Prediction-Enhanced Clinical Reasoning: What’s the Prognosis?

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Prognosis

What, Why, and How...

Prognosis

What?

Predict health outcomes

“Predicted optimal level of improvement in function and the amount of time needed to reach that level…”

“Understanding the difference between what a person currently does and what they potentially could do…”

“Identifying realistic, achievable goals and outcomes”

Prognosis – What?

- Prognosis is a key element to patient management
- Prognosis related components:
  - Which outcomes could happen?
  - How likely are they to happen?
  - Over what time period?
Prognostic Study Questions

- Symptomatic course:
  - “What is the most likely course?”
  - Survival curves: change in recovery based on factors of interest
- Prognostic factor research:
  - “What factors are associated with clinical outcome?”
  - Differential recovery based presentation, disease state
- Prognostic model research:
  - “What combination of factors change the prognosis for my patient?”
    - Individual risk
- Stratified medicine:
  - “Can we identify risk groups that differentially respond to a particular treatment?”
    - Effect modifiers

Survival Curves

Pain Response Classification Does Not Predict Long-Term Outcome in Patients With Low Back Pain Who Are Sick-Listed Christiansen et al. 2010

Predictive (Prognostic) Factors

- Within a given health condition, what factors are associated with clinical outcome?
  - Musculoskeletal research:
    - high reported disability, somatic pain
    - high fear
    - maladaptive coping
    - comorbid depression

Prognostic Factors

Influence of leg pain on recovery after an acute episode of LBP

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Risk Factors

<table>
<thead>
<tr>
<th>Non-modifiable</th>
<th>Modifiable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unable to change via treatment</td>
<td>Able to change via treatment</td>
</tr>
<tr>
<td>Examples:</td>
<td>Examples:</td>
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<tr>
<td>Non-clinical characteristics</td>
<td>Non-clinical characteristics</td>
</tr>
<tr>
<td>Age</td>
<td>Work demands</td>
</tr>
<tr>
<td>Sex</td>
<td>Clinical characteristics</td>
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<tr>
<td>Employment</td>
<td>Physical factors</td>
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<tr>
<td>Clinical characteristics</td>
<td>Leg pain</td>
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<tr>
<td>Duration of symptoms</td>
<td>Comorbid pain</td>
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<tr>
<td></td>
<td>Disability with activities</td>
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<td></td>
<td>Psychosocial factors</td>
</tr>
</tbody>
</table>

Impact of Risk Factors

- Non-modifiable factors provide important information to enhance shared decision making and improve communication with patients, family members, care givers, and other healthcare providers
- Modifiable factors also provide potential targets for treatment

Prognostic Model

- Can improve prediction in complex, highly variable conditions?
- Identification of modifiable conditions with missed opportunity
Prognostic Study Questions

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Stratified Medicine

- Treatment Effect Modification
  - Linked to risk models
  - Aim treatment toward those at highest risk
  - Relative treatment effect is inconsistent across patients
- Questions...
  - Is there clinically important variation in prognosis across individuals?
  - Is the intervention associated with substantial risk of harm or cost?
  - Is there robust evidence of important individual variation in tolerance?

Treatment Effect Modification

- Must utilize RCT design with tests of interaction

Prognostic Study Appraisal

1. Are the results of the study valid?
2. What are the results?
3. Can I apply this valid, important evidence about prognosis to my patient?
Keep in Mind...

Prognosis

“Estimating the risk of future outcomes in individuals based on clinical and non-clinical characteristics”

“Predicting outcomes does not provide etiological information (not cause and effect)”

“Although all causal factors are predictive of outcome, not all predictive factors are necessarily causal”


Why should we care?
- Patient education
- Management of expectations
- Plan of care development
- Allocation of resources
  - Conditions with natural history favoring recovery may not initially require intervention
  - Conditions unresponsive to interventions should not be treated; maybe require referral to other provider

Prognostic Information
- Treatment Decisions
- Expected Outcomes
- Shared Decision Making
- Enhanced Communication

Expected Outcomes
- Natural history
- Regardless of intervention
- Rationale for optimal “prognostic study” design
  - Observational, prospective cohort (single-arm study)
  - Elimination of treatment effects; assuming heterogeneous treatment is provided

Predictor(s)
Time
Outcome
Prognosis — Why?

- Outcome Domains
  - Single domain vs. multiple single domains
  - Recovery (complex, multifactorial domain)
  - Importance of shared decision making...
    - Pain
    - Function
    - Work status
    - Recovery...

“Recovery”

Which Prognostic Factors for Low Back Pain Are Generic Predictors of Outcome Across a Range of Recovery Domains?

