NHTSA Research Roadmap for Studying Advanced Automatic Collision Notification

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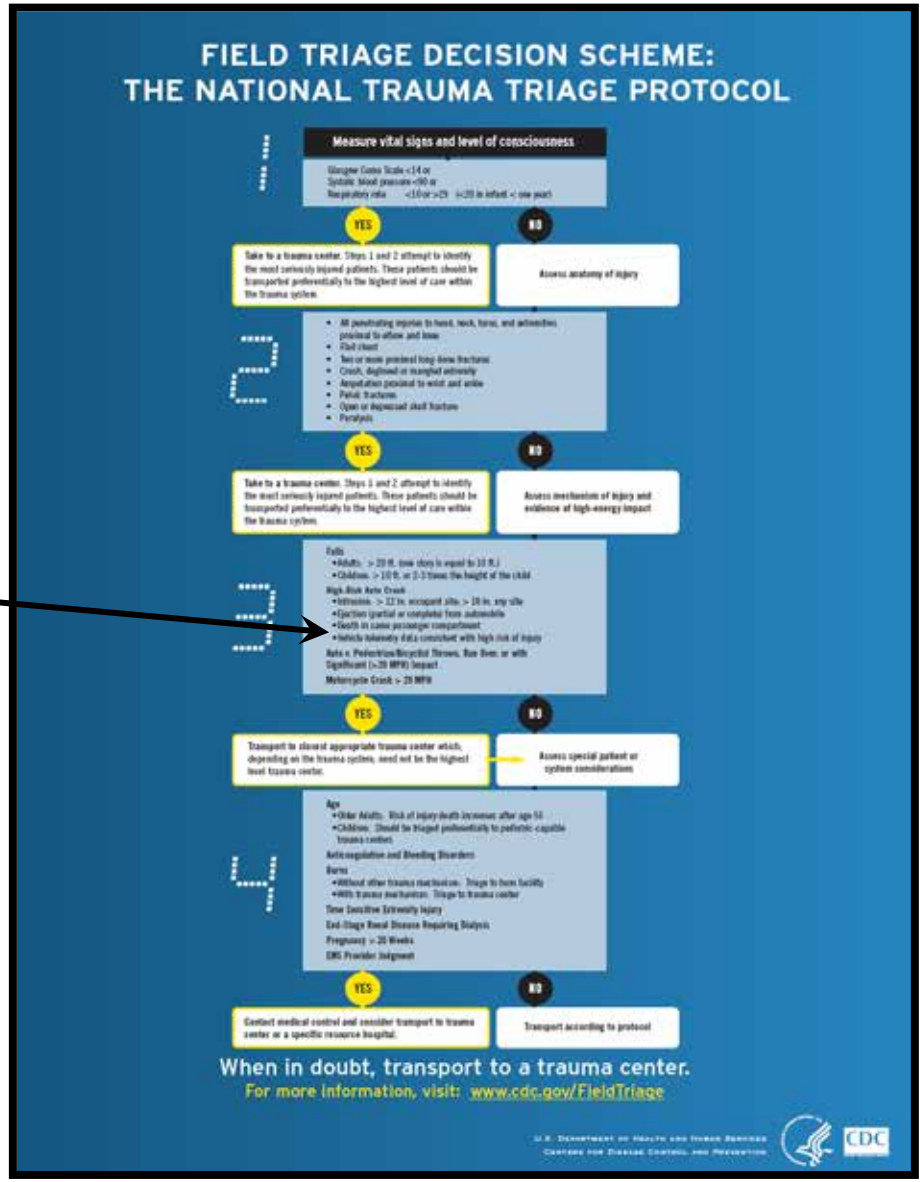
Background

Background

- "Right person, right place, right time"
  - For example: transport to Level I trauma center vs. non-trauma center can reduce mortality by 24% (MacKenzie et al. 2006)
- Telematics data use in triage of motor vehicle crash occupants added to the 2006 American College of Surgeons Field Triage Decision Scheme
- Centers for Disease Control and Prevention (CDC) Expert Panel identified need for injury algorithm development and pilot studies of AACN
  - "Recommendations from the Expert Panel: Advanced Automatic Collision Notification and Triage of the injured Patient" (2008)

2006 Field Triage Decision Scheme

“Vehicle telematics consistent with high risk of injury”



"Right person, *right place*, right time"

