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Epidemiology of Injuries in National Collegiate Athletic Association Men's Baseball: 2014–2015 Through 2018–2019

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Context: The National Collegiate Athletic Association has supported men's baseball championships since 1947. Since its inception, the number of participating teams and athletes has considerably expanded.

Background: Frequently conducting injury surveillance of collegiate baseball athletes is essential for identifying developing temporal patterns.

Methods: Exposure and injury data collected in the National Collegiate Athletic Association Injury Surveillance Program during 2014–2015 through 2018–2019 were analyzed. Injury counts, rates, and proportions were used to describe injury characteristics; injury rate ratios were used to examine differential injury rates.

Results: The overall injury rate was 3.16 per 1000 athlete-exposures. The preseason injury rate was significantly higher than the regular season injury rate. The most commonly injured body parts were shoulder (16.1%), arm or elbow (16%), and hand or wrist (13.9%). The most reported specific injury was hamstring tear (7.9%).

Conclusions: The findings of this study aligned with previous studies—most injuries were due to noncontact and overuse mechanisms, less than one-half of injuries were related to upper extremity body parts, and one-third of all injuries were reported among pitchers.

Key Words: collegiate, sport-related, surveillance

Key Points

- Across the study period, the competition injury rate was consistently higher than the practice injury rate in NCAA Men's Baseball.
- The overall preseason injury rate was higher than the regular season injury rate despite fluctuations of preseason and regular season injury rates across the study period.
- A majority of injuries were attributed noncontact and overuse mechanisms; moreover, the most reported specific injuries were hamstring tears (partial or complete) and lateral ligament complex tears (partial or complete) of the ankle.

Baseball is a popular sport in the United States, is well-participated in across all ages, and is among the most popular sports both at the high school and collegiate levels.[1] Particularly at the collegiate level, the National Collegiate Athletic Association (NCAA) reported 954 teams with 36 011 total athletes participating men's baseball in the 2018–2019 season.[1] Baseball routinely requires its participants to perform rapid acceleration in both the upper and lower extremities. Specifically, the overhead throw involves high-velocity shoulder internal rotation, causing significant stress on the glenohumeral joint[2] with ensuing stress on the medial anatomy of the elbow.[3] Furthermore, the lower extremities are also subjected to precipitously accelerate and decelerate in different directions.[4] Together, these movements place baseball athletes at high risk of various types of injury. Given the prominent popularity of baseball at the NCAA level, coupled with the aforementioned injury risk, routine monitoring of injuries sustained by baseball athletes is warranted to assess the effects of acute and long-term outcomes after injury.

Health surveillance systems have universally used tools to observe injury incidence and outcomes across a variety of diseases and are efficient techniques with which to study athlete population subtleties. The NCAA recognized the importance of monitoring injury characteristics (exposures, mechanisms, and details) among collegiate athletes and established the injury surveillance system in 1982,[5] which is now called the "Injury Surveillance Program" (ISP).[6] Although many researchers have examined injuries sustained by professional baseball players (for example, hamstring strains and ulnar collateral ligament injuries),[7–9]

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studies in which investigators examined the injury profile of collegiate baseball players remain comparatively limited. Wasserman et al[10] and Dick et al[11] have separately reported findings from epidemiological investigations of NCAA men's baseball injuries from different eras. Similar patterns, such as a higher incidence of competition injuries than practice injuries, were observed in both studies. Furthermore, it has been previously reported that the most commonly observed NCAA men's baseball injuries were upper extremity-related (shoulder, arm, or elbow) and resultant of noncontact and overuse mechanisms.[10] In particular, ulnar collateral ligament injuries are among the most prevalent injuries among baseball athletes and are associated with notable time loss (TL).[12–14] Conversely, hamstring strain injuries are among the most prevalent lower extremity injuries observed in this population and are also associated with notable TL.[15,16] Thus, it is imperative to continuously examine injury rates and trends across NCAA men's baseball-related injuries to inform athletic trainers (ATs) and other sports medicine staff. The purpose of this study was to describe the epidemiology of men's baseball-related injuries captured by the NCAA ISP between the 2014–2015 and 2018–2019 academic years.

