Editorial

Numerical rating scale for self-report of pain intensity in children and adolescents: Recent progress and further questions

1. Introduction

Until very recently there has been an anomaly in the assessment of the intensity of pediatric pain. The most commonly used self-report scale is the one that, up to now, has had the smallest amount of supportive research. This scale, the numerical rating scale (NRS), is administered by asking patients to say a number, usually from 0 to 10, to express the intensity of their pain.

Compared with well-known published scales such as the Faces Pain Scale – Revised, Wong-Baker FACES Pain Rating Scale, Oucher, Coloured Analogue Scale, and Pieces of Hurt, the NRS has the great advantage of requiring only a verbal interaction between the clinician and child, without the necessity for paper or plastic materials which can raise concerns about purchase, storage, distribution, and infection control.

The NRS is well established with adults (Dworkin et al., 2005). However, very few studies before 2009 have reported using the NRS with children and adolescents, or have provided data supporting the use of this scale. Stinson et al. (2006), in their landmark systematic review of self-report measures, wrote:

Another key area for future research is the standardization and validation of a verbally administered 11-point numerical rating scale given its wide use in clinical practice. This measure should be studied using experimental and clinical pain stimuli over a wide age range and types of pain. It is also important to determine the responsibility of this measure to analgesic administration for acute procedural and post-operative pain. Finally, the relative superiority of verbal or graphic numerical rating scales needs to be addressed (p. 154).

Miró et al. (in press), in a paper in this issue, have responded to the call of Stinson et al. (2006). In a methodologically sophisticated sequence of studies, they have provided excellent data supporting the use of the NRS. Briefly, they carried out a study with 175 schoolchildren aged 8–12, and another study with 63 children undergoing surgery aged 6–16. They report very promising data on discriminant, concurrent, and predictive forms of validity, as well as acceptability to children. The NRS appeared to be functionally very similar to their comparison measure, the Faces Pain Scale – Revised. Miró et al. conclude:

In both studies, measuring the pain intensity in children with the NRS-11 was simple because it was easy to use and score and did not require any equipment. It was also easily understood by the participants, did not take too much of the researcher’s time and was well accepted by the children. Consequently, the NRS-11 could easily be integrated into practice and research. In short, the NRS-11 seems to be appropriate for both clinical and research applications in young people (for example, it would be a good choice for epidemiological and clinical research studies that use telephone interviews) Miró et al. (in press).

The findings and conclusions of Miró et al. nicely complement those of another recent publication (von Baeyer et al., 2009). In that article three separate datasets are reported, two with surgical patients and one with children recalling immunization pain, all also showing good support for use of the NRS with children and adolescents. The scales used for comparison with the NRS were the Faces Pain Scale – Revised and the Visual Analog Scale.

The main questions remaining for study of the NRS have to do with (a) instructions for administration; (b) the top verbal anchor or definition of the meaning of 10/10 on the scale; (c) the minimum age at which most children are able to use the NRS; and (d) the question of screening children to determine whether they are able to use the NRS.

2. Instructions for administration

There are as yet no widely accepted and standardized instructions for administration of the NRS. The clinician says something like, “I’d like you to tell me a number to show how much pain you have. Zero would be no pain at all, and 10 would be the worst pain.” Examples of variations on this wording, collected from clinicians via an e-mail survey in April, 2009, are shown in Table 1.

The instructions can be seen to vary in vocabulary (e.g., in use of words like “scale” that may not be meaningful in the intended sense to younger children) and especially in the wording of upper anchors. Research will be needed to identify standard instructions that are clearly understood by most children over a wide age range.

3. Verbal anchors for highest pain level

As seen in Table 1, clinicians use a wide variety of words and phrases to explain the meaning of a score of 10/10 on the NRS. Such phrases vary as to complexity and concreteness. This contrast is illustrated, for example, between the phrase “very, very big pain” and the phrase “worst pain you can imagine ever having, like an elephant ripping off your arm.” Although the upper anchors have been used interchangeably in clinical settings, and have been considered

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*Commentary on: EURPAIN-d-09-00179r2 Evidence for the use of a numerical rating scale to assess the intensity of pediatric pain by Jordi Miró, Elena Castarlenas, and Anna Huguet.*
variations on a definition of maximum pain, it is likely that the different wordings are interpreted by patients to have quite different meanings. The following actual conversation between a mother (a member of my research group) and her 8-year-old daughter nicely illustrates the effect of varying anchors (personal communication).

