A Standardized Evidence-Based Model of Orthopaedic Physical Therapy Practice: A Quest for the Holy Grail?

Guy G. Simoneau

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A STANDARDIZED EVIDENCE-BASED MODEL OF ORTHOPAEDIC PHYSICAL THERAPY PRACTICE: A QUEST FOR THE HOLY GRAIL?

Guy G. Simoneau, PhD, PT, ATC

Professor, Physical Therapy Department

EVIDENCE LEADING TO A STANDARD MODEL OF PRACTICE

- Does using evidence improve delivery of care (less $$$) and outcomes
- The various forms of evidence that are needed – with a quick glance to specific examples
- Delivery of information as a part of the puzzle
- (Without threatening individuality of care to refine treatment based on patient and clinical expertise)
“One bum knee meets 5 physical therapists” … and gets 5 different answers!!

The Wall Street Journal, September 1994

But, is it really necessary to agree on what is wrong and how the condition should be treated? Or, is part of being a professional for each of us to decide what we think is best for the patient?

WHAT HAPPENS WHEN WE USE EVIDENCE?

Does Adherence to the Guideline Recommendation for Active Treatments Improve the Quality of Care for Patients With Acute Low Back Pain Delivered by Physical Therapists?

Julie M. Fritz, PhD, PT, ATC; **Joshua J. Cleland, PhD, DPT, FAOMPT;**
and Gerard P. Brennan, PhD, PT*

… use of patient education and exercise therapy for the treatment of acute back pain … staying active …

Medical Care • Volume 45, Number 10, October 2007

“One bum back meets 5 physical therapists” … and gets ?? different answers!!
All Patients with Low Back Pain Receiving Physical Therapy (2004-2005)  
- Age >60 or <18  
  - n = 811  
- Symptom duration >30 days  
  - n = 568  
- >3 therapy visits  
  - n = 523  
- Duration of physical therapy <10 days  
  - n = 283  
- Post-surgical visit  
  - n = 62  
- Initial Oswestry <10%  
  - n = 27  
- Incomplete data  
  - n = 43  

Patients Eligible for Inclusion  
- n = 1190

PERCENT IMPROVEMENT

<table>
<thead>
<tr>
<th></th>
<th>Adherent</th>
<th>Non-Adherent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pain</td>
<td>60.5</td>
<td>38</td>
</tr>
<tr>
<td>Disability</td>
<td>59.4</td>
<td>35.1</td>
</tr>
</tbody>
</table>

PERCENT WITH A SUCCESSFUL OUTCOME (>50% REDUCTION IN DISABILITY)

<table>
<thead>
<tr>
<th></th>
<th>Adherent</th>
<th>Non-Adherent</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>64.7</td>
<td>36.5</td>
</tr>
</tbody>
</table>

Number-Needed-To-Treat = 3.6 (95% CI: 3.0–4.5)
RESULTS

<table>
<thead>
<tr>
<th></th>
<th>All Subjects (n=471)</th>
<th>Adherent (n=132)</th>
<th>Non-Adherent (n=339)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Visits</td>
<td>5.5 (2.5)</td>
<td>4.6 (2.0)*</td>
<td>5.9 (2.2)*</td>
</tr>
<tr>
<td>Duration of care (days)*</td>
<td>28.5 (19.5)</td>
<td>25.4 (16.2)*</td>
<td>29.7 (20.6)*</td>
</tr>
<tr>
<td>Prescription medication</td>
<td>54.1%</td>
<td>46.2%*</td>
<td>57.2%*</td>
</tr>
<tr>
<td>Diagnostic procedures</td>
<td>21.0%</td>
<td>14.4%*</td>
<td>23.6%*</td>
</tr>
<tr>
<td>Injections</td>
<td>13.2%</td>
<td>9.1%*</td>
<td>15.9%*</td>
</tr>
</tbody>
</table>

1 year follow-up

$1692 $2829

* P < 0.05

WHAT HAPPENS WHEN WE USE EVIDENCE

Based on this example it could be argued that application of scientific evidence is important to improve care of patients and reduce cost of health care.
WHAT HAPPENS WHEN WE USE EVIDENCE

So, what kind of evidence exist to help my clinical practice?

