

# Improvements in Outcome for Adult Patients with Major Trauma

## An evaluation of the Colorado Trauma System



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# Philosophy of a Trauma System

“Right Patient”

“Right Place”

“Right Time”

# Colorado's Trauma System

Legislation passed in 1995

Establish criteria for designating trauma centers

Establish triage and transfer guidelines

Create the Colorado Trauma Registry

# Study Question

As Colorado's trauma system has matured, has there been a change in outcome for adult patients with major trauma?

# Adult Patients with Major Trauma

Data from the Colorado Trauma Registry

1998-1999 vs 2008-2009

Age 15+

Major Trauma = ISS 16-75

AIS/ISS determined using ICDMap-90

# Injury Severity Score

Derived from the Abbreviated Injury Scale (AIS)

Based on severity of anatomic injury

Accounts for injuries to more than one body region

Scores range from 1-75 with a higher score indicating higher injury severity

Correlates well with risk of mortality

# Demographics

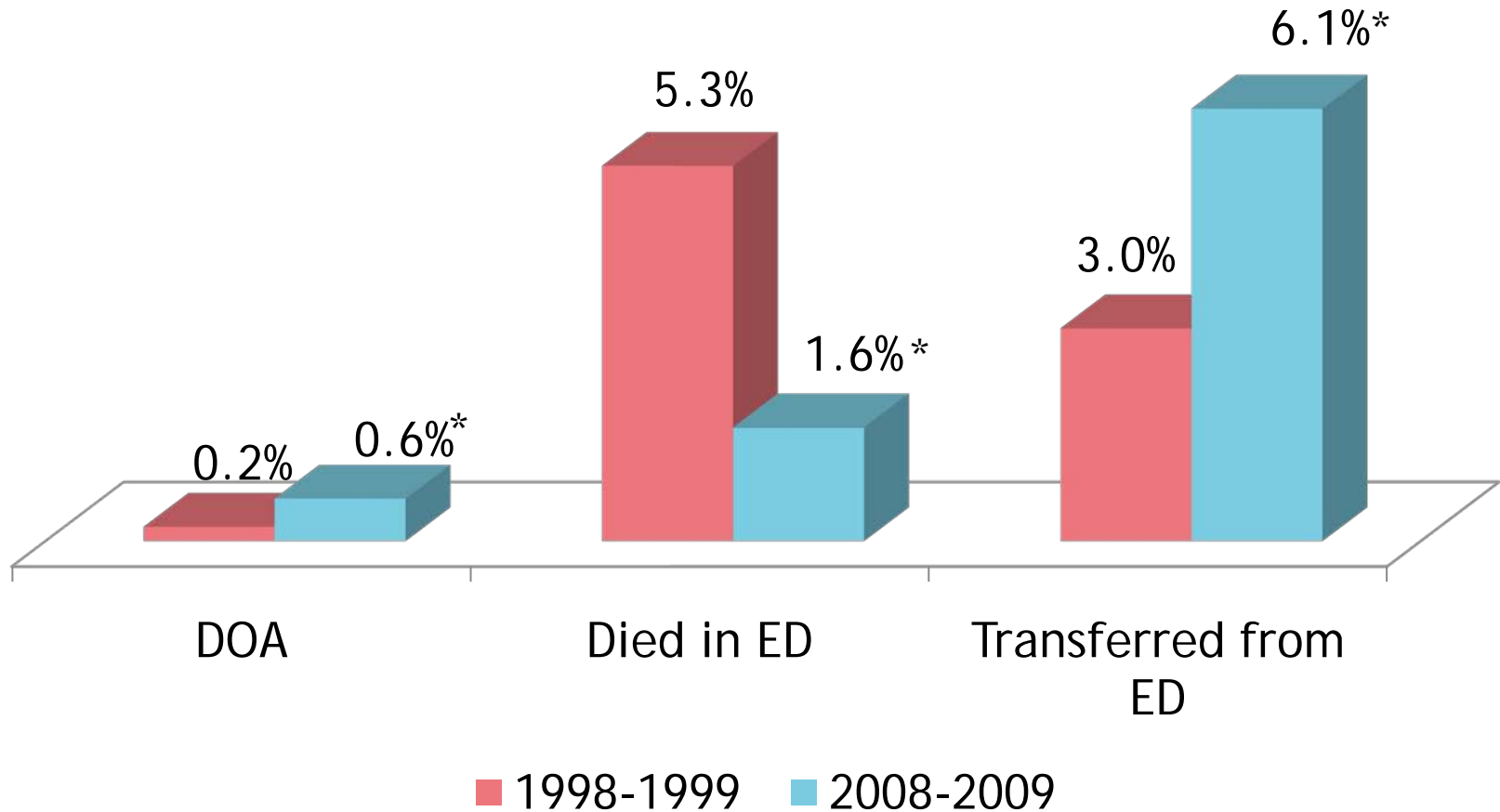
## Adult Patients with Major Trauma Reported in the Colorado Trauma Registry

