Clinical Decision Support Tools in the Management of Work-Related Musculoskeletal Disorders

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doug.gross@ualberta.ca
Objectives – You will learn:

• What are Clinical Decision Support tools?

• Rationale for using CDS tools in practice

• About an inventory of CDS tools for making treatment decisions for injured workers with musculoskeletal disorders

• The level of evidence supporting CDS tools
Technology is the worst it will ever be.

- Daniel Susskind
Two potential futures due to technology:

1) A more efficient version of what we do today – streamlined and optimized.

2) *Transformation* of how we work, think, and make decisions.
Clinical Decision-Making
How can we make the best decisions?
Clinical Decision-Making
Clinical Decisions Influenced by:

1) Knowledge
   May be inadequate, inappropriate, or irrelevant

2) Reasoning Process/ Logic
   May be faulty or biased

→ Less Than Optimal Decisions
Clinical Decision Support Tools

- CDS Tool = Any resource designed to aid directly in making therapeutic choices for patients

- Use patient characteristics to generate **specific** recommendations

- May incorporate technology/ computers
Desirable Characteristics of CDS Tools

- Easy to use and interpret
- Valid and reliable
- Inexpensive
- Meaningful to users
Most Importantly CDS Tools Should:

Lead to better clinical outcomes
Types of CDS Tools

1) *Knowledge Base* – Textbooks, clinical journals, databases
Types of CDS Tools

1) *Knowledge Base*

2) *Expert System* – Codified rules developed by peer-acknowledged experts
A decision support system for lower back pain diagnosis.
- Lin et. al. Dec Sup Sys, 2006

“…capable of performing at a level comparable to domain experts (surgeons)…”
Evaluate your Symptoms

To begin a checkup with Dr. Schueler, select the symptom that bothers you the most.

Enter a letter to browse symptoms

Dr. Schueler has been an emergency physician, teacher, and author for over twenty five years. Although he designed freemd to feel like a real physician visit, it is a computer program and not a live doctor. freemd is provided for educational purposes only and should not be used as a substitute for an evaluation and treatment by a physician. Get more information.

The Doctor is In

Ten Symptoms of Serious Disease
Ten Subtle Symptoms You Shouldn't Ignore
Eight Symptoms That Send People to the ER
Ten Most Popular Symptom Checkups
Eight Most Popular Injury Checkups

Ten Most Popular Women's Checkups
Ten Most Popular Child Checkups
Ten Most Popular Infant Checkups
Five Most Popular Pregnancy Checkups
Six Most Popular Men's Checkups
1) Knowledge Base

2) Expert System

3) Predictive/Classification Algorithms – Data informed tools that incorporate statistical models and often computers
Treatment-Based Classification Algorithm

Stanton T R et al. PHYS THER 2011;91:496-509

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Clinical Prediction Rules: A Physical Therapy Reference

By USBMIS, Inc

Open iTunes to buy and download apps.

Description

This application offers a comprehensive look at clinical prediction rules (CPRs) as they relate to physical therapy practice. Pertinent information is readily accessible to influence clinical decision making while also providing sufficient depth. CPR development level is provided, a quality assessment score is listed as well as a clinical bottom...

Clinical Prediction Rules: A Physical Therapy Reference Support

...More

iPhone Screenshots

Assess... Clinical Identification...

Clinical Identification of Lower Extremity Deep-Vein Thrombosis (DVT) Wells Criteria

Predictor Variables

Active cancer (treatment ongoing, within previous 6 months, or palliative)

- Yes
- No

FRACTURE
HEAD INJURY
OSTEOPOROSIS
VENOUS THROMBOEMBOLISM
PERIPHERAL NEUROPATHY

$39.99

Category: Medical
Released: May 31, 2011
Version: 1.10.0_20
Size: 5.9 MB
Language: English
Seller: USBMIS, Inc.
© 2011, Jones & Bartlett Learning, LLC
Rated 4+

Requirements: Compatible with iPhone, iPod touch, and iPad. Requires iOS 3.1.2 or later
Our Project = Scoping Review

**Purpose** – Comprehensively search scientific and “grey” literature for information on CDS tools for selecting interventions for MSK disorders

Inventory existing tools
Clinical Decision Support Tools for Selecting Interventions for Patients with Disabling Musculoskeletal Disorders: A Scoping Review

Douglas P. Gross¹ · Susan Armijo-Olivo² · William S. Shaw³ · Kelly Williams-Whitt⁴ · Nicola T. Shaw⁵ · Jan Hartvigsen⁶,⁷ · Ziling Qin² · Christine Ha² · Linda J. Woodhouse¹ · Ivan A. Steenstra⁸