<table>
<thead>
<tr>
<th>Preliminary words</th>
<th>Anchors</th>
<th>Additional words and notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>On a scale of 0–10 where</td>
<td>0 is no pain and 10 is the worst pain you can imagine</td>
<td>What is your pain now; on average; worst; lowest</td>
</tr>
<tr>
<td>What is your pain on a scale of 0–10?</td>
<td>0 is no pain at all and 10 is the worst possible pain you could have</td>
<td>Some people will add in extra things to accentuate the 10 – like you can’t live with it, gut-wrenching, you’re in total agony and then also factor in some of their own grimacing facial expressions to drive home the point. Very rarely, some add that 5 is kind of in the middle</td>
</tr>
<tr>
<td>Using a number from 0 to 10, tell me how much pain you have right now</td>
<td>0 would mean that you have no pain, and 10 would mean that you have the worst, or most, pain you could imagine</td>
<td>Tell me how much pain you have when you move (cough, turn etc). Have you ever had a 10/10?</td>
</tr>
<tr>
<td>I’d like to know how strong the pain is. Can you give me a number for the pain (right now/at its worst/at its best)</td>
<td>If 0 is no pain and ten is the worst pain you’ve ever had or you can imagine?</td>
<td>I often hear other providers trying to give the kids an example of the worst possible pain, such as arm being ripped off or hot poker to the eye</td>
</tr>
<tr>
<td>How much pain are you having between 0 and 10</td>
<td>If 0 is no pain and 10 is the worst pain you can imagine?</td>
<td></td>
</tr>
<tr>
<td>On a scale of 0–10 with</td>
<td>0 being no pain and 10 having the worst pain you can imagine ever having, like an elephant ripping off your arm</td>
<td>What number is your pain now?</td>
</tr>
<tr>
<td>Tell me on a scale 0–10 what is the level of your pain</td>
<td>0 is no pain and 10 is the worst possible pain</td>
<td></td>
</tr>
<tr>
<td>If</td>
<td>0 is ‘no pain at all’ and 10 is ‘the worst pain you can imagine’</td>
<td>What number would you give your pain?</td>
</tr>
<tr>
<td>To understand your pain better (to understand how much you hurt) we suggest you give your pain a score (number, rating)</td>
<td>At 0 you don’t have any hurt at all. At 10 it’s a very, very big pain</td>
<td></td>
</tr>
<tr>
<td>If</td>
<td>0 is no pain or achiness and 10 is the most pain or achiness</td>
<td>How much do you have in your back?</td>
</tr>
<tr>
<td>For older children and adolescents, 11+</td>
<td>0 would be no pain at all, and 10 would be worst pain</td>
<td></td>
</tr>
<tr>
<td>I’d like you to tell me a number to show how much pain you have</td>
<td>What number would you give your pain when you have the most pain? (least, usual, right now)</td>
<td></td>
</tr>
<tr>
<td>For younger children, 8–10 years</td>
<td>0 is no pain or no hurt. 10 would be the most hurt or the worst hurt</td>
<td>Which number would show how big your hurt is? (worst, least, etc.)</td>
</tr>
<tr>
<td>Pretend we have a ruler with numbers to show</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

While a few studies have examined the effects of varying pictorial anchors on faces scales (e.g., Chambers and Craig, 1998), we are not aware of any published studies on verbal anchors suitable for use with children.

4. Minimum age for use of NRS

Little research is available to identify at what age most children are able to make valid use of the NRS. Use of numbers for scaling requires not only the ability to count by rote, but also to estimate quantities using numbers. Estimation of quantities is typically taught in schools beginning around the second or third year of primary education (e.g., Saskatchewan Education, 2008). I believe that there is a general consensus among clinicians (supported by the Internet survey mentioned above) that 8 or 9 years is an appropriate minimum age for use of the NRS. That consensus should be examined by attempting to teach use of the NRS to children from age 5 to 11 years to estimate quantities (not necessarily only of pain), testing the hypothesis, for example, that the proportion of children who succeed will increase rapidly over that age span and will exceed 50% by age 8.

5. Screening of children to determine whether they can use the NRS

Clinicians are often unsure as to whether they can rely on children’s self-reports of their pain intensity, particularly when the scores are very high. They may be tempted to dismiss these ratings as exaggeration or as a reflection of not understanding the scale. Thus, it would be desirable to have a way to screen children to determine whether they understand the scale and can use it reliably. Unfortunately, no adequate screening tool has yet been identified to accomplish this goal (Besenski et al., 2007). For the present, when self-report scores are in doubt, it is wise to complement them with observational intensity scores and to take the context of the child’s ratings into account (von Baeyer, 2009).
6. Conclusion

The numerical rating scale, like all self-report pain scales, has limitations. Scores are subject to many social, cognitive, and contextual influences. In particular, the user should remember that scores are meaningful within patients over time, and not necessarily across patients. A child who scores 10/10 may not have more severe pain than a child who scores 6/10, because the two children may understand the scale or its anchors differently. However, a change over time in either child’s scores will often be meaningful.

Pending further research on instructions, anchors, age range, and screening, I conclude with Miró et al. that the NRS has major practical advantages in terms of not requiring any physical materials and in terms of widespread acceptance in clinical practice. With the supportive data provided by Miró et al., its use can now be tentatively recommended.

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