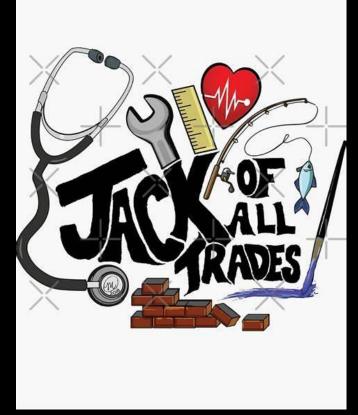
# TRAUMA SYSTEMS: PAST, PRESENT, AND FUTURE

NOTS – 2022 Jeffrey A. Claridge, MD, MS ∑@ClaridgeJeffrey











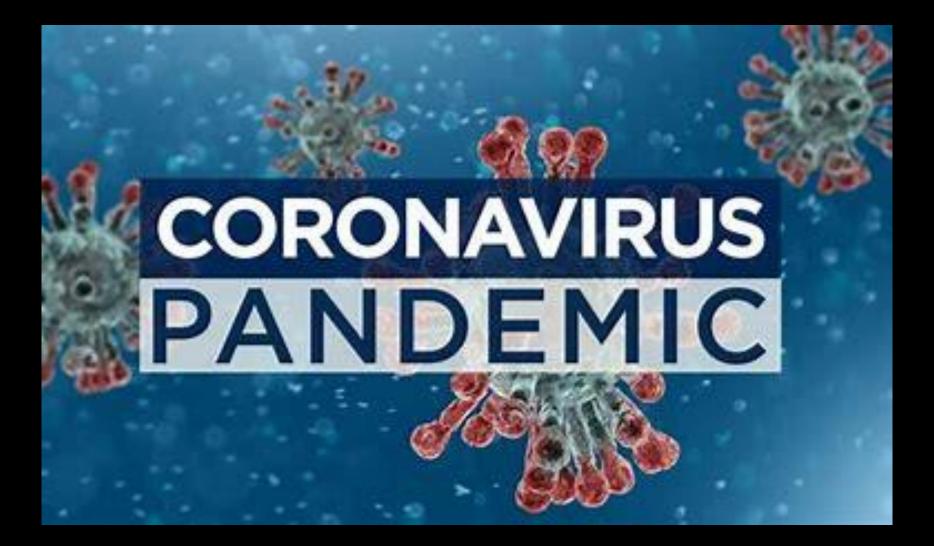




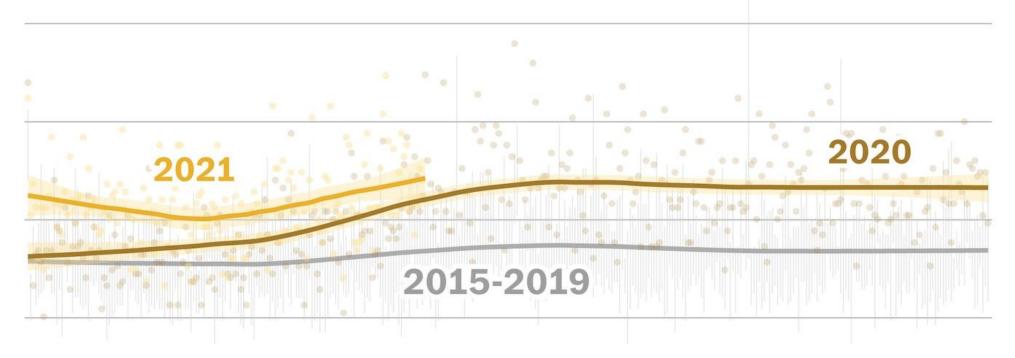




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### Daily U.S. gun deaths

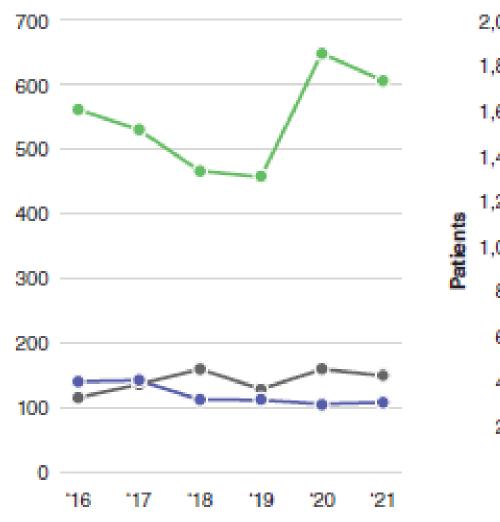


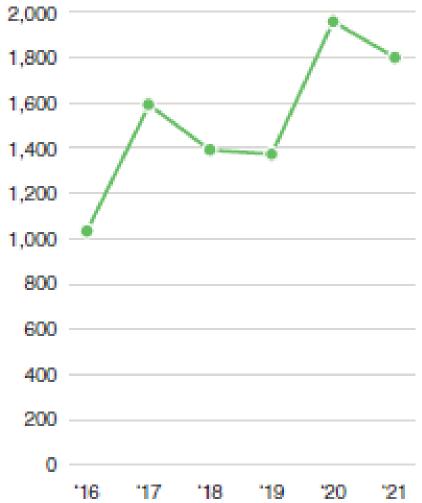
Jan.



#### ADMITTED BY TYPE AND YEAR

#### TOTAL BY YEAR





■GSW ■Stab ■All Others

## Main Objectives

- Discuss history of Trauma Systems: Nationally and Locally
- Discuss where we are now
- Explore where we can go
- Entertain you for 45 minutes

## History of Trauma Systems

## History of Trauma Systems

• The history of trauma care in America parallels our history of caring for injured military personnel during war

#### Servicemembers, Deaths & Injuries in American Wars

	Years	Total US Servicemembers	Battle Deaths	Wounded	Other Deaths
American Revolution	(1775-1783)	217,000	4,435	6,188	
War of 1812	(1812-1815)	286,730	2,260	4,505	
Indian Wars	(1817-1898)	106,000	1,000		
Mexican Wars	(1846-1848)	78,718	1,733	4,152	11,550
Civil War	(1861-1865)	3,263,363	214,938	281,881	283,394
Spanish-American War	(1898-1902)	306,760	385	1,662	2,061
World War I	(1917-1918)	4,734,991	53,402	204,002	63,114
World War II	(1941-1945)	16,112,566	291,557	670,846	113,842
Korean War	(1950-1953)	5,720,000	33,739	103,284	20,507
Vietnam War	(1964-1975)	8,744,000	47.434	153,303	42,786
Desert Shield/Storm	(1990-1991)	2,322,000	148	467	1,800
GRANDTOTALS	Source U.S. Dept of Veteran Affairs	41,892,128	651,031	1,430,290	539,054

Find Free Military and Genealogy Resources at MyGenealogyAddiction.com

## THE REVOLUTIONARY WAR

- Among many other historical actions and implications
- Revolutionary War also played a role in the development (or division) of trauma services as we know them today.



