



# North Carolina Trauma System Report

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## A summary of collected data

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# CONTENTS

Introduction	3	NC Trauma System	10
Trauma System	4-5	Level I Trauma Centers	11-12
State Trauma Advisory Committee (STAC)	6	Level II Trauma Centers	13
Regional Advisory Committee (RAC)	7	Level III Trauma Centers	14-15
EMS Transport	8	Trauma Registry	16
Research	9	Data/Outcomes*	17-20

## North Carolina Trauma System Mission Statement

To provide optimal trauma care and services to the people in North Carolina by: Facilitating Injury prevention activities;

- Enhancing knowledge of and education about the trauma system; Monitoring and Improving quality of care;
- Identifying resources to meet system needs;
- Facilitating research that enhances evidence-based practice;
- Assuring that quality trauma care is available for under-served and special needs populations through expansion of and equitable utilization of existing resources; and
- Collaborating with agencies with similar interests.

\*Data for this report is a cumulative collection from the 2015 calendar year.

# INTRODUCTION

The North Carolina trauma system has been growing and evolving for over forty years since its inception in the 1970's, beginning with the North Carolina Emergency Medical Services Act of 1973 and creation of the North Carolina Office of Emergency Medical Services (OEMS). The initial focus was on trauma "center" development and by 1980, OEMS had adopted criteria for Level I and II trauma centers (based upon the American College of Surgeons "Resources for Optimal Care of the Injured Patient" guidelines) and established a site visit process for those hospitals interested in seeking state designation. By 1982, Duke Hospital, UNC Hospitals, and North Carolina Baptist Hospital became the first three designation Level I trauma centers in North Carolina. Other teaching hospitals joined the fledgling system over the next decade, representing the major population areas across the breadth of the state from Asheville (Mission Hospitals) in the west, to Charlotte (Carolinas Medical Center) and Greensboro (Moses Cone Memorial) in the central, to Raleigh (WakeMed), Greenville (Pitt County Memorial), and Wilmington (New Hanover Regional) in the east. Level III trauma center criteria were adopted in 1990, and since that time community hospitals in Shelby, Gastonia, Charlotte, Concord, High Point, and Fayetteville have joined the system.

Improving care for injured patients required clinical data collection and analysis, so OEMS collaborated with the Department of Surgery at UNC Hospitals to design the first North Carolina Trauma Registry in 1987, which became the basis for the current NTRACS®. The registry was guided from the outset by the Trauma Registry Task Force, with broad representation from OEMS, epidemiologists, trauma center providers and administrators. This collegial group was the genesis of mutual support and collaboration among all individual trauma centers has since evolved into our current statewide voluntary trauma system of care.

The Trauma Systems Task Force, convened by the EMS Advisory Council in the early 90's, submitted recommendations which resulted in the Trauma System Act of 1993. The task force developed rules that would define specifics of the trauma system, including creation of Regional Advisory Committees (RACs)-each led by an Level I or II trauma center- which covered the entire state and were the basic building blocks of the new system. To support an inclusive system, each acute care hospital in the state was required to choose an affiliation with one of the eight RACs.

As the system grew and evolved, the number of stakeholder groups also increased, which resulted in creation of the State Trauma Advisory Committee (STAC) in 2003 to advise OEMS on all trauma related issues. The STAC's mission is to provide a public forum to facilitate trauma system development and coordination of trauma activities between the state's various trauma interest groups. In 2004, STAC and OEMS together developed the **North Carolina Trauma System Mission Statement:**

To provide optimal trauma care and services to the people in North Carolina by:

- Facilitating injury prevention activities;
- Enhancing knowledge of and education about the trauma system;
- Monitoring and improving quality of care;
- Identifying resources to meet system needs;
- Facilitating research that enhances evidence-based practice;
- Assuring that quality trauma care is available for under-served and special needs populations through expansion of and equitable utilization of existing resources;
- Collaborating with agencies with similar interests.

This annual report is an effort to reinvigorate the use of our statewide trauma registry data to provide benchmarking reports, and serve as a catalyst for creation of a NC trauma system collaborative to collectively address quality and evidence-based practices espoused in our mission statement. We hope you will use these reports to critically evaluate aspects of care delivered in your facility and region, and participate in sharing of these findings with colleagues from across the state as we inaugurate our quarterly collaborative sessions.

Sincerely,



*Michael Thomason, MD, FACS*

*NC OEMS Trauma Medical Advisor*

# TRAUMA SYSTEM

trauma trau·ma (trô'mə, trou'-) n. pl. trau·mas or trau·ma·ta (-mə-tə) : A serious bodily injury or shock, as from violence or an accident

trauma. (n.d.). The American Heritage® Stedman's Medical Dictionary. Retrieved July 26, 2014, from Dictionary.com website: <http://dictionary.reference.com/browse/trauma>

**Blunt Trauma** is caused by a combination of forces: deceleration, acceleration, shearing, crushing, and compression. Due to the combination of forces, often blunt trauma causes more life-threatening injuries (McQuillen, et al., 2002)

**Penetrating Trauma** signifies an injury produced by a foreign object that penetrates tissue. The severity of the injury (ISS score) is related to the structures damaged (McQuillen, et al., 2002).