METHODS

Study Data

Men's baseball-related exposure and injury data collected in the NCAA ISP during 2014–2015 through 2018–2019 were analyzed in this study. The methods of the NCAA ISP have been reviewed and approved as an exempt study by the NCAA Research Review Board. The methods of the surveillance program are detailed separately within this special issue. Briefly, ATs at participating institutions contributed relevant injury and exposure data by using their clinical electronic medical record systems. A reportable injury was one that occurred due to participation in an organized intercollegiate practice or competition and required medical attention by a team certified AT or physician (regardless of TL). Scheduled team practices and competitions were considered reportable exposures for this study. Data from 16 (2% of membership) participating programs in 2014–2015, 12 (1% of membership) in 2015–2016, 20 (2% of membership) in 2016–2017, 25 (3% of membership) in 2017–2018, and 89 (9% of membership) in 2018–2019 qualified for inclusion in these analyses. Qualification criteria are detailed in the aforementioned methods manuscript.[17]

Statistical Analysis

Injury counts and rates (per 1000 athlete exposures [AEs] in which 1 AE was defined as 1 athlete participating in 1 exposure event) were evaluated by event type (practice or competition), competition level (Division I, Division II, or Division III), season segment (preseason, regular season, or postseason), and TL (TL or non-TL [NTL]). Weighted and unweighted rates were estimated, and results were presented in terms of unweighted rates (due to low frequencies of injury observations across levels of certain covariates) unless otherwise specified. Temporal patterns in injury rates across the study period were evaluated using stratified (across aforementioned variables) rate profile plots. Similarly, temporal trends in rates of the most commonly reported injuries were also examined across the study period. Injury counts and proportions were examined by TL (TL or NTL), body parts injured, injury diagnoses, playing positions, and activities. Injury rate ratios (IRRs) were used to examine differential injury rates across event types, competition levels, and season segments. IRRs with associated 95% confidence intervals (CIs) excluding 1.00 were considered statistically significant. All analyses were conducted using SAS (version 9.4; SAS Institute).

RESULTS

A total of 1793 men's baseball injuries from 567 926 AEs were reported to the NCAA ISP during 2014–2015 through 2018–2019 academic years (rate = 3.16 per 1000 AEs). This equated to a national estimate of 64 053 injuries overall (Table 1). Markedly, 1016 injuries were sustained in competition during the study period, and the competition injury rate was higher than the practice injury rate overall (IRR = 1.58; 95% CI = 1.44, 1.73). Competition injury rates increased from 2014–2015 to 2015–2016 and then considerably decreased between 2015–2016 and 2017–2018 (Figure A). Likewise, the practice injury rate increased steadily between 2014–2015 and 2016–2017 and then slightly decreased and leveled off during 2017–2018 to 2018–2019 (Figure A). The overall Division I injury rate (rate = 3.62 per 1000 AEs) was higher than the Division II (rate = 2.82 per 1000 AEs) and Division III (rate = 3.12 per 1000 AEs) injury rates. Statistically significant differences were observed in comparisons between Division I and II (IRR = 1.28; 95% CI= 1.15, 1.44), and Division I and III (IRR = 1.16; 95% CI = 1.04, 1.30). Notably, no significant differences were observed between Division II and Division III injury rates.

Injuries by Season Segment

During the study period, 488 preseason injuries (national estimate: 19 646), 1269 regular season injuries (national estimate: 42 842), and 36 postseason injuries (national estimate: 1564) were reported in men's baseball (Table 2). The preseason injury rate was significantly higher than the regular season (IRR = 1.32; 95% CI = 1.19, 1.47) and postseason (IRR = 3.16; 95% CI = 2.25, 4.43) injury rates. Preseason injury rates increased sharply between 2014–2015 and 2016–2017, decreased slightly thereafter during 2016–2017 to 2017–2018, and increased again during the last year of the study (Figure B). Regular season injury rates increased between 2014–2015 and 2015–2016 and decreased thereafter (Figure B). Postseason was not included due to low injury frequency counts in select years.

Time Loss

Approximately one-third (33.6%) of all reported injuries resulted in TL of greater than or equal to 1 day (TL was not recorded in approximately 34% of all reported injuries), and NTL injuries accounted for a similar proportion. TL injuries accounted for similar proportions of both practice (33.1%) and competition (34%) injuries. Temporal patterns in TL injury incidence were comparable across event types. Competition- and practice-related TL injury rates increased during 2014–2015 to 2015–2016 (Figure C). Thereafter

Table 1. Reported and National Estimates of Injuries, AEs, and Rates Per 1000 AEs by Event Type Across Divisions[a]

Number / AEs / Rate/1000 AEs (95% CI)

