A SYSTEMATIC REVIEW
OF
UNIDIMENSIONAL PAIN ASSESSMENT TOOLS

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• Three unidimensional pain assessment tools are currently used to measure the intensity of patient’s pain
• Patient populations are varied inclusive of adults of all ages with acute, chronic or malignant pain due to miscellaneous causes
• Pain tools must be easy to use and their purpose easy for patients with diverse backgrounds to understand
• There is also a need to establish whether there is agreement and sensitivity correlation between the tools and the patients’ preferred choice
Aim

- To evaluate the agreement and sensitivity correlation between unidimensional pain assessment tools viz.
  - visual analogue scale (VAS)
  - numeric rating scale (NRS)
  - categorical or verbal descriptor scale (VDS)
  - Faces scale
Visual Analogue Scale (VAS)

- VAS is a visual scale that allows the patient in pain to visually select a point on a 10 cm scale.

- The point selected would correspond to their personal experience of pain.

- This scale has two anchoring points as shown below:

  No pain  Worst pain ever imagined
Numeric Rating Scale (NRS)

- It is typically an 11-point (0-10) scale.
- End points are the extremes of no pain (0) and the worst pain (10).
- The patient is asked to either select the number on the scale that best represents his or her pain score.
• Comprises a list of adjectives used to denote increasing pain intensities
• The words used are no pain, mid, moderate or severe pain
• For documentation purposes these adjectives are assigned numbers

Verbal Descriptor Scale (VDS)
• A self reporting pain scale by patient used mainly for children and adults who cannot understand the other scales which need translation
• The patient chooses a face that describes how he is feeling
• The numbers corresponding to the Faces: 0, 2, 4, 6, 8, or 10 are used for documentation

FACES Scale

0  NO HURT
2  HURTS LITTLE BIT
4  HURTS LITTLE MORE
6  HURTS EVEN MORE
8  HURTS WHOLE LOT
10 HURTS WORST
Method

- Search of electronic databases (Pubmed, Ovid, Cochrane DSR, ACP Journal Club, DARE, CCTR, CINAHL, and Medline)
- Other electronic sources
- Hand review of relevant journals
- The search was confined to publications in English only
Keywords

• pain measurement tools/scales
• pain assessment tools
• descriptors of pain
• pain intensity
• VAS, NRS, VDS, and Faces scale and
• various combinations
Selection Criteria - PICO

- Cognitively intact adult patients with acute or chronic pain
- Pain intensity was measured with specified unidimensional pain scales
  - Visual Analogue Scale
  - Numerical Rating Scale
  - Verbal Descriptor Scale
  - Faces Scale
- Comparison with a validated reference tool
- Patient preference on the pain assessment tool
Results of Literature Search

