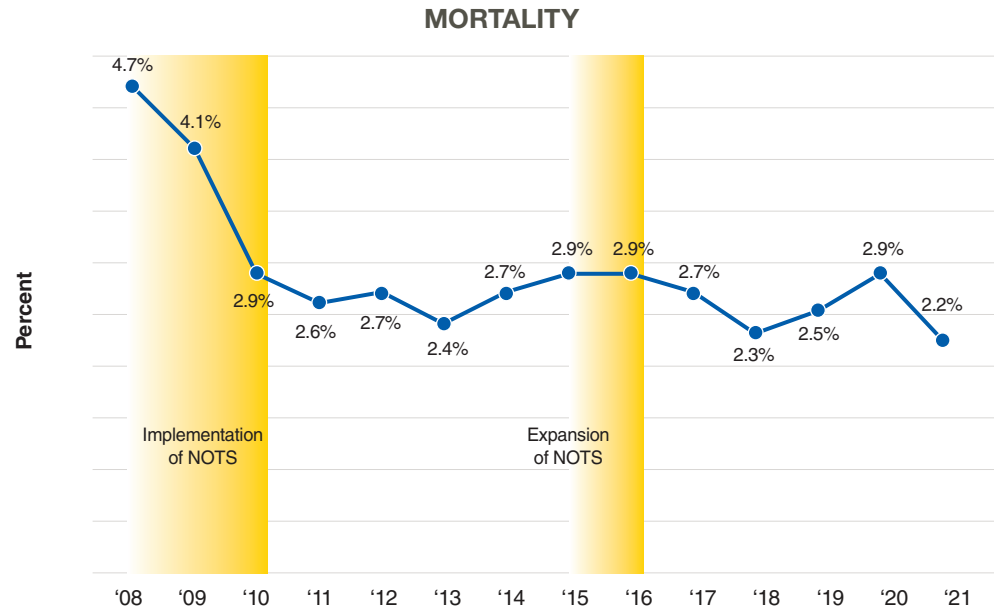
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# Our Mission Statement

## Right patient. Right place. Right time.

To provide the highest **quality of care** to patients across the region by rigorously evaluating and improving outcomes, optimizing resources and providing education utilizing a collaborative approach with hospitals, emergency medical services and public health services.



# Executive Summary

## Greeting From Our Medical Director

As medical director of the Northern Ohio Trauma System (NOTS), I am pleased to introduce you to the publication of our 2022 annual report. It is important to recognize this report is comprised of data from our member trauma centers and does not represent the entire burden of injury to Northeast Ohio. For the most part, the data presented depicts the demographics and outcomes of our region's most seriously injured patients, those requiring the evaluation and services of our trauma centers. The 2022 annual report, as does our previous reports, continues to document NOTS' remarkable and enduring legacy of trauma system development throughout Northeast Ohio. It demonstrates the impact and sustainability of this unique effort in private and public collaboration of our regional healthcare systems and EMS services to develop and achieve an inclusive trauma system. Most importantly, as NOTS has expanded from the original four trauma centers to 12, it has continued to adapt through the leadership and direction of our Advisory Board, while still remaining committed our mission:

*To provide the highest quality of care to trauma patients across the region by rigorously evaluating and improving outcomes, optimizing resources, and providing education across the region utilizing a collaborative approach with hospitals, emergency medical services and public health services.*

I would like to acknowledge and thank our the NOTS staff, our trauma program manager, Ms. Danielle Rossler, our data specialists, Ms. Olivia Houck and Ms. Sara Arida, and our EMS coordinator, Tod Baker. Without their combined efforts, this report and many of the accomplishments attributable to NOTS would have not been possible. We hope you find the NOTS 2022 Annual Report valuable as we look forward to continuing our service to our member healthcare systems, their trauma centers and the citizens of Northeast Ohio.

Sincerely,  
Glen Tinkoff, MD, FACS, FCCM

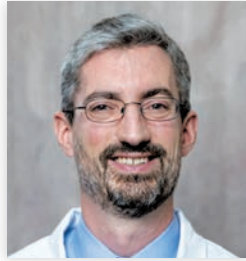


**Glen Tinkoff, MD, FACS, FCCM**  
Trauma Medical Director, NOTS

# NOTS Staff



**Glen Tinkoff,  
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NOTS



**Michael Dingeldein,  
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**Danielle Rossler,  
MBA, BSN, RN**  
Trauma Program Manager



**Sara Arida,  
CSTR, CAISS, RHIT**  
Data Specialist



**Olivia C. Houck,  
MPH, CPH**  
Data Specialist



**Tod Baker,  
EMS-P**  
EMS Coordinator





# Current NOTS Hospitals

## Level I

1. Cleveland Clinic Akron General
2. MetroHealth Medical Center (Adult)
3. University Hospitals Cleveland Medical Center
4. University Hospitals Rainbow Babies & Children's Hospital

## Level II

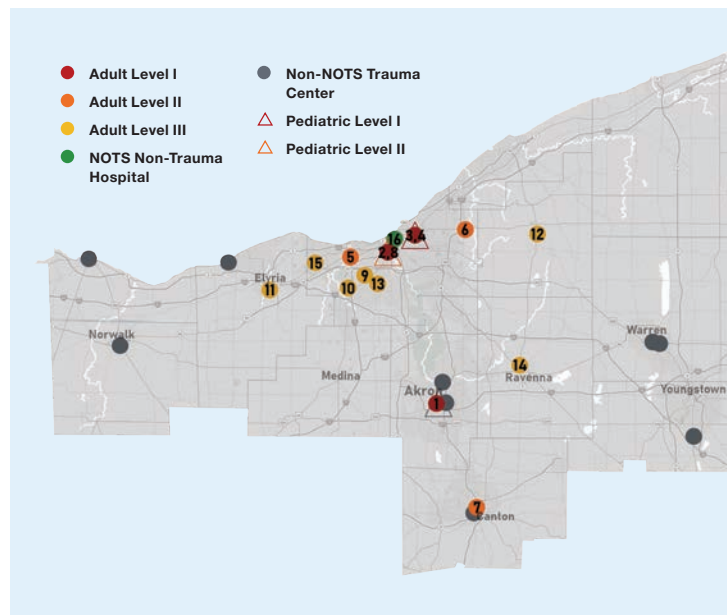
5. Cleveland Clinic Fairview Hospital
6. Cleveland Clinic Hillcrest Hospital
7. Cleveland Clinic Mercy Hospital - Canton\*
8. MetroHealth Medical Center (Pediatric)

## Level III

9. MetroHealth Parma Medical Center
10. Southwest General Health Center
11. UH Elyria Medical Center
12. UH Geauga Medical Center
13. UH Parma Medical Center
14. UH Portage Medical Center
15. UH St. John Medical Center

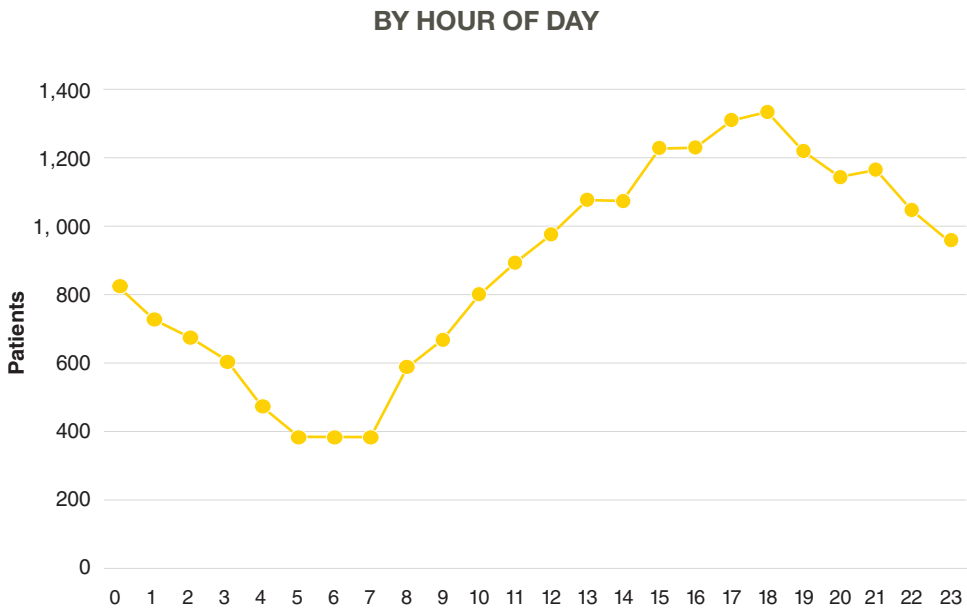
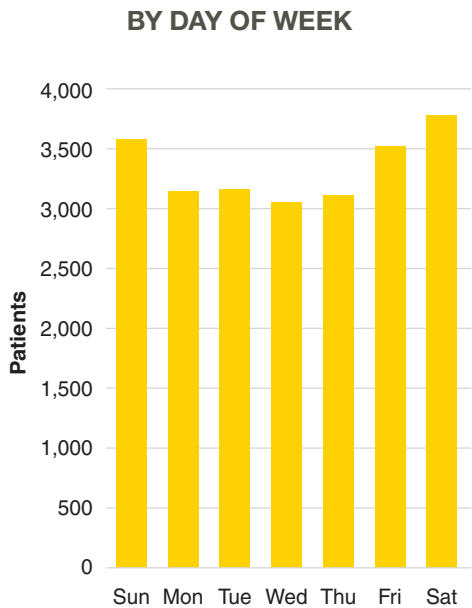
## NOTS Non-trauma