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Methods

- Searched healthcare, computing science and management literature
- Identify and inventory available tools
- Comment on status of the research
## Results – Description of Papers

### Discipline of Lead Authors

<table>
<thead>
<tr>
<th>Discipline</th>
<th># of Articles (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Health Care</td>
<td>116 (100%)</td>
</tr>
</tbody>
</table>

### Type of Tool Discussed in the Article

<table>
<thead>
<tr>
<th>Type of Tool</th>
<th># of Articles (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPR/Classification System</td>
<td>79 (68%)</td>
</tr>
<tr>
<td>Treatment Algorithm</td>
<td>15 (13%)</td>
</tr>
<tr>
<td>Questionnaire</td>
<td>11 (10%)</td>
</tr>
<tr>
<td>Theoretical/Empirical Model</td>
<td>6 (5%)</td>
</tr>
<tr>
<td>Computer-Based Tool</td>
<td>5 (4%)</td>
</tr>
</tbody>
</table>

### Condition Aimed at by Tool

<table>
<thead>
<tr>
<th>Condition</th>
<th># of Articles (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low Back Pain</td>
<td>67 (58%)</td>
</tr>
<tr>
<td>Neck/Shoulder/Arm Pain</td>
<td>21 (18%)</td>
</tr>
<tr>
<td>General MSK Disorders</td>
<td>12 (10%)</td>
</tr>
</tbody>
</table>
Identified 8 Available Tools

‘Low Tech’ Questionnaires/Surveys
- Keele STarT Back Screening Tool
- Orebro Musculoskeletal Pain Questionnaire
- Pain Recovery Inventory of Concerns and Expectations

‘Computerized’ CDS Tools
- Work Assessment Triage Tool
- Decision Support Software
- Repetitive Strain Injury Quick Scan
- WCB-Alberta Soft Tissue Continuum of Care Model
- Pain Management Advisor
Classification Tool for LBP

STarT Back Tool – Perhaps the most developed and validated

Considered as an example
Theoretical Background

Concept of subgroup & targeting for primary care low back pain

- Psychological obstacles to recovery
  - Enhanced package of care (complex)

- Physical obstacles to recovery
  - Face to face ‘conservative’ treatment

- Low risk of chronicity
  - Advice, reassurance & medication

Patients are not all the same
**STaRT Back Questionnaire**

**STaRT Back:** For these questions, please think about your back pain over the last few days.

1. How **bothersome** has pain spreading down your legs from your **back** been in the last few days?
   - Not at all
   - Slightly
   - Moderately
   - Very much
   - Extremely

   ![Rating Scale](image)

2. How **bothersome** has pain in your **shoulder** or **neck** been in the last few days?
   - Not at all
   - Slightly
   - Moderately
   - Very much
   - Extremely

   ![Rating Scale](image)

For each of the following, please cross one box to show how much you agree or disagree with the statement, thinking about the last few days.

3. In the last **few days**, I have **dressed more slowly** than usual because of my back pain.
   - Completely disagree
   - Strongly disagree
   - Slightly disagree
   - Moderately disagree
   - Slightly agree
   - Strongly agree

   ![Rating Scale](image)

4. In the last **few days**, I have only **walked short distances** because of my back pain.
   - Completely disagree
   - Strongly disagree
   - Slightly disagree
   - Moderately disagree
   - Slightly agree
   - Strongly agree

   ![Rating Scale](image)

5. It’s **really not safe** for a person with a condition like mine to be **physically active**.
   - Completely disagree
   - Strongly disagree
   - Slightly disagree
   - Moderately disagree
   - Slightly agree
   - Strongly agree

   ![Rating Scale](image)

6. **Worrying thoughts** have been going through my mind a lot of the time in the last few days.
   - Completely disagree
   - Strongly disagree
   - Slightly disagree
   - Moderately disagree
   - Slightly agree
   - Strongly agree

   ![Rating Scale](image)

7. I feel that **my back pain is terrible** and that **it is never going to get any better**.
   - Completely disagree
   - Strongly disagree
   - Slightly disagree
   - Moderately disagree
   - Slightly agree
   - Strongly agree

   ![Rating Scale](image)

8. In general, in the last **few days**, I have **not enjoyed** all the things I used to enjoy.
   - Completely disagree
   - Strongly disagree
   - Slightly disagree
   - Moderately disagree
   - Slightly agree
   - Strongly agree

