



Engineering  
Prevention



Medical  
Treatment



## Indiana University CIREN QUALITY CONTROL CONTRACTOR

### Transportation Research Center

The Transportation Research Center (TRC) resides within the School of Public and Environmental Affairs (SPEA). It is part of Indiana University's rich tradition of research, training, and technical assistance in public sector planning, programs, operations, and evaluation. Staff at the Transportation Research Center have been involved in transportation-related research and technical assistance since 1970 when TRC's predecessor, the Institute for Research in Public Safety, was created. TRC staff members have distinguished themselves in a variety of research and technical assistance projects for federal, state, and local governments, concentrating on vehicle crash investigations, traffic safety technologies, injury control, and database management and quality control.

The TRC has conducted a broad range of projects for the U. S. Department of Transportation, the vast majority of which were sponsored by the National Highway Traffic Safety Administration (NHTSA) and involved motor vehicle crash investigations, data collection, reporting, and quality control. TRC staff members are proud of the over thirty-year organizational history of contractual involvement in highway traffic safety data collection and the development of data collection programs for the NHTSA. In addition to thousands of on-site, in-depth, and "Special Crash" motor vehicle collision investigations, TRC staff have quality controlled tens of thousands of crash cases generated within the National Crash Severity Study (NCSS), the National Automotive Sampling System (NASS), and the Crash Injury Research and Engineering Network (CIREN) systems.

### Expertise

Motor vehicle crash data collection and investigatory skills were developed over more than three decades of conducting federally-sponsored research studies: *Multidisciplinary Highway Crash Investigation Team* (Federal Highway Administration, 1970), *A Study to Determine the Relationship Between Vehicle Defects and Vehicle Crashes* (National Highway Safety Board, 1972), *Tri-Level Study of the Causes of Traffic Accidents* (National Highway Traffic Safety Administration, 1973, hailed as "the definitive study of the causes of traffic accidents" by *FORTUNE* magazine), *National Crash Severity Study* (National Highway Traffic Safety Administration, 1976), *Establishment of Zone Centers*

*for the National Accident Sampling System* (National Highway Traffic Safety Administration, 1977), *Operations of Zone Center A for the National Accident Sampling System* (National Highway Traffic Safety Administration, 1979), and *Special Crash Investigations, Central Region* (National Highway Traffic Safety Administration, on-going). As well, TRC staff skill development included vehicle exterior damage assessment, vehicle interior intrusions and occupant contact points identification, crash scene permanent and transitory data collection and diagram preparation, scene and vehicle photography, occupant interview techniques, collection and coding of occupant injury information from medical sources, crash dynamics and occupant kinematics analyses, and speed estimates.

Not only was motor vehicle crash case quality control experience developed during the *Operations of Zone Center A for the National Accident Sampling System* project, but TRC staff members were intimately involved in the creation of the substance and style of the process itself. Moreover, TRC staff contributed significantly to the development and refinement of the *National Accident Sampling System's Crashworthiness Data System Data Collection, Coding, and Editing Manual* and the *NASS Injury Coding Manual*.

### CIREN

Since 1996, the Crash Injury Research and Engineering Network (CIREN) has provided the National Highway Traffic Safety Administration (NHTSA) with a substantial number of cases that, on a crash-by-crash basis, present more highly detailed injury data on crash-involved occupants than have previous motor vehicle crash research studies that targeted detailed injury data on a relatively small number of crashes. This detailed injury information includes hospital discharge summaries, radiological images and results narratives, operation notes, autopsy reports, and photographs of injuries. As the NHTSA mission since 1966 has been to reduce traffic crashes and their consequences as much as possible (that is, save lives, prevent injuries, and reduce traffic-related health care and other economic costs), the CIREN system is a logical progression of previous highway traffic safety research that acknowledges the realities of motor vehicle crash occurrences with the desire to reduce injuries and their severities.

In August 2000, TRC staff began development of a CIREN quality control process by reviewing 50 completed cases. The process was, and remains, an electronic review of completed CIREN cases submitted by the 10 current Centers and, through TRC comments and suggested changes reported in the “Review Notes” tab that is part of the Electronic Data Collection System (EDCS) software, then returning those comments and suggested changes to the Center of record. Centers have the option of accepting or rejecting the offered TRC comments and suggestions.

The ultimate quality control review goal is to achieve, in a timely manner, the highest degree possible of data completeness, data accuracy, and internal case consistency among and between CIREN cases, specifically, and with other NHTSA-sponsored motor vehicle crash research programs, generally, through following established National Automotive Sampling System (NASS) case review protocols within the precepts of CIREN. The TRC staff strives to continually refine the quality control review process to ensure the accuracy, validity, and internal consistency of submitted cases.

## **CIREN Quality Control (QC) Review**

Performing the Quality Control (QC) review on a CIREN case is a multi-stage operation. A CIREN case is divided into two components. Each part must contain the same Center reference; specifically, to identify one of the ten Centers as the Center of record. One component contains collected data from the crash scene, involved vehicles, and vehicle occupants (for ease of differentiation, this part of the case will be referred to as the “NASS” component). The other component contains medical information on occupants injured in motor vehicle crashes who sustained injuries of interest to participating CIREN Centers; for example, injury information collected from autopsy reports, discharge summaries, radiological narratives, operation notes, injury photographs, and other ancillary medical sources (this part of the case will be referred to as the “CIREN” component).