16. St. Vincent Charity Medical Center\*



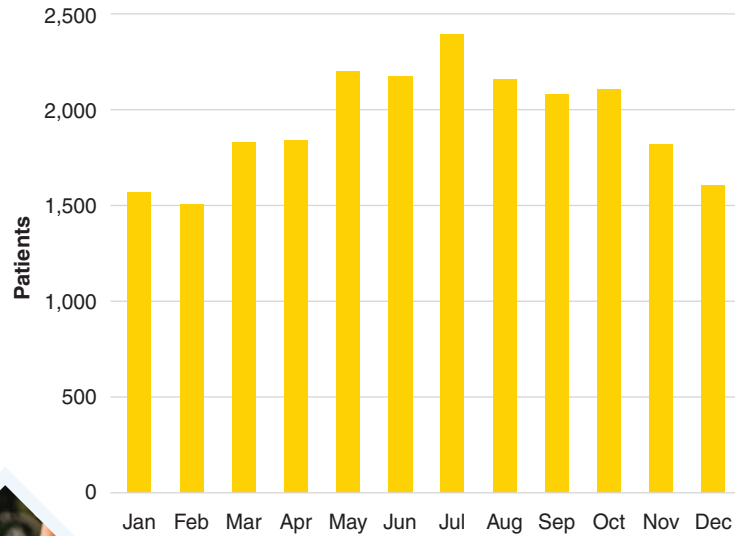
\*These centers did not contribute data to this year's annual report. Cleveland Clinic Mercy Canton, will contribute data in future years. As a non-trauma hospital, St. Vincent will not contribute data to the regional registry.

# Frequency of Trauma

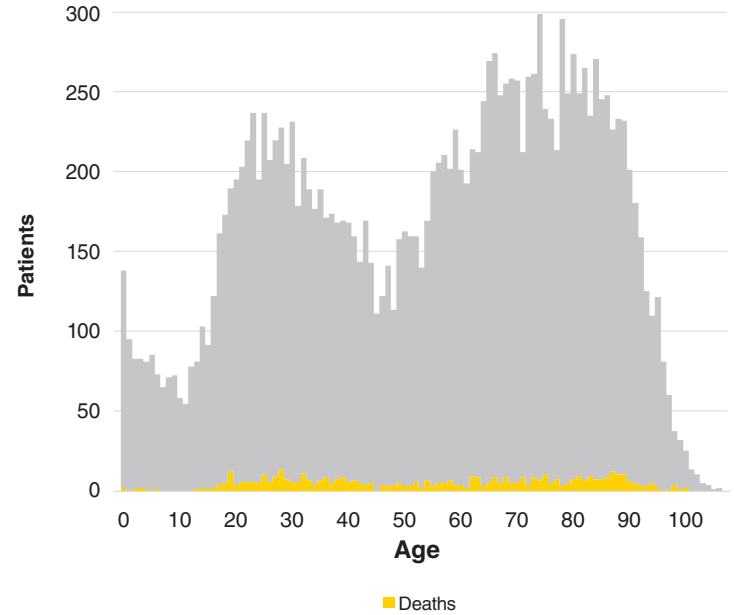




**BY MONTH**

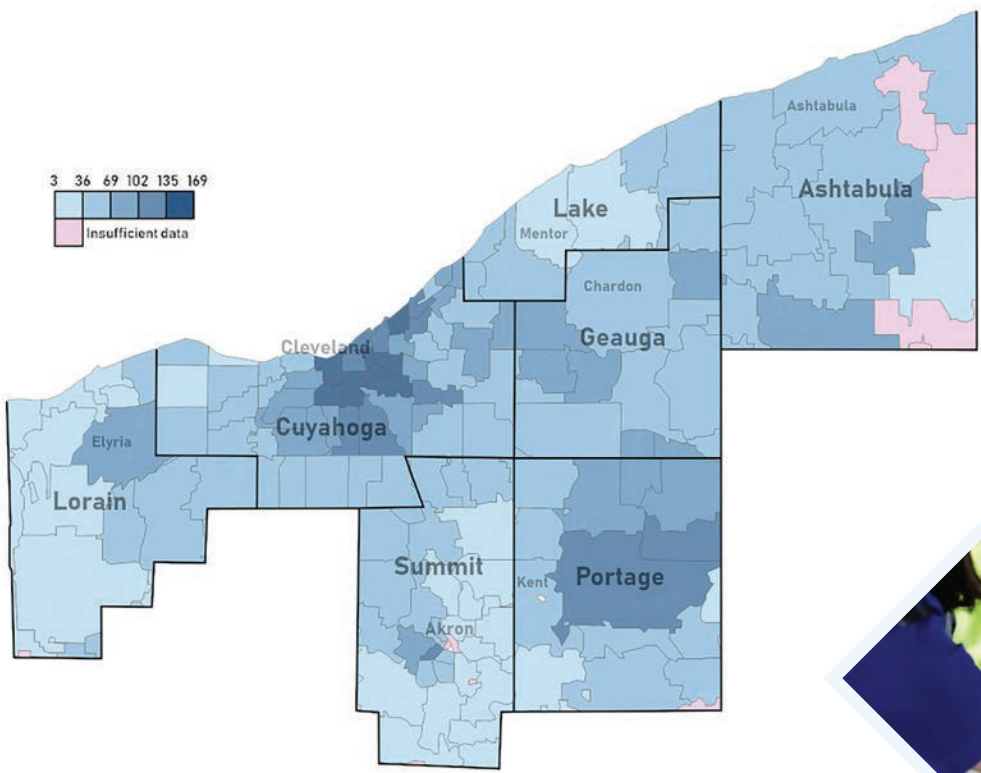


**BY AGE**



# All Trauma

ALL TRAUMATIC INJURY PATIENTS SEEN AT A NOTS TRAUMA CENTER  
BY HOME ZIP CODE (PER 10,000 POPULATION)

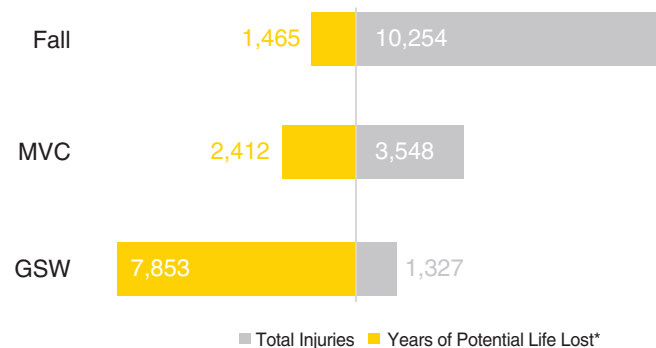


# Years of Potential Life Lost

Years of potential life lost (YPLL) is measure of the years a person would have lived had they not died prematurely. This is used to give an idea of population burden of disease. For example, a high YPLL can point to lost contributions a person could have made to society. In these calculations, 75 years was used as the reference life expectancy.

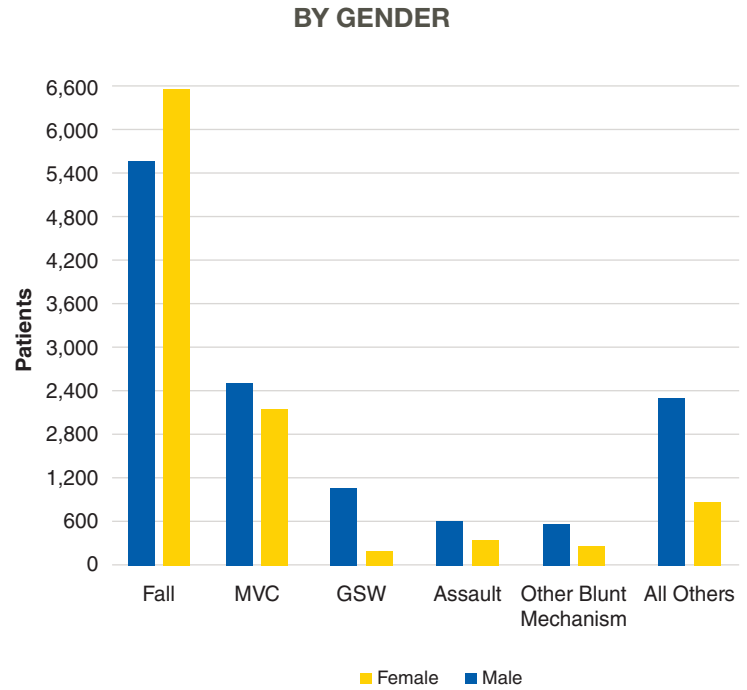
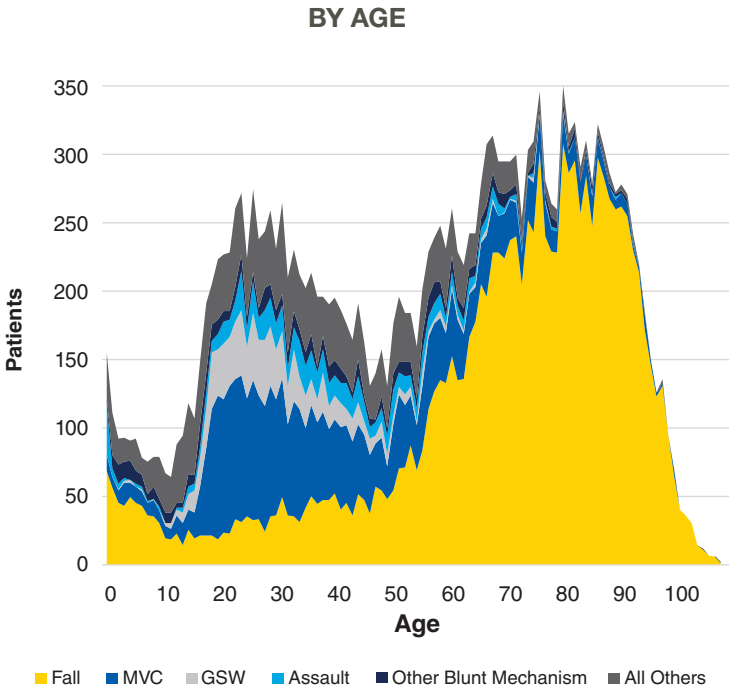
We looked at YPLLs for the top three mechanisms of injury in 2021: falls, motor vehicle collisions (MVC) and gunshot wounds (GSW). YPLLs were inversely proportional to total injuries of that mechanism, with falls having the most injuries but fewest YPLLs and GSWs having the least injuries but highest YPLLs. This is because falls tend to be more fatal in older individuals and GSWs in general occur more often in younger individuals.