THE GOOD NEWS

THE BAD NEWS
4 BASIC TYPES OF CLINICAL EVIDENCE

- **Diagnosis**
  - Accuracy & precision of diagnostic tests including the history and physical examination
- **Prognosis**
  - Power of prognostic markers
- **Therapy**
  - Efficacy of therapeutic, rehabilitative, and preventive regimens
- **Harm**
  - Potential for harm with our treatments

DIAGNOSIS

Which test is more likely to give me an accurate diagnosis?
How accurate is a positive test?
How accurate is a negative test?

DIAGNOSIS REQUIRES UNDERSTANDING PROBABILITY STATISTICS

- Sensitivity (with 95%CI)
- Specificity (with 95%CI)
- Likelihood ratios
  - +LR (with 95%CI)
  - -LR (with 95%CI)

SpPin
  - HIGH specificity
  - Positive
  - Rules IN
SnNout
  - HIGH sensitivity
  - Negative
  - Rules OUT
**DIAGNOSIS FOR ANTERIOR CRUCIATE LIGAMENT TEAR**

<table>
<thead>
<tr>
<th>Test</th>
<th>Sensitivity</th>
<th>Specificity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lachman test</td>
<td>85% (83-87)</td>
<td>94% (92-95)</td>
</tr>
<tr>
<td>Pivot shift</td>
<td>24% (21-27)</td>
<td>86% (80-93)</td>
</tr>
<tr>
<td>Anterior drawer (chronic condition)</td>
<td>92% (88-95)</td>
<td>91% (87-94)</td>
</tr>
<tr>
<td>Anterior drawer (acute condition)</td>
<td>49% (43-55)</td>
<td>58% (50-70)</td>
</tr>
</tbody>
</table>


**DIAGNOSIS RESEARCH REQUIRES AN INTENT**

- Rule out a condition*
- Screening “bad” injuries

*Cervical spine fracture

Or seek additional tests if the test is positive

**CANADIAN C-SPINE RULE**

Sensitivity 1.0 (95%CI 0.98 to 1.0)
Specificity .43 (95%CI .40 to .44)

Dr. Guy Simoneau, Marquette University, copyright, do not duplicate
DIAGNOSIS RESEARCH REQUIRES AN INTENT

- Rule in a condition
  - To provide more effective treatment

Shoulder anterior instability

ANTERIOR INSTABILITY

- Using apprehension (not pain) as + sign

<table>
<thead>
<tr>
<th>Test</th>
<th>Sensitivity</th>
<th>Specificity</th>
<th>Positive Likelihood Ratio</th>
<th>Negative Likelihood Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Farber et al (2006)</td>
<td>72%</td>
<td>99%</td>
<td>20.2</td>
<td>0.29</td>
</tr>
<tr>
<td>Farber et al (2009)</td>
<td>81%</td>
<td>92%</td>
<td>10.4</td>
<td>0.20</td>
</tr>
<tr>
<td>Speer et al (1994)</td>
<td>67%</td>
<td>99%</td>
<td>67</td>
<td>0.33</td>
</tr>
<tr>
<td>Lo et al (2004) – pain or app</td>
<td>64%</td>
<td>99%</td>
<td>58.6</td>
<td>0.37</td>
</tr>
<tr>
<td>Gross &amp; Distefano (1997) – pain</td>
<td>32%</td>
<td>99%</td>
<td>5.3</td>
<td>0.09</td>
</tr>
</tbody>
</table>

POSTERIOR CRUCIATE LIGAMENT TEAR

  - Performed multiple clinical tests for PCL laxity in 39 patients (78 knees), 19 with a torn PCL
  - Gold standard was MRI

Posterior Sag Sign

Posterior drawer test
**POSTERIOR CRUCIATE LIGAMENT TEAR**

<table>
<thead>
<tr>
<th>Test</th>
<th>Sensitivity</th>
<th>Specificity</th>
<th>Positive Likelihood Ratio</th>
<th>Negative Likelihood Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Posterior drawer</td>
<td>90%</td>
<td>99%</td>
<td>90.0</td>
<td>0.10</td>
</tr>
<tr>
<td>Posterior sag sign</td>
<td>70%</td>
<td>100%</td>
<td>79.0</td>
<td>0.31</td>
</tr>
<tr>
<td>Quadriceps active drawer</td>
<td>54%</td>
<td>97%</td>
<td>18.0</td>
<td>0.47</td>
</tr>
<tr>
<td>Reverse pivot shift</td>
<td>20%</td>
<td>95%</td>
<td>5.2</td>
<td>0.78</td>
</tr>
<tr>
<td>KT-1000</td>
<td>60%</td>
<td>94%</td>
<td>14.3</td>
<td>0.15</td>
</tr>
</tbody>
</table>