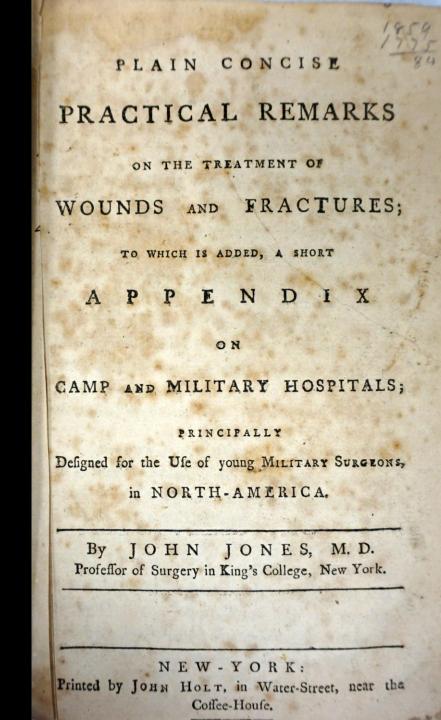


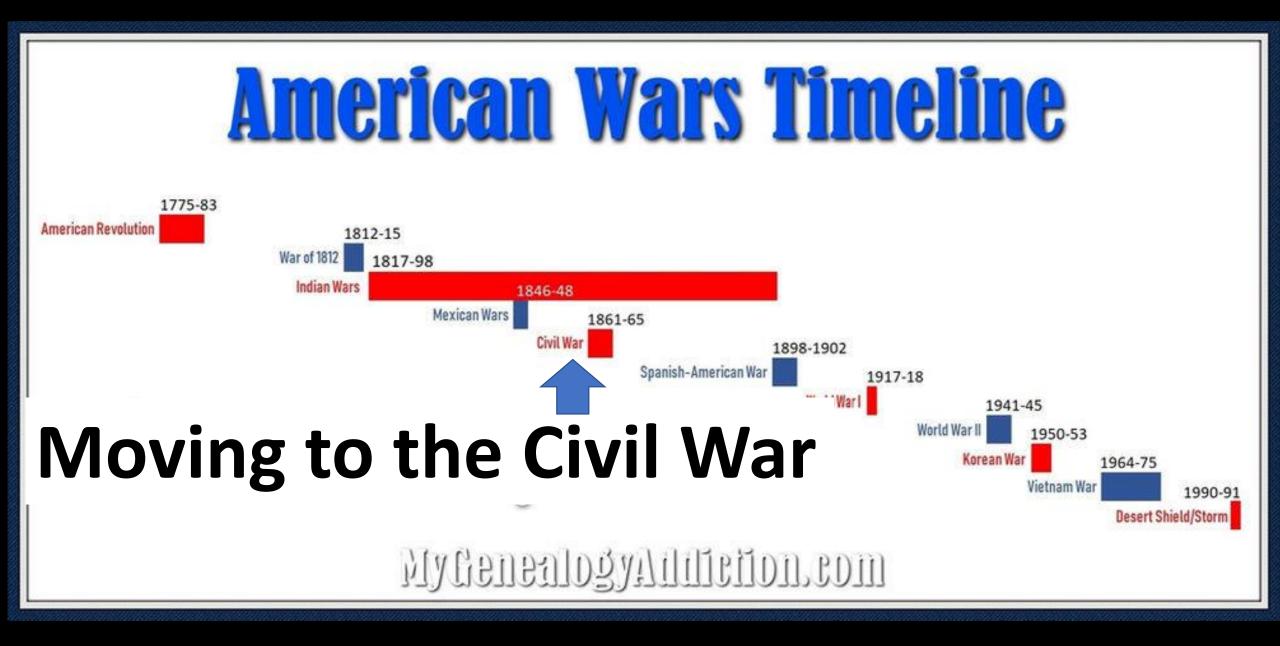
### Creation of the "Trauma Surgeon" Dr. John Morgan

- Prior to the War, common practice within the field of medicine was to incorporate all categories of care into one individual; one physician
- Recognizing that trauma (specifically surgical care) was becoming a specialty of its own first took shape during the Revolutionary War when John Morgan, a colonial physician, initiated the separation of internal medicine from surgery.

## First?? Trauma Manual

- John Bard, who was the first individual to publish a scientific paper on a surgical topic from the American colonies
- John Jones, who authored the first surgical works written by an American and printed in North America. Jones also – more importantly – published "Plain, Concise, Practical Remarks on the Treatment of Wounds and Fracture" in 1775, which became the guide for surgeons during the War.



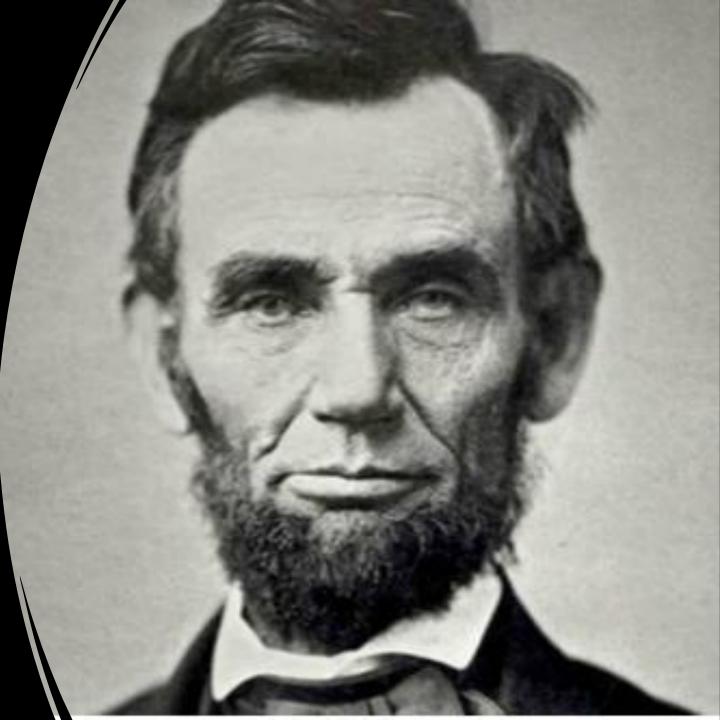




Civil War ambulance crew demonstrating removal of injured soldiers from the field. Library of Congress, Prints & Photographs Division, Civil War Photographs, reproduction number, LC-DIG-cwpb-03950.