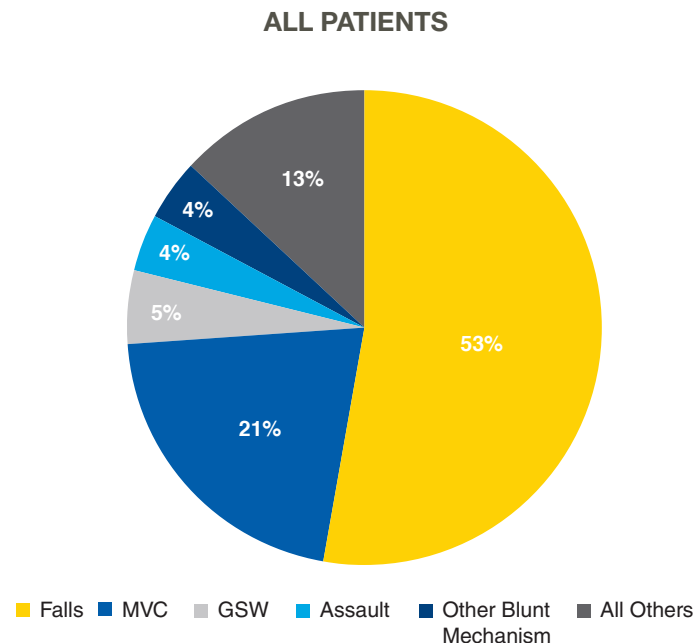
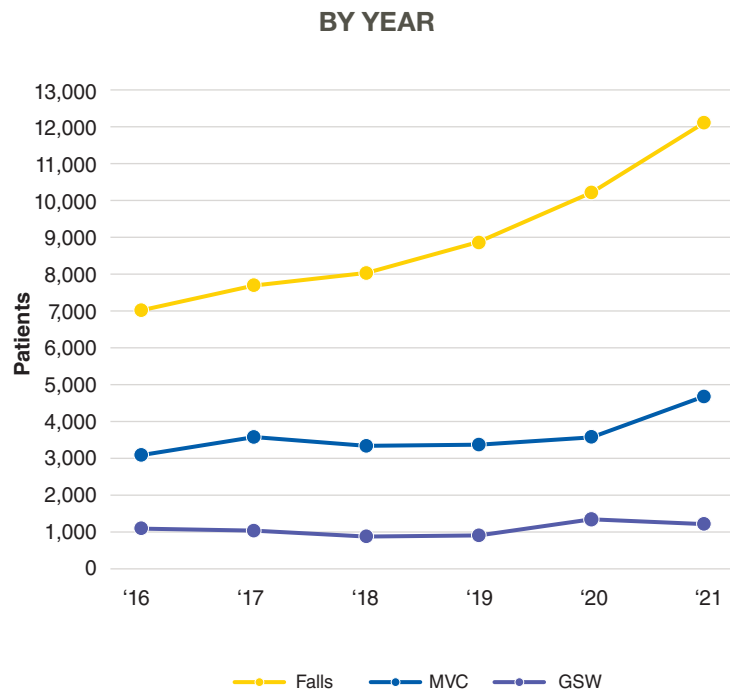
## YEARS OF POTENTIAL LIFE LOST FOR TOP THREE MECHANISMS OF INJURY



	Total Injuries	Deaths	Mortality	YPLL*	Mean YPLL per Death
Fall	12,510	209	1.7%	2,672	12.8
MVC	4,644	81	1.7%	1,869	23.1
GSW	1,205	149	12.4%	3,915	26.3

# Mechanisms of Injury

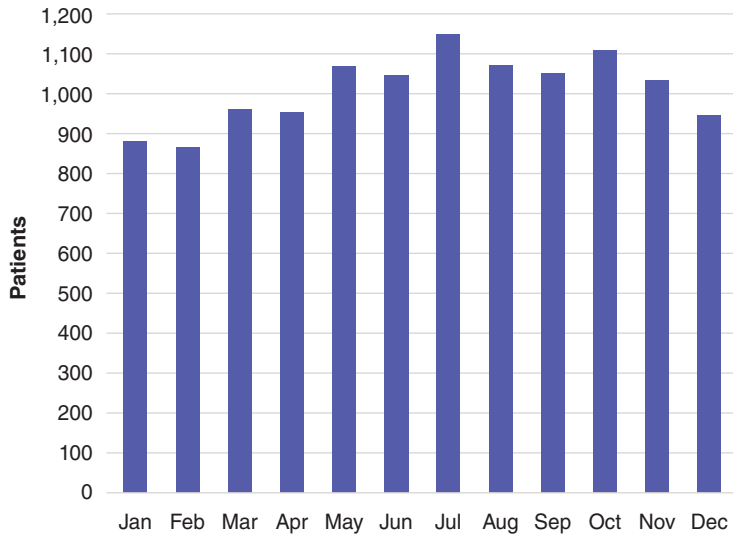




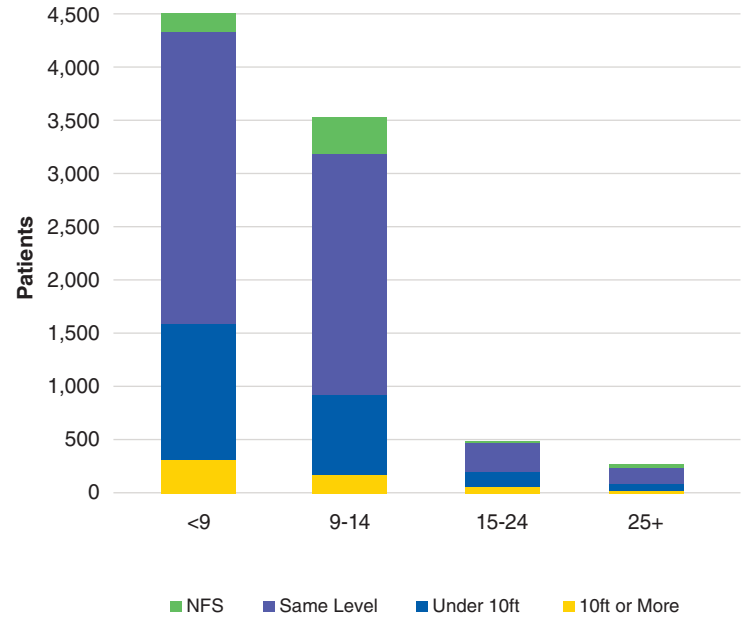
Note: All others includes: Asphyxiation, Bicycle, Biting, Burn, Drowning, Hanging, Horse and Rider, Motorcycle, Not Documented, Off Road/Other Vehicle, Other, Other Penetrating, Pedestrian Struck, Sport Injury, Stabbing, Unknown, and Watercraft

# Falls

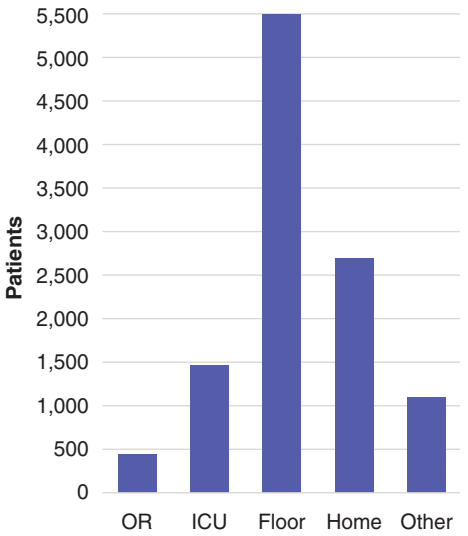
BY MONTH



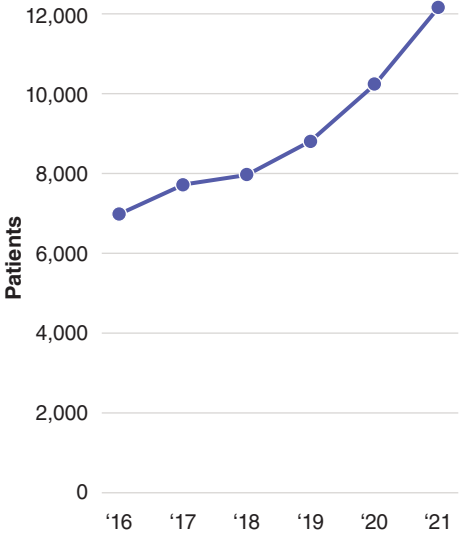
BY INJURY SEVERITY SCORE (ISS)



