Neurotrauma Symposium

FRONTIERS IN TRAUMATIC BRAIN INJURY TREATMENT
FOR HEALTHCARE PROVIDERS

Saturday, May 11, 2019 | 9 a.m.–7 p.m.
University of Cincinnati Gardner Neuroscience Institute Outpatient Building
3113 Bellevue Ave, Cincinnati, OH 45219

UC Gardner Neurosciences Institute
Neurotrauma Center

Karen Burk
Amy Ewing

UC Department of Neurosurgery
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University of Cincinnati | COLLABORATIVE FOR RESEARCH ON ACUTE NEUROLOGICAL INJURIES
Reminders

- If you haven’t registered, please do so. Both for CME credits and our records.
- Coffee, tea, water back of room
- Lunch available @1:00
- Remember to visit our vendors
- Bathrooms to the right off of lobby
- May be a photographer around
- Data blitz cards-please complete & hand in
- We welcome your feedback! Please complete evaluations and put in tray on registration table
- Keep your nametag
- 5 pm —there will be a tour group coming through,
- Bartenders to only serve those with one of our nametags.
Traumatic Brain Injury in Southern Ohio

Laura Ngwenya, MD, PhD
Assistant Professor, Department of Neurosurgery
Director, Neurotrauma Center
2.8 Million TBI related ED visits, hospitalizations, and deaths annually in the United States
TBI in Ohio

2,330 Deaths\(^1\)

6,768 Hospitalizations\(^2\)

111,757 ED Visits\(^2\)

Source: \(^1\)Ohio Department of Health, Vital Statistics \(^2\)Ohio Hospital Association
By Age and Gender

![Bar chart showing the number of TBI records by age group and gender.]

Source: Ohio Department of Public Safety Division of Emergency Medical Services, Ohio Trauma Registry
*29 TBI records where age group and gender were not recorded (blank or unknown) were excluded.
By Hospital Discharge Disposition

- Home Without Services
- Skilled Nursing Facility
- Inpatient Rehab or Designated Unit
- Deceased
- Home With Services
- Another Type of Rehabilitation or Long-Term Care Facility
- Hospice
- Left Against Medical Advice or Discontinued Care
- Long-Term Care Hospital (LTCH)
- Transferred to Another Hospital
- Intermediate Care Facility
- Court/Law Enforcement
- Psychiatric Hospital or Psychiatric Distinct Part of a Hospital

Percentage of TBI Records
Adjusted Odds* of **Unemployment** by Severity of Worst Lifetime Traumatic Brain Injury (TBI)

- Mild TBI: < 5 Mins. LOC
- Mild TBI: 5 - 30 Mins. LOC
- Moderate or Severe TBI

- Seeking Employment
  - 0.7
  - 1.3
  - 2.6
- Unable to Work
  - 2.1
  - 3.4
  - 3.1

*Compared to Ohioans with no TBI with loss of consciousness, adjusted for age, gender and race/ethnicity

Adjusted Odds* of **Disability** by Severity of Worst Lifetime Traumatic Brain Injury (TBI)

- Mild TBI: < 5 Mins. LOC
- Mild TBI: 5 - 30 Mins. LOC
- Moderate or Severe TBI

- Blind/Serious Vision Difficulty
  - 2.2
  - 2.3
  - 3.9
- Difficulty With Mobility
  - 3.8
  - 3.8
  - 3.7
- Difficulty in Self-Care
  - 3.0
  - 7.3
  - 7.5
- Independence in the Community
  - 4.7
  - 4.7
  - 4.3
- Serious Difficulty With Cognition
  - 5.0
  - 5.0
  - 5.0
- Any Disability Endorsed
  - 1.9
  - 1.9
  - 2.3

*Compared to Ohioans with no TBI with loss of consciousness, adjusted for age, gender and race/ethnicity
Figure 17:

Adjusted Odds* of Disability by Severity of Worst Lifetime Traumatic Brain Injury (TBI)

*Compared to Ohioans with no TBI with loss of consciousness, adjusted for age, gender and race/ethnicity
UC Health - Region’s only Level I trauma Center

UC Gardner Neuroscience Institute Neurotrauma Center - Regional and national expertise in treating patients with neurotrauma
Neurotrauma Center Program Improvement
TBI by Severity