   ![Rating Scale](image)

9. Overall, how **bothersome** has your **back pain** been in the last few days?
   - Not at all
   - Slightly
   - Moderately
   - Very much
   - Extremely

   ![Rating Scale](image)
Keele SBST produces two scores: Overall scores and *psych* subscale scores.
Comparison of stratified primary care management for low back pain with current best practice (STarT Back): a randomised controlled trial

Jonathan C Hill, David G T Whitehurst, Martyn Lewis, Stirling Bryan, Kate M Dunn, Nadine E Foster, Kika Konstantinou, Chris J Main, Elizabeth Mason, Simon Somerville, Gail Sowden, Kanchan Vohora, Elaine M Hay

Lancet 2011; 378: 1560-71

Use lead to better clinical outcomes

Figure 2: Mean change from baseline in RMDQ (primary outcome measure) scores at 4-month and 12-month follow-ups in all participants (A), low-risk participants (B), medium-risk participants (C), and high-risk participants (D).

RMDQ=Roland and Morris Disability Questionnaire.
### Keele STarT Back Screening Tool

<table>
<thead>
<tr>
<th>Question</th>
<th>No</th>
<th>Yes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Has your back pain spread down your leg(s) at some time in the last 2 weeks</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Have you had pain in the shoulder or neck at some time in the last 2 weeks</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Have you only walked short distances because of your back pain</td>
<td></td>
<td></td>
</tr>
<tr>
<td>In the last 2 weeks, have you dressed more slowly than usual because of back pain</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Do you think it’s not really safe for a person with a condition like yours to be physically active</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Have worrying thoughts been going through your mind a lot of the time</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Do you feel that your back pain is terrible and it’s never going to get any better</td>
<td></td>
<td></td>
</tr>
<tr>
<td>In general have you not enjoyed all the things you used to enjoy</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

**Overall, how bothersome has your back pain been in the last 2 weeks?**

<table>
<thead>
<tr>
<th>Degree</th>
<th>Not at all</th>
<th>Slightly</th>
<th>Moderately</th>
<th>Very much</th>
<th>Extremely</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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Get score

Medium Risk. Recommended action – consider referral to Physiotherapy.
STarTBack Low Back Pain Screening Questionnaire
By MSK2Media
Open iTunes to buy and download apps.

Description
Screen low back pain patients to produce better management outcomes.

Back pain remains an international challenge for primary health clinicians and suffers of back pain. Using a

MSK2Media Web Site → STarTBack Low Back Pain Screening Questionnaire Support →

...More

iPhone Screenshots
This is a simple questionnaire to help determine if your low back pain is likely to develop into an ongoing problem.

My back pain has spread down my leg(s) at some time in the last 2 weeks.

Begin

Agree

Disagree

Customer Ratings
We have not received enough ratings to display an average for the current version of this application.
Identified 8 Available Tools

Questionnaires/Surveys

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- Pain Management Advisor
Work Assessment Triage Tool (WATT)

- Web-based tool for selecting rehabilitation programs for injured workers
- Developed using Machine Learning techniques
- **Internal validity** - Higher accuracy than ‘humans’
- **External validity**: Moderate agreement compared to ‘humans’ but more likely to recommend evidence-based programs of care

https://ignitephysio.ca/watt/
### WORK ASSESSMENT TRIAGE TOOL

<table>
<thead>
<tr>
<th>Worker Job Info</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Does worker have a job to return to?</strong></td>
</tr>
<tr>
<td><strong>Occupational Category</strong></td>
</tr>
<tr>
<td><strong>Currently working</strong></td>
</tr>
<tr>
<td><strong>Modified work available</strong></td>
</tr>
<tr>
<td><strong>Worker's score (out of 10) on the Occupational Item of the Pain Disability Index (PDI). To view the PDI visit <a href="#">here.</a></strong></td>
</tr>
<tr>
<td><strong>Pain VAS out of 10 at assessment</strong></td>
</tr>
<tr>
<td><strong>Diagnosis Group</strong></td>
</tr>
<tr>
<td><strong>Does worker demonstrate pre-accident functional abilities?</strong></td>
</tr>
<tr>
<td><strong>Number of calendar days from injury to assessment</strong></td>
</tr>
<tr>
<td>Prediction from positive rules</td>
</tr>
<tr>
<td>---------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Hybrid (Functional Restoration Program with Integrated Workplace Component)</td>
</tr>
<tr>
<td>Worksite-Based Program</td>
</tr>
<tr>
<td>Provider-based (Functional Restoration Program)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Prediction from negative rules</th>
<th>Duration</th>
<th>Confidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not Complex (Chronic Pain Management Program)</td>
<td>---</td>
<td>1</td>
</tr>
</tbody>
</table>
the Decision Support System