**BY ED DISPOSITION**

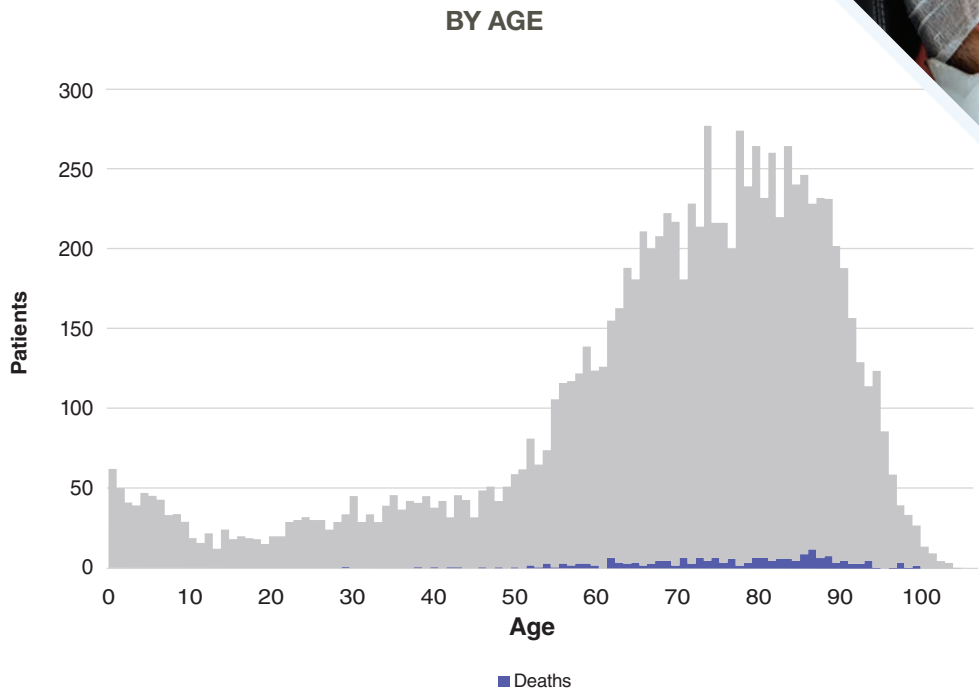


**BY YEAR**

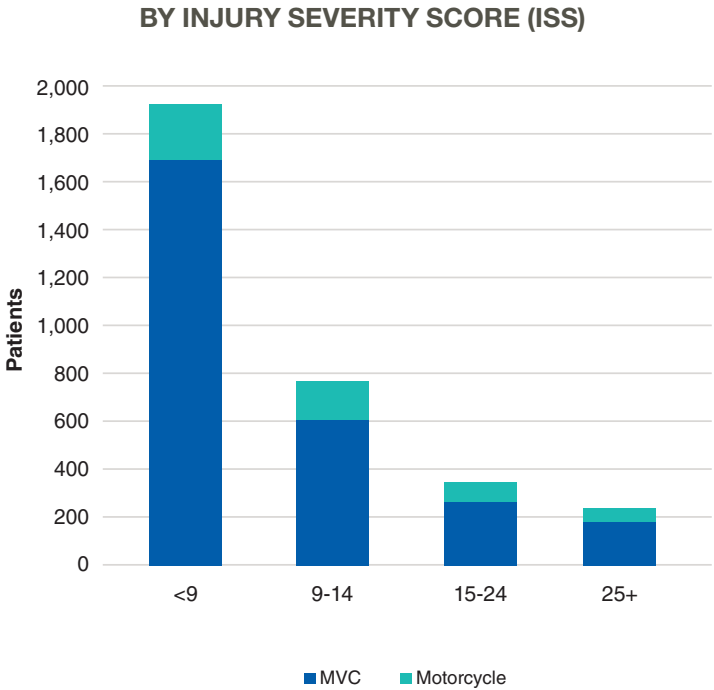
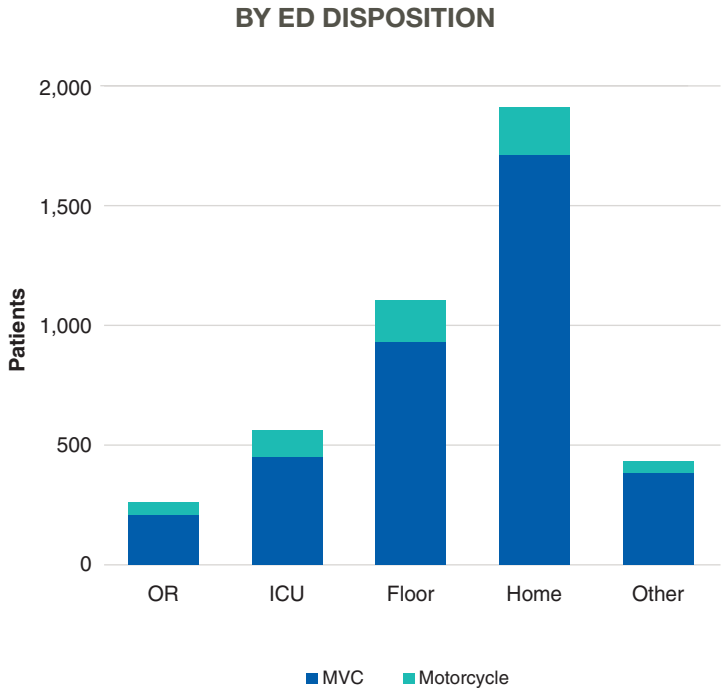