	1998-1999 (N=4,305)	2008-2009 (N=7,662)
Male	69.3%	70.1%
<i>Average Age</i>	<i>42.3 years</i>	<i>48.6 years*</i>
Trauma Type		
<i>Blunt</i>	<i>89.8%</i>	<i>93.4%*</i>
<i>Penetrating</i>	<i>6.9%</i>	<i>4.2%*</i>
Thermal	0.3%	0.3%
Other	3.0%	2.1%*

\* Statistically significant difference

# Disposition from the Emergency Dept

Adult Patients with Major Trauma: *Not admitted as Inpatient*



\* Statistically significant difference



# Trauma Center Designation Level

## Hospitalized Adult Inpatients with Major Trauma

Designation Level	1998-1999 (n=3,928)	2008-2009 (n=6,914)
<i>Level I</i>	35.8%	38.8%*
<i>Level II</i>	46.7%	43.5%*
Level III	17.5%	17.8%

\* Statistically significant difference

# Injury Severity Score Group

Hospitalized Adult Inpatients with Major Trauma

ISS Group	1998-1999 (n=3,928)	2008-2009 (n=6,914)
<i>ISS 16-24</i>	<i>61.9%</i>	<i>72.5%*</i>
<i>ISS 25-49</i>	<i>35.2%</i>	<i>25.7%*</i>
<i>ISS 50-75</i>	<i>2.9%</i>	<i>1.8%*</i>

\* Statistically significant difference

# Inpatient Mortality Rates

## Hospitalized Adult Inpatients with Major Trauma

In the field or on arrival to the ED	1998-1999	2008-2009
<i>SBP &lt; 90</i>	37.5%	27.3%*
Intubated	34.0%	32.1%
RR < 10 or > 29	28.4%	26.3%
GCS motor < 5	28.0%	25.8%

\* Statistically significant difference

# Inpatient Mortality Rates

## Hospitalized Adult Inpatients with Major Trauma

	1998-1999	2008-2009
<i>Major liver lacerations</i>	32.4%	13.2%*
<i>Flail chest</i>	16.2%	6.3%*
Aortic injuries	39.3%	25.6%
Penetrating injuries - head, neck, torso	38.4%	30.9%
Unstable pelvic fracture	20.3%	15.2%
Significant burns ( $\geq 30\%$ TBSA)	50.0%	55.6%

\* Statistically significant difference

# Inpatient Mortality Rates

Hospitalized Adult Inpatients with Major Trauma

	1998-1999	2008-2009
<i>Head/Neck AIS <math>\geq 3</math></i>	13.5%	9.8%*
<i>Abdomen AIS <math>\geq 3</math></i>	6.6%	1.6%*
Chest AIS $\geq 3$	2.7%	2.9%

\* Statistically significant difference

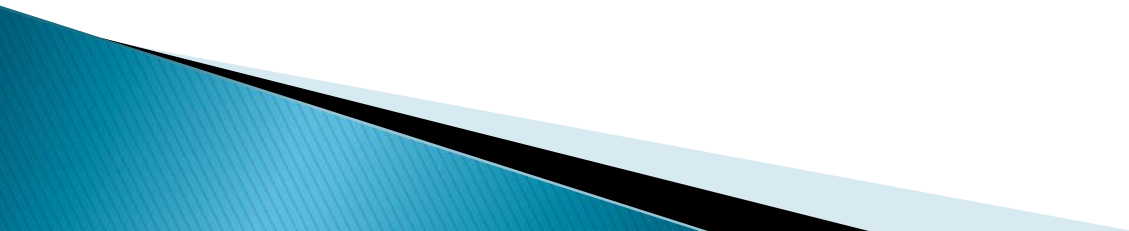
# Inpatient Mortality Rates

## Hospitalized Adult Inpatients with Major Trauma

	1998-1999	2008-2009
<i>All ISS 16-75</i>	12.5%	8.7%*
<i>ISS 16-24</i>	4.4%	3.5%*
ISS 25-49	23.7%	21.6%
ISS 49-75	48.3%	36.2%

\* Statistically significant difference

Has the survivability of adult trauma patients with severe injuries improved over time?



