Pros and Cons of Clinical Prediction Rules
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Clinical Prediction Rules

• Clinical prediction rules are algorithmic decision tool (that uses parsimonious clinical findings) designed to aid clinicians in determining a diagnosis, prognosis, or likely response to an intervention.


JMMT 2008
EDITORIAL
Potential Pitfalls of Clinical Prediction Rules
Pros of Clinical Prediction Rules

It is a Sophisticated method to Pattern Results

- Clinical reasoning and treatment decision making methods used by clinicians are highly complex and decisions are rarely based on a single parameter (Boyd, 2011; Kassirer, 2010).
- CPR’s cluster multiple parameters

Clinical Examples?

- SOB + Chest Pressure + Left Arm Pain =
- Elderly women + Fall + Inability to weight bear + ER deformity of the hip =
- LBP + Immobility + Fear + Inactivity =

Some Clinical prediction rules have clinical sensibility

- Pain during walking/standing, pain relief during sitting, bilateral leg pain, leg pain worse than back pain, older age = ?
- Unilateral OA, multi-plane hip ROM loss, weakness of the hip, duration of symptoms of < 1 year, reduced gait speed = ?

Cook et al. Physiother Research International. 2011

Clinical prediction rules have been used in clinical practice and have been effective

- Canadian C-Spine Rules
- Ottawa Ankle Rules
- Wells Criteria for DVT
- PERC score for reducing mortality

Good Clinical prediction rules typically outperform paternalistic care

- Paternalistic care
- Computerized decision typically beats the clinician, especially when the outcome is complex
- Not you? That’s paternalistic thinking!


Cons of Clinical Prediction Rules
Most CPRs are Derivation Only

- Development of the rule—establishing the independent and combined effect of explanatory variables (or clinical predictors), which can be symptoms, signs, or diagnostic tests
- Generated through some form of regression analysis

(Reminder) All derived prescriptive rules are a reflection of treatment effect

- May be prognostic
- May be reflective of a bogus outcome measure
- May be spurious (Left Hip replacement)

Sample is not Generalizable

- Inclusion criteria is too specific (18 to 60 but mean in the low thirties, ODI >20)
- Population is dissimilar to clinical population routinely seen

More?

- Most use tools that have low inter-rater reliability
- Most do not report accuracy
- Most have very wide confidence intervals
- Many are "so-what" studies


Sample Size is too Small

Lumbopelvic Manipulation for the Treatment of Patients With Patellofemoral Pain Syndrome: Development of a Clinical Prediction Rule

- N=49….~27 variables

Regression Modeling with Small Sample Sizes is not Robust

- Predictive Modeling (CPRs) are exceptionally Fragile with Prescriptive Studies

FRAGILE
Many Lack Clinical Sensibility

• Left hip for total hip replacement?
• Bilateral involvement for benefit of manipulation of the cervical spine
• Low back pain leads to poorer prognosis for shoulder disorders

Getting Published does not mean it is valid

• There are 3 million papers published each year, not all of them are good
• The “peer review” system has problems
• Self-serving cliques of reviewers, who are more likely to review each others’ grant proposals and publications favorably
• Some journals are fixated on these studies
• Journals need papers; they are more flexible

The CPR Fails to Capture all Those who Benefit

• CPRs only capture a percentage of people who would benefit or would be diagnosed by the condition (tend to be specific, not sensitive)
• Thus, with a sensitivity of 63%, the Manip CPR captured 63 of the 100 subjects who benefitted from manipulation. 37% were missed by the CPR

CPRs are Used as clinical decision making models

- CPR's are NOT clinical decision making models
- CPR's represent a finding within the clinical decision making process
- CPRs are usually very specific and should be used in context with other findings and near the end of the examination

Prescriptive CPRs

- Prescriptive CPRs are more difficult to design and publish
- Are more difficult to find significance because the outcome measure is malleable (and different among studies)
- Frequently inappropriately derived (single arm studies), and the results are prognostic, versus prescriptive
- Bottom Line: There is trouble here.