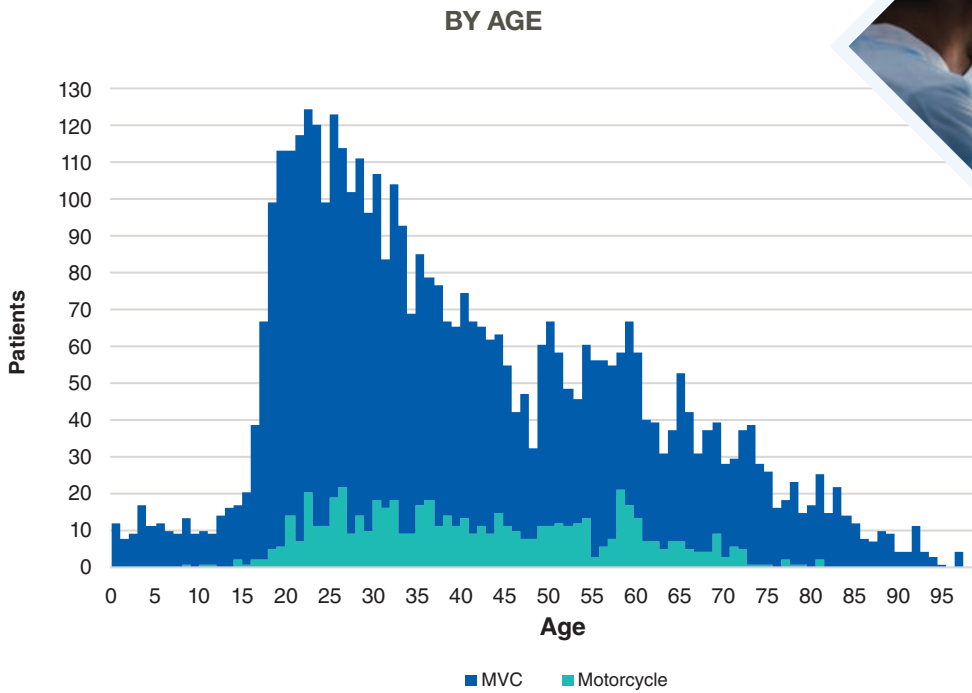
# Falls



# Motor Vehicle and Motorcycle Crashes

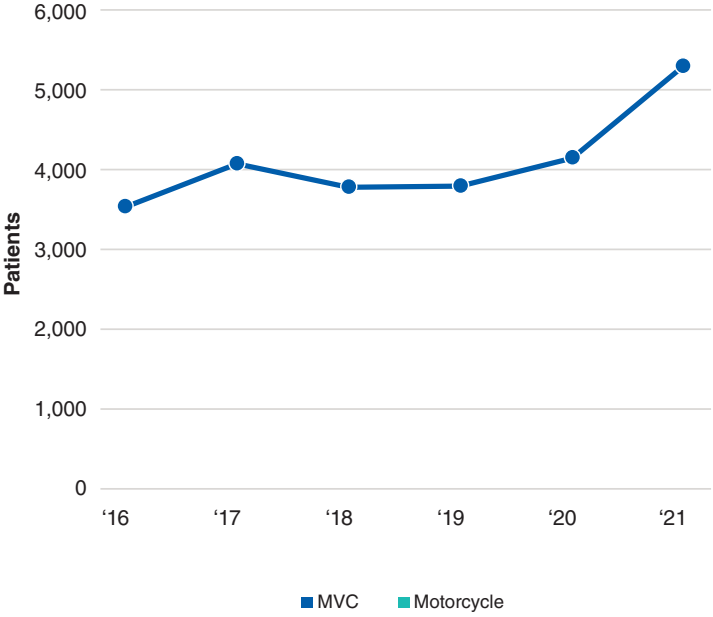


# Motor Vehicle and Motorcycle Crashes

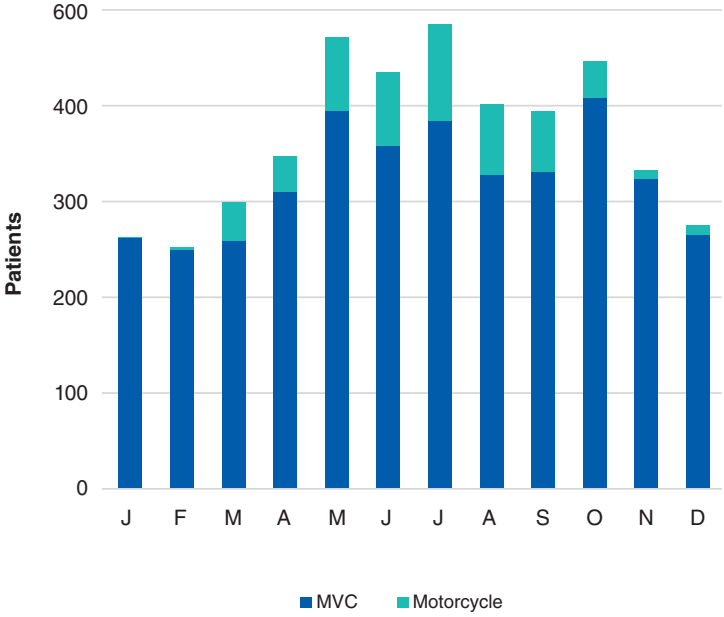




BY YEAR

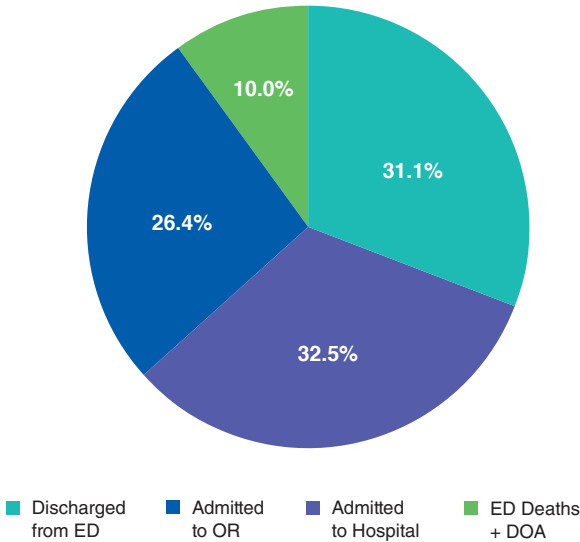


BY MONTH



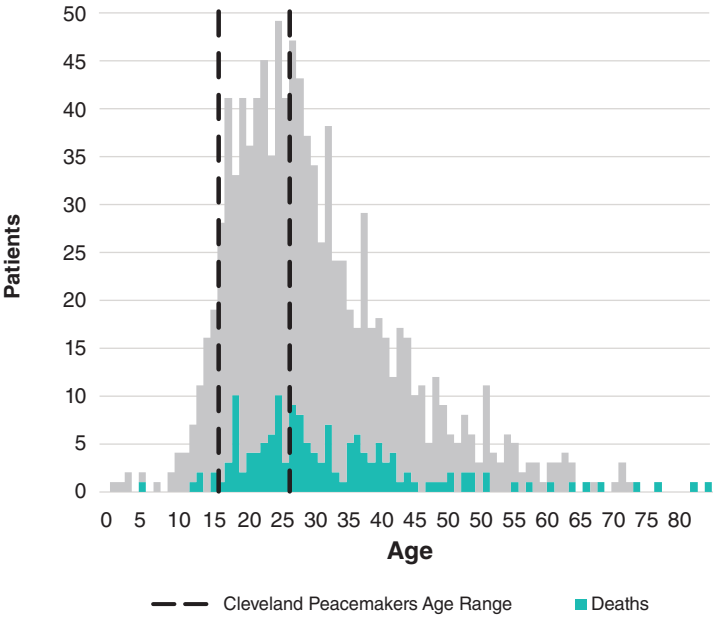
# Gunshot Wounds

BY ED DISPOSITION

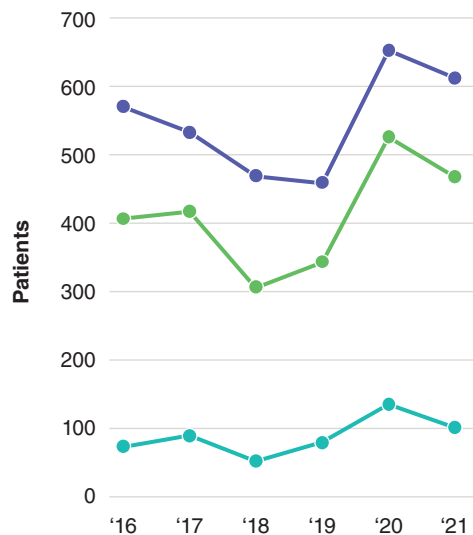


	2016	2017	2018	2019	2020	2021
ED Deaths	76	89	56	79	134	103
Admitted Deaths	38	39	43	39	49	46
Total	114	128	99	118	183	149
All GSW	1,060	1,049	838	893	1,327	1,209

BY AGE

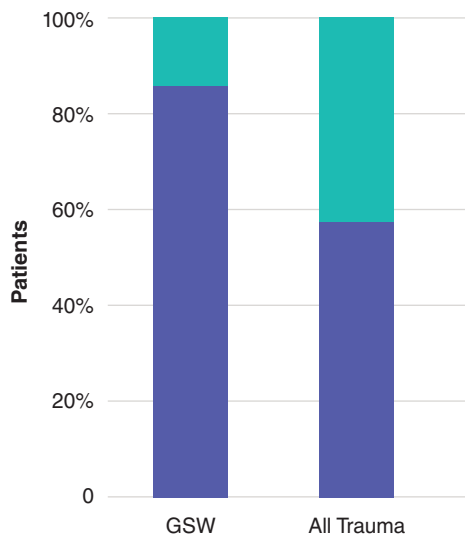


## BY YEAR AND ED DISPOSITION



■ Discharged from ED ■ Admitted ■ ED Deaths

## VS. ALL TRAUMA BY GENDER

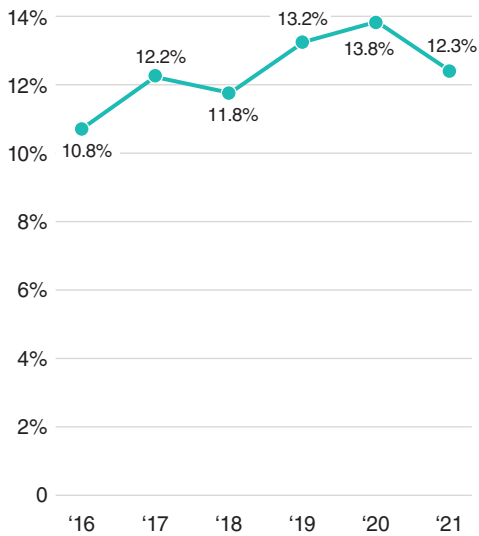


■ Male ■ Female

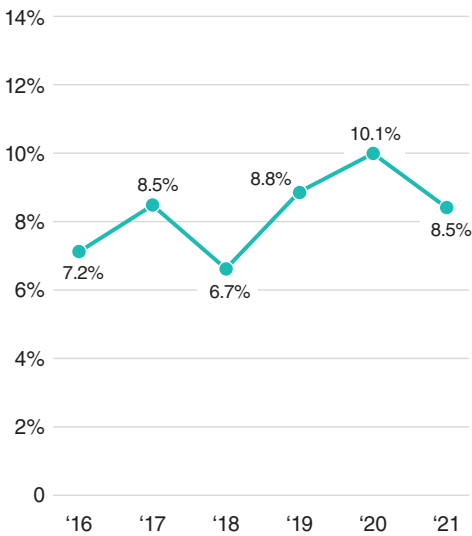
- There were 1,209 GSWs seen in 2021 (compared to 1,327 in 2020)
- 86% of GSW patients were male
- 31.1% were discharged from the ED
- 32.5% were taken directly to the OR from the ED
- Of those who were admitted, 45% went directly to the OR
- Of those who were admitted, 36% had a stay in the ICU, with a median ICU stay of 3 days
- The mortality rate of those who were admitted was 7.5%