Division	Overall		Practices		Competitions	
	Reported number	National Estimate	Reported	National Estimate	Reported	National Estimate
I	619	18299	189	5906	430	12393
	170899	5120715	83200	2642693	87699	2478022
	3.62 (3.34, 3.91)	3.57 (3.29, 3.86)	2.27 (1.95, 2.60)	2.23 (1.91, 2.56)	4.90 (4.44, 5.37)	5.00 (4.54, 5.46)
II	611	17473	262	8151	349	9323
	216623	5637994	121794	3448246	94829	2189748
	2.82 (2.60, 3.04)	3.10 (2.88, 3.32)	2.15 (1.89, 2.41)	2.36 (2.10, 2.62)	3.68 (3.29, 4.07)	4.26 (3.87, 4.64)
III	563	28280	326	18383	237	9897
	180404	7673413	105428	4735149	74976	2938264
	3.12 (2.86, 3.38)	3.69 (3.43, 3.94)	3.09 (2.76, 3.43)	3.88 (3.55, 4.22)	3.16 (2.76, 3.56)	3.37 (2.97, 3.77)
Overall	1793	64053	777	32439	1016	31613
	567926	18432122	310422	10826088	257504	7606034
	3.16 (3.01, 3.30)	3.48 (3.33, 3.62)	2.50 (2.33, 2.68)	3.00 (2.82, 3.17)	3.95 (3.70, 4.19)	4.16 (3.91, 4.40)

Abbreviations: AEs, athlete exposures; CI, confidence interval.

[a] Data are presented in the order of reported number, followed by athlete exposures (AEs), estimated injury rates, and associated 95% confidence intervals (CIs) for each cross-tabulation of division and event types. Data pooled association wide are presented overall and separately for practices and competitions. National estimates were produced using sampling weights estimated on the basis of sport, division, and year. All CIs were constructed using variance estimates calculated on the basis of reported data. A reportable injury was one that occurred due to participation in an organized intercollegiate practice or competition and required medical attention by a team certified athletic trainer or physician (regardless of time loss). Only scheduled team practices and competitions were retained in this analysis.

competition- and practice-related TL injury rates decreased until 2017–2018, and the competition-related TL injury rate increased slightly between 2017–2018 and 2018–2019 (Figure C).

Injury Characteristics

Overall, upper extremity injuries accounted for the largest proportion of all injuries reported during the study period, namely, shoulder (16.1%), arm or elbow (16%), and hand or wrist (13.9%). The most common injuries sustained during competitions were upper extremity injuries, namely, hand or wrist (18%), arm or elbow (16%), and shoulder (12.8%). Shoulder (20.3%) injuries and arm or elbow (16.1%) injuries accounted for the largest proportions of all reported practice injuries; thigh (10.9%) and trunk (10.3%) injuries also accounted for noteworthy proportions of all practice-related injuries. Injuries to the hand or wrist accounted for a greater proportion of competition injuries than practice injuries (18% versus 8.6%, respectively) (Table 3). Noncontact (33.2%), overuse (19.2%), and surface contact (10%) injuries accounted for most reported injuries (Table 3). Particularly, overuse injuries accounted for a greater proportion of practice injuries (26.1%) than competition injuries (13.9%).

Across the study period, strains (26.1%), sprains (14.3%), and contusions (13.2%) accounted for most reported men's baseball injures. Muscle strains accounted for a higher proportion of practice injuries (28.8%) than competition injuries (23.9%). Conversely, contusions accounted for a greater proportion of competition injuries (17.8%) than practice injuries (7.2%). The most commonly reported specific injuries during the study period were partial or complete hamstring tears (7.9%) and partial or complete lateral ligament complex tears (ankle sprains) (3.8%). The injury rate of hamstring tears fluctuated throughout the study period (Figure D). The overall injury rate of hamstring tears (partial or complete) was 2.5 per 10 000 AEs, and the overall injury rate of lateral ligament complex tears (partial or complete) was 1.23 per 10 000 AEs.

Injuries by Baseball-Specific Activities and Playing Positions

Most injuries in men's baseball between 2014–2015 and 2018–2019 occurred during pitching (18.5%), batting (13.4%), and base running (10.3%). Comparable proportions of competition (18.2%) and practice (18.8%) injuries were attributed to pitching, whereas batting (competition: 16.1%, practice: 9.8%) and base running (competition: 12.5%, practice: 7.5%) injuries accounted for larger proportions of competition injuries than practice injuries. A notable proportion of practice injuries was attributed to throwing (16.2%). Overall, most injuries reported during the study period were among pitchers (31.1%), outfielders (16.5%), and corner infielders (11%). Injuries to pitchers accounted for a larger proportion of practice injuries (35.7%) than competition injuries (27.6%). Injuries to outfielders and corner infielders accounted for comparable proportions of practice- and competition-related injuries (Table 4).

