Slide 1 – Title of Project and Presenter Affiliation

Slide 2 – Definition and characteristics of pulmonary contusions. This slide outlines the nature, occurrence, timeline, diagnostic testing and treatment of pulmonary contusions.

Slide 3 – This slide outlines the biomechanical mechanisms which cause pulmonary contusions.

Slide 4 – This slide contains a diagram of an alveoli and it's interaction with the atmosphere and de-oxygenated blood.

Slide 5 – This slide shows the three possible injuries that a lung can sustain. Edema of the alveoli is when the lung tissue swells; pulmonary hemorrhage is when the lung tissue bleeds and atelectasis is when the tissue collapses.

Slide 6 – This slide outlines talking points from a 1993 study of pulmonary contusions in a population of patients suffering blunt trauma. PC stands for pulmonary contusion, MVC stands for motor vehicle crash and CXR stands for chest x-ray.

Slide 7 – This slide outlines talking points from a 1986 study of pulmonary contusions in a population of patients suffering. ISS stands for Injury Severity Score, which is a measure of injuries based on threat to life, GCS stands for Glasgow Coma Score, which evaluates a patient's neurological and physical functioning.

Slide 8 – This slide is a title slide to transition into case studies from CIREN.

Slide 9 – This slide contains a summary of the first case to be presented. It includes vehicle information, occupant characteristics and calculated data relating to the crash forces. CDC stands for Collision Deformation Classification, which identifies the crash formation and severity based on damage to the vehicle, and PDOF stands for Principal Direction of Force, which identifies the direction of force on the vehicle based on clock position.

Slide 10 – This slide contains the scene diagram, exterior and interior pictures of the case vehicle and a picture of the tree that was struck by the vehicle in this case study.

Slide 11 – This slide lists the injuries suffered by the case occupant and shows their ISS and length of stay (LOS) in the hospital following the crash.

Slide 12 – This slide contains a CT (computerized tomography) scan from this patient. It shows a small pulmonary contusion in the top part of the lung on the right side. A pulmonary contusion appears as an area that's cloudy white on a CT scan. Also, due to the orientation of the patient at the time of the scan, the contusion on the top right is actually in the front of the patient's left lung. Image the person is lying flat on their back with the feet in your lap and their head further away.

Slide 13 – This slide contains a summary of the second case to be presented. It includes vehicle information, occupant characteristics and calculated data relating to the crash forces.

Slide 14 – This slide contains the scene diagram, exterior and interior pictures of the case vehicle and an exterior picture of the striking vehicle.

Slide 15 – This slide lists the injuries suffered by the case occupant and shows their ISS and length of stay in the hospital following the crash.

Slide 16 – This slide contains a CT scan from this patient. It shows a medium-sized pulmonary contusion in the lung on the left side of the image. Based on the previous explanation of orientation on a CT scan, this contusion is in the right lung.

Slide 17 – This slide states the objective of this study, to use CIREN data to analyze pulmonary contusions.

Slide 18 – This slide titles the next section, Characteristics.

Slide 19 – This slide describes the study population. As of July 2006, 3,000 CIREN case occupants were found and this study looked at 2,184 of those occupants. 816 were excluded based on young age, far-side lateral, rear impact and rollover crashes..

Slide 20 – This slide lists the statistical methods used to analyze the data.

Slide 21 – This slide contains descriptive information of the study population. Over half had blunt chest trauma and one-third of those had pulmonary contusions. Those with pulmonary contusions and over the age of 50 had a higher occurrence of rib fractures than their younger counterparts..

Slide 22 – This slide lists characteristics of the study population. BMI stands for body mass index, which is calculated from a person's height and weight.

Slide 23 –This slide contains the crash characteristics experienced by the study population.

Slide 24 – This slide lists the injury characteristics of the study population and their distribution of severe injuries by body region.

Slide 25 – This slide shows the percentage of study occupants that were reported to have a pulmonary contusion by age.

Slide 26 – This slide is a continuation of slide 25 and shows the percentage of study occupants that were reported to have a pulmonary contusion by gender.

Slide 27 – This slide is a continuation of slides 25 & 26 and shows the percentage of study occupants that were reported to have a pulmonary contusion by ISS.

Slide 28 – This slide is a continuation of slides 25, 26 & 27 and shows the percentage of study occupants that were reported to have a pulmonary contusion by fatality.

Slide 29 – This slide shows the percentage of study occupants that were reported to have a pulmonary contusion by Delta V, which is the change in velocity experienced by the case vehicle in the crash.

Slide 30 – This slide is a continuation of slide 29 and shows the percentage of study occupants that were reported to have a pulmonary contusion by deformation location.

Slide 31 – This slide is a continuation of slides 29 & 30 and shows the percentage of study occupants that were reported to have a pulmonary contusion by collision type.

Slide 32 – This slide has a graph that shows the percent of case occupants with pulmonary contusion that were in frontal or near-side lateral crashes. They are broken down by delta V in this bar chart.

Slide 33 – This slide lists the variables used in a multivariate analysis that analyzed the incidence of pulmonary contusion. Due to missing values in almost one-third of cases, airbag deployment was excluded from the model.

Slide 34 – This slide shows the odds ratios for the risk of a pulmonary contusion based on age and delta v. It shows that those under the age of 25 were 1.5 times more likely to get a pulmonary contusion and those in a crash with a delta v of 46 kph or more were almost twice as likely to get a pulmonary contusion.

Slide 35 – This slide shows the odds ratios for the risk of a pulmonary contusion based on fixed object and 2 vehicle collisions. It shows that occupants in frontal collisions were more likely to sustain a pulmonary contusion when their crash involved a fixed object as opposed to another vehicle. It also shows that there is no difference in the likelihood of a pulmonary contusion in near-side lateral crashes that involve a fixed object or another vehicle.

Slide 36 – This slide lists the variables used in a multivariate analysis that analyzed the incidence of mortality among those with a pulmonary contusion.

Slide 37 – This slide shows the results of the second model, that pulmonary contusion is not a risk factor for mortality.

Slide 38 – This slide titles the next section, Coding.

Slide 39 – This slide shows a CT scan of a minor pulmonary contusion (same as the case detailed previously) and it’s associated injury severity score of 3.

Slide 40 – This slide shows CT scans of medium (same as the case detailed previously) and major pulmonary contusions and their associated injury severity scores of 3.

Slide 41 – This slide lists conclusions found by the study team.

Slide 42 – This slide is a continuation of slide 41 and lists more conclusions found by the study team.

Slide 43 – This slide lists limitations in this study, including the lack of airbag data and uniform severity scores (all unilateral pulmonary contusions are scored a 3 despite their size).

Slide 44 – This slide contains disclaimers identifying the National Highway Traffic Safety Administration (NHTSA) as the funding source for CIREN and the views expressed being those of the Maryland CIREN team and not those of NHTSA.

Slide 45 – This slide contains a word of thanks for the other participating CIREN centers.