**Article Full Title**

Lumbopelvic manipulation for the treatment of patients with patellofemoral pain syndrome: development of a clinical prediction rule

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**Paper Abstract**

The purpose of this study was to investigate the effectiveness of lumbopelvic manipulation at reducing symptoms of patellofemoral pain syndrome (PFPS) and to create a clinical prediction rule for the potential of immediate success of lumbopelvic manipulation in patients with PFPS. A prospective cohort/predictive validity study was conducted and included fifty subjects, male and female, between the ages of 18 and 45 years with PFPS. Each patient underwent a standardized history and physical examination, and then performed three traditionally pain-provoking exercises followed by use of the Numeric Pain Rating Scale (NPRS) and the Global Rating of Change Questionnaire to evaluate severity of symptoms. After the assessment, all patients were treated with lumbopelvic manipulation, and then underwent a re-test of the three exercises. The criteria for success was a 50% or greater reduction in pain on the NPRS, or moderate or greater improvement on the Global Rating of Change Questionnaire after lumbopelvic manipulation. Five predictor variables were established using a binary logistic regression model, and the strongest predictor of success was hip internal rotation asymmetry of greater than 14 degrees. A clinical prediction rule was established to predict success of lumbopelvic manipulation in patients with PFPS, but more research is needed to validate the clinical prediction rule due to a limited sample size and omission of some predictor variables.

**NIH Risk of Bias Tool**

Quality Assessment Tool for Observational Cohort and Cross-Sectional Studies

1. **Was the research question or objective in this paper clearly stated?**

Yes

1. **Was the study population clearly specified and defined?**

Yes

1. **Was the participation rate of eligible persons at least 50%?**

Cannot Determine, Not Reported, Not Applicable

1. **Were all the subjects selected or recruited from the same or similar populations (including the same time period)? Were inclusion and exclusion criteria for being in the study prespecified and applied uniformly to all participants?**

Yes

1. **Was a sample size justification, power description, or variance and effect estimates provided?**

No

1. **For the analyses in this paper, were the exposure(s) of interest measured prior to the outcome(s) being measured?**

Yes

1. **Was the timeframe sufficient so that one could reasonably expect to see an association between exposure and outcome if it existed?**

Yes

1. **For exposures that can vary in amount or level, did the study examine different levels of the exposure as related to the outcome (e.g., categories of exposure, or exposure measured as continuous variable)?**

Yes

1. **Were the exposure measures (independent variables) clearly defined, valid, reliable, and implemented consistently across all study participants?**

Yes

1. **Was the exposure(s) assessed more than once over time?**

Yes

1. **Were the outcome measures (dependent variables) clearly defined, valid, reliable, and implemented consistently across all study participants?**

Yes

1. **Were the outcome assessors blinded to the exposure status of participants?**

Cannot Determine, Not Reported, Not Applicable

1. **Was loss to follow-up after baseline 20% or less?**

Yes

1. **Were key potential confounding variables measured and adjusted statistically for their impact on the relationship between exposure(s) and outcome(s)?**

Yes

**Key Finding #1**

45% of patients with patellofemoral pain syndrome (PFPS) experienced a reduction in symptoms that met the study’s criteria for success immediately following lumbopelvic manipulation.

**Key Finding #2**

The strongest predictor of success of lumbopelvic manipulation was hip internal rotation asymmetry of greater than 14 degrees, which increased the post-test probability of success of lumbopelvic manipulation to 80%.

**Key Finding #3**

**Key Finding #4**

**Please provide your summary of the paper**

The study found that 45% of patients with patellofemoral pain syndrome (PFPS) experienced a reduction in symptoms that met the study’s criteria for success immediately following lumbopelvic manipulation. This study evaluated patient-reported symptoms immediately after lumbopelvic manipulation, which differed from previous studies that have been conducted. Notably, the strongest predictor of success was hip internal rotation asymmetry; if a patient in this group had asymmetry in hip internal rotation of more than 14 degrees, post-test probability for success of lumbopelvic manipulation increased to 80%. Although this is a notable finding, the study could not establish a cause and effect relationship between lumbopelvic manipulation and decreased PFPS symptoms due to the lack of a control group or a competing intervention in the study. The authors developed a clinical prediction rule to help determine which patients with PFPS may be most appropriate for a lumbopelvic manipulation as an intervention for PFPS. Five variables were established as predictors for success by linear regression analysis. The five variables were: side to side difference in hip internal rotation greater than or equal to 14 degrees, ankle dorsiflexion (knee flexed) greater than 16 degrees, navicular drop greater than three mm, no self-reported stiffness with sitting greater than 20 minutes, and squatting reported as the most painful activity. However, the sample size was limited and further research is necessary to establish validity of this clinical prediction rule. Although more research is needed in this area, the study suggests that lumbopelvic manipulation may be a successful intervention to reduce symptoms in patients with PFPS.

**Please provide your clinical interpretation of this paper. Include how this study may impact clinical practice and how the results can be implemented.**

This study suggests that lumbopelvic manipulation can be an effective intervention in patients with PFPS, particularly in those patients with hip internal rotation asymmetry greater than 14 degrees. Of clinical significance, the study suggested that lumbopelvic manipulation may lead to a decrease in self-reported pain scores in patients with PFPS. Although the clinical prediction rule was not validated, the results of this study established five predictor variables that can assist clinicians in considering which patients with PFPS may respond most favorably to lumbopelvic manipulation. Ultimately, this may help clinicians be more efficient in identifying PFPS patients who may respond positively to lumbopelvic manipulation and may be used in patients with irritable symptoms in an effort to decrease pain level in patients with PFPS.