## **CIREN Quality Control (QC) Process**

The TRC is a node in the nationwide Electronic Data Collection System (EDCS) network that is managed through the Volpe Center in Cambridge, Massachusetts. CIREN Centers are other nodes on the same network. When a CIREN Center judges that a case is complete, that case is marked “QC Ready” and the case automatically migrates to the TRC, usually overnight. CIREN cases that are forwarded to the TRC are electronic copies that cannot be altered except by the addition of TRC review notes. The TRC completes the required quality control review and the review notes migrate back, electronically, to the originating CIREN Center as “QC Complete” (if justified, a case can be returned to the submitting Center as “QC

Incomplete”). An e-mail message is sent to both the Center of record and the NHTSA’s Contracting Officer’s Technical Representative (COTR) documenting that the QC process has been completed. The Center of record then has the opportunity to peruse and analyze the QC comments and suggestions and, if needed, discuss those comments and suggestions with the TRC staff (TRC does not have the ability to make any changes to a case, itself). Once the TRC releases a case as “QC Complete,” that specific case can no longer be accessed by TRC staff after a period of time has passed. A case will ultimately migrate to the CIREN Web site as “Published,” and will be available to qualified analysts through the CIREN archive. During this quality control review process, there are two paramount principles that guide TRC staff in the performance of tasks associated with CIREN case reviews: (1) ensure case data conform as closely as possible to agreed upon investigative, coding, and quality control procedures, and (2), ensure case data are internally consistent.

As has been previously stated, each CIREN case exists as two separate but linked components, the “NASS” component that is accessed via the NASSMAIN application and the “CIREN” component that is accessed via the CIREN application.

## **“NASS” Case Components**

The “NASS” component records the motor vehicle crash with a Case form, General Vehicle form(s), Exterior Vehicle form(s), Interior Vehicle form(s), Safety Systems form(s), Occupant form(s), and Pictures/Thumbnails (photographs). These forms are to be coded with crash data collected through agreed upon investigatory protocols. To do so, Center crash investigators must be well-versed in agreed upon variable coding requirements contained within the current electronic version of the crash reconstruction software. The electronic *NASS 2000 CDS Data Collection, Coding, and Editing Manual* and its updates contain sections to match each form mentioned above. Additionally, Center investigators must be familiar with the current versions of *WinSMASH*, *NASS Vehicle Measurement Techniques*, *NASS Photography Guidelines*, and *Collision Deformation Classification – SAE J224 Mar 80*. Each tab in the NASSMAIN layout is opened by a member of the TRC staff and each entry reviewed.

## **“CIREN” Case Components**

The CIREN application is similar to the NASSMAIN application in that the data encoding process is accomplished through a succession of forms with tabs and subtabs. There are two principal features of the “CIREN” component: (1) the occupant’s/patient’s demographic, anthropometric, diagnostic, and treatment data (i.e., the tabs and subtabs on the various CIREN/Medical components) and, (2) the specific injury data that are coded according to the

NASS adaptation of AIS90 and NASS injury mechanism coding protocols.

As with the review of the “NASS” component, each “CIREN” tab must be opened and each entry scrutinized. QC review of the “CIREN” component ascertains whether those data elements that are coded have been coded in an internally consistent manner. Additionally, QC reviews include ensuring all medical narrative entries contain no proper names, internal reference numbers, or exact dates.

The “CIREN” component provides an overview of case injuries by supplying data from hospital discharge summaries, radiology images and narratives, operation notes, and EMS activities. Perhaps the most critical tab in the “CIREN” component is the Injury Analysis tab. This section not only identifies the “case occupant,” but details that occupant’s seating position, seat posture, restraint use, air bag deployment (if any), crash dynamics, occupant kinematics, possible vehicle/occupant contact points, and resultant injuries and their severities. Also, an injury list is generated that identifies the case occupant’s injuries, each injury’s aspect (location), and vehicle component “causing” that injury. Also, an injury may be linked to an intrusion

to the vehicle’s interior, an interior contact point that may have been struck by one of the occupant’s body regions, radiological images and explanations, notes on any operation procedures performed, presence of linked injury photographs, and clarifying ancillary notes. These aforementioned injury data are to be coded from medical information collected through agreed upon investigatory protocols.

## Summary

As previously noted, the Crash Injury Research and Engineering Network is a logical progression of previous highway traffic safety research. The unique characteristic of CIREN is providing motor vehicle crash reconstruction data as an adjunct to the presentation of occupants’ resultant injuries. Being a hospital-based research system, the ten CIREN centers collect and report injury information in exquisite detail for virtually every submitted case.

The Indiana University Transportation Research Center looks forward to continuing its working partnership with the U.S. Department of Transportation, the National Highway Traffic Safety Administration, the current CIREN Centers, and the Volpe Center.