## What is a Trauma System?

**Trauma System:** Being able to provide a coordinated and systematic means of delivering trauma patients rapidly to definitive care.<sup>1</sup> A Trauma care system represents a continuum of integrated care that is a coordinated effort between out-of-hospital and hospital providers with close cooperation of medical specialists in each phase of care.<sup>2</sup> Trauma Systems help to ensure that the millions of people injured each year get the right care, at the right place, at the right time. The right care can help people continue to live to their full potential, despite having experienced a severe injury.<sup>3</sup>

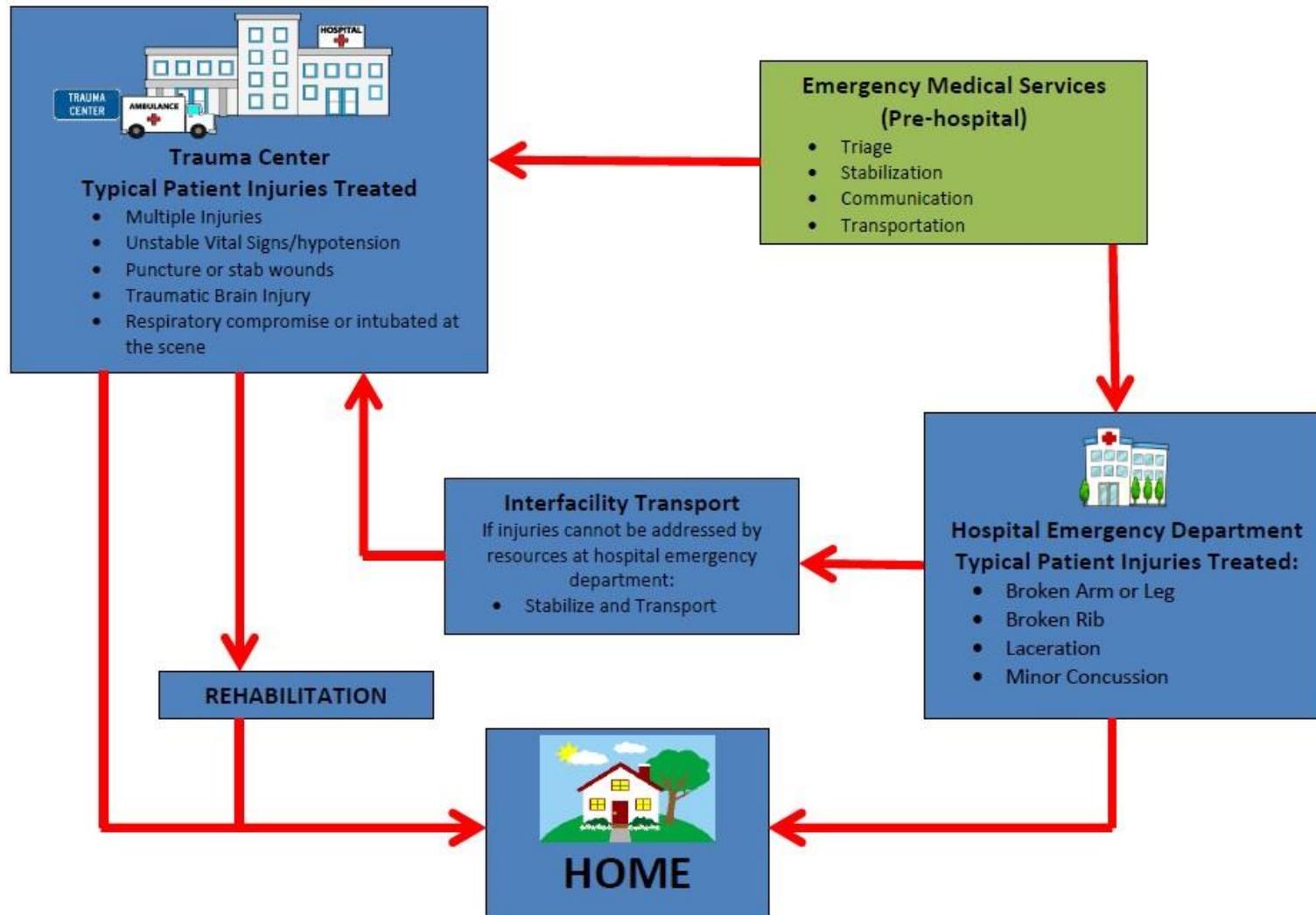
<sup>1</sup> Department of Human Services. *Review of Trauma and Emergency Services. Acute Health Division: Victorian Government Department of Human Services, 1999*

<sup>2</sup> American College of Emergency Physicians Policy Statement: *Trauma Care Systems Development, Evolution and Funding. J. Trauma 1999; 47 (Suppl.): S110*

<sup>3</sup> [http://www.cdc.gov/traumacare/access\\_trauma.html](http://www.cdc.gov/traumacare/access_trauma.html)