SUMMARY

This study aimed to describe the epidemiology of NCAA men's baseball-related injuries reported to the NCAA ISP between the 2014–2015 and 2018–2019 academic years. Consistent with previously reported findings, the competition injury rate was higher than the practice injury rate across the study period.[10,11] In comparison with 2005–2006 through 2013–2014, the competition and practice injury

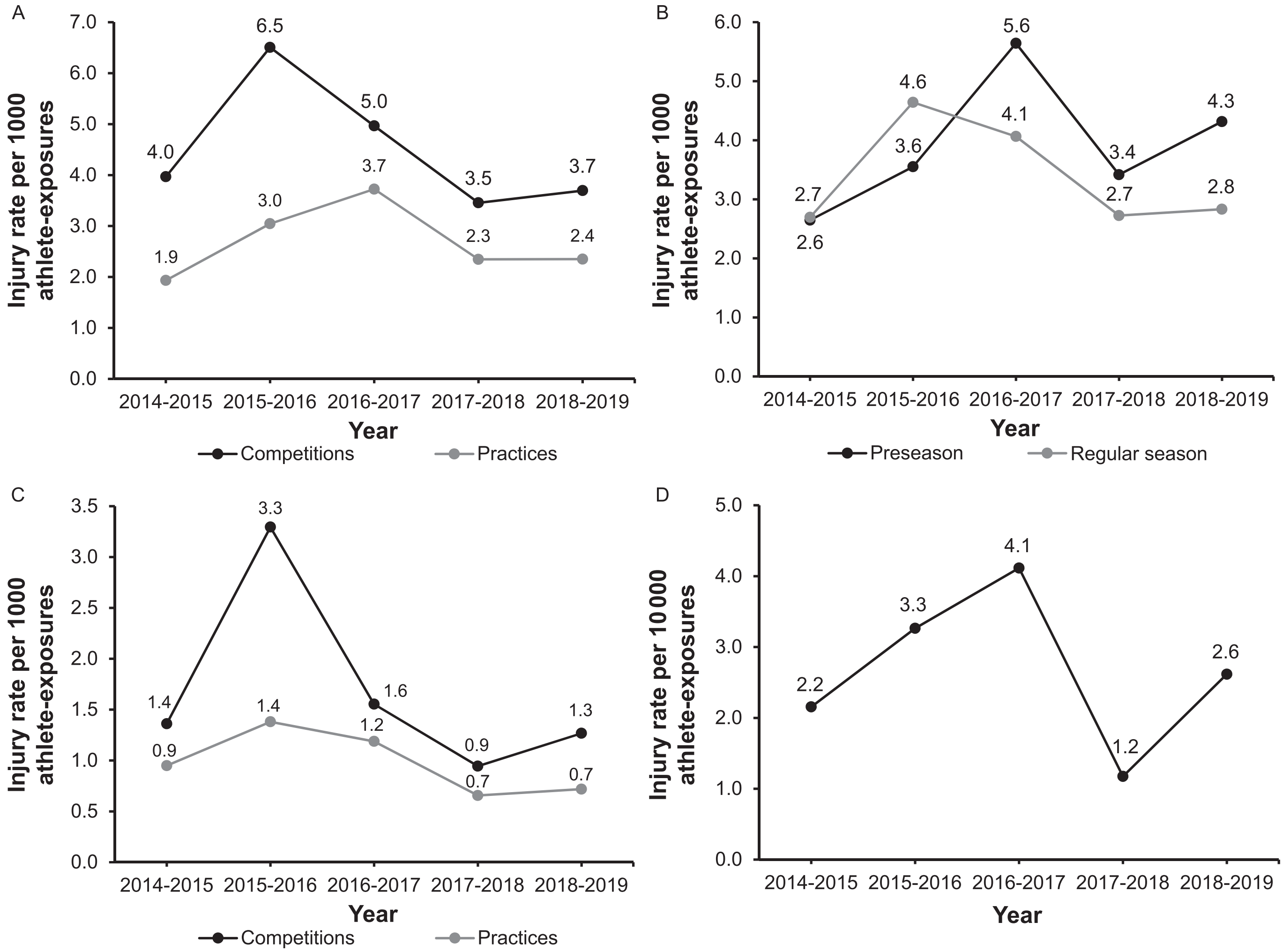

Figure. Temporal patterns in injury rates between 2014 and 2019. A, Depicts overall injury rates (per 1000 AEs) stratified by event type (competitions or practices). B, Depicts injury rates (per 1000 AEs) stratified by season segment. C, Depicts rates (per 1000 AEs) of time loss injuries stratified by event type (competitions or practices). D, Depicts rates (per 10 000 AEs) of the most commonly reported injury, namely, partial or complete hamstrings tear. Rates presented in all figures are unweighted and based on reported data.