- All tests had higher specificity than sensitivity, therefore each is better as a rule in test
- The posterior drawer test has a high +LR, and small –LR, making it an excellent diagnostic test

**CPR FOR DIAGNOSIS OF CERVICAL RADICULOPATHY**

- Upper limb tension test A
- Involved C-spine rotation < 60°
- Distraction test
- Spurling test A

**Tendinitis**

<table>
<thead>
<tr>
<th>Test</th>
<th>Sensitivity</th>
<th>Specificity</th>
<th>Positive Likelihood Ratio</th>
<th>Negative Likelihood Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calis et al (2000)</td>
<td>95.2%</td>
<td>30.7%</td>
<td>1.37</td>
<td>0.16</td>
</tr>
<tr>
<td>MacDonald et al (2000)</td>
<td>67.5%</td>
<td>42.6%</td>
<td>1.93</td>
<td>0.29</td>
</tr>
<tr>
<td>(not stated)</td>
<td></td>
<td></td>
<td>(1.17, 1.99)</td>
<td>(0.10, 1.60)</td>
</tr>
<tr>
<td>Park et al (2005)</td>
<td>71.5%</td>
<td>66.2%</td>
<td>2.12</td>
<td>0.43</td>
</tr>
<tr>
<td>(Any severity)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### NEER (IMPINEMENT)

**Tendinitis**

<table>
<thead>
<tr>
<th>Test</th>
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<th>Specificity</th>
<th>Positive Likelihood Ratio</th>
<th>Negative Likelihood Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calis et al (2000) (Stage 1)</td>
<td>71.4%</td>
<td>30.7%</td>
<td>1.65</td>
<td>0.93</td>
</tr>
<tr>
<td>MacDonald et al (2000) (not stated)</td>
<td>83.3%</td>
<td>50.8%</td>
<td>1.69</td>
<td>0.33</td>
</tr>
<tr>
<td>Park et al (2005) (Any severity)</td>
<td>68.0%</td>
<td>68.7%</td>
<td>2.19</td>
<td>0.47</td>
</tr>
</tbody>
</table>

### IMPINGEMENT

**Item cluster for subacromial impingement**

- Positive Hawkins-Kennedy test
- Painful arc (60-120 degrees) during active shoulder elevation
- Positive (pain and/or weakness) with infraspinatus test: resisted ER with arm along the body
  - All 3 positive: +LR of 10.56
  - If 2 of 3 positive: +LR of 5.03
  - If all 3 negative: -LR of .17

*Park et al, J Bone Joint Surg, 2005*

**IMPINGEMENT**

**Item cluster for subacromial impingement**

- Hawkins-Kennedy +LR 1.63 -LR .61
- Neer impingement +LR 1.76 -LR .35
- Painful arc +LR 2.25 -LR .38
- Empty can (Jobe's) +LR 3.90 -LR .57
- External rotation +LR 4.39 -LR .50

- 3 or more positive tests: +LR of 2.93
- Less than 3 positive tests: -LR of .34

*Michener et al, 2009*
Classification systems
- Low back pain – treatment based classification
- Low back pain – movement impairment
- ???

Diagnosis … but with impairment qualifiers
- Patellofemoral joint pain, associated with
  - Hip weakness
  - Excessive foot pronation
- Shoulder pain, associated with
  - Scapular dyskinesia

OTHER DIAGNOSTIC PARADIGMS

Physical Therapy Prognosis
- What are my odds of getting better with conservative care?
- How much time is needed for recovery of this injury given the offered treatment?
- What are my chance of reinjury?
- What prognostic factor predicts successful treatment?

PROGNOSIS

"As physical therapists, not only do we need to know our literature on prognosis, but we need to acquire additional evidence, particularly when we want to change prognoses through the use of preventive intervention."

"The dictionary fails to note that prognosis also is often what establishes (and enhances) a health care professional's credibility. As a young physical therapist, thanks to my ignorance and the lack of a body of published data, I usually would offer a two-word prognosis: "It depends." If a patient asked when to expect full range of motion, I might say, "It depends." If a persistent patient asked what it depended on, again I might deliver sage wisdom: "It depends on a lot of things." Only the patient's persistence determined how long I was allowed to sputter ambiguously."

