

An Update on the Crash Injury Research and Engineering Network (CIREN)

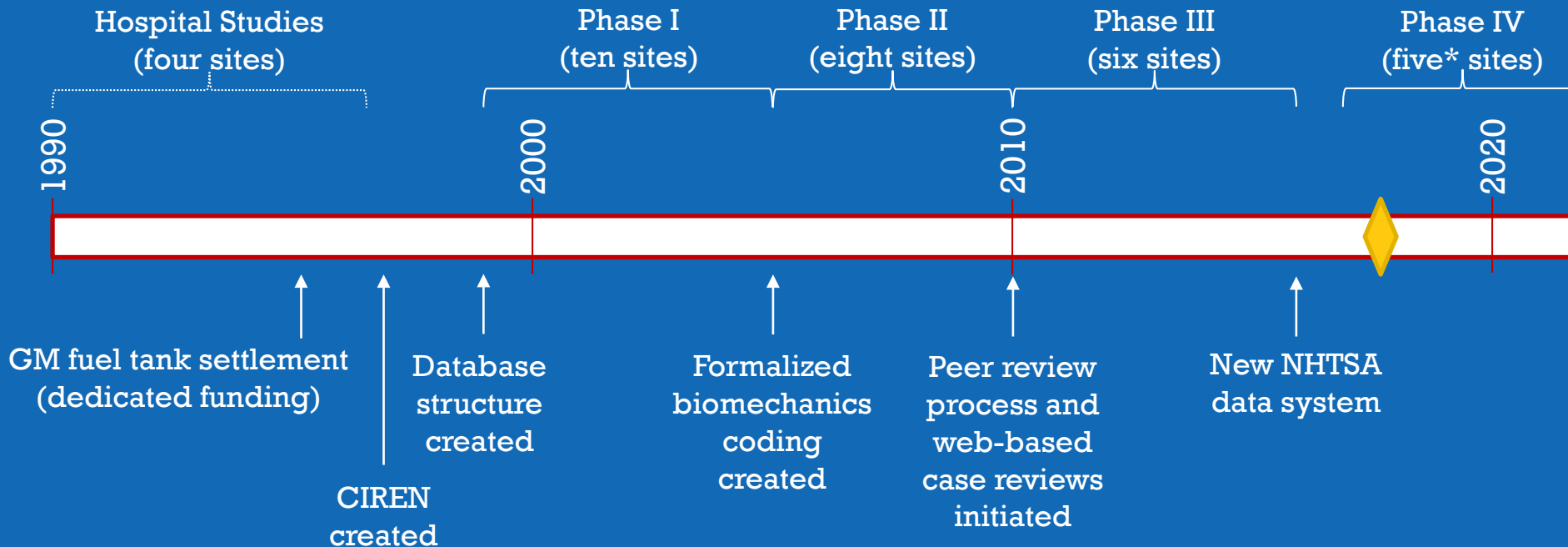
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NHTSA
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION



Program history





NHTSA field data collection

- National Center for Statistics and Analysis (NCSA)
 - FARS - records-based census of fatal traffic crashes
 - CRSS - records-based sample of reported crashes
 - CISS - investigation-based statistical sample of tow-away crashes
 - SCI - targeted high-interest investigations
- Human Injury Research Division (Office of Vehicle Safety Research)
 - CIREN - injury causation-focused investigation-based purposive sample





CIREN field investigation

- CIREN follows the standard NHTSA field crash investigation approach with a few exceptions
 - Only access consented participants' vehicles
 - Additional seat, steering, and restraint documentation
- Crash investigators undergo standard NHTSA training



CIREN core functions

Database

- ~200 cases/year
- >5,500 total cases
- Biomechanics coding
- DICOM repository
- Shared design
- Public access

Catalyst

- Hypothesis generation
- Research initiatives
- Real-world driven
- Relate life to lab

Knowledgebase

- Physicians
- Engineers
- Epidemiologists
- Crash investigators
- Industry
- NHTSA

Sentinel

- Early problem identification
- NHTSA directives
- Real-time capture



Revised CIREN center roles

- Continued emphasis on in-depth review of injury causation
 - Split data collection and biomechanical analysis roles
 - The “enrolling” center investigates crash and collects data, then a “reviewing” center assigns injury causation
 - Medical Center - enrolls patients and investigates crashes
 - Engineering Center - conducts biomechanical analysis of cases
 - Integrated Center - performs both Medical Center and Engineering Center roles
- Joint case review meetings allow group discussion on all but the simplest cases