## Civil War and President Abraham Lincoln

- ?creation of the first trauma manual
- ?first time processes to care for injured patients were formally documented



## **ABRAHAM LINCOLN**

- Significant role toward the progression of trauma care within our country.
- This time period also set the stage for the <u>developments in injury</u> <u>management</u> that came about during both World Wars and the <u>Korean War</u>.



## Civil War

- Marked by significant battlefield injuries the Civil War initiated <u>systems of care</u> for injured soldiers
  - helped to shape the triage
  - aid
  - rapid transport to field or general hospitals

## WWII

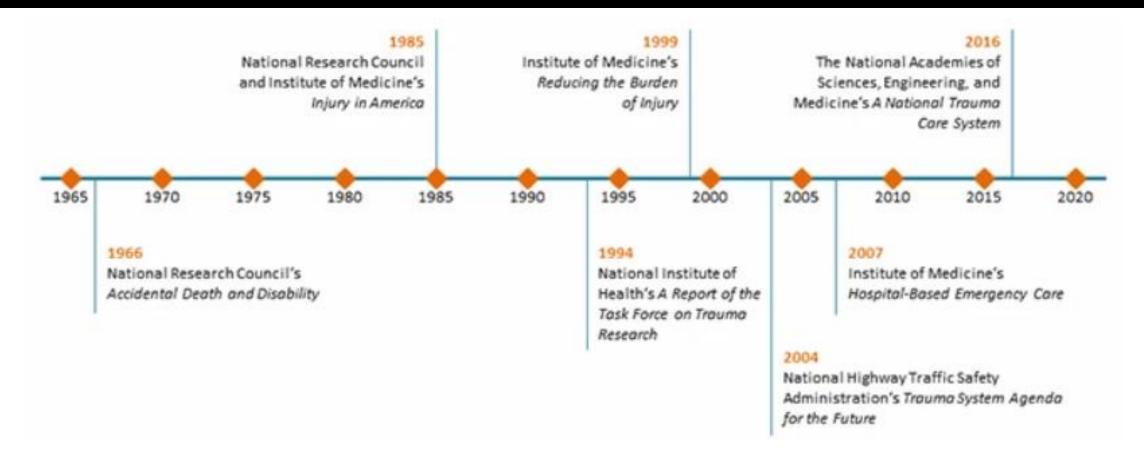
- Later, the concept of taking researchers into the battlefield to study outcomes (or how they fare after their treatment) began during World War II.
- Many of these wartime advances served as models for the modern trauma system.

# Let's Shift to Civilian Life now... and local history

#### • 1983

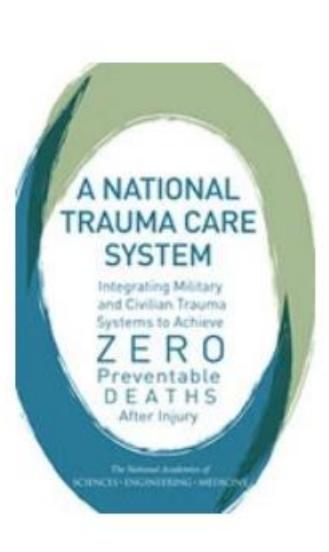
- 1st Local Helicopter Transfer Program –
- Became Second Busiest Service in The Nation
  - MD to MD Referral
  - Transport To Any Hospital
    - FAA Approved landing Pad
  - Physician on Every Flight
  - Receiving Hospital Guaranteed Flight Payment

## Trauma Care Vs. Trauma Systems



Seven reports in the past 50 years have highlighted the need for a national trauma system.

- The 2016 NASEM report, mentioned earlier, outlines 11 recommendations for completing the nation's trauma system,
  - Federal leadership,
  - coordination between military and civilian health leaders,
  - stronger collaboration between states
  - steps to address gaps in trauma care
  - a national trauma research plan with dedicated funding for clinical trials



# What about the history of Trauma Systems in our region

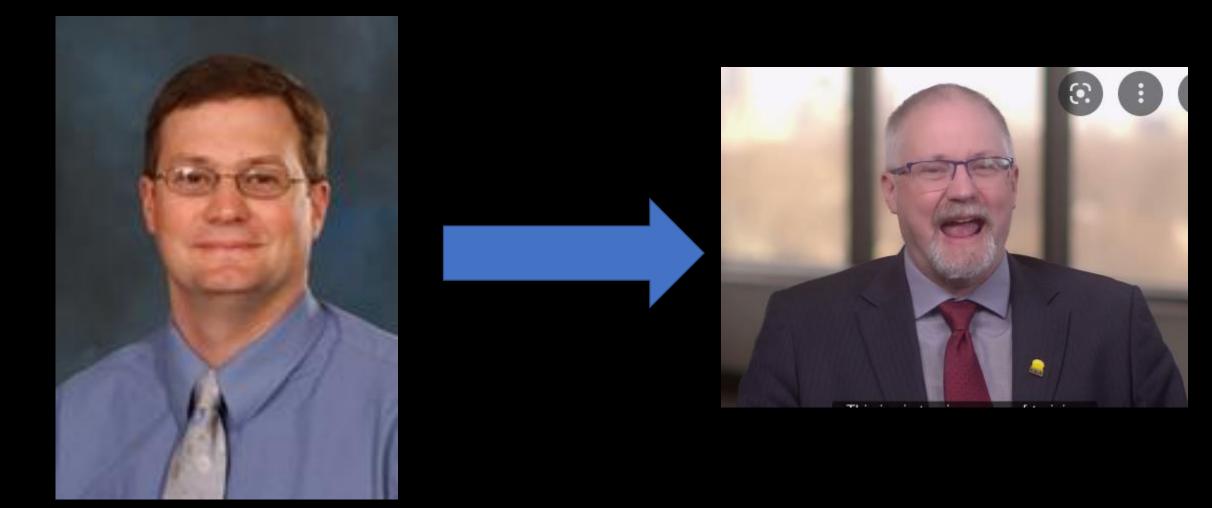


The Cleveland Fire Department's Engine NO. 2 on Public Square, ca. 1910. WRHS.