JULES ROTHSTEIN

WHO RESPONDS TO TREATMENT?

Predictors of Response to Physical Therapy Intervention in Patients With Primary Hip Osteoarthritis

Alexis A. Wright, Chad E. Cook, Timothy W. Flynn, G. David Baxter, J. Nancy Abbot

Physical therapy intervention defined as exercises and manual therapy

CONSERVATIVE MANAGEMENT OF HIP OA?

5 predictors

- Unilateral hip pain
- Age less or equal to 58 years
- Duration of symptoms less or equal to 1 year
- Pain of greater or equal to 6/10 on a numeric pain rating scale
- 40-m self-paced walk test time of less than or equal to 25.9 seconds

CONSERVATIVE MANAGEMENT OF HIP OA?

Table 3. Number of Participants Receiving Physical Therapy in the Success and Nonsuccess Groups Who Were Positive for Each Predictor Variable

<table>
<thead>
<tr>
<th>No. of Predictor Variables Present</th>
<th>No. of Participants in the Physical Therapy Success Group</th>
<th>No. of Participants in the Physical Therapy Nonsuccess Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤4</td>
<td>7 (9.5%)</td>
<td>0 (0%)</td>
</tr>
<tr>
<td>≥3</td>
<td>9 (40.9%)</td>
<td>0 (0%)</td>
</tr>
<tr>
<td>≤2</td>
<td>21 (95.5%)</td>
<td>11 (23.9%)</td>
</tr>
<tr>
<td>1</td>
<td>22 (100%)</td>
<td>36 (78.3%)</td>
</tr>
<tr>
<td>0</td>
<td>0 (0%)</td>
<td>16 (21.7%)</td>
</tr>
</tbody>
</table>

*The 5 variables forming the multivariate logistic regression model were: (1) unilateral hip pain, (2) age of ≤58 years, (3) pain of ≥6/10, (4) 40-m Sprints time of ≤25.9 seconds, and (5) duration of symptoms ≤1 year.

22 of 68 participants (32%) were considered to have success
WHAT IS THE RECOVERY RATE POST THA?

Kennedy et al, JOSPT, 2011

WHO REQUIRES ACL RECONSTRUCTION POST ACL TEAR?

JOSPT 2008

HAMSTRING INJURIES: RECOVERY TIME?

Askling et al, AJSM 2007

* Compared to the other side
** Distance from the ischial tuberosity
**HAMSTRING INJURIES: RECOVERY TIME?**

- Increased recovery time if:
  - > 1 day needed to walk pain-free following injury
    - More likely (adjusted odds ratio [AOR] 4.0; 95% CI: 1.3, 12.6) to take longer than 3 weeks to return to competition
  - History of hamstring injury
    - Elevated risk of a delayed return to competition (AOR, 4.2; 95% CI: 1.0, 18.0)

_Warren et al, BJSM 2010_

---

**Who is at risk for ACL injury?**

_Who will do well post whiplash?_

- 50% of people will continue to have problems at 12 months
  - "I know the moment they walk into the clinic…"
WAD: PROGNOSTIC FACTORS OF POOR OUTCOMES

- Higher NDI (>30%)
- High pain scores
- Older age
- Cold hyperalgesia
- Post traumatic stress
- Kinesiophobia
- Greater decreased ROM

PROGNOSTIC FACTORS OF POOR OUTCOMES FROM WAD

- Variables with moderate evidence of a significant effect:
  - Older age (≥65)
  - Disrupted sleep
  - Lower education
  - Divorced/spouse
  - History of previous neck pain
  - No seatbelt used
  - Presence of neck pain at crime

- Variables with strong evidence of no effect:
  - Female gender
  - Presence of back pain at crime
  - Previous whiplash injury

TREATMENT

- What technique is better to improve shoulder external rotation range of motion in individuals with adhesive capsulitis?
  - The Patient or Problem
  - The Intervention
  - Comparison Intervention
  - Outcome(s)
MECHANISTIC STUDIES

Not only understanding IF it works but WHY it works!!