Competitive procurement

- Indefinite Delivery Indefinite Quantity (IDIQ) contract mechanism
- Base-level awards issued July 2017
- Occupant enrollment Task Order issued September 2017
 - Base year with four option years - through September 2022
 - Crash investigators underwent training at updated NHTSA Crash Investigation Training Academy in Oklahoma City, OK
- Future Task Orders anticipated
 - Research projects
 - Vulnerable road users



Current CIREN sites

Medical Centers

- Inova Trauma Center
 - University of Virginia Hospital
 - Winchester Medical Center
- University of Alabama at Birmingham
- University of Maryland, Baltimore

Engineering Centers

- Medical College of Wisconsin
- University of Virginia

Integrated Centers

- Emory University
- Wake Forest University



What's new for CIREN?

- NHTSA Data Modernization
 - Crash Data Acquisition Network (CDAN)
 - Updated field investigation techniques
 - Total Station for scene and vehicle crush measurement
 - Rugged convertible tablet PCs allow in-field data entry





What's new for CIREN?

- Inclusion criteria
- Injury coding
 - AIS 2015
 - Enhancements to BioTab (injury causation coding)
 - New coding application
 - CISS and SCI using similar approach



Inclusion criteria

- CIREN strives to enroll seriously injured occupants in “clean” crashes of newer model vehicles
 - Higher confidence in causation assessment
 - Helps identify potential problem areas with the latest designs
 - More suitable for analysis and reconstruction
- Purposive study design gives us this flexibility
 - We aren’t forced to take specific cases
- Minimize time spent on cases that won’t tell us very much



Adult Preferred				Adult Extended			
Vehicle criteria	Restraint criteria	Occupant position	Injury severity	Vehicle criteria	Restraint criteria	Occupant position	Injury severity
Frontal Crashes – generally 10 o'clock to 2 o'clock impact angle with front plane damage							
CY-6 (+SC)	3pt belt NGM + DFA	Row 1 outboard	AC	†	Deployed frontal bag (unbelted)	†	†
MY1998+	3pt belt NGM	Rows 2+	AC	n/a			
MY1998+	3pt belt NGM + DFA	Row 1 outboard	TLS	n/a			
MY1998+	WCR	Any	Any	n/a			
Side Crashes – generally 8 o'clock to 10 o'clock or 2 o'clock to 4 o'clock impact angle with side plane damage							
CY-6 (+SC)	Any	Near-side any row	AC	MY2005+	Side torso and head bag deployment	†	†
MY2005+	3pt belt NGM	Far-side any row	AC	Any	†	†	†
MY2005+	WCR	Any	Any	n/a			
Rear – generally 5 o'clock to 7 o'clock impact angle with rear plane damage							
n/a				CY-6 (+SC)	3pt belt	Any	AC
Rollover Crashes							
n/a				CY-6 (+SC)	3pt belt	Any	AC
Success Cases* – high-energy crashes with minor or no injury to case occupant							
n/a				CY-6 (+SC)	3pt belt	Any	Any

AC=adult conventional, CY=calendar year, DFA=deployed frontal airbag, MY=model year, NGM=no gross misuse (lap and shoulder belt positioned over occupant as designed), SC=sisters and clones, TLS=thoracolumbar spine, WCR=wheelchair-seated occupant using adaptive restraint

* requires NHTSA pre-approval, must prove other properly-restrained occupants sustained serious injury

† same criterion as in Preferred



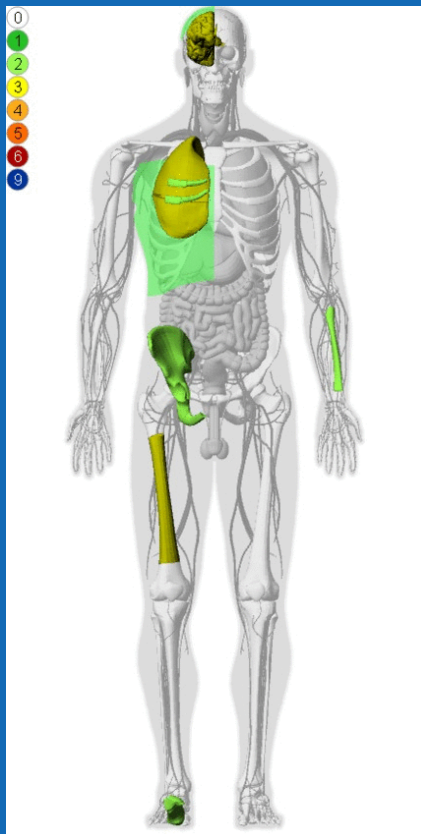
Inclusion criteria

- Admission to CIREN trauma center or partner site (direct or transfer)
- Injury severity (AIS 2015)
 - One AIS 3+
 - Two AIS 2 in different body regions
 - Some clinically significant AIS 2 qualify (due to demotion in newer AIS)
- Newer vehicles - six years or less in age generally
 - Sisters and clones (accounts for generational changes)
 - Some special exceptions
- Emphasize cases with high research value