- 4,587 related articles
- Sorted out 10 full text papers and 5 abstracts
- The critique reviewed
  - the population studied
  - measurements of agreement / correlation / association, clinical adequacy and patient preferences
  - Validity of the tools
<table>
<thead>
<tr>
<th>S/N</th>
<th>Study</th>
<th>Pain Scales</th>
<th>Patient / Sample</th>
<th>Measures of Agreement /Correlation/Association &amp; Outcome</th>
<th>Validity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Kaur K. &amp; Ong B.C. 2000 Singapore</td>
<td>VAS &amp; VDS</td>
<td>3 ethnic groups – Chinese, Malay &amp; Indian Convenience sampling - 1.083 post-surgical patients n = 540 Group 1 patients undergoing lower limb surgery n = 300 Group 2 patients undergoing lower abdominal surgery n = 240</td>
<td>• Spearman correlation coefficient between 0.316 &amp; 0.800 (p&lt;0.01) • VDS considered a cost effective, simple and accurate method</td>
<td>+ Applicable</td>
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<td>2</td>
<td>Jaywant S.S. and Pai A.V. 2003 Mumbai, India</td>
<td>VAS, NRS &amp; FACES</td>
<td>n = 50 Acute burn patients (2nd to 6th weeks of injury) Random presentation of pain scales</td>
<td>• Pearson correlation (1 tailed and 2 tailed) • One tailed correlation significant at p&lt;0.01 VAS/NRS 0.892 VAS/FACES 0.820 NRS/FACES 0.784 • 64% preferred NRS with FACES</td>
<td>+ Applicable</td>
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<tr>
<td>3</td>
<td>Briggs M &amp; Closs JS 1999</td>
<td>VAS &amp; NRS</td>
<td>n = 417 orthopaedic patients</td>
<td>Spearman’s rank correlation 0.79, P&lt;0.00001 (worst pain) &amp; 0.70 P&lt;0.00001 (average pain)</td>
<td>++ Applicable</td>
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<tr>
<td>4</td>
<td>Rodriguez CS, McMillan S &amp; Yarandi H. 2004</td>
<td>VAS, NRS &amp; FACES</td>
<td>Non randomized sample n = 37 patients – older adults with head and neck cancer and communication impairments post surgery</td>
<td>Stronger relationship at last measurement time (3rd time) 1. NRS-3 &amp; FPS-3 r=0.89, P=0.0001 2. NRS-3 &amp; VAS-3 r=0.75, P=0.0001 3. VAS-3 &amp; FPS-3 r=0.70, P=0.0001 Most preferred and easiest to use tool - NRS.</td>
<td>+ Applicable</td>
</tr>
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<td>5</td>
<td>Fosnocht DE, Chapman CR, Swanson ER &amp; Donaldson GW 2005</td>
<td>VAS &amp; VDS</td>
<td>Convenience sample non-Hispanic whites n = 1,499 patients – 1, 999 comparisons</td>
<td>Spearman rho correlation of the change in VAS and VDS change in pain 0.667, P&lt; 0.001 The VDS is likely to be considered the gold standard for pain assessment in the ED</td>
<td>+ Applicable for ED; may not apply to a specific population or a specific pain syndrome</td>
</tr>
<tr>
<td>Reference</td>
<td>Study Design</td>
<td>Sample Characteristics</td>
<td>Data</td>
<td>Applicability</td>
<td></td>
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<tr>
<td>Puntillo KA &amp; Neighbor ML 1997</td>
<td>NRS &amp; VDS</td>
<td>English-speaking ED patients n = 95 Spanish-speaking n = 21</td>
<td>Spearman correlations between the scores on the 2 scales were moderate to very high (rho = 0.48 to 0.96) and statistically significant (p &lt; 0.05 to p &lt;0.001) at each of the 7 time periods. English speaking preferred the NRS (50) over the VDS (35) and Spanish speaking preferred the VDS (11) over the NRS (9). Not statistically significant.</td>
<td>+ Applicable</td>
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<tr>
<td>Stuppy DJ 1998</td>
<td>VAS, NRS, VDS &amp; FACES</td>
<td>Convenience sample n = 60 African American – 24 Caucasian – 36</td>
<td>FACES &amp; VAS r = 0.829 FACES &amp; NRS r = 0.95 FACES &amp; VDS r = 0.81 P&lt; 0.001 n=32, 53.3% preferred FACES n=18, 30% preferred NRS</td>
<td>+ Applicable</td>
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<td>Paice, J &amp; Cohen, F 1997, 1997</td>
<td>VAS, NRS &amp; VDS</td>
<td>Convenience sample n = 50 hospitalised adult patients with cancer</td>
<td>Spearman correlation VAS &amp; NRS r = 0.847, p&lt; 0.001 VAS &amp; SDS r = 0.708, p &lt; 0.001. Preference 50% - NRS 38% - SDS 12% - VAS</td>
<td>++ Applicable</td>
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<tr>
<td>Taylor LJ &amp; Herr K. 2003</td>
<td>NRS, VDS &amp; FACES</td>
<td>Convenience sample n = 57</td>
<td>Spearman rank correlation coefficient r = 0.81 to 0.96 in cognitively intact. r = 0.74 to 0.83 in cognitively impaired Preference Faces Scale</td>
<td>+ Applicable</td>
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<tr>
<td>Randall et al. 2004</td>
<td>VAS &amp; NRS</td>
<td>n = 85 consecutive patients with chronic pain</td>
<td>Pearson correlation coefficient r= 0.906 and p value (&lt;0.0001)</td>
<td>++ Applicable</td>
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<tr>
<td>6</td>
<td>Soh G &amp; Ang HG 1992</td>
<td>VAS &amp; VDS</td>
<td>n = 79 cancer patients</td>
<td>High correlation</td>
<td>Applicable</td>
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<tr>
<td>7</td>
<td>Holdgate A, Asha S, Craig J and Thompson J 2003</td>
<td>VAS &amp; NRS</td>
<td>n = 79 Australians</td>
<td>r = 0.95, 95% CI</td>
<td>Applicable</td>
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<tr>
<td>8</td>
<td>Freeman K, Smyth C, Dallam L &amp; Jackson B</td>
<td>VAS &amp; FACES</td>
<td></td>
<td>R = 0.92</td>
<td>Applicable</td>
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<tr>
<td>9</td>
<td>Koshy RC, Kuriakose 2004</td>
<td>VAS &amp; VDS</td>
<td>n = 99</td>
<td>VAS preferred tool</td>
<td>Applicable</td>
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<td>10</td>
<td>Hollen PJ et al 2004</td>
<td>VAS &amp; NRS</td>
<td>n = 68</td>
<td>Cronbach’s alpha 0.89</td>
<td>Applicable</td>
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</table>
## Review of Pain scales

