PRE-PARTICIPATION INJURY RISK STATUS AS A PREDICTOR OF MEDICAL EXPENDITURES AND SECONDARY INSURANCE COSTS FOR COLLEGE FOOTBALL PLAYERS

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BACKGROUND AND PURPOSE

- Athletes who have elevated injury risk may impose greater injury treatment costs on college athletic programs
- Little evidence exists to guide strategies for reduction of sports injuries and their associated costs[1]
- Predictive modeling has been used to identify high-risk athletes,[2] but has not been used to assess related costs
- Core and lower extremity (LE) sprains and strains account for approximately 65% of college football injuries[2]
- The purpose of this study was to evaluate pre-participation categorization of college football players as high-risk versus low-risk for prediction of subsequent costs associated with treatment of sport-related injuries

SUBJECTS AND PROCEDURES

- 171 NCAA Division I-FCS football players who participated in the 2009 and 2010 seasons
  - Age: 19.9 1.5 years; Height: 1.85 0.07 m; Weight: 100.97 18.70 kg
- Wall Sit Hold (WSH) test and Oswestry Disability Index (ODI) survey administered with pre-participation exam
- High-Risk classification based on ≥ 2 of 3 risk factors identified by previous analyses [3]
  1) Starter: ≥ 1 game
  2) Low WSH time: ≤ 60 sec (2009 bilateral test) or ≤ 41 sec (2010 non-dominant unilateral test)
  3) High ODI: ≥ 4 points
- Classification of players: 46 High-Risk and 125 Low-Risk in terms of core or LE sprain / strain susceptibility
- Operational definition of injury:
  - Interruption of participation in practice session or competition event
  - Evaluation by athletic trainer or physician
  - Administration of therapeutic procedures
  - Inclusion on coach's injury report
- Records reviewed to obtain injury treatment cost data, i.e. primary and secondary insurance payments
  - Cost related to treatments administered in athletic training room not included
  - In-house fluoroscopy limited insurance payments for diagnostic imaging in many cases
- Analyses of injury treatment cost data:
  - Total insurance payments (primary + secondary) for core or LE sprain / strain
  - Total insurance payments (primary + secondary) for any musculoskeletal (MSK) injury (including fractures)

RESULTS

- Costs for core or LE sprain / strain (Total payments: $133,309; Secondary payments: $14,516)
  - Among 46 High-Risk players – 87% (40/46) injured; 37% (17/46) with treatment costs ($79,159; $9,787)
  - Among 125 Low-Risk players – 30% (38/125) injured; 8% (10/125) with treatment costs ($54,150; $4,729)
    - Total insurance payments per player: High-Risk 4 X greater than Low-Risk
    - Secondary insurance payments per player: High-Risk 5.6 X greater than Low-Risk
- Costs for any MSK (core or upper / LE + fracture) injury (Total payments: $224,604; Secondary payments $25,893)
  - Among 46 High-Risk players – 37% (17/46) with treatment costs ($109,375; $14,678)
  - Among 125 Low-Risk players – 8% (10/125) with treatment costs ($115,229; $11,215)
    - Total insurance payments per player: High-Risk 2.5 X greater than Low-Risk
    - Secondary insurance payments per player: High-Risk 3.5 X greater than Low-Risk
- Average per player secondary payment for 27 injured players with any cost for core or LE sprain / strain ($538)
  - 17 of 40 injured High-Risk players: $576
  - 10 of 38 injured Low-Risk players: $473
    - Average per injured player who imposed any cost 1.2 X greater for High-Risk than Low-Risk

Core or LE Sprain / Strain Prediction		
Group	Injury	No Injury
High-Risk	40	6
Low-Risk	38	87
Total	78	93
Fisher's exact p <.001		
Sensitivity = .51	Specificity = .94	
+LR = 7.95	-LR = .52	
OR = 7.95 / .52 = 15.26 (90% CI: 6.94 - 33.56)	RR = .870 / .303 = 2.86 (90% CI: 2.25 - 3.64)	

Injury Treatment Cost Prediction*		
Group	Any Cost	No Cost
High-Risk	17	29
Low-Risk	10	115
Total	27	144
Fisher's exact p <.001		
Sensitivity = .63	Specificity = .80	
+LR = 3.13	-LR = .46	
OR = 3.13 / .46 = 6.74 (90% CI: 3.22 - 14.12)	RR = .370 / .080 = 4.62 (90% CI: 2.56 - 8.34)	

* Same case distribution for core or LE sprain / strain and any musculoskeletal injury

		Core or LE Sprain / Strain		Any MSK Injury	
		Total	Secondary	Total	Secondary
Per player within group	High-Risk (n=46)	$1,721	$213	$2,378	$319
	Low-Risk (n=125)	$433	$38	$922	$90
Per injured player within group	High-Risk (n=40)	$1,979	$245	$2,734	$367
	Low-Risk (n=38)	$1,425	$124	$3,032	$295

Treatment Cost for Any MSK Injury Relative to Number of Risk Factors for Core or LE Sprain / Strain						
Risk Factors	N	Any Cost	Total Cost	Total Cost Average per Player	Secondary Cost	Secondary Cost Average per Player
0	60	0	$0	$0	$0	$0
1	63	9	$131,751	$2,091	$12,337	$181
≥2	43	18	$92,852	$2,159	$13,556	$315

CONCLUSIONS

- The WSH test, ODI survey, and anticipated game exposure can categorize athletes as high- or low-risk for injury
  - Categorization of injury risk also appears to identify athletes who will impose higher costs for medical services
- Although the 3-factor injury prediction model was developed to identify players at-risk for core or LE sprain / strain, the model also appears to identify players who will impose higher costs for other MSK injuries as well
  - Individualized injury prevention programs for high-risk players may reduce secondary insurance expenditures

REFERENCES

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3. Wilkerson GB, et al. Prediction of core and lower extremity strains and sprains in collegiate football players: a preliminary study. *J Athl Train.* 2012;7 (in press).