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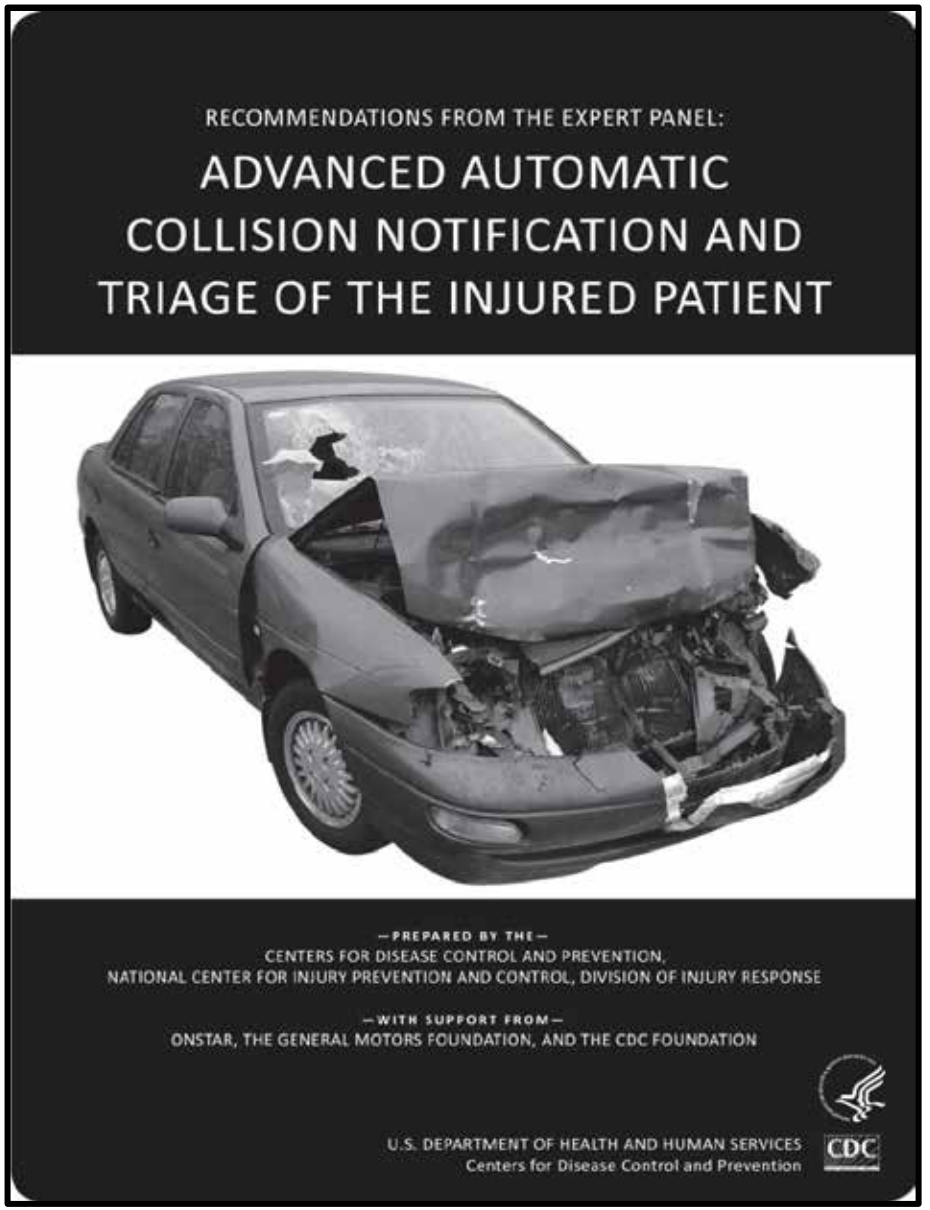
CDC Expert Panel - AACN

- Recommended Measures
  - Via telematics
    - Delta V
    - PDOF
    - Seat belt usage
    - Multiple impacts
    - Vehicle type
  - Via voice communication
    - Age
    - # of occupants
    - # of vehicles
    - Presence of injury



NHTSA Historical AACN Work

U.S. Department
of Transportation
**National Highway
Traffic Safety
Administration**

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People Saving People
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DOT HS 809 304

February 2001

Automated Collision Notification (ACN) Field Operational Test (FOT) Evaluation Report

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ACN Field Operational Test (FOT)

- Timeframe: 1995 to 2000
- Purpose
  - Establish EMS response times relative to time of crash
  - Determine if ACN information can reduce those times
- System Description
  - Outfitted 700 vehicles with ACN system
    - GPS, crash sensor and embedded cell phone
  - Basic injury algorithm based on delta-V and PDOF (Malliaris et al., 1997)
  - Study ran in Erie County, PA for nearly 3 years
- Results
  - 15 ACN crashes during study
  - PSAP notified within 1 minute of crash

Injury Prediction Algorithms

- Champion et al. (1998,1999) studied criteria for recognizing time critical injuries at the crash scene
- Under NHTSA Contract, Malliaris et al. (1997) developed model to predict injuries based on crash attributes which was used to develop a software program called the “URGENCY” algorithm
- URGENCY predicts probability of AIS 3+ using vehicle crash and occupant data
- Updates and applications of the URGENCY algorithm have continued (Augenstein et al., 2001, 2005; Bahouth et al., 2008; Rauscher et al., 2009)

Event Data Recorders

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NHTSA EDR Rulemaking

- NHTSA published an update to the final rule on January 14, 2008 regulating Event Data Recorders (EDRs)
  - *Did not mandate EDRs*
  - Established uniform set of criteria for EDRs voluntarily installed in vehicles
  - Applied to vehicles with GVWR of 3,855 kg (8,500 lb) or less
  - Effective date of rule is September 1, 2012
- NHTSA Vehicle Safety and Fuel Economy Rulemaking and Research Priority Plan, 2011-2013
  - 2011 milestones related to rulemaking proposal to require EDRs on light vehicles to which Part 563 applies and an advance proposal for future enhancements