# TRAUMA SYSTEM

## Regional Trauma System



# STAC

## State Trauma Advisory Committee (STAC)

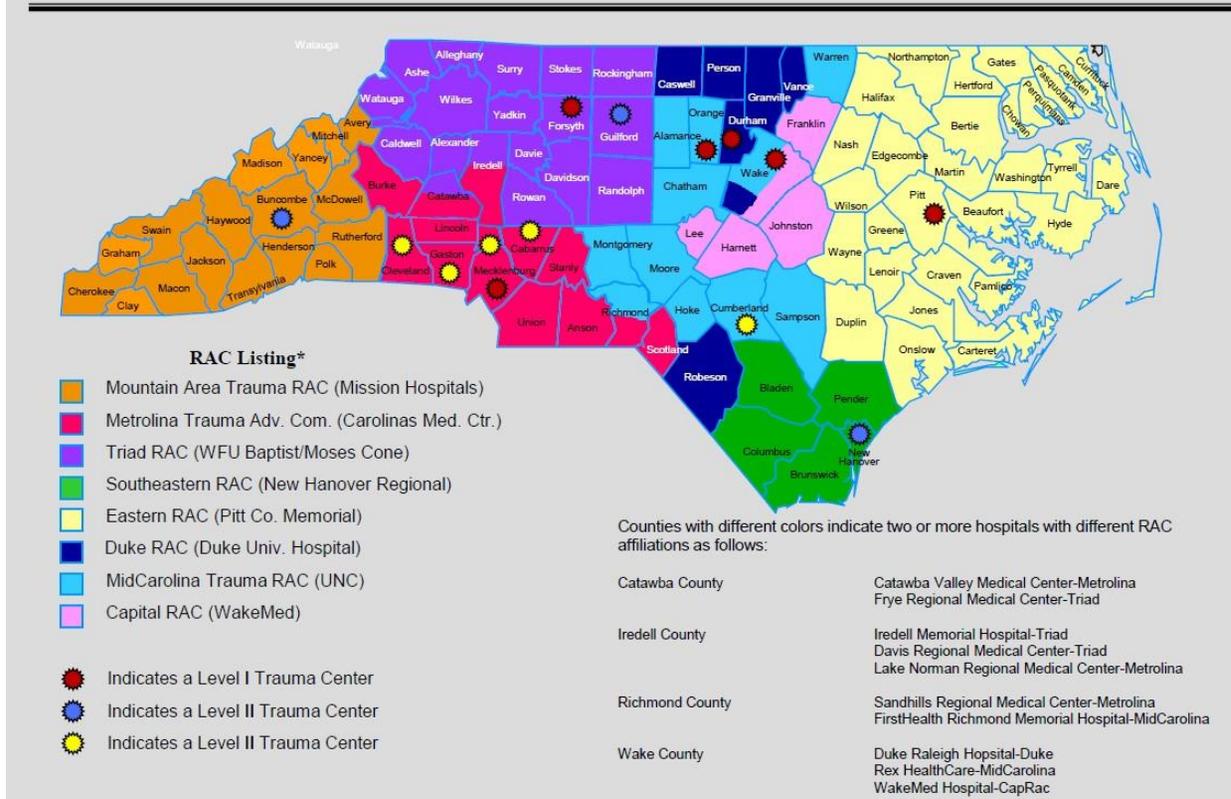
The State Trauma Advisory Committee is comprised of representatives from trauma centers across the state, the purpose of which is to provide a forum to facilitate trauma system development and coordination of trauma activities, to provide a manageable meeting format while keeping the system inclusive and to ensure input from all groups. Each group reports activities/issues to the STAC through a designated representative.

The contributing committees to STAC include:

- Trauma Medical Directors
- Trauma Program Managers
- Performance Improvement
- Trauma Registrars
- State Trauma Manager
- Regional Advisory Committee
- Injury Prevention
- Air Medical Transport
- Burn Care

# RAC

## Regional Advisory Committee (RAC) Affiliations by Hospitals January 2017



## Regional Advisory Committees (RAC)

Level I and II Trauma Center's in North Carolina are tasked with the development and support of Regional Advisory Committees. There are eight Regional Advisory Committees (RAC) whose purpose is to oversee the development, implementation, and evaluation of the regional trauma system. Each RAC is aligned with either a Level I or II Trauma Center as the lead facility in their area, and work to develop regional plans, policies, guidelines and performance improvement initiatives. Each hospital and EMS System must submit annual affiliations and participate with the RAC that includes the Level I or II Trauma Center in which the majority of trauma patient referral and transports occur.

# EMS AND TRAUMA

## A note from the North Carolina EMS Medical Director

The trauma community has been involved with EMS in North Carolina from the very beginning of EMS. Before emergency medicine even existed early trauma pioneers were making the rounds throughout the state building up support for the need for quality prehospital care and the standards to insure quality care. That level of support has been one of the pillars of EMS in North Carolina and is still evident in the close working relationship individual trauma centers have with EMS on a local level. The close collaboration at a state level between the State Committee on Trauma and the NC EMS Advisory Council is also very important. The state trauma system has supported the EMS system in North Carolina through training and by insuring every EMS patient with a traumatic injury has a designated trauma center where they can receive quality care. Trauma centers have supported EMS systems in their use of TXA and have been a strong voice of support for scope of practice changes which have allowed EMS providers to provide the highest level of care possible. This strong level of trauma center cooperation with EMS has made NC an international leader in the care of trauma patients.



JE "Tripp" Winslow, MD MPH

Medical Director NC Office of EMS



# RESEARCH

In 2016 the NC Trauma Research Committee was revitalized after a few year of inactivity. The committee is open to anyone interested in being involved and has a core group of participants at this time. Committee meetings are held monthly in Raleigh with virtual participation made available. The purpose of the monthly meetings are to review statistical analyses and make plans for the continued progress on each project.

Examples of projects the committee has worked on are:

- Trauma Center Performance Improvement using risk-adjusted mortality and length of stay
- Helicopter utilization
- Pre-hospital Glasgow Coma Scale Motor as a predictor of the need for trauma center level care

Any ideas for future research or process improvement projects would be reviewed by the committee for feasibility and potential positive impact on trauma care in the state.

