Review Article

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An Overview of Clinical Prediction Rules in Low Back Pain: Clinical Decision Making in Likelihood for (UN) Certainty

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Abstract

Clinical prediction rules (CPR) or clinical decision rules (CDR) use a cluster of symptoms and signs to identify and subgroup patients who were likely to present with a particular diagnosis (diagnostic CPR), or to respond to a treatment (therapeutic CPR) or to have a change in outcome (prognostic CPR). The objective of this review article was to update the utility of CPRs for clinical decision making in evaluation and treatment of people with low back pain (LBP) from an evidence-informed perspective. The CPRs on LBP provide a clinical direction but not a defnitive decision rule for predicting diagnosis, therapy and prognosis. There were two reviews, four studies on spinal manipulation, one study on stabilization exercise, one study on mechanical diagnosis and therapy, one study on pilates-based exercise and one study on mechanical lumbar traction. In addition, there was one study each on prescription, rate of recovery and return to work. The reviewed studies were mostly on development and few were on validation, with no study found on impact analysis of CPR in LBP. There is thus scope for future research in this area.

Keywords: Clinical Examination; Clinical Decision Making; Orthopedic Decision Making; Orthopedic Rehabilitation.

Clinical prediction rules (CPR) or clinical decision rules (CDR) use a cluster of symptoms and signs to identify and subgroup patients who were likely to present with a particular diagnosis (diagnostic CPR), or to respond to a treatment (therapeutic CPR) or to have a change in outcome (prognostic CPR). The objective of this review article was to update the utility of CPRs for clinical decision making in evaluation and treatment of people with low back pain (LBP) from an evidence-informed perspective.

Spinal Manipulation

Childs et al[1] validated the CPR in their multicenter randomized, controlled trial of 131 patients who were randomly assigned to receive manipulation plus exercise or exercise alone by a physical therapist for 4 weeks. Clinical prediction rule criteria (symptom duration, symptom location, fear-avoidance beliefs, lumbar mobility, and hip rotation range of motion) was used to select patients. "Treatment effects are greatest for the subgroup of patients who were positive on the rule (at least 4 of 5 criteria met); health care utilization among this subgroup was decreased at 6 months. Compared with patients who were negative on the rule and received exercise, the odds of a successful outcome among patients who were positive on the rule and received manipulation were 60.8. A patient who was positive on the rule and received manipulation has a 92% chance of a

successful outcome, with an associated number needed to treat for benefit at 4 weeks of 1.9."

Cleland et al [2] examined the generalizability of 3 different manual therapy techniques in CPR-satisfying 112 LBP patients who were randomly assigned to receive 1 of the 3 manual therapy techniques for 2 consecutive treatment sessions followed by exercise regimen for an additional 3 sessions. Although ODQ and NPRS showed group-time interactions, no differences between the supine thrust manipulation and side-lying thrust manipulation were found at any follow-up period. Thrust differed from non-thrust manipulation for ODQ and NPRS at 1-week and 4-weeks. Thrust group also had better ODQ at 6-months follow-up. The study findings supported the generalizability of the CPR to another thrust manipulation technique, but not to the nonthrust manipulation technique.

Flynn et al [3] developed a CPR for identifying patients for their likelihood to improve following spinal manipulation in their cohort study of 71 patients with nonradicular LBP of whom 32 had successful outcome. The CPR had five variables (symptom duration, fear-avoidance beliefs, lumbarhypomobility, hip internal rotation range of motion, and no symptoms distal to the knee) and the presence of four out of five of these variables (positive likelihood ratio = 24.38) increased the probability of success with manipulation from 45% to 95%.

Fritz et al [4] examined the association between duration and distribution of symptoms, and prognosis after spinal manipulation in 141 patients (with symptoms of <16 days duration and no symptoms distal to the knee) who participated in two previously published studies. Sixty-three subjects (45%) were found to have successful treatment outcomes. The sensitivity of the two criteria was 0.56, specificity was 0.92, and the positive likelihood ratio was 7.2.

Stabilization Exercise

Hicks et al [5] developed a CPR to predict treatment response to a stabilization exercise program through a prospective, cohort study of 54 out-patients with nonradicular LBP of whom eighteen subjects were grouped as treatment successes, 15 as treatment failures, and 21 as somewhat improved. The developed CPR had a positive likelihood ratio of 4.0 and negative LR of .18 considering the variables of age, straight-leg raise, prone instability test, aberrant motions, lumbar hypermobility, and fear-avoidance beliefs.