# Gunshot Wounds

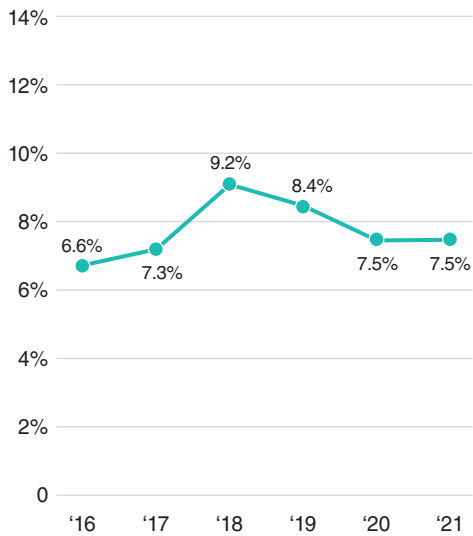
MORTALITY BY YEAR



ED MORTALITY BY YEAR



ADMITTED MORTALITY BY YEAR

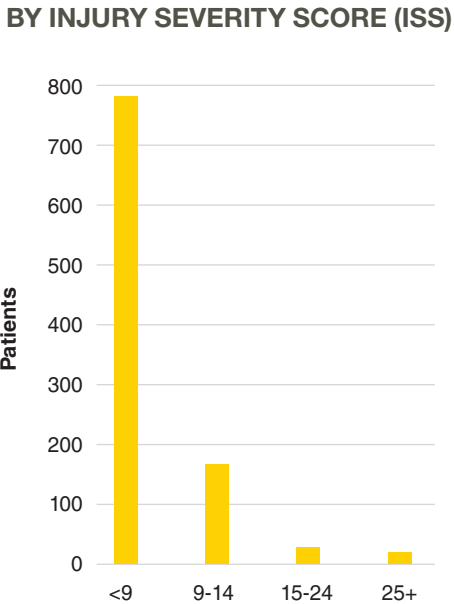
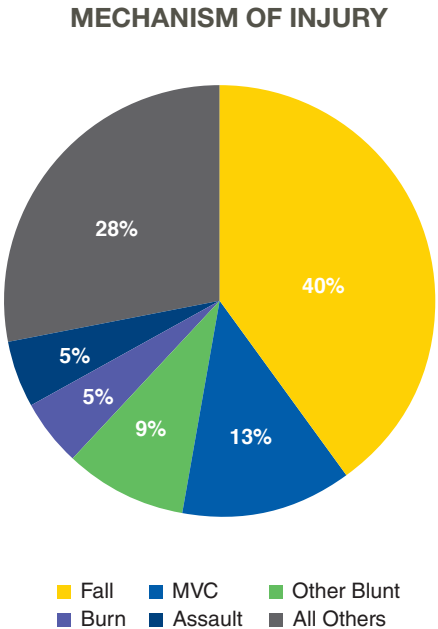




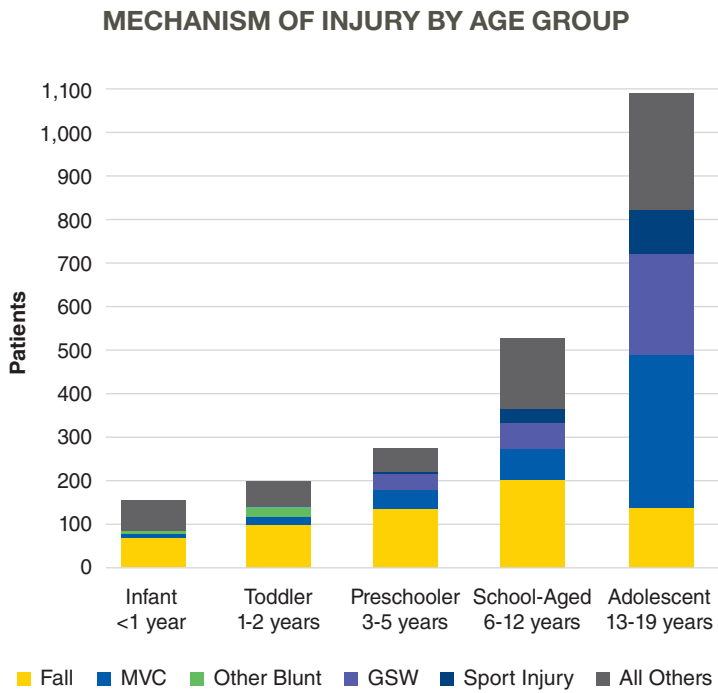
# Pediatric and Adolescent 14 years and younger

Mechanism Of Injury	Patients
Fall	548
MVC	171
Other Blunt	126
Burn	75
Assault	67
Sport Injury	65
Bicycle	59
Pedestrian Struck	58
Off Road/Other Vehicle	52
Biting - Human or Animal	48
GSW	36
Other Penetrating	29
Horse and Rider	16
All Others*	14
Grand Total	1364

\*All others includes Asphyxiation, Motorcycle, Stabbing and Other



# Pediatric and Adolescent 19 years and younger

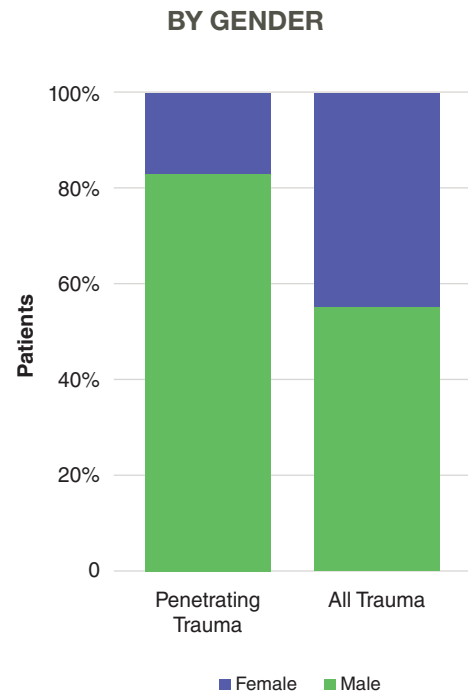
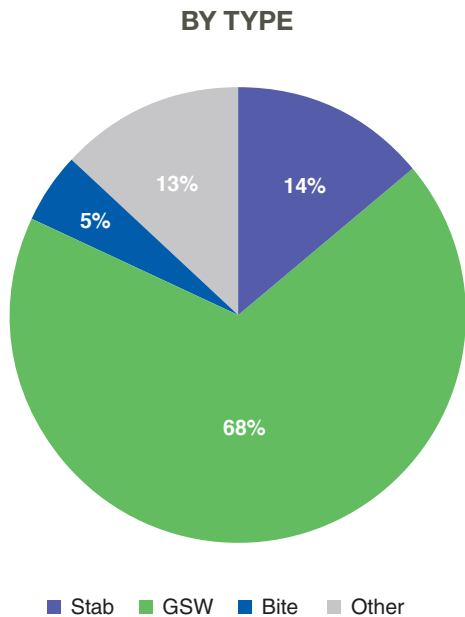
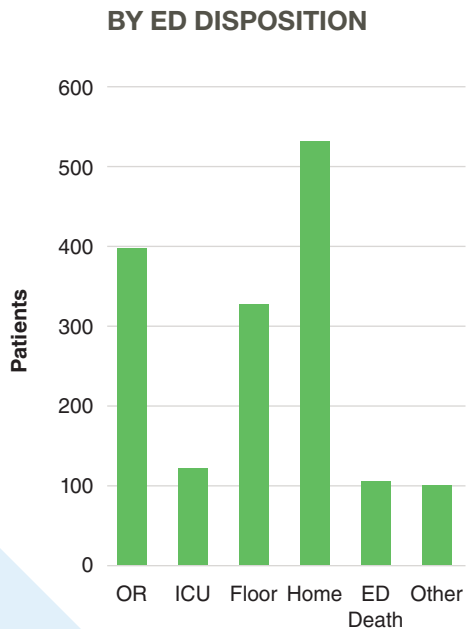


Pediatric Mechanism	Infant <1 Year	Toddler 1-2 Years	Preschooler 3-5 Years	School-Aged 6-12 Years	Adolescent 12-19 Years
Fall	68	101	137	203	139
MVC	12	17	40	71	349
Other Blunt	29		36	48	73
GSW	17				161
Sport Injury			36		100
All Others	71	59	56	161	268

Note: Due to small case counts in some categories, some cells were combined to protect patient privacy

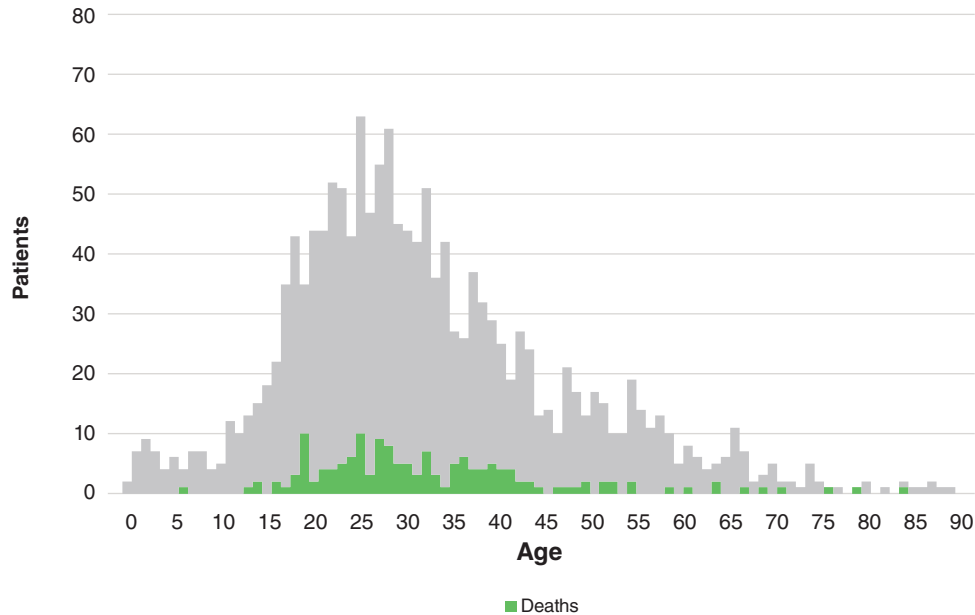


# Penetrating Trauma

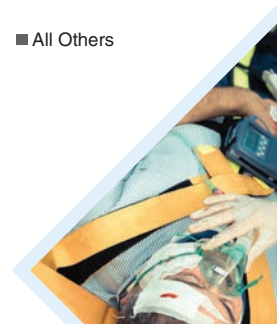
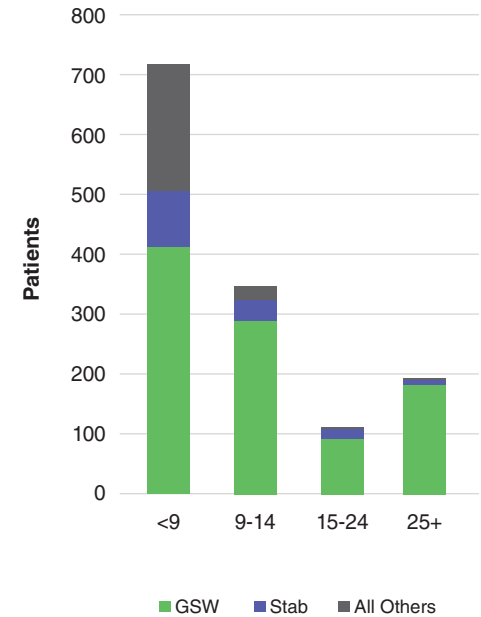


