



Clinical pain research

## How do medical students use and understand pain rating scales?

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### HIGHLIGHTS

- Medical students refer to their own worst pain when rating another's afterwards.
- Medical students' clinical exposure did not affect pain estimates.
- Facial expression was the most frequently reported indicator of maximum pain.
- Medical students preferred the numerical rating scale over other pain scales.

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### ABSTRACT

**Background and aims:** Pain is a multidimensional experience that is difficult to describe and to assess. To scale current pain, assessment refers to a maximum level of pain, but little is known about this process. Further, clinicians tend to underestimate patients' pain, with or without patients' own reports, and to underestimate to a greater extent with more clinical experience, possibly due to recalibration of a personal pain scale with increasing exposure to severe pain. We sought to determine how medical students rated pain in early years of clinical exposure, and in relation to experience of their own and others' worst pains.

**Methods:** An online survey sampled medical students' rating and description of their own worst pain and of that witnessed in another; also what would cause the maximum level of pain and what behaviours characterised it. Last, they indicated their preference among pain scales.

**Results:** Thirty-six medical students provided responses, the majority in their first six months of clinical exposure. Students' own worst pain was rated a mean of 6.7/10 (s.d. 1.6) on a numerical scale; causes were diverse but with many bone fractures. Mean worst pain observed in another was rated 8.6/10 (s.d. 1.4); causes included fractures, gallstones, and sickle cell crises. Another's worst pain was significantly higher (mean 9.4, s.d. 0.8 vs mean 8.0 s.d. 1.4) when rated after the student's own pain than before it (presentation order randomised).

We found no effect of clinical exposure on estimation of worst pain in another person, nor was there a personal tendency to rate pain using more or less extreme values. Students expected pain of 10/10 to be presented with many verbal, facial and whole body behaviours, and signs of physiological stress. Collectively, behavioural descriptions were rich and varied, but with many incompatibilities: for instance, between 'writhing' and 'rigidity' expected in the person with extreme pain. Most students preferred the numerical rating scale over visual analogue and verbal scales.

**Conclusions:** The study requires replication, particularly for clinical experience, where we found no significant difference in estimation of another's pain over the first three years of medical students' clinical exposure, but the comparison was underpowered. Despite no systematic individual difference in using pain ratings, there was a marked effect of rating another's worst pain higher when the rater had previously rated his/her own worst pain. This suggests anchoring estimate of another's pain in personal pain experience, and a possible way to mitigate clinicians' underestimation of patients' pain.

Medical students' recognition of the importance of facial expression in indicating another's pain severity was encouraging, but most students anticipated only a narrow range of behaviours associated with extreme pain, thereby excluding other authentic behaviours.

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**Implications:** Many clinical guidelines mandate regular pain assessment for hospital inpatients, and encourage routine assessment in community and outpatient settings, in order to decide on and monitor treatment. Replication and elaboration of this study could extend our understanding of how clinicians interpret pain scales completed by patients, and how they estimate patients' pain.

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## 1. Introduction

The widely accepted pain definition, 'an unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage' [1], has an accompanying note emphasising subjectivity of pain and the central place of self-report. There is no necessary association between physical findings and intensity of pain, particularly in chronic pain [2,3]. Given common processes, whatever its origins, chronic pain could arguably be considered a disease in its own right, without reference to presumed pathology [4].

Multiple pain self-report methods are in common use, in clinical and research settings [5,6]; commonest are the visual analogue scale (VAS), numerical rating scale (NRS), and verbal rating scale (VRS) [6,7]. All are generally described as having satisfactory reliability, validity and sensitivity to change [8,9], with thoughtful methods of deriving cutpoints or percentages of clinically significant change with treatment [10,11]. However, there is no agreement on important elements such as the timescale for the rating [12], nor the wording of the crucial upper limit [5], and little is known of the internal processes or external influences by which the person in pain approximates that multidimensional experience in a unidimensional score [13–15].

Independent of self-report, observers, particularly clinicians, make their own estimations of pain in others. While this can be helpful for those who are unable to report their pain (through cognitive underdevelopment or impairment), it is subject to systematic biases [16], commonly underestimation [16,17]. These biases may arise from patient characteristics such as sex, ethnicity, and status [16,18,19]; presence or absence of medical evidence [20]; or from observer characteristics such as doubt about the authenticity of pain [21], empathy [22], or length of experience [17]. These biases are somewhat resistant to correction by exposure to the patient's rating [23]. Treatment decisions [24,25] may be based on irrelevant information [26] although facial expression offers a reliable basis for observational judgement [27].

However, little is known about how clinicians' own experience informs their estimation of others' pain, and their interpretation of the upper end of pain intensity scales. Estimation of others' pain tends to become more conservative with experience [17], possibly because clinicians recalibrate internal reference points as they become habituated to observing intense pain through clinical experience [28]. We investigated possible bias in medical students' ratings of pain in their early exposure to clinical experience; in relation to their personal experience of pain; and to their exposure to patients' pain. Specifically, we asked:

- 1 Is there individual bias to higher or lower ratings for students' own pain?
- 2 Does increasing exposure to patients produce lower ratings of others' pain?

- 3 Is there a relationship between rating of students' own worst pain and others' worst pain?
- 4 What do students look for in others to indicate maximum pain?

## 2. Materials and methods

Ethics approval was granted by the University Departmental Ethics Committee (UCL CEHP/2014/527). UCL medical students in years 4 to 6, their first three years of intensive clinical exposure, were recruited via advertising on UCL medical student Facebook pages and through social networks. Using the ANOVA power calculator, a medium effect size of  $F=0.5$ , an  $\alpha$  error probability of 0.05, and an estimated power of 0.811, a minimum sample size of 27 was calculated [29].

The invitation to participate contained a link to an online survey presented using Qualtrics survey software [30]. Following information about the survey, consent consisted of clicking on 'Yes, I wish to take part in the survey'. First, the participant was asked if s/he was a medical student, and in which year. Then there followed 8 forced-choice and 4 free response questions marked \* below, the latter provided with an expandable text box (see [Supplementary File](#)).

The questions fell into three main areas: the participant's own experience of pain (\*cause of own worst pain, rating of worst pain experienced on NRS, \*what would pain rated 10 feel like if participant had not rated own worst pain 10/10; rating of most recent vaccination on NRS; rating of worst pain on VRS; rating of worst pain experienced on VAS); ranked preference of the three scales; the participant's experience of worst pain in another person (\*cause of worst pain observed in another person, estimation of that pain on NRS, and \*how the participant would know when another person was experiencing pain of 10/10). There were two orders of questions (questions about the participant's pain before or after those about observed pain), assigned to participants at random order.

The NRS presented for self and other had the anchors 'no pain' at 0 and 'extreme pain' at 10. The VAS was a single line with a movable slider to mark the point representing pain, with the same anchors as the NRS. The VRS used the following unnumbered but ordered categories: no pain, mild pain, moderate pain, severe pain, very severe pain.

Data were collected automatically by the Qualtrics system and downloaded as an Excel file. Quantitative data were checked for normal distribution (using the Kolmogorov–Smirnov test) and appropriate tests applied [31]. Qualitative data from free text responses were analysed using concepts from thematic analysis [32] but were not sufficiently rich for full thematic analysis. Repeated themes and meanings were sought in reading and re-reading responses, and were independently categorised by both authors who then reached consensus.

A technical error occurred for the worst pain rating using the VAS: disabling the numeric component of the slider (since visible numbers would have changed the VAS into a numerical scale)

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