## History of Trauma Systems



## History of Trauma Systems



 $\equiv$  News Live First Alert Weather Newsletter Closings Friday Football Frenzy Sports Seen On TV Telemu



## Why Have a Trauma System ?

- A collaborative trauma system enhances the chance of survival regardless of proximity to an urban trauma hospital
  - Predetermined and organized response to managing injured patients
  - Best utilization of resources
  - Best utilization of funding
  - Collaboration on violence prevention
  - Ensures the use of best practices

State of Ohio ACS Trauma System Review

> Final Report for Ohio Department of Public Safety Ohio EMS / Trauma Research Grants EMS Fund Priority 2 2012 - 2013

- Determining location and number of trauma centers needed
- Working collaboratively ... not competitively

## What has our region done

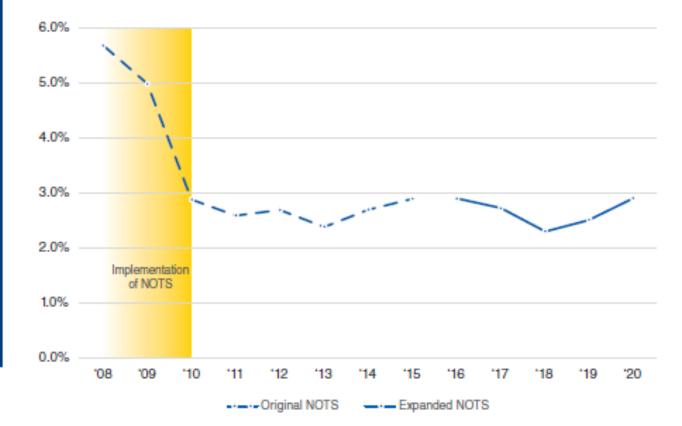
#### **MISSION STATEMENT**



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 the public health services.

Right patient. Right place. Right time.

#### MORTALITY



## Key Points of Information: It can work

Regional collaboration across hospital systems to develop and implement trauma protocols saves lives within 2 years

Jeffrey A. Claridge, MD, MS, FACS, Debra Allen, BSN, RN, CCRN, Brendan Patterson, MD, Fred DeGrandis, JD, Charles Emerman, MD, David Bronson, MD, and Alfred Connors, MD, *Cleveland*, OH

## Mortality Before and After NOTS

	Pre-NOTS	Post-NOTS	Relative decrease in mortality
Blunt Injuries	N = 10892	N = 14968	
	3.5%	2.2%	<b>↓37%</b>
Penetrating	N = 1480	N = 1749	
	10.1%	6.5%	<b>↓36%</b>
ISS > 14	N = 1774	N = 1816	
(severely injured)	25.4%	19.3%	<b>↓24%</b>
Age > 64	N = 2762	N = 3558	
	7.5%	5.5%	<b>↓27%</b>

## Regional system improves area trauma care, Cleveland Clinic and MetroHealth officials say

Updated: Sep. 24, 2012, 6:00 p.m. | Published: Sep. 24, 2012, 5:00 p.m.

CLEVELAND, Ohio -- A study analyzing the outcomes of nearly 30,000 trauma patients who have been treated at area trauma centers since 2008 shows:

- The mortality rate for traumas in Cleveland dropped from 5.7 percent to 2.7 percent.
- The mortality rate for traumas on Cleveland's East side dropped from 5.3 percent to 3.2. percent.
- The mortality rate in Cuyahoga County and surrounding counties dropped from 4.4 percent to 2.7 percent.

## Improvements of TBI Patients

EAST 2014 PLENARY PAPER

## Decreased mortality in traumatic brain injury following regionalization across hospital systems

Michael L. Kelly, MD, Aman Banerjee, MD, Michael Nowak, PhD, Michael Steinmetz, MD, and Jeffrey A. Claridge, MD, Cleveland, Ohio

EAST 2015 PLENARY PAPER

Functional and long-term outcomes in severe traumatic brain injury following regionalization of a trauma system

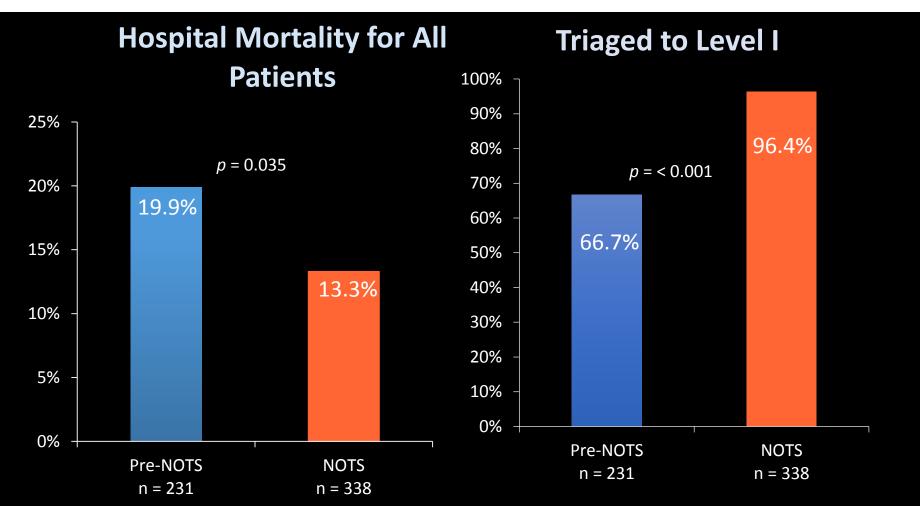
Michael L. Kelly, MD, Mary Jo Roach, PhD, Aman Banerjee, MD, Michael P. Steinmetz, MD, and Jeffrey A. Claridge, MD, Cleveland, Ohio



The most severe and "time sensitive" patients have also had better outcomes > J Trauma Acute Care Surg. 2017 Jan;82(1):58-64. doi: 10.1097/TA.000000000001302.

# Trauma system regionalization improves mortality in patients requiring trauma laparotomy

David Schechtman<sup>1</sup>, Jack C He, Brenda M Zosa, Debra Allen, Jeffrey A Claridge