# Penetrating Trauma

BY AGE

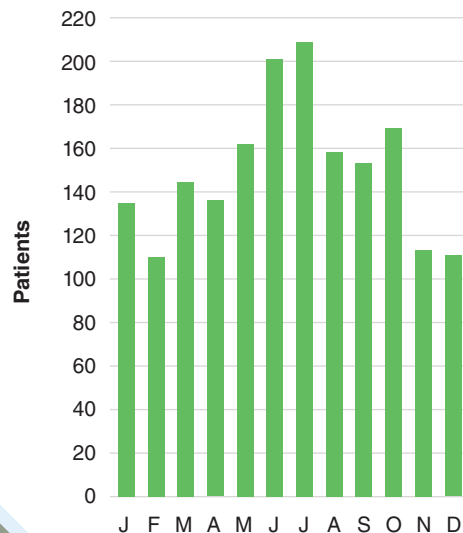


BY INJURY SEVERITY SCORE (ISS) AND MECHANISM

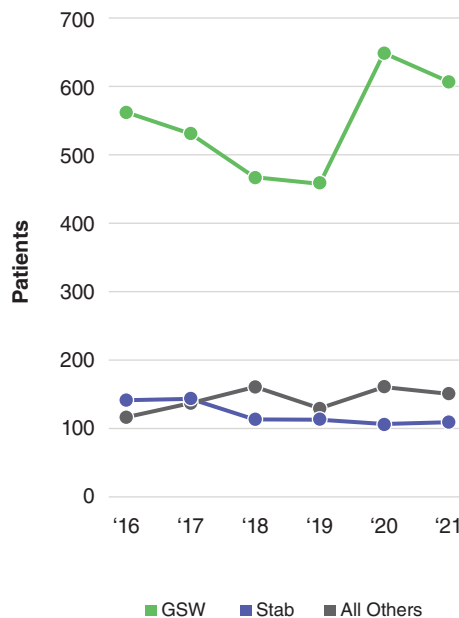




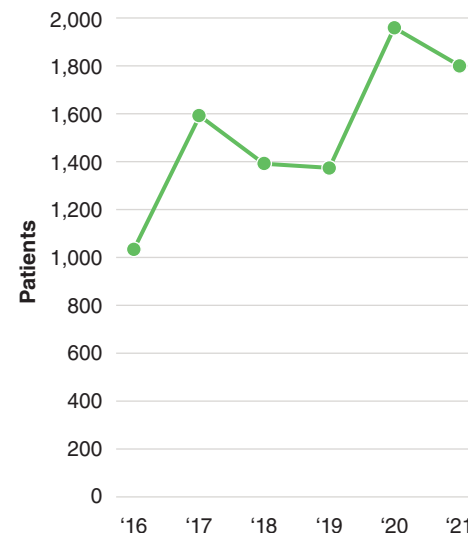
BY MONTH



ADMITTED BY TYPE AND YEAR



TOTAL BY YEAR



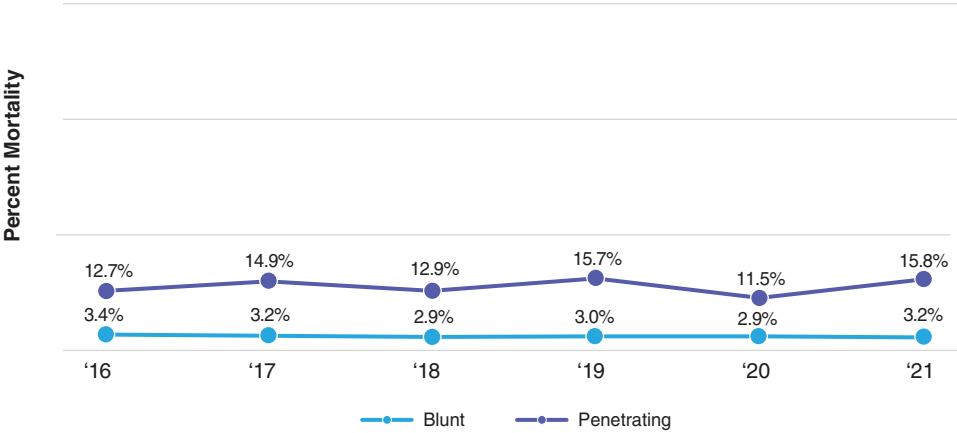
There were a record high number of penetrating traumatic injuries in 2020, coinciding with the COVID-19 pandemic. This number dropped slightly in 2021 but has not returned to pre-pandemic levels.

# Outcomes

Figures on these pages show the trends of mortality in the NOTS region over time. Data includes all admission and ED deaths secondary to trauma, and is separated based on blunt and penetrating injuries. Blunt injuries are mechanisms of injury such as falls or motor vehicle crashes. Penetrating injuries primarily include gunshot wounds or stabbings. Included is the number of patients (n) by each category for each year.

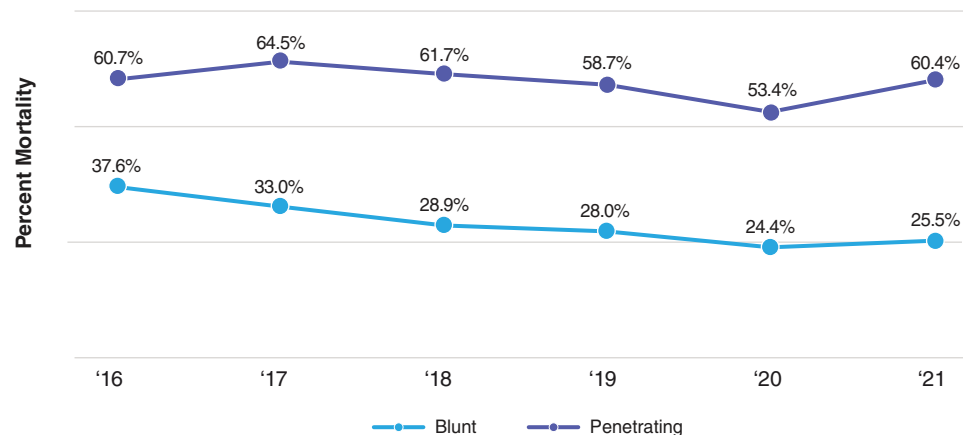
## MORTALITY: ALL ADMITTED PATIENTS AND ED DEATHS

This figure shows mortality over time for patients of all injury severity scores (ISS). In 2021, the region saw 11,076 patients with blunt injuries and 977 patients with penetrating injuries. The mortality percentages are not adjusted for injury severity or any other factors. Overall counts of injuries increased since 2020, with the mortality rate for penetrating injuries increasing and the blunt mortality rate increasing very slightly between 2020 and 2021.



	2016	2017	2018	2019	2020	2021
Blunt	8,739	9,114	8,743	9,830	10,653	11,076
Penetrating	896	912	799	788	979	977

## MORTALITY: ADMITTED PATIENTS AND ED DEATHS WITH INJURY SEVERITY SCORE OF 25+



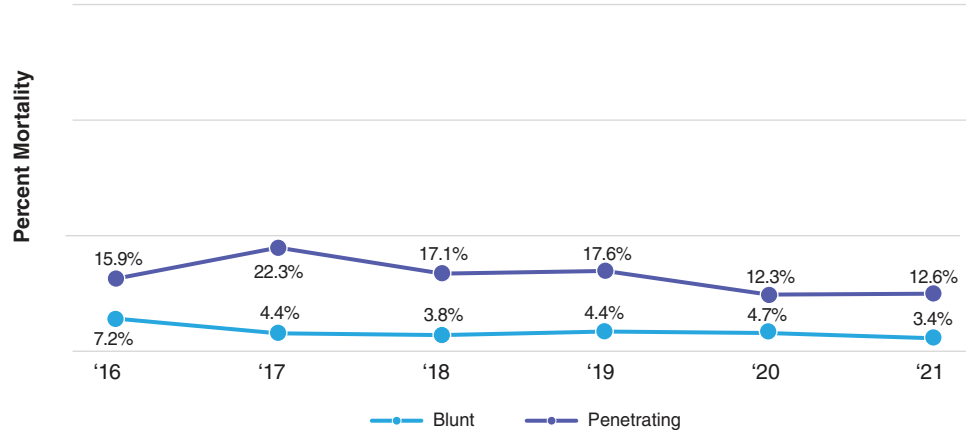
This figure represents patients with the highest severity of injury: an ISS of 25 or higher. A large percentage of these patients have life-threatening injuries and a markedly reduced likelihood of survival. A general rule of thumb is that roughly 50% of patients with an ISS  $\geq 25$  do not survive their injuries. In 2021, penetrating mortality increased, and blunt mortality slightly increased since 2020. Of note, part of the trauma surgeon's job is to respect family and patient wishes and recognize that it is our responsibility to allow people to die comfortably. At this time, we do not monitor how often we honor patient and family wishes to provide comfort care only and withhold life-sustaining therapy.