- Over 1300 patients in database
- February 2017

- Mild (GCS 13-15) = 70%
- Moderate (GCS 9-12) = 10%
- Severe (GCS 3-8) = 20%
Polytrauma
TBI by Age and Gender at UC Health

- **Male**: 66%
- **Female**: 33.9%

Bar chart showing:
- Under 25: 0%
- 25-44: 5%
- 45-64: 10%
- 65 and Older: 15%
By Mechanism

- Fall: 49%
- MVC or MCC: 26%
- Pedestrian Struck: 7%
- Penetrating: 4%
- Other: 6%
- Assault: 8%
Penetrating Injuries

GSW Mechanism

- Gunshot wound
- Knife
- Other object
- Other (see commentary)

Inflicted by...

Self-inflicted

[Bar charts showing distributions of mechanisms and perpetrators]
Motorcycle Accidents

Counts/frequency: Helmeted (18, 20.7%), Unhelmeted (69, 79.3%)
Alcohol and Drug Use

Tested Alcohol Positive: 24.1%
24.8%
48.1%

Tested Illicit Drug Positive: 26.1%
13.2%
60.8%

University of Cincinnati | Collaborative for Research on Acute Neurological Injuries
Seizures

Witnessed (18, 48.6%), Suspected (6, 16.2%), EEG-confirmed (13, 35.1%)
Imaging Findings

Counts/frequency: Calvarial fracture (224, 17.3%), Contusion / IPH (405, 31.3%), Epidural hematoma (EDH) (98, 7.6%), Intraventricular hemorrhage (IVH) (141, 10.9%), Negative head CT (111, 8.6%), Subdural hematoma (SDH) (752, 58.2%), Skull base fracture (334, 25.9%), Traumatic subarachnoid hemorrhage (SAH) (690, 53.4%)
Employment and Marital Status

### Employment Status

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<thead>
<tr>
<th>Employment Status</th>
<th>Percentage</th>
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</thead>
<tbody>
<tr>
<td>Full or Part Time</td>
<td>28.9</td>
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<tr>
<td>Student</td>
<td>4.5</td>
</tr>
<tr>
<td>Active Military</td>
<td>0.1</td>
</tr>
<tr>
<td>Retired</td>
<td>32.3</td>
</tr>
<tr>
<td>Unemployed</td>
<td>32</td>
</tr>
<tr>
<td>Unknown</td>
<td>2.1</td>
</tr>
</tbody>
</table>

### Marital Status

<table>
<thead>
<tr>
<th>Marital Status</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Married / Sig Other</td>
<td>34.1</td>
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<tr>
<td>Divorced / Separated / Widowed</td>
<td>18.8</td>
</tr>
<tr>
<td>Single</td>
<td>38.7</td>
</tr>
<tr>
<td>Other / Unknown</td>
<td>8.4</td>
</tr>
</tbody>
</table>
Medical Records
• Unique approaches to managing and analyzing healthcare big data
Efforts in Last 2 Decades

- Over 4000 preclinical studies on TBI
- Over 200 Phase 2 or greater clinical trials
• Can we learn from our experience of practicing medicine?
• Can we use the data collected in routine health care?
• Can we improve patient outcomes?
• Can we derive new therapeutics from our experiences?
Thank You

Andrea Thomas, NP
Neurotrauma Nurse Practitioner

Amy Horner, RN – Neurotrauma Nurse Navigator

Karen Burk – Neurosurgery Program Manager

Jed Hartings, PhD Department of Neurosurgery
Brandon Foreman, MD Department of Neurology
Amy Ewing – CRANI Administrative Executive

http://www.uchealth.com/neurotrauma
Big Data

• 2000s
• Volume – organizations collect data from a variety of sources (business transactions, social media, machine data)
• Velocity – data streams in at unprecedented speed and must be dealt with in a timely fashion
• Variety – data comes in all types and formats (structured, unstructured, numeric, video)
Informatics

• High powered analytics
• Not just what data you have
• But what you do with the data
• Data visualization
• Specialized analytics tools
• Data Scientists
Evidence Based Medicine

• Mid 1990s
• EBM – “conscientious, explicit, judicious use of current best evidence in making decisions about care of individual patients”
• Rigorous collection of data
• Randomized controlled trial (RCT)
Practice Based Medicine

- Comparative effectiveness research
- Real world clinical practice
- Unselected patient populations
- Longer term outcomes
Plan-Do-Study-Act