rates observed in the current study were lower.[10] This difference may have been influenced by the implementation of more specialized training regimes, incorporating elements such as workload monitoring,[18] which has been ubiquitously adopted at the professional level to notable success in mitigating practice-related injuries. It would follow that competition-related injury incidence would also decrease as a result of workload monitoring and adjustment in the interest of reducing general and muscle fatigue. Resultantly, players may be better physiologically rested before competition. Data collection within the NCAA ISP, in its current form, does not include training details or workload-related data. Therefore, it remains challenging to truly assess this paradigm by using surveillance data. Future researchers should identify specific training adaptations that mitigate the burden of injury.

Preseason injury rates were significantly higher than regular and postseason injury rates. This may be attributable to the volume of offseason and preseason training involved in collegiate baseball. Preseason functional movement screenings have been observed to detect musculoskeletal inequalities that, if left unaddressed, may become exacerbated during preseason training, leading to injury.[19–21] As such, describing injury risk factors from preseason injury screenings needs additional attention.[19–21] Broadly, differences in injury rates across Division I, II, and III programs were observed in the present study and may be due to varied clinician-to-patient ratios, which is associated with patient health outcomes and has been observed to vary across divisions of competition.[22] Targeted, small-sample studies are warranted to further describe factors contributing to the observed results, including the ratio of athletes to ATs across different levels of collegiate baseball membership institutions.

Notably, sports injury surveillance is perhaps not well positioned to reconcile the relationship between risk factors, such as training volume, biomechanical deficiencies, and injury risk.[18,19] For instance, the NCAA ISP in its current state does not capture unique measures of potential risk exposure, such as pitch count, types of pitches thrown, or number of hits during batting practice. Including the abovementioned exposures may provide a more sensitive

Table 2. Reported and National Estimates of Injuries, AEs, and Rates Per 1000 AEs by Season Segment Across Divisions

Number
AEs
Rate per 1000 AEs (95% CI)

Division	Preseason		Regular Season		Post Season	
	Reported	National Estimate	Reported	National Estimate	Reported	National Estimate
I	106	3207	496	14475	17	618
	32847	1102118	129217	3782373	8835	236224
	3.23 (2.61, 3.84)	2.91 (2.30, 3.52)	3.84 (3.50, 4.18)	3.83 (3.49, 4.16)	1.92 (1.01, 2.84)	2.62 (1.70, 3.53)
II	171	5007	427	12110	13	356
	50593	1496413	156592	3952133	9438	189448
	3.38 (2.87, 3.89)	3.35 (2.84, 3.85)	2.73 (2.47, 2.99)	3.06 (2.81, 3.32)	1.38 (0.63, 2.13)	1.88 (1.13, 2.63)
III	211	11433	346	16257	6	590
	38093	1870364	132270	5401771	10040	401278
	5.54 (4.79, 6.29)	6.11 (5.37, 6.86)	2.62 (2.34, 2.89)	3.01 (2.73, 3.29)	0.60 (0.12, 1.08)	1.47 (0.99, 1.95)
Overall	488	19646	1269	42842	36	1564
	121533	4468895	418080	13136277	28313	826950
	4.02 (3.66, 4.37)	4.40 (4.04, 4.75)	3.04 (2.87, 3.20)	3.26 (3.09, 3.43)	1.27 (0.86, 1.69)	1.89 (1.48, 2.31)

Abbreviations: AEs, athlete exposures; CI, confidence interval.

