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DEVELOPMENT OF A PREDICTION MODEL FOR HIP REPLACEMENT AMONGST FORMER ELITE RUGBY PLAYERS

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Abstract:

Purpose: Hip osteoarthritis has been shown to be the highest musculoskeletal morbidity amongst former elite rugby players, with over 6 times the prevalence of hip replacement when compared to the general population. Identifying predictive factors associated with hip replacement as well as of their relative importance may help to develop medical and educational strategies to reduce this health problem. The purpose of this analysis was to develop a prediction model to identify those individuals at the highest risk of hip replacement.

Methods: Data from a cross-sectional study of English former elite rugby union players, undertaken between 2014 and 2016, was used to develop the prediction model. The outcome was self-reported hip replacement. Candidate predictors were identified from the literature and clinical expertise, and then revised based on clinical and sporting judgement. These included age, playing BMI, total years, level and primary position of play, professional status, number of games, weekly hours of training as a youth and adult, slipped upper femoral epiphysis (SUFE), hip dysplasia, severe hip injury, and a family history of hip OA. Missing predictor data was imputed using multiple imputation by chained equations. A logistic regression model was fitted with the least absolute shrinkage selection operator (LASSO) in R. A 10-fold internal cross-validation with the mean-squared error was performed to assess non-zero coefficients, and therefore identify significant predictor variables. Regression model assumptions and diagnostics were checked, and the predictive ability of each model was examined by discrimination and calibration measures.

Results: Of the 259 participants in this study, five had missing data on outcome, and therefore those were excluded for the analysis. 39 players (15.4%) had received a hip replacement. Players were on average 60.5 years of age, with a mean playing BMI of 27.9kg/m², and a mean lifetime playing exposure of 22.3 years. Of all candidate predictors, lasso regression selected ten important variables to be included into the final model. These were hip injury, age, SUFE, professional status, family history, playing position, level of play, hours per week training as a youth, total years of rugby, and current BMI. In the full multivariable model, hip injury, age, SUFE, family history and playing in the second row or as a centre, wing or fullback, were significant predictors of hip replacement. The area under the receiver operator curve (AUROC) for this model, was 0.89.

Conclusions: This analysis demonstrated that it is possible to develop a prediction model for hip replacement amongst former elite players, with a relatively small dataset. Injury, age, SUFE, family history and position of play were seen to be key predictors of hip replacement. These specific risk factors should be further investigated to better understand the progression of osteoarthritis, and manage and mitigate the risk of hip replacement, within this population.

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