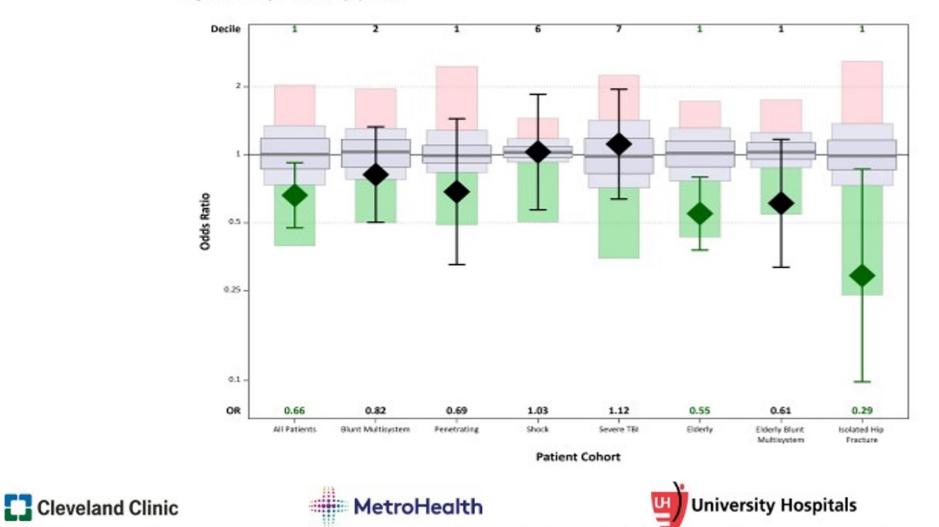




## Risk Adjusted Mortality by Cohort

Spring 2022 TOJP Benchmark Report ID: Northern Ohio Collaborative

#### Figure 2: Risk-Adjusted Mortality by Cohort

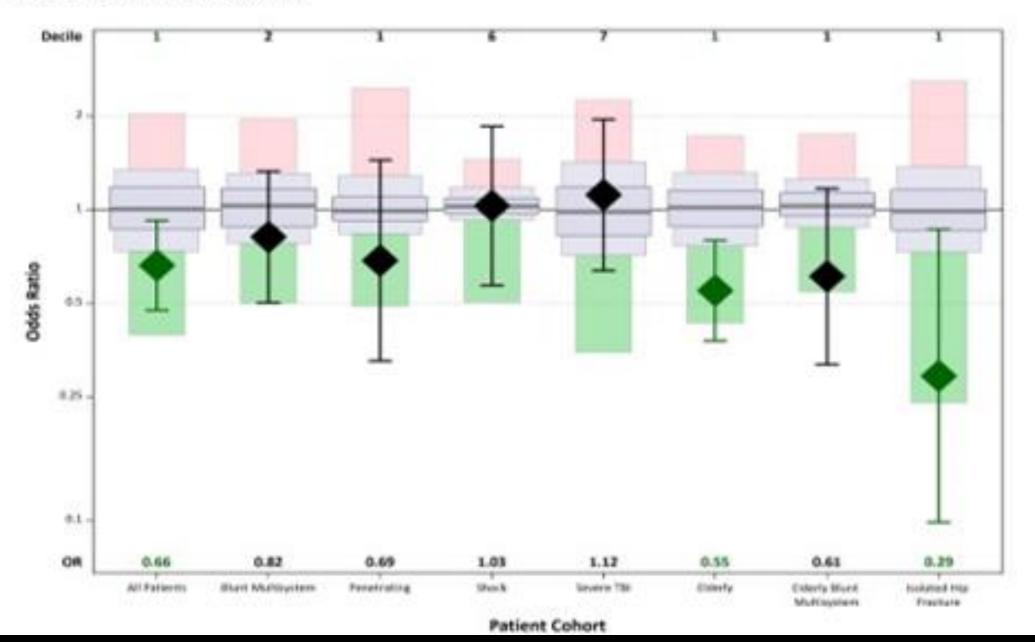




Quality Assurance, Peer Review Risk Management Report privileges as outline in Ohio Revised Code Sections 2371 (A), 2305.25 -2305.253, and 2305.28

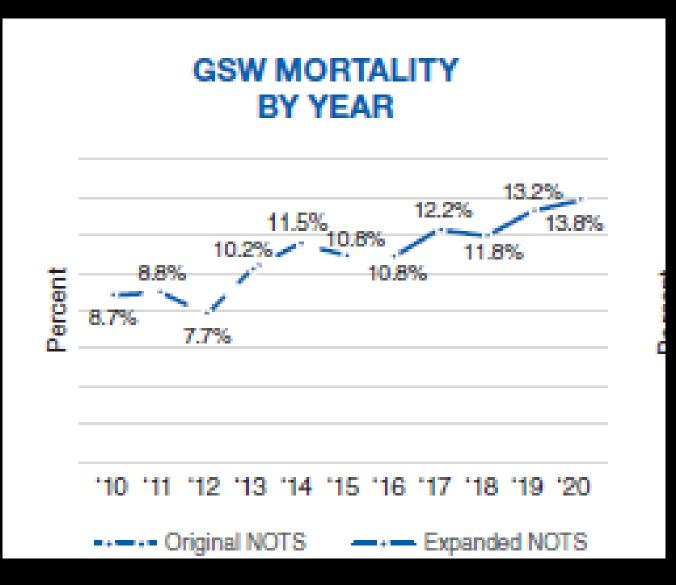
Earling 2023 TCBP Senctionaris Report ID: Northern Ohio Cullaboration

#### Figure 2: Risk-Adjusted Mortality by Cohort

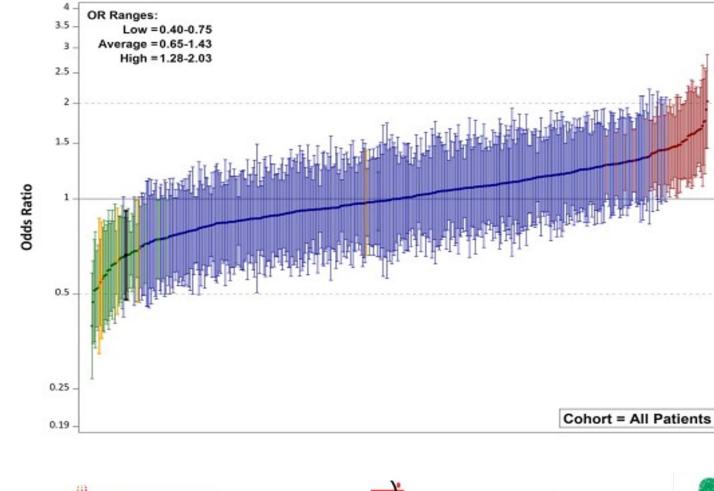


## Where can we go from here

### Have not sustained all initial improvements





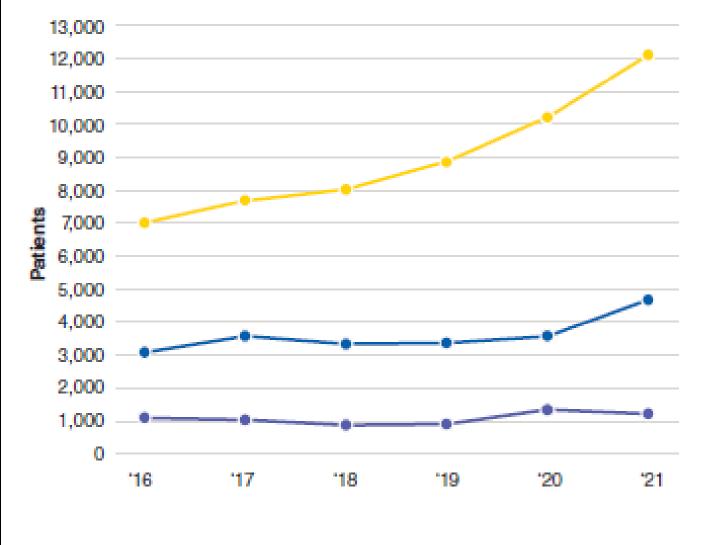


Odds Ratios by TQIP Hospital; Mortality





#### **BY YEAR**



## Trauma Systems

- Trauma Systems must put patients and community first... They need to be committed to improving and saving lives
- Continue to share data
- ?? Need some monitoring/regulation/oversight



united states 🗙



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Find a Surgeon

**Search Institutions** 

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## Relationship between trauma center volume and outcomes