[a] Data are presented in the order of reported number, followed by athlete exposures (AEs), estimated injury rates, and associated 95% confidence intervals (CIs) for each cross-tabulation of division and season segments. Data pooled association wide are presented overall and separately for preseason, regular season, and postseason. National estimates were produced using sampling weights estimated on the basis of sport, division, and year. All CIs were constructed using variance estimates calculated on the basis of reported data. A reportable injury was one that occurred due to participation in an organized intercollegiate practice or competition and required medical attention by a team certified athletic trainer or physician (regardless of time loss). Only scheduled team practices and competitions were retained in this analysis.

insight into injury risk in this population. The high prevalence of overuse mechanisms, as well as injury to the upper extremity, was identified in the present study. Given the complex interaction between risk factors, such as early specialization, workload management, and biomechanical factors, prevention and etiological studies of overuse upper extremity injuries in baseball are uniquely difficult.[19,20,23,24]

Intervention may require a multifaceted approach that involves all levels of baseball participation as well as adherence to suggested guidelines, such as pitch counts and rest days to minimize development of these injuries.[25,26] Future researchers should attempt to ascertain what preventative measures are used in collegiate baseball as well as player history regarding injury prevention measures during their adolescent careers.[27] Therefore, it may be prudent to consider alternative methods of capturing at-risk exposure time that may be best suited for the nuances of this sport. With that said, workload management has been investigated across different levels of baseball.[28–30] However, few researchers have investigated this subject in collegiate athletes.[31] Although workload management is theoretically logical, the evidence to support their effects on reducing the burden of risk remains mixed as it pertains to all positions other than pitchers (infielders, outfielders, and catchers). This is partly due to heterogeneity across metrics used and outcomes measured.[23] Among reported injuries, 31% were attributed to pitchers (of which 61.6% were to the upper extremity). Despite obvious differences in athlete characteristics and level of competition, the results observed here are comparable to those observed among youth (25% of youth players ages 9–12 years old) and professional (67% of pitchers to pitchers were to the upper extremity) baseball.[9,24,27,32,33] Pitching injuries have been exclusively studied in the context of workload management, including counting pitches thrown during warm-up, between innings, and during gameplay to study their burden of risk.[18] Among NCAA men's baseball athletes, evidence supporting the effect of workload management on reducing risk of injury has been inconsistent, and as such, studies in which researchers closely monitor baseball player activities during practice and competition are necessary.

The most common injury diagnoses reported in NCAA men's baseball across the study period were strains, sprains, and contusions; this result was consistent with previous findings within this population.[10] As strains are a hallmark injury in nearly 26% of all reported injuries, further attention should be given to reduce the burden of this deleterious injury. Among collegiate baseball players, the most commonly reported specific injury was hamstring tear (partial or complete), which is consistent with reports from previous researchers investigating professional and youth baseball athletes.[9,15] Hamstring tears were most commonly reported among infielders (24.3%), outfielders (25.7%), and pitchers (24.3%). This is not surprising given that these athletes repeatedly make split-second reactions using significant explosive movements[4] to cover ground toward a batted ball during gameplay. The increasing incidence trajectory of hamstring tears from 2014–2015 to 2016–2017, followed by a sharp decrease in 2017–2018, should be given further attention. Previous researchers implementing prophylactic injury prevention strategies (among professional baseball players), including increasing range of motion and muscle extensibility, have demonstrated varied degrees of risk reduction.[9,34,35] Athlete-specific muscular injuries such as hamstring tears are observed to be associated with persistent symptoms, lengthy recovery periods, and increased risk of reinjury.[36] Granular athlete-level data may be needed to better understand hamstring tears and associated temporal

Table 3. Distribution of Injuries by Body Part, Mechanism, and Injury Diagnosis Stratified by Event Type[a]