- Spreadsheet-based database to help ergonomists better match workers with the work environment
- Designed to identify ergonomic risks for work-related upper extremity disorders
- Qualitatively tested in one study (2005)
- Developed for one specific worksite
RSI Quick Scan

• Dutch tool to evaluate risk of RSI based on work/office ergonomics

• Was not found to be cost-effective

• Still in use by ‘Arbo Unie’
WCB-Alberta Continuum of Care

• Involved 3 components:
  - Staged application of rehab services
  - Case management protocols (computerized prompts)
  - Contracted services with providers

• The impact and effectiveness of the model has been evaluated.

• Still clinically used in the WCB-Alberta system
WCB-Alberta Continuum of Care

INJURY

1 Week 4 6 8 10

18 Weeks

ONSET

Case Management

Medical Management

Active Physical Therapy

Chiropractic

RTW Assessment

Rehabilitation Options

Functional Restoration

Worksite-Based Services

Biopsychosocial Chronic Pain Management

Hybrid / Integrated Vocational Rehab
Pain Management Advisor (PMA)

- Designed to enhance management of chronic pain.

- Relies on rule-based algorithms derived from expert knowledge of pain specialists.

- Limited information available online and the corresponding author of the article was unresponsive.
Take Home Messages

• Clinical Decision-Support Tools are available that may improve patient care and outcomes

• Computer-based CDS tools are rapidly developing for use in clinical settings

• Computerized tools may in the future allow therapists to make data-informed decisions
Acknowledgements

Funding for scoping review provided by WCB-Manitoba

Co-Investigators: Ivan Steenstra, Bill Shaw, Nicola Shaw, Jan Hartvigsen, Susan Armijo-Olivo, Kelly Williams-Whitt, Christine Ha, Linda Woodhouse
“There is no reason for any individual to have a computer in their home.”

- Ken Olson, 1977
Digital Corporation
Pain Recovery Inventory of Concerns and Expectations (PRICE)

**Instructions:** The following survey will ask you about your current limitations due to back pain, your worries about recovery, and your current levels of pain and distress. Your responses will help your clinicians plan and support you. The survey consists of 40 questions that should take approximately 5-10 minutes, but you are encouraged to take your time. Please answer every question unless you find it inappropriate or irrelevant to your situation.

Today, would you find it difficult to perform the following activities because of your back pain?

<table>
<thead>
<tr>
<th>Activity</th>
<th>0</th>
<th>1</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stand up for 20-30 minutes.</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Climb one flight of stairs.</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Walk a few blocks (1000 feet).</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Walk several miles.</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Reach up to high shelves.</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Throw a ball.</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Run one block (about 300 feet).</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Take food out of the refrigerator.</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Make your bed.</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Put on socks (or pantyhose).</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Bend over to clean the bathtub.</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Move a chair.</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Pull or push heavy doors.</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Carry two bags of groceries.</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Lift and carry a heavy suitcase.</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

- **Survey for patients with back pain**
- **Consists of 46 items**
- **Targets 3 interventions**
  (Functional restoration, Workplace-based, or Chronic pain program)
PRCE Early Intervention Decision Algorithm

Initial patient consult for acute LBP (< 2 weeks)

Standard intake and evaluation

Medical red flags?

No → Conservative care and reassurance only

Yes → Treat or refer as needed

Administer and score PRCE questionnaire

Cluster A: Low risk (40%)

Cluster B: Psychological distress (20%)

Cluster C: Workplace concerns (20%)

Cluster D: Activity limitation (20%)

Supportive intervention
- Crisis management
- Assess fears and concerns
- Assess coping and support
- Case management
- Problem solving
- Cognitive-behavioral strategies

Activity intervention
- Assess pain beliefs
- Educate about LBP
- Promote return to activity
- Graded activity training
- Supervised exercise

Workplace intervention
- Inquire about job
- Assess workplace support
- Assess job demands
- Contact supervisor
- Identify RTW barriers
- Facilitate job modifications
Clinical Prediction Rules/ Clinical Algorithms

• Very popular for management of back pain

• Examples include Fritz CPR for identifying responders to manipulation and Delitto’s classification system

• We identified 38, but evaluation has shown mixed or unsuccessful results