### Comparison: VAS – NRS correlation

<table>
<thead>
<tr>
<th>Model</th>
<th>Study name</th>
<th>Statistics for each study</th>
<th>Correlation and 95% CI</th>
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<tbody>
<tr>
<td></td>
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<td>Lower 95% CI</td>
<td>Upper 95% CI</td>
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<td>Fixed (pooled)</td>
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<tr>
<td></td>
<td>Stuppy 1998</td>
<td>0.80</td>
<td>0.68</td>
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<td></td>
<td>Holdgate 2003</td>
<td>0.95</td>
<td>0.92</td>
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<tr>
<td></td>
<td>Jaywant 2003</td>
<td>0.91</td>
<td>0.86</td>
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<td></td>
<td>Randall 2004</td>
<td>0.71</td>
<td>0.49</td>
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<tr>
<td></td>
<td>Rodriguez 2004</td>
<td>0.89</td>
<td>0.87</td>
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<tr>
<td>Random (pooled)</td>
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</table>

Meta Analysis
Results

- VAS was used as the gold or validated reference standard in 8 studies
- Two used the NRS
- All studies showed positive correlation analysed by Spearman’s rank correlation or Pearson correlation tests
- Correlation coefficients ranged from moderate to high 0.316 to 0.96 with statistical significance of \( p < 0.01 \) to \( p < 0.001 \)
- 6 papers studied patient preferences
  - NRS was rated by subjects to be the most preferred and easiest pain assessment tool.
  - In one study the non-speaking patients preferred the VDS scale more whereas the English speaking preferred NRS
  - Faces scale was the preferred tool in one study which compared all 3 unidimensional scales (NRS, VDS & Faces)
Abstracts

- VAS was reference standard
- 2 studies showed high correlation coefficients $r = 0.92$ ($p<0.05$) and 0.95
- Another study had a Cronbach alpha value of 0.89
- All abstracts mentioned similar high correlation
• Findings were consistent in all the studies covering both medical and surgical disciplines
  - Emergency Department
  - Post surgery
  - Orthopaedic
  - Oncology
  and different ethnic groups
• Majority found VAS difficult to understand and surgical patients in particular found it physically problematic
• The three pain assessment tools are all valid measurements of pain intensity for patients
• Numerical rating scale is the first choice among patients
Thank You

• ADNs Kaldip Kaur & Tracy Ayre
• Dr Edwin Chan
• NCJC members