A B Nathens <sup>1</sup>, G J Jurkovich, R V Maier, D C Grossman, E J MacKenzie, M Moore, F P Rivara

Affiliations + expand

PMID: 11231745 DOI: 10.1001/jama.285.9.1164

**Conclusions:** Our results indicate that a strong association exists between trauma center volume and outcomes, with significant improvements in mortality and LOS when volume exceeds 650 cases per year. These benefits are only evident in patients at high risk for adverse outcomes.

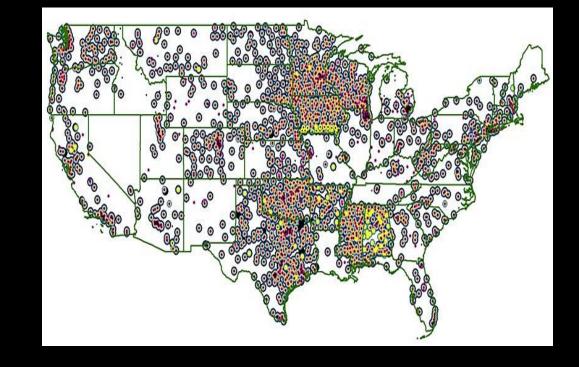
> J Trauma Acute Care Surg. 2021 Jul 1;91(1):171-177. doi: 10.1097/TA.000000000003178.

## Is more better? Do statewide increases in trauma centers reduce injury-related mortality?

Evelyn I Truong <sup>1</sup>, Vanessa P Ho, Esther S Tseng, Colette Ngana, Jacqueline Curtis, Eric T Curfman, Jeffrey A Claridge

• **Objectives:** Trauma centers are inconsistently distributed throughout the United States. It is unclear if new trauma centers improve care and decrease mortality. We tested the hypothesis that increases in trauma centers are associated with decreases in injury-related mortality (IRM) at the state level.

# Where are our trauma centers?



- We sought to examine if:
  - 1. <u>Having more</u> trauma centers is associated with lower injury-related mortality
  - 2. <u>Adding</u> trauma centers is associated with decreases in injury-related mortality

#### IS MORE BETTER? DO STATEWIDE INCREASES IN TRAUMA CENTERS REDUCE INJURY-RELATED MORTALITY?

#### **Data Sources:**

2014-2018:

- Injury Mortality Data from the Centers for Disease Control
- Trauma Center (TC) location from the Trauma Information Exchange Project

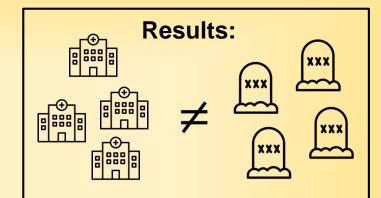


#### Analysis:

Do increases in TC change injuryrelated mortality (IRM)?

- Geographic Information Systems (GIS)
- Longitudinal Regression Analysis, with fixed effects within states





- Large variability in trauma center # between states
- More centers associated with higher IRM
- Changes in trauma centers not associated with IRM

Truong EI et al. EAST Annual Scientific Assembly January 2021 @metrohealthcle @esthertsengmd
@vanessapho @claridgejeffrey
@EAST\_Trauma

Eastern Association for the Surgery of Trauma Advancing Science, Fostering Relationships, and Building Careers

## Conclusions

- Having more trauma centers and increasing the number of trauma center within a state were not associated with decreases in state-level injury related mortality
- In this case, more is not better
- However, more work is needed to identify the optimal number and location of trauma centers to improve injury related mortality



# Decreasing the number of deaths from gun violence

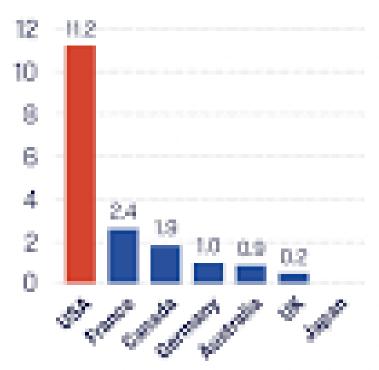
What is the number needed to show benefit???

# 7. Decreasing the number of deaths from gun violence

What is the number needed to show benefit???

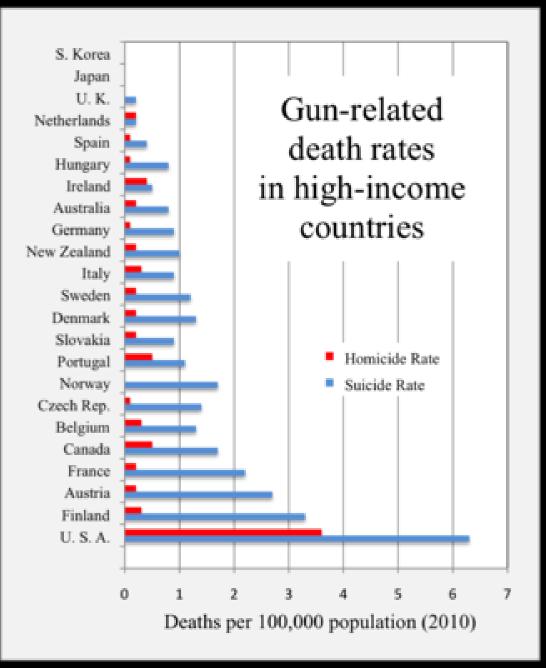


#### GUN DEATH RATE PER 100,000



## AMERICANS ARE 25 TIMES MORE LIKELY TO DIE FROM GUN VIOLENCE THAN RESIDENTS OF PEER NATIONS





JAMA Internal Medicine | Original Investigation | FIREARM VIOLENCE

#### Modeling Contagion Through Social Networks to Explain and Predict Gunshot Violence in Chicago, 2006 to 2014

Ben Green, MSc; Thibaut Horel, MSc; Andrew V. Papachristos, PhD

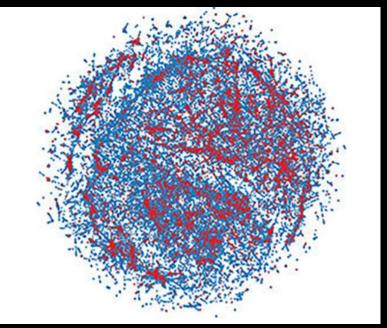
- An individual within these social networks was at the greatest risk of being shot within a period of about 125 days after their "infector," the person most responsible for exposing the subject to gun violence, was the subject of gun violence.
- These results provide evidence that gun violence is not just an epidemic, but it has specific network patterns that might provide plausible opportunities for interventions
- "There is a real value in understanding the timing of these events as a way to identify victims, and where we can insert resources such as violence- and harm-reduction programs into these networks."