The Outcome Measure is Malleable

- OMERACT-OARSI Criteria
- PASS (Patient Acceptable Symptom State)
- GRoC (change of 5)
- No Surgery (versus went to surgery)
- MCID's
- Results suggested that different “CPRs” were developed from same sample using different outcomes measures!!!
When Different Outcomes are Used

<table>
<thead>
<tr>
<th>Model</th>
<th>Variables</th>
<th>Individual P value</th>
<th>Coefficient</th>
<th>Model F value</th>
<th>Model Adjusted R²</th>
<th>Model P value</th>
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<tbody>
<tr>
<td>ODI Change Score</td>
<td>Lower initial ODI</td>
<td>&lt;0.01</td>
<td>0.7</td>
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<tr>
<td></td>
<td>Mini CPR</td>
<td>0.04</td>
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<td>HEPS compliance</td>
<td>0.07</td>
<td>-3.8</td>
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<tr>
<td></td>
<td>Shorter duration sx</td>
<td>0.01</td>
<td>-2.5</td>
<td></td>
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<tr>
<td></td>
<td>Younger age</td>
<td>&lt;0.01</td>
<td>-3.6</td>
<td>24.0</td>
<td>46.2</td>
<td>P&lt;0.01</td>
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<tr>
<td>NPRS Change Score</td>
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<td></td>
<td>Lower initial ODI</td>
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<td>-2.4</td>
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<td>-3.5</td>
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<tr>
<td></td>
<td>Shorter duration sx</td>
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<td>HEPS compliance</td>
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<td></td>
<td>Diagnosis</td>
<td>&lt;0.01</td>
<td>-2.6</td>
<td>46.6</td>
<td>67</td>
<td>P&lt;0.01</td>
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<td>Total Visits</td>
<td>Mini CPR</td>
<td>&lt;0.01</td>
<td>2.8</td>
<td>8.3</td>
<td>0.5</td>
<td>P&lt;0.01</td>
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<td>Rate of Recovery</td>
<td>Lower initial NPRS</td>
<td>0.09</td>
<td>1.7</td>
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<tr>
<td></td>
<td>Mini CPR</td>
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<td>-2.6</td>
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<td></td>
<td>No irritability</td>
<td>0.05</td>
<td>2.3</td>
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<td></td>
<td>Total (100%)</td>
<td>&lt;0.01</td>
<td>-3.8</td>
<td>7.7</td>
<td>16.7</td>
<td>P&lt;0.01</td>
</tr>
</tbody>
</table>

Different rules for different outcomes measures.
Hope we pick the right one!!

When Different MCI D’s are Used

<table>
<thead>
<tr>
<th>Model</th>
<th>Variables</th>
<th>Individual P value</th>
<th>Odds Ratio (95% CI)</th>
<th>Nagelkerke R²</th>
<th>Wald Statistic</th>
<th>% Correct</th>
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<tbody>
<tr>
<td>CPR 1</td>
<td>No CPR</td>
<td>0.901</td>
<td>2.056 (1.261-3.356)</td>
<td>0.11</td>
<td>2.491</td>
<td>57.1%</td>
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<td>CPR 2</td>
<td>Change</td>
<td>Change</td>
<td>0.91</td>
<td>1.893 (1.044-3.409)</td>
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<td>CPR 3</td>
<td>Learv1</td>
<td>Learv1</td>
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<td>0.569 (0.352-0.911)</td>
<td>0.16</td>
<td>0.485</td>
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<td>CPR 4</td>
<td>Learv2</td>
<td>Learv2</td>
<td>0.96</td>
<td>1.043 (0.901-1.201)</td>
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<td>Learv3</td>
<td>Learv3</td>
<td>0.31</td>
<td>0.437 (0.259-0.726)</td>
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<td>0.457</td>
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<td>CPR 6</td>
<td>Learv4</td>
<td>Learv4</td>
<td>0.81</td>
<td>0.997 (0.813-1.206)</td>
<td>0.67</td>
<td>2.317</td>
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</tbody>
</table>

Prescriptive Concerns

- Some (Beattie and Nelson 2006; Chaitow, 2010) have expressed concern regarding the indiscriminate use of CPRs and the potential undermining of clinical reasoning during the care of a patient.

We didn’t find that

Figure 1: Trend Line involving those who Manipulate and Either Use or Don’t Use the Clinical Prediction Rule, for Each Scenario (as percentages of those who would manipulate).

Decision Making

- There are no situations in which one single decision point answers the care questions for the patient.
- Decisions have multiple trigger or “fork” points.
- 1 CPR meets only 1 fork point.

“Statistical predictions do not form a clinical decision, but instead, inform a clinical decision.”


Thank You