

Catastrophic and Severe Injuries in Organized and Recreational Softball during the period 1985-2020



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INTRODUCTION

Softball is a sport played by millions of Americans each year at all levels of play, from children playing with their parents in their back yard to collegiate athletes and everything in between. In general, softball is considered a relatively safe sport¹. However, the participation of potentially vulnerable populations including youth, elderly, and individuals at levels of high competition creates an increased risk for catastrophic injury. Catastrophic injuries as defined by the National Center for Catastrophic Sport Injury Research (NCCSIR) are “fatalities, injuries that result in permanent functional disability, and serious injuries that result in temporary functional disability with full recovery.”² Knowledge of the prevalence and types of catastrophic injuries affecting softball participants will inform prevention measures at all levels of play.

PURPOSE

The purpose of this retrospective research study was to discuss the frequency of catastrophic and severe injury in the United States at organized and recreational levels of play during the period 1985-2020 for participants at all age groups.

METHODOLOGY

- The NEISS (or National Electronic Injury Surveillance System) is a database which has been operated by the Consumer Product Safety Commission in the United States for more than 45 years. This database collects product-related emergency department visits from a sample of 100 hospitals regarding product or sport related events. The NEISS records information regarding the type of injury and surrounding patient demographics, information about the injury, and other contextual information.
- The NEISS database was examined for softball-related injuries from the years 2001-2020. The product code for softball injuries relating to the activity itself, apparel, or equipment (5034) was used to identify cases. In order to stay within the scope of this paper relating to catastrophic and severe injuries as defined by the NCCSIR guidelines, eligible events included dispositions of “admitted to hospital” (codes 2, 4, and 5), “transferred” (code 6) and “fatalities” (code 8). Narrative reviews were conducted for all data to exclude cases which did not meet the NCCSIR guidelines of catastrophic sport injuries in organized sport. Therefore, cases which did not involve confirmed participants were excluded to ensure the scope of the study is limited to softball players in organized sport.
- The National Center for Catastrophic Sport Injury Research (NCCSIR) is an organization which conducts surveillance of catastrophic injuries within organized sports in the United States at the youth, high school, and collegiate levels. Cases are captured primarily through web searches of media reports or individual reports to sportinjuryreport.org.
- Catastrophic injury records were searched for injuries sustained during softball play for the years 1982-2020. Cases were identified and compiled to ensure that all relevant data was present. Ad hoc searches were conducted for cases to fill in missing information and gather additional information as needed. Cases were reviewed to ensure they were all related to organized play.

RESULTS

- The NEISS data produced a national estimate of 4,922 severe injuries and 169 fatalities among individuals participating in softball during the period 2001-2020. (Figure 1)
- The most common modality of injury was facial/skull fracture (49.3%), followed by internal organ injury (34.1%) and Other (15%), which included incidences of sudden cardiac arrest, myocardial infarction, seizure, heat exhaustion, heatstroke, and rupture of the eye. (Figure 2)
- Brain hemorrhage including subdural hematoma and subarachnoid hemorrhage, nerve damage, and lightning strike accounted for the remaining 0.8%, 0.4%, and 0.3% of injuries, respectively. (Figure 2)
- Of the fatalities reported in the NEISS data, 66.7% were due to cardiac arrest, and 33.3% were due to lightning strike.

Diagnosis	Disposition				Total
	Transferred	Admitted	Held for observation	Fatality	
Facial/Skull Fracture	1420	992	16	0	2428
Nerve Damage	0	5	15	0	20
Internal Organ Injury	446	1219	16	0	1681
Brain Hemorrhage	39	0	0	0	39
Lightning Strike	0	0	0	15	15
Other	135	366	84	154	739
Total	2040	2582	131	169	4922

Figure 1: Crosstabulation of severe injuries by diagnosis and disposition in the NEISS data