## Trauma Mortality Data Sets Used for Statewide Inter-Institutional Comparison In Outcomes

Pascal O. Udekwe, MBBS, MBA/MHA, WakeMed Health & Hospitals  
 Sharon Schiro, PhD, University of North Carolina, Chapel Hill  
 Rhonda Vincent, MSN, APRN, CNS, WakeMed Health & Hospitals

### Introduction

National data from trauma registries has allowed for analysis of mortality outcomes and attempts at institutional comparison. Variability in data field definitions confound these comparisons. Research has demonstrated movement of institutions between high and low performing groups by field redefinition. We evaluated the ability of narrowed data sets in a state based trauma registry with uniform data field definitions to detect risk adjusted differences in institutional mortality and performance.

### Hypothesis

Narrowed mortality data sets reducing field and data variability can accurately allow for inter-institutional comparison and guide performance improvement.

### Methods

Blinded data from a state registry for 2013 was utilized. Mortality, ICU Length of Stay (ICULOS) and Hospital Length of Stay (HLOS) were evaluated in data sets sequentially restricted by age (18-55), ISS (9-25), Blunt injury, and excluding transfers out. Multiple logistic regression was utilized to evaluate influence of ISS, age, gender, emergency department hypotension and Glasgow Coma Scale Score (GCS)-Motor (M) component on mortality and length of stay. Inter-institutional variance was tested with ANOVA.

### Results

Multiple logistic regression in the most restricted data set demonstrated no significant impact of age, gender, or emergency department hypotension on mortality or ICULOS. GCS-M remained a significant variable in all outcomes. Elimination of patients with initial GCS 3 eliminated GCS-M as a confounding variable with no residual significance in GCS-M by ANOVA. Four quadrant plots of ISS/Mortality, ISS/HLOS and ISS/ICULOS show institutional means compared to state means.

### Conclusions

Restricting data sets to a defined patient group for comparative outcomes in trauma care in a state wide registry is feasible. Institutional comparisons of ISS, mortality, ICULOS & HLOS to average performance allows for an assessment of outcomes and value relative to regional peers.

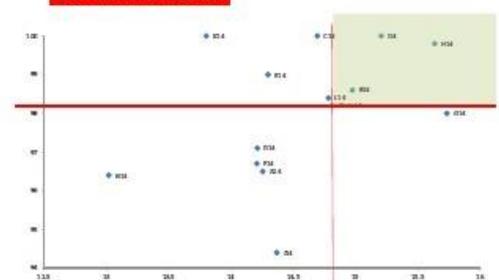
### References

- Nachreiner AB, Coyer HG, Plides J. The American College of Surgeons Trauma Quality Improvement Program. *Surg Clin N Am* 92(2012):441-454.
- Kozar RA, Holcomb JB, Xiong W, Nachreiner AB. Are all deaths recorded equally? The impact of hospital case on risk-adjusted mortality. *J Trauma Acute Care Surg*. 2014;76: 634-641.
- Hashmi ZG, Schneider ES, Castillo BC, et al. Benchmarking trauma centers on mortality alone does not reflect quality of care: Implications for pay-for-performance. *J Trauma Acute Care Surg*. 2014;76: 1184-1191.



### Statewide Data Comparison

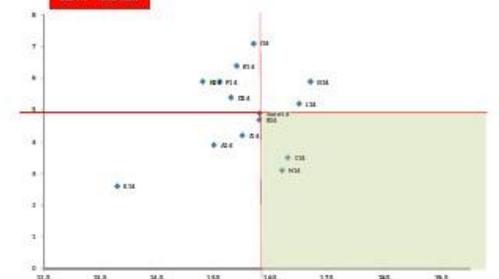
#### 2014 – All Patients ISS/Survival



#### 2014 – Hospital LOS



#### 2014 – ICU LOS



# NC TRAUMA SYSTEM

## North Carolina Trauma Today

The Office of Emergency Services (OEMS) is the state regulatory office tasked with oversight of EMS and Trauma regulations in North Carolina. The rules that govern Emergency Medical Services and Trauma, which include standards for trauma center Designation as well as trauma system design are the [Title 10A Chapter 13 Subchapter P](#) rules which are written into the North Carolina Administrative Code with recent revisions effective January 1, 2017.

The OEMS offers hospitals two types of reviews for initial or renewal of trauma center designation. A hospital can undergo a state only review and be designated as a NC Trauma Center. For those centers also seeking or wishing to maintain ACS verification in addition to state designation they may undergo a combined site review with reviewers from the ACS and oversight from OEMS trauma staff. These combined reviews ensure a more efficient process as well as a cost savings for centers seeking both verification and designation.

Currently there are 14 designated Trauma Centers in North Carolina. These consist of six Level I Trauma Centers, three Level II Trauma Centers and five Level III Trauma Centers.

NC does not designated pediatric trauma centers, but there are currently three pediatric trauma centers in North Carolina that are verified by the American College of Surgeons.

There are two burn centers in North Carolina, both of which are verified Burn Center by the American Burn Association (ABA).