Injury coding

- Visual Anatomical Injury Descriptor (developed by US Army Research Lab)
- AIS 2015 coding engine with visualization
- Customized for NHTSA to include BioTab injury causation coding
 - CISS, SCI and CIREN utilize same core variables and attributes
 - CIREN includes evidence and mechanism variables



Modified Injury Case "test1"

Injury Count: 9, TSP: 001242.4, MAIS: 4, ISS: 34, NISS: 34, mpFCI: 1

- 1 [110402.1 0100] Scalp; contusion; subgaleal hematoma if >6 months old; Right
- 3 [441408.3 01ES, 01ET] Lung; contusion; unilateral; major; 1 or more lobes; Right, Lung Lobe 1; Right, Lung Lobe 2
- 2 [450202.2 1033, 1034] Rib Cage; fracture(s) without flail; any location unilateral or bilateral two ribs [OIS I]; Right Anterior / Frontal, Rib 3; Right Anterior / Frontal, Rib 4
- 1 [410402.1 0170] Skin/subcutaneous/muscle; contusion; hematoma; Right, Chest
- 2 [752211.2 0200] Radius fracture; Radius shaft fracture; Left
- 2 [856151.2 01NT, 01NU] Pelvic ring fracture, posterior arch intact [stable fracture]; Right, Ilium Bone; Right, Ischium Bone
- 3 [853252.3 0100] Femur fracture; Femur Shaft fracture; simple; spiral; oblique; transverse; Winquist I; open; Right
- 2 [857361.2 0100] Calcaneus fracture; fracture line into one joint surface; Right
- 4 [140628.4 0100] Cerebrum [includes basal ganglia, thalamus, putamen, globus pallidus]; diffuse axonal injury (DAI); NFS; Right



BioTab injury causation coding revisions

- Since initiated in 2005, over 2,900 cases (>24k injuries) coded using the formalized approach
- Protocol has evolved due to lessons learned
 - Revised attribute lists for evidence and contributing factors
 - Revised rules/configurations for Involved Physical Components
 - Isolated: Generally one, maybe adjacent component
 - Tandem: sequential or stacked components (new)
 - Critical: multi-point contact
 - BioTab generally described in Schneider et al 2011, but expect more detail on the current approach in another forum



CIREN data access

- Case viewer
 - XML-based
 - Query feature
 - New URL soon
- SAS data sets
 - Crash portion like NASS-CDS
 - Data dictionary
 - 2017 release: 2,104 cases

CIREN The Nation's Largest Learning Laboratory

Search Criteria

CIREN was established in 1996 and is a multi-center research program involving a collaboration of clinicians and engineers in academia, industry, and government. Level 1 Trauma Centers are linked together through a computer network associated with this research program. Each Center collects detailed crash and medical data on approximately 60 motor vehicle crashes per year. After the necessary coding and quality control takes place, the information is added to a database on the computer network linking the centers. The CIREN database consists of multiple discrete fields of data concerning these crashes, including crash reconstruction and medical injury profiles. Personal and location identifiers and highly sensitive medical information have been removed from the public files to protect patient confidentiality.

Select a Single Case

Case ID: GET CASE

Search Criteria: SAVE LOAD Browse No file selected.

RESET CRITERIA SEARCH

Select From a List of Cases Based on Criteria Below

Crash Year and Month

Crash Date: Year: All Month: All

Vehicle

Make: All

Model: All

Body Category: All

Start Model Year: All

End Model Year: All

Vehicle Damage

Primary: All

Secondary: All

PDOF: to degrees

Delta V: to mph kmph

Barrier Equivalent Speed: to mph kmph

Rollover:

Occupant

Age: to Months Years

Sex: All

Seat Position: All

Height: to cm

Weight: to kg

Injury

Body Region: All

Abdomen

Ankle

Arm

AIS/NASS Code: Maximum AIS: to

- Cases enrolled in Phase IV will be accessible separately from the “legacy” cases - anticipated access summer 2018



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www.nhtsa.gov

(then navigate to Crash Injury Research or just search for “NHTSA CIREN” on Google)

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