4 separate models:
- Pain intensity
- Self-report disability
- Total visits
- Report of rate of recovery

Meeting the CPR for spinal manipulation was present in all models

“Universal Prognostic Predictor”

Prognosis — How?

- Previous Research
  - Identify relevant prognostic factors
    - Systematic Review
    - Empirical prognostic studies
- Screening Tools
  - Identification of individuals at risk
  - Unidimensional vs. multidimensional measures
- Caveat: Should be specific for your patient population and clinical setting
  - Acute vs. chronic
  - Primary vs. secondary care

Three primary approaches (Grobbee & Hoes, 2009)

1. Mechanistic and pathophysiological insight
   - Biomedical model
2. Empirical prognostic research
   - Risk scores
   - Prediction models
3. Clinical expertise

Prognosis — How?

Three primary approaches (Grobbee & Hoes, 2009)

1. Mechanistic and pathophysiological insight
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3. Clinical expertise
Prognosis – How? (Example)

- Risk scores
  - STarT Back Tool
    - Prognosis (for persistent LBP disability)
      - Low risk
      - Medium risk
      - High risk
    - Targeted LBP treatment pathways
      - Low risk
      - Medium risk
      - High risk

Prognostic Risk Stratification

1. Identify patient subgroups (based on prognosis)
2. Provide targeted treatment

“Prediction-Enhanced” Clinical Reasoning

Stratification of Treatment

- Targeting treatment to subgroups of patients based on key characteristics (modifiable and non-modifiable)
- Common approaches
  - Based on prognostic risk
  - Based on mechanisms
  - Based on treatment response

Example: STarT Back Approach
Disagree | Agree
---|---
1. My back pain has spread down my leg(s) at some time in the last 2 weeks | 0 | 1
2. Have you had pain in the shoulder or neck at some time in the last 2 weeks | 0 | 1
3. I have only walked short distances because of my back pain | 0 | 1
4. In the last 2 weeks I have dressed more slowly than usual because of back pain | 0 | 1
5. It's not really safe for a person with a condition like mine to be physically active | 0 | 1
6. Worrying thoughts have been going through my mind a lot of the time | 0 | 1
7. I feel that my back pain is terrible and it's never going to get any better | 0 | 1
8. In general I have not enjoyed all the things I used to enjoy | 0 | 1
9. Overall, how bothersome has your back pain been in the last 2 weeks? | Not at all | Slightly | Moderately | Very much | Extremely
| 0 | 0 | 0 | 1 | 1 |

Total score (all 9): _____________ Sub Score (Q5-9):______________

**STaRT Risk Categories**

- **Low Risk**: Few physical and/or psychological factors present
- **Medium Risk**: Physical and psychological factors present; psychological factors are not high
- **High Risk**: High level of psychological factors present; with or without physical factors

**STaRT Risk: Targeted Treatment**

- **Low Risk**: Advice and education
- **Medium Risk**: Advice, education, and physical therapy to address symptoms and function
- **High Risk**: Advice, education, and psychologically informed physical therapy

**Psychologically Informed Physical Therapy**

- **Integration**
  - Physical Treatment Approach
  - Psychological Treatment Approach

“Middle Way” between narrowly focused standard PT practice based on biomedical principles and the more cognitive-behavioral approaches developed originally for the treatment of mental illness

(Main & George, 2011)
**Effects of Stratified Care**

- Higher improvement in disability scores at 4 (d = 0.32) and 12-months (d = 0.19)
- Increased cost savings at 12-months
- SBT high risk – higher improvement in disability scores at 6-months (2.3, 95% CI: 0.8 – 3.9)
- 50% less time off work (4 vs. 8 days, p = 0.03)


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**Translational Research Perspective**

"Use of stratified care model"  
"Identification to Implementation"

**Primary Care Settings**  
**Outpatient Physical Therapy Settings**

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**Pragmatic implementation of a stratified primary care model for low back pain management in outpatient physical therapy settings: a two-phased, parallel cohort study design**  
(Benecki & George, in review)

- **Phase 1** – confirm that physical therapist attitudes and beliefs can be changed and maintained toward a biopsychosocial treatment orientation
- **Phase 2** – determine if those changes are associated with improved clinical outcomes for therapists that receive stratified care training and education compared to those that do not

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**Summary**

- Prognosis involves an element of prediction; however we are beyond using ‘crystal balls’
- Prognosis is a key element to patient management
- Several types of prognosis related study questions; each intended to provide different information
- Stratified care models based on prognostic risk have potential to improve prediction-enhanced clinical reasoning in physical therapy settings

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**Thank You!**