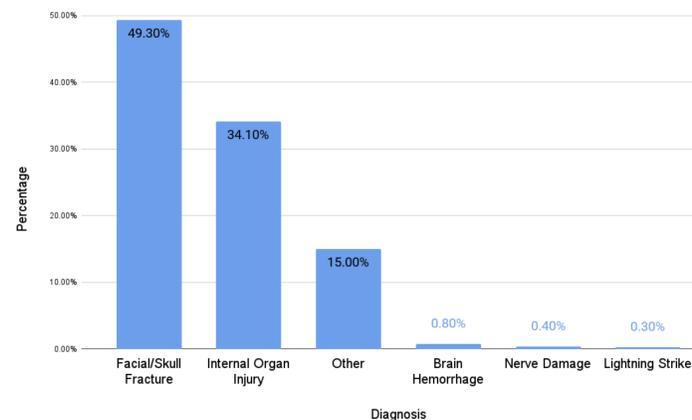


Figure 2: Bar graph presentation of frequency by diagnosis in the NEISS data (n=4922)

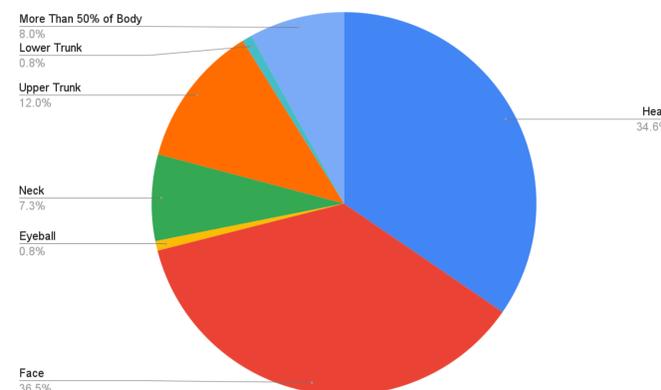


Figure 3: Pie chart presentation of injury frequency by body part in the NEISS data (n=4922)

- The NCCSIR database captured 9 fatal and 17 non-fatal injuries during the period 1985-2020.
- Among the fatal events 6 were due to sudden cardiac arrest, 1 due to traumatic brain injury, 1 due to commotio cordis, and 1 unknown.
- 35.3% of non-fatal injuries were due to facial/skull fracture, followed by 23.5% due to brain hemorrhage, 17% due to cervical spine injury, and one instance each of lower leg injury, hypertrophic cardiomyopathy, eye injury, and unknown. (Figure 4)

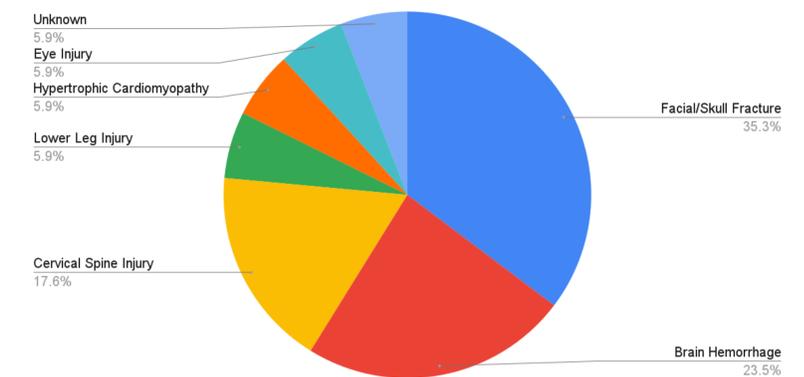


Figure 4: Distribution of non-fatal injuries in the NCCSIR data (n=17)

DISCUSSION

- The distribution of non-fatal catastrophic and severe injuries varied between the two data sources. The NCCSIR demonstrated a high percentage of brain hemorrhage and relatively high percentage of cervical spine injuries, both of which were represented at a low percentage in the NEISS.
- Facial/Skull fractures was the most common non-fatal injury in both databases.
- The percentage of sudden cardiac death was equal between both data sources (66.7%) and was the leading cause of death in softball participants
- Despite being the second largest cause of non-fatal catastrophic injury in the NEISS data, internal organ injury was not captured by the NCCSIR database.

CLINICAL RELEVANCE

- The high number of cardiac events resulting in fatalities suggests that participant EKG screening³, access to AEDs and CPR training for coaching personnel may prevent cardiac events and improve the chance of survival.
- Increased usage of protective face guards at high levels of competitive play could significantly decrease the number of catastrophic facial fractures.

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