- Allows patients and caregivers to be catalysts for change
- Uses data generated in healthcare delivery
- Knowledge gained from research and patient care is reciprocal
plan
strategy
action
research
teamwork
direction
idea
goal
vision
Closing Remarks

• Thank you!!
• Parking has been paid for
• Hand in your CRANI Research Blitz Score Cards
• Reception in the lobby – wear your nametag
Figure 3: Traumatic Brain Injury Death Rates by Age and Gender, Ohio, 2014

While the overall death rate for TBI was 18.6 per 100,000 in 2014, rates vary greatly by gender and age. Rates were approximately three times higher among males than females for all age groups except for adults 85 and older where the rate was approximately two times higher for males than females. The death rates for both genders were somewhat consistent through age 64 and then began to increase significantly with age. The rate for males 85 and older was 204 per 100,000. For females, it was 95 per 100,000, showing a significant increased risk of death for males over the age of 85 who sustain a TBI. Note: The number of deaths for males and females in this age group was similar – 159 for females compared to 169 for males.

Source: Ohio Department of Health, Vital Statistics
Data from death certificates indicate that TBI deaths among Ohio residents fluctuated somewhat between 2000 and 2014. However, there was an overall increase in both the rates and number of TBI deaths in 2014 compared to 2000. From 2000 to 2014, the death rate for TBI increased nearly 17 percent from 15.9 per 100,000 to 18.6 per 100,000, and the number of deaths increased by 28 percent.
The above figure shows that the hospitalization rates increased gradually from 2002 until 2007 when the rate was 67.9 per 100,000 persons. Since 2007, the rate has decreased to 55.1 per 100,000 persons in 2014. Although this appears to be a positive trend, it should be considered in light of a rising death rate and persistent rising number of ED visits.
Figure 4: Traumatic Brain Injury Deaths by Mechanism and Intent, Ohio, 2014

Data show that unintentional falls (33 percent) were the foremost mechanism of injury for TBI deaths in 2014. Suicide (28 percent) was the second-most-common injury followed by motor vehicle crashes (21 percent).
Figure 6: Hospitalization Rates for Traumatic Brain Injuries by Gender and Age, Ohio, 2014

Hospitalization rates for TBI are lowest for both males and females ages 5 to 14 (23.5 per 100,000 and 11.8 per 100,000 respectively). The highest rates are seen among those age 75 and older. Rates are higher among males than females for all age groups except for adults 85 and older, in which the female rate (334 per 100,000) is higher than the male rate (324.2 per 100,000).

Source: Ohio Hospital Association
Figure 7: Traumatic Brain Injury Hospitalizations by Mechanism and Intent, Ohio, 2014

Unintentional falls are the leading mechanism for TBIs that result in hospitalizations (37 percent) followed by motor vehicle crashes (24 percent). The mechanism could not be determined for 24 percent of TBI-related hospitalizations because an external cause of injury code (E-Code) was not reported.
Figure 9: Rates of Emergency Department Visits for Traumatic Brain Injuries by Gender and Age, Ohio, 2014

ED visits for TBI are highest at either end of the age spectrum, with the highest rates among adults 85 years of age and older followed by children age 1 to 4. In 2014, females age 85 years and older led the number of ED visits with approximately 2,500 visits per 100,000. ED rates were higher among males than females for younger age groups (under age 25), and females had higher rates among the older age groups (55 and older) compared to males.

Source: Ohio Hospital Association
Figure 10: Traumatic Brain Injury Emergency Department Visits by Mechanism, Ohio, 2014

Unintentional falls are the leading mechanism for TBI-related ED visits (41 percent) followed by struck by/against (16 percent) and then motor vehicle crashes (12 percent). The mechanism could not be determined for 19 percent of TBI-related ED visits because an external cause of injury code (E-code) was not reported.

Source: Ohio Hospital Association
The number of ED visits due to TBI for recreation-related activities among children age 0 to 18 remained stable from 2002 to 2014, while TBIs related to sports activities increased during this time. It is not clear if this is due to an actual increase of occurrence, a greater recognition for the need for medical care, or improved reporting.
Figure 14: Number of Traumatic Brain Injury Records by Injury Location, Ohio, 2014*

Source: Ohio Department of Public Safety Division of Emergency Medical Services, Ohio Trauma Registry
*422 records where the injury location was not recorded (blank) were excluded