A SYSTEMATIC REVIEW OF PROPENSITY SCORE METHODS USED IN ORTHOPAEDIC RESEARCH

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Purpose: Propensity score (PS) is an analytical method to address unbalanced confounders among nonrandomized study subjects, in order to diminish selection bias. There is a tendency that an increasing number of studies use PS in orthopaedic research. However, the quality of reporting in this field has not been fully evaluated. The purpose of this study was to systematically review the PS methods used in orthopaedic research, identifying any existing reporting issue and associated bias.

Methods: Four databases were searched from Jan 1st, 2008 to December 5th, 2018: Medline, EMBASE, CINAHL, and Cochrane Central Register of Controlled Trials. Inclusion criteria were: 1) orthopaedic conditions; 2) applying any propensity score methods; 3) observational studies and controlled trials; 4) published studies. We also excluded those only planned but not actually used PS. For each study included, we extracted data for the characteristics of the studies (e.g. year, journal, study questions etc.) and the PS methods used (e.g. type of PS analysis, method to choose variable included in the PS, missing data reporting, etc.); if the studies used PS-matching analysis, we also extracted details of the matching methods (e.g. ratio of matching, use of replacement etc.). Descriptive statistics were summarized in tables, using percentages for categorical variables and median (Q1-Q3) for continuous variables.

Results: We identified 528 studies with PS analysis after two rounds of paper screening. The number of studies has increased over the past ten years, from only 2 published in 2008 to 166 in 2018. Most of the studies were cohort studies (including retrospective cohort); others were case-controlled studies. A majority of these studies used PS-matching analysis (77%) and regarded PS analysis as the main analysis (93%). However, only 80% reported details of variables included in the PS models, and hardly did they report how they chose these variables. A small portion of studies reported the rate of missing data (23%), and how they dealt with these data (26%). For those studies with PS matching, only 4% reported all the four main features of matching methods for reproducibility- the ratio of matching, the method for matching, use of replacement, and analysis used. In addition, though most studies presented the comparison of interventional and control groups in a table, less than half of the studies (43%) compared the initial and matched population.

Conclusion: The popularity of incorporating PS analysis in statistical methods has been increasing in orthopaedic research; yet, the reporting of the PS methods was hardly adequate. Most of the methods could not be reproduced due to missing key features. When appraising each individual study, we cannot rule out selection bias due to lacking the report of missing data and the imbalance assessment between original and matched population. We recommended that a standard should be proposed for the reporting of studies using propensity score methods in orthopaedic research.