Logistic regression model using data from 2000

Age

Injury Severity Score (ISS)

Trauma Type (Blunt vs. Penetrating)

Designation level of facility where hospitalized

Data from 2,774 inpatient hospitalizations

Overall mortality = 12.1%

Apply the model to 2001-2008

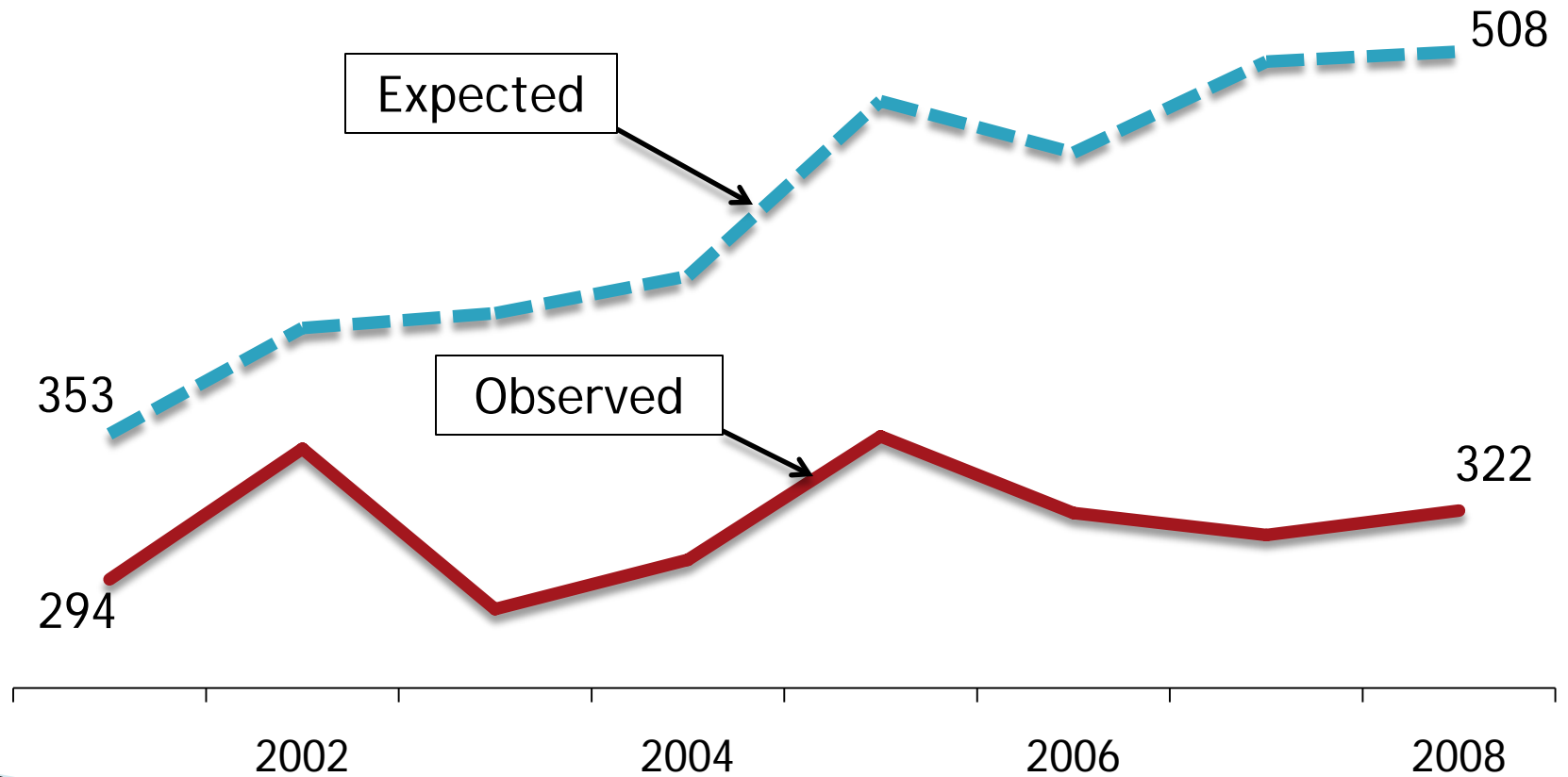
Compare expected vs. observed outcomes





# Expected vs. Observed Inpatient Deaths

## Adult Patients with Major Trauma, 2001-2008



# These results suggest that

inpatient mortality rates have significantly declined for adult patients with major trauma, particularly those with:

- Hypotension in the field or on ED arrival
- Major liver lacerations
- Flail chest
- Severe head/neck injuries
- Severe abdominal injuries

resulting in a significant decrease in the observed vs. expected number of inpatient deaths

# Questions?

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