	2016	2017	2018	2019	2020	2021
<b>Blunt</b>	370	479	460	522	577	609
<b>Penetrating</b>	141	155	120	155	161	192



# Outcomes

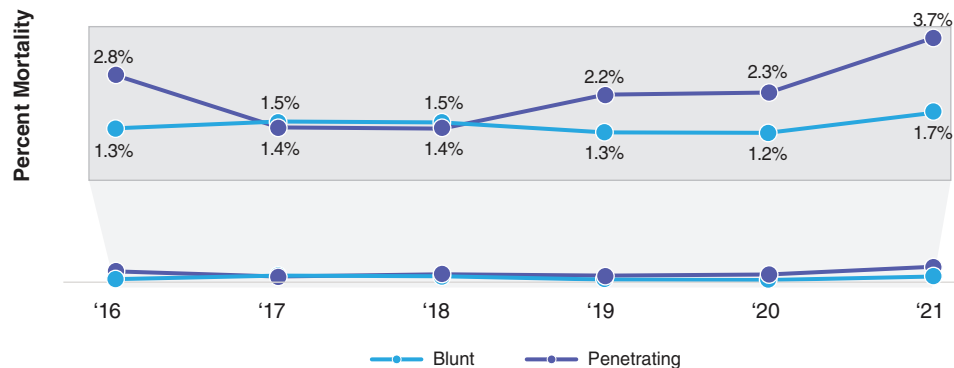
## MORTALITY: ADMITTED PATIENTS AND ED DEATHS WITH INJURY SEVERITY SCORE OF 15-24



This group represents patients with a moderate severity of injury. At the inception of NOTS, our specific goal was to improve the outcomes of this patient group. Though we may never reduce the number to zero, striving to do that is still our goal. Mortality for both penetrating injuries increased slightly while mortality for blunt injuries decreased.

	2016	2017	2018	2019	2020	2021
Blunt	745	857	815	860	935	969
Penetrating	90	103	111	91	130	111

## MORTALITY: ADMITTED PATIENTS AND ED DEATHS WITH INJURY SEVERITY SCORE OF 9-14



Patients with a minor ISS of 9-14 are numerous, while deaths are relatively rare. Deaths in this patient group often have contributing comorbid health conditions. Both blunt and penetrating mortality increased between 2020 and 2021.

	2016	2017	2018	2019	2020	2021
<b>Blunt</b>	3,021	3,268	3,347	3,748	4,271	4,376
<b>Penetrating</b>	263	294	296	224	308	323

# NOTS Advisory Board



**Jeffrey A. Claridge, MD, MS, FACS**

Division Director of Trauma, Critical Care, Burns  
and Acute Care Surgery  
*The MetroHealth System*

Professor of Surgery  
*Case Western Reserve University,  
School of Medicine*



**Matthew L. Moorman, MD, MBA, FACS,  
FAWM, FCCM**

Chief, Division of Trauma, Critical Care,  
and Acute Surgery  
*University Hospitals, Cleveland Medical Center*



**R. Matthew Walsh, MD, FACS**

Professor of Surgery Rich Family Distinguished  
Chair of Digestive Diseases Chairman,  
*Department of General Surgery,*

Digestive Disease Institute Chairman  
*Academic Department of Surgery,  
Education Institute, Cleveland Clinic*



**Christopher Miller, MD, MS**

Chair  
*University Hospitals Cleveland Medical Center  
Department of Emergency Medicine*

Clinical Professor of Emergency Medicine  
*Case Western Reserve University,  
School of Medicine*



**Bernard Boulanger, MD, MBA**

Executive Vice President, Chief Clinical, Officer  
*The MetroHealth System*

Professor of Surgery,  
Senior Associate Dean,  
*Case Western Reserve University,  
School of Medicine*



**Nicole A. Carlton**

Cleveland Commissioner  
*Division of Emergency Medical Services*



**Bradford L. Borden, MD, FACEP**

Chairman  
*Emergency Services Institute*  
Associate Chief of Staff  
*Staff Affairs, Cleveland Clinic*



**John H. Wilber, MD**

Chairman  
*Department of Orthopaedic Surgery, MetroHealth Medical Center*  
Professor of Orthopaedics  
*Case Western Reserve University, School of Medicine*



**Brendan M. Patterson, MD, MBA**

Chair  
*Department of Orthopaedics, Cleveland Clinic*  
Professor  
*Orthopaedics, Case Western Reserve University, School of Medicine*



**Paul R. Hinchey, MD**

President  
*Community Delivery Network*  
Interim Chief Operating Officer  
*University Hospitals Cleveland Medical Center*



**Sharyna C. Cloud, MPA**

Senior Program Officer  
*Enterprise Community Partners, Inc.*



**Brandy Carney**

Chief  
*Cuyahoga County Public Safety & Justice Services*

# Glossary Of Terms

**Adolescents:** Patients ages 13-19 years.

**Cause of Death:** For the purpose of national mortality statistics, every death is attributed to one underlying condition, based on information reported on the death certificate, and uses the international rules for selecting the underlying cause of death from the condition stated on the death certificate. For injury deaths, the underlying cause is defined as the circumstance of the accident or violence that produced the fatal injury.

**Coroner:** A person whose standard role is to confirm and certify the death of an individual within a jurisdiction. A coroner may also conduct or order an inquest into the manner or cause of death, and investigate or confirm the identity of an unknown person who has been found dead within the coroner's jurisdiction.

**Drowning:** This category includes injuries from drowning/near drowning and submersion with and without involvement of watercraft.

**Emergency Department (ED):** A medical treatment facility specializing in emergency medicine and the acute care of patients who present without prior appointment, either by their own means or by ambulance. The emergency department is usually found in a hospital or other primary care center.

**ICD-10 Code:** The International Classification of Diseases, Tenth Revision, Clinical Modification (ICD-10-CM) is a system used by physicians and other health care providers to classify and code all diagnoses, symptoms and procedures recorded in conjunction with hospital care in the United States.

**Frequency:** The number of times an event occurs.

**Geriatric:** Patients ages 65 and older.

**Gunshot Wounds (GSW):** This category includes injuries from firearms, including unintentional, suicide, homicide, legal intervention and undetermined intent.

**Homicide:** The killing of or intent to kill one person by another.

**Incidence:** The number of instances of illness or injury during a given period of time in a specified population.

**Injury:** Any unintentional or intentional damage to the body resulting from acute exposure to thermal, mechanical, electrical or chemical energy or from the absence of such essentials as heat or oxygen. According to the Injury Surveillance Guidelines, an injury is the physical damage that results when a human body is suddenly or briefly subjected to intolerable levels of energy. Injury can be a bodily lesion resulting from acute exposure to energy in an amount that exceeds the threshold of physiological tolerance, or it can be an impairment of function resulting from a lack of one or more vital elements (air, water or warmth), as in strangulation, drowning or freezing. The time between exposure to the energy and the appearance of an injury is short. The energy causing an injury may be one of the following:

- Mechanical
- Radiant
- Thermal
- Electrical
- Chemical

**International Classification for Diseases (ICD):** The ICD provides the ground rules for coding and classifying cause of death data.

**Injury Severity Score (ISS):** The Injury Severity Score (ISS) is an established medical score to assess trauma severity. It correlates with mortality, morbidity and hospitalization time after trauma. It is used to define the term major trauma. A major trauma (or polytrauma) is defined as the Injury Severity Score being greater than 15.

**Major Trauma:** A patient with injuries that result in death, intensive care admission, major operations of the head, chest or abdomen, a hospital stay of three or more days, or an ISS of greater than 15.

**Minor Trauma:** A patient who is entered into the trauma system, has an ISS of less than or equal to 15, and survives until hospital discharge.

**Mechanism of Injury (MOI):** The manner in which a physical injury occurred (e.g., fall from a height, ground-level fall, high- or low-speed motor vehicle accident, ejection from a vehicle, vehicle rollover). The MOI is used to estimate the forces involved in trauma and, thus, the potential severity for wounding, fractures, and internal organ damage that a patient may suffer as a result of the injury.

**Mortality:** Deaths caused by injury and disease. Usually expressed as a rate, meaning the number of deaths in a certain population in a given time period divided by the size of the population.

**Morbidity:** Number of persons, nonfatally injured or disabled. Usually expressed as a rate, meaning the number of nonfatal injuries in a certain population in a given time period divided by the size of the population.

**Pedestrian:** This category includes injuries among pedestrians hit by a train, a motor vehicle while not in a traffic, or another means of transportation.

**Pediatric:** Patients ages 0-15 years.

**Penetrating:** This category includes injuries caused by cutting and piercing instruments: knives, swords, daggers, power lawn mowers, power hand tools or household appliances.

**Risk Factors:** Characteristics of people, behavior or environment that increase the chance of disease or injury occurring. Examples: alcohol use, poverty and gender.

**Struck By/Against:** This category includes injuries resulting from being struck by or striking against objects or persons. This category includes being struck (unintentionally) by a falling object, being struck or striking objects or persons (sports), and injuries sustained in an unarmed fight or brawl.

**Years of Potential Life Lost (YPLL):** The concept of years of potential life lost involves estimating the average time a person would have lived had he or she not died prematurely.



### **NOTS 2022 Annual Report**

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