# LEVEL I TRAUMA CENTERS

**Carolinas Medical Center**  
Charlotte, NC



[Carolinashealthcare.org/locations/carolinas-medical-center](https://carolinashealthcare.org/locations/carolinas-medical-center)



**Duke University Hospital**  
Durham, NC

[Dukehealth.org](https://dukehealth.org)

**University of North Carolina Hospitals**  
Chapel Hill, NC



[UNCMedicalcenter.org](https://UNCMedicalcenter.org)

# LEVEL I TRAUMA CENTERS

**Vidant Medical Center**  
**Greenville, NC**



[Vidanthealth.com](http://Vidanthealth.com)



**Wake Forest University**  
**Baptist Medical Center**  
**Winston-Salem, NC**

[Wakehealth.edu](http://Wakehealth.edu)

**WakeMed Health & Hospitals**  
**Raleigh, NC**



[Wakemed.org](http://Wakemed.org)

# LEVEL II TRAUMA CENTERS

**Mission Health System**

**Asheville, NC**



[Mission-health.org](http://Mission-health.org)



**New Hanover Regional Medical Center**

**Wilmington, NC**

**Cone Health**  
**Greensboro, NC**



[Conehealth.com](http://Conehealth.com)

[Nhrmc.org](http://Nhrmc.org)

# LEVEL III TRAUMA CENTERS

**Cape Fear Valley Medical Center**  
**Fayetteville, NC**



[capefearvalley.com](http://capefearvalley.com)



**CaroMont Regional Medical Center**  
**Gastonia, NC**

[caromonthhealth.org](http://caromonthhealth.org)

**Carolinas Health System, Cleveland**  
**Shelby, NC**



[Carolinashealthcare.org/locations/carolinas-healthcare-system-cleveland](http://Carolinashealthcare.org/locations/carolinas-healthcare-system-cleveland)

# LEVEL III TRAUMA CENTERS

**Carolinas Health System Northeast  
Concord, NC**



[Carolinashealthcare.org/locations/carolinas-healthcare-system-northeast](https://Carolinashealthcare.org/locations/carolinas-healthcare-system-northeast)



**NovantHealth Presbyterian Medical  
Center  
Charlotte, NC**

[Novanthealth.org/presbyterian-medical-center.aspx](https://Novanthealth.org/presbyterian-medical-center.aspx)

# TRAUMA REGISTRY

By the late 1980's the NC OEMS realized the importance of establishing a state trauma registry. This was initiated in 1987 and supported by OEMS funding as well as grants from the Governor's Highway Safety Program (GHSP) and began as a custom programmed registry through the Department of Surgery at UNC-CH. The registry was guided by a Trauma Registry Task Force which met quarterly and was comprised of epidemiologists, hospital administrators, emergency physicians, trauma registrars, trauma nurse coordinators, trauma medical directors and OEMS staff. Around 240 data points were collected in the original registry.

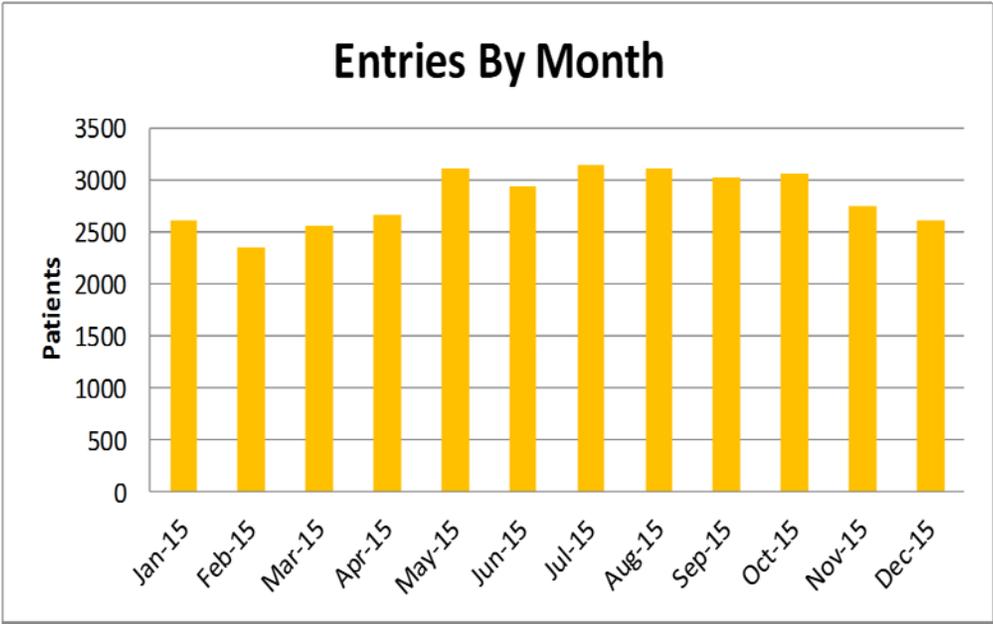
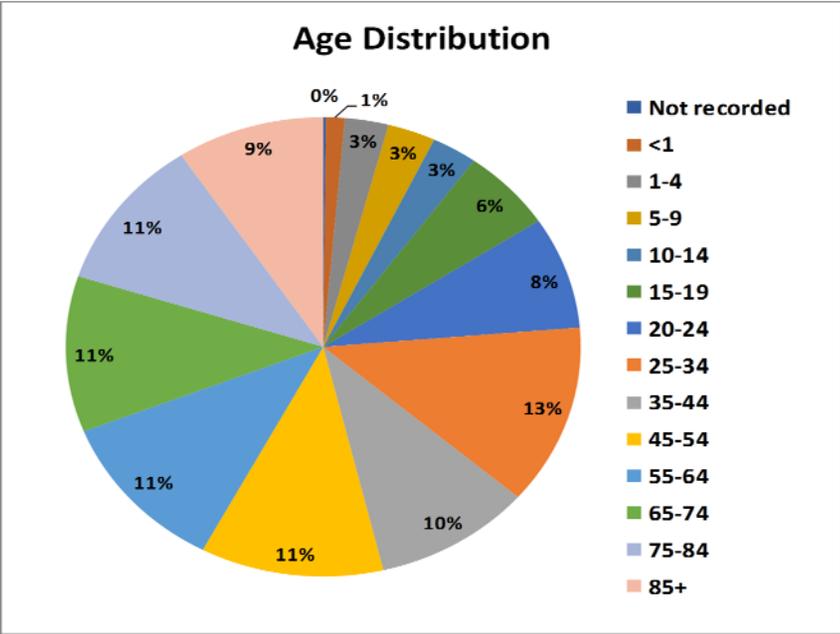
By 1994 the registry was migrated to the NTRACS software product which was originally offered through the American College of Surgeons and later purchased and maintained by Digital Innovations, Inc. (DI). DI's V5 registry software is currently utilized as the state registry product with around 350 data points submitted weekly from each trauma center.

