Clinical Prediction Rules in Sports Medicine
Objectives

- Define a clinical prediction rule
- Identify the three types of clinical prediction rules
- Discuss the development of clinical prediction rules
- Implement several clinical prediction rules for one’s practice setting
What are Clinical Prediction Rules (CPRs)?

- Evidence-based medicine
- Clinical decision making algorithm
- Increase sensitivity and specificity of clinical exam
- Decrease use of unnecessary tests
- Decrease use of ineffective treatments

Glynn & Weisbach (2011)
Types of CPRs

- **Diagnostic**
  - Probability that a specific condition exists

- **Prognostic**
  - Likely outcome for patients with a specific condition

- **Prescriptive**
  - Determine which patients will likely respond favorably to a specific treatment or combination of treatments

Glynn & Weisbach (2011)
How are they developed?

- 4 levels of CPRs
  - IV: rule has been developed and tested in a specific population; predictor variables are selected
  - III: validation of the CPR in a patient sample; confirm predictor variables weren’t due to chance or errors within the study; new patients, new investigators
  - II: validated in a broad patient population
  - I: demonstrated effectiveness in a varied population on a large scale

Glynn & Weisbach (2011)
Several studies defined 5 criteria that correlate with a low probability of c-spine injury after blunt trauma.

Prospective study of more than 34,000 patients presenting to EDs after blunt trauma to validate findings.

- 818 patients with positive imaging.
- 8 of those 818 met NEXUS criteria and would not be imaged based on CPR; only 2 were clinically significant findings.

Hoffman et al. (2000)
Clinical Implications – NEXUS Protocol

- False negative rate of 1 in 4000
- 12.6% reduction in c-spine radiographs
- Change in EMS protocols for spine boarding

Hoffman et al. (2000)
Diagnostic CPRs
Ottawa Ankle Rules (I)

- Pain near the malleoli AND at least one of the following:
  - Inability to bear weight immediately AND four steps in the ED
  - Tenderness anywhere along the distal 6 cm of either malleoli
- GET X-RAY

Leddy et al. (1998)
<table>
<thead>
<tr>
<th>Score</th>
<th>Risk</th>
<th>% Likelihood of DVT</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 points</td>
<td>Low</td>
<td>6</td>
</tr>
<tr>
<td>1-2 points</td>
<td>Medium</td>
<td>28</td>
</tr>
<tr>
<td>3 or more points</td>
<td>High</td>
<td>73</td>
</tr>
</tbody>
</table>

Riddle et al. (2005)
### LE DVT (I)

<table>
<thead>
<tr>
<th>Predictor Variables</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Active cancer (treatment within last 6 months, current, or palliative)</td>
<td>1</td>
</tr>
<tr>
<td>Recent immobilization, paresis, paralysis</td>
<td>1</td>
</tr>
<tr>
<td>Major surgery in last month, or recently bedridden for at least 4 days</td>
<td>1</td>
</tr>
<tr>
<td>Local tenderness along path of deep vein</td>
<td>1</td>
</tr>
<tr>
<td>Edema of calf and thigh</td>
<td>1</td>
</tr>
<tr>
<td>Girth measure at 10 cm distal to tibial tuberosity 3 cm &gt; contralateral measure</td>
<td>1</td>
</tr>
<tr>
<td>Pitting edema ipsilaterally</td>
<td>1</td>
</tr>
<tr>
<td>Superficial dilation of veins</td>
<td>1</td>
</tr>
<tr>
<td>Alternative diagnosis more or just as likely as DVT</td>
<td>-2</td>
</tr>
</tbody>
</table>

Riddle et al. (2005)
## UE DVT (II)

<table>
<thead>
<tr>
<th>Score</th>
<th>Risk</th>
<th>% Likelihood of DVT</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 points</td>
<td>Low</td>
<td>12</td>
</tr>
<tr>
<td>1 point</td>
<td>Medium</td>
<td>20</td>
</tr>
<tr>
<td>2 or more points</td>
<td>High</td>
<td>70</td>
</tr>
</tbody>
</table>

Constans et al. (2008)
**UE DVT (II)**

<table>
<thead>
<tr>
<th>Predictor Variables</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Presence of a device in a vein (catheter, port,) or pacemaker</td>
<td>1</td>
</tr>
<tr>
<td>Pitting edema</td>
<td>1</td>
</tr>
<tr>
<td>Local UE pain</td>
<td>1</td>
</tr>
<tr>
<td>Alternative diagnosis more or just as likely as DVT</td>
<td>-1</td>
</tr>
</tbody>
</table>