Mechanical Diagnosis and Therapy

Schenk et al [6] used the spinal manipulation CPR and compared the effectiveness of spinal thrust manipulation (STM) and mechanical diagnosis and therapy (MDT) in 31 patients, who were randomized to the STM group (n = 16) and to the MDT group (n = 15). "Both groups exhibited statistically significant improvements in ODI and NPRS scores from baseline to final visit but there was no significant difference in scores between groups at 4 weeks."

Pilates-Based Exercise

Stolzeet al [7] derived a CPR to identify a subgroup of 96 LBP patients likely to benefit from Pilates-based exercise in a prospective cohort study. Ninety-five participants completed the study, with 51 achieving a successful outcome. "A preliminary clinical prediction rule with 5 variables was identified by the authors: total trunk flexion range of motion of 70° or less, duration of current symptoms of 6 months or less, no leg symptoms in the last week, body mass index of 25 kg/m2 or greater, and left or right hip average rotation range of motion of 25° or greater. If 3 or more of the 5 attributes were present (positive likelihood ratio, 10.64), the probability of experiencing a successful outcome increased from 54% to 93%."

Mechanical Lumbar Traction

Caiet al [8] developed a CPR for identifying patients who improved with mechanical lumbar traction by conducting a prospective, cohort study of 129 patients of whom 25 had positive response to a standardized mechanical lumbar traction program, which comprised three sessions provided within 9 days. "A clinical prediction rule with four variables (non-involvement of manual work, low level fear-avoidance beliefs, no neurological deficit and age above 30 years) was identified. The presence of all four variables (positive likelihood ratio = 9.36) increased the probability of response rate with mechanical lumbar traction from 19.4 to 69.2%."

Prescription

May and Rosedale [9] reviewed the spinal CPRs and found 16 studies on 9 different CPRs. "The studies investigated responders to manipulation, stabilization exercise, physical therapy, chiropractic, traction, rehabilitation, usual care, and zygapophyseal joint injections. Eleven of these studies related to the derivation stage and five to the validation stage. The manipulation and stabilization CPRs had been the most studied. The derivation

studies were mostly high quality, whereas none of the validation studies were. As regards the manipulation CPR, evidence to date for its clinical utility is limited and contradictory. For the stabilization CPR, there was limited evidence that it may be considered but only with caution and in similar patients."

Rate of Recovery

Hancock et al [10] developed a CPR to identify 239 LBP patients likely to recover at different rates and compared clinician's prognostic judgement with the prediction rule. The CPR (low pain intensity, short duration of symptoms and fewer previous episodes) was able to differentiate between patients who recover quickly and those who recover slowly. Therapists were found to predict patients likely to recover at different rates but they did not perform as much as the CPR.

Return to Work

Heymans et al [11] developed cPR to identify patients that are of high risk for long-term work disability, production loss and sick-leave by a secondary analysis in a cohort of 628 workers on sick-leave between 3 and 6 weeks due LBP. Longer work absence was found to be related to "moderate" to "poor" job satisfaction, a higher score of fear avoidance beliefs, higher pain intensity, chronic complaints and female gender.

Physiotherapy

Haskins et al [12] reviewed the diagnostic, prescriptive and prognostic CPRs on physiotherapy management of LBP by searching MEDLINE, EMBASE, CINAHL, AMED and the Cochrane Database of Systematic Reviews and found 23 studies which described the development of 25 unique CPRs, including 15 diagnostic, 7 prescriptive and 3 prognostic rules. The majority (65%) of studies described the initial derivation of one or more CPRs. No studies were found investigating the impact phase of rule development.

Patel et al [13] reviewed randomised controlled trials that validated CPRs on LBP patients by searching MEDLINE, EMBASE, PSYCINFO, AMED (1980-2009), PubMed, ISI Web of Knowledge and the Cochrane Library. The review found three papers and the available data did not support the use of clinical prediction rules in the management of non-specific low back pain.

The CPRs on LBP provide only a clinical direction but not a defnitive decision rule for predicting diagnosis, therapy and prognosis per se. There were two reviews on physiotherapy management, four studies on spinal manipulation, one study on stabilization exercise, one study on mechanical diagnosis and therapy, one study on Pilates-based exercise and one study on mechanical lumbar traction. In addition, there was one study each on prescription, rate of recovery and return to work. The reviewed studies were mostly on development and few were on validation, with no study found on impact analysis of CPR in LBP. There is thus scope for future research in this area.

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