Registry education is provided by a yearly data dictionary training as well as various trauma centers periodically hosting the American Trauma Society's Trauma Registry Course and the AIS coder training course. An annual NC Trauma Registry Symposium is hosted each spring by one of the NC trauma centers which provides a day long learning opportunity with continuing education credits.

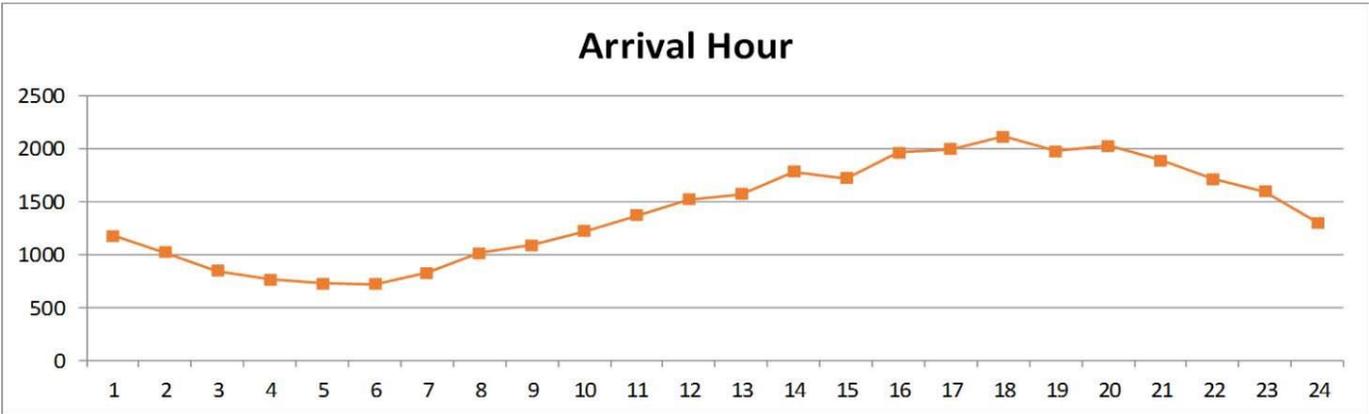
The data tables in this report include data from 2015, the most recent completed year of weekly data submission into the NC Trauma Registry. The following table shows the percentage of data entry completion for selected data points in the NCTR.



# DATA 2015

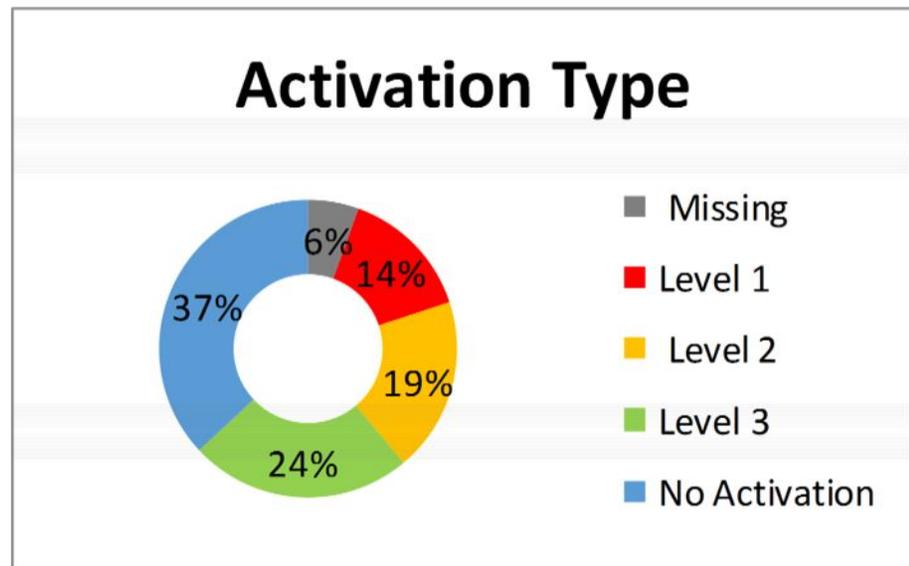


Our aging population and increase in injuries in the elderly is evident in the trauma registry's age demographics.



