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:

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| No pain | Worst pain ever imagined |
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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
• 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.
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>
</tr>
<tr>
<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>
</tr>
<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>
</tr>
<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>
<tr>
<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></td>
<td>Author(s)</td>
<td>Tools</td>
<td>Description</td>
<td>Methodology</td>
<td>适用性</td>
</tr>
<tr>
<td>---</td>
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<td>-----------------------------------------------------------------------------</td>
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<tr>
<td>6</td>
<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>+</td>
</tr>
</tbody>
</table>
| 7 | Stuppy DJ 1998             | VAS, NRS, VDS & FACES | Convenience sample n = 60 African American – 24 Caucasian – 36 | FACES & VAS r = 0.829  
FACES & NRS r = 0.95  
FACES & VDS r = 0.81  
P< 0.001  
n=32, 53.3% preferred FACES  
n=18, 30% preferred NRS | +    |
| 8 | Paice, J & Cohen, F 1997, 1997 | VAS, NRS & VDS | Convenience sample n = 50 hospitalised adult patients with cancer | Spearman correlation  
VAS & NRS r = 0.847, p< 0.001  
VAS & SDS r = 0.708, p < 0.001.  
Preference  
50% - NRS  
38% - SDS  
12% - VAS | ++   |
| 9 | Taylor LJ & Herr K. 2003   | NRS, VDS & FACES | Convenience sample n = 57 | 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 | +    |
<p>| 10| Randall et al. 2004        | VAS &amp; NRS | n = 85 consecutive patients with chronic pain | Pearson correlation coefficient r= 0.906 and p value (&lt;0.0001) | ++   |</p>
<table>
<thead>
<tr>
<th></th>
<th>Study Authors</th>
<th>Assessment Tools</th>
<th>n</th>
<th>Correlation Measure</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<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>
</tr>
<tr>
<td>7</td>
<td>Holdgate A, Asha S, Craig J, Thompson J 2003</td>
<td>VAS &amp; NRS</td>
<td>n = 79 Australians</td>
<td>r = 0.95, 95% CI</td>
<td>Applicable</td>
</tr>
<tr>
<td>8</td>
<td>Freeman K, Smyth C, Dallam L, Jackson B</td>
<td>VAS &amp; FACES</td>
<td>R = 0.92</td>
<td>Applicable</td>
<td></td>
</tr>
<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>
</tr>
<tr>
<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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</tbody>
</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>95% CI</th>
<th>95% CI</th>
<th>Correlation and 95% CI</th>
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</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Lower</td>
<td>Upper</td>
<td>No of subjects</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Random</td>
<td>Stuppy 1998</td>
<td></td>
<td>0.80</td>
<td>0.68</td>
<td>0.87</td>
</tr>
<tr>
<td></td>
<td>Holdgate 2003</td>
<td></td>
<td>0.95</td>
<td>0.92</td>
<td>0.97</td>
</tr>
<tr>
<td></td>
<td>Jaywant 2003</td>
<td></td>
<td>0.89</td>
<td>0.82</td>
<td>0.94</td>
</tr>
<tr>
<td></td>
<td>Randall 2004</td>
<td></td>
<td>0.91</td>
<td>0.86</td>
<td>0.94</td>
</tr>
<tr>
<td></td>
<td>Rodriguez 2004</td>
<td></td>
<td>0.71</td>
<td>0.49</td>
<td>0.84</td>
</tr>
<tr>
<td>Fixed</td>
<td></td>
<td></td>
<td>0.89</td>
<td>0.87</td>
<td>0.91</td>
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<td></td>
<td></td>
<td></td>
<td>0.88</td>
<td>0.78</td>
<td>0.93</td>
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</table>

**Meta Analysis**

- Positive correlation
- Negative correlation
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)
• 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