HARM

- Case reports
- Need to be systematically reported along with results of all diagnostic and intervention studies

Standardization of Adverse Event Terminology and Reporting in Orthopaedic Physical Therapy: Application to the Cervical Spine

Carlesso et al., JOSPT, 2010
PUTTING IT ALL TOGETHER

A Potential Example for the Treatment of Acute Low Back Pain

- Duration of symptoms < 16 days
- FABQ work subscale 18 or less
- Symptoms not distal to the knee
- At least one hip internal rotation PROM > 35°
- Hypomobility at one or more lumbar levels with spring testing

Flynn et al, Spine, 2002

PUTTING IT ALL TOGETHER

A Clinical Prediction Rule for Classifying Patients with Low Back Pain Who Demonstrate Short-Term Improvement With Spinal Manipulation

- Duration of symptoms < 16 days
- FABQ work subscale 18 or less
- Symptoms not distal to the knee
- At least one hip internal rotation PROM > 35°
- Hypomobility at one or more lumbar levels with spring testing

PUTTING IT ALL TOGETHER

A Clinical Prediction Rule To Identify Patients with Low Back Pain Most Likely To Benefit from Spinal Manipulation: A Validation Study

May J, Lee D, Chibs, PhD, PT; Julie M. Dorf, PhD, PT; Timothy W. Flynn, PhD, PT; James L. Jeglum, PhD, PT; Maj Kevin X. Johnson, PT

Annals of Internal Medicine, 2004

<table>
<thead>
<tr>
<th></th>
<th>Fits the Prediction Rule</th>
<th>Does Not Fit the Rule</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manipulation Treatment Group</td>
<td>MATCH</td>
<td>Unmatched</td>
</tr>
<tr>
<td>Exercise Treatment Group</td>
<td>Unmatched</td>
<td>Unmatched</td>
</tr>
</tbody>
</table>
PUTTING IT ALL TOGETHER

OUTCOME AT 6 MONTHS
- Taken medication in last week? 27.8% 43.8%
- Currently seeking treatment? 11.1% 43.8%
- Missed work in last 6 weeks? 5.6% 24.0%

PRACTITIONERS AND THE EVIDENCE
- Study of 321 PTs in England & Australia

"The basis of over 90% of each group’s choice of treatment interventions reflected what was taught during their initial training."

"Research literature ranked least in importance as a basis for choosing techniques, and review articles fared little better."

PRACTITIONERS AND THE EVIDENCE

Integration of:
- best research evidence
- clinical expertise
- patient values

NOT Integration of:
- best research evidence
- clinical expertise
- patient values

Childs et al, JOSPT, April 2012

DELIVERY AND ACCESS

Journal of Orthopaedic & Sports Physical Therapy
JOSPT INTERNATIONAL PARTNERSHIPS
FROM 2007 TO DATE

Number of Partners and Countries By Year

<table>
<thead>
<tr>
<th>Year</th>
<th>Partners</th>
<th>Countries</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>2008</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>2009</td>
<td>13</td>
<td></td>
</tr>
<tr>
<td>2010</td>
<td>18</td>
<td></td>
</tr>
<tr>
<td>2011</td>
<td>19</td>
<td></td>
</tr>
<tr>
<td>2012</td>
<td>23</td>
<td></td>
</tr>
</tbody>
</table>

JOSPT WEBSITE TRAFFIC
AVERAGE MONTHLY VISITS/UNIQUE VISITORS PER MONTH

Number of Visits

<table>
<thead>
<tr>
<th>Year</th>
<th>Total Visits</th>
<th>Unique Visits</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007</td>
<td>16,389</td>
<td></td>
</tr>
<tr>
<td>2008</td>
<td>23,788</td>
<td></td>
</tr>
<tr>
<td>2009</td>
<td>38,618</td>
<td></td>
</tr>
<tr>
<td>2010</td>
<td>47,084</td>
<td></td>
</tr>
<tr>
<td>2011</td>
<td>56,060</td>
<td></td>
</tr>
<tr>
<td>2012</td>
<td>60,199</td>
<td></td>
</tr>
</tbody>
</table>

PHYSICAL THERAPY IMPACT

Impact factor 2.538
- Rehabilitation (5 of 43)
- Orthopaedics (9 of 61)
- Sports (11 of 81)
JOSPT HITS ON PUBMED LINKOUT
NUMBER OF TIMES USERS CLICKED JOSPT’S LINKS ON PUBMED

Number of Hits

JOSPT SEARCHES ON CROSSREF
NUMBER OF TIMES USERS LOOKED FOR JOSPT DOIS

Number of Searches

EDUCATION
THANK YOU!