Yale study finds that gun violence is a 'contagious' social epidemic

JANUARY 4, 2017

By Bess Connolly

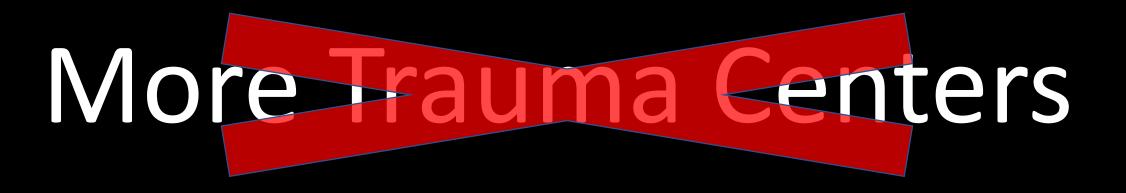




Graphical representation of the largest connected component of the network.

Each node represents a unique individual. Red nodes identify subjects of a fatal or nonfatal gunshot injury; blue nodes represent people who were not subjects of gun violence.

### The Answer is not:



## LET'S BE COMPETIVE TOGETHER.... AGAINST THE DISEASE!!!

#### 10 Leading Causes of Death, United States 2019, All Races, Both Sexes

					Age G	roups					
Rank	<1	1-4	5-9	10-14	15-24	25-34	35-44	45-54	55-64	65+	All Ages
1	Congenital Anomalies 4,301	Unintentional Injury 1,149	Unintentional Injury 714	Unintentional Injury 778	Unintentional Injury 11,755	Unintentional Injury 24,516	Unintentional Injury 24,070	Malignant Neoplasms 35,587	Malignant Neoplasms 111,765	Heart Disease 531,583	Heart Disease 659,041
2	Short Gestation 3,445	Congenital Anomalies 416	Malignant Neoplasms 371	Suicide 534	Suicide 5,954	Suicide 8,059	Malignant Neoplasms 10,695	Heart Disease 31,138	Heart Disease 80,837	Malignant Neoplasms 435,462	Malignant Neoplasms 599,601
3	Unintentional Injury 1,266	Malignant Neoplasms 285	Congenital Anomalies 192	Malignant Neoplasms 404	Homicide 4,774	Homicide 5,341	Heart Disease 10,499	Unintentional Injury 23,359	Unintentional Injury 24,892	Chronic Low. Respiratory Disease 133,246	Unintentional Injury 173,040
4	SIDS 1,248	Homicide 284	Homicide 155	Homicide 191	Malignant Neoplasms 1,388	Malignant Neoplasms 3,577	Suicide 7,525	Liver Disease 8,098	Chronic Low. Respiratory Disease 18,743	Cerebro- vascular 129,193	Chronic Low. Respiratory Disease 156,979
5	Maternal Pregnancy Comp. 1,245	Heart Disease 133	Heart Disease 91	Congenital Anomalies 189	Heart Disease 872	Heart Disease 3,495	Homicide 3,446	Suicide 8,012	Diabetes Mellitus 15,508	Alzheimer's Disease 120,090	Cerebro- vascular 150,005
6	Placenta Cord Membranes 742	Influenza & Pneumonia 122	Chronic Low. Respiratory Disease 69	Heart Disease 87	Congenital Anomalies 390	Liver Disease 1,112	Liver Disease 3,417	Diabetes Mellitus 6,348	Liver Disease 14,385	Diabetes Mellitus 62,397	Alzheimer's Disease 121,499
7	Bacterial Sepsis 603	Perinatal Period 57	Influenza & Pneumonia 52	Chronic Low. Respiratory Disease 81	Diabetes Mellitus 248	Diabetes Mellitus 887	Diabetes Mellitus 2,228	Cerebro- vascular 5,153	Cerebro- vascular 12,931	Unintentional Injury 60,527	Diabetes Mellitus 87,647
8	Respiratory Distress 424	Septicemia 53	Cerebro- vascular 37	Influenza & Pneumonia 71	Influenza & Pneumonia 175	Cerebro- vascular 585	Cerebro- vascular 1,741	Chronic Low. Respiratory Disease 3,592	Suicide 8,238	Nephritis 42,230	Nephritis 51,565
9	Circulatory System Disease 406	Cerebro- vascular 52	Septicemia 36	Cerebro- vascular 48	Chronic Low. Respiratory Disease 168	Complicated Pregnancy 532	Influenza & Pneumonia 951	Nephritis 2,269	Nephritis 5,857	Influenza & Pneumonia 40,399	Influenza & Pneumonia 49,783
10	Necrotizing Enterocolitis 354	Benign Neoplasms 49	Benign Neoplasms 31	Benign Neoplasms 35	Cerebro- vascular 158	HIV 486	Septicemia 812	Septicemia 2,176	Septicemia 5,672	Parkinson's Disease 34,435	Suicide 47,511

WISQARS<sup>™</sup> Produced By: National Center for Injury Prevention and Control, Centers for Disease Control and Prevention

Data Source: National Center for Health Statistics (NCHS), National Vital Statistics System

#### Years of Potential Life Lost (YPLL) Before Age 65 2020 United States

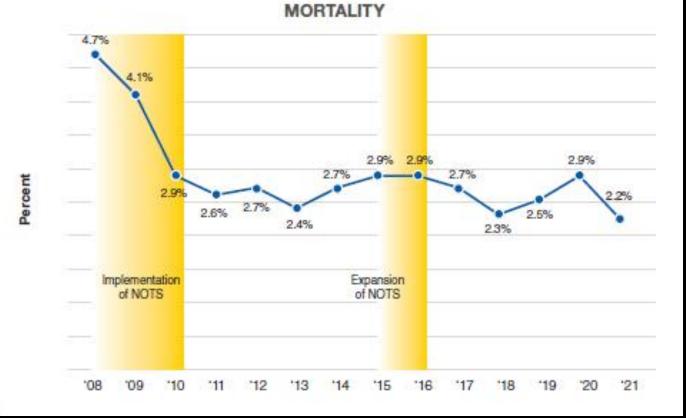
2020 United States All Races, Both Sexes All Deaths