# DATA 2015

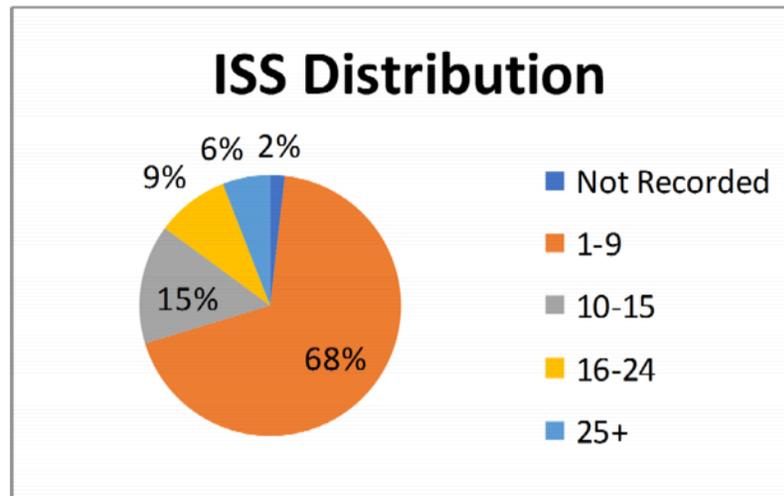
Mechanism of Injury (MOI)	Total
Total	33899
Fall	13227
MVT Occupant	6698
Missing	2711
Pedestrian-Other	2578
MCC	1715
Firearm	1643
Pedal Cyclist-Other	1471
Cut/pierce	1233
Struck by/against	723
Other-specified-classifiable	367
Machinery	318
Fire/Flame	201
Hot object/substance	197
Unspecified	196
MVT-Pedal Cyclist	178
Other-specified-NEC	102
Drowning	75
Natural/Environmental	73
MVT-Unspecified	70
Other Land Transport	56
Suffocation	24
MVT-Other	22
Overexertion	12
Adverse effects-Medical Care	4
Poisoning	4
Adverse effects-Drugs	1



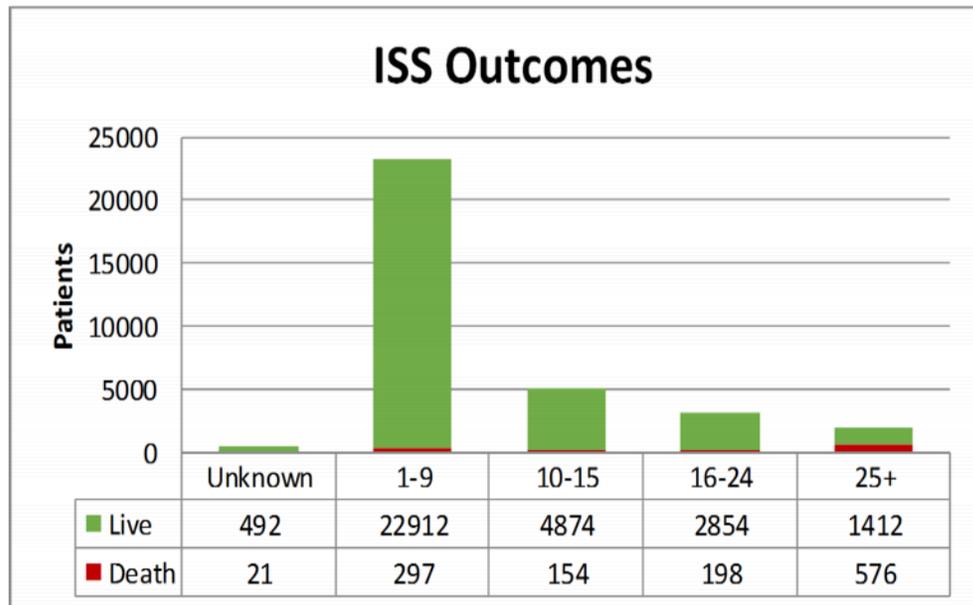
In the 2006 report only 15% of trauma patients activated the trauma team.

# OUTCOMES 2015

ED Disposition	Frequency
Floor	14365
ICU	4782
OR	3886
Home	3860
Telemetry unit	1686
Trauma Center	802
Missing	768
Observation unit	505
Step-down unit	467
PICU	364
Burn Center	327
Morgue	318
L&D	123
Transferred	91
Correctional facility	55
AMA	46
Mental health facility	26
Special procedure room	12
SNF	10
Hospice	6
Nursing home	4



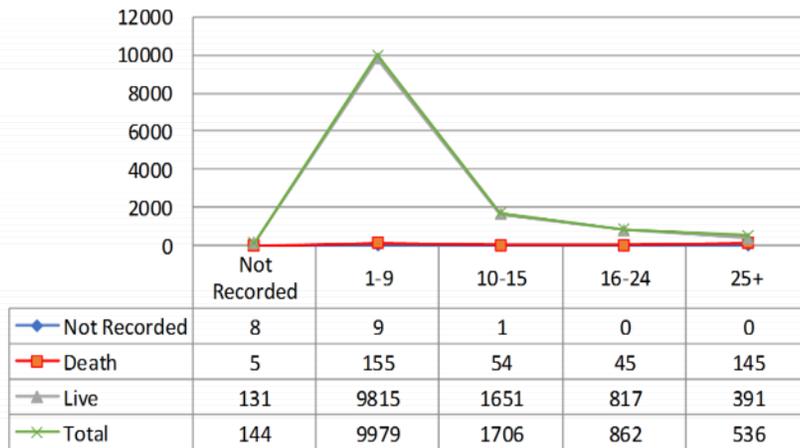
The injury severity score (ISS) is an anatomical scoring system that provides an overall score for patients with multiple injuries.