	Overall		Competitions		Practices	
	Injuries Reported (%)	National Estimate (%)	Injuries Reported (%)	National Estimate (%)	Injuries Reported (%)	National Estimate (%)
Injury site						
Head/face	123 (6.86)	3672 (5.73)	81 (7.97)	2235 (7.07)	42 (5.41)	1437 (4.43)
Neck	18 (1.00)	679 (1.06)	10 (0.98)	335 (1.06)	8 (1.03)	344 (1.06)
Shoulder	288 (16.06)	10 266 (16.03)	130 (12.80)	3845 (12.16)	158 (20.33)	6421 (19.79)
Arm/elbow	287 (16.01)	9979 (15.58)	162 (15.94)	5185 (16.40)	125 (16.09)	4794 (14.78)
Hand or wrist	250 (13.94)	8110 (12.66)	183 (18.01)	5378 (17.01)	67 (8.62)	2731 (8.42)
Trunk	159 (8.87)	6113 (9.54)	79 (7.78)	2502 (7.91)	80 (10.30)	3611 (11.13)
Hip/groin	80 (4.46)	3039 (4.74)	37 (3.64)	1445 (4.57)	43 (5.53)	1594 (4.91)
Thigh	199 (11.10)	8019 (12.52)	114 (11.22)	3727 (11.79)	85 (10.94)	4292 (13.23)
Knee	132 (7.36)	4850 (7.57)	71 (6.99)	2241 (7.09)	61 (7.85)	2609 (8.04)
Lower leg	74 (4.13)	2944 (4.60)	45 (4.43)	1468 (4.64)	29 (3.73)	1476 (4.55)
Ankle	106 (5.91)	3871 (6.04)	56 (5.51)	1984 (6.28)	50 (6.44)	1887 (5.82)
Foot	40 (2.23)	1348 (2.10)	26 (2.56)	714 (2.26)	14 (1.80)	635 (1.96)
Other	37 (2.06)	1162 (1.81)	22 (2.17)	555 (1.76)	15 (1.93)	608 (1.87)
Mechanism						
Player contact	78 (4.35)	2603 (4.06)	61 (6.00)	1905 (6.03)	17 (2.19)	698 (2.15)
Surface contact	180 (10.04)	6547 (10.22)	117 (11.52)	3742 (11.84)	63 (8.11)	2805 (8.65)
Bat contact	25 (1.39)	981 (1.53)	19 (1.87)	517 (1.64)	6 (0.77)	465 (1.43)
Batted ball	112 (6.25)	3468 (5.41)	85 (8.37)	2656 (8.40)	27 (3.47)	812 (2.50)
Pitch	109 (6.08)	3737 (5.83)	84 (8.27)	2829 (8.95)	25 (3.22)	908 (2.80)
Thrown ball	22 (1.23)	773 (1.21)	9 (0.89)	321 (1.02)	13 (1.67)	452 (1.39)
Base contact	46 (2.57)	1312 (2.05)	39 (3.84)	1013 (3.20)	7 (0.90)	299 (0.92)
Noncontact	595 (33.18)	22 821 (35.63)	311 (30.61)	10 399 (32.89)	284 (36.55)	12 422 (38.29)
Other contact	62 (3.46)	2335 (3.65)	40 (3.94)	1070 (3.38)	22 (2.83)	1266 (3.90)
Overuse	344 (19.19)	12 174 (19.01)	141 (13.88)	4332 (13.70)	203 (26.13)	7842 (24.17)
Illness/infection	27 (1.51)	851 (1.33)	17 (1.67)	490 (1.55)	10 (1.29)	362 (1.12)
Other or unknown	193 (10.76)	6451 (10.07)	93 (9.15)	2340 (7.40)	100 (12.87)	4111 (12.67)
Diagnosis						
Abrasion/laceration	34 (1.90)	1808 (2.82)	19 (1.87)	725 (2.29)	15 (1.93)	1083 (3.34)
Concussion	54 (3.01)	1195 (1.87)	40 (3.94)	894 (2.83)	14 (1.80)	301 (0.93)
Contusion	237 (13.22)	7649 (11.94)	181 (17.81)	5637 (17.83)	56 (7.21)	2011 (6.20)
Dislocation/subluxation	67 (3.74)	2205 (3.44)	49 (4.82)	1509 (4.77)	18 (2.32)	696 (2.15)
Entrapment/impingement	60 (3.35)	2377 (3.71)	22 (2.17)	880 (2.78)	38 (4.89)	1497 (4.61)
Fracture	62 (3.46)	1829 (2.86)	48 (4.72)	1326 (4.19)	14 (1.80)	504 (1.55)
Illness/infection/ derm.	11 (0.61)	391 (0.61)	5 (0.49)	147 (0.46)	6 (0.77)	244 (0.75)
Inflammatory condition	207 (11.54)	6560 (10.24)	82 (8.07)	2064 (6.53)	125 (16.09)	4497 (13.86)
Spasm	94 (5.24)	3612 (5.64)	44 (4.33)	1815 (5.74)	50 (6.44)	1797 (5.54)
Sprain	257 (14.33)	9049 (14.13)	155 (15.26)	4357 (13.78)	102 (13.13)	4693 (14.47)
Strain	467 (26.05)	18 313 (28.59)	243 (23.92)	7414 (23.45)	224 (28.83)	10 899 (33.60)
Other	243 (13.55)	9064 (14.15)	128 (12.60)	4846 (15.33)	115 (14.80)	4218 (13.00)

[a] Data are presented in the order of reported number, followed by the proportion of all injuries attributable to a given category. Data pooled across event types are presented overall and separately for practices and competitions. National estimates were produced using sampling weights estimated on the basis of sport, division, and year. A reportable injury was one that occurred due to participation in an organized intercollegiate practice or competition and required medical attention by a team certified athletic trainer or physician (regardless of time loss). Only scheduled team practices and competitions were retained in this analysis.

dynamics. Although the methods of surveillance systems preclude direct etiological inferences, these results are worthy of further discussion. Sports injury surveillance may be augmented with additional athlete-level measures to capture this information in the future.