*Constans et al. (2008)*
## PE – Wells Score (II)

<table>
<thead>
<tr>
<th>Score</th>
<th>Risk</th>
<th>% Likelihood of DVT</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;2 points</td>
<td>Low</td>
<td>3.6</td>
</tr>
<tr>
<td>2-6 points</td>
<td>Medium</td>
<td>20.5</td>
</tr>
<tr>
<td>6 or more points</td>
<td>High</td>
<td>66.7</td>
</tr>
</tbody>
</table>

Calisir et al. (2009)
PE (II)

<table>
<thead>
<tr>
<th>Predictor Variables</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>s/s of DVT (LE edema and TTP of deep veins, at minimum)</td>
<td>3</td>
</tr>
<tr>
<td>No other diagnosis likely</td>
<td>3</td>
</tr>
<tr>
<td>HR &gt;100</td>
<td>1.5</td>
</tr>
<tr>
<td>Surgery or immobilization within 4 weeks</td>
<td>1.5</td>
</tr>
<tr>
<td>Previous PE/DVT</td>
<td>1.5</td>
</tr>
<tr>
<td>Hemoptysis</td>
<td>1</td>
</tr>
<tr>
<td>Active cancer (treatment within last 6 months, current, or palliative)</td>
<td>1</td>
</tr>
</tbody>
</table>

Calisir et al. (2009)
Cervical Radiculopathy (IV)

- Predictor variables:
  - Ipsilateral cervical rotation < 60
  - ULTT A (+)
  - Cervical distraction test (+)
  - Spurling’s A (+)
    - Sidebent to ipsilateral side

- Three or more present, moderate likelihood of the condition being present

Wainner et al. (2003)
Subacromial Impingement (IV)

- Predictor variables
  - Hawkins-Kennedy (+)
  - Painful arc
  - Pain or weakness with ER strength testing (elbow at side)

- All three predictor variables present is a strong indicator for diagnosis

Park et al. (2005)
Full-Thickness RCT (IV)

- **Predictor variables**
  - Painful arc
  - Pain or weakness with ER strength testing (elbow at side)
  - Drop arm (+)

- **All three predictor variables present is a strong indicator for diagnosis**

Park et al. (2005)
SI Joint Pain (IV)

- Predictor variables
  - SI compression (+)
  - SI distraction (+)
  - Femoral shear (+)
  - Sacral provocation (+)
  - Gaenslen’s test (+) R
  - Gaenslen’s test (+) L

- At least three predictor variables present is a moderate indicator for diagnosis

Laslett et al. (2005)
Prognostic CPRs
Recovery with LBP (III)

- **Predictor variables**
  - Initial p! < 8/10
  - p! less than 6 days
  - No more than 1 previous episode of LBP
- All three predictor variables present
- Study participants received mobilization therapy (95% non-thrust) and Voltaren
- 95% better at 12 weeks
  - p! 0-1/10 for 1 week

Hancock et al. (2009)
Interventional CPRs
Cervical Traction for Mechanical Neck Pain (IV)

- **Predictor variables**
  - 55 years or older
  - Shoulder abduction test (+)
  - ULTTA (+)
  - Peripheral symptoms with A/P glides of C4-C7
  - Neck distraction test (+)

- Three or more predictor variables indicates a moderate likelihood that traction and exercise will produced a perceived benefit

Raney et al. (2009)
MWM and Exercise for Lateral Epicondylitis (IV)

- **Predictor variables**
  - Under 49 y.o.
  - Pain-free grip > 25# (ipsilateral)
  - Pain-free grip < 76# (contralateral)

- At least two predictors indicates a shift in likelihood that the condition will improve with 3 weeks of MWM and rehabilitation

Vicenzino et al. (2009)
Lumbar Manipulation for LBP - Success (II)

- **Predictor variables**
  - Peripheral pain proximal to the knee
  - Symptoms no longer than 16 days
  - Hypomobile l-spine
  - Hip IR >35 on either side
  - Fear Avoidance Belief Questionnaire (work subscale) <19

- At least four predictor variables indicates a large increase in likelihood that function will improve by 50% within 2 tx

Hancock et al. (2008)
Joint Mobilization and Stretching for Lateral Ankle Sprain (IV)

- **Predictor variables**
  - Increased symptoms with standing
  - Increased symptoms at end of day
  - Navicular drop of at least 5 mm
  - Hypomobile distal tib-fib

- At least three predictor variables indicates a moderate likelihood of improvement within 2 tx

Whitman et al. (2009)


Bibliography


THANK YOU!