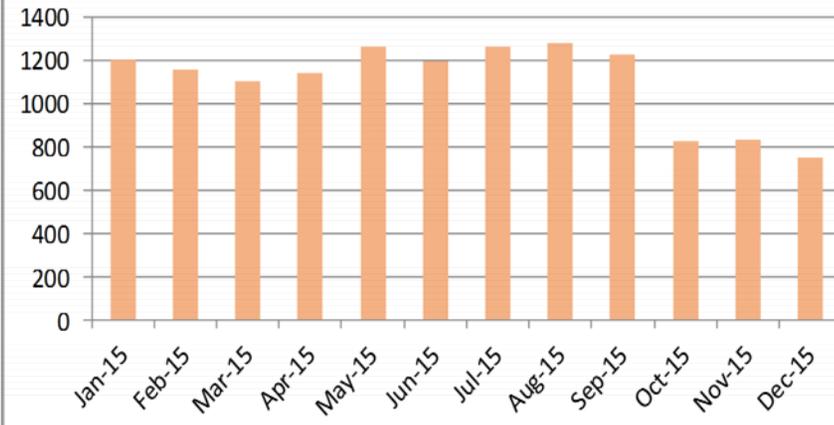
# FALLS DATA 2015

Falls have become the leading mechanism of injury for patients in the NCTR, totaling 13,227 in 2015.

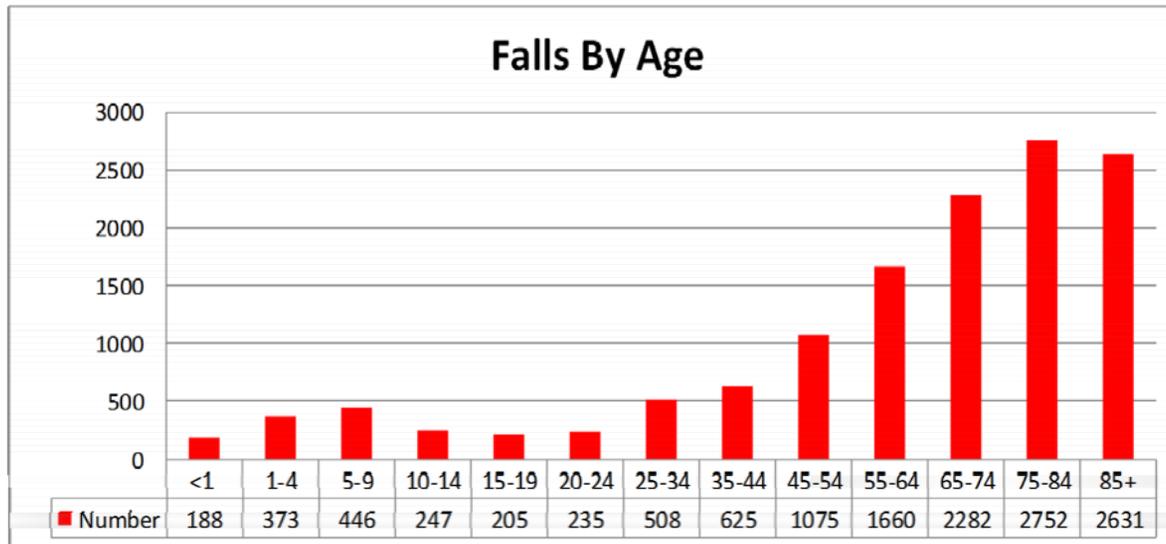
### Falls - ISS/Survival Status



### Falls Patients by Month



### Falls By Age



# CONCLUSION

A system approach to trauma care is the best means to ensure our citizens are protected from unnecessary premature death or disability from a severe injury. An established trauma system ensures that the right patient is delivered to the right hospital, and emergency medical and hospital resources are effectively coordinated to optimize the delivery of trauma care. Trauma systems reduce death and disability by promoting injury prevention and ensure that resources required for optimal trauma care are available when and where they are needed.

In 2015 there were 33,899 entries into the North Carolina Trauma Registry from our 14 trauma centers. Of the patients entered into the trauma registry, 1246 of them died from a traumatic injury. This means 32,653 patients who suffered a traumatic injury were saved at one of our North Carolina Trauma Centers in 2015. The purpose of this report is to highlight our North Carolina Trauma System and the work that is done to minimize the loss of life from traumatic injury.

The limitations of the data in this report is the fact that trauma patients are taken to various non-trauma center hospitals in North Carolina on a daily basis. Without data submission from these hospitals, there is no reliable way to track the care these patients receive. This is where the system approach and our Regional Advisory Councils (RAC's) come into play. By encouraging participation from all hospitals in their specific RAC, the hope is that trauma care at the non-trauma designated hospitals will be consistent and appropriate transfers are made to the designate trauma center.

*Thank you to Rhonda Vincent, RN for assistance in creation of the 2015 Trauma Report.*