In summary, regular surveillance of NCAA men's baseball injuries is crucial, as it offers critical understanding of injury incidence and related outcomes within this population. Here, we demonstrate unique injury characteristics (for example, mechanisms of injury and commonly injured body parts) that can be targeted for injury prevention initiatives. By using surveillance systems, we have the capacity to elucidate underlying injury patterns among sports that subsequent researchers can use to explain the etiology of injury risk and sequalae within this group of student-athletes.

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Table 4. Distribution of Injuries by Men's Baseball-Specific Activities and Player Position

	Overall		Competitions		Practices	
	Injuries Reported (%)	National Estimate (%)	Injuries Reported (%)	National Estimate (%)	Injuries Reported (%)	National Estimate (%)
Activity						
Base running	185 (10.32)	7479 (11.68)	127 (12.50)	3983 (12.60)	58 (7.46)	3495 (10.77)
Batting	240 (13.39)	7433 (11.60)	164 (16.14)	5128 (16.22)	76 (9.78)	2305 (7.11)
Conditioning	43 (2.40)	2338 (3.65)	2 (0.20)	112 (0.35)	41 (5.28)	2226 (6.86)
Fielding	149 (8.31)	4258 (6.65)	99 (9.74)	2968 (9.39)	50 (6.44)	1290 (3.98)
General play	89 (4.96)	3860 (6.03)	46 (4.53)	1520 (4.81)	43 (5.53)	2339 (7.21)
Chasing/diving	74 (4.13)	2178 (3.40)	52 (5.12)	1132 (3.58)	22 (2.83)	1046 (3.22)
Pitching	331 (18.46)	12 459 (19.45)	185 (18.21)	6383 (20.19)	146 (18.79)	6076 (18.73)
Catching	85 (4.74)	3986 (6.22)	47 (4.63)	1849 (5.85)	38 (4.89)	2138 (6.59)
Running	123 (6.86)	4816 (7.52)	60 (5.91)	1788 (5.66)	63 (8.11)	3028 (9.33)
Sliding	57 (3.18)	2096 (3.27)	47 (4.63)	1656 (5.24)	10 (1.29)	441 (1.36)
Throwing	211 (11.77)	7743 (12.09)	85 (8.37)	2660 (8.41)	126 (16.22)	5083 (15.67)
Other/unknown	206 (11.49)	5406 (8.44)	102 (10.04)	2434 (7.70)	104 (13.38)	2972 (9.16)
Position						
Base runner	119 (6.64)	4714 (7.36)	94 (9.25)	3269 (10.34)	25 (3.22)	1446 (4.46)
Batter	122 (6.80)	3899 (6.09)	89 (8.76)	2896 (9.16)	33 (4.25)	1003 (3.09)
Catcher	177 (9.87)	6094 (9.51)	89 (8.76)	2709 (8.57)	88 (11.33)	3385 (10.43)
Corner infielder	197 (10.99)	7921 (12.37)	105 (10.33)	3152 (9.97)	92 (11.84)	4769 (14.70)
Middle infielder	193 (10.76)	5264 (8.22)	115 (11.32)	2823 (8.93)	78 (10.04)	2441 (7.52)
Outfielder	295 (16.45)	11 271 (17.60)	179 (17.62)	5781 (18.29)	116 (14.93)	5490 (16.92)
Pitcher	557 (31.07)	21 114 (32.96)	280 (27.56)	9389 (29.70)	277 (35.65)	11 726 (36.15)
Unknown/other	133 (7.42)	3776 (5.90)	65 (6.40)	1595 (5.05)	68 (8.75)	2180 (6.72)

Note: Data presented in the order of reported number, followed by the proportion of all injuries attributable to a given category. Data pooled across event types are presented overall, and separately for practices and competitions. National estimates were produced using sampling weights estimated on the basis of sport, division, and year. A reportable injury was one that occurred due to participation in an organized intercollegiate practice or competition, and required medical attention by a team certified athletic trainer or physician (regardless of time loss). Only scheduled team practices and competitions were retained in this analysis.

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