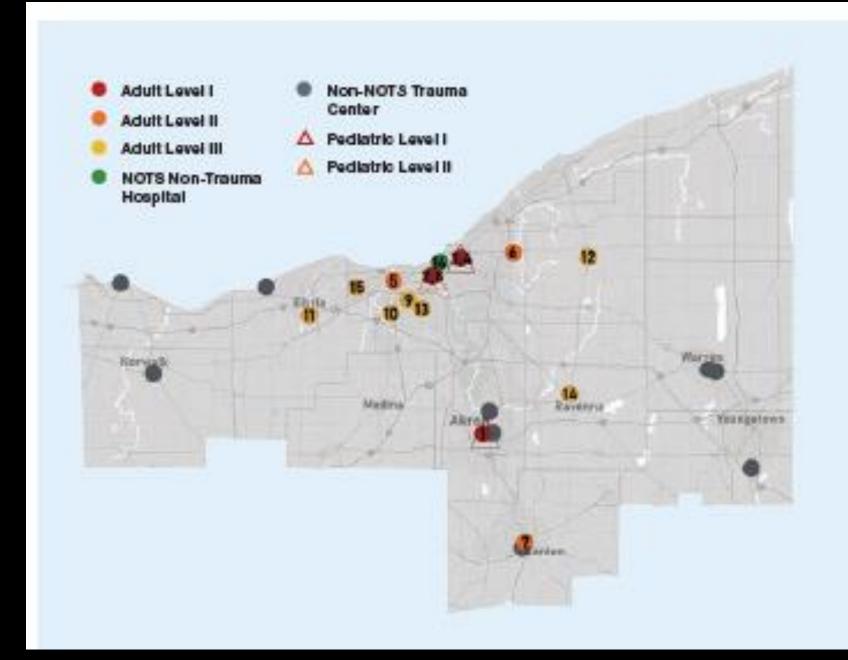
Cause of Death	YPLL	Percent	
All Causes	13,630,717	100.0%	
Unintentional Injury	3,403,047		25.0%
Malignant Neoplasms	1,542,327	11.3%	
Heart Disease	1,443,729	10.6%	
Suicide	942,431	6.9%	
Homicide	771,608	5.7%	
COVID-19	708,789	5.2%	
Perinatal Period	626,615	4.6%	
Liver Disease	409,897	3.0%	
Congenital Anomalies	368,888	2.7%	
Diabetes Mellitus	330,236	2.4%	
All Others	3,083,150		22.6%

#### **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.





## Moving forward:

- NOTS is committed to working together to
  - Work with prehospital providers
  - Evaluate prehospital and hospital resuscitation
  - Provide educational opportunities
  - Work to prevent injuries
    - GUN VIOLENCE
    - FALLS

## In Closing:

## Trauma Center By: me Album: Thoughts of a Trauma Surgeon

## Original:





## Trauma Center By: me Album: Thoughts of a Trauma Surgeon

## Original:





## Trauma Center By: me Album: Thoughts of a Trauma Surgeon

## Original:







Dr. Trauma ... you're on call So, I Guess this means you'll be here til tomorrow, eh? Yeah, ha, ha; guess who's on That be me... Call me once, Call me twice, Call me all night, yeah We're a trauma center, roundin' on patients

- Sippin crappy coffee; you crazy if you think I'll ev'a finish
- I told you I'm a trauma center, I'll be the last to go home,
- You can bet it; just don't to it
- For the cheddar, cause we're a trauma center
- I don't go looking for no trouble,
- But somehow the patients always find me;
- Don't make me see you in the trauma center
- With your momma crying 'cause her only son is dying
- She don't know it's already your third tonight
- Cause we're a trauma center

(Verse 1) Good god man, our teams workin all the time I got CEOs tellin me about budget And now we got no nurses, and beds be full With other hospitals calling to transfer some peeps I got weights round my neck the size mountain tops and treating folks shot with Glocks ridin in the Lex Resident days, we used to eat Ramen and cold cereal

Now we're taking call, to pay off our debt It's me on all night and then to be back again Treating patients like they won't see tomorrow Two patients shot, they may not And more patients coming, keeping you up til six We're taking trips to fast-food just to eat Tryin not to fall asleep at the red-light I was in debt a couple 100 thou, now I'm still not worth a million I'll put money in my 401K, and 529 for the children

We're a trauma center, roundin' on patients

- Sippin crappy coffee; you crazy if you think I'll ev'a finish
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#### (verse 2)

Since we got the Covid, there is even more violence We got republicans and dems, who cares about the affiliation We are one, it is senseless to not prevent this Too many gunshots after the sun goes down At any given instant another incident

I'm just given you a glimpse of every night we be on And they hold the ORs, just in case we need to come up hot It isn't that we don't love our job, we just want less gsws We need to teach them kids, they are not bullet proof Not sure whose gonna do it; but we don't need to lose more baby blues

These short fuses leading to way too much news

Please make love not war and keep safe from dyin in our trauma center.

We're a trauma center, roundin' on patients

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#### (Verse 3)

I got tired while I was on call, but now I'm back We're ready to see whatever comes through those doors Got manuscripts on my back, lectures to give to the studs Got charts to sign, to get the coders off my back Listen boss, get off my back; your get your money Cause I dictated them cases to get all those RVUs I move through the EMR like Mozart composing songs My kids, Zach n' Autumn, wondering when I'll get home

Reality check, have no ideas what our salaries should be I give call to my team with a pat on the back They share what they know and work to show their skill And they drain pus, get airways, resuscitate, and save lives It's the life of a trauma surgeon, you all know See us in the ED, and scrubbed in the OR We were on for 24, and just kept goin Livin on adrenaline and for savin lives

We're a trauma center, roundin' on patients

- Sippin crappy coffee; you crazy if you think I'll ev'a finish
- I told you I'm a trauma center, I'll be the last to go home,
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- She don't know it's already your third tonight
- Cause we're a trauma center

(Verse 4) Yeah, NOTS, Thank you Cleveland Ha, Ha, no problem, we don't stop, nah Save the thanks for the last, Talk of the NOTS Thoughts of a midlife surgeon, baby Thanks, y'all NOTS Staff, and trauma posse, you know

The NOTS Board, The Docs, and the Nurses Amazing EMS providers, ooh David, Greg, and Nicole We're gonna keep lovin this job Y'all surgeons gonna keep healin Heck y'all, we got this We're built for this stuff; Trauma Nights, Savin Lives We run this trauma center!



## The End... Peace