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Docket #'s: NHTSA-2008-0004-0001; NHTSA-2009-0108-0032

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Data Elements – NHTSA EDR Final Rule

Table 1: Required Elements

Delta V, longitudinal

Maximum delta V, longitudinal

Time, maximum delta V

Speed, vehicle indicated

Engine throttle, % full

Service brake, on/off

Ignition cycle, crash

Ignition cycle, download

Safety belt status, driver

Frontal air bag warning lamp, on/off

Frt airbag deployment, time to deploy – single stage or 1st stage, driver/right frt pssgr

Multi-event, number of events (1,2)

Time from event 1 to 2

Complete file recorded (yes, no)

Table 2: Optional Data Elements

Lateral acceleration

Longitudinal acceleration

Normal acceleration

Delta V, lateral

Maximum delta V, lateral

Time maximum delta V, lateral

Time for maximum delta V, resultant

Engine rpm

Vehicle roll angle

ABS activity (engaged, non-engaged)

Stability control (on, off, engaged)

Steering input

Safety belt status, right front passenger (buckled, not buckled)

Frt airbag suppression switch status, right front passenger (on, off, or auto)

Frt airbag deployment, time to nth stage, driver/right frt pssgr

Frt air bag deployment, nth stage disposal, driver / rt frt pssgr (whether the nth stage deployment was for occupant restraint or propellant disposal purposes

Side airbag deployment, time to deploy, driver / rt frt pssgr

Side curtain airbag deployment, time to deploy, driver side / right

Pretensioner deployment, time to fire, driver / passenger

Seat track position switch, foremost, status, driver / right front pssgr

Occupant size classification, driver / right front pssgr

Occupant position classification, driver / right front pssgr

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NHTSA EDR Data Collection & Analysis

- NHTSA has over 4,000 cases of crashes with EDR data in its National Automotive Sampling System – Crashworthiness Data System (NASS-CDS)
- Analysis to date
  - Compared EDR data to standardized crashes of similar vehicles
  - Compared EDR delta-V to delta-V from reconstructions
  - Current contract investigating multi-variable injury prediction models using EDR data elements
  - Craig et al. (2011 – ESV) evaluated the association between individual EDR data elements and injury severity measures (MAIS 3+, ISS 16+)

NHTSA EDR Data Analysis, Ctd.

- Crash Injury Research and Engineering Network (CIREN) EDR cases
  - Craig et al. (2009) studied hospital care-based outcomes of crash occupants using CIREN EDR cases
  - Craig et al. (2011) continued prior efforts but with greater emphasis on documenting the association between potential EDR or voice-collected predictor variables and individual or composite hospital care-based outcomes

Current NHTSA AACN Efforts

NHTSA AACN Efforts – Overall Aims

- Estimate the benefits (lives saved, e.g.) of full implementation of AACN within EMS/Trauma systems nationwide
- Work with EMS and 911 communities to assure voluntary integration of AACN with emergency notification (911) and response
- Assure optimal triage and emergency care for injured crash occupants

NHTSA / CDC AACN Collaboration

- Two joint AACN working groups established in 2009 between NHTSA and the Centers for Disease Control (CDC)
  - *Group 1*: Efficacy, Economic Impact & Injury Algorithm Development Working Group
  - *Group 2*: Systems & Implementation Working Group

NHTSA/CDC Group 1 – *Objectives*

1. Document methodologies for estimating benefits of nationwide AACN implementation
2. Develop and implement strategies for determining the impact of post-crash response, transport and care on health outcomes
3. Assess the cost effectiveness of nationwide AACN implementation integrated with EMS/trauma systems
4. Assess the impact of over- and under-triage of crash occupants on the EMS and Trauma Systems
5. Gain consensus on a uniform injury severity predicting algorithm and associated data collection and communication protocols
6. Complete pilot study or studies to cover the broad aspects of AACN data collection, communication and EMS/trauma system use following CDC Expert Panel recommendations

NHTSA/CDC Group 2 – *Objectives*

In conjunction with Federal partners and stakeholders:

1. Implement and evaluate a coordinated national strategy for deployment of AACN protocols
2. Educate pertinent emergency response personnel medical, nursing, and paramedical personnel (PSAPs, EMS, Trauma System) on specific protocol(s)
3. Support/promote regionalized, accountable system(s) of emergency medical and trauma care

NHTSA Vehicle Safety and Fuel Economy Rulemaking and Research Priority Plan, 2011-2013

Advanced Automatic Collision Notification (AACN)

Description: AACN provides emergency personnel with pre-arrival information (crash severity, GPS coordinates, other occupant and vehicle data) when a severe crash occurs. The agency is working with the Centers for Disease Control (CDC) and EMS providers to examine required data elements and potential benefits and triage capabilities of AACN to transport those seriously injured to a Level 1 trauma hospital. The agency will review research results and decide on next steps.

Next Milestone: Agency decision in 2013

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Docket #: NHTSA-2009-0108-0032

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Questions?

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